The Administrator of the Federal Aviation Administration and acting Administrator of the Transportation Security Administration signed this notice of proposed rulemaking, and FAA submitted it for publication in the Federal Register. This is not the official version as the Office of the Federal Register may have edits as part of its publication process. Refer to the official version in a forthcoming Federal Register publication: www.federalregister.gov.
BILLING CODE 4910-13-P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Parts 36, 43, 45, 48, 89, 91, 107, 108, 119, 133, 135, 137, and 146

[Docket No. FAA-2025-1908; Notice No. 25-07]

RIN 2120–AL82

DEPARTMENT OF HOMELAND SECURITY

Transportation Security Administration

49 CFR Parts 1540 and 1544

RIN 1652-AA80

Normalizing Unmanned Aircraft Systems Beyond Visual Line of Sight Operations

AGENCY: Federal Aviation Administration (FAA), Department of Transportation, and Transportation Security Administration (TSA), Department of Homeland Security.

ACTION: Notice of proposed rulemaking (NPRM)

SUMMARY: This action proposes performance-based regulations to enable the design and operation of unmanned aircraft systems (UAS) at low altitudes beyond visual line of sight (BVLOS) and for third-party services, including UAS Traffic Management (UTM), that support these operations. The FAA Reauthorization Act of 2024 directs the development of this proposed rule. This proposed rule is necessary to support the integration of UAS into the national airspace system (NAS). This proposed rule is intended to provide a predictable and clear pathway for safe, routine, and scalable UAS operations that include package delivery, agriculture, aerial surveying, civic interest, operations training, demonstration, recreation, and flight testing. TSA proposes to make

complementary changes to its regulations to ensure it can continue to impose security measures on these operations under its current regulatory structure for civil aviation.

DATES: Send comments on or before [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: Send comments identified by docket number FAA-2025-1908 using any of the following methods:

- Federal eRulemaking Portal: Go to https://www.regulations.gov/ and follow the online instructions for sending your comments electronically.
- Mail: Send comments to Docket Operations, M-30; U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE, Room W12-140, West Building Ground Floor, Washington, DC 20590-0001.
- Hand Delivery or Courier: Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- Fax: Fax comments to Docket Operations at (202) 493-2251.

Docket: Background documents or comments received may be read at https://www.regulations.gov/ at any time. Follow the online instructions for accessing the docket or go to the Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Michelle Ferritto, ARM-100, Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20592; Phone: Phone: 844 359-6982; Email: 9-FAA-UAS-BVLOS-Rule@faa.gov.

SUPPLEMENTARY INFORMATION:

List of Abbreviations and Acronyms Frequently Used in This Document

AAM	Advanced Air Mobility
AC	Advisory Circular
ACAS	Airborne Collision Avoidance System
ADS-B	Automatic Dependent Surveillance-Broadcast
AE	Associated Elements
AGL	Above Ground Level
API	Application Programming Interface
ARC	Aviation Rulemaking Committee
ASOS	Automated Surface Observing System
ASRS	Aviation Safety Reporting System
ATC	Air Traffic Control
ATM	Air Traffic Management
AWOS	Automated Weather Observing System
BVLOS	Beyond Visual Line of Sight
C2	Command-and-Control
CBI	Confidential Business Information
CFR	Code of Federal Regulations
CMSA	Conformance Monitoring for Situational Awareness

COA	Certificate of Waiver or Authorization
COMAT	Company Materials
ConOps	Concept of Operations
COS	Continued Operational Safety
DAA	Detect and Avoid
DOC	Declaration of Compliance
DOT	Department of Transportation
DSS	Discover and Synchronization Service
EASA	European Union Aviation Safety Agency
EC	Electronic Conspicuity
FAA	Federal Aviation Administration
FRIA	FAA-Recognized Identification Areas
FSDO	Flight Standards District Office
GA	General Aviation
GCS	Ground Control Station
GPS	Global Positioning Systems
HAZMAT	Hazardous Materials
HIRF	High Intensity Radiated Field
HME	Hazardous Materials Endorsement
HMR	Hazardous Materials Regulations
IBR	Incorporation by Reference
ICAO	International Civil Aviation Organization
IRFA	Initial Regulatory Flexibility Analysis

IUEI	Intentional Unauthorized Electronic Interaction
JARUS	Joint Authorities for Rulemaking on Unmanned Systems
LAANC	Low Altitude Authorization and Notification Capability
MAIS	Maximum Abbreviated Injury Scale
METAR	Meteorological Aerodrome Report
MIT/LL	Massachusetts Institute of Technology Lincoln Laboratory
MOA	Memorandum of Agreement
MOC	Means of Compliance
MOPS	Minimum Operational Performance Standards
MOSAIC	Modernization of Special Airworthiness Certification
NAICS	North American Industry Classification System
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
nm	Nautical Miles
NOTAM	Notice to Airmen
NPRM	Notice of Proposed Rulemaking
NTSB	National Transportation Safety Board
NWS	National Weather Service
OMB	Office of Management and Budget
OpSpecs	Operation Specifications
OST	Office of the Secretary of Transportation
PAO	Public Aircraft Operation
PHMSA	Pipeline and Hazardous Materials Safety Administration

PNT	Positioning, Navigation, and Timing
POI	Principal Operations Inspector
RFA	Regulatory Flexibility Act
RPA	Rule of Particular Applicability
SAC	Special Airworthiness Certificate
SARPS	Standards and Recommended Practices
SBA	Small Business Administration
SDSP	Supplemental Data Service Provider
SMS	Safety Management System
SOH	State of Health
SORA	Specific Operations Risk Assessment
SPSO	Service Provider Standard Order
SRA	Safety Risk Assessment
STA	Security Threat Assessment
STEM	Science, Technology, Engineering, and Mathematics
sUAS	Small UAS
SUI	Simplified User Interaction
sXu	System X for sUAS
TAF	Terminal Area Forecast
TRACON	Terminal Radar Approach Control
TSA	Transportation Security Administration
TSO	Technical Standards Order
UA	Unmanned Aircraft

UAS	Unmanned Aircraft System
UAT	Universal Access Transceiver
UES	Universal Enrollment Service(s)
UFT	UTM Field Test
UPP	UTM Pilot Program
USS	Unmanned Aircraft System Service Supplier
USSP	U-Space Service Provider
UTM	Unmanned Aircraft System Traffic Management
VLOS	Visual Line of Sight
VSL	Value of Statistical Life
VTOL	Vertical Takeoff and Landing
xTM	Extensible Traffic Management

Table of Contents

<u>I. Executive Summary</u>

A. Purpose of this Regulatory Action

This action proposes performance-based regulations for the design and operation of unmanned aircraft systems (UAS) beyond visual line of sight (BVLOS) and for third-party services that support these operations, including UAS Traffic Management (UTM).

The purpose of this proposed rule is to enable the expansion of BVLOS UAS operations for commercial and recreational purposes at low altitudes in the national airspace system (NAS).[1] To date, the Federal Aviation Administration (FAA) has allowed some such operations through individualized exemptions and waivers to existing regulations. This NPRM leverages lessons learned from individual exemptions and waivers to create the repeatable, scalable regulatory framework FAA proposes here that would allow for wide-scale adoption of UAS technologies. This proposed rule would be the next phase of integrating UAS into the NAS and provide a predictable and clear pathway for operators to conduct expanded operations safely. Further, this proposed rule's Automated Data Service requirements would provide clarity for manufacturers and service providers producing UAS and offering key enabling services, such as UTM, to UAS operators. FAA anticipates that this proposed rulemaking will allow operators to conduct a variety of operations, including package delivery, agriculture, aerial surveying, civic interest (to include wildfire recovery, wildlife conservation, and public safety), flight training, demonstration, flight testing, and recreation.

Since the promulgation of 2016's operating requirements for small UAS in part 107, FAA has sought to incorporate more complex operations (*e.g.*, larger, and more automated aircraft operating BVLOS of the operator) safely into the NAS through appropriate regulatory means. In June 2021, FAA chartered the UAS BVLOS Aviation Rulemaking Committee (ARC), soliciting recommendations to support a regulatory framework reflective of the technological capabilities of UAS. In March 2022, the ARC

---

[1] Pursuant to 5 U.S.C. 553(b)(4), FAA has provided a summary of this proposed rule in the docket for 2120-AL82, *available at* www.regulations.gov.

provided FAA with recommendations on how BVLOS operations could be safely integrated into the NAS.

Further, in May of 2024, Congress passed FAA Reauthorization Act of 2024 (Public Law [Pub. L.] 118-63). Section 930 of Pub. L. 118-63 directs the FAA Administrator to issue a notice of proposed rulemaking (NPRM) and subsequent final rule establishing a performance-based regulatory pathway for UAS to operate BVLOS. In addition, section 932 directs the FAA Administrator to establish procedures to approve third-party service suppliers of UTM. As part of its ongoing efforts to integrate UAS operations into the NAS, and pursuant to 49 U.S.C. 44807, the FAA Administrator is proposing to amend FAA regulations to adopt specific rules for BVLOS operations of UAS in the NAS.

Based on its experience over the past few years with enabling limited BVLOS operations through exemption or waiver and with the comprehensive set of recommendations from the UAS BVLOS ARC, FAA has developed the framework proposed in this rule to enable routine and scalable BVLOS operations in the NAS. This proposed framework would accommodate technologies as they evolve and mature using a performance-based regulatory framework.

In addition, the Transportation Security Administration (TSA) is proposing revisions to its regulations to ensure that the decision to regulate these UAS operations under part 108 does not inadvertently create a security gap under TSA regulations. Under this proposal, which has been developed in consultation with FAA, TSA would continue to ensure the security of the national airspace by imposing appropriate security requirements. TSA notes that in the sections of this preamble related to package delivery operations, TSA has included a request for comment regarding potential security program applicability in a final rule. This request for comment relates to a broader set of activities than package delivery operations. While FAA and TSA are issuing a joint proposed rulemaking, the agencies intend to concurrently issue separate final rules.

B. Overview of the Proposed Rule

This proposed rule would establish requirements for conducting UAS BVLOS operations in United States airspace. FAA anticipates many, though not all, operations under proposed part 108 will be commercial. This action would normalize certain low altitude UAS operations and expedite the introduction of BVLOS UAS operations in the NAS while ensuring the safety and efficiency of United States airspace. This proposed rule is the next step in integrating UAS into the NAS, which FAA anticipates would provide safety, societal, and economic benefits.

Section II of this preamble details the legal authority for this rulemaking, while section III of this preamble provides a background of prior rulemakings and policy efforts FAA has undertaken to allow UAS operations in the United States. Section IV of this preamble describes the approach FAA has proposed to integrate BVLOS UAS operations, including the novel approaches to authorizing aircraft and personnel proposed under part 108 and the framework for third-party service suppliers proposed by part 146. Section V of this preamble describes the operational requirements applicable to all BVLOS operations conducted under part 108. These general operating requirements include the administrative requirements for the two tiers of operational authorization, permits and certificates, as discussed in section VIII of this preamble. Section VI of this preamble outlines FAA's approach for airspace management, including requirements for strategic deconfliction, detect and avoid (DAA), operations in uncontrolled and controlled airspace, operations over people, operations of multiple aircraft, and other conditions for safe operation.

This rule proposes a novel structure for operations personnel, as discussed in section VII of this preamble. Under this proposal, FAA would not require airman certificates but would require each operator – both permitted and certificated – to have an operations supervisor responsible for the overall safety of the operation. In addition, FAA proposes that operators must have qualified flight coordinators, who are individuals responsible for monitoring and, if necessary, intervening in an operation to ensure safe conditions. Whereas the operations supervisor has operational control over the entire operation, the flight coordinator(s) would have tactical oversight of individual aircraft.

FAA anticipates that the operations conducted under part 108 would have a variety of operational personnel positions and therefore does not propose to require any additional operations personnel positions. All operators would be responsible for identifying the necessary operations personnel to ensure the safety of the operation, in addition to ensuring that the operations personnel have the necessary knowledge and skills for their role. In this manner, responsibility is tied to the company operating the UAS rather than an individual that has limited control of the actual operation and can be removed from their position if necessary.

As noted above, section VIII of this preamble describes the permit and certificate structure proposed by this rule. Permitted operations would allow operators to conduct certain BVLOS operations using a streamlined approach under a permit issued by FAA. The permit structure would allow package delivery, agricultural operations, aerial surveying, civic interest, unmanned aircraft (UA) operations training, flight test, demonstration, and recreational operations, though subject to certain limitations on size, number of aircraft, and other operating requirements. Those operators conducting higher risk threshold operations, due to size, weight, speed, or other parameters, would instead need to seek operational certification. Obtaining an operating certificate would allow for more complex package delivery, agricultural operations, aerial surveying, and civic interest operations than operating under an operating permit. Certificated operations would receive greater oversight from FAA but would also be able to use larger aircraft, have more aircraft, and have more flexibility to operate over people. Operations conducted under an operating certificate would require operators to develop a safety management system (SMS) and a training program for operations personnel.

Maintenance personnel would not be certificated under this proposed rule. Section IX of this preamble details the requirements for maintenance and maintenance personnel. Maintenance standards for these aircraft would be set by the manufacturer and be based on industry adopted consensus standards, and personnel that maintain them would be required to be competent in their duties and receive the training required by the manufacturer to perform those duties.

Sections X and XI of this preamble lay out the proposal for the new airworthiness acceptance process developed to allow for an efficient approval process of part 108 UAS, while maintaining the integrity of the NAS and the safety of the public. Using industry consensus standards, this action would establish a regulatory process for airworthiness acceptance of a UAS, consisting of a UA and its associated elements (AE), where the UA weighs not greater than 1,320 pounds (including anything attached to, or carried by the

UA). Proposed part 108 would include new operational requirements for UA with airworthiness acceptance, enabling routine BVLOS operations without waivers or exemptions.

Section XII of this preamble discusses corresponding changes to related regulations in other parts of title 14 of the Code of Federal Regulations (CFR) including a noise regulatory approach for UAS operating under proposed part 108.

Finally, this action would create a defined regulatory approval pathway for third-party services and providers of those services—first to approve services that support UTM, and then eventually, to approve services that support extensible traffic management (xTM). FAA broadly defines all those service providers—be it third-party service suppliers or services self-provided by the operators—as Automated Data Service Providers.[2]

As further discussed in section XIII of this preamble, FAA would create a new part 146 to establish the process by which FAA would regulate automated data service providers as well as their automated data services. The purpose of part 146 is to provide a regulatory framework for appropriate government oversight of automated data services that support aircraft operations, especially those conducted under part 108. At the same time, the framework is designed to be flexible enough to accommodate the natural evolution and development of the technologies and systems on which these services are based. Through proposed part 146, FAA would authorize automated data service

---

[2] The term Extensible Traffic Management (xTM) is used to refer to cooperative service environments in general and is comprised of UTM, AAM, etc. FAA further discusses these concepts in its Urban Air Mobility (UAM) Version 2.0 Concept of Operations (ConOps) (Apr. 26, 2023), *available at* www.faa.gov/sites/faa.gov/files/Urban%20Air%20Mobility%20%28UAM%29%20Concept%20of%20Operations%202.0_1.pdf.

providers certificated under part 146 to provide services that would manage UAS traffic and information necessary for safe and efficient operation in the airspace. The provision of such services would be crucial, given the projected increase in numbers of UAS operating in the NAS once part 108 is finalized. Under this proposal, strategic deconfliction and conformance monitoring services provided under part 146 would be key to the successful integration of UAS into the NAS and would be a requirement for several categories of UAS BVLOS operations under proposed part 108.

C. Summary of the Costs and Benefits

The benefits of the proposed rule are the economic, safety, and health values that would result from scaled BVLOS operations. These benefits derive from the increase in regulatory certainty and efficiency, and framework for scaled operations, that proposed rule would provide. FAA evaluates the benefits of the proposed rule qualitatively. Compared with operations under the current regulatory framework, this proposed rule may result in incremental costs to comply with requirements for design, production, and operations. There may also be cost implications to becoming certificated to provide automated data services. FAA provides potential unit costs and example total costs.

However, given that the proposed rule includes requirements that mirror current BVLOS exemptions while also proposing several new requirements to mitigate risks inherent in expanded BVLOS operations, incremental costs are few, and benefits would likely exceed costs. See section XIV.A of this preamble for more information.

II. Authority for this Rulemaking

FAA's authority to issue rules on aviation safety is found in title 49 of the United States Code (U.S.C.). subtitle I, § 106 describes the authority of FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of FAA's authority.

This rulemaking is issued under the authority described in subtitle VII part A, subpart iii, § 44807, Special authority for certain UAS, which permits FAA Administrator[3] to use a risk-based approach to determine if certain UAS may operate safely in the NAS. Section 44807(b) provides a list of factors that the FAA Administrator must consider when determining which types of UAS may operate safely in the NAS, including size, weight, speed, operational capability, proximity to airports and populated areas, operation over people, operation within visual line of sight (VLOS), or operation during the day or night. Section 44807(b) further requires the FAA Administrator to consider whether an airman certificate under § 44703, a type, production, airworthiness, or design and production certificate under section 44704 of chapter 447, or a Certificate of Waiver or Authorization (COA) is required. Per § 44807(c), when the FAA Administrator determines that certain UAS may operate safely in the NAS per that section, "the Administrator shall establish requirements, or a process to accept proposed requirements, for the safe and efficient operation of unmanned aircraft systems in the national airspace system."

In addition, FAA Reauthorization Act of 2024 (section 930 of Pub. L. 118-63) amended chapter 448 of title 49 of the U.S.C. by adding section 44811 to require the FAA Administrator to establish performance-based regulations for UAS to be used for

[3] *See* section 927 of FAA Reauthorization Act of 2024, Pub. L. 118-63.

BVLOS operations. The FAA Administrator must, at a minimum, establish acceptable risk levels for BVLOS operations; standards for remote pilots or UAS operators; an approval or acceptance process for UAS which may leverage special airworthiness certificates (SAC) or a manufacturer declaration of compliance (DOC) process; operating rules for UAS that are approved or accepted; protocols of networked information; and safety of manned aircraft operating in the NAS. However, § 44811 does not require the FAA Administrator to rescope any ongoing rulemaking efforts. This regulation is within the scope of these authorities.

The FAA Reauthorization Act of 2018 (Pub. L. 115-254), which adopted 49 U.S.C. 44808, requires FAA to conduct rulemaking to authorize the carriage of property by small UAS for compensation or hire within the United States. FAA intends this proposal will also address that requirement. Furthermore, this rulemaking is promulgated pursuant to 49 U.S.C. 40103(b)(1) and (2), which directs FAA to issue regulations: (1) to ensure the safety of aircraft and the efficient use of airspace; and (2) to govern the flight of aircraft for purposes of navigating, protecting, and identifying aircraft, and protecting individuals and property on the ground. In addition, 49 U.S.C. 44701(a)(5) charges FAA with promoting safe flight of civil aircraft by prescribing regulations FAA finds necessary for safety in air commerce and national security.

On June 6, 2025, the President issued Executive Order No. 14307, *Unleashing American Drone Dominance,* which directs that “the Secretary of Transportation, acting through the Administrator of the FAA, shall issue a proposed rule enabling routine

BVLOS operations for UAS for commercial and public safety purposes.[4] A final rule shall be published within 240 days of the date of this order, as appropriate." FAA is publishing this proposed rule to fulfill that directive.

A. Section 44807 Statutory Findings

To determine whether certain UAS may operate safely in the NAS pursuant to 49 U.S.C. 44807, the Administrator must find that the operation of the UAS would not create a hazard to users of the NAS or the public. The Administrator must also determine whether a certificate under 49 U.S.C. 44703 ("Airman certificates") or section 44704 ("Type certificates, production certificates, and airworthiness certificates, and design and production organization certificates"), or a certificate of waiver or certificate of authorization, is required for the operation of the UAS subject to this proposed rule. Using a risk-based approach, the Administrator has determined that UAS operations under this proposed rule would operate safely in the NAS; the individual findings required by section 44807 are as follows.

1. Hazard to Users of the NAS or the Public

Section 44807(b)(1) requires the Administrator to determine which types of UAS operations, because of their size, weight, speed, operational capability, proximity to airports and populated areas, operation over people, and operation within or BVLOS, or operation during the day or night do not create a hazard to users of the NAS or the public.

The hazards to the NAS and the public from BVLOS UAS operations are twofold: the collision risk posed to other users of the NAS (including manned aviation

---

[4] 90 FR 24727.

and other UAS), and the risk of collision debris or a faulty UAS posed to persons and property on the ground. Here, these safety concerns would be mitigated by the provisions of this rule. The risks to other NAS users and to persons and property on the ground would be mitigated by the airworthiness acceptance process, the personnel regulations, the general operating rules, and the specific operating rules for operating permits and operating certificates. The risks to other NAS users are further mitigated with the use of strategic deconfliction and conformance monitoring. In addition, the risks to people and property on the ground are mitigated through the designation of population density categories (and the corresponding restrictions on certain operations to certain population density categories), the general prohibition of operations over open-air assemblies, and the hazardous material carriage restrictions.[5]

Accordingly, the Administrator has found that the UAS operations subject to this proposed rule would not create a hazard to users of the NAS or the public. FAA invites comments on this finding.

2. Certificate Requirements

In addition, 49 U.S.C. 44807(b)(2) requires the Administrator to determine whether the UAS operations subject to this proposed rule pose a safety risk sufficient to require airworthiness certification or airman certification.

<u>i. Airworthiness Certification</u>

The Administrator has determined that airworthiness certification should not be required for the UAS subject to this proposed rule. As discussed in section X of this

[5] This rulemaking uses the definition of hazardous material as defined in 49 U.S.C. § 5102(2) and 49 CFR § 171.8.

preamble, the proposed airworthiness acceptance regulatory framework would prevent incidents like loss of flight or control stemming from factors such as structural integrity, software and hardware functionality, performance attributes, and operational factors. Specifically, the proposed design and performance standards require the UAS to handle all expected flight and ground stresses during its operations without compromising the UAS's safe operation.

From a risk perspective, FAA considers UAS operations under proposed part 108 fall between part 107 small UAS and aircraft with a SAC.[6] Part 108, which encompasses BVLOS operations, presents higher risks than part 107 due to the potential for airspace conflicts with other users, operation of larger aircraft, operation over densely populated areas, and riskier operational use cases such as package delivery. The intrinsic risks associated with routine BVLOS operations of UAS require mitigations beyond what is required under part 107. Conversely, the SAC process would require a higher level of initial FAA oversight than would be necessary for BVLOS operations envisioned under part 108, because it would require FAA to conduct an airworthiness inspection of each UAS produced. Proposed part 108 airworthiness acceptance requirements described in section X aim to mitigate those risks and promote the safety of people on the ground and other airspace users. FAA determined the requirements proposed in section X are appropriate for UA without passengers or crew where airworthiness certification under 14 CFR part 21 is more appropriate to ensure the safety of those on board those aircraft.

[6] FAA has proposed changes to the SAC process to enable enhancements in safety and performance and to increase privileges under a number of sport pilot and light-sport aircraft rules in the *Modernization of Special Airworthiness Certification* notice of proposed rulemaking, 88 FR 47650 (July 24, 2023).

Consequently, the regulatory and certification demands for BVLOS operations are more stringent than those for part 107 but less so than for light-sport aircraft. This intermediate positioning supports a balance between flexibility and safety. Therefore, the Administrator finds, pursuant to § 44807(b)(2), that airworthiness certification would be unnecessary for the UAS subject to this proposed rule. FAA invites comments on this finding.

<u>ii. Airman Certification</u>

The Administrator has also determined that airman certification should not be required because certification is not consistent with the envisioned UAS and operations subject to this proposed rule. On manned aircraft, the pilot is responsible for operational control and safety of flight from the flightdeck. Pilot responsibilities on the flightdeck are constructed around pilot control, including seeing and avoiding other aircraft, interacting with air traffic control (ATC), and monitoring instruments and displays. With the increasing autonomy of UAS, particularly those anticipated for use under this proposal, the role of the pilot has and will continue to decrease. The UAS industry has increasingly come to rely on technology, rather than human interaction or intervention, to ensure safe operation. Industry reliance on technology rather than human interaction is driven in part by the fact that UAS do not carry responsible persons that can control and ensure the safety of flight from within the aircraft.

As discussed herein, the proposed personnel provisions serve to provide personnel with the knowledge, training, and skills to operate the anticipated UAS safely under this proposed rule. In addition, other mitigating provisions of this rule would ensure that the risk posed by the UAS is offset by the design requirements (section XI of this preamble) and general operating requirements (section VI of this preamble) that further mitigate risk as operations increase in complexity. Therefore, the Administrator finds, pursuant to 49 U.S.C. 44807(b)(2), that airman certification would be unnecessary for the UAS and operations subject to this proposed rule. FAA invites comments on this finding.

B Authority for Regulating Third-Party Services

Section 932 of FAA Reauthorization Act of 2024, Pub. L. 118-63, directs the FAA Administrator to establish procedures, including rulemaking, to approve third-party service suppliers. Those would include suppliers of UTM services to support the safe integration and commercial operation of UAS. In accordance with this provision, the Administrator must ensure, to the maximum extent practicable, that industry consensus standards are included as an acceptable means of compliance for third-party services. Consistent with this direction from Congress, FAA proposes to regulate third-party service suppliers and the use of third-party services.

FAA also has authority to regulate air agencies under chapter 447 of title 49, U.S.C. FAA may issue certificates to air agencies (49 U.S.C. 44702) as well as "examine and rate" air agencies (49 U.S.C. 44707). Congress defined air agencies to include certain aviation schools (§ 44707(1)), repair stations (§ 44707(2)), and "other air agencies the Administrator decides are necessary in the public interest" (§ 44702(3)). FAA proposes to regulate automated data service providers that support aircraft operations using a distributed computational system under this authority to regulate air agencies.[7] Regulation of these automated data service providers is necessary in the public interest.

[7] 49 U.S.C. chapter 447.

In 49 U.S.C. 40101(d), Congress identified the following matters for FAA to consider as being in the public interest: “assigning, maintaining, and enhancing safety and security” and “encouraging and developing civil aeronautics, including new aviation technology.” Enabling automated data services to mitigate the potential risk that BVLOS operations could pose to the NAS would enhance aviation safety and aid in the development of new aviation technology.

For further discussion on the legal authority of third-party services and FAA rulemaking procedure for regulating such services, see section XIII.B of this preamble.

C. Authority for Regulating Noise

In 49 U.S.C. 44715, FAA has the responsibility to “protect the public health and welfare from aircraft noise.” This responsibility came with broad authority to adopt regulations and noise standards to carry out this mandate. Historically, FAA has applied the part 36 noise certification regulations when the agency issued type certificates as provided in § 44715(a)(3).

However, FAA has authority to apply noise standards for aircraft with or without type certificates. As such, FAA is proposing in this rule to exercise that authority and use a regulatory approach for UAS operating under part 108 that would apply noise requirements as part of airworthiness acceptance.

For further discussion on the legal authority of FAA to regulate noise as part of the airworthiness acceptance process, see section XII.A of this preamble.

D. Transportation Security Administration Authority

The security of the nation’s transportation systems is vital to the economic health and security of the United States. Ensuring transportation security while promoting the movement of legitimate travelers and commerce is a critical counter-terrorism mission assigned to TSA.

Following the attacks of September 11, 2001, Congress created TSA under the Aviation and Transportation Security Act (ATSA) and established the agency's primary federal role to enhance security for all modes of transportation. The scope of TSA's authority includes assessing security risks, developing security measures to address identified risks, and enforcing compliance with these measures. TSA has broad regulatory authority to issue, rescind, and revise regulations as necessary to carry out its transportation security functions.[8]

III. Background

A. Related FAA and Department of Transportation (DOT) Actions

FAA began developing its regulatory framework for UAS in 2012 after Congress passed the FAA Modernization and Reform Act of 2012 (Pub. L. 112–95). Section 333 of Pub. L. 112–95 directed the Secretary of Transportation to determine which types of UAS do not create a hazard to users of the NAS or the public or pose a threat to national security. Based on such findings, Congress directed the Secretary to establish requirements for the safe operation of such UAS. Since the passage of Pub. L. 112-95, FAA has been incorporating limited UAS operations into the NAS using a phased, incremental, and risk-based approach to enable UAS operations through narrowly tailored regulations, individual grants of regulatory relief through FAA exemptions and waivers, and by authorizations based on discrete statutory authorities. Understanding the

[8] *See, e.g.*, 49 U.S.C. 114(*l*)(1), 44903(b).

steps FAA has already taken to integrate UAS into the NAS is critical to understanding why these proposed regulations to enable scaled BVLOS operations is the appropriate next step in this phased approach.

1. Registration and Marking Requirements for Small Unmanned Aircraft

On December 16, 2015, FAA published the Registration and Marking Requirements for Small Unmanned Aircraft interim final rule (Registration Rule).[9] The Registration Rule, which established 14 CFR part 48, enabled a simplified, web-based registration system for small UA,[10] as an alternative to the registration requirements found in 14 CFR part 47. The Registration Rule required all small UAS owners to register under the existing part 47 or 48 by March 31, 2016.

The Registration Rule also established marking requirements for small UA. In accordance with that rule, all small UA must display a unique identifier. Each small UA operated in accordance with part 107 must display a unique registration number, visible on inspection of the small UA.

2. Operation and Certification of Small Unmanned Aircraft Systems

On June 28, 2016, FAA and DOT jointly published the Operation and Certification of Small Unmanned Aircraft Systems final rule (the 2016 Final Rule) establishing 14 CFR part 107.[11] Part 107 created a regulatory structure allowing small UAS to operate within specified parameters without requiring airworthiness certification,

---

[9] *Registration and Marking Requirements for Small Unmanned Aircraft* interim final rule, 80 FR 78645 (Dec. 16, 2015).

[10] "Small UAS" is defined in 14 CFR § 1.1 as an unmanned aircraft weighing less than 55 pounds on takeoff, including everything that is on board or otherwise attached to the aircraft.

[11] *Operation and Certification of Small Unmanned Aircraft Systems* final rule, 81 FR 42064 (Jun. 28, 2016).

exemption, or waiver. Part 107 established operational rules for certain routine civil operation of small UAS in the NAS in a safe manner. To mitigate risk to people and property on the ground and to other users of the airspace, the 2016 Final Rule established operating limitations for small UAS such as limiting operations to daylight and civil twilight, within confined areas, and within visual line-of-sight. The 2016 Final Rule also established airspace restrictions, remote pilot certification, visual observer requirements, and operating limitations. Finally, the 2016 Final Rule included a waiver provision[12] allowing individual operators to deviate from certain specifically identified operating limitations if FAA found the applicant could safely conduct the proposed operation under the terms of the COA.

3. Operation of Small Unmanned Aircraft Systems Over People

Published by FAA on January 15, 2021, the Operation of Small Unmanned Aircraft Systems Over People final rule[13] allowed routine operations over people in accordance with part 107 and routine operations at night under certain conditions without a waiver or exemption. Under regulations implemented by the rule, the requirements for routine operations over people vary depending on the level of risk that operations of small UA present to people on the ground. In the Operation of Small Unmanned Aircraft Systems Over People final rule, FAA established four categories of permissible operations over people based on the risk of injury they present: Category 1, Category 2,

---

[12] *See* 14 CFR §§ 107.200 and 107.205.

[13] *Operation of Small Unmanned Aircraft Systems over People* final rule, 86 FR 4314 (Jan. 15, 2021). *Operation of Small Unmanned Aircraft Systems Over People; Delay of Effective Date; Correction* final rule, 86 FR 11623 (Feb. 26, 2021); *Operation of Small Unmanned Aircraft Systems Over People; Delay; Withdrawal; Correction* final rule, 86 FR 3630 (Mar. 10, 2021).

Category 3, and Category 4. Under this rule, operations over people (in accordance with the categories) are permitted with small UA that have an airworthiness certificate.

4. External Marking Requirement for Small Unmanned Aircraft

The External Marking Requirement for Small Unmanned Aircraft interim final rule (External Marking Rule, 2019) was published on February 13, 2019.[14] The External Marking Rule requires small UA owners to display the unique identifier assigned by FAA upon completion of the registration process (registration number) on an external surface of the aircraft. Small UA owners are no longer permitted to enclose the FAA-issued registration number in a compartment on the aircraft, such as inside of a battery compartment.

5. Remote Identification of Unmanned Aircraft

The Remote Identification of Unmanned Aircraft final rule (Remote ID Final Rule) was published on January 15, 2021.[15] The Remote ID Final Rule requires that UA broadcast certain identification, location, and performance information while in-flight. The remote identification of UA is necessary to ensure public safety and the safety and efficiency of the NAS. Remote identification provides airspace awareness to FAA, national security agencies, law enforcement entities, and other government officials. The broadcasted information can be used to distinguish compliant airspace users from those potentially posing a safety or security risk. The Remote ID Final Rule applies to UA flown for both recreational and commercial purposes. It allows operators to request

---

[14] *External Marking Requirement for Small Unmanned Aircraft* interim final rule, 84 FR 3669 (Feb. 13, 2019).

[15] *Remote Identification of Unmanned Aircraft* final rule, 86 FR 4390 (Jan. 15, 2021); *Remote Identification of Unmanned Aircraft; Delay* final rule, 86 FR 13629 (Mar. 10, 2021).

authorization to operate without remote identification for aeronautical research and other limited purposes. UA manufactured for operation in the NAS are subject to the production requirements of the Remote ID Final Rule. There are limited exceptions in the Remote ID regulations that allow manufacturing UA without remote identification, including home-built UA and United States Government UA, amongst others.

6. Modernization of Special Airworthiness Certification Notice of Proposed Rulemaking and the Safety Continuum

On July 24, 2023, FAA published the Modernization of Special Airworthiness Certification (MOSAIC) NPRM.[16] The MOSAIC NPRM proposed enabling enhancements in safety and performance and would increase privileges under several sport pilot and light-sport aircraft rules. The proposed language in the MOSAIC NPRM would also expand the types and characteristics of aircraft that sport pilots may operate. The proposed changes would increase the suitability of light-sport category aircraft for flight training, limited aerial work, and personal travel. As the MOSAIC NPRM notes, FAA is updating the requirements for light-sport aircraft due to a developed understanding about the purposes and flexibilities of light sport aircraft. This development is framed in the context of the safety continuum. As noted in the MOSAIC NPRM, FAA bases the rigor of certification requirements and operational limitations on a safety continuum that looks at public exposure to risk for each aircraft and operation. As the risk increases due to increased operating privileges and aircraft capability, so do the

[16] *Modernization of Special Airworthiness Certification* notice of proposed rulemaking, 88 FR 47650 (Jul. 24, 2023).

requirements and corresponding rigor of requirements and procedures for aircraft and airman certification.[17]

The safety continuum represents the targeted level of safety because of FAA regulation, guidance, and oversight, which changes based on risk and societal expectations of safety. FAA uses the safety continuum to determine the appropriate level of regulatory oversight for a variety of aircraft, from small UAS to large transport category aircraft. The differing targeted level of safety balances the needs of the flying public, applicants, and operators while facilitating both the advancement of safety and the encouragement of technological innovation.

Light-sport aircraft appear at the low end of the safety continuum for manned operations because of its aircraft design and recreational use. As a result, there is less FAA oversight. Given there is no pilot nor passengers on board UAs, FAA has decided UA operations involve less risk and should fall lower on the safety continuum than light sport aircraft. Therefore, UAS operations under parts 107 and 108 are positioned on the lower end of the safety continuum and FAA is proposing a level of oversight for part 108 operations are positioned between the oversight for part 107 small UAS and MOSAIC aircraft. The reasons for this placement and for more information as to risk, please see section III.A of this preamble.

B. Use of Exemptions, Type Certificates, and Waivers

The intent of this proposed rule is to provide a predictable, stable, and transparent regulatory construct that enables scaled BVLOS operations. Presently, UAS operators

[17] 88 FR 47653.

looking to conduct BVLOS operations require some level of regulatory relief by way of exemption or waiver.

1. Exemptions for UAS BVLOS operations

The exemption process has proven to be a useful tool for FAA to enable operations that cannot be conducted under part 107, particularly for operations using UA weighing 55 pounds or more.[18] However, operating by exemption often requires navigating a labyrinth of regulations designed for both manned and unmanned aviation to determine from which regulations exemption should be sought to operate UAS BVLOS. Each exemption is specific to the operation that the petitioner is pursuing, but typically the exemptions include relief from certain requirements of parts 91 and 135 that are not compatible with UAS operations. This section describes the history of using the exemption process for UAS operations and what the exemption process requires. This background is intended to help draw out how this rulemaking will move UAS operations from the limits of "enablement though exemption", which requires case-by-case assessment and contributes to the current "patchwork" of rules and exemption precedents that today's operators rely on, to "enablement by rule", in which a right-size regulatory framework could streamline how FAA enables operation, manufacture, and supporting services of BVLOS UAS.

In the early 2010s, prior to the development and implementation of the regulatory framework of part 107 (the 2016 Final Rule), FAA relied on the flexibility provided in section 333 of Pub. L. 112-95 to allow certain UAS operations in the NAS by way of the

---

[18] The 55 lb. weigh limit for UAS operating under part 107 is not waivable under § 107.205.

FAA exemption process. Under the section 333 authority, the Secretary of Transportation was granted the authority to determine if an airworthiness certificate was necessary for safe operation of a UAS. While this statutory flexibility permitted FAA to issue thousands of exemptions, the regulatory framework resulting from the 2016 Final Rule created a much more stable, transparent, and scalable system for early civil UAS operations and this process of evolving from operation by exemption to operation by rule is a precursor to FAA's objectives through this proposed rule.

Section 347 of the FAA Reauthorization Act of 2018 (Pub. L. 115-254) granted the Secretary the authority to determine, using a risk-based approach, which UAS may operate safely in the NAS. Congress further extended this discretionary authority to determine if an airworthiness certificate was necessary and clarified that the Secretary may determine if an airman certificate under section 44703 was necessary. This authority, codified at 49 U.S.C. 44809, was further extended in the FAA Reauthorization Act of 2024.[19] The FAA Reauthorization Act of 2018 also established an additional avenue for limited recreational operations under 49 U.S.C. 44809.

Section 44807 grants the Administrator of FAA the authority to use a risk-based approach to determine if certain UAS may operate safely in the NAS on a case-by-case basis. The requirements for petitioning for an exemption are codified in 14 CFR part 11. Under 14 CFR § 11.15, a petition for exemption is a request to FAA by an individual or entity ("petitioner") asking for relief from the requirements of a regulation. Under 14 CFR § 11.81, petitioners must include the following information in their petitions for

---

[19] Per updates to 49 U.S.C. 44807 as provided by § 927 of FAA Reauthorization Act of 2024 (Pub. L. 118-63), the authority to determine if certain UAS are safe for operation the NAS rests with the Administrator the of FAA rather than with the Secretary of Transportation.

exemption: name, mailing address, and other contact information (such as email or fax number); the specific section or sections of 14 CFR from which they are seeking exemption; the extent of relief that is being sought and the reason for seeking relief; the reasons why granting this request would be in the public interest, that is, how this exemption would benefit the public as a whole; the reasons why granting the exemption would not adversely affect safety, or how the exemption would provide a level of safety at least equal to that provided by the rule from which exemption is sought; a summary that FAA can publish in the Federal Register that states the rule from which the exemption is sought along with a brief description of the nature of the exemption sought; any additional information, views, or arguments available to support the exemption request; and, if a petitioner wants to exercise the privileges of their exemption outside of the U.S., the reason why the petitioner needs to do so.

FAA recommends that the petitioner review all FAA guidance to ensure that the petition includes all necessary information, if relevant, including concept of operations, operations manual, emergency procedures, checklists, maintenance manual, training program, flight history (hours, cycles, accidents), and a safety risk analysis.[20] The safety risk analysis is required for all complex operations for any proposal that includes, but is not limited to, flight over or in the proximity of people, flight beyond visual line of sight, operation of multiple UAS, operations from a moving vehicle, package delivery, part 135 operations, or ground speeds. Guidance for the safety risk analysis can be found in FAA

[20] FAA, *Section 44807: Special Authority for Certain Unmanned Aircraft Systems* (Mar. 20, 2024), *available at* www.faa.gov/uas/advanced_operations/certification/section_44807.

Order 8040.4, *Safety Risk Management Policy*, and FAA Order 8040.6, *UAS Safety Risk Management Policy*.

FAA has issued thousands of exemptions using the 49 U.S.C. 44807 authority described herein.[21] Many of these exemptions permit the use of UAS for agricultural operations, including thousands of exemptions enabling agricultural operations with UAS over 55 pounds. Agricultural spraying operations comprise the vast majority of exemptions for UAS above 55 pounds, with over 1,700 operator certificates issued for agricultural operations at the time of publication of this proposed rule. FAA-issued exemptions also include advanced UAS operations reflected in four precedent-setting exemptions issued in fall of 2023 expanding BVLOS operational capabilities and supporting the Unmanned Traffic Management Operational Evaluation.[22] FAA has also issued several exemptions for UAS operators operating under part 135. Upon obtaining

---

[21] Prior to the finalization of the 2016 Final Rule, FAA had granted numerous exemptions to unmanned aircraft operators for purposes such as experimental operations, agricultural operations, BVLOS and other various use-case applications. These exemptions were granted with minimal Part 61 pilot certification requirements to the remote pilot-in-command. Examples include unmanned aircraft agricultural operations only requiring the remote pilot-in-command to possess a private pilot certificate or even in later cases a minimum of remote pilot certificate, as opposed to similar operations with manned aircraft that require a commercial pilot certificate. The 2016 Final Rule obviated the need for exemptions for this particular relief for UA under 55 pounds with the establishment of a part 107 remote pilot certificate but did not extend to UA weighing 55 pounds or more. The first exemption to substitute a part 61 commercial pilot certificate with a part 107 remote pilot certificate with additional training requirements under these circumstances was to DroneSeed Co., Exemption No. 17936. FAA subsequently issued several grants of exemption allowing the use of a remote pilot certificate for commercial operations with UA above 55 pounds, although requiring a second-class medical certificate. In November 2022, FAA issued a grant of exemption to Amazon Prime Air permitting them to conduct BVLOS operations with a UA weighing 55 pounds or more and requiring the pilot-in-command to hold a part 107 remote pilot certificate with a third-class medical certificate, Exemption No. 18601B.

[22] *See* Phoenix Air Unmanned, LLC, Exemption No. 20973, Regulatory Docket No. FAA-2023-1827, *available at* www.regulations.gov/document/FAA-2023-1827-0009; uAvionix Corporation, Exemption No. 21097, Regulatory Docket No. FAA-2022-0921, *available at* www.regulations.gov/document/FAA-2022-0921-0013; Zipline International, Inc. Exemption No. 19111B, Regulatory Docket No. FAA-2020-0499, *available at* www.regulations.gov/document/FAA-2020-0499-0033; UPS Flight Forward, Exemption No. 18339D, Regulatory Docket No. FAA-2019-0628, *available at* www.regulations.gov/document/FAA-2019-0628-0029.

their exemption(s), operators must then seek operational approval, typically by obtaining an operating certificate under 14 CFR part 135 or 137, depending on the operation type.

Exemptions are issued on a case-by-case basis and each exemption petition is individually assessed by FAA. This process can be time and resource-intensive for operators. This proposed rule is intended to level the playing field for operators by offering a well-defined and purpose-built set of regulations for the operation, manufacture, and supporting services for BVLOS UAS operations. Furthermore, this proposed rule should foster innovation and growth among U.S. businesses in this market and simultaneously allow these businesses to serve a larger U.S. customer base.

2. Type Certification for UAS

Furthermore, FAA also allows UAS manufacturers to pursue type certification for their UAS. However, the type certification process was not designed for UAS, which have shorter expected lifespans than manned aircraft, do not carry people, and are redesigned easily and often by manufacturers. As such, the type certification pathway may not be the most appropriate path for most of the operational uses envisioned for these aircraft. Like the exemption process, operators using a type certificated UAS must then seek operational approval, typically under 14 CFR part 135 or 137 depending on the operation type.

3. Current use of Waivers for UAS

In addition, FAA continues to use the flexibility of the waiver process in issuing waivers for more complex operations under part 107. FAA has issued thousands of waivers since the 2016 Final Rule. Since the Operation of Small Unmanned Aircraft Over People final rule eliminated the need for most night waivers, the most common types of waivers granted in recent years have been for altitude limitations, BVLOS operations, operation of multiple UA, and operations over people. Waivers are processed faster than exemptions and submission and approval of them has improved as UAS operators have become more familiar with the appropriate safety cases. FAA recognizes the flexibility that comes with waivers and, as noted in various sections below, many of the proposed requirements of part 108 are subject to waiver.

C. Beyond Visual Line of Sight Aviation Rulemaking Committee

On June 8, 2021, FAA established the UAS Beyond Visual Line-of-Sight Operations ARC with the goal of providing recommendations to FAA for performance-based regulatory requirements to normalize safe, scalable, and economically viable UAS BVLOS operations that are not receiving the provisioning of Air Traffic Management (ATM) services.[23] This ARC took a holistic approach in recommending a performance-based regulatory framework for BVLOS operations.

FAA requested that, at a minimum, the ARC's recommendations clearly address requirements to support the following concept of operations (ConOps): long-line linear infrastructure inspections, industrial aerial data gathering, small package delivery, and precision agriculture aircraft operations, including crop spraying. The ARC did not specifically address aircraft or operations carrying passengers or crew, nor did it address the integration of operations for which ATM services are being provided.

[23] FAA, *UAS Beyond Visual Line-of-Sight Operations Aviation Rulemaking Committee,* Aviation Rulemaking Committee Charter (Jun. 8, 2021), *available at* www.faa.gov/regulations_policies/rulemaking/committees/documents/media/UAS%20BVLOS%20ARC%20Charter%20(eff.%206-8-2021).pdf.

The ARC's final report was submitted to FAA on March 10, 2022.[24] In this report, the ARC provided an extensive list of recommendations to FAA. Overall, the ARC recommended that FAA set an acceptable level of risk for UAS that is consistent across all types of operations being performed. The ARC also recommended a series of modifications to the right-of-way rules in Low Altitude Shielded Areas (within 100 feet of a structure or critical infrastructure as defined in 42 U.S.C. 5195c) and in Low Altitude Non-Shielded Areas (below 400 feet above ground level (AGL)) to accommodate UAS operations. The ARC's report provided comprehensive recommendations that the UAS industry argued would enable BVLOS operations by regulation, including package delivery by UAS, in a safe and economically viable manner. In addition, it provided recommendations for developing a regulatory approach to enable the use of third-party services to support UAS BVLOS operations.[25] As discussed throughout this preamble, FAA considered the recommendations provided by the BVLOS ARC in developing this proposed framework.

D. BVLOS Operations and International Leadership

Establishing a regulatory framework for BVLOS operation that enables several valuable use cases would establish the U.S. as a global leader in UAS operations. Home of the Wright Brothers and the Chicago Convention, the U.S. has long been a leader in aviation and has claimed many firsts in this industry including the first powered airplane,

---

[24] *Unmanned Aircraft Systems Beyond Visual Line of Sight Aviation Rulemaking Committee Final Report* ("BVLOS ARC Report") (Mar. 10, 2022), *available at* www.faa.gov/regulations_policies/rulemaking/committees/documents/index.cfm/document/information/documentID/5424.

[25] Section XIII of this preamble discusses the ARC recommendation regarding third-party services in greater detail.

the home of the pilot who flew the first solo transatlantic flight, and the first pilot to break the sound barrier.[26] For UAS, however, the United States has strong peers competing for leadership in this space. Globally, several countries have taken significant steps to enable BVLOS operations including China, the United Kingdom, Ireland, Australia, Japan, and Rwanda.[27] Key to other countries' successes is that these other countries have provided the UAS industry with a clear regulatory framework that facilitates the scaling of BVLOS operations.

There are several recent examples of countries advancing the integration of UAS operations into their airspaces, including BVLOS operations. In June of 2023, Canada's Minister of Transport announced standardized BVLOS rules for small and medium drones.[28] In 2021, the European Aviation Safety Administration (EASA) adopted three regulations that together create the conditions necessary for both drones and manned aircraft to operate safely and has begun the gradual implementation of U-space, a type of airspace designated for safely integrated operation of manned and unmanned aircraft.[29] The U-space approach provides cooperative airspace for manned and unmanned aircraft where the manned aircraft are equipped with technology to enable sharing airspace with

---

[26] Vaughn College, Greatest First Flights in Aviation History in Honor of Aviation History Month (Nov. 14, 2019), *available at* www.vaughn.edu/blog/greatest-first-flights-in-aviation-history-in-honor-of-aviation-history-month/.

[27] Commercial Drone Alliance, U.S. Global Leadership in Aviation at Stake: Scaled BVLOS UAS Operations Around the World (Nov. 27, 2024).

[28] Minister of Transport Announces Canada's first proposed drone safety regulations for beyond visual line-of-sight operations, Transport Canada (Jun. 23, 2023), *available at* www.canada.ca/en/transport-canada/news/2023/06/minister-of-transport-announces-canadas-first-proposed-drone-safety-regulations-for-beyond-visual-line-of-sight-operations.html.

[29] *Drones: Commission adopts new rules and conditions for safe, secure and green drone operations*, Directorate-General for Mobility and Transportation, European Commission (Apr. 22, 2021), *available at* transport.ec.europa.eu/news-events/news/drones-commission-adopts-new-rules-and-conditions-safe-secure-and-green-drone-operations-2021-04-22_en.

the UAS. Australia and the EU have also published guidance for BVLOS operators seeking to fly using the specific operations risk assessment (SORA) framework developed by the Joint Authorities for Rulemaking on Unmanned Systems (JARUS).[30] In Shenzhen, China, a commercial drone company made over 100,000 drone deliveries in 2022, demonstrating UAS logistics at scale.[31] In Rwanda, UAS are regularly deployed to transport blood and medicines to hospitals in remote regions and these programs have existed as early as 2016.[32]

Foreign commercial aviation authorities (CAAs) enabling BVLOS operations through their own regulatory frameworks have fostered attractive environments for U.S. companies to expand their operations abroad. Today, U.S. companies are performing BVLOS operations abroad including in Italy, the U.K., Rwanda, and Japan.[33] An overarching goal of this proposed rule is to encourage U.S. UAS companies to expand,

---

[30] *See* European Aviation Safety Agency, *Specific Category – Civil Drones*, *available at* www.easa.europa.eu/en/domains/drones-air-mobility/operating-drone/specific-category-civil-drones#Registration%20of%20drone%20operators; *see also* Civil Aviation Safety Authority. *Beyond visual line of sight operations*, *available at* www.casa.gov.au/drones/flight-authorisations/beyond-visual-line-sight-operations#HowtorenewyourBVLOSflightapproval.

[31] *See* Zeyi Yang, *Food delivery by drone is just part of daily life in Shenzhen*, MIT Technology Review (May 23, 2023), *available at* www.technologyreview.com/2023/05/23/1073500/drone-food-delivery-shenzhen-meituan.

[32] *See* World Economic Forum, *Medicines from the sky: how drones can save lives* (Apr. 21, 2020), *available at* www.weforum.org/stories/2020/04/medicines-from-the-sky-how-a-drone-may-save-your-life/; see also World Economic Forum, *Medicine from the Sky: Opportunities and Lessons Learned from Drones in Africa* (Mar. 2021), *available at* www3.weforum.org/docs/WEF_Medicine_from_the_Sky_2021.pdf.

[33] *Italy Chosen For Amazon Prime Air Service In Late 2024*, Intrieste (Oct. 20, 2023), *available at* www.intrieste.com/2023/10/20/italy-chosen-for-amazon-prime-air-service-in-late-2024/; Jack Daleo, *Google's Wing to Use Drones to Fly Blood Between London Hospitals*, Flying Magazine (Sep. 17, 2024), *available at* www.flyingmag.com/modern/googles-wing-to-use-drones-to-fly-blood-between-london-hospitals/; Jack Daleo, *Rwanda launches nationwide drone delivery service with Zipline*, Freight Waves (Dec. 15, 2022), *available at* www.freightwaves.com/news/rwanda-launches-nationwide-drone-delivery-service-with-zipline; *Skydio Secures Nationwide BVLOS Approval for Remote Drone Operations In Japan*, Skydio (Jun. 6, 2023), *available at* www.skydio.com/blog/nationwide-bvlos-approval-for-remote-drone-operations-in-japan.

innovate, and thrive domestically. A robust domestic UAS BVLOS operating environment could spur technological innovation, bolster U.S. aerospace manufacturing, provide services like package delivery to large swaths of the public, create skilled jobs, and secure the U.S. as a leader for UAS BVLOS operations, UTM, and UAS manufacturing.

Due to the relatively low cost of highly capable UAS technology, hundreds of thousands[34] of new operators have entered the aviation community. This significant increase in the volume of UAS and UAS operators, as well as the rapid advancement of UAS technologies, has created significant opportunities—and challenges—for the integration of UAS into the United States airspace. These UAS in the NAS pose new challenges and risks but safety remains paramount for FAA. Through research, industry partnerships and feedback, and regulatory changes, FAA has made steady progress toward integrating UAS operations of varying complexity in the NAS in a safe, timely, and equitable manner.

In proposing this rule, FAA fully expects that the scope and frequency of UAS operations in the NAS would increase as BVLOS operations become normalized. FAA also appreciates that this proposal would open a new range of opportunities and possible concepts of operations for local communities interested in leveraging the benefits of UAS. FAA emphasizes that it is important for community leaders, local elected officials, and operators to ensure that the general public is informed and engaged in early planning discussions and that the individuals involved in planning the operation have a clear plan

[34] FAA, *Drones by the Numbers*, *available at* www.faa.gov/uas.

for how they will respond to the public's interest, questions, and concerns about operations occurring in local communities. FAA will support community leaders, local elected officials, and operators with responding to the public in its role as a regulator and encourages localities and operators to leverage best practices for community engagement in introducing UAS operations.[35]

IV. UAS Integration into the NAS

A. Enabling UAS BVLOS Operations

FAA has long intended to develop a regulatory framework for more advanced UAS operations, enabling the more complex operations that industry has successfully demonstrated at small scale using waivers and exemptions. Waivers, exemptions, and other authorizations, such as operations conducted at UAS Test Sites or through the Integration Pilot Program[36] and BEYOND[37] initiatives, have safely enabled numerous BVLOS operations including infrastructure inspection, package delivery, and surveillance. These operational advancements have occurred within the existing aviation regulatory framework, one that did not imagine the types of technologies that could, at a minimum, replace the human eye or that could coordinate operations through decentralized automation platforms. To realize the next phase in UAS operations, FAA proposes a new set of regulations specific to UAS.

---

[35] For more information regarding legal considerations applicable to state and local regulation of UAS, please see FAA and DOT's 2023 Fact Sheet, *available at* www.faa.gov/sites/faa.gov/files/State-Local-Regulation-of-Unmanned-Aircraft-Systems-Fact-Sheet.pdf.

[36]*Available at* www.faa.gov/uas/programs_partnerships/completed/integration_pilot_program

[37]*Available at* www.faa.gov/uas/programs_partnerships/beyond

UAS technology, as well as the various systems that support it, has advanced faster than the regulatory framework. Having clear regulations and guidance about how to operate BVLOS is essential for future integration of UAS. This rule proposes requirements for airworthiness acceptance, operating requirements, and a framework for automated data service providers to enable scalable, repeatable, and safe BVLOS operations.

The airworthiness and operating requirements would reside in part 108 of title 14 of the CFR, a new part that represents FAA's commitment to a regulatory framework that permits increasingly complex UAS operations while building on the knowledge gleaned from existing rules. The proposed requirements for automated data service providers would reside in new part 146. This proposed framework would provide assurance that operations can be conducted safely, but also within the appropriate position on the safety continuum. As discussed throughout this rule, FAA recognizes that type certification may not be the most appropriate regulatory regime for the safe operation of proposed part 108 aircraft, nor may the airman certification structure of manned aviation be appropriate for these types of operations.

Proposed part 108 would enable UAS BVLOS operations through design, procedural, and operational requirements. Operations traditionally accomplished through manned aviation could be executed more safely and at greater scale than currently conducted. In this context, UAS, using programmed paths managed by third-party services, operating BVLOS, can offer alternatives to manned aircraft to perform the same function safely. UAS can supplement tasks that would otherwise be accomplished by surface transportation or individuals, which could have a positive impact on safety. A UA can fly over crops distributing pesticide or fertilizer without the need for a person to fly a full-sized aircraft low to the ground and risk an accident or pilot exposure to chemicals. Enabling BVLOS operations could have a transformative impact on logistics. Life-saving medicine, equipment, or even human organs can be transported rapidly between points, without having to contend with traffic congestion, or requiring a pilot to fly a helicopter into a high-risk situation. Local regulatory authorities can use UAS to inspect the underside of bridges or check the integrity of the railroad tracks that crisscross the wide expanse of the United States, both more efficiently and more safely than is possible without UAS. UAS-based collection and analytics can inspect more energy production, transmission, and storage infrastructure per day compared to a manual, ground-based inspection, which significantly increases the opportunity to detect and remedy leaks and other issues.

Through the proposed airworthiness acceptance process, operational and personnel frameworks, and standards for automated data service supply, the level of risk proposed in this rulemaking would be equivalent to the level of acceptable risk in part 107, but for more complex aircraft and operations. Part 107 notably did not require any airworthiness certification or design standards, instead fixing the weight at 55 pounds and relying on operating limitations to ensure safe operation. In the 2016 Final Rule, FAA acknowledged the biggest concerns for risk were the inability of a pilot to maintain safe separation from other aircraft and the possibility of a loss of control in flight due to a failure of the control link. The risk-based approach in part 107 has proven to be safe and effective for operations conducted within VLOS.

As we have seen through existing operations that we have enabled through exemptions and waivers, the existing technological tools to enable these operations are generally already available, and need only a repeatable, scalable regulatory framework that would allow the various potential benefits that UAS BVLOS operations could provide to be realized. This can also be seen through the new and novel approaches FAA has seen implemented through special programs such as BEYOND. Under existing systems, operators can equip a UAS with technology that will detect other aircraft, both manned and unmanned, and program it to avoid other aircraft in a consistent, safe manner. Similarly, should a mechanical malfunction occur, the technology is able to avoid impacting people through pre-programmed flight responses. This use of technology, in combination with management of the areas within which the UAS operates, helps mitigate the risks involved in these operations, as described in this preamble.

The regulations under this proposal would also ensure that operators address and manage cybersecurity risks. To that end, this proposed rule would require cybersecurity policies be in place for most operators. The security of computers and networked systems is an overarching goal. Operators under proposed part 108, with the limited exception of recreational operators, would be required to assess and monitor cybersecurity risks continuously and take appropriate precautions to protect their operations from being compromised on an ongoing basis.

The part 107 framework for small UAS operations prioritized individual responsibility for operations, placing the burden of safe operations on the remote pilot in command. While there is merit in this approach, it does not always align with the way

UAS are used, especially in a BVLOS operation. This proposed rule would place responsibility at a corporate level, utilizing flexible approaches to training, operations personnel duty assignment, and development of manuals, while also providing the flexibility to allow operators to make risk-based decisions to conduct operations safely. Under this proposed rule, the person exercising control over the operation would not be certificated by FAA. Instead, FAA proposes to require an operations supervisor who would act on behalf of the company and be responsible for the overall safety and security of the operation, including ensuring that operations are conducted within the parameters of the applicable requirements and that personnel are appropriately trained for their role. The position would also demand knowledge of the relevant regulatory requirements, as well as company procedures and the specific requirements associated with the UA used in their operations. In addition, this rule proposes the utilization of flight coordinators, if required by the aircraft design, who would have more direct involvement in the operation of a UA and would similarly require training in safe operation.

This proposed rule is designed to assess and manage risks to people and property on the ground and other users in the NAS while allowing the growth of UAS operations. The main factors considered in assessing the risks are the industry-consensus standards that inform the design of the UAS, the weight, speed, and size of the UA, the environment it is operating in or over, technological mitigations to include strategic deconfliction, conformance monitoring, and DAA capabilities, and what, if anything, it is transporting.

Under proposed part 108, many types of operations would take place over people. One significant risk factor for these operations would depend on the number of people the

UA is operating over. Proposed part 108 would address a variety of operating environments. To present an accurate and consistent picture of population, FAA is proposing the use of LandScan, a Federally sponsored and freely accessible set of population data. LandScan provides a basis for operational categories to allow complex operations over areas with increased population density, with both technological and operational requirements to ensure continued safety.

In proposed part 108, operations would be conducted primarily below 400 feet AGL (unless authorized by the Administrator to go higher), and this rule would establish new requirements to allow for safe operations BVLOS in this more integrated airspace. UAS operating under part 108 would be required to yield right of way to traffic broadcasting their position using Automatic Dependent Surveillance-Broadcast (ADS-B) Out equipment. Under proposed part 108, strategic deconfliction would be required for operations over certain populated areas, and operations in controlled airspace would require strategic deconfliction, conformance monitoring, and the ability to detect cooperative and non-cooperative aircraft in certain airspace classifications. Operators would need to be aware of factors such as the location, weather, obstacles, and other traffic to ensure safe operation, even as they may not be physically present at the flight operation.

As discussed in section III.A.5 of this preamble, FAA is approaching airworthiness in the context of a safety continuum that considers exposure of the public to risk for each aircraft and operation. Whereas traditional manned aircraft generally require a type certification or special airworthiness certification to operate in the NAS, FAA is proposing a process that would ensure public safety while also being mindful of the level of appropriate rigor associated with the operational envelope of UA operating under proposed part 108. While type certification is appropriate for manned operations, it does not necessarily follow that the time, resources, or requirements for type certification are appropriate to allow safe operation of UAS under proposed part 108. With airworthiness acceptance and industry consensus standards, FAA is proposing a process that will provide a more time and resource appropriate avenue to allow more complex UAS operations while appropriately mitigating risk. FAA is also proposing changes that will streamline compliance with UAS noise requirements. FAA recognizes that a fast and efficient process is critical as the UAS technology is constantly changing. A particular model of UAS may only be produced for a matter of months before substantial changes occur and a new version is produced. A lengthy approval process would not only slow advancement, but the costs would be greater to implement design improvements. Thus, the airworthiness acceptance, as proposed under part 108, will allow the use of industry consensus standards and a streamlined acceptance process.

Likewise, FAA proposes a streamlined approach for operations. An operator would apply for authorization to operate using a UA that holds an airworthiness acceptance. Proposed part 108 has a two-level framework that manages risk in an efficient manner: permits and certificates. A smaller-scale operator can apply for an operating permit, which could be issued with sufficient oversight in a prompt and efficient manner. For those operators wanting to expand by operating larger aircraft in size or number, operating over larger concentrations of people, or conducting higher risk or more complex operations, an operating certificate would be required. This certificate would be more akin to operating certificates in traditional aviation and would entail a higher level of interaction with FAA for both issuance and oversight of the certificate.

FAA further proposes new part 146 to create requirements for the standards and establish FAA oversight of automated data service providers. As part 108 enables UAS BVLOS operation, data is critical to the safe and effective operation of these aircraft, as the ability to operate BVLOS is predicated on the fidelity and assurance of the data. To support the operational and airworthiness requirements of part 108, FAA proposes part 146 to enable those providing these services to obtain certification and defines minimum performance standards for those services using industry consensus standards. Proposed part 146 is essential for laying the groundwork for the next step for UAS operations and providing a service approval pathway that could be used to support other types of operations, both manned and unmanned, in the future. This proposal would ensure operators have options in the services that they use depending on their needs, while being assured that they meet a standard that will keep the public safe. And by keeping the regulation flexible, and allowing operators to choose the service they need, future technological innovations would be recognized while allowing choice by the part 108 operators and competition among the part 146 service providers.

B. Need for Automated Data Service Providers

An automated data service provider is a person or company who provides an automated data service using a distributed computational system to support or manage aircraft operations, promoting safety and efficiency of the operation. Automated data service providers may or may not be directly involved in the aircraft operation but would nonetheless support the operation before or during its flight. Automated data service providers would add an important layer of safety and risk mitigation benefits to the operating requirements proposed in this rulemaking. To realize those benefits to scale, FAA proposes to regulate automated data service providers and their services under proposed part 146.[38]

Not all automated data services and providers of those services would be subject to proposed part 146. Only those that provide services to support an aircraft operators' ability to comply with an FAA requirement by promoting the safety and efficiency of the operation would be subject to part 146. FAA would not, nor intends to, regulate an entity that does not fall under its purview; as such, providers of automated data services that are not provided to support an aircraft operators' ability to comply with an FAA requirement or do not impact NAS safety nor efficiency would not be enabled through proposed part 146.[39]

FAA selected the term "automated data service provider" to avoid confusion with terms used to describe services provided by FAA's Air Traffic Organization, which are not subject to this rulemaking. In addition, in presentations and discussions, FAA personnel and industry stakeholders have also used terms such as "third-party service suppliers" and "UTM service providers." The term automated data service provider is

[38] See section XIII of this preamble for further discussion on FAA's proposal to regulate automated data service providers and authorize their services.

[39] Strategic deconfliction is one example of an automated data service that would be promulgated under proposed part 146. Strategic deconfliction would significantly scale UAS BVLOS operations under proposed part 108. Using strategic deconfliction, a UAS operator can strategically deconflict flight paths, thereby operate safely in the NAS. In contrast, automated data services providers providing fleet management services to aircraft operators would not be regulated under proposed part 146. Fleet management services are used by operators to fulfill a business need, not a safety objective, thus would not be regulated under proposed part 146. For a detailed discussion on the scope and applicability of automated data services and providers of those services under proposed part 146, see section XIII.E of this preamble.

intended to cover both of those terms. The selected term would also include persons and companies that self-provision their own services (often referred to as vertically integrated companies), as well as persons and companies that provide distributed services dependent on ground-based sensors or equipment—sometimes referred to as Infrastructure-as-a-Service. In addition, the term "automated data service providers," and part 146 in general, may apply to companies that are new to aviation and market a specific product to UAS operators, such as mobile network operators that have a UAS-specific command-and-control (C2) link offering.[40]

Automated data services may fulfill a variety of purposes, including mitigating risk, depending on their exact functionality. For example, automated data services that provide strategic coordination for UAS operations reduce the risk of midair collision between UA, thereby reducing the risk of harm to people and property due to falling debris from that midair collision. Other kinds of automated data services may support operators' DAA responsibilities, including by providing surveillance information or avoidance maneuvering instructions that could be more comprehensive or accurate than those the operators may provide using their own systems. Automated data services may also help operators avoid controlled flight into terrain, or loss of control, by providing operators with specialized data before and during flight operations to manage a variety of risk factors.

[40] Under proposed part 146, all these terms referring to UTM servicers or third-party servicers and the providers of such services would fall within the umbrella term of automated data service provider. Whether the automated data services are self-provided or outsourced to a third-party, any entity that provides automated data services to support an aircraft operation complying with an FAA regulation would be subject to proposed part 146 regulations.

FAA recognizes that it might not be feasible for some UAS operators to provide all the services and functionality necessary to meet BVLOS safety requirements in-house. This could be for a variety of reasons, including resource and technical knowledge constraints. Automated data services may provide a cost-effective, safe, and scalable means for those UAS operators to meet some of the regulatory requirements in part 108. As a result, automated data services that meet the minimum requirements proposed in this rule would provide a viable set of alternative solutions to ensure operational safety and regulatory compliance without placing undue restrictions or responsibilities on UAS operators.

FAA expects that automated data service providers will deploy services to meet emerging demands and capabilities, some of which are yet to be developed. These services may be based on emerging industry standards that will develop to meet market demands. Recognizing the rapid pace of technological change, FAA proposes a flexible regulatory structure designed to enable the recognition of new services as future standards are designed. Section XIII of this preamble provides the framework for regulating automated data service providers and their services.

C. Definitions (§ 108.5)

FAA proposes to add several definitions in § 108.5 that are unique to operations conducted under proposed part 108. FAA is proposing definitions for AE, C2 link, conformance monitoring, DAA, flight coordinator, ground control station, hazardous material, life-limited part, operational intent, operations personnel, package delivery, safe distance, strategic deconfliction, strategic conflict detection, strategic conflict resolution, and target average conformance. These terms have specific meanings and usage in part 108 that may be unfamiliar to readers, or their usage in part 108 is specifically important to the new UAS framework. These definitions would help the public understand the context of how these terms are used and identify their specific usages throughout part 108. FAA invites comments on the use of the terms and the associated language used in the definitions, as well as if any definitions are not needed, or if any definitions should be added to the list. Discussion and further context for the definitions included in this section can be found in the pertinent sections of the preamble.

V. Part 108 General Requirements (Subpart A)

Currently, most UAS operations in the United States fall under part 107, which applies to small UAS operated within VLOS of the remote operator. Since larger and more complex UAS operations are not covered by part 107, nor are operations permitted beyond VLOS under part 107 without a waiver, UAS operators continue to rely on requesting regulatory exemptions and waivers to allow them to conduct such operations. While FAA has utilized the flexibility of the existing structure broadly to permit increasingly complex and advanced UAS operations, the current regulatory framework impedes full integration of all operations into the U.S. airspace. FAA seeks to fulfill its regulatory responsibility of ensuring the safety and efficiency of the NAS by facilitating the increased integration of UAS into the NAS and realizing UAS operational benefits. Therefore, FAA proposes to enable complex UAS operations, specifically those conducted BVLOS of the operator, under the proposed structure of part 108.

FAA understands that expanding UAS operations may introduce certain safety risks to the NAS. As part of addressing those safety risks, proposed part 108 would require new sets of processes and guidelines for UAS BVLOS operations, including requirements for UAS operators and maintenance personnel.

Under this proposed rule, FAA would require all UAS operators to obtain either an operating permit or an operating certificate to conduct their UAS operations under this part. Operators without an operating permit or certificate would not be allowed to operate under proposed part 108. Under this proposed rule, whether a UAS operator applies for a part 108 operating permit or an operating certificate would depend on the scale and overall risk of their UAS operation. FAA expects that presenting UAS operators with those two options would cultivate a flexible approach for operators to obtain the necessary credentials to then be able to comply with the requirements of this proposed part.[41]

Under this proposed rule, FAA would require operators who wish to conduct BVLOS operations using an operating permit to comply with subpart D of part 108. Likewise, operators who wish to conduct BVLOS operations using an operating certificate would be required to comply with subpart E of proposed part 108. For a discussion on the distinction between part 108 operating permits versus operating certificates, see section VIII of this preamble.

Regardless of whether an operator holds an FAA-issued operating certificate or an FAA-issued operating permit, the proposed rule would require all part 108 operators to comply with the applicable operating rules under subpart B. Subpart B of proposed part 108 would prescribe the general rules of engagement that each operator would need

[41] See section VIII of this preamble for the process of obtaining a part 108 operating permit or certificate.

to abide by in order to conduct UAS BVLOS operations under part 108, including preflight operating requirements and regulations related to operating BVLOS over people. A further discussion on general operating rules is contained in section VI.B of this preamble. Lastly, proposed part 108 would also prescribe operating personnel requirements under subpart C, aircraft maintenance and alterations requirements under subpart F, and general procedural requirements—which includes inspection requirements and prohibitions against engaging in fraudulent or deceptive practices—under subpart A of the proposed part.[42]

A. Applicability (§ 108.1)

Proposed § 108.1 states that the requirements in proposed part 108 would apply to any person[43] who wishes to conduct UAS BVLOS operations in the NAS. Regarding operator requirements, as proposed in § 108.1(a), the requirements of part 108 would apply to any person who (1) conducts, or intends to conduct, UAS BVLOS operations in U.S. airspace; (2) requests FAA issuance of an operating permit or an operating certificate; (3) performs maintenance on a UAS under an operating permit or certificate issued in accordance with this proposed part; (4) is involved in the design, manufacture, or production of UAS to be operating in accordance with part 108; (5) requests FAA airworthiness acceptance of a UAS in accordance with subparts G and H of this part; or (6) submits a voluntary consensus standard for acceptance or approval by FAA as a means of compliance for any provision of part 108.

---

[42] For subpart A, General, see section V of this preamble; for subpart C, Operations Personnel, see section VII of this preamble; for subpart F, Maintenance and Alterations, see section IX of this preamble.

[43] Per 14 CFR § 1.1, a person is described as an individual or an entity, including a corporation, company, association, governmental entity, etc.

In addition to noting who part 108 would apply to, FAA is also proposing specific exclusions from part 108 to delineate between the different regulations that UAS could be operated under. As proposed in § 108.1(b), part 108 would not be applicable to any persons who choose to conduct UAS operations under 14 CFR part 107 or part 91.

In addition, UAS operations conducted under the recreational flyer provisions of 49 U.S.C. 44809 would not be subject to this rulemaking. FAA anticipates that certain operations such as agricultural, package delivery, aerial surveying, photography, and flight testing currently conducted under waivers or exemptions to 14 CFR part 107, 91, or 135 would transition to the operations under part 108 when their exemptions expire, and a reasonable transition can occur. For operations that would not fall within the proposed operating requirements of part 108, FAA believes those operators who are currently complying with FAA requirements to conduct safe and efficient UAS operations may continue to do so in accordance with their existing framework. Proposed part 108 is not intended to fulfill the need for every type of operation related to UAS but rather would expand the types of operations that can be conducted under existing FAA regulations.

FAA considered whether it would be appropriate to amend part 107 or to add an additional subpart to proposed part 108 to provide a regulatory path for certain VLOS operations with aircraft weighing 55 pounds or greater with less automation than envisioned for airworthiness acceptance under this proposed part. Ultimately, FAA determined that adding a VLOS subpart to proposed part 108 would unnecessarily complicate the rule, as the risk mitigations under this proposed part rely on minimal human intervention to manage risk for BVLOS operations of larger aircraft with more complex operations. Operation of larger VLOS aircraft is a different risk set than what is being addressed in proposed part 108 and including it would add significant complexity to the structure of this proposed rule.

In addition, at this time FAA has also opted out of expanding the VLOS rules under part 107 to add UAS weighing 55 pounds or greater because doing so could unnecessarily delay this proposed rule. The 55-pound limit within part 107 functions as a significant risk mitigation in VLOS UAS operations and increasing the weight threshold would require FAA to either develop new risk mitigation measures or have sufficient data to establish that operations can be safely conducted at a higher weight threshold with no additional risk mitigation measures.

Also, FAA is unable to gauge the public's need or desire for VLOS operations of aircraft weighing 55 pounds or greater where the operator cannot, or would be seriously disadvantaged to, meet the airworthiness or operational requirements proposed for part 108. While FAA anticipates that there may be business cases in which manually operated UA equal to or exceeding 55 pounds may be the best option, FAA expects these cases to be limited in number based on current operations. Further, FAA's intention with proposed part 108 is to create a regulatory framework for greatly expanded UAS operations with new and more capable UA, not to create a retrofit model for existing UAS with limited lifespans. Nevertheless, FAA recognizes that there are many existing UAS weighing 55 pounds or greater that are currently operating under an exemption to part 91 and those types of operations will be able to continue as they always have. FAA invites comments on whether there is a need or desire to expand part 107 for VLOS UAS operations weighing 55 pounds or greater. FAA also considered updating the relevant part 91 regulations[44] that are not currently in alignment with operations of a UA and are frequently the cause of exemptions needed for operators choosing to operate under that part. FAA, however, has opted out of updating part 91 in this way because doing so could unnecessarily prolong this rulemaking. In addition, FAA is unsure how great the need would be for part 91 exemptions after the framework for part 108 is put into place. Finally, FAA invites comments on the assumptions above related to parts 91 and 107, and areas where FAA may be lacking information.

It is important to note that, while proposed part 108 enables the operation of UA BVLOS, there is no prohibition from operating within VLOS under proposed part 108, so long as all the regulatory requirements are met. To illustrate this, an aircraft weighing less than 55 pounds that is to be operated within VLOS would have several options for which part they could operate under. They could operate under part 107, proposed part 108, part 91, or 49 U.S.C. 44809. Each regulation has its own set of unique requirements and allowances. An operator would have to meet all relevant requirements associated with the regulatory part they choose to operate under.

Proposed part 108 is not intended to be used for carriage of people. The risk mitigations provided by this part are not sufficient for passenger carriage nor were they designed with carriage of people in mind. To that end, FAA proposes in § 108.1(b)(4) that UA operated under part 108 are not permitted to carry a person. Operations contemplating carriage of people would appropriately occur under other regulatory parts, such as 14 CFR parts 91 or 135.

---

[44] FAA has granted relief from several regulations within 14 CFR; notably, from §§ 91.7(a), 91.109(a), 91.119(b), 91.119(c), 91.121, 91.151(a), 91.151(b), 91.209(a)(1), 91.403(b), 91.405(a), 91.407(a)(1), 91.409(a)(1), 91.409(a)(2), 91.417(a), 91.417(b), among other sections of part 91.

B. Reporting and Prohibitions

1. Reproduction or Alteration (§ 108.10)

FAA expects that all parties affected by this proposed rulemaking would comply with FAA requirements when conducting UAS BVLOS operations under proposed part 108. Engaging in fraudulent or deceptive practices would be prohibited under proposed part 108, as it is under all existing FAA regulations.[45]

Proposed § 108.10(a) would prohibit anyone from making any fraudulent or intentionally false statement to any information submitted to FAA to show compliance with proposed part 108. Persons would be prohibited from fraudulently reproducing or altering an FAA-issued operating certificate or permit. If anyone were to engage in fraudulent or deceptive practices, proposed § 108.10(b) would enable FAA to issue penalties to those persons for their violations. Those penalties could include issuing a denial to applications for part 108 operating permits, part 108 operating certificates, certificates of waiver or authorizations, or declarations of compliance. Under the proposed rule, FAA may also penalize violators by suspending or revoking any permit, certificate, authorization, DOC, or similar that were already issued or accepted by FAA. Lastly, anyone violating this provision may also be subject to civil penalties.

2. Prohibition on Interference with Unmanned Aircraft Operations Personnel (§ 108.15)

[45] As proposed in the *Falsification, Reproduction, Alteration, Omission, or Incorrect Statements* notice of proposed rulemaking (89 FR 8560), FAA intends to use a comprehensive prohibition on fraudulent or deceptive practices that covers all FAA regulations. If that rule becomes final, proposed § 108.10 would be redundant.

Proposed § 108.15 would prohibit anyone from assaulting, threatening, intimidating, or interfering with operations personnel of a UA in the performance of their duties regarding the operation of a UA. This requirement would be necessary to protect the safety and efficiency of the NAS. Bad actors who interfere with UAS operations may endanger public safety, or any persons or property—both in the air or on the ground—which is anathema to FAA's obligation to ensure the safe and efficient use of the NAS. FAA notes that nothing in this requirement would preclude law enforcement, emergency services, the intelligence community, military personnel, or FAA personnel executing their authorized duties from intervening in operations in the interests of national security, emergency response, or oversight and surveillance necessary for the safety of the NAS.

3. Inspection, Testing, and Demonstration of Compliance (§ 108.20)

To ensure operations are conducted in accordance with existing rules and limitations, and FAA's statutory oversight responsibilities,[46] §§ 108.20(a)(1) and (2) proposes that an operator would need to have their authorization to operate and identification readily accessible when operating and present it to any of the following: FAA, the National Transportation Safety Board (NTSB), and law enforcement officers. This measure would ensure that all operators are appropriately authorized, enhancing the safety and security of airspace operations. This requirement would set the stage for obligations aimed at maintaining operational integrity and oversight. This mandate would hold the operator accountable for unauthorized access and operation of UAS, which could result in incidents or accidents. The proposed requirement that operators have their

[46] *See* 49 U.S.C. 44701(a)(2)(A).

authorization and identification on hand is so that government personnel would be able to verify that the operation is authorized and that qualified personnel are in control. This would ensure that operations are conducted efficiently and in compliance with regulatory standards.

Section 108.20(a)(3) further proposes that an operator would need to make available, upon request of FAA or any authorized representative of the NTSB, any document, record, or report required to be kept under the regulations of 14 CFR chapter I. By ensuring that all relevant documents, records, and reports are readily available for inspection, government representatives would be able to monitor compliance with established safety standards and regulations. This oversight would be essential for identifying potential areas of non-compliance or safety risks that could jeopardize the safety of operations. Utilizing these documents as part of regular and ad-hoc inspections would allow for a proactive approach to safety management, enabling the early detection and resolution of safety issues before they lead to accidents or incidents.

In the aftermath of an incident, the availability of comprehensive documentation is important for thorough investigations conducted by the NTSB or other relevant authorities. These documents would provide a detailed account of operational procedures, maintenance records, personnel qualifications, and other factors that might contribute to understanding the root causes of an incident. Access to such information supports developing effective recommendations to prevent future occurrences, thereby improving overall safety standards.

Section 108.20(b) proposes that each operator of UAS would be required to, upon request, allow FAA to make or witness any test or inspection of the UAS, including any aspect of the operation of a UAS, and if applicable, the automated data services utilized, to determine compliance with this part, including access to the operations area for the aircraft. This proposed requirement is consistent with FAA's exercise of its authority to ensure operational safety in the NAS. In circumstances in which FAA were to identify a safety issue that warrants review of the operation, this proposed requirement would permit FAA review of all applicable information to make any appropriate determinations about the safety of the operation.

The ability for FAA to perform inspections without prior notice would ensure that operators consistently adhere to the highest standards of safety as a fundamental practice, not just when an inspection is anticipated. This continuous state of readiness and compliance would safeguard not only the operators and their assets, but also the public potential hazards.

Moreover, these inspections would serve as a feedback loop. They would allow FAA to observe operational practices, the state of equipment, and adherence to regulations. Such inspections would promote transparency and accountability. By allowing FAA access to conduct these evaluations, operators would demonstrate their commitment to operating within existing limitations and requirements. This openness would build trust among stakeholders, including regulatory bodies, the public, and other airspace users.

Section 108.20(c) proposes that each employee of, or person used by, the operator who is responsible for maintaining the operator's records would need to make those records available to FAA. Making records accessible to FAA would allow for thorough audits and reviews that can verify compliance with safety standards, operational procedures, and maintenance practices. These records would include, but would not be limited to, logs of operational procedures, maintenance and repair records, safety assessments, and employee training records and any other record relating to compliance.

Requiring records to be available for inspection would encourage operators to maintain accurate and comprehensive documentation of their operations. This practice would support continuous improvement by facilitating regular reviews and updates to safety practices based on insights gained from record analysis.

As part of FAA's safety oversight framework, this proposal would require individuals holding an FAA airworthiness acceptance to make available evidence of such acceptance and any other requisite documents upon request. It would ensure that aircraft operating within FAA's regulatory jurisdiction meet the safety standards, thereby protecting the public, enhancing the integrity of the aviation industry, and fostering continuous improvement in aviation safety.

Section 108.20(d) proposes that failure by any operator to make available to the Administrator upon request, the certificate, operations specifications, or any required record, document, or report would be grounds for suspension of all or any part of the operator's permit or certificate.

4. Aviation Safety Reporting System: Prohibition Against Use of Reports for Enforcement Purposes (§ 108.25)

Proposed § 108.25 would prohibit FAA from using reports submitted to the National Aeronautics and Space Administration (NASA) under the Aviation Safety Reporting System (ASRS) in any enforcement action against part 108 operators. This prohibition would not apply, however, in cases where the information submitted to

NASA concerns accidents or criminal offenses, which are wholly excluded from ASRS. ASRS was originally created to collect aviation safety event information from pilots, mechanics, air traffic controllers, and other users of the NAS. Under part 107, UAS pilots operating within the VLOS may also use ASRS to report safety events.

The prohibition in proposed § 108.25 against FAA using ASRS data in enforcement actions would be very similar to how such reports are protected and used for part 91 pilots, part 107 UAS pilots, and other airspace users who are subject to various portions of FAA regulations. FAA and NASA have recognized the benefit of having accurate, candid, and timely reports of unsafe (or potentially unsafe) conditions in the NAS. Such data and reports are vital for proactive and generative safety assurance, enabling FAA to identify leading indicators of increasing risk prior to an accident or incident. As FAA stated in Advisory Circular (AC) 00-46F, "the effectiveness of this program in improving safety depends on the free, unrestricted flow of information from the users of the NAS." FAA is concerned that, without such a prohibition on enforcement actions, pilots, UAS operators and other NAS users would be disincentivized from making safety reports, including acknowledging unintentional or honest mistakes, for fear of being penalized by FAA.

5. Base of Operation and Operator Identification (§§ 108.30 and 108.35)

FAA proposes in §§ 108.30(a) and (b) that each operator would be required to maintain a principal base of operations in the United States and would be required to provide FAA with a physical address. This physical address would serve as the primary point of contact for FAA, though (per proposed § 108.30(d)) the operator may perform operations at locations other than the principal base of operations, as authorized by FAA.

Further, per proposed § 108.30(c), the operator would need to notify FAA at least 30 days prior to changing their principal base of operations. However, recreational operators would not be required to submit a principal base of operations, in accordance with proposed § 108.475(f)(3). Recreational operators would only be required to submit a physical address.

By ensuring that all operators supply a physical address, FAA would have the ability to accomplish prompt and cost-effective service of process and service of other safety-critical or time-sensitive documents, including notices of proposed civil penalties, orders of suspension or revocation, and emergency orders of suspension or revocation. In addition, as this proposed rule would only apply to operations conducted within the United States, FAA finds it necessary that the physical base of operations is also located in the United States. While part 47 aircraft registration does require the aircraft owner to provide a mailing address, FAA is including this requirement for a principal base of operations in proposed part 108 because it is important for FAA to know the primary location where the operator will be conducting operations to conduct inspections. The address required for part 47 is the owner's mailing address, which may or may not be where the UA is located or from which it is operated.

In addition, FAA proposes in § 108.35(a) that an operator would not be able to operate or advertise services of a UA under part 108 using a business name other than what is listed on the operating permit or operating certificate. If the operator were to operate under a d/b/a, the business names would need to be provided on the application and listed on the permit or certificate to be valid. Furthermore, in proposed § 108.35(b), no person would be able to operate a UA under part 108 unless the identity of the operator is displayed on the UA in a manner acceptable to FAA. In addition to the registration number, FAA proposes that an operator would need to include the company name or trademark on the exterior of the aircraft for ease of identity in the case of a lost aircraft or off-site landing. FAA also encourages the addition of contact information in the form of a phone number, QR code, or other method to enable people who may come across the UA be able to report the sighting easily.

These proposed requirements in § 108.35 would be consistent with FAA practices for other commercial operations and would ensure FAA has sufficient information to contact the operator as necessary, including in instances where a UA is destroyed and access to remote ID or other electronic systems is not possible, or FAA has other reason to contact the operator. In addition, as with other regulations applicable to commercial operations, the proposed prohibition on advertising under a different name would ensure that the people using the operator have the assurance that the company is operating within the regulatory framework established by FAA and would ensure FAA can appropriately link the operator who is advertising with the approval for the operation.

C. Recordkeeping (§ 108.40)

FAA proposes in § 108.40 to require each operator under proposed part 108 to maintain records for each aircraft used in part 108 operations, each required operations personnel used in part 108 operations, any mechanical irregularities for the UA and its AE, any maintenance or alterations performed on the UA or its AE, and all initial and recurrent training taken by each person required to receive training under proposed part 108. The operator would also be expected to provide FAA access to the records upon request, either electronically or in paper form.

For aircraft records, FAA proposes under § 108.40(a) that operators would need to include a current list of UA used in the permitted or certificated operation, the total time in service of each UA, and the status of any life-limited parts. FAA and industry rely heavily on current aircraft status and past aircraft servicing and inspections to determine airworthiness of an aircraft. FAA would therefore require these records to be kept by the operator under this part.

FAA further proposes in § 108.40(a)(3) that an operator who performs a flight under this proposed rule would need to maintain records of each flight, including the date, time, and duration of the flight; the aircraft registration number; the type of operation (*e.g.*, package delivery); the flight path including destination, origin, and altitude(s); the name of the designated operations personnel assigned to each flight; and landing locations if different from origin and destination locations. FAA is proposing this recordkeeping to ensure the availability of information critical to incident or accident investigations. By requiring the operator to maintain these, FAA and operator would have historical data to determine root causes of occurrences, incidents, or accidents.

Proposed §§ 108.40(a)(3)(vii) and 108.40(a)(3)(viii) include operation type-specific recordkeeping requirements for package delivery and agricultural operators. Under proposed § 108.40(a)(3)(vii), FAA would require package delivery operators to keep a record of the pickup points and delivery locations for each operation. FAA is proposing this requirement in addition to destination, origin, and landing locations because some UA do not physically land to pick up or deliver packages and it would be critical for FAA to know who the customers or warehousers are and where they are located in the event of an incident or accident investigation. Under proposed §

108.40(a)(3)(viii), FAA would also require the operators performing agricultural operations to keep a record of the name and address of each person for whom agricultural UA services were provided, the date of the service, and the name and quantity of the substance dispensed be kept as a record by the operator. The rationale for this additional requirement is that the agricultural operator may be contracted to provide services to one or more customers, and it is important for FAA to know who these customers are and where they are located in the event of an incident or investigation. Oftentimes, FAA does not discover non-compliance, accidents, or incidents involving aircraft until after the flight has been completed. By requiring these detailed records to be kept by the operator, FAA and operator would have historical data to look back on to determine root causes to occurrences, incidents, or accidents.

Because personnel are a key contributor to how any permit or certificate holder conducts safe operations, FAA proposes in § 108.40(b) that each operator would need to maintain records on each person required for the safe operation of the UAS used in its operations, including their full name, qualifications in sufficient detail to determine the individual's ability to participate in part 108 operations, current duties and date of duty assignment, and information relating to an individual's release from employment for cause. In addition, for operators holding an operating certificate, the operator would also need be required to maintain records on the date and times of operations personnel assigned work shifts, the length of the rest period prior to each duty period for each of the required personnel, and the total hours on duty per calendar day for each of the required operations personnel which, as discussed in VII.F, would require a minimum of 10-hour rest periods and maximum 14-hour duty days. This information would be valuable in understanding if persons are fit for duty and appropriately qualified. In addition, this information would be beneficial to FAA for continued surveillance purposes.

FAA proposes in § 108.40(c) that operators would need to provide logs for personnel to record mechanical irregularities. Having this log would allow personnel to view current and previous discrepancies for corrections and airworthiness of the aircraft. FAA further proposes that operations personnel would be required to enter, or to have entered, in the log each mechanical irregularity for the UA and their AE that comes to the person's attention. For operators to ensure that faulty or inoperative equipment is addressed per manufacturers' maintenance instructions, operations personnel would need to create a log of the faulty item should it come to their attention. This log would ultimately be used by both maintenance personnel for correction and operations personnel for determining overall UA airworthiness. In addition, when entering a log of mechanical irregularity, FAA proposes that personnel who take corrective action concerning a reported or observed failure or malfunction would need to enter, or need to have entered, the action taken in the log. This would ensure that any person(s) responsible for determining UA airworthiness can decide the UA's overall operational status.

Further, FAA proposes that, under § 108.40(d), the operator would be required to maintain records of the UA inspection status for each maintenance or alteration activity to the UA or its AE. It is important for anyone operating the UA to be able to determine when the last inspections were performed and the status of all the required inspections as outlined in the manufacturer's maintenance instructions. In addition, persons performing maintenance on the UA would be required under proposed § 108.40(d)(1) to make a record of that activity, including a description of the work performed, the date of completion of the work, the identification of the person who performed the maintenance, and a return to service approval. These requirements would additionally help persons responsible for airworthiness determination to ensure proper airworthiness status of the UA by showing a complete log of all work performed.

FAA proposes in § 108.40(d)(2) that operators would not need to comply with the logging and documenting requirements of proposed § 108.40 for removal and replacement of UA batteries designed for frequent, toolless replacement if the operator has other means of tracking battery use, life, and performance. Some UA designs necessitate the removal of the aircraft batteries on every flight for charging. Aircraft designed this way are expected to have an easy, toolless feature that prevents the battery from being installed improperly and ensures that the battery is secure. Therefore, all of the information generally required for other maintenance entries may not be needed in these cases and may become overly burdensome if required for every flight. However, FAA recognizes that batteries are essential to most UA operations and does propose that operators would still need a way to track battery use, life, and performance.

FAA also proposes in § 108.40(d)(3) that operators would not need to comply with the logging and documenting requirements of § 108.40 for removal and replacement of UA components that are designed for toolless removal and installation, such as removable rotors which may be necessary to remove for UA storage, so long as the operator has procedures for ensuring that any part that is removed is inspected for serviceability prior to being reinstalled and: (1) the parts are reinstalled on the same aircraft; (2) the parts are not subject to time limits; or (3) the operator has other means of tracking installations and use. Through current experience, FAA understands that UA often have various removable parts that are frequently removed and replaced without being deemed faulty. These typical parts are removed for reasons such as storage or repositioning of the UA. FAA does not intend to overburden an operator with logging and documenting parts that the manufacturer has designed to be normally removed and reinstalled. So long as operators have procedures for ensuring parts are removed, inspected, and reinstalled, FAA has concluded that safety would not be affected by not requiring logging and documenting normal removal and reinstallation of parts.

Personnel training is of great importance, as it ensures appropriate qualification, competency, and proficiency of a person performing their duties. To understand each person's qualification, competency, and proficiency, proposed § 108.40(e) would require the operator to keep a record showing personnel training. Initial and recurrent training records are important because they show a person's baseline qualifications and continuing proficiency. In addition to requiring recordkeeping of all initial and recurrent training, operators would additionally need to maintain records on initial and recurrent training on handling hazardous materials and for agricultural operations. As described in section VIII.C 9, these types of operations would have additional knowledge requirements to address the use of agricultural products. In addition, these training records would give a snapshot of company policies and procedures at the time that the training occurred. This may be of importance when reviewing archival records for root cause of non-compliance or a safety incident.

FAA proposes that the records required by § 108.40(e) would need to contain the person's name, the date of hire or start of a related job function, the most recent training completion date, a description, copy, or reference to training materials used to meet the training requirement, the name and address of the organization providing the training, and a copy of the certification issued when the individual was trained, which would show that training has been completed satisfactorily. All of this documentation would help not only the operator to have a complete description of the training event for tracking, scheduling of future training, and archival documentation for non-compliances, but also would help FAA to determine continued compliance.

Finally, this proposal would include minimum retention periods. FAA recognizes that operators may struggle to keep track of old records and the necessity for archival data from those records becomes unnecessary and non-applicable as time goes on. FAA therefore proposes that UA records, mechanical irregularity records, and maintenance records would need to be kept either for the life of the aircraft, or for 24 months, as applicable. Records of the total time in service of each UA and the status of any life-limited parts must be kept for the life of the aircraft as they establish important history for the UA that must be maintained. Records of each flight performed, must be retained for a period of 24 months. Personnel records must generally continue to be maintained as long as the employee is employed and continue until 12 months after the person has separated from the company, to include any training performed or received, however, duty and rest records only have to be maintained for 3 months. Records of mechanical irregularities and maintenance performed must also be retained for a period of 24 months.

In addition, personnel and training records would need to be retained for 12 months following the separation of the personnel from the operator. This amount of time would be sufficient for these records to be useful. FAA does not want to impose on an operator record filing that, after years of retention, may create faulty, inundated databases with records that have not shown to be of concern within the previous 12 months. FAA proposes that initial and recurrent training records required by § 108.315, initial and recurrent training records required by § 108.440(b), initial and recurrent training records required by § 108.570(a) and records received for agricultural operations required by §§ 108.445(i)-(j) and 108.575(g) would need to be retained under the proposed above requirements for 12 months after separation.

Finally, FAA proposes that operators holding an operating certificate would need to retain records in proposed § 108.40(b)(5) concerning the date and times of operations personnel assigned work shifts, the length of the rest period prior to each duty period for each of the required operations personnel, and the total hours on duty per calendar day for each of the required operations personnel for a period of 3 months. Information contained in these records are related to individual flights. FAA would use this type of data during routine surveillance inspections to determine individual flight compliance with regulations. FAA does however recognize the burden that would be imposed on an operator should records for multiple flights be required to be kept for long periods at a time. Operator databases would be overloaded with data. During routine surveillance, FAA typically reviews samplings of this type of data to determine overall compliance. FAA does not see the need to retain lengthy archival data concerning individual flights.

D. Reporting (§ 108.45)

FAA has a duty to ensure the safety of the NAS. To do so, FAA needs to be aware of accidents, incidents, and precursor safety events and occurrences in the NAS. The reporting requirements proposed in § 108.45 are intended to capture a diverse set of data ensuring that FAA can appropriately track and monitor the safety of UAS operations under this part.

In § 108.45(a)(1), FAA proposes that each operator would be required to report aggregate flight data to FAA. This data would include the total number of flight hours operated for each individual UA, including the specific make, model, or series of aircraft and the associated FAA registration number. This data would be helpful for three reasons. First, it would support FAA's safety oversight functions. By collecting flight data, FAA would gain insights into UAS operations. This information would help FAA identify potential risks, and areas for improvement. Second, this data would be useful in identifying trends that could otherwise lead to accidents or incidents. Monitoring flight hours would allow FAA to track usage patterns and identify any anomalies or excessive usage. This would also aid in preventing accidents due to overuse or fatigue-related issues. Third, reporting flight data would ensure compliance with regulations by enabling FAA to verify that operators are adhering to their operational limits.

In § 108.45(a)(2) FAA proposes requiring operators to provide flight data to the manufacturer or permit and facilitate flight data collection by the manufacturer to ensure continued operational support for the operator. Traditionally, these data collection systems are already voluntarily implemented within the industry to analyze flight data to aid in the identification of safety issues with the UA design. FAA envisions that this could be accomplished by submitting the data log file to support both § 108.725 and § 108.905. In § 108.45(b), FAA proposes requiring each operator to report the registration and serial numbers of each aircraft used in part 108 operations. This report would need to be made in a form or manner acceptable to the Administrator. FAA notes in proposed § 108.45(b) that this reporting can be combined with the flight data reporting required under proposed § 108.45(a). Requiring this reporting allows FAA to easily determine an operator's compliance with § 108.115 as well as to ensure ongoing regulatory compliance.

In § 108.45(c), FAA proposes that operators would be required to submit a monthly interruption report summary to FAA when there is an occurrence related to an unplanned or precautionary landing away from the normally designated landing location or where the planned UAS route is altered due to known or suspected mechanical difficulties or malfunctions. By analyzing these occurrences, FAA would gain insights into common failure modes. This information would inform maintenance practices and would help improve reliability—including potential changes that the manufacturer may need to make or that can be addressed through revisions to industry consensus standards. Aggregated reports would allow FAA to assess the overall health of a growing and diverse fleet of UAS. This would inform regulatory decisions, training programs, and safety best practices, among other outcomes. Taken together, these reporting requirements would serve as essential tools for maintaining safety, compliance, and operational efficiency.

FAA further proposes that operators certificated under subpart E would be mandated under § 108.45(d)(1) to report to the UA manufacturer any failure, malfunction, or defect that results in a momentary or permanent loss of control or communication of the UAS if it has endangered, or may endanger, the safe operation of the UA. Under the proposed rule, operators would also have to provide such reports to FAA upon request. FAA's intent for this proposed requirement is that this information could be used by the manufacturer to monitor and identify negative trends affecting the safe operation of the UA and its AE. Reporting reliability issues to the UAS manufacturer would provide a vital source of data to help detect and mitigate potential hazards and improve aircraft design. Safety reporting can provide precursor data before a hazard leads to a more significant event. By analyzing these events, industry may be able to avoid future incidents or accidents.

Operators would need to include specific details in their reports, including the date, aircraft identification and nature of the failure. Furthermore, FAA proposes in § 108.45(d)(1) that service difficulty reports would also need to include identification of a part or system involved, which aids in pinpointing root causes and assessing overall system reliability. FAA also proposes in § 108.45(d)(1) requiring operators to indicate the apparent cause of the failure, malfunction, or defect. This could include factors such as wear, cracks, a design deficiency, or a personnel error on the part of the operator. Regardless of what the cause is, understanding the root cause would inform better preventive measures. To assist manufacturers in determining the best course to address a service difficulty report, FAA also proposes in § 108.45(d)(1) that operators would need to report any corrective actions taken.

The service difficulty reporting requirements for operators to report to automated data service providers in proposed § 108.45(d)(2) would substantially mirror those discussed in proposed § 108.45(d)(1), albeit with several notable exceptions. The requirement to make service difficulty reports related to service usage would apply to all users of a service, not just operational certificate holders. Because the operational use of automated data services is new, FAA wants to enable greater information exchange between users and service providers when the failure, malfunction, or defect of an authorized service has endangered or may endanger the safe operation of the aircraft. This proposed rule would require that users report details of the apparent failure of an automated data service, which could include operational or functional issues including notification of a contingent state, interface issues, data issues, time delay/latency issues, or the operational response to information or alerts from a service. FAA intends for this to be broad so that users and service providers alike can recognize a range of issues, including systemic incorrect usage of a service that may be due to ambiguities in documentation, design, or other factors.

Prompt reporting of service difficulties of not later than 7 days after the occurrence would enable manufacturers and automated data service providers to play a proactive role in assessing and mitigating potential safety risks. By reporting to the aircraft manufacturer or the automated data service providers, operators would contribute to a broader understanding of real-world performance and reliability. This feedback would inform design improvements, corrective actions, and other sets of standards upon which the airworthiness acceptance and service authorization rely. Therefore, in proposed § 108.45(h)(4), FAA proposes that reporting under (d)(1) and (d)(2) would need to occur no later than 7 days after the occurrence.

FAA proposes several security-related reporting requirements in § 108.45(e). Any security breach where an operator loses control of the UAS would need to be reported to FAA. This would include unauthorized control that may be careless in nature or perpetrated by a malicious agent, regardless of if that individual is an employee or an outsider. Furthermore, an operator would need to report unauthorized access to the operator's facilities, including areas where UAS are loaded, hazardous materials are stored, or goods are prepared for transport. Finally, an operator would need to report unauthorized access to the operator's networks, devices, or data, regardless of its impact on UAS operations' integrity, accuracy, or reliability. In the report for any incident, the operator would need to include the date and time of the incident, the nature and scope of the incident, identification of any vulnerabilities that led to loss of control or unauthorized access, and corrective actions taken. These security-related reporting requirements would work in conjunction with similar requirements FAA proposes for aircraft manufacturers (sections X and XI) and automated data service providers (section XIII). Reporting security incidents would ensure that potential threats are identified and addressed promptly and contributes to national security by preventing misuse of UAS technology. Reporting would allow FAA to investigate breaches, assess vulnerabilities, and implement corrective measures. It also would help prevent future incidents. Reporting such breaches helps safeguard critical data and maintain public trust.

FAA proposes in § 108.45(f) that part 108 UAS operators report any deviation from this part in the event of an emergency within 10 days, excluding Saturdays, Sundays, and federal holidays. While emergencies may necessitate deviations from standard procedures, reporting these deviations would ensure transparency and accountability on the part of the operator, and may provide insights into operational challenges that could inform changes in training or operational policies.

FAA proposes in § 108.45(g) that operators must report to FAA any operation of a UA that involves damage to property, other than the UA, which exceeds $500, and for any malfunction or failure of any system that leads to operations into an unauthorized area. Note that these reports are in addition to the reporting of aircraft accidents and serious incidents required under 49 CFR 830. FAA chose not to add a duplicative reporting requirement as FAA would also receive these notifications in due course through that regulatory process. FAA intends to use the data both to track overall safety performance and to establish and update relevant safety policies for ongoing BVLOS UAS operations under the rule. Reports under proposed § 108.45(g) would need to include the date, time, and location of the event, as well as a description of the event (including operational factors including whether use, failure, malfunction, or defect of an automated data service provider was a factor) and any known contributing factors. FAA proposes requiring reports within 10 days of the event. This would be consistent with the corresponding reporting requirement in proposed § 107.20.

Finally, FAA proposes in § 108.45(h) reporting timeframes for each reporting requirement enumerated under proposed § 108.45. Under the proposed rule, flight data and UA registration and serial numbers (§§ 108.45(a) and 108.45(b)) would need to be provided to FAA at least once each calendar month. FAA intends to provide an automated interface to facilitate the collection of this data and anticipates that most manufacturers and operators will incorporate automation to comply with this request, so that data collection could be as frequent as near real-time, weekly, or any other frequency that is at least once a month. As this is a new requirement, FAA invites comments on the impact this might have on operators, including potentially less-burdensome alternatives.

Summaries of occurrences under interruption reports (§ 108.45(c)) would need to be provided no later than the end of the 10th day of the following month in which the occurrence took place, which would be consistent with other similar requirements in other regulations.[47] Service difficulty reports (§ 108.45(d)) would need to be submitted 7 days after the occurrence, with additional information provided as needed to supplement the initial report which is also consistent with similar requirements.[48] Security occurrences (§ 108.45(e)) would need to be reported no later than 96 hours after the occurrence, with supplemental information after the initial report as needed, which would be a new requirement but is being proposed as a 96-hour requirement due to the nature of the information. Emergency conditions and event reporting (§§ 108.45(f) and (g)) would need to be submitted within 10 days of the deviation or event, respectively.

Lastly, in considering appropriate reporting requirements for operations under part 108, FAA is considering requiring UA operators to report to FAA all aircraft traffic targets received by their UA operating under this part. This would include reporting ADS-B targets used to meet § 108.195 and part 89 compliant remote ID received by the operator's UA. The latter remote ID reporting requirement would have required additional aircraft reception capability that is not explicitly required by the proposed part 108 rule. This reporting requirement would allow FAA to have a more comprehensive awareness of operations within airspace used by part 108 operators. It would allow FAA to better respond to governmental or public inquiries about UAS operations as low altitude UAS operations increase in scale. However, the presumed additional cost to meet the reporting requirement for the UA manufacturer, part 108 operator, and FAA is considerable. FAA requests comment on whether FAA should require this traffic target

---

[47] *See, e.g.*, 14 CFR § 135.417, 14 CFR § 121.705, 14 CFR § 91.1417.

[48] *See, e.g.*, 14 CFR § 135.415, 14 CFR § 121.703, 14 CFR § 125.409.

reporting, and if so, what type of general time latency would be appropriate for FAA to require.

VI. Conducting UAS BVLOS Operations (Subpart B)

Subpart B of proposed part 108 prescribes the general operating requirements for all operators conducting operations under proposed part 108. To conduct UAS BVLOS operations in the NAS under this proposed rule, FAA would require part 108 operators to comply with all applicable requirements of this part. As noted in proposed § 108.100(a), this rule would establish two pathways for operation under part 108, operating permits and operating certificates. Subpart B applies to operations conducted under an operating permit (subpart D) and operations conducted under an operating certificate (subpart E). Further description of the operating permits and certificates can be found in section VIII of this preamble and personnel requirements can be found in section VII of this preamble.

This rule proposes requirements for BVLOS operations conducted within the United States, using risk-based criteria that permit further evolution of operations than currently allowed in existing regulations. The below section lays out FAA's reasoning and proposed requirements for a BVLOS operating framework, while this section describes the overall requirements applicable to all BVLOS operations envisioned under this rule.

Proposed part 108, like part 107, would have specific risk mitigation and hazard reduction provisions that would facilitate integration. The requirement for all part 108 operations to have a means to avoid manned aircraft broadcasting their position using ADS-B Out equipment would extend to Class G airspace, providing additional collision risk reduction compared with the strategic mitigations provided through the regulatory requirements of part 107. In addition, UAS would be required to have anti-collision lighting that conforms to an industry standard to ensure that they are visible to manned aircraft.

To meet the requirements of proposed part 108, operations under this proposed part would require the use of a registered aircraft (section VI.A.2) with an airworthiness acceptance received in accordance with subparts G and H of part 108, with an exception for flight testing. The UA and its AE would be required to be equipped with aircraft lighting (section VI.A) and be in safe condition for operation (section VI.B). This rule proposes to permit operations in both uncontrolled (section VI.F) and controlled airspace (section VI.G), with operations limited to 400 feet AGL and below. Access to controlled airspace would depend on the operator holding an approved method for strategic deconfliction and conformance monitoring, as discussed in section VI.I.

This rule also proposes a set of criteria by which operators could operate over people (section VI.H). These criteria would rely on a population distribution data set called LandScan USA, developed by the Oak Ridge National Laboratory, and define categories and criteria for operation. This rule would continue to prohibit operations over open-air assemblies.

In order to enable operations in controlled airspace and over people, this rule also proposes requirements for strategic deconfliction (section VI.I), changes to right-of-way rules (section VI.J), and Remote ID performance (section VI.K). These three proposed requirements would provide a framework for the kind of shared, dynamic environment FAA anticipates this proposed rulemaking could enable. In addition, this rule sets requirements for shielded operations (section VI.L), which would permit BVLOS operations within 50 feet of an obstacle or a structure or other designated areas, without further authorization. The proposed rule would permit operations with multiple UA (section VI.M).

Finally, this rule proposes requirements to prohibit careless or reckless operation (section VI.N), manuals (section VI.O), and emergency conditions (section VI.P).

A. Operating Unmanned Aircraft under Part 108

As explained in section X of this preamble, FAA is proposing that a UA operating under this rule would be required to have an airworthiness acceptance rather than an airworthiness certification. Because an individual UA evaluation by FAA would not take place, FAA would additionally require under proposed § 108.720(a)(1) that the manufacturer develop limitations for the UAS to be operated as specified in the manufacturer's UAS operating instructions. This requirement would ensure that operators do not exceed the manufacturer's operational limits on the UA, which could lead to UA failure. Under this proposed rulemaking, manufacturers would develop and test UA to meet consensus standards for FAA airworthiness acceptance. Manufacturers would need to demonstrate that the UAS design may be safely used in BVLOS operations in accordance with FAA-accepted consensus standards.

Accordingly, to operate under proposed part 108, operators would be required to use a UA that holds an airworthiness acceptance, as noted in proposed § 108.105(b), except for UA operated under the flight test permit of proposed § 108.470. These UA and AE would need to be in condition for safe operation and, per proposed § 108.105(a), meet the equipage requirements of subpart H, further described in section XI. These equipage requirements to meet proposed § 108.105(c) would provide the assurance that the aircraft would be able to operate safely, including the fidelity of the AE, suitability and durability of materials, and lighting requirements.

1. Aircraft Lighting (§ 108.110)

Using an anti-collision lighting system or position lights on UA would provide a means for a manned aircraft pilot to observe UA. As such, FAA has proposed in § 108.110 that aircraft lighting would be required for operations under part 108. Proposed § 108.110(a) would require operators to use an anti-collision lighting system during all flight operations, day or night, except when in the interest of safety, as discussed below. To comply with proposed § 08.110(a), the anti-collision lighting system would need to meet the requirements of proposed § 108.830. In addition, proposed § 108.110(b) would require operators use lighted position lights during all operations at night when operating a UA that is equipped with position lights per the requirements of proposed § 108.835.

An anti-collision light is designed to minimize the risk of collision with other aircraft while airborne. Anti-collision lighting usually consists of white pulsating strobe-type lights. The bright flash of an anti-collision light is typically the first visual a pilot has at night of another aircraft, allowing pilots to take appropriate actions to avoid collisions. Under this proposal, anti-collision lights would be required during all operations, as the use of the anti-collision lights can always provide awareness of an aircraft operation prior to and during flight.

As stated in § 108.110(c), this proposal would also permit the flight coordinator to reduce the intensity of, or turn off, the anti-collision lighting if they determine that, because of operating conditions, it would be in the interest of safety to do so. FAA anticipates that there may be situations, primarily during takeoff and landing, where the flight coordinator may want to either reduce the intensity of or turn off the anti-collision lighting due to close proximity with the flight coordinator or other persons on the ground. Allowing the flight coordinator to reduce the intensity of or turn off the anti-collision lighting during takeoff and landing would help to maintain the flight coordinator's full night vision adaptation, which generally takes 30 minutes after exposure to bright lights. If the flight coordinator were to lose their night vision adaptation from exposure to the anti-collision light, they might no longer be able to ensure that the takeoff or landing area is clear for operations.

The primary purpose of requiring lighted position lights on UA during night operations is to enhance the visibility of these aircraft to other airspace users. This requirement would help prevent midair collisions and ensure safe distance between aircraft, particularly in areas of high traffic density or when operating in proximity to manned aircraft. Position lights would make it easier for pilots of manned aircraft and other UA operators to see and track UA, thereby facilitating better situational awareness and decision-making in flight.

Enforcing the use of lighted position lights at night would align with existing regulations for manned aircraft, promoting a consistent and predictable environment for all airspace users. This requirement would ensure that UA are visible to other pilots and air traffic control, thereby supporting safer coexistence and minimizing the risk of incursions or airspace violations.

2. Registration (§ 108.115)

Per 49 U.S.C. 44101, all aircraft operated in the NAS must be registered with FAA. No person is allowed to operate a UA unless it has been registered by its owner, unless the aircraft meets a limited exception from registration.[49] There are currently two ways to register a UAS. Part 47, which broadly applies to all aircraft, including UA, and part 48, which provides an alternate route to register a small UA, defined as those weighing less than 55 pounds. Since part 108 would cover operations of UA weighing greater than 55 pounds, part 48 could not be used for all part 108 operations without making significant changes to part 48. FAA has determined that it is appropriate for UA operated under part 108 to follow the existing registration structure set out in part 47. Though small UA may operate under part 108, FAA is proposing that all aircraft conducting part 108 operations would be required to follow the registration procedures of part 47, as proposed in § 108.115(a). As a result, FAA is proposing to amend § 48.1, Applicability, to require small UA that operate under 108 to use the registration procedures of part 47.

The web-based registration process under part 48 was designed as an alternative streamlined system for the registration and marking of small UA. Aircraft records created under part 48 only contain a minimal amount of data, such as the owner's name, email address, physical address, and phone number, the manufacturer and model of the UA, and the standard remote identification serial number or remote identification broadcast module serial number, if applicable. The part 48 database cannot house document images, such as transfers, security conveyances, or airworthiness applications and certificates. Such documents would likely be commonplace for part 108 UAS. Therefore,

[49]Section 48.105 Registration: Small unmanned aircraft intended exclusively for limited recreational operations adds an exception to the general registration requirement for small UA for recreational flyers. In those cases, a Certificate of Aircraft Registration issued in accordance with § 48.110 constitutes registration for all the small UA used exclusively for operations in compliance with 49 U.S.C. 44809 owned by the individual identified on the application.

any UAS operating under part 108 would be required to register under part 47 (*e.g.*, an N-number), regardless of weight. To facilitate this, FAA is also proposing to amend the applicability under part 48 to restrict the registration of small UA operating under part 108, in addition to small UA that hold an airworthiness certificate. UA operating under part 107 may continue to be registered under the requirements of part 48.

The aircraft registration requirements in part 47, along with the requirements pertaining to the recording of aircraft title and security documents in part 49, necessitate a filing and recording system for the collection of ownership and financial interests in aircraft. FAA Aircraft Registry is the official repository for all title and security documents affecting an interest in aircraft and all airworthiness applications and certificates. Contrary to part 48, part 47 does not restrict the eligibility for aircraft registration based on aircraft weight.

It is possible that a UA currently registered under part 48 could obtain airworthiness acceptance under proposed part 108. However, to be operated under part 108, the aircraft would need to be registered under part 47. While it is not possible to transfer a part 48 registration to part 47, due to the nature of the registrations and the necessary information for each, a current part 48 registration holder could cancel that registration and then submit a new application for a part 47 registration.

While FAA proposes to amend part 47 to apply its registration requirements to part 108 operators, the Agency also considered allowing registration under part 48 or even imposing registration requirements in part 108 itself. If the registration requirements were implemented under part 108, they would be tailored to the particularities of operations under this rule. This could eliminate requests for information that are not available to UAS operators and issuing proof of registration other than a physical registration certificate. FAA requests comment on a potential registration process tailored to UAS operations under this part.

B. General Operating Rules (§ 108.120)

FAA proposes in § 108.120(a) that operations conducted under part 108 would need to be conducted with a UAS that is in a condition for safe operation, including both the UA and the AE. Proposed § 108.120(a) would prohibit an operator from initiating or continuing a flight if they know or have reason to know that the UA or the AE are no longer in a condition for safe operation. As noted in the 2016 Final Rule, FAA considers safe operation to be essential to ensure overall safety of flight. Determinations made of the overall condition of the UAS include an evaluation based on the make, model, age, type and completeness of continued maintenance and inspections of the aircraft and AE. The varied designs of possible UAS mean that FAA cannot prescribe every possible condition that could render a UAS unfit for operation. An unsafe condition could include damage to the structure of the UA, damaged or inoperative flight control systems, data link failures, or damage to propulsion systems.

FAA proposes in § 108.120(b) that operations conducted under part 108 would need to be conducted in accordance with the manufacturer's operating instructions or other procedures acceptable to FAA. While the manufacturer's operating instructions would be the authoritative source of the limits and capabilities associated with the operation of the UA, as discussed in section X.G, FAA recognizes that some operators may have additional operational considerations that may require deviations from the operating instructions defined by the manufacturer. In those circumstances, the operator may request additional operational flexibility from FAA by demonstrating how the operation could still be safely conducted. Possible permutations could include different ratios of flight coordinator to aircraft operations or operating environment conditions not considered by the manufacturer.

FAA proposes in § 108.120(c) that, except for operations conducted under a flight test permit under § 108.470 or in accordance with § 108.555, operations conducted under part 108 would need to be conducted with properly installed and operational instruments and equipment. The manufacturer, as required under proposed § 108.720, would develop a list of parts necessary for the safe operation of the aircraft, or a list of equipment that is allowed to be inoperative.

Finally, as proposed in § 108.120(d), FAA proposes that persons occupying this position would be directly responsible for, and be the final authority as to, the safe and secure operation of all aircraft under their purview. If a company has multiple operations supervisors, each operations supervisor would only be responsible for the operations of aircraft in their assigned responsibility. Similarly, FAA proposes to require that the operations supervisor ensure that the operator complies with all applicable regulatory requirements and its operations manual. Accordingly, the operations supervisor should demonstrate skill in ensuring safe operations and in management. This role would oversee the entire operation, or where multiple operations supervisors are used, their specific areas of responsibility. They must have knowledge of all other roles involved, as well knowledge of the UA, the AE, and flight plans. Though other personnel may be responsible for performing individual safety-of-flight actions, both before and during flight, the operations supervisor holds the overall responsibility and is the final authority for safe operations. The operations supervisor would also be responsible for ensuring that all applicable personnel are properly trained and knowledgeable before an operation commences. FAA proposes in § 108.140 that operations conducted under part 108 would be limited to a speed equal to or less than what is prescribed in the manufacturer's operating instructions. The aircraft manufacturer is in the best position to know the design limits for the aircraft that they produce. FAA chose to use groundspeed because most small UAS lack the equipment to determine true airspeed and generally rely on technologies such as Global Positioning Systems (GPS) to determine UA speed. However, this poses some challenges. If a UA has a strong tailwind, it is possible that the true airspeed might be very low. As such, FAA recognizes that some UA may need to operate at higher ground speeds to maintain a minimum safe operating speed and FAA would provide relief for an operator to exceed the stated groundspeed in the manufacturer's operating instructions in those operating conditions.

FAA proposes in § 108.140(b) that operations conducted under part 108 would be limited to a weight equal to or less than specified for the type of operating permit or operating certificate that the operator is using for that operation. The weight would include the weight of the UA as well as the weight of any items attached to or carried by the UA. While part 108 would allow operations with varying sizes of UA weighing not greater than 1,320 pounds, FAA has proposed weight limitations associated with different types of operations to further mitigate the risks associated with BVLOS operations. For further information about the specific weight restrictions, see the descriptions of permitted and certificated operations in section VIII.

FAA proposes in § 108.145 that operations conducted under part 108 would not be allowed to be conducted in weather conditions other than those described in the manufacturer's operating instructions. In developing a UA for airworthiness acceptance under part 108, manufacturers would be required to identify which weather conditions the UA may safely operate in or ensure the UA has the capability to identify and avoid those weather conditions for which the UA is not designed to operate, per proposed §§ 108.720(a)(1)(i) and 108.890. Operators therefore would need to ensure the weather conditions do not exceed the design considerations and limitations of the UAS used in the operation.

FAA also proposes in § 108.145 that a UA that has frost, ice, or snow adhering to the UA prior to takeoff, except as provided in the manufacturer's operating instructions, would not be allowed to operate under proposed part 108. As with manned aviation, frost, ice, and snow can result in significant degradation of UA performance, including controllability and changes in the weight of the aircraft. Barring any significant mitigations identified by the manufacturer, FAA does not find it in the interest of safety to allow any operations under these conditions.

FAA proposes in § 108.150(a) that operations conducted under part 108 would be required to be conducted from locations that are pre-designated and access-controlled and ensure any persons who are not directly participating in the operation are safely segregated from flight operations. This mitigation would reduce the risk posed by and to non-participants during any stage of the operation. Restricting access to only those involved in the operation would ensure appropriate oversight for safety of flight.

In addition, FAA proposes in § 108.150(b) that UA operated under part 108 would need to be monitored and controlled from a location that is physically located within the United States, including its territories and inter-island operations when operating in United States airspace. This would follow the same restriction that is present in part 107. As discussed in the part 107 final rule, the International Civil Aviation Organization (ICAO) recognizes UAS as aircraft and therefore has applied existing standards and recommended practices (SARPS) for aircraft to UAS. ICAO remains in the process of determining how the SARPS can accommodate UAS, but presently, the ICAO SARPS are quite restrictive for UAS. This proposed rulemaking would likely go beyond what ICAO currently allows for UAS. As such, FAA would restrict proposed part 108 to operations within United States airspace. Any operations outside the United States would not fit within the applicability of part 108. FAA considered adding an option to request authorization to monitor and control UAS from outside the United States. FAA seeks comment on whether it should expand the scope of § 108.150 to allow UAS to be monitored or controlled from outside the United States.

Finally, FAA proposes in § 108.150(c) that operators must address physical security and seek to prevent unauthorized access to the operation's facilities, including controlled access areas, as applicable. An operator may use controlled access areas to protect hazardous materials before those materials are loaded onto a UA, for example. FAA also anticipates that, due to the size, scope, and complexity of operations, the operator may have other areas they deem sensitive and choose to utilize controlled access areas. FAA is utilizing performance-based language in this proposed requirement to provide operators flexibility with how controlled access areas are designated.

FAA proposes in § 108.155 that the operator would need to be able to determine the location of each UA during flight operations. The ability to determine the geographic location during operations and to find the UA when it is has landed during normal, abnormal, and emergency situations are important considerations for maintaining situational awareness and safety of the operation. FAA anticipates that most UAS will have software that will provide the operator with the appropriate information to determine its location.

C. ADS-B and Transponder Use (§ 108.160)

FAA proposes in § 108.160 that no operator would be allowed to operate a UA with ADS-B Out equipment in transmit mode or with a transponder in transmit mode under part 108. As previously discussed in the Remote Identification of Unmanned Aircraft final rule (86 FR 4390, January 15, 2021), the installation and use of ADS-B Out transmitters on UA may negatively affect the safe operation of manned aircraft in the NAS. The projected numbers of UA operations have the potential to saturate available ADS-B frequencies, affecting ADS-B capabilities for manned aircraft and potentially blinding ADS-B ground receivers. Currently, operators conducting operations under part 107 cannot operate a UA with ADS-B Out in transmit mode, per § 107.53. FAA also prohibits the use of ADS-B Out to meet the requirements of remote identification, as per § 89.125. The proposed restriction on ADS-B equipment in § 108.160 is consistent with FAA's existing limitations.

D. Area of Operations (§ 108.165)

FAA proposes in § 108.165 that all operators would be required to obtain approval from FAA for the area of intended operations prior to operation. Understanding potential risks, anticipating their impact on both flight and ground operations, and mitigating those risks are all critical to safe part 108 operations. Under this proposed requirement, before beginning operations in a new area the operator would identify known hazards, mitigate such hazards with proper planning and effective controls, and plan for contingencies for any new hazards identified during operations. In developing this proposal, FAA utilized its ongoing experience with the authorization and oversight of waiver and exemption holders. In proposed § 108.165(a), FAA would require operators to receive approval from FAA prior to beginning operations in an area and would expect the operator to be responsible for certain requirements as described below for those intended operations. In requesting approval from FAA for a new operating location, the operator would submit information to FAA that includes the operating area boundaries, estimated number of daily operations, and other operating characteristics as appropriate. FAA anticipates that operators would report, and FAA would collect, this information through the same portal as the application process uses for permit and certificate oversight.

Proposed § 108.165(b) would require the operator to designate safe alternate landing areas that the UA can reach if it is unable to complete the intended flight. Proposed § 108.165(b) lists specific requirements that landing areas would have to meet to satisfy the proposed regulation. First, the safe alternate landing area would need to avoid areas where overflight is prohibited. Second, the safe alternate landing area would need to provide for a landing without posing undue hazard to persons or property on the ground. FAA has proposed these requirements to ensure that, in a situation when an immediate landing is required, the operator is prepared with an area that would not create a hazard to persons and property on the ground. In the planning of these proposed alternate landing areas, it is critical that operators understand that the need to land the UA in a timely manner is paramount for circumstances such as emergencies or abnormal events.

In § 108.165(c), FAA proposes that the operator would be required to designate appropriate takeoff, landing, and loading areas that have restricted access to only those persons participating in the operation and that are free of any obstructions that could pose a hazard to persons who are not participating in the operation. Designating appropriate takeoff, landing, and loading areas that have restricted access would ensure that only authorized people have access to the operating areas. This would keep unauthorized persons away from operating areas and lower the risk to non-participants, who may not be aware that an operation is in progress. In addition, FAA proposes that takeoff, landing, and loading areas would need to be adequate for the planned operation, considering such items as size, surface, obstructions, and lighting. FAA anticipates operators to use UA of various sizes and capabilities, which would also have performance characteristics that may require takeoff, landing, and loading areas of differing complexities. By requiring operators to ensure that these areas are adequate, operators would be required to consider the individual necessities of the UA and the operation.

FAA proposes in § 108.165(d) that the operator would be required to ensure adequate communications coverage and availability, and appropriate lost link procedures. As discussed in section XI.D of this preamble, a lost link or loss of control of the UA pose significant risks to aviation safety. As part of the flight planning for a new operational area, the operator would need to assess the coverage area for C2 link system configuration utilized for the intended operational area and verify operational status. The operator would not be able to commence a UAS operation if a control link is working improperly, whether due to a result of radio interference or for some other reason. The operator would be expected to resolve any radio interference or other spectrum complications prior to beginning operations in that area.

Before beginning operations in a new area, FAA proposes in § 108.165(e) that the operator would need to ensure that the planned operations minimize risk to persons and property on the ground, as appropriate, and consider terrain and obstacles that the operator intends to overfly. FAA expects operators to plan for and be aware of the number of persons and property on the ground around operations and consider possible flight paths with the least presence of people and moving vehicles, while also considering the terrain and human-made obstacles the operator intends to overfly. The operator would be required to verify the maximum height of obstructions. To accomplish this, the operator could perform an area assessment or use a capable third party to do so.

Further, as discussed in section VIII.C.5, § 108.550(b) proposes to also require certificated operators to perform a ground risk assessment of pedestrians, vehicles, terrain, and man-made obstacles.

E. Preflight Requirements (§ 108.170)

Ensuring the safe conduct of operations begins with determining that the aircraft is in a safe condition for flight and reviewing appropriate information concerning the operating environment. FAA has proposed in § 108.170 that operators would be required to meet certain preflight requirements before conducting each operation under part 108.

In § 108.170(a), FAA proposes that, prior to operating under part 108, the operator would need to ensure that the weather conditions are appropriate for the intended operation, in accordance with the aircraft limitations specified by the manufacturer, and that are determined in a manner acceptable to FAA. This is because flying in adverse weather conditions, or in weather conditions that the UA is not designed to handle, may increase operational risk. Familiarity with forecast weather conditions is an important part of the flight planning process. Title 14 of the CFR contains requirements on the use of weather information and the level of approval required for that information for various operations. For example, within 14 CFR parts 121 or 135, there is a requirement to use weather reports or forecasts from a source "approved by the Administrator."

Aviation weather currently provides surface weather observations [*e.g.*, Meteorological Aerodrome Report (METAR)] and forecasts [*e.g.*, Terminal Area Forecast (TAF)] at and around many airports. These observations and forecasts are typically only valid out to five miles from the location where the observation was taken or around the airport the TAF was generated for. To date, FAA's current sources "approved by the Administrator" include, but are not limited to, Automated Surface Observing System (ASOS), Automated Weather Observing System (AWOS), and information provided by the National Weather Service (NWS).

Massachusetts Institute of Technology Lincoln Laboratory (MIT/LL) reports[50] from November 2017 note the sparseness of off-airport observations of visibility, clouds

[50] *See* MIT/LL, *Preliminary UAS Weather Research Roadmap*, ATC-438 (November 2017), and MIT/LL, *Preliminary Weather Information Gap Analysis for UAS Operations*, ATC-437 (November 2017).

and ceiling, and surface winds. The report summaries state that: "airport-specific weather information (*e.g.*, METAR, TAFs, etc.) do not readily translate to conditions at remote launch locations, which may be 10-30 miles from the nearest airport…the results show significantly less weather information available to support low-altitude flight than for typical manned-flight profiles."

FAA estimates that, for airspace below 400 feet only, around 3% of the continental United States and 2% of Alaska airspace is covered by an approved source of weather information, with most of that being on or near airport environments. However, given that part 108 UAS operations would operate primarily outside of this area of approved observation coverage, those operations will need additional sources of weather information to operate safely. FAA anticipates that some of this weather information gap could be filled by third-party weather providers or come from other non-traditional sources, such as locally owned and operated devices.

As BVLOS UAS operations mature, they may require a more detailed and definitive set of meteorological information to operate safely. For BVLOS operations, the fidelity of the meteorological information would need to be such that the operator can determine whether the vehicle can safely operate within the manufacturer's limitations. Traditionally FAA has required operators to use weather information that was from sources approved or provided by FAA. However, for the reasons stated above, this is not practical or appropriate for most UA operations, so FAA is proposing to allow operators to obtain weather information in other ways. This could include the use of weather services provided under an automated data service provider construct under proposed part 146, or through other sources found acceptable to the Administrator.

FAA proposes in § 108.170(b) that the operator would need to be familiar with any airspace and flight restrictions along the entire route of flight, including the review of any applicable Notices to Airmen (NOTAMs). Another important aspect of assessing the operational environment is the consideration of airspace information to identify any known flight restrictions along the route. To comply with this requirement, FAA expects the operator to assess the departure, enroute, and destination airspace; special use airspace; NOTAMs; temporary flight restrictions; and UA flight restrictions to ensure compliance with airspace rules and restrictions. As stated in proposed § 108.180 and further discussed in section VI.G, UAS operations under this proposal would only be allowed in controlled airspace under certain conditions and may be subject to FAA authorization. If an operator did not assess this information prior to conducting operations, operations could transverse through controlled airspace and result in adverse events, such as disruptions to aircraft receiving ATM services or loss of separation between controlled and uncontrolled aircraft. Similarly, an operator would need to be familiar with special use airspace, NOTAMs, and any ground hazards associated with the flight. The operator would need to be aware of special use airspaces to avoid conflict or potential national security issues with the operations or events being conducted within those airspaces. In addition, NOTAMs indicate the real-time and abnormal status of the NAS impacting every user and concern the establishment, condition, or change of any facility, service, procedure, or hazard in the NAS. These impact UA operations as well as manned aircraft operations.

FAA proposes in § 108.170(c) that the operator would need to assess the population density category or categories to be overflown. Obtaining this information in advance would allow the operator to comply with proposed § 108.185. For further discussion, see section VI.H of this preamble.

FAA proposes in § 108.170(d) that the operator would need to identify the location of ground obstacles and hazards associated with the specific flight operation being flown. Because part 108 UAS operations are conducted at low altitudes, the operator would need to be aware of structures, obstructions, and other hazards that may pose a risk to the specific flight operation. Awareness of these ground hazards would enable the flight coordinator to appropriately plan around or avoid such hazards that may result in adverse events when preparing to conduct the operation. Given the advances in geospatial information systems, 3D mapping software, and publications, operators should have access to sufficient information to be able to comply with this requirement. FAA seeks comment on this assumption.

To comply with proposed § 108.170(e), the operator would be required to ensure that the UAS are in a condition for safe operation. It is critical that all aircraft operated in the NAS, including UAS operated under proposed part 108, are in a safe condition to minimize risk. Being in a safe condition not only minimizes the risk for other aircraft in the NAS, but also minimizes the risk for persons and property on the ground.

FAA proposes in § 108.170(f) that the operator would need to ensure there are sufficient personnel available for the operation. While there are no specific staffing requirements under this proposal, an operator not having sufficient personnel necessary for their individual operation could present a safety risk. Increased pressure to "get the job done," and personnel taking on additional work beyond their duty assignment, or lack of experience with certain duties, can degrade the safety of the operation. Operations with insufficient personnel may experience mistakes with potential undesired results in any part of the operation. Task saturation or diversion of attention could create gaps in monitoring the automated systems and over-reliance on those systems. Incomplete knowledge and experience with those systems could cause errors that could lead to an incident or accident at various points during an operation.

FAA is proposing in § 108.170(g) that, if required by § 108.180 or § 108.185, the operator would need to ensure that a strategically deconflicted operational intent is accepted prior to takeoff. As described in section VI.I of this preamble, strategic deconfliction is a set of functions that aid in managing conflicts between UAS operating under part 108.

FAA proposes in § 108.170(h) that the operator would need to ensure that there is enough available power or fuel, considering wind and forecast weather conditions, for the UAS to operate for the intended operational time, such that the UA can land without posing an undue risk to aircraft or people and property on the ground, or the reserve power recommended by the manufacturer, if greater, is satisfied. A key aspect of preflight planning involves ensuring that there is sufficient fuel or power to conduct the intended operation and land safely. Since the amount of fuel or power necessary for an operation may be impacted by wind and weather conditions, FAA proposes requiring the flight coordinator to consider these conditions in making the determination whether there is sufficient fuel or power to conduct the intended operation. FAA considered establishing and enforcing a standard flight time that the UAS would need to have in its power reserve to land safely (*e.g.*, 5 minutes, 10 minutes, etc.). However, limitations should be relevant to the operation. As such, imposing a standard time that a UAS needs to have in its power reserve may be unreasonably burdensome for some UAS operations. The flight coordinator would be better situated to determine what constitutes sufficient power or fuel for their specific UAS operation.

FAA proposes in § 108.170(i) that the operator would need to ensure that operations would be conducted within the weight and balance limitations defined by the aircraft manufacturer. Compliance with the weight and balance limits of any UAS are critical to flight safety. Operating above the maximum weight limitation compromises the structural integrity of the UAS and adversely affects its performance. Operators must be aware that, even while operating within center of gravity limits, the UAS can be overloaded. Though the UAS manufacturer may specify a maximum gross takeoff weight, and the operator would need to comply with that limitation, there may be additional conditions that affect overall takeoff performance such as high elevations, high temperatures, and high humidity (high-density altitudes) that the operator could consider in determining the weight for a specific operation.

Conditions such as these may require a reduction in weight before a flight is attempted. Operating with the center of gravity outside the approved limits could result in control difficulty and unstable or unknown flight characteristics. Operating within the center of gravity would ensure the UA is operating in the most stable, balanced, and predicted condition. As listed in section X of this preamble, under the proposed process for airworthiness acceptance, the manufacturer would need to provide weight and balance data. Therefore, because of the effects of an out-of-balance or overweight condition, FAA proposes that the operator should ensure that weight and balance will be calculated and conducted within the limitations defined by the aircraft manufacturer.

In § 108.170(j), FAA proposes that, for the safety of the operation, property, and people around the operation, the operator would need to ensure that any object attached to, or carried by, the UA is secure and does not adversely affect the flight characteristics or controllability of the UA. If not directly attached to the underside of the UA during transport or if lowered during operations, the operator should be able to calculate weight and balance with emphasis on a lateral center of gravity. If during maneuvering forward airspeed is increased, light loads generally tend to shift further aft and may become unstable. Any unstable load may flutter, oscillate, or rotate, resulting in reduced aircraft control and undue stress on the UA.

Finally, in proposed § 108.170(k), the operator of a part 108 UA would need to ensure that their UA navigation and communication systems are working properly. This is critical for ensuring that the UAS operation can be conducted successfully.

F. Operating Restrictions (§ 108.175)

FAA proposes in § 108.175 that an operator would not be allowed to operate a UA under part 108 higher than 400 feet AGL unless the operator is in Class G airspace and temporarily transiting steeply changing terrain, is operating within a 400-foot radius of a structure and does not fly higher than 400 feet above the structure's immediate uppermost limit, or needs to maneuver up to 450 feet AGL temporarily in order to avoid a collision.

Like part 107 and existing UAS exemptions and waivers, FAA proposes to permit UA operating under proposed part 108 to operate up to 400 feet AGL. An altitude limitation provides a necessary barrier between UA operations and most manned aircraft operations in the NAS. In addition to the altitude limitation of 400 feet AGL, FAA would require the altitude of the UA to be flown within a 400-foot radius of a structure to not fly higher than 400 feet above the structure's immediate uppermost limit when operating within the confines of a structure. This limitation has the same reasoning as the buffer of 500 feet from manned aircraft in that manned aircraft must generally maintain at least 500 feet from a structure. In addition, FAA would permit operations to exceed 400 feet AGL if necessary to avoid a collision.

This prohibition against close operation near obstacles and structures is intended to mitigate the risk of collision. The operating speed of manned aircraft is another factor that contributes to collisions with structures or obstacles. For most manned aircraft, the operating speed is much higher than the operating speed of a UAS.

FAA does not believe that an altitude above 400 feet AGL is justified for part 108 UAS operations, except in the narrow circumstances prescribed in this part. If allowed, higher altitude UA operating in the NAS would potentially be unable to maintain adequate separation from manned aircraft. If UAS were permitted to operate above 400 feet AGL, it could increase the risk of a collision between UAS and non-equipped aircraft. At this time, FAA does not have sufficient data to eliminate the 100-foot buffer between UA operating at 400 feet AGL and below and manned aircraft generally occupying airspace 500 feet AGL and above established in part 107. The United States aviation system is designed to have sufficient safety margins, as well as redundancy in risk mitigations. The 400-foot AGL maximum altitude proposed by this rule upholds those principles.

The maximum operating altitude imposed by this rule is intended to limit the height of the UA above the ground over which it is flying AGL. It is incumbent upon the operator to maintain flight at or below this maximum operating altitude. Lastly, during all operations, the UA must be operated at an altitude that would not create a hazard to persons or property. Operating at an altitude that would not create a hazard to persons or property also means that the UA must be operated at a distance from a structure or obstruction to not create a hazard to persons or property.

FAA recognizes, however, that certain terrain may obstruct the operator's ability to comply with this requirement to remain at or below 400 feet AGL. For example, in areas with steep terrain, such as open pit mines, gorges, and small canyons, it may be unsafe or impractical for the aircraft to dive or climb rapidly to stay no more than 400 feet above the terrain immediately below. Rather than require operators to maintain a consistent altitude of 400 feet AGL or below, FAA deems it would be more important for the operator to use their best judgment in maintaining a safe altitude and reduce any operating safety risks. FAA's primary objective is to ensure that UAS BVLOS operations promote NAS safety and efficiency. As such, FAA proposes in § 108.175(a)(1) that, in the interest of safety, the operator would be able to operate higher than 400 feet AGL in situations where the operator is briefly transiting steeply changing terrain.

In addition, FAA proposes in § 108.175(a)(2) that an operator may operate higher than 400 feet AGL when operating a UA within a 400-foot radius of a structure and does not fly higher than 400 feet above the structure's immediate uppermost limit. Manned aircraft are not able to operate safely that closely to a structure, so the UAS operator would be able to maintain separation.

FAA proposes in § 108.175(a)(3) that the operator could temporarily exceed 400 feet AGL if necessary to avoid a collision. While it would remain incumbent upon the operator to be aware of any obstructions that could pose a hazard, per § 108.165(c)(2) and maintain safe distance from other aircraft in line with the requirements in § 108.195, FAA acknowledges that there are circumstances that may require the operator to temporarily climb to avoid a collision. One example could be ascending above 400 feet AGL to avoid hitting birds or other wildlife and then returning to 400 feet AGL or below when the hazard has passed. FAA has proposed this section to permit operators the leeway to exceed the 400 feet AGL limit in Class G airspace in their operating area to the altitude and duration necessary to avoid unexpected objects.

Class G airspace is considered uncontrolled airspace. Research conducted by MITRE for FAA found that in Class G airspace, a drone with no mitigations could be expected to collide with manned aircraft between once every 10,000 flight hours in the most heavily used Class G airspace, to once every 1 million flight hours in the least used Class G airspace. The addition of mitigations under part 108, such as those described above, would substantially lower the collision risk in Class G airspace even further.

FAA proposes in § 108.175(b) to make clear that operators would be required to comply with certain other requirements like those that apply to part 107 and recreational operators. Proposed § 108.175(b) provides that part 108 operations would need to comply with flight restrictions and other conditions codified in 14 CFR §§ 91.133, 91.137-91.145, and 14 CFR § 99.7. Flight restrictions are established under certain circumstances to maintain the safety and security of the NAS. Scenarios warranting the establishment of flight restrictions may include responses to disaster areas such as wildfires and hurricanes, protection of sensitive sites, major sporting events, and for emergency and national security situations.

FAA proposes in § 108.175(c) that operators should notify the controlling agency for any operations planned within a military operating area (MOA) or on and military training route (MTR). Operators must always exercise extreme caution and remain vigilant of all MTRs and or non-regulatory SUAs. While MOAs and MTRs do not rise to the level of being classified as prohibited or restricted areas, the potential for low level military operations are higher in these areas and increased awareness and precautions are warranted.

Finally, similar to the restriction found in part 107, FAA proposes in § 108.175(d) a provision that would prohibit any UAS operations that interfere with operations and traffic patterns at airports, heliports, seaplane bases, space launch and reentry sites or any facilities used for VTOL aircraft landing and takeoffs. Airspace designations as described in proposed § 108.180(a) should help ensure UA operations do not interfere with operations at airports within controlled airspace. However, since many airports are within uncontrolled airspace, this proposal would also cover uncontrolled airspace where such operations could represent a higher likelihood of an encounter with a part 108 operation during takeoff or landing.

G. Operation in Controlled Airspace (§ 108.180)

FAA proposes in § 108.180(a) to enable routine BVLOS UAS operations in certain areas within controlled airspace at or below 400 feet AGL when participating in strategic deconfliction and conformance monitoring (as described further in this section, and in section VI.I). Per proposed §§ 108.180(c) and (d), airspace authorization would only be required in those portions of Class B, Class C, or Class D airspace, or within the lateral boundaries of the surface area of Class E airspace designated for an airport, that

FAA specifically designates as requiring authorization. Operators would be able to access the remaining portions of controlled airspace without an airspace authorization.

Currently, operators authorized to conduct BVLOS operations via exemptions or waivers must obtain an authorization from FAA to access controlled airspace on a case-by-case basis. As FAA moves toward enabling routine BVLOS operations, this process to authorize these operations in controlled airspace needs to become more scalable and less resource intensive.

One approach FAA considered is a process similar to the one FAA uses for recreational and part 107 operators. Under that process, operators can request authorization to access controlled airspace using either FAADroneZone or a Low Altitude Authorization and Notification Capability (LAANC) service provider. (See section XII.B.6 for additional details about FAADroneZone and LAANC services). LAANC and FAADroneZone collect data about the operator, including contact information, location and altitude of operation, date of operation, and time of operation. Once the operator has authorization through LAANC or FAADroneZone, they usually do not have any other interaction with FAA prior to accessing the airspace.

BVLOS operations in controlled airspace under proposed part 108 would present a different regulatory construct than part 107 or recreational operations. An operator otherwise in compliance with part 108 would have other touchpoints with FAA that would provide the minimum information that FAADroneZone and LAANC currently provide for part 107 and recreational operations. For example, under this proposal, a part 108 BVLOS operator in controlled airspace would be required to participate in strategic deconfliction and conformance monitoring services, as defined in section VI.I.

As a result, FAA would not need to rely on a system like FAADroneZone or LAANC to have the basic informational touchpoint with part 108 operators. This would negate the need for automated approvals. Instead, FAA could limit its interaction to operators seeking to conduct higher risk, more complex operations that require individual evaluation and coordination.

In § 108.180, FAA proposes that operations at or below 400 ft AGL in Class B, Class C, Class D airspace, or within the lateral boundaries of the surface area of Class E airspace designated for an airport, can occur without an exemption or waiver, except for in those areas FAA specifically designates as requiring airspace authorization (as provided in proposed §§ 108.180(c) and (d)). FAA would engage in a risk-based analysis to determine where BVLOS operations cannot be conducted safely or cannot be conducted safely without prior authorization. FAA anticipates these designations would be close to airports and other areas in controlled airspace where uncoordinated UAS operations could affect the safety of the NAS. The risk-based analysis will include the potential for primary radar returns by larger UAs enabled by proposed part 108. Under this proposal, operators would be allowed to conduct part 108 BVLOS operations in all other portions of Class B, Class C, Class D airspace, or within the lateral boundaries of the surface area of Class E airspace designated for an airport without prior FAA authorization, so long as the operators meet the minimum operating requirements proposed in § 108.180. This would present a scalable approach to airspace access that focuses on those operations that require special attention.

In many ways, airspace designations under proposed § 108.180 would be similar to the UAS facility maps that part 107 and recreational operators use to identify where airspace access authorizations are available. The principal difference between those maps and the process in proposed part 108 is that FAA would require authorization in those places where advance coordination is mandated in the interest of safety.

In addition, FAA proposes additional requirements to operate in Class B and C under proposed part 108. The largest concentration of manned aircraft operating at low altitude within the vicinity of an airport occurs within Class B and C airspace. As a result, FAA considers there to be a higher risk of a collision in this airspace. To mitigate this risk, FAA proposes to require UA operating in Class B or C airspace to be equipped with a DAA system that meets the requirements in §§ 108.825 and 108.195. FAA also proposes to require UA operating in Class B or C airspace to detect and avoid manned aircraft that are not broadcasting their position via ADS-B or an electric conspicuity device. FAA recognizes that most aircraft operating in Class B or C airspace are otherwise required to broadcast their position via ADS-B or an electronic conspicuity device. Nonetheless, under certain circumstances, aircraft could be operating in this space without ADS-B or an electronic conspicuity device. For example, an aircraft could be experiencing an equipment failure or could have received authorization from ATC to deviate from these requirements. FAA seeks comment on whether these requirements are appropriate mitigations to address the risk of collision with manned operations in this airspace and any information that provides more insight into if, and to what extent, operations with ADS-B Out turned off happen in controlled airspace below 500 feet.

Designated airspace requiring prior authorization would be compiled annually in FAA Order JO 7400.[XX], which FAA would incorporate by reference into § 108.180. FAA would then publish periodic designation updates for airspace requiring prior authorization in the *Federal Register* and seek public comment through an NPRM. After considering comments and making any appropriate adjustments, FAA would publish the adopted designation updates in a final rule. At the end of the year, FAA would apply the updates to FAA Order JO 7400.[XX+1] and then incorporate the new version of the Order by reference. The currently incorporated version of FAA Order JO 7400.[XX] would be available on FAA's website, along with any periodic updates. In addition to making these designations available on its website, the agency anticipates making electronic information available for service providers to incorporate into their UAS information service offerings.

FAA further proposes in § 108.180(a) to require operators to conduct operations at 400 feet AGL or below and to use strategic deconfliction and conformance monitoring services that meet the requirements of § 108.190 (see section VI.I). The purpose of these requirements would be to mitigate the risk of collision with other aircraft. FAA has identified several important risk reductions associated with strategic deconfliction and conformance monitoring; the functionality of both capabilities is described in greater detail in section VI.I.

First, strategic deconfliction[51] would reduce the risk of collision between UA. By definition, controlled airspace exists over and around airports which, in turn, serve major population centers. Where there are greater concentrations of people, FAA anticipates that there would be UA operating in closer proximity to people than in less densely populated areas. Operators who provide a service to people in urban environments may

[51] Strategic deconfliction is discussed in section VI.I.

also be conducting more frequent operations than those in more rural areas. Operators may also be limited in room to maneuver in controlled airspace due to natural or human-made obstacles. Given these additional challenges to operating in controlled airspace in addition to the proximity and frequency of operations, FAA determined that BVLOS operations would present an increased risk of collision in these areas. FAA determined that improving operators' situational awareness of other operations through strategic deconfliction services would help reduce this risk.

Second, using strategic deconfliction services would also help reduce the risk of UA having near misses and engaging in avoidance maneuvers to avoid each other. Controlled airspace is highly structured and requires aircraft to operate in their designated areas to avoid conflicts. ATC manages controlled airspace to maintain the structure and separation necessary for the safety of the airspace. It is not necessary, however, for FAA to provide these types of services for UA operating at 400 feet AGL or below due to the extremely low likelihood of interaction with manned aircraft. Strategic deconfliction would provide the situational awareness for operators to understand where other UA are operating or intend to operate. This would help provide predictability and structure at 400 feet AGL and below that would help reduce the risk that UA would have an unexpected encounter or near miss that would require avoidance maneuvers. This would be particularly helpful in areas with a high density of UAS operations, as it would reduce the likelihood of a cascading set of uncoordinated maneuvers that could introduce risk to both UAS and manned aircraft operating in the area.

Third, using strategic deconfliction services would enable NAS users to participate in a data exchange network that would benefit the entire community of NAS stakeholders. Flight notification would allow the operator to share relevant operational information with other data exchange networks and users, including manned aircraft. For manned aircraft operating at 400 feet AGL and below, this would provide information that could help mitigate risk associated with BVLOS and aircraft not broadcasting their position using ADS-B Out equipment operating in the same airspace. For example, manned aircraft and UA could use this information for operational prioritization. FAA anticipates that the demand for UA operations in controlled airspace around major metropolitan areas would continue to grow, causing interactions between lower priority routine operations and higher priority emergency or first responder operations (manned or unmanned) to become more frequent. Universal exchange of information would facilitate operational prioritization, to avoid preventable interference with priority services.

In § 108.180(a), FAA also proposes requiring conformance monitoring in controlled airspace to help provide predictability, structure, and the necessary situational awareness to reduce risk associated with introducing UA operating BVLOS at 400 feet AGL or below. Conformance monitoring would provide notice to users when a UA does something unexpected or inconsistent with its previously indicated operational plan. Conformance monitoring would make NAS-users aware of BVLOS UA operating off-nominally.

Conformance monitoring would help reduce risk in several ways. First, conformance monitoring would notify other users of off-nominal conditions in the NAS that may require additional action to maintain safe operations. Notification would provide situational awareness to help NAS users react and adjust operational plans as necessary to maintain safe operations. Second, conformance monitoring would provide an operator important information about its own operations. A BVLOS operator could use conformance monitoring to understand when off-nominal conditions occur, allowing for real-time adjustment during the operations. Third, operators, equipment manufacturers, service providers, and regulatory agencies could use conformance monitoring data to study and identify the causes of off-nominal operation. Understanding why off-nominal operations occur and what their impact is on safety would help FAA and other stakeholders improve safety and efficiency for BVLOS operations at 400 feet AGL or below.

H. Operations Over People (§ 108.185)

Part 107 currently allows for operations over people; however, part 107 is limited to UA weighing under 55 pounds and includes restrictions on how operations over people may be conducted. Under part 107, operations over people may only be conducted over persons directly participating in the operation or located under a covered structure or inside a stationary vehicle that can provide reasonable protection from a falling UA, or if the operation complies with categorical requirements. The categorical eligibility requirements for operations over people under part 107 are based on aircraft weight, compliance with aircraft impact severity limits, and FAA-accepted DOC.

Currently, to operate a UA under part 107 over people, an operator must either (1) operate in compliance with part 107 subpart D; (2) request a waiver under part 107; or (3) obtain a type certificate. If the UA weighs 55 pounds or more, the operator must obtain a 49 U.S.C. 44807 determination for the specific aircraft and operation and, at a minimum depending upon location and type of operation, an exemption that provides relief from several part 91 and part 61 regulations that do not apply to UAS.

As noted in section III.A.2, the current part 107 process is limited in scalability. Part 107 was developed for VLOS operations, small UA, and individual pilots operating a single UA. As such, the part 107 regulations allowing operations over people and related waiver provision were crafted with this limited scale in mind. Proposed part 108, however, would allow for a much larger scale of operations, which merits the proposed approach for operations over people.

A calculation based on population density can be used as a general estimation for ground risk to people. As the population density overflown increases, there is a corresponding increase in the risk of a person being harmed by a UA crash. Since some portion of UAS operations are expected to be driven by demand from the population nearby, such as package delivery, FAA anticipates that increasing the required mitigations as the overflown population increases would help mitigate risks in a proportional fashion.

In § 108.185(c), FAA is proposing five categories of ground risk to people based on population density for part 108. The proposed population categories seek to find a balance between risk and increasing integration of UAS in the NAS. Though FAA strives to establish performance-based regulations where possible, in this case, prescriptive requirements are appropriate to ensure that is no ambiguity when determining a population density level (*i.e.*, one operator's determination of population density level would not differ from another's). This would ensure applied mitigations would be consistent across operators. This would be especially important with strategic deconfliction, which relies on all UA complying with the requirement for it to mitigate risk successfully.

The categories would be defined by metrics that could be assessed consistently by independent users and regulators. FAA proposes to use the Oak Ridge National Laboratory's LandScan USA product as a source of population location and density to assess population density for low-risk UAS BVLOS operations considered under this rule. The LandScan data is accessible in machine-readable format at no cost. FAA's proposal would require the use of the appropriate LandScan data set to determine population density, including proper selection of day or night data. LandScan USA updates annually, which ensures accurate population density data. FAA intends to provide guidance on the implementation of new data published by LandScan following the annual update.

LandScan USA is partially based on census data and the data is processed to reflect the estimated location of people during both day and night. This publicly available data is free to access and can be analyzed with common mapping software. FAA anticipates that UAS operators, service providers, and other industry stakeholders may be interested in developing specialty applications to process and share the LandScan data.

FAA expects that there would be various methods to access this data. Some operators may not choose to take on the determination themselves and look to service providers for a ground risk assessment. Some operators may fully automate this ground risk analysis into their automated flight planning software. The LandScan web site also offers a viewing application. While the map on the LandScan website is not as precise as the downloadable data, it can be useful in understanding the general population density of an area. The LandScan website map does not give exact population count nor measure distance, both necessary for making a final decision about which population density category an operation falls within. FAA is considering publishing a map, similar to the UAS Facility Map for LAANC data, which would assist operators in determining population density categories. FAA invites comments on whether this would be helpful or desirable.

All operators would need to reach the same conclusion for the population density category for any point in the NAS. This would ensure that all operators in that area will enact the same minimum level of mitigations. Knowing what mitigations other operators would be required to employ would create certainty for an operator. As such, FAA is proposing using the LandScan data to determine the population density category for a specific place.

FAA considered including a "shelter factor" in the population density determination to account for the protection offered by a building. However, FAA decided to not include it in proposed § 108.185. The static nature of the population density data does not account for the ratio of time spent inside and outside of buildings, nor does it account for abnormal events which could cause people to go outside unexpectedly. In addition, the ability of a building to protect its occupants from a falling UA is not assumed, particularly with larger and heavier UA.

Each population density category would have operational restrictions. Each category level would build upon the prior level, layering on mitigations as deemed appropriate for the additional risks posed by increased population density. The requirements of each category of operations over people would include the mitigation(s) for that level and all the mitigations of numerically lower levels, with the exception of Categories 2 through 5 not having to follow the Category 1 requirement to stay away from people. For example, an operation in Category 4 airspace would need to comply with the mitigations of Category 2 and 3 as well as the Category 4 mitigations. For operations in Categories 3, 4, and 5, FAA intends to address the ground risk over areas of increasing population density by requiring the use of strategic deconfliction that meets the requirements of § 108.190.

The following descriptions of the five categories of population density describe why certain mitigations would be required at increasing levels of density. The mitigations would be layered on at increasing category levels, such that a higher-level area would require the mitigations applied at all lower levels (with the exception of category 1's mitigation), plus additional mitigation(s) at that level. This graduated approach to risk management is designed to proportionally add safety mitigations to reduce risk of harm to people on the ground.

1. Category 1 Operations

FAA proposes in § 108.185(c)(1) that Category 1 areas would be those with few to no people, defined as being farther than 1 statute mile from any LandScan USA cell which contains 10 or more people. In addition, any operations that are unable to comply with the requirements for Category 2 would be limited to this category. This would be the lowest category with the fewest number of mitigations being applied to the operation. As a result, Category 1 would be the most restrictive in terms of location regarding flights over higher population density. While all part 108 operations would be allowed to operate in Category 1 airspace, those permitted operations that would be limited to Category 1 would be ones that pose a higher risk to persons and property on the ground. As such, it is critical to operate in airspace over areas with very low population densities.

2. Category 2 Operations

FAA proposes in § 108.185(c)(2) that under Category 2, the operational area would cover locations where people are expected near the flight path, but at low densities, such as rural areas found near farms. This would be defined as being within 1 statute mile of a LandScan USA cell which contains 10 or more people. In areas of this level of population density, operations would be more likely to be targeted toward mission types which overfly fields and infrastructure, such as agricultural and inspection missions, which generally have fewer people than areas in which package delivery would be likely to be more prevalent.

Because of the increased risk to the overflown population compared to Category 1, FAA proposes to preclude Category 2 operations from using radio frequency devices that operate in accordance with 47 CFR parts 5 and 15 in their C2 systems. These radio frequency devices operate on specific radio frequency spectrum allocations in a manner in which all users have equal access. As such, systems and equipment that use that spectrum should expect harmful radio frequency interference anytime during use. This harmful interference could prevent the UA from staying in its intended flight area or from being directed by an operator to perform avoidance maneuvers from other traffic.

The likelihood of the harmful interference would be expected to increase commensurate with increasing overflown population since many household consumer electronics operate on these same radio frequencies. Because of this, FAA proposes to manage the risks associated with spectrum interference of the C2 link by precluding operators from relying on radio frequency devices that are susceptible when in Category 2 operations.

3. Category 3 Operations

FAA proposes in § 108.185(c)(3) that Category 3 operational areas would include areas of moderate population, such as developments and single-family homes, which are often located within a few miles of small, higher density areas such as shopping centers or schools. Specifically, proposed Category 3 would be defined as being within 1 statute mile of a LandScan USA cell which contains 25 or more people. Package delivery operations under this proposal would drive portions of the quantity of UAS missions to higher population density levels.

Because Category 3 operations would be conducted over a population density greater than that of Category 2, FAA proposes to increase the mitigations in these areas to enhance and further protect associated ground risks. Therefore, FAA is proposing an additional mitigation for Category 3 and higher categories: the requirement to use a strategic deconfliction capability. Simulations have shown that using strategic deconfliction, a process of reserving segments of an intended path for the time the UAS is expected to occupy it, can reduce UA-UA collisions drastically when nearly all operators in the same area comply (see section VI.I for extensive discussion and rationale for this requirement).

FAA found that strategic deconfliction dramatically reduces the likelihood of ground-based injuries or fatalities by reducing the likelihood of collision between UA. However, since Category 1 and 2 operations would be limited to areas that already have very low population densities, the likelihood of ground-based injury or fatality would already be low. Fewer simultaneous BVLOS operations would be expected in such areas, and any falling debris would be much more likely not to fall on a person. Therefore, FAA determined that there would be marginal additional safety benefit to requiring use of strategic deconfliction when operating above Category 1 and Category 2 areas. By contrast, Category 3 areas are expected to include suburban developments where operations such as package delivery and infrastructure inspection would be more likely to occur, thus there would be an increased risk to people outside at certain times of day if strategic deconfliction is not required.

4. Category 4 Operations

FAA proposes in § 108.185(c)(4) that Category 4 operational areas would include areas such as shopping centers and multifamily housing. This would be defined as being within 0.5 statute mile of a LandScan USA cell which contains 100 or more people. FAA anticipates that many Category 4 areas of operations may be of higher risk to persons and property, as these areas allow for flight over increasingly populated areas. As referenced in section IV of this preamble, FAA would consider the UA airworthiness acceptance to meet an acceptable level of reliability for all operations under this proposal. Therefore, operational reliability remains a mitigating risk factor for any higher risk operation.

FAA proposes that operators would be required to obtain an operating certificate to operate in Category 4 operating areas, subject to certain limitations depending on the type of operation. As further described in section VI.O of this preamble, operations conducted with an operating certificate would be required to have specific manuals and procedures accepted and approved by FAA. This requirement would involve FAA evaluation to ensure specific practices and procedures are taking place in an effective and safe manner. In addition, operations conducted with an operating certificate would require a level of routine FAA surveillance to ensure that these practices and procedures continue to meet the specific standard. With this added level of initial and continued oversight, along with the limitations on the types of operation that can be conducted under a certificate in Category 4 areas, risk under Category 4 would continuously be evaluated and mitigated.

5. Category 5 Operations

FAA proposes in § 108.185(c)(5) that Category 5 operational areas would include locations like major metropolitan downtown areas. Category 5 would be defined as being within 0.5 statute mile of a LandScan USA cell that contains 2,500 or more people. In mitigating risk in what FAA considers the highest ground risk category, FAA proposes that the UA would need to be equipped with a DAA system that meets the requirements in proposed § 108.825 and § 108.195, and additionally can detect and avoid aircraft that are not broadcasting their position via ADS-B or an electric conspicuity device. At this level of ground risk, the system would need to be agnostic to the intruder aircraft's equipage and would need to detect all airborne aircraft. Requiring a DAA capable of detecting all airborne traffic would ensure that persons on the ground would be protected from any potential debris from an airborne collision. Due to the high volume of persons on the ground in an area designated as Category 5, the potential for persons to be impacted by fallen debris or large pieces of aircraft would be greater should an airborne collision occur. By requiring a DAA system capable of detecting all aircraft, the risk of collision would greatly be reduced, which also further reduces the likelihood of hazards to persons on the ground.

FAA welcomes comments and information that provides more insight into if, and to what extent, ADS-B Out off operations happen in dense urban areas below 500 feet. In addition, FAA has issued some operators authorizations to operate in mode C veils without transmitting ADS-B Out, however, FAA does not have sufficient data on how often, or if, ADS-B Out operations are conducted below 500 feet AGL, nor on the necessity of such operations.

6. Operations Over Open-Air Assemblies

In addition to the population density categories, proposed § 108.185(b) would prohibit all UA operations over open-air assemblies of persons unless specifically authorized by FAA. FAA has determined that the likelihood of impact with persons would greatly increase should a UA have an airborne collision or failure during operations over open-air assemblies of persons. Generally, open-air assemblies are areas of large gatherings of persons, but other areas can also be considered open-air assemblies. FAA considers open-air assemblies of persons on a case-by-case basis. For example, in an FAA legal interpretation, FAA determined that a picnic area, if it is sufficiently populated, could be an open-air assembly of persons, as could a beach.[52]

Based on the high probability of injury to persons in the event of a malfunction or operator error, FAA proposes that the safest means to protect open-air assemblies of persons would be to prohibit all operations from operating over open-air assemblies of persons, unless otherwise authorized by FAA. This would also prohibit transient operations over open-air assemblies of persons. Given the low altitude of operations,

---

[52] *See* FAA Legal Interpretation addressed to Banner Tow USA (March 3, 2010).

higher potential UA weight, and minimal options for maneuverability should an airborne collision or failure occur, sustained operations would likely impact persons directly below. During transient operations, the UA's current direction of flight would likely be the trajectory for impact. A UA failure with a forward momentum may create a larger debris field with a trajectory directly into the open-air gathering. Furthermore, UA intended for operation under this proposed rule may weigh 1,320 pounds, significantly greater than the 55 pounds permitted for certain transient operations under part 107. The risk associated with transient operations and the potential for greatest impact is something that cannot be broadly mitigated at this time and must be evaluated on a case-by-case basis.

I. Use of Strategic Deconfliction and Conformance Monitoring (§ 108.190)

FAA proposes in § 108.190(a)(1) to require part 108 operators conducting their operations in controlled airspace to use approved capabilities for strategic deconfliction and conformance monitoring. In addition, under proposed § 108.190(a)(2), part 108 operators flying over a population density of Category 3 or higher would be required to use an approved capability for strategic deconfliction. Operators may meet these respective requirements by opting into using an authorized automated data service provided by an appropriately certificated service provider under proposed part 146, or by receiving their own part 146 certificate and authorization so that the operator can self-provision the service. This is so long as the service provision meets part 146 requirements to provide reasonable and non-discriminatory access to airspace and adhere to other procedural requirements for all users of the service.[53] For further discussion on part 146, see section XIII of this preamble.

1. Description of Strategic Deconfliction and Conformance Monitoring

In proposed §§ 108.190(b) and (c), FAA sets forth performance-based requirements for performing strategic deconfliction and conformance monitoring.[54] FAA proposes in § 108.190(b) that having a strategic deconfliction capability—required in both controlled airspace and when flying over a population density of Category 3 or higher--would mean being able to perform strategic conflict detection and resolution prior to takeoff, and in relation to other UA operations that are discoverable at that time, as well as being able to maintain a target average conformance to all operational intents that are utilized by the operator.

The first requirement for strategic deconfliction is a preflight function; it is the ability to perform strategic conflict detection prior to takeoff and in relation to other UA operations that are discoverable at that time.[55] This capability would check the operator's operational intent against conflicts with other discoverable operational intents.[56] In

---

[53] FAA emphasizes that automated data service providers do not have the authority to provide operators with access to the NAS, as that authority resides solely within FAA. However, certain services—such as strategic deconfliction—have the capability to coordinate its user's operational intent with others in the network, therefore may block that space for a specific time, which may inadvertently result in non-equitable treatment of aircraft operators. FAA has established a priority of operations schema, providing guidance to operators in identifying priorities of operations, and providing an indication of whether conflicts can exist among operations at the same priority level. FAA's priority schema, for applicable services, is addressed in AC 146-1, available in the public docket for comment.

[54] FAA derived definitions for strategic deconfliction and conformance monitoring, as well as several terms used in the regulatory text, from ASTM F3548-21, Standard Specification for UAS Traffic Management (UTM) UAS Service Supplier (USS) Interoperability, which is an industry consensus standard.

[55] *See* proposed § 108.190(b)(1).

[56] In proposed § 108.5, FAA defines operational intent as a volume-based representation encapsulating the intended flight path for a UAS operation and comprising one or more overlapping or contiguous 4-dimensional volumes defined by length, height, width, and a beginning and ending time.

addition to detecting conflicts, through the ability for strategic conflict resolution, strategic deconfliction provides the operator with an opportunity to adjust their operational intent (for example, by following a different path, flying at a different altitude, or departing at a different time) until a conflict-free route is found.

The second requirement for strategic deconfliction is to achieve a target average conformance when operating the UA in accordance with the operational intent. A target average conformance is a lagging indicator of how safely and efficiently the operator flew the strategically deconflicted routes. The operator's automated data service provider would support this function by calculating how often the operator stayed within its operational intents and then notifying the operator if the value were to fall below an established threshold.[57]

UAS operators and service providers would not be required to report the target average conformance value to FAA on an ongoing basis. However, FAA would be able to verify these values through compliance and safety assurance activities via the operator-reported data in accordance with proposed § 108.45 in any instance of failure, malfunction, or defect in an authorized service. Furthermore, FAA may verify these values by inspecting records maintained by the operator's automated data service provider certificated under part 146, in accordance with § 146.330.

In addition to strategic deconfliction, UAS operated in controlled airspace would also be required to have a conformance monitoring capability provided by an automated

[57] This calculated value would be provided by the automated data service provider on a recurring basis for the duration of the flight operation and is generally represented as a percentage.

data service provider certificated under proposed part 146.[58] FAA proposes in § 108.190(c) that this capability would need to include two specific functions. The first function would be to provide time-sensitive alerts to operations personnel whenever the UA exits its operational intent, consistent with criteria or parameters established prior to takeoff. The second function would be to communicate information to other airspace users and FAA about the alert—via means acceptable to FAA.[59]

An alert to the operator of a non-conformant UA would help the operator gain and maintain situational awareness of their aircraft by notifying the operator of the need to take action to bring the UA back into the approved operational intent. Making the alert available to other NAS users would enable further collision risk reduction by making impacted operators of nearby UAS and manned aircraft aware of the off-nominal operation, allowing those operators to determine their best course of action to avoid a collision.[60] Finally, making the alert available to FAA would enable FAA to maintain the safety of aircraft operations in controlled airspace.

[58] A service providing conformance monitoring for a UAS operation is required to also provide strategic deconfliction for the operation. This is further discussed in AC-146, available in the docket for this proposed rulemaking.

[59] When communicating information about alerts to FAA, FAA generally anticipates that only alerts that result in safety concerns would need to be communicated immediately to the Agency. For example, alerts regarding operational intents transitions from a conforming to a nonconforming state may not pose a safety concern because the non-conformance is expected and may only be temporary until conformance is re-established. Such alerts would not need to be communicated to FAA immediately. However, alerts regarding operational intents transitions to a contingent state may pose a safety concern; such alerts are considered time-sensitive and would need to be communicated to FAA immediately. Further guidance on information regarding alerts that need to be communicated to FAA, including FAA criteria for identifying those alerts, is discussed in AC-146, available in the docket associated with this rulemaking.

[60] FAA anticipates that manned aircraft may choose to participate in the UTM network to maintain situational awareness of UAS operations nearby. Manned aircraft who choose to do so would be able to receive alerts, provided they subscribe to receive push notifications for a given area of interest.

Proposed § 108.190(d) states that, unless otherwise authorized by FAA, operators would need to meet the requirements in §§ 108.190(b) and (c) by using a service provider certificated under proposed 146 with the appropriate service authorization. Operators could choose to either self-provision the necessary services described above by applying for and receiving their own certificate and corresponding service authorization under proposed part 146 or use another certificated service provider to provide the service for them. These options are meant to strike the optimal balance between ensuring airspace safety, while providing a degree of flexibility to UAS operators. Some operators may choose to build their own service that includes features uniquely suited to their own needs, while other operators may prefer to shop across an open and competitive marketplace of qualified services. Overall, FAA anticipates automated data service providers would offer a range of products with various price points and additional value-added features for UAS operators.

2. Requiring Use of Strategic Deconfliction and Conformance Monitoring

In 2022 and 2023, in response to BVLOS ARC recommendation TP 2.2[61], FAA contracted with Johns Hopkins University Applied Physics Laboratory to conduct extensive simulation-based research of UAS interactions using USS to provide strategic deconfliction to determine the safety benefit of the functionality and to inform FAA policy about its use, including for this rulemaking. The simulation environment represented commonly expected UAS mission profiles, vehicle behavior, airspace

[61] ARC recommendation TP 2.2 states: "FAA and NASA should conduct a study to determine what level of aircraft operations in a defined volume of the airspace would trigger the need for mandatory participation in federated or third-party services." The ARC recommendation further mentioned that an "interoperable safety services such as strategic deconfliction" is an example of one of these services.

restrictions and variations in population density. In total, the Applied Physics Laboratory conducted more than 450,000 airspace simulations representing nearly 94 million UAS flight hours, the research showed midair collisions between UAS were about 100 times less likely to occur when strategic deconfliction was used by all UAS, compared with simulations in which UAS did not use strategic deconfliction.[62] The use of strategic deconfliction resulted in a corresponding two-order-of-magnitude decrease in the rates of ground-based injuries or fatalities when simulated over a wide range of locations and variations in population density.[63] However, with 75 percent of UAS participating in strategic deconfliction, the midair collision rate decreased by only about half. This is a significantly higher number of midair collisions, which occurs because non-participating UAS would follow routes that would intersect with operational intents, resulting in collisions in some instances.

Separate from this research, the ASTM International USS Interoperability Workgroup conducted a series of analyses between 2020 and 2023 to characterize the safety benefit of strategic deconfliction services. The three independent modeling efforts yielded similar results indicating significant reduction in collision risk for UAS using strategic deconfliction, compared with using no strategic deconfliction. ASTM International published this safety case framework for strategic deconfliction in appendix

---

[62] Johns Hopkins Applied Physics Laboratory, *Initial Safety Criticality Assessment of Unmanned Aircraft System Traffic Management (UTM) Strategic De-Confliction and Impacts to Beyond Visual Line of Sight Operations* (2022) (provided in docket).

[63] *See* Zanlongo, S., *Ground Risk Assessment Report for Urban UTM Operations*, AOS-23-1252 Version 1 (2023) (provided in docket).

X4 of the Standard Specification for UTM UAS Service Supplier Interoperability[64] with a representative safety analysis resulting in a 97.9% reduction in midair collisions using strategic deconfliction. This is within the same order of magnitude of the collision risk reduction found in FAA's research with Johns Hopkins University. The combined results from FAA and ASTM workgroup analyses—that were conducted separately and used different approaches—provide a strong body of evidence that requiring the use of strategic deconfliction is highly effective at reducing midair collisions between UAS.

The strategic deconfliction model is less effective if there is not an inflight means, such as conformance monitoring, to verify that UAS are flying within their operational intents. The Applied Physics Laboratory research indicated that deviations outside of those operational intents could increase collision risk with another UAS, even if it is operating in its own strategically deconflicted operational intents nearby.[65] Separately, conformance monitoring capabilities have been demonstrated in the UTM Pilot Program (UPP) and UTM Field Test (UFT) scenarios to be effective at further reducing collision risk, especially if the UAS did not have DAA that could recognize and maneuver away from other UAS.[66]

Furthermore, beginning in the fall of 2023, FAA established the UTM Key Site Operational Evaluation in North Texas. This initiative establishes partnerships with

---

[64] *Standard Specification for UAS Traffic Management (UTM) UAS Service Supplier (USS) Interoperability*, ASTM F3548-21 (2022), www.astm.org/f3548-21.html.

[65] Zanlongo, S., *Conformance Monitoring Assessment Report for Urban UTM Operations*, AOS-23-1253 Version 1 (2023) (provided in docket).

[66] FAA, *UTM Field Test (UFT) Final Report* (Nov. 6, 2023), www.faa.gov/uas/advanced_operations/traffic_management/UFT-Final-Report.pdf.

operators and UAS Service Suppliers (USS)[67] and works with suitable participants in attaining the necessary exemptions to operate BVLOS at a key site. As discussed further in section XIII, USS are UAS-specific automated data service providers and form a crucial component in the development of the UTM ecosystem. FAA anticipates that USS will coalesce into networks that provide all manner of services necessary for full integration of UAS including, but not limited to, strategic deconfliction and conformance monitoring services.

FAA has learned through data collection and observation of the UTM Key Site Operational Evaluation that industry can effectively self-govern many aspects of standing up and running a USS Network.[68] This effectiveness was a result of industry committing to adhere to an interoperability standard, in this case ASTM F3548-21, which has a performance target and feedback mechanism for operators. This self-governance included mechanisms for the automated data service providers to measure and track each operator's conformance rate over time. It also provided opportunities for operators whose conformance rate was too low to come into compliance with the expected performance target. As part of this industry-led initiative, FAA would issue a letter of acceptance to an automated data service provider, who has been paired with a UAS operator, if the pair

[67] An automated data service provider that fulfills the strategic deconfliction or conformance monitoring functions, whether self-provisioned by the operator, or deployed by another person, is referred to as a USS, a provider of particular type of UAS services to the UTM ecosystem.

[68] Per the *UTM Concept of Operations v2.0* (Mar. 2, 2020), www.faa.gov/sites/faa.gov/files/2022-08/UTM_ConOps_v2.pdf, USS Network is an amalgamation of USSs connected to each other, exchanging information on behalf of subscribed operators. The USS Network shares operational intent data and other relevant details across the network to ensure shared situational awareness for UTM participants.

has successfully demonstrated that their automated data service is effective in managing UA to UA collision risk.[69]

Based on the success observed, FAA issued 2 letters of acceptance to automated data service providers in July 2024—one to Zipline and another to Wing. In the letter of acceptance issued to the automated data service providers, FAA highlighted its findings that using strategic deconfliction is a safe and effective means of managing collision risk among UA flying simultaneously, by multiple operators, and in the same area. In addition, FAA took the opportunity from this industry-led initiative to develop a streamlined regulatory approval process of certain automated data services. The UAS industry has expressed to FAA the need for approving certain automated data services, in this case strategic deconfliction, to scale their UAS BVLOS operations safely. As a result, FAA proposes the creation of part 146 in this rulemaking, allowing UAS operators to scale their BVLOS operations, given a service's proven safety benefit. For a further discussion FAA's proposal for regulating automated data services providers, and their services—such as strategic deconfliction or conformance monitoring—see section XIII of this preamble.

3. Alternatives Considered

FAA considered requiring the use of strategic deconfliction and conformance monitoring for all UAS operations but settled on proposing that strategic deconfliction would only be required when operating a UA in controlled airspace or over a population

[69] Each FAA-issued letter of acceptance to an automated data service provider compliments an FAA waiver or exemption issued to the UAS operator paired with that same provider. While the waiver or exemption issued to the UAS operator highlight the operational conditions or limitations the operator needs to abide by to deviate from FAA's requirements, the letter of acceptance documents FAA's analysis of industry's self-governance documents and the automated data service's testing results.

density of Category 3 or higher and that conformance monitoring would only be required when operating a UA in controlled airspace. In making this determination, FAA considered comments received in response to a May 2023 Federal Register notice regarding UAS BVLOS operations (BVLOS FRN)[70] that included FAA-funded simulation research into the effectiveness of strategic deconfliction at reducing collision risk between UAS and insights gained from the UTM Key Site Operational Evaluation.

In the BVLOS FRN, FAA asked the public about requiring UAS BVLOS operations to use services providing strategic deconfliction and conformance monitoring in any airspace. Many of the comments argued that such a requirement was not proportionate to the underlying risk of collision between UA in sparsely populated areas. Commenters argued that the likelihood of collision between UA in such areas would be lower because fewer UA are likely to be operating simultaneously and in proximity to each other. Commenters also argued that, in the event of a collision, it would be unlikely that falling debris would cause property damage or injuries to people on the ground in sparsely populated locations. Commenters also emphasized that, because conformance monitoring relies on a real-time network connection to send alerts, the function may not be implementable in remote parts of the United States with poor cellular connectivity, especially if alternative C2 link options were not available. FAA agrees with the commenters, and therefore has proposed requiring strategic deconfliction only in controlled airspace, or when flying over a population density of Category 3 or higher, and conformance monitoring only in controlled airspace.

[70] 88 FR 33855 (May 3, 2023).

FAA also considered the approach recommended by the BVLOS ARC, which was to not require strategic deconfliction or conformance monitoring, but rather to allow their use via a service if an operator chose to do so. However, FAA has determined that, without a requirement for all operators in certain environments to perform strategic deconfliction, there would be only a marginal safety benefit. As discussed earlier, strategic deconfliction is most effective when all UAS in a given area are participating in the function.

FAA also considered permitting operators to find their own way to manage collision risk with other UAS. This would provide operators with a variety of solutions, which might include manual coordination with other operators; use of emergent collision avoidance technology predicated on detecting other UAS; or use of an automated data service provider certificated under part 146. However, FAA found that while it would be desirable to provide maximum flexibility, such an approach would have decreasing safety benefits because operators may not be aware of each other's operations. Further, there is not yet a demonstrated operationally validated solution for tactical collision avoidance between UAS.[71] FAA seeks comments on whether the UAS-to-UAS collision risk is appropriate for the nature of proposed operations when the operator is using strategic deconfliction or conformance monitoring through a part 146 certificated entity.

J. Operations Near Aircraft: Low Altitude Right-of-Way Rules (§ 108.195)

FAA's system of right-of-way is based on the foundational principle of "see-and-avoid," a concept based on aircraft maneuverability, piloting skillset, physical limitations

---

[71] The RTCA minimum operational performance standards (MOPS) for Airborne Collision Avoidance System X for sUAS (ACAS sXu) provide an algorithmic means of alerting and avoiding other drones, but require a sufficient means of detecting other drones that has not been standardized.

of VLOS, and the conspicuity of other aircraft to determine right-of-way. This is the basis of §§ 91.113 and 91.115, as well as other part 91 requirements such as cloud clearances, visibility minimums, aircraft lighting for night operations, and other associated design and flight requirements. FAA has taken this consistent approach into account in developing right-of-way rules for proposed part 108.

Under FAA's approach to right-of-way, the aircraft with right-of-way can continue their flight unimpeded, while the other aircraft gives way. The proposed changes to the right-of-way structure envisioned under part 108 would maintain that principle, updating the existing requirements under part 91 to accommodate this new entrant. Under proposed § 108.195 and the proposed amendments to § 91.113, UA operating under part 108 would be required to yield to all manned aircraft broadcasting their position using ADS-B or electronic conspicuity equipment, and those operating in specific locations. Specifically, manned aircraft operating in a Category 5 population density area as described in proposed § 108.185, operating in Class B or C airspace as described in proposed § 108.180(b), or departing from or arriving at an airport or heliport would have right-of way over the UA.

The BVLOS ARC made several proposals related to right-of-way in their final report. These included allowing for "detect-and-avoid" (a technology-based approach to "see-and-avoid"), giving UA right-of-way in shielded areas, giving UA right-of-way over non-cooperative aircraft, and giving cooperative manned aircraft right-of-way over UA. "Cooperative" in this context meaning aircraft broadcasting their position using ADS-B Out equipment or electronic conspicuity equipment. FAA is proposing to adopt the BVLOS ARC's recommendations related to giving UA right-of-way in shielded areas, giving manned aircraft broadcasting their position using ADS-B Out equipment or electronic conspicuity equipment right-of-way over part 108 UA, and giving part 108 UA right-of-way over manned aircraft who are not broadcasting. FAA has decided not to update § 91.113 based on the BVLOS ARC's proposal related to "detect-and-avoid" at this time. This change would require further updates to part 91, affecting legacy aviation in a manner that is out of scope of this rulemaking effort.

Proposed § 108.195(a) states that UA operating under part 108 would be required to yield right-of-way to all aircraft departing from or arriving at an airport or heliport or equipped and broadcasting their position using ADS-B Out equipment that meets the performance requirements of § 91.227. FAA acknowledges that ADS-B Out systems may occasionally fail to meet the performance requirements of § 91.227. Therefore, FAA expects DAA standards would include performance requirements for the UAS so that the system can avoid aircraft when ADS-B Out equipment exhibits performance deficiencies.

In addition to ADS-B Out equipment that meets § 91.227, FAA would allow for an electronic conspicuity device that broadcasts a signal on Universal Access Transceiver (UAT)/978 MHz and that would also provide a means for the manned aircraft operator to retain their right-of-way over the UA. FAA anticipates that equipment that is able to broadcast limited ADS-B information, including aircraft location, would make manned aircraft electronically conspicuous to UA that are already listening for that signal. A portable device would be capable of fulfilling this requirement. FAA does not foresee this limited-information broadcast to fulfill the full requirements of ADS-B equipment that must comply with § 91.227. Instead, it would only be used to make UA aware of the presence of a manned aircraft that the UA must yield to.

FAA considered mandating ADS-B Out for all operations below 500 feet for manned aviation operators but decided that was not tenable due to the additional cost and burden that would impose. However, FAA plans to define new requirements for a portable low-cost electronic conspicuity (EC) device that could be used by manned aviation operators solely to retain right-of-way over a part 108 UA. This could be in the form of a new Technical Standing Order (TSO), or another form of approved specification issued by FAA, but FAA invites comment on the best way to enable this technology. The specification would allow for the device to be battery-powered and easily moved between aircraft, which would minimize costs for an owner of multiple aircraft and for a pilot of different rental airplanes by only having to purchase one device. This EC device could use its own antenna or attach to an external antenna and broadcast the aircraft's identification and location repeatedly, informing nearby receivers of the location of a manned aircraft that would need to be avoided by UAS. This EC device would be useable in any manned aircraft, including fixed-wing, rotorcraft, balloons, and ultralight vehicles, without expensive installations or reliance on onboard electrical systems.

FAA also considered requiring part 108 UA to monitor and perform separation for aircraft that are broadcasting their position over a networked connection, such as the internet. This could enable a technological solution on the manned aircraft side where the pilot of a manned aircraft could use something as simple as an app on their cell phone that was low cost, or free to provide right-of-way retention. However, research into this as a viable solution has not yet occurred and the concept is still too new to incorporate into a rulemaking proposal without significant interest. However, FAA notes that the section 906 of FAA Reauthorization Act of 2024 requires the Comptroller General to conduct a study of technologies and methods that may be used by operators of UAS to DAA manned aircraft that may lawfully operate below 500 feet AGL and that are not equipped with a transponder or ADS-B Out equipment or not otherwise electronically conspicuous. This type of technology, which might not rely on transponder or ADS-B equipment, could potentially be one way of meeting the intent of this study. Therefore, FAA seeks comments on whether FAA should consider an added equipage requirement in the final rule for UA in the event that such a technological solution could be delivered before the rule is implemented.

It is important to note that, per proposed § 108.195(b), FAA states that UA would be required to remain at a safe distance from aircraft to which the UA would be required to yield the right of way. FAA is also proposing an amendment to § 91.113 to reference proposed § 108.195 (for more discussion, refer to section XII.B.5.ii). The right of way rule would not apply for UA operations in shielded areas, as specified in proposed § 108.205. When conducting operations in shielded areas, FAA proposes that UA would have the right-of-way over all manned aircraft. As noted above and further discussed in the following section VI.L, this is motivated by the fact that manned aircraft are extremely unlikely to be operating in shielded areas. Also discussed previously in section VI.H, the existing framework for avoiding collisions has been predicated on conditions largely specific to manned aircraft operations. To enable BVLOS operations, this proposed rule considers how to fulfill those functions in the context of strategic deconfliction, right of way requirements, and DAA. Strategic deconfliction requirements, referring to the preflight planning that ensures that the routes taken by all UA in a given area do not conflict, was discussed in section VI.I, while the proposed right of way requirements to increase conspicuity was discussed in section VI.J.

In proposed § 108.195(b), FAA further proposes that operators would need to use a method acceptable to the Administrator for determining safe distance that statistically mitigates the risk of a collision to a remote event. FAA anticipates that an acceptable standard would require the ability to calculate and verify separation distances with manned aircraft in order to determine proximity, have a means to measure the performance of the equipment used to determine separation, and ensure that the assumptions used in the separation distances are appropriate and comparable to the types of operations intended to be conducted. FAA also expects that any such safe distance used would place no undue tactical burden on other aircraft such that a UA operating BVLOS may cause a potential safety hazard for a manned aircraft by trying to avoid the UA. The minimum safe distance used would need to be based on the balance of the technological capability of the systems and the interaction with the manned aircraft.

The first criteria, calculating and verifying separation, could be met by the operator having DAA technology installed on their aircraft that meets the design and performance requirements set out in a relevant industry consensus standard that has been accepted by FAA pursuant to the process described below. At the time of this preamble, FAA has reviewed DAA and associated calculation methodologies in reports from MIT/LL, the DAA standards proposed by ASTM Committee F38 on UAS, and RTCA Airborne Collision Avoidance System (ACAS) standards. Based on this, FAA anticipates that industry has many means to be able to calculate the separation distance of a UA to manned aircraft in tactical DAA mitigation strategies. FAA looks to industry and other stakeholders to recommend any further industry consensus-based standards as a means to be able to show FAA their tactical DAA separation calculations.

The second criteria, to measure the performance of the equipment used to determine separation, could be achieved with design and development compliance to the RTCA ACAS sXu or other DAA design standards for GPS systems for tactical mitigation, as well as connectivity to strategic deconfliction networks for strategic mitigation. In current part 107 BVLOS waiver operations, operators have used both strategic and tactical DAA systems, which generate associated performance data for their operation. Strategic DAA has consisted of lowering the estimated aircraft encounter rates through preflight planning that avoided known traffic areas, pre-launch holds when traffic approached the launch area, and early or strategic pre-DAA or separation to avoid an encounter and maintain a safe distance. Operators have been able to demonstrate meaningful increases in separation distances from other aircraft using tactical DAA systems, such as radar, cameras, and ADS-B In systems, when compared to what would have been the closest point of approach without the DAA or separation system detecting and avoiding the other aircraft. FAA expects that this same level of performance in part 108 BVLOS operations would allow for scalable integration of more expansive operations.

The third criteria, using appropriate assumptions for separation distances, could be met by operators utilizing a DAA technology that is validated for the operation expected for their aircraft and supported by appropriate flight data sets for the intended operations. In the process of validating DAA technology, FAA expects that a manufacturer of a UA would comply with a DAA industry consensus standard for design requirements. The operator could review the operations manual of the UA to understand the aircraft's DAA tactical abilities and how the aircraft may be used safely within their expected BVLOS operations. FAA expects that an industry consensus standard would utilize a standardized means of performance validation.

K. Remote Identification of Unmanned Aircraft (§ 108.200)

FAA proposes in § 108.200(a)(1) that, unless otherwise authorized by FAA, no person would be able to operate a UA under part 108 unless the UA meets the requirements for standard remote identification. In addition, in proposed § 108.200(a)(2), FAA provides that the UA is not required to broadcast the control station location as required under § 89.305 (b) and (c) if the unmanned aircraft is being operated without a flight coordinator in accordance with 108.310. In addition, in § 108.200(a)(3) FAA proposes that the UA would be required to broadcast a remote identification operational status message that indicates whether the UA is being operated BVLOS, a status which indicates that the unmanned aircraft is being operated without a flight coordinator in accordance with 108.310, if applicable, and the takeoff location of the unmanned aircraft. FAA is also proposing that the broadcast range would need to be optimized to enable other aircraft to use the remote identification signal for situational awareness. FAA also proposes in § 108.200(a)(3) an update to the minimum performance requirements for standard remote identification: when the UA operational status is set to BVLOS, the performance (range) of the broadcast would need to be sufficient to allow the UA to remain a safe distance from other aircraft. This proposal is intended to enable operators of other aircraft to identify UA that are operating BVLOS so the aircraft can remain separated by a safe distance. This may require higher performance levels for the equipment used to transmit the standard remote ID broadcast from the UA than what is typically used for aircraft operating under part 107. FAA seeks feedback from members of the general aviation (GA) community as to what would be a sufficient distance that the signal would need to be broadcast for GA aircraft to have enough time to maneuver.

FAA proposes in § 108.200(b) that the standard remote identification UA used for part 108 operations under this part would be required to meet the requirements of an FAA-accepted means of compliance for standard remote identification that includes the operational status message element described in this section. FAA notes that the currently accepted remote identification means of compliance (RID-ASTM-F3586-22-NOA-23-01), which is based primarily on ASTM standards F3586-22 and F3411-22a, already voluntarily contains provisions for up to 16 unique operational status indications. FAA has concluded the addition of a BVLOS operational status indication can be implemented without a significant impact to existing users of remote identification.[72] FAA does not anticipate this provision will introduce any additional difficulty for manufacturers when producing UA equipped with remote identification for airworthiness acceptance under part 108. FAA also does not currently intend to impose any additional broadcast requirements on aircraft operated outside of part 108 as part of this rulemaking, so aircraft currently operating that are compliant with standard remote identification using the only currently accepted remote identification means of compliance, using a broadcast module, or operating under an FAA-Recognized Identification Areas (FRIA) would not be impacted. But FAA welcomes comments on whether other operating rules, such as

[72] *See* 87 FR 49520, 88 FR 77895.

part 107, should also be updated to include a broadcast operational status message requirement.

For the airworthiness acceptance of remote identification systems installed on UA operated under part 108, FAA is proposing a new § 89.511 for production requirements for UA produced under an airworthiness acceptance issued under part 108. Currently, production of standard remote identification UA is under either § 89.510 for UA produced under a design approval or production approval issued under part 21 or § 89.515 for UA without design approval or production approval issued under part 21. FAA is proposing a new § 89.511 for UA produced under an airworthiness acceptance issued under part 108. This new section would require the remote identification system installed on UA operating BVLOS under part 108 to meet the airworthiness acceptance requirements under part 108 rather than the requirements in § 89.515, which are intended for UA produced without any airworthiness requirements, such as those operated under part 107 or 49 U.S.C. 44809. The proposed amendment to § 89.511 also requires conforming amendments to §§ 89.505 and 89.515. As such, FAA is proposing amendments to §§ 89.505 and 89.511.

L. Operation in Shielded Areas (§ 108.205)

As discussed in section VI.J, FAA has proposed allowing part 108 UA to have right-of-way while conducting operations in shielded areas. In § 108.205, FAA proposes defining shielded areas as areas within 50 feet of certain infrastructure, to include power lines and substations, railroads, bridges, and pipelines, when permission from the facility or infrastructure owner is obtained. In addition, FAA is reserving the right to designate any other area as shielded, as appropriate. It is important to note that proposed § 108.205

would prohibit UA being operated in shielded areas where manned aircraft are expected to operate.

The proposed use of both infrastructure and protected facilities to create shielded airspace for UAS is intended to enable a broad range of BVLOS UAS operations. Manned aviation must follow the altitude and obstacle requirements of § 91.119, and only in certain instances can manned aircraft intentionally come closer to infrastructure and terrain features than 500 feet. This creates an opportunity for UAS, which can operate closer to obstacles and structures without having the increased risk that would result from manned aircraft attempting to conduct the same operations. Part 108 UA are expected to mostly be smaller than manned aircraft and would therefore be able to navigate more nimbly. This, combined with the lack of humans on board the UA, reduces the risk in shielded operations when compared to manned aircraft.

Traditionally, close-up inspection by manned aircraft (fixed-wing or helicopter) has been the method used by electrical transmission and pipeline utilities to inspect and maintain these lines. By allowing the use of UAS to perform these types of operations, FAA anticipates that the risks associated with these operations would be reduced. But in determining if the UA operation should be considered shielded, FAA must consider the remote possibility of a helicopter air ambulance, helicopter, manned agricultural aircraft, or another type of manned aircraft operating close to infrastructure and in the same area as the UA. FAA has concluded that requiring permission from the infrastructure owner for an operation to be considered shielded would be the best way to deconflict these types of activities, since they would be in the best position to know what types of operations are being conducted. However, it should be emphasized that this in no way provides an infrastructure owner the ability to control the airspace over their infrastructure and any non-shielded operations can still occur without said permission. Furthermore, it should be noted that this is in addition to the requirements proposed in § 108.180 for gaining access to controlled airspace, if required.

With this, FAA finds that the requirement of a 50-foot limit from structures is consistent with the risk accepted based on prior waivers granted and recommendations made from industry. This 50-foot limit would support numerous operations, including building, bridge, and other infrastructure inspection. A 50-foot limit also strikes a balance between allowing an adequate distance away from infrastructure for the safety of the UA and general camera and imaging equipment capabilities, while also providing an appropriate safety margin from other potential manned aircraft operations. In addition, powerline inspection can benefit from the 50-foot limit due to electrical and magnetic field metrics that require minimum UA standoff distances when operating within the vicinity of powerlines. Manned operations should be operating far enough away from powerlines that a 50-foot limit should provide enough of a separation distance from the UA operating under part 108 and manned aviation operations in the vicinity of the UA operation. In time, the definition of a shielded area may expand beyond what has been defined for linear infrastructure. To support the flexible application of shielded operations, FAA proposes to permit additional shielded operations through an authorization under § 108.205.

Operations that propose an operating area within 50 feet of certain infrastructure that do not have permission of the facility or infrastructure owner, do not qualify to fly under the designation of shielded operations. This is to limit operations that may leverage the removal of DAA compliance and strategic deconfliction to be able to conduct operations in areas where the risk of the operation of the aircraft is mitigated based on location, speed, and closeness of the UA to the infrastructure being inspected. The 50-foot offset granted under shielded operations under this rule is meant to provide enough distance for a UA to conduct operations without impeding on other operations in the vicinity of the infrastructure being inspected.

While FAA has defined the specific infrastructure sites of powerlines and substations, railroads, bridges, and pipelines as the qualifying infrastructure, FAA recognizes there are additional structures that could be included in this definition and requests comments on the list.

M. Operations of Multiple Unmanned Aircraft (§ 108.210)

The technological ability for one individual person to manipulate multiple aircraft simultaneously is unique to the UAS environment. FAA recognizes that broader applicability of controlling or monitoring multiple UA per person, or groups of persons, is an important consideration in scaling UAS operations to greater commercial and societal benefit, while also recognizing that this scenario presents greater complication to the operational environment. To ensure there is no safety gap as a result of these differences, FAA has proposed § 108.210 to provide allowance for the operation of multiple UA. Proposed § 108.210(a) states that operators would only be able to conduct operations at a UA to flight coordinator ratio of 1:1, except in accordance with a method acceptable to the Administrator. FAA expects that industry consensus standards would be developed, and later accepted by FAA, which would meet this industry need. FAA would also evaluate proposals from operators related to operating multiple UA on a case-by-case basis. Such an evaluation is already occurring with current UAS operations, including those with package delivery operators and agricultural UAS operators, as part of FAA's review of exemption petitions and waivers. Factors that FAA considers when making such determinations currently include the technology used and the operational procedures in place. FAA anticipates using similar factors when making case-by-case decisions under part 108. Proposed § 108.210(b) states that flight coordinators would not be allowed to be responsible for operations of more UA than what the flight coordinator is reasonably capable of handling during normal, abnormal, and emergency conditions, determined in a method acceptable to FAA. How to determine the number of UA a flight coordinator is capable of handling would be addressed in any consensus standard that may be developed, or FAA would determine this number at the time of evaluation. Proposed § 108.210(c) states that flight coordinators would not be allowed to be responsible for operations of more UA than specified in the manufacturer's operating instructions, which highlights that there may be a difference between the ratio identified in the manufacturer's operating instructions and the ratio at which an operation can be conducted by an operator. The ratio identified in the manufacturer's operating instructions would consider the ability of the technology and system capability, but it would not be able to fully account for the specific operating conditions, individual company procedures, and human factors for any given operator. In addition to the parameters set by the operating instructions, the operator may consider human factors, weather conditions, the category of operating over people, the strategic deconfliction and DAA technologies utilized by the operator, and other relevant information when developing a method acceptable to the Administrator. Being responsible for a UA would include, but would not be limited to, operating or monitoring the UA.

Furthermore, this proposal will only outline the allowed 1:1 operations under part 108, but it will not list an allowable ratio of flight coordinators to a specific number of part 108 UA for any given operation. FAA expects there to be a great deal of variety among part 108 UA designs. As such, the manufacturer of these multiple UA systems would be in the best position to design the maximum number of aircraft to be operated at one time by a single flight coordinator under optimal conditions. Conversely, FAA understands that operators may not hold optimal training commensurate with the expected operation or plan to operate in fully optimal conditions. Therefore, the ratio of aircraft to flight coordinator would be determined based on the UA design characteristics and FAA's review of the operation. FAA recognizes that there is significant interest in the industry in being able to operate 1:many at scale to facilitate further UAS integration. However, at this time there is limited industry standardization, and the variances of aircraft design and operational considerations are too great to be able to codify a singular set of parameters to enable 1:many operations. FAA invites public comment on how 1:many operations could be safely standardized and expanded in the regulations beyond 1:1.

Current 1:many operations have mostly consisted of package delivery operations under parts 107 and 135. In addition, "swarm" operations have been granted waivers under § 107.35 for drone light shows and other entertainment purposes. In many operational use-cases, there may be opportunities to use 1:many operations for the benefit of agriculture, surveillance, infrastructure inspection, and many other operations, as described by the BVLOS ARC in March 2022 (for more information on the BVLOS ARC, see section III.C0).[73]

N. Careless and Reckless Operation (§ 108.125)

Existing FAA regulations such as § 91.13 prohibit a person from operating an aircraft in a careless or reckless manner that may endanger the life or property of another. These regulations also prohibit any object being dropped from an aircraft in flight if doing so would create a hazard to persons or property.

FAA proposes § 108.125(a) to ensure that UAS would not be operated under part 108 in a careless or reckless manner. Proposed § 108.125(b) would also prohibit allowing an object to be dropped from a UA in a manner that would create an undue hazard to persons or property. In § 108.125(c), FAA proposes that part 108 UA would not be able to be operated in such a way that creates a collision hazard with property of another, vehicles, persons, structures, other UA, or aircraft with one or more people on board. As the primary mission of FAA is the safety of the NAS and the public, operation of a UA in a manner that could cause damage to property or injury to persons would be unequivocally prohibited, whether the cause is intent, lack of skill or training, faulty equipment, or recklessness. This is consistent with other FAA regulations and is critical to ensuring a safe NAS. FAA notes that, for purposes of research and development, UA are sometimes intentionally collided into structures and objects, but that intentional

[73] Unmanned Aircraft Systems Beyond Visual Line of Sight Aviation Rulemaking Committee Final Report, (Mar. 10, 2022), *available at* www.faa.gov/regulations_policies/rulemaking/committees/documents/media/UAS_BVLOS_ARC_FINAL_REPORT_03102022.pdf.

testing is not considered to be “careless and reckless” if done with appropriate safety mitigations and intent and does not injure people nor damage another person’s property.

O. Manuals (§§ 108.130 and 108.135)

In § 108.130(a), FAA is proposing that operators would need to ensure that certain documents are available and readily accessible during relevant operations. These documents would include the manufacturer’s provided UAS operating instructions (as described in proposed § 108.720), the manufacturer’s provided UAS maintenance instructions (also described in proposed § 108.720), the manufacturer’s provided UAS configuration and control document (also described in proposed § 108.720), and the company operations manual, as proposed in § 108.135. These documents would provide the operator’s personnel with the UA’s operational procedures and limitations, emergency and abnormal procedures, operations policies, methods and procedures for maintenance, accepted configurations, and general company policies. These documents would be necessary for the safe operation of the UA and for safety of overall operations.

In addition, FAA proposes in § 108.130(b) that the operator would need to ensure that all personnel have access to the documents that pertain to their duties and responsibilities during the performance of their duties. Depending on the duties required, some manuals could be quite extensive. Requiring personnel to have access to pertinent documents would allow personnel to immediately reference relevant information during operations, rather than commit an entire manual to memory. In addition, emergency, abnormal, or procedures that are used infrequently should be verified by manual reference so as not to omit any important step or process.

In § 108.135(a), FAA proposes that each operator would be required to prepare and keep current a manual setting forth the operator's procedures and policies acceptable to FAA, which would be essential to standardize processes and ensure uniformity in tasks performed during operations. A company operations manual aids personnel in following established processes and procedures consistently. This consistency facilitates improved efficiency and reduces errors. A company operations manual would also be an essential resource for new personnel. It would provide a structured overview of operations, policies, and regulatory requirements that need to be followed.

In § 108.135(b), FAA proposes that the company operations manual may be in the form of one or more documents if the appropriate portions of the manual, as well as changes and additions, are always made available and accessible to the operator's personnel when such personnel are performing their assigned duties. Operators should have the flexibility to decide which manuals or sections of manuals would be issued to personnel depending on their duties. This would enable the operator to take smaller sections from large manuals and provide their personnel information related to their specific work functions, rather than information not relevant to their tasks. To ensure that all operations are conducted consistently with what is written, personnel should have a reliable and updated manual to enable him or her to perform his or her mission properly. Having access to applicable documents would also help to improve safety by reducing the risk of incidents through appropriate procedures or work instructions.

Under proposed § 108.135(c), FAA would require the manual be made available to FAA upon request. As part of FAA oversight, surveillance, and continued operational safety (COS), operators would need to make the manual available for review to ensure the manual meets the requirements of the proposed rule and is not contrary to any applicable Federal regulations, the operator's operating certificate or permit, or operations authorizations, as would be required under proposed § 108.135(d). This would also provide FAA with an opportunity to verify the operation complies with its manual.

In addition, FAA proposes in § 108.135(e) that information and instructions contained in the manual must be displayed clearly and be retrievable in the English language. For ease of obtaining information during time-critical moments such as emergencies, manuals would need to be printed in a clearly legible format or in electronic format that displays in a way that is clearly visible in all lighting situations. In maintaining the universal language standard in aviation, FAA proposes that the manual should be retrievable in the English language.

FAA proposes in § 108.135(f) that the manual revision status would need to be controlled in such a way a person can immediately ascertain the information is the most current. Personnel should be able to ensure that all documentation related to operations, processes, and policy is accurate, up-to-date, and compliant with relevant regulations. While FAA is not proposing a requirement for a specific revision format, one way to meet the revision requirement would be to have a document revision history template that includes the current date, the name of the person who made the changes in the revision history template and a description of what changes were made in each revision. A list of effective pages could also be included for easy reference to manual holders to verify that the manual is up to the current revision.

Under proposed § 108.135(g), FAA would require that company manuals must include certain items and procedures in order to standardize important aspects of an operation. First, FAA proposes in § 108.135(g)(1) that a company manual would need to include the name of the personnel required by § 108.135 who are authorized to act for the operator, their assigned area of responsibility, and their duties, responsibilities, and authority. By requiring these personnel to be spelled out in the manual, other persons working for the company would be better able to understand the operational control and structure of the company as it directly relates to responsibility of the operation. In addition, FAA proposes in § 108.135(g)(2) that the manual contain a list of operations personnel positions required and the responsibilities of each role. By making this a requirement, employees would have a means to understand their roles and responsibilities as they relate to the operation. FAA also proposes in § 108.135(g)(3) requiring the company operations manual to include preflight procedures, in order to ensure that all personnel conduct the same process.

FAA recognizes that not all UA are alike. Loading of a UA may be done differently from aircraft to aircraft. Some UA may have external pods, some UA may have a means to attach loads to the exterior of the UA, and some may have an internal bay used to store payloads. Given that not every UA is loaded in the same manner, FAA proposes in § 108.135(g)(4) that the manual would need to contain procedures for ensuring aircraft weight and balance has been accounted for.

As further described in section VI of this preamble, FAA proposes in § 108.135(g)(5) that operators would need to have procedures in their manual on how to notify FAA after an accident has occurred. Because this rule is flexible in how an operator divides the duties and responsibilities for operations personnel, this proposal would not require that the flight coordinator be the individual making notification in the event of an accident, but rather allows the operator to determine which individual would make that notification. FAA therefore proposes that the company manual would need to include company procedures for complying with accident notification requirements.

FAA proposes in § 108.135(g)(6) that the company manual would need to include procedures for ensuring the appropriate operations personnel know the current condition of the UA in order to determine the airworthiness status of the UA. FAA anticipates this could be accomplished in a number of ways, such as the use of a logbook or through the use of electronic messaging or automation. As discussed in sections VI.A and VI.E, preflight and determination of condition of safe flight is paramount for ensuring safety of the operation. Therefore, this proposal would require operators to include procedures to determine the airworthiness status of the UA prior to flight and to communicate that status to appropriate personnel.

FAA proposes in § 108.135(g)(7) that operators would need to have procedures for complying with the recordkeeping and report requirements as required by proposed §§ 108.40 and 108.45. In proposed §§ 108.40 and 108.45, FAA would require that specific records be retained by the operator and that the operator would need to make necessary reports of certain records to FAA. FAA understands that not all operators would utilize the same recordkeeping or reporting databases. FAA anticipates that some operators may store records electronically, while others may store them in hard copy form. In addition, because operator records play a significant role in showing regulatory compliance to FAA, efficient and effective recordkeeping and reporting by an operator would help to ensure that compliance is continuously maintained. FAA therefore would require that operators develop and publish those procedures within the company operations manual.

FAA proposes in § 108.135(g)(8) that the manual would include procedures for access to and use of UA maintenance procedures and inspection criteria. FAA recognizes that not all operators would utilize the same methods of dispersing these procedures to applicable personnel. For example, one operator may choose to provide procedures in hard copy format while another may choose to provide the procedures via electronic form. In order to ensure that the applicable personnel receive and follow current maintenance and inspection procedures, FAA proposes that operators would need to include a procedure in the company operations manual for their access and use.

FAA proposes in § 108.135(g)(9) that the manual would also need to contain procedures for developing and implementing emergency procedures. The company manual should include information that the operations personnel need to develop and implement procedures for what to do in the case of various emergencies.

FAA proposes in § 108.135(g)(10) that a company operations manual includes procedures for the retrieval of aircraft that fail to return to their intended landing location. By making this requirement, FAA can ensure that operators are constantly aware of the location of each UA and how to retrieve a UA that does not return to its intended landing location.

FAA proposes in § 108.135(g)(11) that the manual also contain aircraft loading procedures, as applicable. FAA considers the proper loading of a UA to be critical to safe operation as operations are expected to be conducted over people and roads. Objects dropped from a UA could pose a serious hazard. Similarly, improperly secured or distributed loads may result in a loss of control of the UA and also result in a hazard. Including loading procedures in the manual ensures all operations personnel have access to this critical information.

Finally, FAA would require in § 108.135(g)(12) that operators include procedures for the identification and disposition of hazardous materials in their company operations manual, including procedures designed to avoid potential injury to employees and persons and property. FAA also believes that proper identification of hazardous materials in an operator's system can help to prevent such materials from being improperly offered to (shipped on) traditional carriers. Therefore, FAA proposes § 108.135(g)(12) to ensure that UAS operators are aware of the hazardous materials in their operation including hazardous materials that may be installed in the UA. For example, a large lithium battery that powers the UA should be identified to ensure that employees are aware that there are hazardous materials present within their operation.

P. Emergency Conditions (§ 108.215)

FAA proposes under § 108.215(a) that an operator would be able to request deviation authority from any FAA authorizations or limitations during emergency conditions if the conditions necessitate operations for the protection of life or property and a deviation is necessary for the expeditious conduct of those operations. This is intended to be for humanitarian needs where there is time to ask for authorization, but not time to perform the necessary administrative paperwork that would be needed to allow the operation through standard procedures. If conditions arise requiring emergency operations – for example, search and rescue missions or missions supporting first responders' operations – FAA could authorize operators to deviate from existing FAA authorizations or limitations in support of that emergency operation. Ensuring public and aviation safety is FAA's primary mission, and allowing deviations in the interest of safety would align with FAA's mission.

In addition, FAA proposes in § 108.215(b) that an operator may deviate from any rule under part 108, to the extent required, if the deviation necessitates immediate action to meet an in-flight emergency. The provision of a deviation authority in emergency situations is akin to a similar requirement for traditional aviation, §§ 91.3(b) and (c). Unforeseen circumstances can occur during operations and may require the operator to act immediately and deviate from FAA regulations in order to address the safety concern. If such a situation arises in which an operator needs to deviate from the proposed regulations, the operator may do so in the interest of public and aviation safety.

Nonetheless, as proposed in §§ 108.45 and 108.215(c), operators who deviate from FAA requirements during emergency conditions would be required to send a written report of that deviation to FAA upon FAA's request. Operators would be required to submit documentation describing the deviation and the nature of the emergency to FAA upon request. This would ensure that FAA stays informed of the incidents that could affect safety in the NAS and would allow FAA to determine if the deviation was warranted.

Q. Unmanned Aircraft Flight Restriction (§ 108.220)

FAA proposes in § 108.220 that no person would be allowed to operate a UA within a UA flight restriction established in accordance with part 74 of this chapter, except as prescribed in part 74. This would align part 108 with a concurrent rulemaking titled *Designation - Restrict the Operation of an Unmanned Aircraft in Close Proximity* *to a Fixed Site Facility*, which is proposing these flight restrictions. FAA anticipates that the NPRM for part 74, while separate, will be issued at, or near, the same time as this preamble and proposes these changes to remain consistent with that proposal. If the NPRM for part 74 receives comments that lead to changes that affect this requirement, appropriate changes will be made to this section as well.

VII. Personnel Requirements (Subpart C)

A. Approach to Personnel in Part 108

1. Tailoring Personnel Requirements to Part 108 Operations

FAA issues airman certificates to accommodate the varied personnel roles within manned aviation, to include pilots, air traffic controllers, and other roles. 49 U.S.C. 44703. The regulations that stem from this authority were developed and envisioned for manned aviation, and, in 2018, Congress recognized that traditional airman certification may not provide the necessary flexibility for UAS operations. Therefore, Congress granted the Administrator authority to determine if airman certificates are necessary for the safe operation of UAS. 49 U.S.C. 44807(b)(2). FAA is proposing to exercise this discretionary authority by not requiring airman certificates under part 108 operations. As subsequently discussed in more detail, FAA has determined that the UAS proposed for use under part 108 and the related operations would be varied in ways that make a centralized airman certification impracticable (*e.g.*, the varied UAS and operations could not be subject to a singular, regulated training program).

FAA has determined that it would not require the certification of airmen to operate a UA under this proposed regulation, instead pivoting to a model predicated on corporate responsibility for the safety of the entire operation. FAA is proposing a personnel structure that better reflects the types of aircraft and operations being currently conducted with UAS, along with expectations about how UAS operations may continue to evolve. Under this proposed rule, an operator would have an operations supervisor, who serves in a supervisory role with strategic oversight of and responsibility for the operation, while the flight coordinator role, if necessitated by aircraft design, would be responsible for the tactical safety of the operation. This proposed structure reflects the technological capabilities and interfaces of UAS that are expected to conduct operations under part 108, which are both managed and operated within the airspace in significantly different ways to manned aircraft and UAS operated under part 107. Many UAS are heavily automated and may soon be fully autonomous, and do not require constant pilot interaction as manned aircraft do.

Pursuant to 49 U.S.C. 44807(b)(2),[74] FAA has determined that an airman certificate should not be required for the relevant personnel conducting operations under the provisions of part 108. This rulemaking proposes to shift responsibility for some aspects of the safe operation of UAS under proposed part 108 from humans to systems and from individuals to organizations. In this proposed structure, the operator would be responsible for ensuring the safety of the operation. Among other things, the operator would be responsible for maintenance and alterations, ground handling, loading and unloading of aircraft, and emergency procedures and protocols, even though individuals may accomplish those tasks. While individuals would remain accountable for their actions, the operator would ultimately be responsible for the conduct of their operations

---

[74] In pertinent part, 49 U.S.C. 44807(b)(2) charges the Administrator with determining whether a certificate under § 44703 is required for the operation of UAS identified under § 44807(b)(1). § 44703 promulgates the authority for the issuance of airman certificates.

personnel. In considering this issue, FAA examined the safety and economic implications of not requiring an airman certificate. This proposal would promulgate a framework to ensure that personnel possess the appropriate knowledge, skills, and training to conduct the BVLOS operations covered in this proposal safely. Therefore, as discussed below, FAA proposes personnel requirements tailored to the UAS that would provide adequate safety for BVLOS operations under part 108.

In manned aircraft, the pilot in command is the primary person responsible for operational control and safety of flight from the flightdeck.[75] They are responsible for tasks, including performing preflight inspections of the aircraft, controlling the aircraft, seeing and avoiding other aircraft, and complying with instructions from ATC, in addition to numerous other tasks built specifically around pilot control. However, the increasingly autonomous nature of UAS anticipated for use under this proposal provide alternate pathways to meet the purposes of those regulatory requirements currently applicable to pilots.

In addition, this proposal accommodates the industry's increasing reliance on technology rather than human interaction, including the fact that UAS use systems of monitored automation and control. For example, the design standards of subpart H propose requirements for position, navigation, and timing and UAS must be designed to avoid aircraft in accordance with proposed § 108.195.[76] These functions, when done in a traditional aircraft, are completed manually by a pilot. Under part 108, these functions,

---

[75] *See* pilot in command as defined in 14 CFR § 1.1, stating, in pertinent part, that the PIC is the person who has final authority and responsibility for the operation and safety of the flight.

[76] *See* proposed §§ 108.820 and 108.825, *see generally* section XI of this preamble.

and many of the proposed operating requirements, would be predicated on technology and systems of programming rather than human interaction. An operator under this proposed rule would be responsible for managing the required systems associated with the UA and the operation that will replace traditional airmen roles in aviation. This responsibility would extend to all operations, overseeing personnel, training, maintenance, ground handling, administrative functions, and maintaining a secure facility and operations areas.

Among other things, FAA considered the lack of standardization in the industry, which means that operations using one type of UA are likely to be very different from those conducted with a UA from another manufacturer, both in the context of distinct handling characteristics of the UA and the operations to be performed. For example, the proficiencies required of an agricultural operation will be different from the proficiencies required of a package delivery operation. FAA found that developing a common set of knowledge and skills that could be tested for the variety of UA was impracticable and likely would not be adequate to ensure safe operations. Rather than create a new airman certificate for part 108 operations, which would necessitate developing standards for qualification, training and proficiency, FAA proposes to require operators to assume the responsibility to ensure personnel have the appropriate knowledge, training, and skills necessary to oversee and manage the technology and systems required for automated UAS BVLOS operations.

FAA surveyed its experience with modifying airman certification requirements during the exemption process for UAS BVLOS operations. FAA has regularly employed the discretionary authority of 49 U.S.C. 44701 to modify airman certification requirements to allow operators to conduct UAS BVLOS operations through exemptions.[77] Some of these operators have argued to FAA that certification does not add any value or benefit to operations, due to added administrative burden and costs associated with certification relative to the knowledge and skills that have little relevance to the operation of a UAS. Similarly, operators that were held to a part 107 remote pilot certificate have explained that they still needed to provide the specific knowledge necessary to conduct safe operations because the part 107 knowledge test only covers basic concepts. While the ARC did contemplate the establishment of a new remote pilot certificate, it did point out that UAS provide lower cost ways for people to access the NAS than crewed aircraft, lowering barriers to entry for individuals and companies of a wider income strata to take advantage of this access. According to the ARC, at the highest level, the costs associated with training and becoming a certificated remote pilot are far less than becoming a part 61 certificated pilot, providing individuals a more affordable path into aviation. This has a further positive impact on science, technology, engineering, and mathematics (STEM), employment, and technology transfer.[78]

As discussed further in section VII.A, the proposed rule's approach provides operators with flexibility to assign personnel to the most appropriate roles and responsibilities for the safety and efficiency of their specific operations. The proposed rule addresses personnel through organizational responsibility and operational requirements. Specifically, this proposal contains performance-based and scalable personnel regulations that cover various potential roles, including management positions,

---

[77] *See* section III.B of this preamble for additional discussion on BVLOS exemption history.

[78] *See* BVLOS ARC Report, page 270.

flight coordinators, ground handling personnel, package handling, maintenance personnel, aircraft programmers, information technology staff, and other site-specific personnel depending on the complexity of the operation. Because FAA anticipates the UA operating under part 108 will be varied, the proposed rule would also require operators to tailor personnel training and qualification to the specific UA and its operating environment. The UAS industry has pursued a variety of configurations and systems, both to support the specific design of their UAS and in pursuit of proprietary technological solutions. For example, current UAS designs exhibit diverse user interfaces, from programs that function on mass-produced tablets or cellphones, with others in a closed-loop system with control stations and software specific to the design. There are currently no common interface standards developed by industry, and as such FAA finds that this training and qualification process will reflect the current varied direction undertaken by industry.

The variety of anticipated UA also extends to the UA's AE. Accordingly, given the varying AE needed to comply with proposed part 108, FAA anticipates that companies may employ software, hardware, or information technology personnel, as well as communications and satellite experts. For example, as discussed in section XIII, part 108 operations could include complex interactions with third-party service providers integral to safe BVLOS operations, and specialized personnel may be required to handle these system-level requirements. Depending on the operation type, the operator could also be responsible for multiple aircraft operating at the same time, and therefore personnel may need to be trained and qualified on the technological systems that enable simultaneous flights.

This proposed rule would promulgate a framework involving permitted operations and certificated operations. Permitted operations would be restricted to smaller aircraft and possess limited operating privileges with less direct FAA oversight, while operators conducting more complex certificated operations would enter a closer structured oversight relationship with FAA. When operators conduct BVLOS operations consistent with proposed part 108 requirements, including proposed personnel regulations, FAA anticipates that both permitted and certificated operations could be safely conducted without an airman certificate.

FAA acknowledges that this proposal departs from the existing airman regulations for manned aircraft operations and from FAA's approach to small UAS operations under part 107. Through part 107, FAA created a new small-UAS-specific airman certificate called a remote pilot certificate with a small UAS rating. In doing so, FAA recognized and addressed the shared characteristics of operating a small UAS under a remote pilot's command. However, there are fundamental differences between the existing part 107 and proposed part 108. Under part 107, most of the operators are hobbyist, recreational, and individual flyers who are less likely to know and understand the necessary regulations (*e.g.*, airspace designations, operations over people) without a testing requirement to do so. Therefore, it is important to verify that part 107 operators understand these important restrictions. Thus, the prerequisite for a part 107 Remote Pilot Certificate is a knowledge test focusing on regulations and basic aviation knowledge and does not include a skills test like traditional manned pilot certificates under part 61. Moreover, because the part 107 regulations restrict all operations to visual line of sight, with specific conditions for operating over people and at night, operations are fairly limited in what they can achieve unless the operator holds a waiver or exemption. As a result, part 107 operations are primarily designed for individuals (*i.e.*, the remote pilot). Accordingly, FAA's approach to mitigating risks of part 107 operations is focused on the remote pilot's knowledge of the regulations, and less on the remote pilot's overall skills and reliability of the specific UA.

Despite their size, small UA operated under part 107 are much like traditional aircraft in that they rely heavily on user input and hand flying. These circumstances are dissimilar to the heavier, diverse, and more autonomous UAS that are reliant on technology and programming to a greater degree as envisioned under part 108. To account for these differences, this proposal would reassign most functions performed by pilots in traditional, manned aircraft, and similar or analogous functions performed by remote pilots under part 107 to technology and autonomous systems. As noted above, part 108 would require UAS to be designed to avoid most other aircraft (§ 108.825). Similarly, this proposal would require UAS to have a simplified user interaction (§ 108.810), which is anticipated to greatly reduce the level of human interaction and, therefore, limit potential user errors to ensure safe flight.

2. Operator Responsibility for Personnel

Given the shift from human controlled UA to systems-controlled UA intended to be operated under this rulemaking, FAA proposes to shift certain operating responsibilities from individuals to organizations. This proposed "corporate responsibility model" requires operators to satisfy the regulatory requirements for safe operation, which include ensuring that the personnel they employ meet the requirements in subpart C of part 108. FAA contends that holding operators primarily responsible for the safety of their operations would better address how part 108 operations are expected to occur and the associated risks, which are driven less by individual reactive decision-making and more by management of technology and systems, policies, personnel, security, and other matters that operators must develop and oversee to meet this proposal's requirements.

Rather than prematurely define the appropriate roles and responsibility structures for emerging technologies and operations, the proposal would establish performance-based regulations that ensure part 108 operators meet or exceed management, knowledge, and training, standards for all personnel. These regulations would accommodate the position that the operator would be best positioned to conduct all knowledge and skills training and ensure employee qualification because they would understand the intricacies of their operations as it applies to their specific UA and the corresponding personnel requirements. Similarly, the proposal recognizes that the operator would be best situated to tailor knowledge, qualifications, and training regimes to the type of UA and AE being used, as well as the operational procedures in place. Thus, FAA has determined that the operator should be responsible for holistically managing its operations personnel, providing adequate training to ensure appropriate proficiency. Consistent with this approach, FAA would expect an operator company to take appropriate corrective measures to address issues with an individual's performance issues if and when they arise. While FAA would retain the authority to take enforcement actions against an individual where a regulatory violation occurs by assessing a civil penalty, FAA expects the operator to proactively address potential issues as the authority within the corporate responsibility framework. If FAA finds that an operator company is not managing its workforce effectively, placing the operation or the public at an unsafe level of risk, FAA could take appropriate enforcement against the operator up to and including revocation of their operating permit or certificate.

As noted above, it is anticipated that BVLOS operations under proposed part 108 would likely involve more people than part 107 operations and have different configurations and roles of personnel than manned operations. These BVLOS operation roles could include a variety of positions, including management, flight coordinators, ground handling personnel, package handling personnel, maintenance personnel, aircraft programmers, information technology staff, and other site-specific personnel depending on the complexity of the operation. FAA considered certificating each type of personnel involved in the control of a UA under part 108 operations but concluded that operator certification was sufficient given the risk profile and standard operations observed for the types of operation conducted under proposed part 108. Further, FAA is not in a position at this time to reasonably anticipate the array of business models and personnel preferences given the variety of operations that would be facilitated under this rule.

Moreover, each individual person would likely have a diminished role when compared to airman analogues in manned aviation. As explained above, FAA anticipates part 108 operations to be mostly to fully autonomous, with many functions previously performed by manned aircraft pilots built into the technology and systems. While in manned aircraft, the use of autopilot systems and self-governing technology is becoming more commonplace, the ultimate control and responsibility for the safety of flight rests solely on the pilot. The pilot can always take direct control and maneuver the aircraft as desired or needed, and the pilot cannot rely on anyone outside of the aircraft to intercede control. With respect to controlling a UA during operations, an operator could utilize multiple personnel and combine their efforts to carry out successful and safe flight. For example, an operator could use personnel designated just for UA preflight preparation and checks, while other personnel perform the tracking and monitoring of the UA in flight (see section VI.B). Similarly, an operator may have payload operators with specialized training on loading packages onto specific UA. Some personnel could be removed from the proximity of the flight operations, and even switched during flight without degrading safety. These positions could vary depending on the type of operation and the UA and would generally require only narrow insight into the operation as a whole. FAA contends that these varying roles and responsibilities, which could significantly change from operator to operator, are not amenable to a certificate process that would yield few benefits beyond the safety mitigations proposed in these personnel regulations and the other requirements of part 108. Instead, the proposed rule would require operators to satisfy the performance standards described herein to develop and use qualified personnel with the knowledge, training, and skills to conduct operations safely.

B. Personnel Roles and Responsibilities

While this proposed framework acknowledges a variety of roles could be necessary to meet the operational requirements proposed in this rule, this proposed rule explicitly regulates two roles: the operations supervisor and flight coordinator. The general personnel categories and requirements intend to extend flexibility to operators, given the variability in possible business purposes and operations. Operators would be required to develop procedures and policies that would clearly state the roles and responsibilities necessary for the planned operations in their company operations manual[79] as part of the application process for both permitted and certificated operations. Upon submission of the application, which will include the manual, FAA would evaluate the operations personnel framework, which would be required to be included by proposed §§ 108.135(g)(1) and (2), necessary for safe operation. FAA would consider how the framework outlined in the company operations manual meets requirements for the roles and responsibilities specific to the operation, as proposed in § 108.300(b). For certificated operators, FAA would also consider the training program, as proposed in § 108.540, which would also be included in the certificated operator's application, as proposed in § 108.505(b).

1. Operations Supervisor (§ 108.305)

As proposed in § 108.305(a), FAA would require each operator to have at least one operations supervisor. The operations supervisor would be directly responsible for, and be the final authority as to, the operation of all UA (see proposed § 108.120(d)). FAA proposes that the operations supervisor would maintain individual responsibility for operations in the company to ensure regulatory compliance. This position would also be a point of contact for FAA. FAA expects that this role would be similar to a director of operations in manned aviation, with the responsibility of ensuring that persons in the company comply with the regulations and any authorizations or limitations associated with an operating permit or certificate.

In this proposal, FAA contends that persons occupying this position would need expansive knowledge of aviation safety standards and safe operating practices, as well as

[79] Proposed § 108.135 would require each operator to prepare and keep current a company operations manual that sets forth the operator's procedures and policies acceptable to the Administrator. See also §§ 108.405 and 108.505.

those policies and procedures specific to the operator and the operations. Therefore, the proposed rule accounts for specific areas of expertise necessary for the operations supervisor. In proposed § 108.305(a), FAA proposes to require that the person serving in the role of an operations supervisor be qualified through training, experience, or other expertise (*e.g.*, UAS military experience, academic background). As further discussed in section VII.C, FAA has proposed training requirements that would apply to all personnel, including the operations supervisor. FAA anticipates that each company will tailor the training to fit their particular operational profile, which would include the specific procedures as detailed in their application for operating permit (proposed § 108.405(b)) or operating certificate (proposed § 108.505(b)).

In proposed § 108.305(b), FAA proposes that the operator would be required to inform FAA of any change in personnel assigned as operations supervisor within 10 days of any such change. Because FAA anticipates that the operations supervisor will be a primary point of contact in many cases between the operator and FAA, having this information available in an expeditious fashion is necessary for maintaining appropriate oversight of the operator.

To ensure operation supervisors possess the requisite level of specialized knowledge to successfully carry out their duties, FAA proposes § 108.305(c). In proposed § 108.305(c)(1), the operations supervisor would be required to be knowledgeable of the company policies and procedures. Because FAA is approaching the requirements of personnel from a perspective of corporate responsibility, FAA finds it necessary for the operations supervisor to be able to represent the company with full knowledge of the company's policies and procedures to facilitate safe and regulatorily compliance operations.

In proposed § 108.305(c)(2), FAA proposes that the operations supervisor must have a full understanding of aviation safety standards and safe operating practices, the practices for maintaining a secure facility and operations, and the regulatory requirements of part 108. FAA would expect the operations supervisor to understand the high-level information necessary to maintain the safety of the operation, similar in manner to a Director of Operations under 14 CFR parts 121 and 135. FAA envisions this role would be tailored to the operational parameters of the company. For example, some organizations may require the operations supervisor to maintain significant and direct interaction with operations; others may task the operations supervisor with overseeing a multi-state operational environment, provided there are sufficient safeguards to ensure the operations supervisor is directly responsible for, and the final authority as to, the safe and secure operation of all UA.[80] In addition, some companies may choose to employ multiple people in the operations supervisor role, depending on company needs and the scale of the operation.

2. Flight Coordinator (§ 108.310)

The second personnel position that would be regulated (if required by aircraft design in the manufacturer's operating instructions for UA operation) is that of a flight coordinator. Section 108.310 proposes the requirements for flight coordinators. As explained in section XI.C, UA operating under this proposal would exhibit highly

---

[80] *See* proposed § 108.120(d).

automated features and functions. Direct manual control (*e.g.*, handheld joystick controllers) would not be permitted,[81] and any user interaction would be mediated by an automated control system that enables flight coordinators to execute simple commands, such as changes in airspeed, altitude, and heading. This is in contrast to operations under part 107 where the safety case largely relies on the actions of an individual (the remote pilot in command) who is primarily responsible for the safety of the operation[82] and no requirement for automation exists. Accordingly, FAA chose the term "flight coordinator" rather than "pilot" to avoid confusion and to reinforce that the flight coordinator would not share the exact same roles and responsibilities traditionally given to pilots (both manned aviation pilots and part 107 remote pilots).

In addition, this proposed rule acknowledges that a person directly controlling or monitoring a UA in flight may not be necessary unlike other circumstances where pilots are required for operations (*e.g.*, a pilot inputting manual operations in an airplane, or a remote pilot manually moving a joystick in small UAS operations). The proposal would accommodate fully automated flight, and thus, in accordance with the manufacturer's operating instructions, the flight coordinator role may not require consistent action. However, for this to be the case, a UA design would have to be fully automated and be able to handle both normal operations and emergency situations autonomously. For UA that are not fully autonomous, the flight coordinator would provide direct oversight and monitoring of UAS flights but may not be actively controlling the flight. In those

[81] *See* proposed § 108.810(a).

[82] *See* 14 CFR § 107.19.

circumstances, the flight coordinator would instead be responsible for overseeing the technology and systems that ensure safe operation of autonomous flight.

Proposed § 108.310(a) would require the operator to designate a flight coordinator prior to each flight where a flight coordinator is required by the manufacturer's operating instructions. FAA proposes in § 108.310(b) that no operator may allow a person to direct the flight of a UAS unless they are appropriately qualified and authorized by the operator as a flight coordinator. As further discussed in the following section VII.C, FAA anticipates that operators will develop training requirements appropriately tailored to the personnel requirements consistent with the requirements in § 108.315 that best fit the needs of the company and its operational profile. The operator would thus be responsible for ensuring that the flight coordinator understands the appropriate procedures to conduct the operation. While the operator must assign a flight coordinator prior to each flight, FAA recognizes there may be a situation where the flight coordinator must handoff control to another flight coordinator (*e.g.*, an emergency medical situation). Therefore, proposed § 108.310(c) would require the operator to maintain appropriate handoff procedures if necessary to transfer control from one flight coordinator to another while the flight is in operation.

As previously discussed in section VI.A.1 of this preamble, FAA notes that though the UAS envisioned for use under part 108 are highly automated, the flight coordinator would be required to take appropriate actions, within the limitations of the UAS design, to prevent the UA from posing an undue hazard to other people, aircraft, or property, as proposed in § 108.310(d)(1). Proposed § 108.310(d)(2) would further require the flight coordinator to maintain situational awareness of the UA and to otherwise direct the UA if necessary to comply with the requirements of part 108, again within the limitations of the UAS design. If the flight coordinator is overseeing more than one flight, subject to operating requirements and approval, they must have the skills and training needed to conduct 1:many operations.

FAA also notes, however, that the anticipated highly automated UA may include varying systems, controls, and operational characteristics. To ensure safety, flight coordinators must have experience with the specific make and model of UA that will be used during operations, which would provide familiarity with the UA's distinct features (*e.g.*, flight dynamics, responsiveness under different conditions, and control input procedures). Because acquired knowledge of a UA's specific features is prone to decay over time, this actual experience must be recently acquired and maintained to ensure appropriate familiarity with the UA. However, FAA has determined that this experience need not be extensive, considering the automation requirements and simplified user controls that would be required in proposed subpart H. For these reasons, in proposed §§ 108.310(e), (f), and (g), FAA proposes certain competency and recency requirements. Specifically, FAA proposes a minimum of 5 hours of initial supervised flight experience in the specific make and model of UA in § 108.310(e) and recency within 12 calendar months under § 108.310(f) in order to qualify to serve as a flight coordinator. This 5-hour requirement mirrors the 5 hours of experience required of a flight engineer under 14 CFR § 63.37. FAA recognizes that the duties of a UAS flight coordinator are not completely synonymous with those of a manned flight engineer, but notes that the basic principles of flight responsibility are similar: (*e.g.*, monitoring critical aircraft systems, understanding/coordinating emergency procedures) such that a mirrored 5 hours is an appropriate time of flight experience. FAA seeks comment on whether the 5-hour experience requirement is sufficient for UA operations under part 108.

FAA proposes that this operating experience would be directly supervised by persons who have the foundational level of knowledge about the operation and the UA to intervene in an emergency situation or correct a possible erroneous action by the person seeking to be a qualified flight coordinator.[83] FAA finds these persons to be a fully qualified flight coordinator, an operations supervisor, or a person qualified and designated by the operator to ensure operations personnel are appropriately trained (*e.g.*, a person providing training program). FAA notes that this operating experience would not be required to be to be conducted in an actual operation; in other words, the person may count 5 hours of operational experience in a training scenario to the five hours. This would be how a certificate holder would stand up an initial cadre of flight coordinators upon the inception of an operator; because § 108.310(a) would require a fully qualified flight coordinator where it is required by the manufacturer, the person would need to obtain their supervised operating experience prior to initiating actual operations to be fully qualified. This would be conducted through the training/preparation before actual operations begin. Because permit holders[84] would not be required to have a training program, the operations supervisor would supervise the initial cadre of flight coordinators. In either certificated or permitted operations, should a fully qualified flight

[83] FAA notes that "direct supervision" must provide the ability to conduct these actions when necessary and may include unobstructed visual sight of the flight coordinator's actions, active communication, etc.

[84] Under proposed § 108.475(k), recreational permit operators would not be required to comply with the experience requirements set forth in proposed § 108.310. Therefore, the supervised operating experience 5-hour requirement would not apply and is not contemplated in this section.

coordinator be the designated supervisor, the flight coordinator could obtain their operating experience in actual operations with the fully qualified flight coordinator as the designated flight coordinator for that operation.

Table 1 illustrates who could directly supervise the operating experience in both the initial cadre (*i.e.*, no flight coordinators exist for that operator yet) and during the regular course of business (*i.e.*, the operator has a flight coordinator but is qualifying additional ones).

Table 1. Supervisory Personnel

	Certificated Operators: Direct Supervision May be Conducted by:	**Permitted Operators: Direct Supervision May be Conducted by:**
Initial Cadre of Flight Coordinator(s)	1. Operations supervisor 2. Person designated by operator to ensure personnel are trained	1. Operations Supervisor
Flight Coordinators Established in the Regular Course of Business	1. Fully Qualified Flight Coordinator 2. Operations Supervisor 3. Person designated by operator to ensure personnel are trained	1. Fully Qualified Flight Coordinator 2. Operations Supervisor

After the flight coordinator is initially qualified, the person must maintain proficiency by serving as a flight coordinator for at least 5 hours of operating experience of a UA of the same make and model in the previous 12 calendar months. In the event of a lapse in recency, FAA proposes in § 108.310(g) that the flight coordinator must requalify in order to serve in their role as the flight coordinator. FAA expects these experience requirements and intervals would be reasonable and provide sufficient familiarity with the UAS to ensure the safe oversight of the operation.

3. Other Roles

FAA places responsibility on the operator to identify all needed personnel to meet the requisite safety standards given the operations this proposal seeks to facilitate. FAA anticipates that operations personnel categories under this part would include, but would not be limited to, seven general categories of personnel roles. The breadth of possible operational needs may require individuals outside of the roles listed below. Those roles would be specific to the operation and required for safe operation, but they would not necessarily fit any of the following categories. FAA identified these categories based on data and information gathered from waivers and exemptions the agency has granted to date. FAA acknowledges it cannot foresee every specific role that may be required by future operations. As a result, FAA invites comments on these seven personnel categories and seeks feedback on the types of personnel that may be necessary for BVLOS operations. FAA discussed two categories previously, the operations supervisor and flight coordinator, and the remaining categories include (but are not limited to) those described in table 2:

Table 2. Personnel Roles and Responsibilities

Personnel Role	**Responsibility**	**Proposed Regulation(s)**
Operations Supervisor	Directly responsible for and final authority as to the operation of all UA.	§ 108.300(a)(1), § 108.305
Flight Coordinator	Direct and monitor the UA, and, if necessary, intervene during UA flight to ensure safe operations.	§ 108.300(a)(2), § 108.310
UA Maintenance or Alterations	Determine the performance of the UA, determine whether the UA is in a condition for safe operation, and perform maintenance and repairs on the UA.	§ 108.300((a)(3)
Ground Handling	Retrieve UA from storage, set UA up for operations,	§ 108.300(a)(4)

Personnel Role	Responsibility	Proposed Regulation(s)
	power on the UA, perform physical handling of the UA and corresponding equipment.	
Loading and Unloading of the UA	Act as payload operators or package operators, conduct UA loading and unloading activities, maintain knowledge pertaining to carriage of hazardous materials	§ 108.300(a)(5)
Servicing or Upkeep of Systems (including AE)	Maintaining and repairing systems such as ground control stations, interface equipment, fleet management system, C2 links, and any components necessary for operation but not part of the UA.	§ 108.300(a)(6)
Establishing Flight Paths, Emergency Procedures, and Operational Parameters	Understand automation of UA, input system parameters, set up operations software, programming of system elements (while not in-flight).	§ 108.300(a)(7)

While this proposed rule would allow operators to tailor personnel design to fit the needs of their operations, including by consolidating roles in individual employees when appropriate, this flexibility cannot come at the expense of safety. Accordingly, in proposed § 108.300(b), FAA proposes that an operator may not allow a person to perform multiple roles concurrently if doing so could affect the safety of operations.

C. Personnel Knowledge and Training (§ 108.315)

FAA proposes to require operations personnel to have general and aircraft-specific aviation knowledge and skills as it relates to their respective roles. The permit and certificate holders would be responsible for appropriately training their personnel.

However, because FAA anticipates that operators will build their workforce in a variety of configurations to support their diverse operations, FAA does not propose to require all training for every person involved in the operation. Instead, this proposed rule would allow operators the flexibility to tailor training for appropriate personnel (as determined by the manufacturer's instructions and the operator's policies and procedures) to ensure they have the aviation and aircraft-specific knowledge and skills necessary for safe operations, and, more specifically, to use the specific aircraft and to support other operation elements. Certificate holders, as further described in section VIII.C, would be required to develop and implement a training program in accordance with proposed § 108.540, and to include the training program in their application for the certificate, as proposed in § 108.505(b)(10). FAA does not propose to require that permit holders would need to submit a training program for FAA approval, noting that the expected smaller scope of permitted operations and fewer number of personnel would naturally result in a less complex structure and does not necessitate that more formalized approach.

1. General Aviation Knowledge and Training

Proposed § 108.315 would set forth the general personnel knowledge and training requirements. First, in § 108.315(a), FAA proposes that each operator would be required to ensure that all operations personnel have completed the applicable training under part 108 and that the operations personnel have the knowledge and skills required to conduct their duties specific to their areas of responsibility. While FAA would mandate the inclusion of certain subject matter areas dependent on the personnel role, there would be no prescriptive hours or manner of training requirements. In addition, if there are changes to the UAS utilized or to an operator's operational procedures, FAA expects that updated training would be administered accordingly. To note, FAA would not be responsible for providing such training required under proposed § 108.315; rather, the specific operator would provide the training tailored to their operations and required personnel or ensure they have received appropriate training. Specifically, if the operator uses an outside source or contractor, the operator is still responsible for ensuring the course content meets the need.

As mentioned, FAA would require general knowledge and skills training relevant to their areas of responsibility covering certain subject matter areas proposed in§ 108.315(b). Specifically, FAA finds 19 subject matter areas warranting inclusion in the training program where the personnel would directly deal with matters within that subject area in their role. However, an operator would be responsible for ensuring personnel have applicable knowledge and skill required to conduct their duties safely, therefore, an operator is free to include all subject matter areas in a training program for all personnel, even when a subject area may not pertain to a specific role (*i.e.*, the regulation sets a training curriculum floor, but an operator may choose to include subject areas beyond that). The following preamble text discusses the significance of each subject matter area requirement. Because the regulation would apply the subject area as applicable to the personnel's area of responsibility, FAA also provides discussion for each subject area on the personnel roles expected to receive the subject area training.

In proposed § 108.315(b)(1), operations personnel would be required to receive general knowledge and skills training on the applicable regulations relating to flight operations, such as UA speed, altitude limitations, and equipment requirements associated with operations over people and in controlled airspace. As discussed in section VI, the proposed rule would establish general operating rules governing all operations envisioned under part 108 (*e.g.*, areas of operations, preflight requirements and emergency conditions, aircraft lighting, aircraft registration). To ensure that personnel, first, understand what those regulations would require and, second, do not violate them through ignorance, FAA proposes that all operations personnel would have general knowledge and skills training related to part 108's general operating rules.

In proposed § 108.315(b)(2), FAA proposes that operations personnel would receive general knowledge and skills training on how to determine the classification of specific airspace and what the requirements are for operating in that airspace. Through training, personnel would become knowledgeable on flight restrictions affecting UA operations. Training would also include how to determine which areas are prohibited or restricted. This subject area would be applicable to any personnel involved in flight planning, specifically including the operations supervisor and the flight coordinator.

In proposed § 108.315(b)(3), FAA proposes that operations personnel would receive general knowledge and skills training on the effects of weather on UA performance and aviation weather sources. Knowledge of weather is necessary for safe operation of a UA. For example, space around buildings, smokestacks, and trees, which is safe during clear weather, could easily become hazardous in a windy situation. Accordingly, personnel should understand the effect that different types of weather have on the performance of their specific UA and how to react to that weather. Personnel must be trained in how to utilize the manufacturer's flight manual to reference the weather conditions specific UA may or may not withstand. Lastly, FAA proposes that personnel also be trained on their knowledge of official sources that they can use to obtain weather information and predictions in order to plan the operation of the UAS. Training in this subject area would be applicable to any personnel involved in flight planning, specifically including the operations supervisor and the flight coordinator.

In proposed § 108.315(b)(4), FAA proposes that operations personnel would receive general knowledge and skills training on crew resource management. As discussed previously, FAA anticipates the BVLOS operations under proposed part 108 to increase in shared responsibility and in the number of personnel involved, as compared to typical part 107 operations. Therefore, UAS operations personnel must understand how to function in a team environment, known as crew resource management, because operations allowed by this proposed rule would typically involve a diverse team of personnel. At a minimum, the operations supervisor would need knowledge and skills associated with crew resource management to effectively oversee operations and comply with the management responsibilities outlined in § 108.305 however most operations personnel would likely benefit from this training. Because of the separation between the flight coordinator, ground control stations, ground personnel and possibly other personnel, communication across a team environment is critical to the success of each UA flight.

In proposed § 108.315(b)(5), FAA proposes that operations personnel would receive general knowledge and skills training on the operator's communications procedures. Operational communication procedures training emphasizes clear and concise communication, both internally between operations personnel and externally with stakeholders (*e.g.*, law enforcement, FAA and NTSB representatives, and other airspace users). The ability to effectively exchange information during routine and unexpected situations is crucial, as most operations rely on various personnel performing different tasks such as package loading or maintenance work. To ensure the status of these specific tasks during an operation is communicated effectively, FAA contends that operators would need to train most personnel on company communication procedures.

In proposed § 108.315(b)(6), FAA proposes that operations personnel would receive general knowledge and skills training on the operator's safe distance criteria. This is important because the means of maintaining a safe distance may vary from one operation to another. FAA also anticipates that any DAA systems used may not specifically measure system performance in the same manner. As such FAA expects that each operator will tailor their personnel training to the specific DAA technology that they use. Operations supervisors and flight coordinators would need to be trained on safe distance criteria, as would any operations personnel responsible for ensuring that the AE and other systems are functioning within the specified parameters of the technology (*e.g.*, programming or technical experts).

In proposed § 108.315(b)(7), FAA proposes that operations personnel would receive general knowledge and skills training on the principles of strategic deconfliction and conformance monitoring. Proposed§ 108.190 sets forth the requirements for the use of strategic deconfliction and conformance monitoring, which is a system designed to manage UA traffic to integrate and separate UA in the NAS, allowing for more complex BVLOS operations. Flight coordinators and operations supervisors must be informed on the requirements for the use of strategic deconfliction and conformance monitoring, specifically to understand system limitations and that it is not a replacement for flight coordinator responsibility to take actions to avoid other aircraft.

In proposed § 108.315(b)(8), FAA proposes that operations personnel would receive general knowledge and skills training on determining the performance of UA. This would include training on the weight and balance of the UA to determine impacts on performance. A UA's design limitations are meant to keep it within safe operating parameters, and if a UA is loaded such that the maximum takeoff weight is exceeded, or the balance of the UA is not within those design limitations, then a catastrophic failure could result. To operate safely, flight coordinators, package loaders, and potentially other personnel, such as personnel involved in the decision on what products to offer for delivery, would require knowledge and understanding of fundamental aircraft performance issues, which should include (but is not limited to) load balancing and weight distribution, determining maximum takeoff and landing weights, and understanding available power for the operation with computations based on current atmospheric conditions.

In proposed § 108.315(b)(9), FAA proposes that operations personnel would receive general knowledge and skills training on the physiological effects of drugs and alcohol. Many prescription and over-the-counter medications, as well as alcohol, can significantly reduce an individual's cognitive ability to process and orient situational awareness and initiate corrective action when necessary. Accordingly, all operations personnel need to understand how drugs and alcohol can impact their ability to perform their duties safely.

In proposed § 108.315(b)(10), FAA proposes that operations personnel would receive general knowledge and skills training on aeronautical decision-making and judgment. Even though this proposal would limit the flight of UA to operations at or below 400 feet AGL, manned aircraft will still operate in the same airspace as UA such as (*e.g.*, takeoff and landing, low altitude operations, emergency situations). In addition to contending with manned aircraft, operations personnel may encounter unexpected weather, UA system failures, inflight route changes and other unplanned situations. Accordingly, the flight coordinator and the programming and technical experts would need to understand the aeronautical decision-making and judgment processes so that they can anticipate, plan, and manage any seen and unforeseen circumstances.

In proposed § 108.315(b)(11), FAA proposes that operations personnel would receive general knowledge and skills training on airport and heliport operations. These operations are a critical and complex piece of the NAS. Within the bounds of an area designated as an airport or heliport, there are typically higher volumes of manned air traffic conducting departure and arrival operations (*e.g.*, takeoff and landing), which creates a higher workload environment. Having an understanding through knowledge and skills training regarding these operations would greatly reduce any unnecessary increases in complexity and workload increases to both the UA and manned aircraft operations. This training would seek to ensure that UA flight operations personnel (*i.e.*, those personnel whose roles involve the airborne parts of the UA operation) are fully aware of how manned aircraft conduct operations within the bounds of an airport and be able to identify any airborne hazards while reducing potential conflicts.

In proposed § 108.315(b)(12), FAA proposes that operations personnel would receive general knowledge and skills training on operation at night to ensure familiarity with the risks and appropriate mitigations for nighttime operations. Night operations occur in low visibility without natural light, which can make it harder for pilots of manned aircraft to identify other aircraft or UA. FAA contends that training on this proposal's UA mitigations for night operations, such as aircraft lighting and usage, and other areas like physiological factors and aircraft and airport lighting, would be vital to ensure safe operation during the night. Accordingly, FAA expects that operators conducting night operations would provide the appropriate knowledge and skill training for personnel with roles in those operations to ensure safety and to reduce the risk to other aircraft in the NAS.

In proposed § 108.315(b)(13), FAA proposes that operations personnel would receive general knowledge and skills training on the assignment and transfer of control of a UAS. Seamless handoff procedures are crucial for safe UAS operation. Clear communication during these transitions ensures all personnel share a complete understanding of the UAS's status and any potential issues, preventing confusion and loss of situational awareness. This is especially critical in emergencies, where a smooth and practiced transfer of control to the appropriate personnel is essential to maintain safe operation and avoid potential harm to people or property. This subject area would be applicable to any personnel involved in flight planning, specifically the operations supervisor and the flight coordinator.

In proposed § 108.315(b)(14), FAA proposes that operations personnel would receive general knowledge and skills training in BVLOS strategic and tactical risk mitigation strategies and approaches. Strategic risk mitigation is typically associated with planning that occurs before the flight occurs, such as holding flights from taking off if there are manned aircraft operations in the near vicinity. Tactical risk mitigation is generally associated with technologies that are employed during flight, such as DAA equipment and sensors. This training would apply to both general principles and items specific to their operation. Having an overall understanding through knowledge and skill training of BVLOS risk mitigation strategies and approaches would help an operator and its personnel ensure positive control of the UA at all times. Operations supervisors and flight coordinators would need to be trained on strategic and tactical risk, as would any operations personnel responsible for ensuring that the AE and other systems are functioning within the specified parameters of the technology (*e.g.*, programming or technical experts).

In proposed § 108.315(b)(15), FAA proposes that operations personnel would receive general knowledge and skills training on multi-aircraft operations (where an operator seeks to conduct a part 108 operation with multiple UAs), contingency management, and recovery procedures. Operations supervisors and flight coordinators would need training on how to manage and fly multiple drones at once (1-to-many operations) and understand the specific systems and rules involved if those operations are conducted. To the extent technology improves and allows for even larger drone fleets, the training would likely get more intricate. For example, pilots delivering packages with many UA would need different training than those using UA for inspections.

In proposed § 108.315(b)(16), FAA proposes that operations personnel would receive general knowledge and skills training on the C2 system of the UAS. Different operations personnel must have a strong understanding of the core functions of the C2 system. For flight coordinators, this includes how it transmits commands (flight path, maneuvers) and receives telemetry data (battery level, signal strength, UA health) between the ground control station (GCS) and the UA. Knowing the limitations and potential vulnerabilities of the C2 system is also important for operations supervisors and technical staff, including factors like range (maximum distance for reliable communication), interference (potential signal disruptions from other electronics), and redundancy (backup systems in case of primary C2 failure).

In proposed § 108.315(b)(17), FAA proposes that operations personnel would receive general knowledge and skills training on contingency management and recovery procedures. A risk of UAS operations is the possibility that during flight, the operations supervisor or flight coordinator may become unable to directly control the UA due to a failure of the C2 system that connects the UA and the GCS. Training in contingency management and aircraft recovery would prepare operations supervisors, flight coordinators, and those personnel establishing flight paths, emergency procedures, and operational parameters to handle unexpected situations, and promote the safe, efficient, and responsible recovery of UA that may have experienced landing at an unintended location.

In § 108.315(b)(18), FAA proposes that operations personnel would receive general knowledge and skills training on population density considerations. As further discussed in section VI.H, operations over people are subject to specific operating requirements. In this proposed rule, operators would need to abide by the categories determined by calculations derived from the Oak Ridge National Laboratory's LandScan data in order to operate over people. Understanding these restrictions and considerations is critical for operations planning personnel responsible for planning operations and flight coordinator personnel.

In proposed § 108.315(b)(19), operations personnel would receive general knowledge and skills training on ATC procedures. In order to operate safely near an airport or heliport, operations personnel would need to have knowledge of airport operations and air traffic control procedures, so that the UA does not interfere with either of those operations. In addition, for operators that operate in controlled airspace, knowledge of ATC procedures is critical for understanding the operating environment and what to expect of manned aircraft operations. Finally, knowledge of communication procedures is also important so that the operator can understand how to communicate with ATC and when it is appropriate. This information is appropriate for operations supervisors, flight coordinators, and those personnel establishing flight paths, emergency procedures, and operational parameters.

FAA expects that the permit or certificate holder will include other aeronautical or operational knowledge and skill areas as they see fit. This list is not exhaustive. An operator is responsible for ensuring that all of their operations personnel must have the knowledge required to operate safely, regardless of whether it is included in the previous 19 items.

2. Aircraft-Specific Knowledge and Training

While § 108.315(b) would require generalized knowledge and skill training, as applicable, FAA finds it necessary to require knowledge and skill training specific to the make and model of the UA to be used in the operation. Therefore, proposed § 108.315(c) would require operations personnel to have knowledge and skills training specific to the make and model of UA to be operated relevant to their areas of responsibility that covers certain subject areas (similar to § 108.315(b)). Specifically, FAA finds 12 specific subject matter areas warranting inclusion in the training program where the personnel would directly deal with matters within that subject area in their role.[85] The following preamble discusses the significance of each subject matter area requirement, and the personnel roles expected to receive the subject area training.

In § 108.315(c)(1), FAA proposes that the relevant operations personnel would receive make-and-model knowledge and skills training on the general and operating limitations of the UA used in the operation. As noted herein, FAA anticipates that there will be a variety of aircraft permissible for use under this proposed rule. Familiarity with the specifics of the operator's particular UAS, including any limitations that might affect its ability to complete its flight safely, is a basic tenet of safe operation. FAA anticipates that the operations supervisor and flight coordinator roles would require such training, though it may be appropriate to include other personnel depending on the specific operations.

In §§ 108.315(c)(2) and (3), FAA proposes that the relevant operations personnel would need to receive make-and-model knowledge and skills training on the UA's system setup and configuration and normal and abnormal procedures. While FAA anticipates that most operations would be automated to the extent that personnel need not interfere with an operation, certain operations personnel would need to be familiar with the normal and abnormal procedures associated with the UA. These personnel should be able to discern deviations from standard operating procedures, which can help identify

[85] Because the operator would be responsible to ensure personnel have the applicable knowledge and skill required to conduct their duties safely, pursuant to proposed in § 108.315(a), the operator is free to include all specific subject matter areas, or unlisted subject matter areas, for all personnel if the operator found it would best equip their personnel with operational proficiency.

any problems or mishaps before they become significant. FAA expects that the operator's training materials would be specifically tailored to the aircraft used in their operation. If significant problems or mishaps do arise, FAA proposes in § 108.315(c)(4) that the relevant operations personnel would receive make-and-model knowledge and skills training on emergency procedures specific to the UA used in operation. Such training would provide relevant personnel with the knowledge and skills to address those abnormal circumstances that require personnel to intervene in UA operations (*e.g.*, initiating an immediate landing or return-to-home). FAA anticipates that training in these subjects would be appropriate for operations personnel that must collaborate to plan and execute flight operations, including operations supervisors, flight coordinators, and those personnel responsible for servicing or upkeep of systems, including AE, and establishing flight paths, emergency procedures, and operational parameters.

To further support the expected use in various commercial operations, in proposed §§ 108.315(c)(5)-(6), FAA proposes that the relevant operations personnel would receive make-and-model knowledge and skills training in ground handling and loading, respectively. While these subjects are not applicable to all potential operations under a permit or certificate, an operator would need to ensure that relevant operations personnel are sufficiently trained in the particulars of these functions: for example, attaching payload or spraying substances. FAA anticipates that personnel responsible for ground handling and loading and unloading of the UA would require such training, though it may be appropriate to include other personnel depending on the specific operations.

No matter how well an aircraft is designed, if it is not maintained properly, it will degrade the reliability of the aircraft and the safety of the operation. This includes not only repairing components as they become damaged, but regular inspections to verify condition of the aircraft and related systems. FAA anticipates that the UA operating under part 108 will vary significantly, which would, in turn, necessitate succinct knowledge about the maintenance and inspection dynamics for the make and model of UA. Therefore, FAA proposes to require in § 108.315(c)(7) that the relevant operations personnel receive make-and-model knowledge and skills training in maintenance and inspection procedures for the operation's UAS. FAA anticipates that personnel responsible for UA maintenance or alterations, and for servicing or upkeep of systems, including AE, would require such training, though it may be appropriate to include other personnel depending on the specific operations.

In § 108.315(c)(8), FAA proposes that the relevant operations personnel would need to receive make-and-model knowledge and skills training on preflight procedures. These preflight procedures would likely include inspecting the UA to ensure it is in safe condition for operation and that the AE supporting the operation are in appropriate working order (*e.g.*, diagnostics scans show as normal). These more programmatic functions would be further supported by the proposed make-and-model knowledge and skills training on navigation systems, DAA procedures, and lost-link procedures, as proposed in §§ 108.315(c)(9), (10), and (11), respectively. FAA contends that such training should provide responsible operations personnel with the knowledge and skills to use systems that facilitate deconfliction and safe distance. Training that emphasizes how to identify, use, and troubleshoot, if appropriate under the approval determined by part 146, would be an essential component for safe operation. FAA anticipates that ground handling personnel and personnel responsible for UA maintenance or alterations, and for servicing or upkeep of systems, including AE, would require such training, though it may be appropriate to include other personnel depending on the specific operations.

As noted in § 108.210 and discussed in section VI.M, FAA is proposing that flight coordinators may only operate UA at a 1:1 ratio, though this provision is subject to waiver. However, when an operator is authorized to operate at a higher ratio and intends to do so, FAA proposes in § 108.315(c)(12) that the relevant operations personnel, including operations supervisors and flight coordinators, would receive make-and-model knowledge and skills training on the operation of multiple aircraft.

3. Currency

In § 108.315(d), FAA proposes that both general and make-and-model knowledge and skills training, *i.e.*, the training proposed in §§ 108.315(b) and (c), would be routinely required for operations personnel with relevant responsibilities. Accordingly, to comply with these regulations, the operator would have to ensure that operations personnel receive the appropriate training at least every 24 months. Knowledge of rules, regulations, and operating principles erodes over time, particularly if the person is not required to recall such information on a frequent basis. FAA also notes that even personnel who regularly conduct UAS operations may not fully retain knowledge or proficiency elements that they may not use during their regular operations. For example, a flight coordinator who conducts operations only in Class G airspace may not retain the knowledge that they need ATC authorization to conduct operations in Class B, C, or D airspace. Similarly, if regular operations are never interrupted by abnormal circumstances that require operations personnel to use emergency procedures, these personnel may not retain the knowledge and skills necessary to navigate these critical moments. FAA proposes a recurrent training frequency because that have been used as the method of ensuring the appropriate retention of knowledge and skills for decades. FAA seeks comment on whether a different frequency, or another method for ensuring knowledge and skill retention would be more appropriate.

In § 108.315(d), FAA also proposes to provide a structure that allows training to be provided up to 1-month before or after the month in which it is due without changing the renewal date. This 3-month training window would encourage personnel to not wait until the end of their training window to avoid the perceived penalty of "losing" time. The 3-month training window would also allow personnel to complete training in the month after it is due without penalty to provide flexibility in unforeseen circumstances when the person cannot complete the training by the subsequent base month. This is commonly referred to as a "grace period."[86] Note that this would not have the effect of changing the next due date as the person will be considered to have taken the training during the month it was due (*i.e.*, a person's "base month"). As stated in the proposed regulation, the person will be considered to have taken the training in the month it was due, so as not to encourage last-minute training or extending the training date. For example, if a person originally completed their training in January 2026, they would be required to receive the recurrent training in January 2028 (and may elect to receive training in December 2027). However, due to an unforeseen circumstance or emergency, the person could not complete the training until February 15, 2028. Upon completing the

[86] FAA has provided flexibility of a "grace period" in this manner elsewhere in the regulations: *see, e.g.*, § 135.323.

training on February 15, 2028, the person’s next training month would be January 2030. The person could continue to participate in operations during that 15-day period. Conversely, if the person did not complete the training until March 2028, the person would not be considered qualified from February 1, 2028, until the training was completed in March (*i.e.*, unable to perform the personnel position) and would be in violation of § 108.315 for those operations conducted after January 2028. Once the person completes the training, their new base month would be in March.

The subject matter, training, and testing requirements described above apply to both permitted operators and certificated operators. However, for certificated operations, FAA proposes in § 108.540 that their training be documented in a program acceptable to FAA. FAA expects that the additional services that certification will enable for an operator (flight over higher population densities, interstate operations, etc.) will add scale and complexity to the operation. Therefore, through review and acceptance of the certificated operator's training program, FAA seeks to have greater oversight to ensure the level, scope, and rigor of the knowledge and training provided.

Finally, FAA is not requiring operations personnel to demonstrate a minimum level of flight proficiency to a specific standard as part of the requirements of § 108.315 (*e.g.*, a “check flight” or practical test). Rather, FAA proposes minimum operating experience and recency of flight experience requirements as proposed in § 108.310.

FAA invites comments on the following:

- The proposed performance-based training and testing of personnel under a corporate responsibility model.

- The proposed areas of knowledge in § 108.315, including comments addressing whether additional areas of knowledge should be trained.
- FAA's proposal to not require a minimum level of flight proficiency to a specific standard as part of the requirements of § 108.315.

D. Medical Condition (§ 108.320)

This proposed rule would not require operations personnel to hold a part 67 issued airman medical certificate. However, FAA recognizes the possibility that operations personnel may have a medical condition that could interfere with the safe operation of the UA or safe execution of operations personnel duties. Accordingly, in proposed § 108.320, FAA proposes to prohibit a person from serving in an operations personnel position if that person knows or has reason to know that they have a physical or mental condition that would interfere with the safe operation of a UA or make the person unable to perform duties of their position. Consistent with the proposed rule's emphasis on operator responsibility and control over operations consistent with the requirements of this proposal, FAA also proposes in § 108.320 to similarly prohibit operators from using a person in an operations personnel position if the operator knows or has reason to know that the person has a physical or mental condition that would interfere with the safe operation of the UA or make the person unable to safely perform duties of their position.

Proposed § 108.320 is similar to 14 CFR § 107.17, which applies to small UAS operations, and to 14 CFR § 61.53(b), which applies to operations that do not require a medical certificate.[87] FAA notes that this proposal's analogous prohibitions extend

[87] See 14 CFR § 61.23(b).

beyond the direct operation of a UA to circumstances where a medical condition would jeopardize the safe performance of other operations personnel duties. In other words, proposed § 108.320 would apply to all personnel positions (*e.g.*, ground handlers, maintenance personnel, etc.), not only a flight coordinator. As explained in section VII.B, the proposed rule's personnel requirements would allow operators to develop an operations personnel framework appropriate for the complexity and scale of their operations with FAA review and oversight. More specifically, § 108.300(b) would require operators to identify operations personnel required for safe operation of the UAS and its AE. Accordingly, FAA has determined that medical conditions that would make any person unable to perform the duties of their operations personnel position would raise risks to operation safety, and the proposed rule makes explicit that the prohibition includes such circumstances.

Operations personnel are responsible for knowing their physical and mental conditions, and they must evaluate whether those conditions allow safe participation in UAS operations and the performance of their duties. If a person serving in an operations personnel position is unsure about the limitations of a physical or mental condition, they should consult with a physician. In addition, operations personnel should, if appropriate, take steps to inform the operator of medical conditions in accordance with company policy. Considering the dual responsibility that persons and operators share with respect to medical conditions and safety, operators should develop and adhere to corporate policies that govern reporting and monitoring known medical conditions and potential signs of medical conditions that could interfere with safe operations and the performance of operations personnel duties.

As stated in the final rule adopting part 107, the primary reason for medical certification is to determine if the airman has a medical condition that is likely to manifest as subtle or sudden incapacitation that could cause a pilot to lose control of the aircraft, or impair the pilot's ability to "see and avoid."[88] While FAA anticipates that a wide range of UAS operations could be diversely affected by different conditions, FAA anticipates the UA to be operated under this proposal to be highly autonomous with built in redundancies and preprogrammed commands such that certain medical anomalies that would typically disqualify a person from receiving a part 67 medical certificate could actually safely operate a certain UA. For example, a person who is incapable of moving their fingers would not be able to operate a UA with a control station interface that relies on manual manipulation using the fingers, such as a keyboard and a mouse. However, that person may be able to interact with a control station operated through voice controls, or other assistive technologies, safely. While FAA has not established a list of disqualifying medical conditions under § 108.320, FAA expects operators to use reasoned judgment and knowledge of their operations in developing and adhering to policies that mitigate the risk of medical conditions.

FAA has determined that traditional FAA medical certification via part 67 is not warranted for operators subject to this proposed rule. Part 108 UAS operations present a lower risk than manned operations, in part because the operations do not involve passengers onboard the aircraft that could be injured in the event of an accident. This proposed rule also includes operational requirements that reduce reliance on human

[88] 81 FR 42159.

capacities, and prescriptive medical standards are thus not as critical as they are for individuals exercising pilot privileges on a manned aircraft. For example, proposed § 108.825 would require UA to be designed to "see and avoid" most other aircraft, and proposed § 108.810 would require simplified flight controls that permit only limited human interaction during a UA's flight. As another example, proposed § 108.170(k) would require operators to ensure that a UA's navigation and communication systems are working properly prior to conducting an operation. These operational requirements and limitations render it unlikely that a flight coordinator's impairment would cause the loss of UA navigation to its original destination (or emergency landing destination).

FAA also considered changing "would" to "may" in § 108.320 ("…the person has a physical or mental condition that *would* interfere with the safe operation…") to clarify that a physical or mental condition need not be certain to trigger the prohibition. "Would" conveys definiteness of knowledge about the causal relationship between a medical condition and interference with safe operations or safe performance of operations personnel duties. By contrast, "may" expresses possibility, and thus the use of "may" in these provisions would enlarge the prohibition to include medical conditions that could impact safety but where causation is less certain. FAA declined to adopt this change in part to maintain consistency across similar provisions in the regulations. However, FAA invites comment on whether "may" should be adopted in the final rule. FAA also invites public comment as to whether an airman medical certificate should be required for operations personnel, specifically for flight coordinators, and the costs and benefits of requiring an airman medical certificate.

E. Alcohol or Drugs (§ 108.325)

Despite the enhanced autonomy that FAA anticipates will characterize flight operations, operations personnel would continue to perform essential roles under proposed part 108. Among other things, operations personnel would be responsible for programming, monitoring, and intervening in UA operations, as needed; maintaining and repairing UA and certain AE elements; and the safe handling, loading, and storage of packages, which may include hazardous materials. These functions would require operations personnel to make decisions and exercise judgment in the regular course of business and in emergency situations. Alcohol and drugs can compromise judgment, reaction times, and decision-making, which could have serious consequences even in the context of mostly autonomous UA operations. Accordingly, FAA has determined that operations under proposed 108 must be free from the influence of alcohol and certain drugs to mitigate the risks associated with impairment.

Part 91, which contains the general operating and flight rules, sets forth general alcohol and drug use prohibitions in § 91.17 and § 91.19, which are cross-referenced in § 107.27 for small UAS. Likewise, proposed § 108.325 would require operations personnel and operators to comply with alcohol and drug use prohibitions mirroring those currently in place in parts 107 and 91 of FAA's regulations.

The purpose of these regulations is to ensure that the safety of UAS operations is not impeded by alcohol or drug use. Proposed § 108.325(a) would specifically prohibit serving or attempting to serve in an operations personnel position within 8 hours of consuming an alcoholic beverage, while under the influence of alcohol, while using any drug that affects the person's faculties in any way contrary to safety, or while having an alcohol concentration of 0.04 or greater in a blood or breath specimen. Moreover, as proposed in § 108.325(b), persons who are serving, ready to serve, or immediately available to serve[89] in an operations personnel position would need to submit to alcohol or drug testing upon an appropriate request by a law enforcement officer. These proposed requirements align with the exiting alcohol or drugs rules for operators under part 91.[90] Under § 108.325(c), operations personnel would be required to submit the results of certain alcohol or drug tests in their possession, or authorize the release of the same, to FAA if FAA has a reasonable basis to believe that the person has violated § 108.325(a) and the Administrator makes a request for such results. Proposed § 108.325(d) would prohibit operators from allowing or continuing to allow a person to serve in an operations personnel position in violation of these requirements. To note, paragraph (d)(1) would require the operator to have actual knowledge that the person is in violation of § 108.325(a). "Actual knowledge" in this context means information an employer becomes aware of that an operations person has used alcohol or controlled substances based on the employer's direct observation of the employee, information provided by person's familiar with the employee, a traffic citation for driving while under the influence of alcohol or controlled substances, an employee's admission of alcohol or controlled substance use, or the results of reasonable suspicion testing resulting from observation of employee behavior or physical characteristics sufficient to warrant such testing in accordance with § 108.325(b). Direct observation as used in this instance

[89] The moniker of "immediately available" is intended to cover personnel that may only perform operations on a temporary, short term, or standby basis (*e.g.*, listed as a backup flight coordinator if the assigned flight coordinator becomes incapacitated). This is different from being "ready to serve," which would mean the operations personnel is preparing to imminently begin their assigned duty.

[90] *See* 14 CFR §§ 91.17(a) and (c) (the drug and alcohol regulations proposed in part 108 for UAS operations personnel would align with the drug and alcohol regulations for a part 91 crewmember).

means either direct observation of alcohol or controlled substances use. As used in this section, “traffic citation” means a ticket, complaint, or other document charging driving while under the influence of alcohol or controlled substances. In addition, the operator may not permit a person to serve in an operations personnel position when the person refuses to, first, test upon request of a law enforcement officer in accordance with proposed § 108.325(b) or, second, furnish or authorize the release of test results requested by the Administrator in accordance with § 108.325(c).

F. Duty and Rest (§ 108.330)

FAA defines fatigue in AC 117-3 as a physiological state of reduced mental or physical performance capability resulting from lack of sleep or increased physical activity that can reduce a crew member’s alertness and ability to operate an aircraft or perform safety related duties safely. Further, FAA states that the primary contributor to fatigue is lack of proper sleep and the root-cause for crew member fatigue may be a combination of scheduling and crew members not obtaining the proper amount of rest during their assigned sleep opportunity. FAA states that fatigue can lead to weakness, lack of energy, lethargy, depression, lack of motivation, sleepiness, decreased alertness and situational awareness, and poor decision-making skills. Finally, FAA states that fatigue decreases a person’s ability to perform cognitive tasks and increases variability in performance as a function of time on task.[91]

The importance of alertness, situational awareness, and decision making is not relinquished even though part 108 operations personnel would not perform the traditional

---

[91] FAA AC 117-3, *Fitness for Duty* (Oct. 11, 2012).

role of a crew member onboard the aircraft. Flight coordinators would still be responsible for monitoring a UA and controlling and initiating emergency actions or issuing commands to the aircraft during flight as necessary. Should a situation arise during an operation that would require immediate flight coordinator input, the alertness, situational awareness, and decision making of the flight coordinator would be crucial to ensure a safe outcome as unforeseen events typically happen quickly without warning. FAA also recognizes that all operational personnel play an important part in the overall operation of the UA. Personnel may perform such delegated duties as conducting preflight checks of the UA for the flight coordinator, loading the UA, or assembling the UA prior to operations. In performing such functions, the same importance of alertness, situational awareness, and decision making is necessary to ensure the overall safe outcome of an operation.

Fatigue in manned aviation has led to events such as procedural errors, unstable approaches, lining up with the wrong runway, landing without proper clearances, and overall poor decision making. Though this proposed rule is for highly autonomous UA operations, FAA anticipates similar parallels in operational errors with manned aircraft that have stemmed from fatigue.

FAA has previously determined that if a person has had significantly less than 8 hours of sleep in the past 24 hours, he or she is more likely to be fatigued.[92] In parts 121 and 135, FAA generally requires a minimum of a 10 consecutive hour rest period preceding flight time. Because FAA views less than 8 hours of sleep as being the point

---

[92] *Flightcrew Member Duty and Rest Requirements* final rule, 77 FR 330 (Jan. 4, 2012).

for increased fatigue, a minimum of 10-hour rest period would leave time to complete duty and initiate an 8-hour rest period with an hour prior to the next duty report time. Therefore, FAA proposes in § 108.330 that operations personnel would be limited to a maximum 14-hour duty day and a maximum 50-hour work week. In addition, required operations personnel would be required to take a minimum 10-hour consecutive rest period which is free of all responsibility for work or duty on behalf of the operator within the 24 hours prior to reporting for duty. In addition, FAA proposes that required operations personnel would be required to receive a minimum of one day of continuous rest, which would be free of all responsibility for work or duty on behalf of the operator, per week, each week in which the operator schedules them for duty. As addressed in proposed § 108.475(f)(6), the provisions of § 108.330 would not be applicable to recreational permit holders.

G. Security Threat Assessment for Certain Personnel (§ 108.335)

Pursuant to TSA recommendation, FAA proposes in § 108.335 to require that certain covered persons who are engaged in BVLOS operations undergo up to a Level 3 security threat assessment (STA) conducted by TSA. Covered persons would include those who perform the functions of an operations supervisor; perform the functions of a flight coordinator; have unescorted access to the UAS; have unescorted access to the cargo loaded for transport on the UAS; or have unescorted access to the control or the flightpath of the UAS. As is the nature of their functions and access, such persons naturally play a critical role in the security and integrity of the operations. An individual with bad intent performing such functions could cause great harm to the public by using UAS to conduct attacks or strikes on civilian populations or transporting prohibited cargo over residential or urban areas where no guardrails exist to restrict where the UAS travels. TSA administers such vetting requirements among similarly situated surface, maritime, and aviation transportation workers. FAA believes, and TSA concurs, that similar requirements are advisable for these proposed part 108 UAS operations.

A Level 3 STA includes a check of criminal history, immigration, and intelligence-related databases and watchlists, as codified at 49 CFR 1572.103-107.

Applicants would most likely visit a TSA enrollment center to provide identification verification documents needed for the assessment. TSA may develop other processes in the future to permit the submission of information electronically for this population. Details regarding such alternative processes would be included in a final rule resulting from this NPRM or in a future rulemaking more broadly related to vetting programs promulgated by TSA. The proposed rule text accounts for this potential by stating the individuals must follow the enrollment procedures approved by TSA. Finally, any individual who is adversely affected by security vetting may seek redress from TSA using the procedures and standards codified at 49 CFR part 1515.

The proposed rule also references the information TSA requires applicants to provide for vetting (which TSA has set forth in 49 CFR 1572.9), and the applicant's ongoing responsibilities to maintain an STA (which TSA has described in 49 CFR 1572.11). In addition, TSA notes that it is required by law under 6 U.S.C. 469 to collect fees to recover all vetting costs, and applicants submit those fees to TSA during the enrollment process. The fees for the Level 3 STA are set forth in TSA regulation 49 CFR 1572, subpart E. Finally, any individual who is adversely affected by security vetting may seek redress from TSA using the procedures and standards codified at 49 CFR part 1515.

FAA believes this STA proposal is necessary to ensure the security of these operations and could help mitigate the risk of a person who poses a security threat from serving in a position that impacts the flight of the UAS.

TSA and FAA invite comment on this STA proposal from all affected parties. Based on the data and information received, TSA and FAA may determine that the scope of the affected population or the breadth of the STA should be expanded or decreased for certain covered persons. In light of the potential security risks of these operations, including foreign ownership and operation, TSA and FAA are also interested in whether the scope of individuals who must be vetted should be expanded to include individuals who have ownership or control of the corporate entity conducting BVLOS operations. For instance, TSA imposes STA requirements for individuals who are proprietors, general partners, officers, directors, or owners of an indirect air carrier under 49 CFR 1548.16.

Finally, including the overarching vetting requirement in 14 CFR part 108 rather than TSA's regulations is consistent with other vetting conducted for airmen certificate holders. While TSA's regulations govern the vetting process itself, it is the FAA that denies or revokes a certificate based on TSA vetting. FAA and TSA, however, welcome comments on whether TSA should incorporate the overarching requirement into 49 CFR chapter XII, subchapter C, rather than in the FAA's regulations under 14 CFR part 108.

VIII. Permitted and Certificated Operations (Subparts D and E)

Under this proposal, FAA would require UAS operators to obtain an FAA-issued operating permit or operating certificate to conduct BVLOS operations. The rule proposes two categories of operating authorization delineated by risk: permitted and certificated operations. Permitted operations represent a lower level of risk due to their limited complexity and scope. Permitted operations include package delivery, agriculture, aerial surveying, civic interest, UA operations training, demonstration, recreational, flight tests, and other operations as approved by FAA. Permitted operations would have limitations on the size of the aircraft, number of aircraft in the fleet, and capacity to operate over people, depending on the type of permit. Under this proposal, operators would be required to hold separate permits for each category of operation, renew their permit(s) every two years, and obtain approval from FAA for their area(s) of intended operations.

Certificated operations would allow more complex operations, with larger aircraft, fleet, and greater flexibility to operate over people under this proposed rule. Certificated operations would include package delivery, agriculture, aerial surveying, civic interest, and other operations as approved by FAA. As the operations allowed under a certificate would be more advanced than those under a permit, FAA oversight would be more significant and involved than with a permit. Operators would also be required to hold a communication assessment plan to ensure safety of communication links and ground risk, develop a SMS, submit to validation tests before FAA, obtain approval from FAA for the area of intended operations, and establish and implement a training program for their personnel.

FAA may issue authorizations and limitations as part of the operating permits and certificates, and in conjunction with any waivers or deviations granted. However, FAA is not proposing a requirement to use Operation Specifications (OpSpecs) in the regulations. FAA finds that defining the system that FAA uses to document authorizations and limitations in the regulations would not be needed because such a system would govern the conduct of FAA rather than the regulated community. Instead, FAA intends to produce guidance to industry and FAA inspector workforce on the expectation of how authorizations and limitations will be issued and managed for permit and certificate holders.

The following sections articulate proposed requirements for this operating framework, addressing the manner and form in which applications would be submitted, the specific authorizations and limitations of the various categories of operation, and the process for denials of application and suspensions or revocations of the permit or certificate.

For most of the categories of permitted operations and certificated operations, one of the limitations would be the maximum weight of the UA, including anything carried by or attached to the UA. FAA has included weight limits on UA in both part 107, which has a 55-pound weight limit, and exemptions, which have specific weight limits determined by the type of operation being conducted under the exemption and the UA being used. The highest maximum weight for a part 108 UA would be 1,320 pounds, per proposed § 108.800(b)(3).[93] The basis for the highest maximum weight being 1,320 pounds is the BVLOS ARC recommendations and JARUS limitations based on maximum kinetic energy. However, as discussed in subsequent sections, not all permitted operations nor all certificated operations would be allowed to use UA with a maximum weight of 1,320 pounds. Instead, for many of the categories of permitted and certificated operations, there are lower maximum weight limits. While the reasons for each category's specific weight limitation are detailed in their respective sections, the guiding principle in selecting the weight limitations was a spectrum of risk. The level of risk varied not only because of the type of operation but because of the other associated mitigations, such as population density. In order to translate a relatively abstract concept like risk into specific weight limits, FAA utilized two limitations on weight: the 55 pounds limit for part 107 operations and the proposed 1,320 pounds overall limit for part 108 UA. This rule proposes three weight limits for the various categories of permitted and certificated operations (55 pounds, 110 pounds, and 1,320 pounds) to give structure to the spectrum of risk. FAA welcomes comments on this approach, as well as on the specific weight limits adopted for the various categories of permitted and certificated operations. In particular, FAA requests comments, with supporting data as available, on allowing operations with aircraft between 110 pounds and 1,320 pounds at higher population densities than proposed in this preamble.

A. Requesting Operating Permits or Operating Certificates (§§ 108.400 and 108.500)

[93] FAA has proposed allowing that the 1,320 pounds limit in § 108.800(b)(3) could be subject to waiver if a manufacturer chooses to seek the ability to manufacture a part 108 UA over 1,320 pounds, specific to permitted agricultural, UA operations training, demonstrations, and other operations as determined by FAA.

FAA proposes to create two avenues for operators to conduct operations under part 108. These two paths proposed are operating permits and operating certificates. To conduct operations under part 108, operators would have to obtain either an operating permit or an operating certificate from FAA. This proposal creates a mechanism by which FAA authorizes each operation, which would mean FAA has reviewed the application and issued the permit or certificate, as appropriate. Whether issued a part 108 operating permit or certificate, operators would have to comply with the applicable performance requirements proposed under part 108 as well as any operating limitations imposed by FAA or the manufacturer.

Operating permits, proposed under subpart D of part 108, may be issued for eight possible purposes: package delivery, agriculture, aerial surveying, civic interest, operations training, demonstrations, recreational activity, and flight tests. FAA believes that these categories represent the majority of UAS operations in the NAS. FAA anticipates that most operators would likely seek an operating permit. Alternatively, an operator may seek an operating certificate, which places additional requirements for compliance on the operator in exchange for increased operating privileges. Operating certificates may be requested for four purposes: package delivery, agriculture, aerial surveying, and civic interest operations. Operators conducting flight training, demonstrations, recreational activity, and flight tests would be required to obtain operating permits, as operating certificates would not exist for those purposes. FAA recognizes that operators may request operating permits or certificates for UAS operations other than those categories listed in this proposed rule. As such, FAA may authorize operators to conduct their requested operation on a case-by-case basis pursuant to § 108.400(c) for operating permits and § 108.500(c) for operating certificates.

FAA has sufficient safety data to normalize complex UAS operations for the proposed type of operations listed under § 108.400(a) and § 108.500(a), based on the exemption and waiver requests that FAA has evaluated from operators seeking to conduct those specific operations. Using lessons learned from market needs, as well as the evaluation and issuance of FAA waivers and exemptions, FAA was able to categorize and establish limits for each of the proposed types of UAS operation. FAA did so by assessing the individual risk associated with each type of operation.

For situations where the regulation allows operators to request authorization from FAA to operate beyond the limitations stated in the regulations, FAA may place additional conditions and limitations on the operating permit or the operating certificate, considering any added risk associated with each requested type of UAS operation. FAA would also impose appropriate conditions and limitations for any other UAS operation not listed in this proposed rule and requested under § 108.400(c). FAA would apply conditions and limitations consistent with the level of risk posed by the proposed operation, as it does with existing waivers and exemptions.

FAA anticipates that there may be types of UAS operations that do not meet those specified in § 108.400(a). While FAA invites comments on any additional types of operations that should be included in the rule, FAA further proposes in § 108.400(c) that FAA may approve other operations proposed by an operator that do not fit into the types defined in this proposal. However, FAA emphasizes that this flexibility would not be a license to exceed the limitations for a type of operation already defined in § 108.400(a).

FAA would not accept a request for an operating permit for operations listed in proposed § 108.400(a) in an attempt to exceed the restrictions already placed by FAA on any of the operating categories. For example, if an operator intends to conduct package delivery operations under a permit utilizing a UA with a gross weight of more than 55 pounds, the operator would not be able to petition FAA for a special operating permit because package delivery operating permits are limited to a gross weight of 55 pounds or less. Section VII.B proposes conditions and limitations for each type of operation.

FAA proposes under § 108.400(e) to limit each operator to holding only one operating permit per category of UAS operation. This limitation is necessary to ensure that operators would not compound their FAA-issued operating permits to exceed the restrictions FAA has already placed for each type of operations. For example, part 108 operating permits for package delivery operations would be limited to a fleet size of 100 UA. Likewise, a single operator would not be able to obtain two package delivery operating permits in hopes of doubling the size of their UAS fleet. Operators who would want to exceed that operation size limitation would have to work with FAA to obtain a part 108 operating certificate, which would not have a fleet size limit. As such, FAA believes these limitations would facilitate compliance with FAA requirements.

The only exception to this limitation would be a part 108 operating permit issued for flight test operations. Flight test permits would be issued to UAS manufacturers who want to develop UAS for airworthiness acceptance under proposed part 108. Those UAS manufacturers would need to test their UAS to validate the UAS's performance. Manufacturers may want to test more than one UAS for more than one of the UAS operations listed. As such, FAA proposes to except them from being limited to a single operation.

1. Application Submission (§§ 108.405 and 108.505)

Prior to conducting UAS BVLOS operations under proposed part 108, operators would need to obtain either an FAA-issued operating permit or an FAA-issued operating certificate. To do so, operators would be required to apply for either the operating permit or the operating certificate depending on the type and scale of their UAS operation. Under proposed part 108, FAA would review and evaluate all applications received for operating permits or operating certificates in order to determine whether applicants meet the minimum performance requirements to comply with and operate under proposed part 108.

FAA would require operators to submit their application for an operating permit under proposed § 108.405, or an operating certificate under proposed § 108.505, in a form and manner acceptable to the Administrator. Each applicant would need to describe the operation they seek to conduct under proposed part 108. The application would include questions, data, and documentation requests that verify the applicant's ability to operate in compliance with the applicable requirements of this part. This is proposed to be an online application system. Operators applying for part 108 operating permits would be required to submit the following information in their application package, as required under proposed § 108.405:[94]

[94] Further discussion on requirements for an operator's base of operation and recordkeeping requirements, see section V.C of this preamble. For further discussion on intended area(s) of operation and operator's company manuals, see sections VI.D and VI.O of this preamble.

(1) The operator's name and contact information, which would comprise of the operator's name (including name of individual who serves as the point of contact), physical address, email address, and telephone number.

(2) Address for principal base of operations, if different from the address provided for contact information, in accordance with proposed § 108.30.

(3) Name of the individual(s) who serve as operations supervisor, in accordance with proposed § 108.305.

(4) The intended type of UAS operation, in accordance with proposed § 108.400(a).

(5) The intended area(s) of operation(s), in accordance with proposed § 108.165.

(6) Company manual(s) as required under proposed § 108.405.

(7) A recordkeeping process as required under proposed § 108.40.

(8) Operator reporting procedures, as required under proposed § 108.45.

(9) The type(s) of unmanned aircraft to be used in operations that comply with the requirements of proposed § 108.105.

(10) Additional information the Administrator may determine is necessary to evaluate the application.

In addition, operators applying for a certificate for package delivery operations would also be required to provide documentation of their citizenship status. FAA requests comment on what documentation should be provided, including whether the level of documentation should be similar to that provided in other certification contexts. From a policy perspective, it is FAA's intent that this proposed regulatory pathway for scaled BVLOS operations benefits U.S. companies and encourages growth in their domestic operations. FAA considered proposing application of this requirement to permitted package delivery operations but determined that it may not be necessary in all circumstances given the anticipated smaller scope of these operations. However, FAA requests comment on whether or not permitted package delivery operations should also provide their citizenship status as part of their application, especially in consideration of the DOT regulatory requirement that exists for new certificate applicants in 14 CFR § 204.3(e) which requires a sworn affidavit stating that the applicant is a citizen of the United States.

Under this proposed rule, operators applying for a part 108 operating certificate would be required to submit the same information in their application package as those required by applicants for part 108 operating permits. Applicants for operating certificates would need to identify which type of UAS operations they intend to operate as found under proposed § 108.500(a). UAS operations that do not fall under one of four categories listed in proposed § 108.500(a) could be authorized by FAA, subject to any limitations issued by FAA in conjunction with the certificate.

Because UAS operations under an operating certificate could be larger in scale and therefore could have larger impacts on the safety and efficiency of the NAS, FAA would require applicants for operating certificates to substantiate their application by proving their ability to conduct their proposed operation safely. As such, FAA proposes in § 108.505(b) that applicants for a part 108 operating certificate would need to provide additional information, as well as undergo additional steps, to complete their application package. Proposed additional requirements for applicants for part 108 operating certificates include:[95]

(1) A training program, as required under proposed §§ 108.540 and 108.315.

(2) Communication and ground risk assessments, as required under proposed § 108.550.

(3) SMS, as required under proposed § 108.560.

(4) A hazardous materials program, as required under proposed § 108.570.

(5) Procedures permitting the use of any inoperative equipment, per proposed § 108.555.

(6) Plan for complying with duty and rest requirements, per proposed § 108.330.

(7) For those operators proposing to engage in package delivery, documentation of their citizenship status.

Requiring applicants to verify their ability to comply with the applicable requirements of the proposed part 108 operating permit or operating certificate they seek would assist FAA in properly evaluating and qualifying operators to ensure that they would be able to conduct complex BVLOS operations without compromising the safety or efficiency of the NAS. The operator's application package would be evaluated to determine whether to grant or deny an applicant's request for a part 108 operating permit or operating certificate. FAA would evaluate that information to also ensure that the operator is capable of conducting the operation they seek to conduct.

[95] See section VIII.C of this preamble for further discussion on a part 108 operating certificate assessment plan, training program, SMS, hazardous materials program, inoperative equipment requirement, and duty and rest requirements.

Under proposed § 108.405, FAA would evaluate operating permit applications for completion and may request additional information or documentation, as needed, to supplement the application. In addition to reviewing and verifying the applicant's identification and the intended area(s) for operations, FAA may also review the applicant's operating and maintenance procedures, personnel qualifications, manuals, and record-keeping procedures. By evaluating the information submitted as part of the application, FAA would be able to assess and determine whether the applicant for a part 108 operating permit is sufficiently capable and qualified to conduct the operation they seek to conduct under part 108 without compromising NAS safety or efficiency.

In contrast to evaluating an application for part 108 operating permits, applications for operating certificates under proposed § 108.505 would involve a process similar to part 135 certification, which involves a collaborative effort between the applicant and FAA to review manuals, training programs and operational authorizations. Similar to part 135 certification, FAA would assign a certificate management team to the operator, and evaluations of applications for operating certificates would necessitate regular communication between FAA and the applicant. As a part of this engagement with FAA, the applicant would also be required to demonstrate their capability to meet all the requirements listed under proposed § 108.505(b). FAA anticipates that the communication and demonstration would be an iterative process, which could require multiple instances of communication between FAA and the applicant, depending on the completeness of the application and the complexity of the operation(s). FAA may also request additional information or documentation from the applicant, as needed, to supplement their permit or certificate application.

If FAA approves the application for the requested operation, FAA would then issue the applicant the operating permit or operating certificate, as requested. The following section will discuss FAA issuance of a part 108 operating permit or operating certificate in greater detail.

2. Duration (§§ 108.410 and 108.510)

Section 108.410 proposes that permits would have a set duration of 24 calendar months. Since permitted operations would receive less FAA surveillance, an expiration date for permits is necessary to periodically verify the operators' continued ability to meet regulatory requirements through an application process. Certificated operators would not have an expiration date as FAA would conduct routine and frequent surveillance on those operations to verify continued regulatory compliance. For both operating permits and certificates, FAA would retain its ability to suspend or revoke an operating permit or certificate in accordance with proposed §§ 108.420 and 108.520.

FAA proposes in § 108.510 that, unless suspended or revoked, an operating certificate issued under part 108 would remain in effect until the operator surrenders it to FAA, or the operator fails to meet the requirements of proposed § 108.530, as discussed in further detail below. As explained in section VIII.A, the process of obtaining and maintaining a certificate would require continued collaboration between the operator and FAA. As such, FAA would continue to remain informed on the operator's characteristics, qualifications, and whereabouts through regular surveillance—including whether the operator is still active and in good standing. As such, it is unnecessary to include an expiration date for part 108 operating certificates. Similarly, under this proposal, FAA would retain its ability to suspend or revoke any part 108 operating certificate issued if FAA were to determine that the operator does not meet the requirements of part 108.

In contrast, FAA proposes under § 108.410 that, unless suspended or revoked by FAA, an operating permit issued under this part would remain in effect for a duration of 24 months. Once issued, an operating permit would expire on the last day of the month 24 months from the date in which it was issued. For example, if a permit was issued on March 15 of 2027, the permit would expire March 31, 2029. Operators intending to continue operating under a permit would need to apply for a new permit before the expiration of their existing permit in a form and manner acceptable to the Administrator. FAA proposes to allow operators to submit the application for their new part 108 operating permit up to 120 days in advance of the expiration date listed on their existing operating permit. Applications received and approved for a new permit within this period would be valid for a period of two (2) years beyond the expiration date listed in their existing operating permit.

The proposed 24-month period would be in line with letters of authorization (LOAs), exemptions, certain waivers, and air agency operating certificates that FAA approves. In addition to beneficially verifying the safety of operations in the NAS on a recurring basis, 24 months would also provide operators under a part 108 permit with the opportunity to assess the practicability of their operation on a recurring basis. This proposal also allows the permit holder the option to surrender the permit at any time if the operation is or becomes unfeasible, or if for some reason the operator can no longer comply with the operating requirements of the permit.

FAA further proposes in §§ 108.410(d) and 108.510(b) that permits and certificates are not transferable. However, in accordance with §§ 108.425 and 108.525, FAA proposes that companies that undergo name changes, mergers, and acquisition may be eligible to have the permits or certificate information updated to reflect the new company information, subject to review and oversight by FAA that the operation remains largely unchanged.

3. FAA Issuance of Operating Permits or Operating Certificates (§§ 108.415 and 108.515)

As noted in section VIII.A, FAA would evaluate each application received and may request additional information or documentation, as needed, to supplement the application. If FAA were to determine that an applicant for an operating permit or an operating certificate is able to comply with the applicable requirements under proposed part 108, FAA would issue the requested operating permit or certificate, as applicable.

As set forth in §§ 108.415 and 108.515, FAA would include all of the following information in an FAA-issued operating permit or certificate: the operator's name and the location of their principal base of operations; type of UAS operation; the permit or certificate number and effective date, as applicable; and the expiration date (for permits). While each FAA-issued permit under part 108 would be limited to one kind of UAS operation, FAA may authorize an applicant for a part 108 operating certificate to conduct multiple kinds of operation under a single operating certificate.

The information contained in the permit would provide evidence of the operator's identity as well as the parameters of their operating privileges. Those parameters would include the location of the operation, the date and duration of the issued permit, and whether there are any operating restrictions placed on the permit—*e.g.*, operating over certain population densities or the size limit of the operator's UA fleet. FAA would be able to use this information when doing surveillance to verify whether the operator is indeed authorized to conduct their BVLOS operations, and in doing so, is indeed complying with FAA regulations. FAA would conduct surveillance and oversight similar to that conducted for part 91 and 107 operations, with more robust interactions for certificated operators, as discussed in section VIII.C. In addition to conducting routine surveillance of part 108 operations, FAA would act on reports of violations to conduct further investigations.

Similar to part 108 operating permits, the information comprised in each FAA-issued operating certificate would outline the parameters FAA places on each operator for safely conducting their requested operation. The information would be used to identify the operator as well as provide the operator with evidence of their FAA-issued authorization to conduct UAS operations in accordance with FAA regulations. Through routine surveillance of part 108 operators, FAA would be able to determine that the operator complies with the regulatory requirements of part 108, in addition to additional oversight if necessitated by reports. FAA relies on many sources to further investigate complaints, such as accounts from witnesses, video, and reports from Federal, State, and local law enforcement agencies.

Unlike operating permits, operating certificates, as described in the proposed rule, would remain active, unless otherwise suspended or revoked by FAA, returned to FAA by the operator, or the recency of operations had lapsed. As stated earlier, FAA expects the process of obtaining an operating certificate to be a collaboration between the operator and the Agency. UAS operations conducted using an operating certificate are expected to be more complex and larger in scale than permitted operations. As such, the certification process would include a cooperative effort and constant communication between FAA and the operator. This means FAA would remain informed on the operator's characteristics, qualifications, and whereabouts, including whether the operator is still active and in good standing. Section VIII of this preamble discusses the differences between part 108 permits or certificates in greater detail.

Operating permits and certificates issued under part 108 do not constitute all the approvals that may be needed to transport property for compensation. Operators intending to transport property by air for compensation may be considered an "air carrier" engaged in "air transportation", both of which are defined in 49 U.S.C. 40102 and may require economic authority from the Office of the Secretary (OST). In limited instances, operators whose operations are wholly within the geographic limits of a single State, transporting no more than a *de minimis* volume of passengers or property moving as part of a continuous journey to or from a point outside the State, may be considered as not engaging in air transportation and thus not requiring economic authority. However, these determinations are case specific.[96] Operators proposing to transport property by air for compensation may wish to consult with OST prior to conducting such operations to determine whether economic authority is required. OST has established a streamlined

[96] See Consent Order, *Scott Air LLC d/b/a Island Air Express Violations of 49 U.S.C. 41101 and 41712*, DOT-OST 2012-0002 (Dec. 28, 2012) (Holding that an airline flying routes exclusively within Alaska constituted interstate transportation because it had a public web site, 1-800 phone number, and had reservations connected to routes to other states) accessible at www.transportation.gov/sites/dot.gov/files/docs/Scott%20Air%2C%20LLC%20dba%20Island%20Air%20Express%20Consent%20Order%202012-12-16.pdf.

process for issuing economic authority to UAS operators.[97] To assist in ensuring an efficient Departmental process for these operators, FAA is proposing in this rule to require that these operators include documentation of their citizenship status in the application process under proposed § 108.505(b)(16) for certificated operations.

The general purpose of obtaining economic authority is to enable operations for common carriers and air carriers by providing Federal-level requirements to meet instead of being subject to state regulations that may differ in various states of operation. These Federal requirements include insurance that protects the operator and the overflown public from unintentional damages. Maintaining those requirements is within the Department's scope of authority and in the public interest. Accordingly, should such operations constitute air transportation and require economic authority given by the DOT, the operating permit or certificate issued under part 108 would meet the statutory requirements for air carriers and air carrier certificates contained in chapters 411, 417, and 447 of 49 U.S.C. Specifically, FAA has identified §§ 41701, 41702, 41707, 41708, 41709, 41711, 41712(a), 44702(a), 44705, 44711(a)(4), and 44713(a) as statutes that would apply to operators conducting air transportation under part 108.[98] FAA welcomes comments on the application of chapters 411, 417, and 447 to interstate package delivery operations conducted under part 108.

---

[97] See *Notification to UAS Operators Proposing to Engage in Air Transportation* notification of procedures, 83 FR 18734 (Apr. 30, 2018).

[98] This list is not exhaustive, but it notes the statutory obligations that FAA has noted as being specifically applicable to part 108 package delivery operators. Operators would also need to comply with DOT regulations related to air carriers, including economic authority and liability insurance. See 14 CFR chapter II, subchapter A.

In sum, the Department as a whole will, as part of this proposal, continue to align economic authorities with safety and operational authorities. Because the requirements for obtaining economic authority are provided explicitly in the statute, those rules will apply to UAS air carrier operations in the same way that they apply to all other air carrier operations. Nothing in the proposed rule will exempt entities wishing to carry or deliver property by UAS from the statutory rules set forth in 49 U.S.C. §§ 41101-02, 40101(a)(15), and 41703.

Table 3. Statutory Requirements and Corresponding Proposed Regulations

Statutory Provisions	**Proposed Regulations**
49 U.S.C. 41701	§ 108.565
49 U.S.C. 41702	§ 108.120(a)
49 U.S.C. 41708	§ 108.45
49 U.S.C. 41709	§ 108.20; § 108.40
49 U.S.C. 44702(a)	§ 108.505
49 U.S.C. 44705	§ 108.405; § 108.180; § 108.185; § 108.505; § 108.515; § 108.565
49 U.S.C. 44711(a)(4)	§ 108.500; § 108.565
49 U.S.C. 44713(a)	§ 108.625; §108.745

The Department also notes that foreign civil aircraft, as defined in 49 U.S.C. 41703 and 14 CFR 375.1, may only be navigated in the United States when authorized by the Secretary of Transportation, *e.g.*, under 14 CFR part 375, pursuant to a foreign air carrier permit under 49 U.S.C. 41301 and 41302, or pursuant to an exemption from the permit requirement. 49 U.S.C. 41703 prohibits foreign operators from conducting for-hire intrastate or interstate air transportation operations (*i.e.,* cabotage) unless the foreign operator is authorized for an emergency exemption under 49 U.S.C. 40109(g). Foreign civil aircraft operators may be licensed by DOT to engage in package delivery operations in foreign air transportation pursuant to applicable bilateral aviation agreements by virtue of a DOT-issued foreign air carrier permit under 49 U.S.C. 41301 and 41302, or pursuant to a DOT-issued exemption from the permit requirement. In terms of other commercial air operations conducted solely within the United States, foreign civil aircraft operators are in general limited to non-air transportation/non-package delivery operations under 14 CFR part 375, whereby DOT may authorize an operator to conduct aerial surveying or agricultural and industrial operations performed in the United States.

As with the 2016 rule, the Department only will authorize foreign-registered UAS and foreign civil UAS operators in the United States if it determines that such operations are recognized under international agreements or via findings of reciprocity, and that approval would be consistent with the statutory parameters in § 41703. The concept of reciprocity has a long-standing tradition in international relations, and it has been the long-standing policy of DOT to require a finding of reciprocity before allowing commercial air operations or air transportation to, from, or, as applicable, within the United States. Operators of foreign civil aircraft may wish to consult with DOT prior to conducting such operations to determine what authorization is required.

4. Denials, Revocation, and Suspensions (§§ 108.420 and 108.520)

Under proposed part 108, FAA would have the ability to deny, suspend, or revoke a part 108 operating permit or certificate. FAA proposes that it would be able to deny an application for a permit or certificate if FAA finds that operators are not properly or adequately equipped or are not able to conduct safe operations. Further, FAA proposes that it would be able to revoke or suspend an existing operating permit or certificate if any of the conditions in proposed § 108.420 or § 108.520 are present.

First, FAA would be able to deny an application or suspend or revoke an existing permit or certificate if FAA were to find that the operator does not meet the requirements of part 108. It is critical that operators under part 108 comply with all applicable requirements to ensure the safety of the NAS and persons and property on the ground. Providing FAA with these grounds for a denial, suspension, or revocation would ensure an enforcement mechanism for violations.

Second, FAA may deny an application or suspend or revoke an existing permit or certificate if FAA were to conclude that the applicant is not properly or adequately equipped or is not able to conduct safe operations under this part. This would include those applicants who are unable to conduct safe operations due to financial reasons. For example, an inability to conduct safe operations due to financial reasons may stem from not being able to afford insurance coverage due to damages incurred in an accident involving the UAS or from the operator declaring bankruptcy.

FAA would also be able to deny an application or suspend or revoke an existing operating permit or certificate if the Administrator were to find that the operator previously held any FAA-issued permit or certificate that was revoked. Similarly, FAA would be able to deny an application for a permit or certificate or suspend or revoke an existing operating permit or certificate if the operator filled or intended to fill a management position with an individual who exercised control over an operator, or an individual who held the same or a similar position with an operator, whose permit or certificate was revoked or is in the process of being revoked, so long as that individual materially contributed to the circumstances resulting in the revocation.

In addition, FAA would be able to deny an application for a permit or certificate, or suspend or revoke an existing operating permit or certificate, if an individual who would have control over the operator, or a substantial ownership interest in the operator, had the same or similar control or interest in an operator whose permit or certificate was revoked, or is in the process of being revoked, so long as that individual materially contributed to the resulting revocation. Finally, FAA would be able to deny an application for a permit or certificate or suspend or revoke an existing operating permit or certificate if the operator engaged in any violation of the rule.

Any of these actions may provide FAA with reason to believe that the operating permit or certificate holder, or applicant for an operating permit or certificate, may participate in future violations or non-compliances with FAA regulations. As with any aviation incident or accident, FAA has the authority to conduct investigations into possible violations of 49 U.S.C. subtitle VII (Aviation Programs), part A (Air Commerce and Safety) provisions or regulations and orders issued under that part. When FAA becomes aware of any potential regulatory violation, including violations or non-compliances with FAA regulations, FAA performs an investigation to determine whether a regulatory violation occurred. The investigation is conducted in accordance with agency guidance, such as FAA Orders 8900.1 and 2150.3. After the investigation is complete, FAA Flight Standards Service determines the proper action to take based on the guidance in the above-described FAA Orders. However, FAA would holistically evaluate each applicant with a basis for denial to determine if it has reason to believe it should not issue a permit or certificate. As such, these actions would not require FAA to deny an application or suspend or revoke an existing operating permit or certificate. However, this requirement ensures that FAA would have the authority to deny, suspend, or revoke operating permits or certificates when there is an operator or applicant that may threaten public or aviation safety.

5. Amendments (§§ 108.425 and 108.525)

Under proposed §§ 108.425 and 108.525, FAA would be able to amend any operating permit or certificate it has issued under part 108 if FAA were to determine that safety in air commerce or public interest requires or allows for the amendment. Similarly, an operator would be able to submit a request to amend their operating permit or operating certificate under proposed § 108.425 or § 108.525, as applicable.

Operators would be able to submit a request to change any of the information submitted in accordance with § 108.405—for operating permits—or § 108.505—for operating certificates. Those changes would include, but would not be limited to, changes to the operator's name, address, and type of UAS operation. However, this would not include the ability to transfer a certificate from one legal entity to another. As described in §§ 108.410 and 108.510, permits and certificates are not transferable. However, companies that undergo name changes, mergers, and acquisition may be eligible to have the permits or certificate information updated to reflect the new company information, subject to review and oversight by FAA that the operation remains largely unchanged.

Any changes submitted to FAA would be reviewed in accordance with § 108.425 or § 108.525, as applicable. FAA may decide to grant the amendments—which would then warrant the issuance of an updated permit or certificate. However, if FAA were to determine that it is in the interest of public or aviation safety to deny the operator-requested amendment, then FAA would proceed with issuing a denial. When FAA proposes to issue an order amending, suspending, or revoking all or part of any certificate, the procedure in § 13.19 of part 14 would apply.

Sections 108.425(d) and 108.525(d), would provide operators an opportunity to petition FAA's decision to deny an amendment request that was initiated by the operator. FAA would require operators to submit those petitions within 30 days of receiving FAA amendment or denial of an operator's request to an amendment. Providing operators with the opportunity to appeal FAA's decisions would ensure that operators receive due process. Thirty days should provide operators with sufficient time to submit requests to appeal FAA decisions.

FAA understands that changes to an operation are inevitable over time. It would be the responsibility of the operator to ensure that FAA is informed of any changes in operations or business plan. Similarly, FAA understands that NAS characteristics may change over time and may include stakeholders that do not currently exist. As the entity responsible for the safety and efficiency of the NAS, FAA has to remain vigilant in making decisions that would not compromise that safety or efficiency. This responsibility would include decisions to amend, or requests to amend, any permits or certificates issued by FAA.

B. Permitted Operations

In order to provide simple, rapid access to commencing operations for smaller scale and lower-risk operations, FAA is proposing an expedited path for authorization to operate with part 108 operating permits. Under this proposed rule, FAA would require that a permit be obtained for UA operations training, flight testing, demonstration, and recreational operations beyond visual line of sight. FAA would also provide a path to a permit for package delivery, agricultural use, aerial surveying, and civic interest, though operators would also be able to obtain a certificate for those types of operations.

Though the operating permit requires less time to obtain and has fewer requirements than an operating certificate, FAA still must ensure the safety of the public when issuing operating permits. Because this proposal would not require airman certification for individuals to operate a UA, FAA must ensure that the responsibility of the operation rests with either an individual or an entity that will be held accountable for complying with the requirements of an issued permit. FAA would require that any person or company wanting to conduct a specific operation performed under this proposal would be required to obtain either an operating permit or an operating certificate.

As further discussed in section VIII.B.1 of this preamble, a permit holder would be required to designate an operations supervisor who is directly responsible for and the final authority for every operation of all UA allowed to fly in the NAS under the permit and in accordance with the proposed regulations. FAA considered requiring all persons conducting operations under this proposal to obtain an operator certificate rather than having an operating permit option. However, FAA finds that certain operations, as described in this section, are lower risk, could occur under the operating permit, and do not require the complex process of obtaining an operating certificate.

FAA proposes in § 108.400(a) that operations under a permit would be limited to eight specific purposes: package delivery, agricultural, aerial surveying, civic interest, UA operations training, demonstration, flight test, and recreational. Each of these categories has distinct risk associated with them. For example, agricultural use may involve the use of chemicals, while package delivery operations would be more likely to interact with the public. By categorizing these specific operations through an authorized permit, FAA would be able to mitigate the associated risks with tailored authorizations and limitations.

Finally, FAA proposes that operators could request authorizations to exceed various limitations proposed in certain permit sections of part 108. Each authorization granted to an operational provision could include special conditions and limitations imposed by FAA. Combined with the requirements and limitations described below, FAA anticipates that operations under an authorized permit would be conducted in a manner that would allow for safe operation.

1. Active Aircraft Limits, Weight Limits, and Population Density Limits

FAA anticipates that permitted operations would have less oversight than certificated operations under the proposed framework. The less oversight of permitted operations would be balanced with having more operational limitations than what limitations would be imposed on certificated operations. For permitted operations, FAA proposes a three-pronged approach to risk mitigations. Each type of operation under permit is limited in some combination of weight of aircraft, number of active aircraft, and permissible population densities over which operations can take place.

FAA has used a spectrum to determine the appropriate limitations for each type of permit, considering a combination of the weight, population density restrictions, and number of active aircraft allowed per permit. FAA proposes to limit larger aircraft to lower population densities, while also limiting the fleet size per permit to vary levels of active aircraft, dependent on the operation, (other than recreational operations, which are limited to one active aircraft, and flight test permits, which have no limits on the number of active aircraft). "Active aircraft" refers to the number of UA that are actively being used in operations and are listed on the operating permit application, per proposed § 108.105. This would not preclude an operator from having extra "backup" drones that could be operationalized in the case an active aircraft got damaged or put out of commission. In other words, this does not imply limits on the number of UA owned or registered in an operator's possession.

The limit of one active aircraft for recreational permits is based on the different regulatory requirements for operators holding recreational permits. As discussed in section VIII.B, the operating requirements for recreational permits are tailored to the more limited operations anticipated under this proposed rule, including limiting the distance the UA may be flown, and exceptions from personnel, manual, and general operating rules.

At the other end of the spectrum for proposed permitted operations, flight test permits would not have an active aircraft limit. This is supported by two mitigations in particular. First, flight test permit holders must be qualified UA manufacturers or accredited educational institutions. Second, flight test operations can only be conducted over Category 1 population densities, the most restrictive of the population density categories under proposed part 108.

For the remaining six types of operating permits, FAA proposes set a limit of 100 active aircraft for permitted package delivery, 25 active aircraft for permitted aerial surveying and civic interest, and 10 active aircraft for permitted agricultural, UA operations training, and demonstration operations. The proposed limit on the number of active aircraft is intended to manage the size of the operations allowed under permit. FAA is also attuned to the scope of operations and the appropriate levels of oversight which aviation safety inspectors provide based on risk, which was considered in proposing these active aircraft limits. Given that the proposed operating permit structure has less FAA oversight and fewer regulatory requirements than the proposed operating certificate structure, FAA proposes to use active aircraft limits as a risk mitigation to ensure that operations remain the appropriate size for this oversight and regulatory model. FAA acknowledges that there is no existing precedent for such fleet sizes. FAA has not implemented active aircraft limits on a large scale for UAS operations previously. FAA requests comments on the use of specific active aircraft limits for each type of permitted operation, as opposed to a consistent limit for most commercial operations. In addition, FAA requests comments on the specific proposed active aircraft numbers. In particular, FAA requests comments on if certain types of operations based on their complexity, geographical scale, or other factors warrant different active aircraft limits. FAA also solicits comments regarding the maximum economically feasible size and scope of operations under the proposed limits including estimated numbers of employees, operating locations or bases of operations, and geographic area. Detailed explanations of each active aircraft limit are located in sections VIII.B.4 through VIII.B.9.

FAA also considered proposing a generally consistent number of allowed active aircraft depending on the type of operation while determining whether differentiating between types of operations would be appropriate. As such, FAA considered setting the active aircraft limit to 25 for all operations. Ultimately, FAA determined that variable limits was a more appropriate way of limiting the size of operation to ensure sufficient operator oversight and appropriate level of safety for each different type of operation, while also allowing the different types of operations to have sufficient number of aircraft to be economically viable. FAA invites comment on the concept of a generally consistent active aircraft limit for permitted operations. FAA also welcomes comments, including supporting data, on whether FAA-proposed limits of active aircraft are appropriate in order to support the operations that would be conducted under that type of permit.

As noted previously in this section, FAA is proposing three weight categories for both permitted and certificated operations, with the applicable weight category depending on the type of operation. The highest weight limit, 1,320 pounds, is supported by JARUS Specific Operations Risk Assessment (SORA) and the BVLOS ARC recommendations, as further discussed in section XI.B. of this preamble. It also aligns with the weight limit that has been traditionally used for light-sport aircraft as defined in 14 CFR § 1.1.

The other two proposed weight limitations are 55 pounds and 110 pounds. 55 pounds is consistent with the weight restriction in part 107, while 110 pounds is consistent with FAA's experience of approving operations with UAS over 55 pounds through exemptions. The specific weight restrictions associated with each type of operating permit are described in the following sections (section VIII.B.4-VIII.B.11).

Under proposed part 108, no permitted operations would be able to be conducted over Category 4 or Category 5 population densities. In addition to this broad limitation, FAA proposes to set various limits on population densities over which permitted operations may operate. FAA proposes that the permitted operations that are allowed to have UA up to 1,320 pounds would be able to only operate over Category 1 areas. Permitted operations that are allowed to have UA up to 110 pounds would be able to operate over Category 3 population densities and below, with certain exceptions for civic interest if in an emergency situation. FAA proposes these limits to ensure the permitted operations, with their reduced oversight and regulatory requirements, would be appropriately limited in scope compared to the certificated operations that have more robust training programs, communication and ground risk assessments, and safety management systems to mitigate the risks associated with operations in more densely populated areas.

The following sections discuss the specific weights and population limits associated with the permitted operations, as shown in table 4.

Table 4. Limitations on Permitted Operations by Operation Type

Permit Type	**Maximum Weight**	**Operation Size**	**Maximum Population Density**	**Additional limitations**
Package delivery	55 pounds	100 aircraft	Cat 3	No hazmat
Agricultural	1,320 pounds	10 aircraft	Cat 1	No dispensing over people
Aerial surveying	110 pounds	25 aircraft	Cat 3	
Civic interest	110 pounds	25 aircraft	Cat 3	Must be under contract to Federal/State/local/ Tribal government
UA operations training	1,320 pounds	10 aircraft	Cat 1	
Demonstrations	110 pounds	50 aircraft	Cat 2	
Flight test	1,320 pounds	No limit	Cat 1	
Recreational	55 pounds	1 aircraft	Cat 3	

2. Display of Permit (§ 108.430)

FAA proposes that operators would be required to display their FAA-issued operating permit pursuant to § 108.430. FAA would require operators to provide evidence of a valid permit for the operation being conducted and that is available at the point of aircraft operations control. Current FAA-issued waivers and exemptions require that all operational documents be present at the location where the operation is taking place. Given the use of digital systems, operators should be easily able to produce the operating permit evidence necessary to FAA or to a Federal, State, or local law enforcement officer. Further, requiring that an operator have an operating permit readily available ensures that the permit holder has the operational conditions of the permit accessible for reference. FAA proposes the permit can be in paper form but may be kept on an electronic device that displays the permit legibly and may not be altered by any person that has it stored on a device.

3. Cybersecurity (§ 108.435)

FAA understands that integrating low-altitude UAS BVLOS operations into the NAS may create conditions conducive to new and innovative safety and security threats. In security organizations, a threat is generally regarded as anything that can exploit a vulnerability and obtain, damage, or destroy an asset, and this threat can be either accidental or intentional. Accidental threats usually arise when operators unintentionally violate regulations through ignorance or negligence. Intentional threats arise when persons engage in criminal or malicious activity. Threats from malicious actors are particularly nefarious, but both accidental and intentional threats can exploit vulnerabilities with impacts to both safety and security.

FAA anticipates that proposed part 108 operations may introduce vulnerabilities, particularly regarding cybersecurity. Various cybersecurity threats include unauthorized access to a facility’s hardware, software, control station or other AE, insufficient protections or protocols regarding employee network access, or cyber-attacks by malicious actors. FAA anticipates that UAS operating under this proposed rule would rely on complex technologies that connect the UA to various systems and services, enabling remote control, communications, data transmission, and other functions. These

UAS would thus be susceptible to many of the same cybersecurity risks as other connected technologies. In general, cybersecurity threats may be evaluated by examining the combination of intent, capability, and opportunity. Intent and capability are outside FAA's control, but opportunity can be mitigated against by protecting vulnerabilities. FAA has determined that operators must address the elements listed above to cover the many vulnerable access points that could introduce cybersecurity threats. This proposed rule already includes some requirements to mitigate these threats, including proposed § 108.150(c), which would require operators to develop and implement physical security policies and processes, including preventing unauthorized access to the operation's facilities and protecting other controlled access areas. § 108.875, which would require UA manufacturers to protect the UAS from intentional unauthorized electronic interactions.

To address these cybersecurity risks, FAA proposes to require operators to develop and implement cybersecurity policies and processes to protect networks, devices, and data from unauthorized access. These policies would ensure integrity, accuracy, and-reliability of operations. In § 108.435(b)(1) through (4), FAA proposes that certificated operators must, at minimum, include processes for: protecting software, hardware, and network computing infrastructure necessary to protect operations from unauthorized access[99]; ensuring the operator's employee network access privileges are limited to those necessary to fulfill normal job duties; ensuring access privileges are turned off/removed for former employees; preparing for, responding to, and mitigating the impact of cyber-

[99] www.nist.gov/cyberframework/quick-start-guides.

attacks; collecting and analyzing data to measure the effectiveness of the cybersecurity policy and processes; and any other processes the operator deems necessary to implement effective cybersecurity protections. FAA is utilizing performance-based language in this proposed requirement to provide operators flexibility with how controlled access areas designated.

4. Package Delivery Operations (§ 108.440)

FAA proposes several threshold requirements to distinguish permitted package delivery from package delivery conducted with an operating certificate. These distinguishing factors would be limited to Category 3 population densities and lower (as set forth in § 108.440(h)), lower volume of operations, and smaller UAS. These factors are discussed in more detail in the following paragraphs.

Similar to part 107 operations, FAA proposes to prohibit permitted operators from transporting hazardous materials unless operating in accordance with 49 CFR § 175.9(b), as set forth in § 108.400(d). Transportation of hazardous materials would be allowed under certificated package delivery operations. However, FAA requests comment on whether and how a permitted operator seeking to transport hazardous materials may be appropriate. FAA is particularly interested in the limited scenarios when operators would seek relief to transport hazardous materials (*e.g.*, in support of a disaster response) and what types of conditions and limitations the operators believe would sufficiently ensure an acceptable level of safety.

FAA notes that permitted operators operating under 49 CFR § 175.9(b) are not subject to the prohibition from transportation of hazardous materials. 49 CFR § 175.9(b) provisions apply to certain special aircraft operations. These operations are distinct from package transportation and delivery. For example, 49 CFR § 175.9(b)(1) allows hazardous materials to be loaded and carried in hoppers or tanks of aircraft certificated for use in aerial seeding, dusting spraying, fertilizing, crop improvement, or pest control to be dispensed during such an operation. FAA seeks to provide clarity that § 175.9(b) operations are not considered package delivery operations and are not subject to the prohibition on permitted operators transporting hazardous materials. In addition, FAA notes that while 49 CFR § 175.9 also includes provisions for rotorcraft external load operations (see 49 CFR § 175.9(a)), those operations are not provided the same exceptions as 49 CFR § 175.9(b) operations.[100]

Though FAA does not propose to authorize a permit holder for package delivery from transporting hazardous materials, they may inadvertently receive a package for delivery that contains hazardous materials. Hazardous material packaging regulations require marking and labeling to be included on the outside of a package for identification purposes.[101] Persons loading packages in permitted operations would be required to have adequate knowledge and understanding of the marking and labeling associated with hazardous materials in order to reject a package for transportation. Misidentifying a package or ignorance of the contents, which may contain hazardous materials may result in UA fires, contamination, or personal injury. Accordingly, FAA proposes in § 108.440(b) that package delivery permit holders would be required to ensure that any personnel assigned duties and responsibilities for the handling or carriage of packages have initial and recurrent training in the recognition of hazardous materials and complete

[100] *See* 76 FR 3381.

[101] 49 CFR part 172.

hazardous materials recognition training every 24 calendar months. Requiring this training to be conducted every 24 calendar months would be consistent with requirements listed under parts 135 and 121 hazardous material training.[102]

As proposed elsewhere in this preamble, permitted package delivery operators would be limited in operational scope to enable streamlined approval of lower-risk part 108 operations. One reason these operations would be lower risk is that transporting hazardous materials would be prohibited (will-not-carry operations). In addition, compared with will-not-carry certificated package delivery operators, permitted package delivery operations would be much more limited in size and scope, which would also serve to limit the associated risks. Therefore, FAA believes requiring an approved hazardous materials training program (as proposed for certificated package delivery operations) is overly burdensome. However, FAA believes that attending a hazmat recognition training course and obtaining a certificate of completion achieves the goals of an approved hazardous materials training program without being burdensome. FAA notes that if a permitted package delivery operator wishes to transport hazardous materials, they may do so as a certificated package delivery operator.

One way that FAA proposes a permitted package delivery operator would obtain initial and recurrent training is by taking an FAA training course or an equivalent training acceptable to the Administrator. FAA intends to offer a free online course that would inform permitted package delivery operators about hazardous materials to help ensure they do not inadvertently transport or offer hazardous materials. For example, the FAA

[102] 14 CFR §§ 135.501 and 121.1001.

course would focus on what is considered a hazardous material and what hazardous materials communication markings and labels are (to ensure these packages are rejected and not transported), as well as highlighting some considerations if the permitted operator wishes to ship hazardous materials by an authorized carrier. While this course would provide effective methods of ensuring that the permitted package delivery operator is aware of hazardous materials transportation considerations, it would always be the responsibility of each permitted package delivery operator to ensure they do not transport hazardous materials or offer hazardous materials. Alternatively, a permitted package delivery operator may take a different course or training acceptable to the Administrator. For example, FAA may accept alternative training from a permitted operator who took hazardous material training that meets the requirements in 14 CFR part 135, subpart K or general awareness training in 49 CFR 172.704(a)(1) in the preceding 24 months. Following completion of any initial and recurrent training, the permitted package delivery operator should prepare training records in accordance with § 108.40(e)(1). FAA proposes that each permitted operator would be required to take recurrent training every two years, which mirrors the proposed recurrent training requirements for part 108 certificated package delivery operators. Lastly, FAA notes that this training may support other forms of hazardous materials knowledge, including for part 107 operations. While FAA is not proposing to require this training for part 107 operations, other operators may take this training as an additional means to understand hazardous materials transportation requirements.

FAA proposes in § 108.440(c) that, for package delivery permitted operations, operators would be required to ensure that the payload in, on, or suspended from the UA is properly secured and does not adversely affect the flight characteristics or controllability of the UA. An unsecure payload could shift or disconnect partially, interfering with UA devices or flight characteristics, which may cause shifts in center of gravity and controllability issues. In addition, an unsecure payload could disconnect fully, causing hazard to persons or property on the ground as it releases from the UA. To avoid any hazard to the UA's controllability and flight characteristics and to persons and property on the ground, FAA proposes in § 108.440(c) that operators would be required to ensure payloads are properly secured and do not adversely affect the flight characteristics or controllability of the UA. Generally, this is expected to be specified by the UA manufacturer as the manufacturer is the systems designer and testing of the payload securing device would be completed by the manufacturer. The payload system should be addressed in the manufacturer's operating instructions for each UAS receiving an airworthiness acceptance as further described in section X of this preamble.

FAA proposes in § 108.440(d) that operators would be required to provide notification to each delivery customer that provides the customer information about the delivery method and instructs the customer to remain clear of the UA during delivery by a distance sufficient to minimize the risk of injury. FAA anticipates this may be done through means such as electronic means during the order process prior to delivery, or other means that ensure information is adequately provided to the customer. Because BVLOS package delivery operations may not have operator personnel at the site of delivery, a UA delivering a package close to the ground, possibly with exposed spinning rotor blades, may create a hazard to persons should a person come in contact with the UA. By requiring information about the delivery method to be disseminated, FAA can ensure the consumer would have an adequate understanding of the risk associated with the intended operation. This would allow the operator to conduct a delivery as planned while the customer retains awareness of the specific parameters of the individual delivery in order to reduce the likelihood of injury.

Under proposed § 108.440(e), FAA would require that the operator ensure delivery areas are free of any obstructions that could pose a hazard. Delivery area obstruction information is important to a UA operation because obstructions in the delivery area could damage the UA and increase risk for persons or property on the ground. UA operators should always ensure that not only delivery areas, but any area used for takeoff and landing are free of any obstructions or hazards. FAA anticipates that an operator may accomplish this by in-person visits to an area, customer provided data, onboard cameras used during flight, detailed topography mapping, geospatial data mapping, and other technology that would ensure familiarity to avoid obstacles and hazards.

FAA is proposing in § 108.440(f) that operations for package delivery would have to be conducted with fewer than 100 active aircraft. FAA based this proposed limit for active aircraft on its experience with operations that have been conducted under current UAS exemptions. These operations under exemptions have consistently begun with small numbers of aircraft and incrementally increased in scale, to include operations using 100 aircraft. FAA's intention with this proposal is to ensure that permitted operations are designed to be smaller in scale but remain economically viable, with an active aircraft number that allows for UAS being prepared for delivery with their packages, those in transit to their destinations, and those returning from delivery and being recovered. This is an upper limit, and the responsibility would ultimately lie with the operations supervisor to ensure safety is maintained during all phases of their operations. Package delivery operations, which are expected to typically have multiple UA departing from a single hub station with monitoring oversight by few persons, would be manageable by operations personnel as these numerous UA would likely be visible on a single computer display with very little interaction by a human. In addition, FAA has observed that there is generally a correlation for battery-powered UA between the weight of the UA and the maximum distance possible for the UA to travel. As UA used for package delivery permitted operations are limited to 55 pounds, this correlation would suggest a more limited maximum distance than would be expected for larger UA. Accordingly, though there will be significantly more UA allowed under package delivery permits, the UA would be limited in how far they could get from the departure location. This in turn would minimize the scope of what a flight coordinator has to monitor in terms of geography. This expectation supports allowing more active aircraft under a package delivery permit than would be allowed under other forms of part 108 permits.

Due to the proposed limitations on the size of the operations under a permit, FAA proposes to place controls on how an operator is defined. For the purposes of delineating operator size under a permit, an operator would include those operations directly under the control of the operator, including operations conducted through lease agreements with other persons, subcontractors, or subsidiaries. This is intended to prevent companies from working around the size limitations by setting up shell companies, lease arrangements, or other arrangements which would increase the risk of their operations while avoiding moving to a certificated operation.

Under this proposal, FAA would limit package delivery permitted operations to Category 3 population densities and below, as described in section VI.H, to reduce the risk to individuals and property. Categories 4 and 5 population densities would include areas such as shopping centers, multifamily housing, and cities. FAA has proposed in § 108.185 to limit Category 4 and 5 operations to certificate holders as the mitigations associated with an operating certificate provide the level of safety equal to the increased risk. Certificated package delivery operations could occur in Category 4 and 5 population density areas provided the operator meets the requirements of proposed § 108.565. FAA anticipates that package delivery permit holders would conduct most of their deliveries within housing developments and areas with single-family homes. Further, agricultural, UA operations training, and flight testing permitted operations would be limited to population density Category 1. Those permitted operations would be limited to lower population density categories due to associated increased risks such as carriage of hazardous chemicals, and training and testing which have a higher potential for operator error or in-flight malfunctions. The same risks do not apply to package delivery operations under a permit and therefore, FAA proposes that package delivery operations with a permit may utilize population density categories 3 and below.

Per the discussion in the paragraph regarding package delivery operations in section VIII.A.3, the operator may be considered an “air carrier” engaged in “air transportation” and may require economic authority from the OST. See section VIII.A.3 for more discussions on this topic.

As discussed in section XII.B.6.vi, this rule would eliminate package delivery entirely as an option under part 107. The feasibility of performing extensive package delivery operations with aircraft that are limited to line of sight and prohibited from operating over people is very limited. In addition, part 107 package delivery operations that adhere to the restrictions of that part without waiver or exemption are simply not feasible and unnecessarily encumber limited Agency resources. Furthermore, the scale these types of operations are considering would go far beyond what was contemplated under the part 107 rule. FAA anticipates that many of the package delivery operations currently being conducted under part 107 would shift to permitted operations under part 108, necessitating a change to more capable and reliable UAS but largely keeping the same footprint as the 2016 rule anticipated.

In addition, FAA proposes in § 108.440(g) that package delivery permitted operations would need to be conducted with a UA having a combined gross weight of UA and payload no greater than 55 pounds. Package delivery operations using an operating permit are proposed to be conducted with fewer of the operating requirements, such as training programs, SMS, and DAA systems (for Category 5) than package delivery with an operating certificate. For package delivery permitted operations, a UA weighing greater than 55 pounds would pose a greater risk to human beings should an unplanned landing occur than a small UA would. Fifty-five pounds is consistent with the limit placed on part 107 operators. Without this additional standardization as required by certificated operations, FAA believes that risk to persons and property on the ground would increase with a UA weighing greater than 55 pounds as the standardization under certificated operations is meant to mitigate risk associated with the increased population density.

Finally, FAA proposes in § 108.440(i), that prior to conducting package delivery operations under a part 108 operating permit, the operator must contact TSA to request and obtain a limited security program equivalent to 49 CFR 1544.101(g). FAA finds it necessary to levy this requirement given the national security implications arising from UAS package delivery operations. FAA only proposes to apply this requirement to package delivery operations at this time and notes TSA has requested comment on imposing additional security requirements on other part 108 operations. FAA may adjust this requirement as appropriate to conform to applicable security requirements.

TSA has joined this proposed rulemaking to ensure that TSA's security requirements are appropriately applied to UAS operations that would be permitted or certificated by the FAA under part 108. TSA's proposed amendments are limited to the addition of definitions relevant to UAS operations in 49 CFR part 1540 and two revisions to 49 CFR part 1544 to clarify that these operations are within the scope of its requirements. In addition, the FAA is proposing including in 14 CFR 108.440(i) a requirement for operators to ensure they have obtained a security program from TSA before conducting UAS operations under this proposed rule. Under this requirement, operators are advised that FAA approval is not sufficient. TSA approval is also required.

These proposed requirements are intended to avoid any unintended consequences regarding the security of UAS operations under proposed part 108, consistent with TSA's responsibility for aviation security and the need to ensure the security of UAS operations as recognized in both E.O. 14305 and E.O. 14307. The types of security risks UAS operations pose to the public are described in E.O. 14305, which states that "criminals, terrorists, and hostile foreign actors have intensified their weaponization of these technologies, creating new and serious threats to our homeland.” Specifically, the E.O. notes that “[d]rug cartels use UAS to smuggle fentanyl across our borders, deliver contraband into prisons, surveil law enforcement, and otherwise endanger the public.”

The proposed text would ensure that the decision to regulate these UAS operations under part 108 does not inadvertently create a security gap under TSA regulations.[103] Under this proposal, which has been developed in consultation with TSA, TSA will continue to ensure the security of the national airspace by imposing appropriate security requirements. The proposed text would require UAS operators authorized under part 108 to request a TSA security program. The revisions to TSA’s regulation would permit TSA to issue a limited program to these operations under 49 CFR 1544.101(g). The proposal is consistent with TSA’s regulatory structure, which has long required certain operators regulated under part 119 to request, and maintain compliance with, a TSA-approved security program before conducting operations (both domestic and foreign carriers operating to/through/from the United States).

The proposed text would clarify that under applicable TSA regulations, UAS operators must seek a “limited program” under 49 CFR 1544.101(g). The general requirements for a security program are listed in TSA’s regulations at 49 CFR part 1544. TSA develops standard security programs that meet these requirements. Operators can request amendments to the standard security program to address specific operational issues, and TSA can approve these amendments to the extent they maintain the required

[103] In the absence of the text, this proposed rule might have created uncertainty regarding the applicability of 49 CFR part 1544, potentially resulting in a separate TSA rulemaking proceeding while this more comprehensive rulemaking remained pending. Having concluded that an additional concurrent rulemaking could result in confusion and uncertainty, the agencies decided to work together on this limited issue as the most appropriate path forward.

level of security. In addition, TSA has broad statutory authority to grant exemptions from applicable requirements.[104]

TSA is considering additional changes to security program applicability and requirements in a final rule. While some operations will not require any additional security requirements beyond vetting, in a final rule TSA may expand the applicability of security program requirements to cover more than package delivery operations. TSA is requesting comment on the scope of operations for which a limited security program should be required, in addition to the requirement for vetting. For instance, TSA could choose to regulate all permitted and certificated BVLOS UAS operations, with limited exceptions for certain non-package delivery operations based on (1) UAS size; (2) intended use of the UAS; (3) capabilities of the UAS, including payload; (4) location of operation centers and range of UAS; (5) planned areas of operation; and (6) fleet size. Similarly, recreational operations permitted under part108 may be appropriate for an exemption from such requirements given the size, weight, and range limits associated with those operations.

TSA notes that an expanded security program applicability in the final rule could include any of a range of security program requirements, such as (for instance) requirements to appoint a Security Coordinator and to comply with security directives and emergency amendments to security programs. TSA anticipates developing model language appropriate to the different types of operations that will be permitted by FAA

[104] *See* 49 U.S.C. 114(q).

under part 108. For example, under the existing regulatory requirements in 49 CFR 1544.101(g), TSA could require the following security measures as applicable:

- Preventing or deterring the carriage of any unauthorized weapons, explosives, incendiaries, and other destructive devices, items, or substances.
- Controlling cargo that it accepts for transport on an aircraft in a manner that:
  - Prevents the carriage of any explosive, incendiary, and other destructive substance or item in cargo onboard an aircraft.
  - Prevents unescorted access by persons other than an authorized aircraft operator employee or agent, or persons authorized by the airport operator or host government.
- Either verifying that the chain of custody measures for screened cargo are intact before loading such cargo on aircraft or ensuring that the cargo is re-screened in accordance with TSA's requirements.
- Designating a Security Coordinator at the corporate level that must serve as the operator's primary contact for security-related activities and communications with TSA.
- Implementing control functions with respect to each aircraft operation sufficient to:
  - Prevent unauthorized access to areas controlled by the aircraft operator under an exclusive area agreement in accordance with 49 CFR 1542.111 of this chapter.
  - Prevent unauthorized access to each aircraft.

- Conduct a security inspection of each aircraft before placing it into operations if access has not been controlled in accordance with the aircraft operator security program and as otherwise required in the security program.
  - Prevent unauthorized access to the operational area of the aircraft while loading or unloading cargo.
- Training individuals with security-related duties.

Such requirements would also ensure UAS operators could avail themselves of existing procedures in TSA's regulations to modify their programs to appropriately address their operational environment while maintaining the level of security determined necessary by TSA.[105]

TSA anticipates that many of the larger operators that will seek approval to conduct part 108 operations may already be subject to a TSA security program. TSA would work with these operators to determine whether they need a new program or could modify their TSA-approved program. TSA has also historically adapted its requirements to meet the needs of smaller and seasonal operators and would continue to apply this flexibility for UAS operations approved under part 108, while also ensuring the security risks identified above are being appropriately addressed. TSA and FAA request comments on the proposed text and will work jointly on adjudicating comments relevant to TSA's proposed text in this NPRM. Because FAA is held to the final rule deadline

---

[105] *See, e.g.,* 49 CFR 1544.101.

established by E.O. 14307, TSA will have to meet that deadline as well in co-adjudicating the security-related comments and developing its relevant final rule sections.

5. Agricultural Operations (§ 108.445)

FAA proposes in § 108.445(a) that, except for certificated operations, no operator would be allowed to conduct agricultural operations involving aerial seeding, dusting, spraying, fertilizing, crop improvement, or pest control with a UA under part 108 without, or in violation of, an agriculture permit issued under part 108.

Substances used in agricultural aircraft operations can contaminate soil and water resources and cause health risks to the general public. To ensure the safety of such operations, FAA is proposing in § 108.445(g) that no person would be allowed to dispense an economic poison or cause an economic poison to be dispensed from an aircraft, for a use other than that for which it is designed and registered, contrary to any safety instructions or use limitations on its label, or in violation of any Federal, State or local law or regulation of the United States. Further, because of the associated risks, FAA is therefore proposing in § 108.445(f) that no operator would be allowed to dispense, or cause to be dispensed, from an aircraft, any material or substance in a manner that creates a hazard to persons or property on the ground.

In § 108.445(h) FAA proposes the same relief from the requirements in proposed § 108.445(e) as is currently allowed under part 137 for operators dispensing economic poisons for experimental purposes when under the supervision of a Federal or State agency authorized by law to conduct research in the field of economic poisons or when operating under a U.S. Department of Agriculture permit issued pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136). Operations conducted for agricultural purposes require fundamental knowledge and skills such as identifying and loading of pesticides, dispensing substances with wind drift, and effects of economic poisons and agricultural chemicals on persons, animals, and plants. Dispensing economic poisons and agricultural chemicals from a UA poses an inherent risk to persons and property on the ground. In § 108.445(f), FAA proposes that the operator would not be allowed to dispense, or cause to be dispensed, from an aircraft, any material or substance that creates a hazard to persons or property on the surface. These materials and substance may include products intended for use in purposes such as plant nourishment, soil treatment, propagation of plant life, activities affecting agriculture, horticulture, or forest preservation, but not including the dispensing of live insects in a manner that creates a hazard to persons or property on the ground.

In addition, FAA further proposes in § 108.445(i) that operators conducting agricultural aircraft operations under an operating permit would need to have and keep current a comprehensive training program that is tailored for their proposed operation, in addition to the training required by § 108.315. Proposed § 108.445(i) provides minimum knowledge requirements for the training, including a survey of the area to be worked, safe handling and storage of economic poisons, the proper disposal of used economic poison containers, the general effects of economic poisons and agricultural chemicals on plants, animals, and persons (with emphasis on those normally used in the areas of intended operations), the precautions to be observed in using agricultural chemicals and economic poisons, primary symptoms of poisoning of persons from economic poisons, the appropriate emergency measures to be taken, the location of poison control centers, performance capabilities and operating limitations of the aircraft to be used, and safe flight and application procedures. By requiring a training program that includes the tailored areas described above, any additional risk associated with an individual operation would be further reduced.

FAA proposes in § 108.445(b) that agricultural aircraft operations would need to be conducted with fewer than 10 aircraft directly under the control of the operator, including those held through lease agreements or subsidiaries. Agricultural UA operations, though conducted in areas of overall lower risk to persons and property, would be a more complex operation as it relates to operational supervisor oversight. For example, package delivery operations typically have multiple UA departing from a single location and returning to that same location point, providing for a more controlled oversight environment as the operational supervisor has direct access to the UA, persons, and packages on the ground before and after flight. Conversely, UA agricultural operations currently require personnel to reposition a UA to a specific location for agricultural treatment. While on location, those personnel typically conduct several duties to mitigate any hazards, including preflight site surveys, loading substances on the aircraft, and continuous monitoring of the operational area for persons. As discussed in section VIII.B.4, FAA has observed a correlation between the weight of a UA and distance that the UA can travel from the departure location. As agricultural permitted operations would be able to use larger UA, FAA is cognizant that the larger UA could cover greater distances than smaller UA. As the UA could be located in a larger circumference, in turn increasing the scope that the flight coordinator has to monitor, it is prudent for FAA to limit the number of active aircraft to 10 or fewer. FAA has also based this limit on its experience with existing exemptions that limit agricultural operations to smaller numbers of UA being controlled at one time in comparison to package delivery exemptions, which typically allow a greater number of active UA. As a result, FAA believes that limiting the number of UA under a permitted agricultural aircraft operation would reduce the ancillary risk of such an operation.

FAA proposes in § 108.445(c) that operations conducted under an agricultural permit would also be limited to UA weighing no more than 1,320 pounds. Currently, FAA has issued hundreds of exemptions for UAS agricultural operations, weighing up to 1,125 pounds,[106] with an average weight of approximately 500 pounds. Larger UA typically fly longer missions due to increased battery power and require larger or longer takeoff and landing areas. Longer flight durations and larger or longer takeoff and landing areas require more attention by the operator for preflight and operational oversight. To ensure these operations fall within the expected risk parameters of permitted operations, FAA would allow agricultural operations up to 1,320 pounds under permit, though subject to limiting operations to only Category 1.

Agricultural aircraft operations today typically take place in sparsely populated areas and directly over non-populated areas, close to the ground while dispensing and close to structures. Should a UA collide with the ground or a structure, persons may become vulnerable to the associated hazard from any substance on the aircraft. FAA intends to limit agricultural UA operations to lower categories of operations over people (as further discussed in section VI.H) to mitigate any risks associated with persons and property on the ground. FAA therefore proposes in § 108.445(e) that part 108 agricultural

[106] Pyka, Inc. Grant of Exemption No. 20445

aircraft operations with a permit would be limited to Category 1 population density areas, unless otherwise authorized by the Administrator. As discussed above, dispensing economic poisons and agricultural chemicals from a UA poses an inherent risk to persons and property on the ground.

6. Aerial Surveying Operations (§ 108.450)

Operators conducting photography, videography, mapping, inspection, and patrolling with UAS are currently doing so either under the confines of part 107 VLOS operations, under a waiver to proposed § 107.31, or by relief granted through an exemption allowing for aircraft weighing more than 55 pounds or BVLOS operations. FAA proposes in § 108.450(a) that operators would be able to conduct photography, videography, mapping, inspection, and patrolling under an operating permit.

Aerial surveying operations would be limited by proposed § 108.450(b) to operations with fewer than 25 active UA, either directly under the operator's control, through lease agreements, or subsidiaries. Due to the complexity of these operations under a permit, such as operations being conducted from different locations at any given time, FAA finds that a higher limit than 25 active UA for aerial surveying operations would be detrimental to operational control oversight, as the risk with the operator's management oversight increases with multiple individual operations in different areas. Consistent with the discussion in section VIII.B.4, the correlation between UA weight and maximum distance supports the active aircraft limit of 25 UA for aerial surveying permitted operations. As discussed subsequently, the weight limit for aerial surveying permitted operation UA is greater than that of package delivery, but less than that of agricultural operations. In addition, FAA has considered the proposed allowed population density for the aerial surveying permitted operations in setting the active aircraft limit at 25 UA. Aerial surveying permitted operations are allowed to conduct operations at higher population densities than demonstration permits but are limited to a lower population density than package delivery operations.

FAA proposes in § 108.450(c) those operations conducted for purposes such as photography, videography, mapping, inspection, or patrolling with an aerial surveying permit would also be limited to a UA with a combined total weight of less than 110 pounds, including anything attached to or carried by the UA. Higher-weight aircraft typically fly lengthier missions due to increased battery power or fuel quantity and require larger or longer takeoff and landing areas due to increased size and takeoff and landing speeds directly related to weight. More extended operations and larger or longer takeoff and landing areas would require greater attention to the operator's preflight planning, oversight, and additional risk mitigations to maintain safe operations as the overall complexity of the operation increases. FAA proposes to limit aerial surveying operations to less than 110 pounds. FAA has similarly issued waivers for operations with UA weighing more than 55 pounds. FAA does not however, anticipate a significant need for UA heavier than 110 pounds for purposes of aerial surveying since applications for waivers with UA greater than 110 pounds for these purposes are not requested frequently. Furthermore, FAA can mitigate risk associated with aerial surveying by limiting the UA's weight.

In addition, FAA proposes in § 108.450(d) that aerial surveying operations would be limited to Category 3 population density areas or lower, in accordance with § 108.185. Further, § 108.185 also generally limits permitted operations to categories 3 or lower, as lower population densities correlate to a lower risk to persons and property on the ground. FAA anticipates that aerial surveying operations would occur in a multitude of population densities due to the various purposes of missions, such as newsgathering. However, because of the lower weight and because aerial surveying operations are typically conducted within the confines of a defined area or areas, FAA proposes that a Category 3 population density would provide an acceptable level of safety.

7. Civic Interest Operations (§ 108.455)

Under § 108.455, FAA proposes to allow certain civic interest operations to be conducted under a permit. For the purposes of this rule, civic interest operations would be operations performed by an entity contracted to a Federal, State, local, or Tribal government for purposes including forest and wildlife conservation (including wildfire recovery, wildlife conservation, and tracking climate change) and operations in support of public safety (including fire, accident, and disaster response). In addition, FAA proposes that, when operating in support of a government entity, the operator must coordinate and deconflict operations with the law enforcement or government emergency management agency responsible for incident response in advance and throughout the duration of the operation.

Civic interest operations conducted under part 108 operating permits and certificates would only apply to civil aircraft operations. PAO would continue to be governed under the statutory provisions for public aircraft as set forth in 49 U.S.C. 40102(a)(41) and 40125 and be required to comply with applicable 'all-aircraft' operating requirements as set forth in 14 CFR part 91. In other words, PAO operators can continue to operate as PAO under part 91 pursuant to the terms of their valid COA. These provisions provide the legal basis for PAO in the United States. FAA has issued an AC[107] that provides information to determine whether government or government-contracted aircraft operations conducted within the territory of the United States are public or civil aircraft operations under the statutory definition of "public aircraft." The civic interest category would not replace the use of PAO, but rather would provide other options for operators that do not wish to operate as PAO or cannot meet all the PAO requirements for the type of operation being conducted.

FAA proposes in § 108.455(b) that operations conducted under a civic interest permit would be limited to operations with fewer than 25 aircraft either directly under the operator's control, through lease agreements, or subsidiaries. Civic interest operations usually would occur in response to government safety response and support. As these operations could occur on short notice and in unpredictable operational areas, FAA does not consider it appropriate to increase the overall complexity of the operation by allowing for greater amounts of active aircraft. FAA therefore proposes to limit the number of active aircraft per operator, thus reducing the overall risk associated with the operation. Consistent with the discussion in section VIII.B.4, the correlation between UA weight and maximum distance supports the active aircraft limit of 25 UA for civic interest permitted operations. As discussed subsequently, the weight limit for civic interest permitted operation UA is greater than that of package delivery, but less than that of agricultural operations. In addition, FAA has considered the proposed allowed population density for the civic interest permitted operations in proposing to set the active aircraft

[107] *Available at* www.faa.gov/documentLibrary/media/Advisory_Circular/AC_00-1.1B.pdf

limit at 25 UA, which would be the same as aerial survey. Civic interest permitted operations would be allowed to conduct operations at higher population densities than demonstration permits but would be limited to a lower population density than package delivery operations.

In addition, FAA proposes in § 108.455(c) that UA operating under a civic interest permit would not be allowed to have a combined gross weight of aircraft and payload of more than 110 pounds. Similar to the weight limit proposed for aerial surveying operations, larger aircraft typically have increased battery power, allowing for longer missions, and require larger or longer takeoff and landing areas due to increased size and takeoff and landing speeds directly related to weight. Longer duration operations and larger or longer takeoff and landing areas require more attention by the operator to the amount of preparation and preflight planning of operations.

FAA is proposing that operations at a gross weight of 110 pounds or less would be limited to Category 3 population density areas or lower. The additional mitigations of Category 3 (*i.e.*, the strategic deconfliction requirements of § 108.190), combined with the lower weight, provide sufficient assurance to operate in more densely populated areas. As discussed above, larger UA may fly longer operations and may require larger or longer takeoff and landing areas, increasing the complexity of the operation and the necessary oversight by the operator.

Finally, FAA recognizes that certain life-saving missions with UA, such as search and rescue-related missions in disaster or hard to reach areas, would be in the interest of the general public. FAA does not intend to limit those life-saving operations and recognizes the necessity of the expeditious and precise support that civic interest UA operations could have on short-notice relief. FAA therefore proposes in § 108.455(f) that civic interest operations may be conducted over any population density to the extent necessary to safeguard lives in imminent threat. While FAA does not propose to define how this is determined, it is expected for these to be rare events associated with disasters and other unforeseen emergency situations where the use of the UAS could help save lives. In these situations, the added risk to persons and property on the ground is offset by the life-saving nature of the operation. However, FAA emphasizes that this should not be construed as routine and everyday occurrences and it is still the responsibility of the operator to exercise good judgment and conduct any and all operations in the best interest of safety to everyone involved, as well as to comply with the prohibition on careless and reckless flight.

8. UA Operations Training (§ 108.460)

The overall purpose of UA operations training is to acquire and hone basic airmanship skills. While the UA operations in this proposal would be mostly autonomous, the systems used for monitoring and controlling the UA would use software that provides a means to configure the autopilot system as well as providing an in-flight means of monitoring and controlling aspects of the UAS. These systems can range from straightforward user interfaces to complex arrangements requiring advanced training to program and operate the system. FAA recognizes that some UAS operators would benefit from training by a third party. For example, a UAS manufacturer may be in the best position to train persons on the intricacies and details of the UAS before an operator's first use of that system. Therefore, FAA proposes in § 108.460 that persons operating under a UA operations training permit could perform UAS operations training services for any type of operation authorized under this part. This would not apply to operators conducting their own training programs. UA operations training provided by an operator to their own operations personnel could be conducted under the same permit or certificate they hold for their operations without holding a separate UA operations training permit under this section.

FAA is proposing that a UA operations training permit would be exclusively used for training purposes, rather than other types of revenue operations. As such, no person would be able to use a UA operations training permit in lieu of obtaining the required permit for another type of operation conducted under proposed subpart D.[108] However, this would not preclude a UA operations training company providing training under a UA operations training permit, while the company personnel being trained are conducting operations under a different type of permit. But the general expectation is that UAS operations training would be conducted in a training environment and not during revenue operations. For example, if a company that specialized in UAS training held a UA operations training permit, that company could train personnel who are employed by a different operator that holds an agricultural operations permit. That company could perform "on-site" training with the agricultural operator while actual agricultural operations were being performed. The training elements of the operation would be accomplished under the training permit, and associated limitations, and the agricultural elements of the operation would be conducted under the agricultural permit. The training company personnel could demonstrate flight path techniques, maneuvering, etc., over the

[108] For example, an operator who seeks to conduct agricultural operations would not be able to seek a UA operations training permit to conduct agricultural operations under the guise of UA operations training.

fields. However, the operator holding the UA operations training permit would not be able to use their own personnel to conduct actual agricultural dispensing operations under the UA operations training permit. Rather, they could observe the agricultural operations being performed by personnel of the operator with the agricultural operations permit and provide guidance and advice as part of the training.

FAA proposes in § 108.460(b) that UA and objects carried by the UAS operated under a UA operations training permit would not be able to exceed 1,320 pounds, which is the maximum limit for part 108 UAS under proposed § 108.805 without an authorization from the Administrator. For more details on UA weights under different types of permits, please refer to the introductory language of section VIII.A.1.

FAA proposes in § 108.460(c) that operations would have to be conducted with fewer than ten active aircraft, either directly under the operator's control, through lease agreements, or subsidiaries, unless otherwise authorized by FAA. As discussed in section VIII.B.4, FAA has considered the correlation between UA weight and maximum travel distance when proposing active aircraft limits. As the UA weight limit for training permits is 1,320 pounds, FAA has decided it is prudent to limit the number of active aircraft to fewer than ten because the larger aircraft could travel further than small aircraft and would therefore place an increased burden on the flight coordinator. This aligns with agricultural operations permits under proposed part 108, which would be allowed the same number of active aircraft as training permits for the same proposed weight. As described with other permitted operations above, FAA finds that increasing the number of active aircraft above 10 increases the risk associated with the operation and management oversight of an operation that may require additional review and oversight by FAA. Therefore, operators wanting to provide training with more than 10 active UA would have to request this authority, provide FAA with any information requested, and comply with any additional imposed limitations. FAA does not anticipate that operations with more than 10 aircraft would rise to the level of needing the additional oversight and controls that becoming a certificated operation would entail. This would provide FAA with flexibility to authorize more UAS through an individualized risk-based approach. FAA seeks comment on whether the public and potential operators agree with this approach.

FAA proposes in § 108.460(d) to limit permitted UA operations training with larger aircraft to Category 1 areas, unless otherwise authorized by FAA. Larger UA may be able to operate for longer durations or require larger takeoff and landing areas, increasing the complexity of the operation. Given that the purpose of this permit is to train persons unfamiliar with either the UAS, operating environment, or policies of the operator, FAA finds it appropriate to mitigate ground risk by restricting operations to the lowest population densities proposed by this rule and as further discussed in section VI.H.

9. Demonstrations (§ 108.465)

In § 108.465, FAA proposes that operations for aerial performances, air races, air shows, sales demonstrations, exhibition, and the practice and preparations for these events would be conducted using a demonstration operations permit. FAA currently authorizes and approves waivers and relief granted through exemptions for such purposes. A streamlined regulatory process for UA conducting such operations would benefit the general public and FAA.

Demonstrations with UA are an essential aspect of UA operations, as manufacturers need to demonstrate new UA to the public. In addition, individuals will continue to demonstrate operations such as aerial performances and airshows and have the need to practice those operations before an event.

FAA proposes that demonstration purposes would be limited to operations with fewer than 50 active UA, unless otherwise authorized by FAA. While FAA has proposed active aircraft limits of fewer than 25 UA for similarly sized permits (see sections VIII.B.6-7), FAA has determined that an active aircraft limit of fewer than 50 is appropriate for demonstration permits because they would be limited to a lower population density than aerial surveying operations or civic interest operations. For general manufacturer demonstration purposes, FAA does not foresee an operational circumstance that would require demonstrating 50 or more UA at a time. In addition, FAA finds that a higher allowance of UA for demonstration operations would be detrimental to operational control oversight, as the risk with the operator's management oversight increases with multiple individual operations in different areas. However, FAA recognizes that different demonstrations may necessitate greater flexibility, and FAA therefore proposes that operations of 50 or more UA for demonstration purposes could occur with FAA authorization. Separate authorization would allow for FAA to ensure an acceptable level of safety for each operation.

As discussed in section VI.M, in proposed § 108.210, operations conducted under part 108 would be limited to a UA-to-Flight Coordinator ratio of 1:1, except in accordance with a method acceptable to the Administrator. Demonstration operations with UA typically involve the operator showing system capabilities, UA performance, and maneuvers, and operating at a greater than 1:1 ratio would increase the overall risk of the operation. FAA does recognize that an operation may require a demonstration by a flight coordinator to take place with more than one UA. For example, an aerial display may include multiple UA performing an in-sync lighted demonstration. In this scenario, FAA would have the ability to authorize such operations. This authorization would ensure that FAA has evaluated that an operation does not adversely affect safety.

FAA proposes that aircraft operated under a demonstration permit would not be allowed to have a combined gross weight of UA and payload greater than 110 pounds, unless otherwise authorized by FAA, consistent with the proposed requirements in § 108.800(b)(3). Further, FAA also anticipates UA manufacturers may want to demonstrate UA that have a weight greater than 110 pounds as this rule also allows for authorization from FAA for operations with UA weighing greater than 110 pounds.

UA operated for demonstration purposes typically perform a flight in close proximity to persons to show the UAS capabilities. FAA therefore finds that, by limiting the weight of the UA for demonstration purposes, should an incident occur, the risk associated with a UA weighing no greater than 110 pounds would further be reduced. However, FAA recognizes that operators with a demonstration permit may need to demonstrate a UA heavier than 110 pounds to fully exhibit its capabilities. FAA would therefore have the ability to authorize those operations to ensure that the operation does not adversely affect safety.

FAA proposes that demonstration operations with a permit would be limited to Category 2 density areas or lower as further described in section VI.H of this preamble. FAA believes that operations in these areas would not have an adverse effect on safety as mitigations require the use of specific equipment for obstacle and aircraft detection and avoidance. FAA does not see the need for demonstration operations to occur in higher population density areas as purposes for demonstration typically take place in front of persons in lower density population locations for aerial performances. However, if operators seek to conduct demonstrations in higher density areas, they may seek authorization from FAA. In addition, with the lower density of persons in these areas and the lower weight proposed in this section, FAA believes that risk to persons and property on the ground would be further reduced.

Finally, FAA proposes in § 108.465(e) that, regardless of the categorization of population density in the operating area, operations would need to be conducted at least 500 feet from any persons. Given the dynamic operating environment of many demonstration flights – *e.g.*, light shows or demonstrations of the full capabilities of a UA for a prospective buyer – FAA finds it appropriate to require an additional setback distance to protect spectators from any inadvertent operational deviations.

10. Flight Test Operations (§ 108.470)

FAA proposes to authorize flight testing under a permit in § 108.470, a necessary condition to conduct the development testing required under proposed § 108.930, functional reliability testing required under proposed § 108.935, and production acceptance testing required under proposed § 108.735, as discussed in sections X.J and XI.AA. Flight testing operations have a higher risk due to new aircraft testing and new equipment and software, which require greater attention to the mission as operators focus more on how a UAS performs during early flights. Flight testing operations would be used to understand how a UAS is performing. If further adjustments or corrections need to be made, the risk increases with operations over persons as the testing is a vetting process that could introduce error and failure. Should a mistake or failure occur, persons on the ground would be susceptible to the associated hazard.

Section 108.470(a) proposes that no operator would be allowed to conduct operations involving flight tests of new aircraft designs, modifications, or other development-related operations with a UA under part 108 without, or in violation of, a flight test permit issued in accordance with this subpart. FAA recognizes that flight testing operations carry an increased level of risk, stemming from the testing of new aircraft, equipment, and software. These elements may require applicants to assess the performance of UA or AE during initial flights. The issuance of a flight test permit enables applicants to conduct operations aimed at research and development, as well as the verification of design, functionality, limitations, and reliability testing. Importantly, this permit would allow for operations under part 108 without the requirement for an experimental airworthiness certificate.

Section 108.470(b) proposes that flight test permit operations would only be allowed to be conducted by UA manufacturers qualified under subpart G, or by accredited educational institutions. The purpose of this requirement is to allow only applicants seeking airworthiness acceptance to be granted a flight test permit for development of UAS designed for operations under part 108. FAA does not intend to create a parallel path for experimental airworthiness certification, nor does FAA intend for this provision to allow operators to obtain a flight test permit for recreational use.

Allowing accredited educational institutions to obtain flight test permits would benefit the fields of aviation and aerospace. These institutions are often at the forefront of technological innovation and research, playing a role in advancing UAS technology. By granting them access to flight test permits, it would not only facilitate this research but would also encourage innovation within the academic community.

Accredited educational institutions typically possess the necessary infrastructure, expertise, and oversight to conduct flight testing operations safely. This would ensure that such activities are carried out in a controlled environment, minimizing potential risks to public safety, and ensuring the integrity of national airspace.

Section 108.470(c) proposes limiting flight test permitted operations to Category 1 population density areas or lower, in accordance with § 108.185, unless otherwise authorized by FAA. The purpose of this limitation is to mitigate the hazards associated with flight test of new design, software, and equipment. FAA acknowledges the importance of minimizing public exposure to these potential hazards. The development and testing of aviation technologies inherently involve uncertainties and risks, particularly when introducing novel designs or sophisticated software that have not yet been extensively evaluated in operational environments. These risks can range from system malfunctions or failures to unforeseen interactions with the operational environment, which could potentially lead to incidents or accidents.

FAA's approach to mitigating these risks involves carefully managing the exposure of the public to potential hazards during the critical phases of testing and evaluation. By limiting flight tests to controlled environments or specific conditions, FAA aims to prevent any adverse outcomes that could arise from untested or under-tested technologies. This precautionary measure would ensure that any potential safety issues are identified and addressed in a controlled setting, away from densely populated areas or critical infrastructure, thereby safeguarding public safety.

Section 108.470(d) proposes that, under a flight test permit, the UA and anything attached to or carried by the UA would not be allowed to have a combined total weight greater than 1,320 pounds, unless otherwise authorized by FAA. Testing of all UA designs is necessary and therefore the weight limit must include the maximum allowable weight for any type of part 108 operations. As previously discussed, the population density associated with flight testing permits is very low, which greatly reduces the risk to persons and property on the ground. FAA has therefore proposed allowing higher-weight UA under a flight test permit. As further discussed in VI.A, FAA proposes in § 108.800(b)(3) to limit UA operating under part 108 to no greater than 1,320 pounds max gross takeoff weight, unless otherwise authorized by FAA. This weight limit would be consistent with the safety continuum considered for operations of BVLOS UAS.

In order to permit the full spectrum of flight testing necessary to meet the requirements in subparts G and H, FAA proposes in § 108.470(e) that § 108.105(b), which requires that the UA have an airworthiness acceptance, would not apply to operations conducted under a flight test permit. FAA recognizes the unique nature of flight testing, in which failures can occur as part of the iterative design and development process. Given this context, airworthiness acceptance is not required for aircraft engaged in such testing activities. This approach is based on the understanding that flight testing is inherently designed to identify and push the boundaries of what is currently possible, including testing and validating the limitations of new designs, software, and equipment.

11. Recreational (§ 108.475)

While FAA expects the primary uses of operations conducted under part 108 will be commercial, FAA anticipates that individuals will want to fly UAS BVLOS recreationally. FAA does not want to omit recreational operations from this rule when a framework can be developed to formally ensure safe and secure BVLOS operations. FAA proposes to require non-commercial or recreational operators wishing to conduct operations under this proposal to receive a recreational operating permit. The recreational operating permit and associated requirements under this proposed rule would govern part 108 recreational operations. FAA, therefore, would require that no operator may conduct recreational operations with a UA under this part without, or in violation of, a recreational permit.

As previously discussed, the main purpose of this proposed rule is primarily for commercial purposes, however, FAA anticipates that there will be persons wanting to operate UA recreationally that would not be possible under part 107. FAA anticipates commercial operations under this rule will be conducted mostly over higher population densities with a specific mission and route in mind. FAA does not find it prudent to oversaturate that airspace with additional recreational operations. Therefore, FAA will limit recreational operations to Category 3 population densities or lower. Further, FAA will limit the maximum UA weight under a recreational permit to not more than 55 pounds, which includes anything attached to or carried by the aircraft. To further reduce ground risk with recreational operations, FAA chose to limit the maximum weight in alignment with part 107.

FAA proposes to limit operations with a recreational permit to a maximum distance of 10 nautical miles from the operator. FAA does not anticipate recreational operators will have the need to operate at great distances from the operator. FAA does not have previous data on recreational BVLOS operational distances with UA. As such, FAA chose a 10 nm maximum distance to ensure a smaller operational footprint. This maximum distance would also help manage the operational risk of unforeseen battery depletion, a risk that under other operational permits would be managed by the corporate entity through their company operations manual (which is not required under the recreational permit).

FAA also proposes to limit recreational operations to one UA operated by an operator at a time because of the complexity and workload of operating more than one UA at a time. While this rule does not prohibit ownership of multiple UAS by an individual, operations conducted under a recreational permit would be limited to the operation of one UA at a time. Per proposed § 108.475(f), recreational permit operators would need not comply with the requirements under part 108 for company operations manuals, experience requirements, base of operations, and operations supervisor requirements, the requirement to develop and implement a cybersecurity plan, and duty and rest requirements. By limiting operations to one UA operated by one operator, the complexity of the operation would be reduced by maintaining focus on one single UA by one single operator. FAA proposes this one person to one UA limitation to further reduce risk to persons on the ground as overall attention rests with only one UA by one operator.

Lacking a commercial organizational structure, operators holding a recreational permit do not fit cleanly into the roles delineated in section VII.B. However, the recreational permit holder would need to fulfill responsibilities typically assigned to the operator, the operations supervisor, and the flight coordinator.

C. Certificated Operations

Under this proposal, FAA would require that operations conducted with a UA for purposes of package delivery, agriculture, aerial surveying, and civic interest that are not conducted utilizing an operating permit, as described in section VIII.B of this preamble, would require an operating certificate issued by FAA. Unlike permitted operations, which also include permits for UA operations training, demonstration, flight test, and recreational operations, FAA proposes to limit certificated operations to only package delivery, agriculture, aerial surveying, and civic interest. Operations conducted for UA operations training, demonstration, flight test, and recreational purposes are generally more appropriate in areas with lower population densities, as a lower population density provides inherent risk mitigation should an in-flight occurrence happen. Further, FAA does not anticipate a significant need for UA operations training, demonstration, flight test, or recreational flights to be conducted in higher population density areas. However, FAA proposes that any type of operation that are not package delivery, agriculture, aerial surveying, and civic interest, can be authorized by FAA, subject to any limitations issued by FAA in conjunction with the certificate.

The requirements under proposed part 108 and any authorizations and limitations will be the governing constraints for certificated operations FAA uses to mitigate operational risk. Therefore, FAA proposes that operations under an operating certificate would need to be conducted in compliance with the requirements of part 108 and in accordance with any authorizations and limitations issued by FAA.

FAA considered creating a fifth category of operating certificates for larger UA carrying cargo. This would have been distinct from the package delivery operating certificate due to the size of the UA and how the operations would be allowed to occur. As discussed further in section VIII.C.8, FAA has proposed a limit of 110 pounds on package delivery certificated operations due to the close proximity of package delivery to customers and customers' homes. FAA did contemplate that there might be an interest in having larger aircraft operate between two controlled areas. However, FAA has not yet processed any waivers or exemptions related to this type of operation. FAA lacks information on how industry might conduct this type of activity and therefore could not determine the appropriate risk mitigations for this type of activity. However, FAA welcomes comments on the inclusion of a cargo transportation operating certificate, particularly on what such a certificate may be used for, how it would differ from package delivery, and what risk mitigations would be appropriate.

1. Recency of Operations (§ 108.530)

Proposed § 108.530 prescribes the requirements for operator's recency of operation. Operations under an operating certificate are potentially at a higher risk level than permitted operations due to the allowable size and scope of the operation. FAA proposes in § 108.530(a) that certificated operations under this part must have been conducted within the preceding 12 calendar months, or the operator would be required to receive authorization from FAA to resume operations, as proposed in § 108.530(b). Continued operations throughout a calendar year allow an operator to maintain a certain amount of proficiency with operations, as daily adherence to company manuals, procedures, authorization, and regulatory compliance allows it to become routine. In addition, FAA surveillance would be regularly conducted for active operations. Given the highly autonomous nature of operations conducted under this proposal, FAA feels that proficiency with the overall operation for recency requirements are different than in manned aircraft operations as referenced in § 119.63. Specifically, operations under proposed part 108 would require less hands-on aircraft controlling and focus more on UA observing and operational management. Therefore, a longer period of time could elapse between operations. Further, FAA proposes that FAA may require inspections or reexaminations to determine whether the operator remains properly and adequately equipped and able to conduct a safe operation. FAA anticipates that scenarios may arise that would warrant FAA involvement prior to continued operations such as a certificate holder with little operating experience who has not conducted operations after initial certification.

2. Cybersecurity (§ 108.535)

As discussed in section VIII.B.3, FAA has proposed that operators must develop and implement cybersecurity policies and processes. Highly automated systems are integral to UAS operations, and this reliance on these systems can, if not properly protected, result in a significant vulnerability. In § 108.535, FAA proposes to require operators conducting operations under a certificate to meet the same performance standards as permitted operators proposed in § 108.435. Like permitted operators, FAA proposes that operators would need to develop and implement cybersecurity policies and processes, which are identical to those proposed for permitted operations.

In §§ 108.535(b)(1) through (4), FAA proposes that certificated operators must, at minimum, include processes for: protecting software, hardware, and network computing infrastructure necessary to protect operations from unauthorized access[109]; ensuring the operator's employee network access privileges are limited to those necessary to fulfill normal job duties; ensuring access privileges are turned off/removed for former employees; preparing for, responding to, and mitigating the impact of cyber-attacks; collecting and analyzing data to measure the effectiveness of the cybersecurity policy and processes; and any other processes the operator deems necessary to implement effective cybersecurity protections. FAA is utilizing performance-based language in this proposed requirement to provide operators flexibility with how controlled access areas designated.

3. Training Program (§ 108.540)

Proposed § 108.540 prescribes the requirements for a training program. In § 108.540(a), FAA proposes that certificated operators be required to establish and implement a training program, acceptable to the Administrator, which meets the requirements of subpart C of proposed part 108. Generally, an acceptable training program would ensure that all operations personnel are adequately identified, defined, trained, and evaluated in the performance of their assigned duties. Paragraph (a) also specifically references the requirements of proposed § 108.315 to ensure operations personnel understand they would be required to meet the recurrent training of § 108.315(d) remain proficient in each UA, position, and type of operation in which they serve.

The program would include the initial and recurrent training that ensures operations personnel remain proficient in each aircraft, position, and type of operation in

[109] NIST Quick Start Guide *available at* www.nist.gov/cyberframework/quick-start-guides.

which they serve. Rather than prescribe a specific structure that includes instructors and examiners, this proposed rule would allow an operator to design a training program to fit and support its organizational structure and personnel plan. This flexibility would accommodate the wide variety, scope, and different levels of training that could be appropriate for any given operation. However, the proposal would require the operator to include how all required operations personnel will be trained, not just core operations personnel like operations supervisors and flight coordinators.

In proposed § 108.540(b), FAA would require an operator to ensure that the training facilities, personnel, training material, forms, instructions, and procedures are appropriate and current. However, it is important to note that FAA would not require an operator to provide this training "in-house." As noted in proposed § 108.540(c), an operator is free to develop and conduct its own training or to contract out the training using third-party persons, or any mix thereof, so long as the operator has evaluated the course, found it appropriate, and provided adequate information to FAA to independently evaluate adequacy when submitted with the certificate application in accordance with proposed § 108.505(b)(10). In addition, the training could consist of online courses, hands-on practical courses, instructor-led courses, or any other methods deemed appropriate. Regardless of who provides the training, the operator is ultimately responsible for providing training that meets the requirements of this proposed rule.

In proposed § 108.540(d), FAA proposes that an operator be required to designate a person or persons who are responsible for ensuring that operations personnel are appropriately trained. Importantly, because the designated person(s) would be required to certify as to the proficiency and knowledge of the operations personnel being trained or evaluated, they must also be qualified to determine such matters. The designated person(s) would also be responsible for ensuring that the operations personnel records are accurate and maintained. The proposal would not require that this training role be the only responsibility of the designated person(s). Instead, FAA would simply require they be identified within the company and fulfill the requirements of the role. In addition, while this proposed rule would not require operators to have traditional positions like instructors and examiners on staff, FAA acknowledges that this structure can be beneficial for some operations. FAA encourages operators, especially those without a proven training program, to consider adopting instructional elements of training programs used by successful traditional air carriers.

As noted above, the training program must be acceptable to the Administrator. As proposed in § 108.540(e), FAA may order an operator to change its accepted training program if it finds that the program, its structure, or other elements are not adequate. In response, an operator may file a petition to reconsider within 30 days of receiving notice, which would stay the order until FAA renders a final decision. However, if an emergency requires an action in the interest of safety, FAA may require immediate changes to a training program after providing a statement of its reasons. This proposed approach would preserve FAA's authority and continuing role in identifying and addressing potential deficiencies that could affect safety, which in turn would allow FAA to ensure that operators refine their training regimen considering changes in technology, policy, and other matters, as needed.

Finally, as proposed in § 108.540(f), FAA describes how an operator may file a petition for reconsideration for any changes requested by the Administrator under paragraph (e).

4. Validation Tests (§ 108.545)

The certification process is designed to preclude certification of applicants who are unwilling or unable to comply with the regulations, or to conform to safe operating practices. FAA, therefore, proposes that each operator with an operating certificate must show that they can conduct operations safely and in compliance with applicable regulatory standards. FAA proposes in § 108.545 that an operator can accomplish this through validation testing.

First, under proposed § 108.545(a)(1), an operator would be required to conduct a validation test during the application process for an operating certificate. In § 108.545(a)(2), FAA proposes requiring validation testing for the addition of a new make or model of aircraft if an aircraft of the same make and model or similar design has not been previously validated in the operation. Requiring a validation test for this scenario ensures that an operator is capable of conducting operations with new aircraft using new or existing policies and procedures. FAA proposes in § 108.545(a)(3) requiring validation testing for special performance or unique operational authorizations as determined by the administrator such as new equipment or operational technology. Validation testing ensures operators are not only capable of, for example, utilizing the equipment, but also proficient, qualified, and familiar with all aspects of it. FAA proposes in § 108.545(a)(4) requiring validation testing for an operator wishing to conduct operations with multiple UA by one flight coordinator. This type of validation testing will ensure proficiency of the flight coordinator but also verify that workload management is not affected during an operation.

Proposed § 108.545(a) allows FAA to authorize deviations to the requirement for validation testing. FAA will determine whether validation testing is required. Validation testing may not be required in all instances. For example, FAA may look at the operator's prior experience and the complexity of the change. This allows FAA to exercise discretion.

Finally, FAA proposes in § 108.545(b) that all validation tests must be conducted under the appropriate operating and maintenance requirements of part 108 that would apply if the applicant were fully certificated. This would ensure that the other safety mitigations in part 108 will apply to the validation test and will allow FAA to observe an operator performing as they would during an authorized operation. Prior to obtaining an operating permit or certificate, FAA would issue a temporary permit or certificate to allow any required validation tests to occur. FAA would issue this temporary permit or certificate during the application process prior to the validation tests, unless FAA authorizes a deviation that allows the operator to forego validation tests per proposed § 108.545(a).

5. Communication and Ground Risk Assessments (§ 108.550)

FAA expects any operator that operates under a part 108 operating certificate for a BVLOS operation to maintain a robust C2 analysis of the area of operations, per proposed § 108.550(a). While C2 is an important element to every operation, this extra C2 assessment requirement would be limited to certificated operations due to the greater potential impact of a loss of C2 in operations that could be conducted at that much larger scale. In addition, aircraft are expected to be designed with safety features that minimize the impacts of C2 loss, further minimizing the impacts on smaller operations, as discussed in section XI design requirements. Based on current research and operational approvals of BVLOS operations, FAA has seen C2 metrics that include, but are not limited to, link accessibility, latency of link, and operational processes in the event of lost link. FAA expects that work performed by industry consensus standards bodies will refine the key metrics for C2 over time. For BVLOS operations, an operator would need to be aware of the potential for link to their aircraft to not be available due to interferences and other reasons along the predicted flight path. In addition, FAA expects that BVLOS flights could at times experience intermittent lost link. As such, the operator would need to do an assessment of how link latency and intermittent lost link may impact the safety of their operation and produce mitigation protocols in these instances to maintain a low-risk operation. FAA looks to industry and other stakeholders for additional comment on what additional metrics should be considered in a C2 assessment, which are expected to be documented in a to-be-developed industry consensus standard.

Without mitigations, the size and complexity envisioned for certificated operations would increase operational risk. FAA would reduce and mitigate the increased risks through the certification process proposed in this rule. FAA proposes that protection of persons on the ground in a certificated operation could be reduced further by ensuring operators are familiar with the areas of operation and create their own mitigations which are acceptable to FAA. FAA therefore proposes in § 108.550(b) that certificated operations would have to be conducted in accordance with a ground risk assessment plan acceptable to FAA that includes pedestrian and moving vehicle analysis and considers terrain and human-made obstacles that the operator intends to overfly.

6. Inoperative Equipment (§ 108.555)

FAA is proposing in § 108.555 that no person would be able to conduct an operation under this part with a UAS with inoperative equipment or equipment that has failed its initial performance checks unless all of the following requirements are met. First, the inoperative equipment would need to be not indicated as necessary by the manufacturer of the UA pursuant to the manufacturer's operating instructions and must not be required by subpart H of part 108 or required for the specific type of operation being conducted. Second, the inoperative equipment would need to be removed from the UA, deactivated, or otherwise determined not to interfere with the safe operation of the UA. Third, a determination would need to be made by a person who is authorized by the operator to perform maintenance on the UA that the inoperative equipment does not constitute a hazard to the UA. Finally, information identifying the inoperable equipment would need to be made available to the appropriate operations personnel.

All aircraft equipment is meant to perform a specific function during flight. FAA also recognizes that installed equipment will eventually fail on an aircraft if not earlier replaced. However, not all installed equipment performs a function that is critical to the safe operation of the aircraft. Under this proposed rule, FAA does not want to limit an operator from operating a UA with inoperative equipment if the equipment deemed inoperative is not necessary for safe operation or required for a particular operation. FAA therefore proposes, in § 108.555, that certificated operators may conduct operations with a UA that has inoperative equipment or equipment that has failed its initial performance checks if the inoperative equipment is not required to be operational by the manufacturer or is not required by any other part of this proposed rule. The manufacturer must determine and indicate, under proposed §§ 108.720(a)(v) and 108.870, which items of equipment are essential for the safe operation of the UA. However, FAA is proposing to limit this operational flexibility to certificated operations, as the increased oversight and other mitigations described throughout the proposed rule would provide a sufficient level of assurance of the safety of the operation. Furthermore, FAA proposes that any inoperative equipment would need to be removed from the UA, deactivated, or otherwise determined not to interfere with the safe operation of the UA. The appropriate method can be predetermined by the manufacturer and included in the operating instructions or be determined by the operator. However, FAA will also require that a determination is made by a person authorized by the operator to perform maintenance on the UA that the inoperative equipment does not constitute a hazard to the UA. This requirement ensures that someone inspects the inoperative equipment to determine the cause of the inoperative functionality to determine if safe operations may be continued after removal or deactivation. FAA proposes that information regarding the inoperative equipment be made available to the appropriate operations personnel for their situational awareness and decision making as it pertains to future operations.

7. Safety Management System (§ 108.560)

A safety management system (SMS) is a formal approach for an organization to manage risk and ensure the effectiveness of safety risk controls. An SMS includes procedures, practices, and policies for safety risk management.[110] In the Safety Management Systems for Domestic, Flag, and Supplemental Operations Certificate Holders final rule dated January 8, 2015,[111] FAA stated that requiring an SMS is an effort to continuously improve safety by filling gaps through improved management practices. The UAS industry is constantly growing and technologically advancing, and FAA anticipates this will continue to be the case. In addition, FAA recognizes that operations under this proposal are a new concept compared to traditional manned aviation operations. Though FAA has developed the policy under this proposal to mitigate risks, FAA also sees the benefit of an SMS for operations within a rapidly growing industry. FAA therefore proposes in § 108.560(a) that certificated operations under part 108 would need to develop, implement, and keep current an SMS that meets the requirements of 14 CFR part 5.[112]

In part 5, FAA has outlined the SMS process to ensure that the four major components (safety policy, safety risk management, safety assurance, and safety promotion) are included and developed in such a manner to ensure that the SMS is fully functioning. FAA proposes that a part 108 certificated operator's SMS would need to meet the requirements of part 5 in order to incorporate the benefits of SMS into part 108 operations.

---

[110] FAA Order 8000.369C, *Safety Management System*.

[111] *Safety Management Systems for Domestic, Flag, and Supplemental Operations Certificate Holders* final rule, 80 FR 1307 (Jan. 8, 2016).

[112] Organizations with a sole individual performing all necessary operations functions in the conduct and execution related to the safe operation of the unmanned aircraft are not required to comply with the following provisions of 14 CFR part 5: §§ 5.21(a)(4), 5.21(a)(5), 5.21(c), 5.23(a)(2), 5.23(a)(3), 5.23(b), 5.25(b)(3), 5.25(c), 5.27(a), 5.27(b), 5.71(a)(7), 5.93, and 5.97(d).

FAA proposes an exception to certain part 5 requirements in § 108.560(b) for certificate holders with a sole individual performing all necessary operations functions under part 108. Those certificate holders would not be required to comply with the following provisions of part 5: §§ 5.21(a)(4), 5.21(a)(5), 5.21(c), 5.23(a)(2), 5.23(a)(3), 5.23(b), 5.25(b)(3), 5.25(c), 5.27(a), 5.27(b), 5.71(a)(7), 5.93, and 5.97(d). As discussed in the Safety Management System final rule (89 FR 33068), these particular regulations would be impractical or illogical for single pilot operations when implementing SMS.

Per proposed § 108.560(c), operators would be required to make available to FAA, upon request, all necessary information and data that demonstrates that the operator has an SMS that meets the requirements set forth in part 5. This would ensure that FAA has enough information to verify that an operator has a sufficient SMS.

8. Package Delivery Operations (§ 108.565)

In § 108.565, FAA proposes regulations for package delivery certification, as well as requirements for interstate package delivery operations. Currently, FAA approves package delivery operations with UA through existing part 135 rules, as these are currently the only regulations pertaining to transportation of property with smaller aircraft. However, part 135 does not address UA operations. In developing this rulemaking, FAA is creating a pathway specific to UAS operations, with the appropriately tailored requirements for UAS package delivery. For existing package delivery operations, FAA exempts package delivery operators from numerous part 135, 61, and 91 regulations, as these parts were originally developed for manned aircraft. FAA therefore proposes in part 108 a series of regulations that will allow package delivery operations in the NAS without requiring exemptions.

FAA proposes in § 108.565(b) that package delivery operations conducted with an operating certificate would be required to ensure that the payload in, on, or suspended from the UA is properly secured and does not adversely affect the flight characteristics or controllability of the UA. An unsecure payload could shift or disconnect partially, interfering with UA devices or flight characteristics, which may cause shifts in center of gravity and controllability issues. In addition, an unsecure payload could disconnect fully, causing hazard to persons or property on the ground as it releases from the UA. To avoid any hazard to the UA's controllability and flight characteristics and to persons and property on the ground, FAA proposes in § 108.565(b) that operators would be required to ensure payloads are properly secured and do not adversely affect the flight characteristics or controllability of the UA. Generally, this is expected to be specified by the UA manufacturer as the manufacturer is the systems designer and testing of the payload securing device would be completed by the manufacturer. The payload system should be addressed in the manufacturer's operating instructions for each UAS receiving an airworthiness acceptance as further described in section X of this preamble.

In § 108.565(c), FAA proposes that UA for package delivery with an operating certificate must not have a combined total weight, including anything attached or carried by the aircraft, of greater than 110 pounds. With certificated operations, operators may conduct services over all population densities, as further described in section V.H. One of the main concerns with any UA operations is protection of persons on the ground and reduction of ground risk. In conducting package delivery operations, the UA will most likely be operating within the higher population density area for longer periods of time, as the delivery requires slowing the UA, descending, and making the delivery, then climbing back to altitude and transitioning back to cruise flight for a return to base. To mitigate the associated risk to persons on the ground, FAA proposes to limit the weight of the UA to 110 pounds for certificated package delivery operations. Should a loss of flight occur during certificated package delivery operations, FAA anticipates that a 110-pound maximum weight UA would provide for an acceptable level of risk with ground contact. FAA's experience with granting exemptions for UAS weighing above 55 pounds for package delivery operations[113] demonstrates that these operations, within the appropriate operational framework and mitigations, can be safely conducted. In addition, the design requirements proposed in this preamble would mitigate additional risks, particularly related to loss of control in flight or unplanned landings. FAA anticipates package delivery aircraft may increase in size and weight if there are rapid advances in industry concepts. However, the operational profile of package delivery contains aircraft that are routinely operating into uncontrolled delivery locations at altitudes very close to the ground and over populated areas. As such, the risk profile is very different compared to other types of part 108 operations. Therefore, FAA is proposing to place higher restrictions on the size of aircraft performing these types of operations. The 110-pound maximum limit is similar to current package delivery UA operations that are primarily conducted with UA at or under 110 pounds under existing exemptions.

Further, FAA proposes in § 108.565(d) that operators must ensure that the delivery area is free of any obstructions that could pose a hazard. Since operations will be conducted BVLOS and in close proximity to customers and other people on the ground,

---

[113] FAA Exemption No. 18601A (Sept. 26, 2022), *available at* www.regulations.gov/docket/FAA-2019-0573.

operators must ensure safe operations at the delivery site. FAA anticipates that this may be done by use of onboard cameras, in-person site visits, or other technology with the capability of ensuring safe entry and exit to the area. By ensuring the delivery area is free of any obstructions or hazards, FAA can further reduce risk to persons and property during delivery.

Additionally, in order to continue to protect persons on the ground within the delivery area, FAA proposes in § 108.565(e) that the operator must ensure each delivery customer is provided information about the delivery method that minimizes the risk of injury. Though this proposed rule includes mitigations to ensure safety of the flight and operational area, FAA finds it appropriate to also ensure that customers are aware of the dangers and hazards associated with an active delivery. FAA anticipates that operators may provide this information electronically or by other acceptable means that operators may convey to the customer.

FAA proposes in § 108.565(f), that prior to conducting package delivery operations under a part 108 certificate, the operator must contact the TSA and request and obtain a limited security program equivalent with 49 CFR 1544.101(g). FAA finds it necessary to levy this requirement given the national security implications arising from UAS package delivery operations. FAA only proposes to apply this requirement to package delivery operations at this time and notes TSA has requested comment on imposing additional security requirements on other part 108 operations. FAA may adjust this requirement as appropriate to conform to applicable security requirements.

TSA has joined this proposed rulemaking to ensure that TSA's security requirements are appropriately applied to UAS operations that would be permitted or certificated by the FAA under part 108. TSA's proposed provisions are limited to the addition of definitions relevant to UAS operations in 49 CFR part 1540 and two revisions to 49 CFR part 1544 to clarify that these operations are within the scope of its requirements. In addition, the FAA is proposing including in 14 CFR 108.565(f) a requirement for operators to ensure they have obtained a security program from TSA before conducting UAS operations under this proposed rule. Under this requirement, operators are advised that FAA approval is not sufficient. TSA approval is also required.

These proposed requirements are intended to avoid any unintended consequences regarding the security of UAS operations under proposed part 108, consistent with TSA's responsibility for aviation security and the need to ensure the security of UAS operations as recognized in both E.O. 14305 and E.O. 14307. The types of security risks UAS operations pose to the public are described in E.O. 14305, which states that "criminals, terrorists, and hostile foreign actors have intensified their weaponization of these technologies, creating new and serious threats to our homeland." Specifically, the E.O. notes that "[d]rug cartels use UAS to smuggle fentanyl across our borders, deliver contraband into prisons, surveil law enforcement, and otherwise endanger the public."

The proposed text would ensure that the decision to regulate these UAS operations under part 108 does not inadvertently create a security gap under TSA regulations.[114] Under this proposal, which has been developed in consultation with TSA, TSA will continue to ensure the security of the national airspace by imposing appropriate

[114] In the absence of the text, this proposed rule might have created uncertainty regarding the applicability of 49 CFR part 1544, potentially resulting in a separate TSA rulemaking proceeding while this more comprehensive rulemaking remained pending. Having concluded that an additional concurrent rulemaking could result in confusion and uncertainty, the agencies decided to work together on this limited issue as the most appropriate path forward.

security requirements. The proposed text would require UAS operators authorized under part 108 to request a TSA security program. The revisions to TSA's regulation would permit TSA to issue a limited program to these operations under 49 CFR 1544.101(g). The proposal is consistent with TSA's regulatory structure, which has long required certain operators regulated under part 119 to request, and maintain compliance with, a TSA-approved security program before conducting operations (both domestic and foreign carriers operating to/through/from the United States).

The proposed text would clarify that under applicable TSA regulations, UAS operators must seek a "limited program" under 49 CFR 1544.101(g). The general requirements for a security program are listed in TSA's regulations at 49 CFR part 1544. TSA develops standard security programs that meet these requirements. Operators can request amendments to the standard security program to address specific operational issues, and TSA can approve these amendments to the extent they maintain the required level of security. In addition, TSA has broad statutory authority to proactively grant exemptions from applicable requirements.[115]

TSA is considering additional changes to security program applicability and requirements in a final rule. While some operations will not require any additional security requirements beyond vetting, in a final rule TSA may expand the applicability of security program requirements to cover more than package delivery operations. TSA is requesting comment on the scope of operations for which a limited security programs should be required, in addition to the requirement for vetting. For instance, TSA could

[115] *See* 49 U.S.C. 114(q).

choose to regulate all permitted and certificated BVLOS UAS operations, with limited exceptions for certain non-package delivery operations based on (1) UAS size; (2) intended use of the UAS; (3) capabilities of the UAS, including payload; (4) location of operation centers and range of UAS; (5) planned areas of operation; and (6) fleet size. Similarly, recreational operations permitted under part 108 may be appropriate for an exemption from such requirements given the size, weight, and range limits associated with those operations.

TSA notes that an expanded security program applicability in the final rule could include any of a range of security program requirements, such as (for instance) requirements to appoint a Security Coordinator and to comply with security directives and emergency amendments to security programs. TSA anticipates developing model language appropriate to the different types of operations that will be permitted by the FAA under part 108. For example, under the existing regulatory requirements in 49 CFR 1544.101(g), TSA could require the following security measures as applicable:

- Preventing or deterring the carriage of any unauthorized weapons, explosives, incendiaries, and other destructive devices, items, or substances.
- Controlling cargo that it accepts for transport on an aircraft in a manner that:
  - Prevents the carriage of any explosive, incendiary, and other destructive substance or item in cargo onboard an aircraft.
  - Prevents unescorted access by persons other than an authorized aircraft operator employee or agent, or persons authorized by the airport operator or host government.

- Either verifying that the chain of custody measures for screened cargo are intact before loading such cargo on aircraft or ensuring that the cargo is re-screened in accordance with TSA’s requirements.
- Designating a Security Coordinator at the corporate level that must serve as the operator's primary contact for security-related activities and communications with TSA.
- Implementing control functions with respect to each aircraft operation sufficient to:
    - Prevent unauthorized access to areas controlled by the aircraft operator under an exclusive area agreement in accordance with 49 CFR 1542.111 of this chapter.
    - Prevent unauthorized access to each aircraft.
    - Conduct a security inspection of each aircraft before placing it into operations if access has not been controlled in accordance with the aircraft operator security program and as otherwise required in the security program.
    - Prevent unauthorized access to the operational area of the aircraft while loading or unloading cargo.
- Training individuals with security-related duties.

Such requirements would also ensure UAS operators could avail themselves of existing procedures in TSA’s regulations to modify their programs to appropriately address their operational environment while maintaining the level of security determined necessary by TSA.[116]

TSA anticipates that many of the larger operators that will seek approval to conduct part 108 operations may already be subject to a TSA security program. TSA would work with these operators to determine whether they need a new program or could modify their TSA-approved program. TSA has also historically adapted its requirements to meet the needs of smaller and seasonal operators and would continue to apply this flexibility for UAS operations approved under part 108, while also ensuring the security risks identified above are being appropriately addressed. TSA and FAA request comments on the proposed text and will work jointly on adjudicating comments relevant to TSA's proposed text in this NPRM. Because FAA is held to the final rule deadline established by E.O. 14307, TSA will have to meet that deadline as well in co-adjudicating the security-related comments and developing its relevant final rule sections.

Per the discussion in the paragraph regarding package delivery operations in section VIII.A.3, the operator may be considered an "air carrier" engaged in "air transportation" and may require economic authority from the Office of the Secretary. See section VIII.A.3 for more discussions on this topic.

9. Hazardous Materials (§ 108.570)

In § 108.570, FAA proposes regulations to enable the safe transportation of hazardous materials under part 108 for certificated package delivery operations.[117]

---

[116] *See, e.g.,* 49 CFR 1544.101.

[117] This rulemaking uses the definition of hazardous material as defined in 49 U.S.C. § 5102(2) and 49 CFR § 171.8.

Currently, the primary means for UAS operators to transport packages containing hazardous materials in air commerce is as a part 135 air carrier. Part 135 air carriers must have an FAA-approved hazardous materials training program and an FAA-accepted hazardous materials manual. FAA issues each operator an Operations Specification permitting or prohibiting the acceptance, handling, and transportation of hazardous materials in commerce.[118] These requirements apply regardless of whether a certificate holder transports hazardous materials or does not transport hazardous materials. Hazardous materials requirements are function-based and scale to the scope and complexity of a certificate holder's operation.

Hazardous materials training requirements apply equally in UAS and non-UAS operations. Hazardous materials training requirements focus on ground-based job functions associated with any item for transport on board an aircraft, as well as the personnel who perform or directly supervise these functions. These job functions include acceptance, rejection, handling, storage incidental to transport, packaging of company material (COMAT), and loading. Recurrent training would be required every two years.

In 2017, FAA published AC 121-40, *14 CFR Part 121 and Part 135 Dangerous Goods Transportation Operations*, to help support the hazardous materials manual and training program. Ultimately, AC 121-40 promotes the safe and efficient transportation of hazardous materials. UAS applicants have successfully used this AC during the part 135 precertification process and FAA continues to encourage UAS applicants and operators,

[118] See 14 CFR part 135 subpart K (training program requirements) and 14 CFR § 119.49(c)(12) (Operations Specifications). Parts 135.21 and 135.23 establish the requirements for hazardous materials manuals, including the exception that certificate holders who use only one pilot are not required to have a hazardous materials manual.

including those in package delivery operations subject to this proposed rulemaking, to use this AC.

To account for novel UAS-related considerations associated with certificate holder systems and the transportation of hazardous materials, FAA requests UAS certificate holder applicants seeking a will-carry authorization to conduct a safety risk assessment (SRA). An SRA, which is part of a SMS program, is a systematic process that involves identifying, analyzing, and controlling hazards and risks.

The SRA determines what the potential risk mitigations should be to eliminate or control identified risk and promotes employee awareness regarding hazards, aids in identifying personnel and property at risk, determines existing control measures and their adequacy to prevent injuries, and prioritizes hazards and their control measures. An SRA ensures that the certificate holder properly assesses the additional risks that may be present with these UAS operations and that they develop appropriate risk mitigations to reduce the risk to an acceptable level.

Ultimately, when issuing an operations specification for the carriage of hazardous materials, FAA limits UAS certificate holders to the types and amounts of hazardous materials specified in their accepted hazardous materials manual and approved hazardous materials training program. A UAS certificate holder may request a modification to the types and quantities of hazardous materials they are authorized to transport by submitting an updated hazardous materials training program and manual to receive an updated operations specification. This is different than a will-carry non-UAS certificate holders, as their operations specification only identify that they are authorized to accept, handle, and transport hazardous materials; it is not limited to a list of types and quantity of hazardous materials. Thus, in this preamble, FAA proposes that the authorization for a will-carry package delivery operation be aligned with current UAS certificate holder operations specifications in that the authorization will be limited to the type and quantity of hazardous materials that an operator can accept, handle, and transport.

Any person[119] (including a UAS certificate holder) who offers or transports hazardous materials in commerce must comply with the Hazardous Materials Regulations (HMR).[120] This includes requirements such as training, loading, hazardous communication, packaging, and segregation. FAA notes that the HMR were originally promulgated for hazardous materials transportation inside of cargo compartments, typically on type-certificated aircraft. Therefore, the HMR does not necessarily account for the unique hazards associated with UAS transportation.[121] FAA believes that this rulemaking and its certification and operational standards will be relevant to future HMR amendments specific to UAS.

FAA notes that section 933 of the 2024 FAA Reauthorization Act requires the Secretary to use a risk-based approach to establish the operational requirements,

---

[119] The HMR defines a person in 49 CFR § 171.8 as "an individual, corporation, company, association, firm, partnership, society, joint stock company; or a government, Indian Tribe, or authority of a government or Tribe, that offers a hazardous material for transportation in commerce, transports a hazardous material to support a commercial enterprise, or designs, manufactures, fabricates, inspects, marks, maintains, reconditions, repairs, or tests a package, container, or packaging component that is represented, marked, certified, or sold as qualified for use in transporting hazardous material in commerce. This term does not include the United States Postal Service or, for purposes of 49 U.S.C. §§ 5123 and 5124, a department, agency, or instrumentality of the government."

[120] 49 CFR parts 171-180.

[121] For example, the HMR generally require a hazardous materials package to be designed, constructed, maintained, filled, its contents so limited, and closed, so that under conditions normally incident to transportation there will be no identifiable release of hazardous materials into the environment, the effectiveness of the package will not be substantially reduced, and there will be no hazardous materials adhering to the outside of the package during transport; however, the conditions normally incident to transportation may not account for the unique characteristics of UAS transportation.

standards, or special permits necessary to approve or authorize an air carrier to transport hazardous materials by unmanned aircraft systems providing common carriage under part 135 or under successor authorities, as applicable, based on the weight, amount, and type of hazardous material being transported and the characteristics of the operations subject to such requirements, standards, or special purposes UAS.

In addition, paragraph (d) of section 933 requires the Secretary to make necessary conforming amendments to the HMR under parts 173 and 175 to implement this risk-based approach to the carriage of hazardous materials via UAS by air carriers. Any comments to this NPRM involving revisions to the HMR, would have to be considered by PHMSA in a separate rulemaking. FAA seeks comments on the types of operational requirements and standards that could facilitate air carriers transporting hazardous materials by UAS in a risk-mitigated manner.

Currently, most UAS certificate holders transport small packages. Most hazardous materials transported by these certificate holders are excepted from HMR requirements, under certain conditions, due to their perceived lower risk, especially when transported as a single consignment over a relatively short distance from certificate holder ground personnel. UAS operators who cannot meet the HMR requirements must apply for and obtain a special permit from PHMSA in accordance with 49 CFR part 107, subpart B. Special permit applications should demonstrate an equivalent level of safety to the requirements in the HMR for which the applicant is seeking relief. This is also true if a UAS operator wishes to obtain relief from other HMR requirements, such as shipping papers, pilot notifications, markings, labels, and packaging requirements. Currently, FAA is unaware of any special permits seeking relief from the HMR to better enable hazardous materials transport onboard UAS.

Prior to the issuance of the first part 135 UAS certificate holder, 14 CFR part 133 certificate holders were the only operators in the NAS transporting cargo, including hazardous materials, outside an airframe. When rotorcraft transport hazardous materials as external loads, the HMR requires the certificate holder to apply for and obtain an approval[122] (*i.e.*, a special permit) from the PHMSA Associate Administrator. In addition, part 133 certificate holders must also produce a plan for approval by their Principal Operations Inspector (POI) to mitigate the hazards created by such cargo. This requirement is supported by a 2009 legal interpretation, FAA's Office of the Chief Counsel stated that "the transport of hazardous materials, especially forbidden hazardous materials, in external load operations creates 'a hazard to persons or property on the surface."

Having an additional emphasis on safety evaluation is important when hazardous materials are transported outside of an airframe. However, FAA does not propose a similar mechanism in this preamble. Instead, as discussed elsewhere in this preamble, similar safety components can be accomplished with an SRA acceptable to the Administrator that provides, but does not require, coordination with another agency. This ultimately will make the authorization process more expeditious and less burdensome on the part 108 package delivery operator.

[122] 49 CFR § 175.9(a)

Lastly, FAA notes that part 133 certificate holders are only authorized to drop cargo from above ground level in the event of an emergency; currently, there are no authorized transportation modes that allow dropping cargo from above ground level as a part of regular operations. As discussed elsewhere in this preamble, this is one reason why FAA is proposing to require a specific authorization when a will-carry part 108 package delivery operator wishes to deliver or unload hazardous materials by releasing or dropping such materials from above ground level.

With respect to small UAS operations,[123] part 107 was promulgated in 2016; however, part 107 prohibits the carriage of hazardous materials via small UAS. This prohibition is not subject to waiver. In the part 107 final rule, FAA stated "that the carriage of hazardous materials poses a higher level of risk than the carriage of other types of property… [and] the transport of hazardous materials, especially forbidden hazardous materials, in external load operations creates a hazard to persons or property in the surface."[124] Therefore, FAA did not authorize the carriage of hazardous materials under part 107 because part 107 did not include airworthiness requirements, and part 107 operators are not required to have hazardous materials training programs or manuals. Part 107 operators who wish to transport hazardous materials must petition FAA for a regulatory exemption to § 107.36.

Working from the baseline of the part 107 prohibition on the carriage of hazardous materials and part 135 air carrier certification requirements, the BVLOS ARC

---

[123] 14 CFR § 1.1 defines a small UAS as an unmanned aircraft weighing less than 55 pounds on takeoff, including everything that is on board or otherwise attached to the aircraft.

[124] 81 FR 42076.

issued two hazardous materials-specific recommendations in their March 2022 Final Report. These recommendations include allowing UAS to transport hazardous materials and including an exception (for specific quantity and types) to all applicable HMR requirements. The rationale for this recommendation specified that the exception could match the types and quantities of hazardous materials provided in 49 CFR 175.10(a), which applies to hazardous materials carried by passengers or crewmembers in their carry on or checked baggage. However, FAA does not have the regulatory authority to revise the HMR; this authority is delegated to PHMSA.

FAA acknowledges that the HMR have mostly been developed for traditional aircraft operations. The transportation of hazardous materials has almost exclusively been conducted in cargo compartments with well-defined capabilities and almost all passengers and crew fly on type certificated aircraft.[125] Similarly, 14 CFR requires that trained crewmembers are onboard aircraft to detect, assess, and mitigate emergencies caused or aggravated by hazardous materials. This involves using onboard detection systems and what crewmembers, passengers, or supernumeraries see, hear, or smell onboard an aircraft. However, not all UAS are expected to be able to as readily detect or mitigate hazardous materials-related events, which is why it is necessary to ensure that any hazardous materials operations by UAS provide an equivalent level of safety as compared to transportation by traditional aircraft.

The HMR requirements were originally designed for manned operations. Therefore, UAS capabilities and operator-specific mitigations are relevant to the overall

---

[125] *See* 14 CFR §§ 25.855 and 25.857 for current cargo and baggage compartment requirements on transport category aircraft.

risk characterization of part 108 hazardous materials transport. This is especially relevant given the wide array of operating environments and the means of transport and delivery currently used in UAS operations. The variety of these environments and means of transport/delivery are only expected to increase with part 108 operations. With payload capacity expected to increase significantly under part 108 and the types of hazardous materials also expected to grow beyond common consumer items, FAA does not believe it is in the interest of regulatory flexibility or safety to provide specific hazardous material types or quantity allowances for UAS operations. Instead, as noted elsewhere in this preamble, FAA believes that an operation-specific analysis should be conducted by the operator (via an SRA acceptable to the Administrator) to ensure that all appropriate hazards are considered and addressed to ensure the safe transportation of hazardous materials in commerce. However, FAA is open to future regulatory development and industry partnerships to develop broader-based performance-based approaches proportionate to the risk.

i. FAA Authorization to Permit or Prohibit Accepting, Handling, and Transporting of Hazardous Materials

FAA proposes to enable part 108 hazardous materials transportation in a safe and efficient manner. Currently, FAA lacks sufficient data to conclude what types of hazardous materials should be authorized for package delivery transportation for all part 108 operations. As such, the most efficient and effective way to authorize this transportation is to individually assess the risks for the types and amounts of hazardous materials that each part 108 certificated operator wants to transport in the context of their overall operation and system design. Thus, as detailed in this preamble, FAA proposes that when a part 108 package delivery certificated operator wants to transport hazardous materials, they will be able to obtain a will-carry authorization by having an accepted hazardous materials manual, approved hazardous materials training program, and SRA acceptable to the Administrator. The specific proposal is detailed further in this preamble.

As noted in the aircraft airworthiness section, proposed part 108 aircraft would not be type-certificated. Meanwhile, the HMR are promulgated on the understanding that hazardous materials, in air mode, are transported on type-certificated aircraft intended to protect crew, passengers, and supernumeraries onboard. If there are releases of hazardous materials onboard type certificated aircraft, those releases are usually confined to aircraft cargo compartments; trained crew or other ground personnel would mitigate the release.

Proposed part 108, as an enabling regulation, is intended to establish a safety framework that can be tailored to any individual part 108 package delivery certificated operation—from small and simple to large and complex.

FAA proposes enabling regulations to allow for the transportation of hazardous materials under part 108 for package delivery certificated operations. Hazardous materials cannot be authorized merely as a function of hazard class, division, packaging group, or package quantity, especially as part 108 proposes to utilize non-type certificated UAS and given the wide array of aircraft, operators, and operations within the proposed part 108 domain. Therefore, these proposed enabling regulations scale to all part 108 package delivery service certificated operators.

FAA has previously stated that a “certificate holder's hazardous materials program constitutes the foundation for safely transporting dangerous goods by air.”[126] Current hazardous materials requirements, including operations specification, hazardous materials manuals, and hazardous materials training programs, have been proven to readily scale to all types of operators, including UAS certificate holders. These requirements are an efficient means of ensuring personnel are trained in the functions they are performing or directly supervising; therefore, FAA proposes similar requirements for part 108 certificate holders transporting hazardous materials in package delivery certificated operations.

Proposed § 108.570 regulates the transport of hazardous materials. Package delivery operators, regardless of whether they transport hazardous materials, must comply with the requirements by creating safety policies, implementing procedures and programs for personnel training, job function assignments and management roles, handling and storage of hazardous materials, and recordkeeping. To ensure an adequate level of safety by implementing requirements similar to current part 135, FAA is taking an approach based on two transport categories of hazardous materials: will-carry and will-not-carry. Part 108 package delivery certificated operators, regardless of their will or will-not carry status, will need to be able to identify hazardous materials based on hazard communication information and recognize that they cannot transport hazardous materials without proper FAA authorization. Therefore, FAA proposes that both will-carry and will-not carry operators would need accepted hazardous materials procedures and

[126] FAA, AC 121-40, *14 CFR Part 121 and Part 135 Dangerous Goods Transportation Operations* (Dec. 13, 2017).

information (often colloquially referred to as an accepted hazardous materials manual) and an approved hazardous materials training program. However, will-carry operations would also need an SRA acceptable to the Administrator to address the risk associated with the transportation of hazardous materials.

These proposed requirements increase the level of safety to enable the safe transportation of hazardous materials. FAA notes that the type and amount of hazardous materials authorized will be specific to the aircraft, operation, operating environment, and other relevant considerations. Therefore, FAA is not proposing a blanket prohibition on the carriage of hazardous materials analogous to § 107.36 for certificated package delivery operators. However, in the future, FAA may propose data-informed, risk-based regulatory carve-outs for part 108 operators regardless of their aircraft, operation, or operating environment. As new operations are established and more data is collected, such an approach may be appropriate. As noted above, FAA is also open to supporting the development of performance-based standards. Currently, with the small numbers of UAS package delivery operators and operations, limited data, and many unique factors relevant to each operator, FAA believes that proposed requirements serve as an efficient means to enable the transport of hazardous materials.

FAA proposes in § 108.570(a) that certificated package delivery operators seeking authorization to transport packages in air commerce would need to obtain a will-carry or will-not-carry authorization from FAA, which permits or prohibits the accepting, handling, and transporting of hazardous materials. All required documents must be submitted to FAA when obtaining the authorization. Specifically, FAA proposes that to obtain a will-carry authorization, a certificated package delivery operator must have an accepted hazardous material procedures and instructions, an approved hazardous materials training program, and an SRA acceptable to the Administrator. To obtain a will-not-carry authorization, a certificated package delivery operator must have an approved hazardous materials training program and an accepted hazardous materials manual. When issuing the authorization, FAA will review the submitted materials to ensure the applicant achieves regulatory compliance, has properly assessed the unique UAS-related risks associated with their operations, and has developed appropriate risk mitigations to reduce the risk to an acceptable level.

FAA believes that the hazardous materials manual, training program, and SRA are critical to designing a safety system that supports the safe transportation of hazardous materials in the NAS. Hazardous materials manual and training program requirements are established requirements for current part 135 operations. Transportation of hazardous materials under proposed part 108 certificated package delivery operations are similar to part 135 operations. On-ground hazardous materials requirements apply consistently, no matter the type of transport vehicle; thus, as detailed in this preamble, FAA has concluded that the hazardous materials manual and training program requirements should also apply to part 108 certificated package delivery operations. However, part 108 UA differ from traditional part 135 aircraft, with additional risks to carrying hazardous materials because of UAS operations. Therefore, FAA is proposing that an additional analysis (*i.e.*, SRA) must be conducted to ensure that the operations account for new hazards and risks to a specific operation. These proposed requirements are further detailed below.

Lastly, as noted in the discussion of HMR requirements, all operators who transport hazardous materials in commerce are subject to the HMR. While a will-carry authorization allows hazardous materials to be accepted, handled, and transported by the operator, the regulatory requirements for these functions are detailed in the HMR; the operator must ensure they also comply with these requirements. For example, 49 CFR § 175.30 of the HMR requires the operators to inspect shipments. However, if an operator cannot comply with any of the HMR requirements, they may apply for and obtain a Special Permit from PHMSA (see part 107, subpart B); the will-carry authorization does not replace or exempt an operator from obtaining a special permit from PHMSA when the operator cannot perform any function not authorized in the HMR.

ii. Approved Hazardous Materials Training Program

FAA proposes that certificated package delivery operators must have an approved hazardous materials training program. This proposed requirement is like the current approved hazardous materials training programs for part 135 certificate holders. In the final rule that established part 135 hazardous materials training program requirements (2120-AG75; 70 FR 58795), FAA stated:

> A hazardous materials training requirement is a critical step toward reducing the number of improperly prepared or undeclared shipments. These requirements establish mandatory hazardous materials training programs with uniform standards.[127] Hazardous materials training programs will ensure that company personnel are trained to comply with the requirements of the HMR, which they perform or directly supervise.[128] In addition, each certificate holder must train

[127] 70 FR 58799

[128] 70 FR 58813

each crewmember and person performing or directly supervising any of the following job functions involving any item for transport on board an aircraft[129]:

- Acceptance;
- Rejection;
- Handling;
- Storage incidental to transport;
- Packaging of company materials; or
  Loading

Ultimately, these requirements ensure that personnel who are not authorized to transport hazardous materials do not inadvertently do so. Therefore, the training program for will-not-carry certificated package delivery operators ensures that personnel are trained to recognize hazardous materials packages, refuse them for acceptance, submit incident reports, and submit discrepancy reports, as appropriate. There is a significant safety benefit to the overall NAS in ensuring this training is offered effectively. Hazardous materials, including COMAT, can be offered for transportation by the UAS operator, and operator personnel must comply with the appropriate regulations and operating procedures. These training requirements also apply to will-carry certificated package delivery operators and ensure that their personnel know the appropriate requirements for their operations (*e.g.*, what packages to accept or reject). This means that the operator can scale the overall scope of the training requirement based on their hazardous materials operations.

Once undeclared hazardous materials are offered into transportation, it can be very difficult for downstream operators to know there may be improperly offered hazardous materials in their system. FAA notes that the HMR requires hazardous materials training in accordance with 49 CFR part 172, subpart H; however, this training

[129] 70 FR 58797

only applies to hazmat employees.[130] Therefore, will-not-carry certificated package delivery operations personnel are not subject to the HMR training requirements. However, they are subject to FAA-approved hazardous materials training requirements. In addition, FAA continues to believe that the purpose of hazardous materials training, as described, provides a safety benefit. For these reasons, FAA proposes that certificated package delivery operators have an approved hazardous materials training program.

In addition, FAA also proposes various exceptions to certain scenarios for the hazardous materials training requirement, similar to those authorized for part 135 certificate holders, to ensure that part 108 certificated package delivery operators are afforded the same regulatory flexibility as part 135 certificate holders. This includes (1) flexibility in the period between a person's hire date or start of a new job function that requires training and when training is completed, (2) allowance for differences training, and (3) flexibility in when recurrent training must be completed.

FAA proposes to allow a person to perform a § 108.570(b) job function between their hire date or start of a related job function and completion of training for that function under the supervision of another trained employee. FAA recognizes that a

[130] 49 CFR § 171.8 defines a hazmat employee as a person who is (i) employed on a full-time, part-time, or temporary basis by a hazmat employer and who in the course of such full-time, part-time or temporary employment directly affects hazardous materials transportation safety; (ii) self-employed (including an owner-operator of a motor vehicle, vessel, or aircraft) transporting hazardous materials in commerce who in the course of such self-employment directly affects hazardous materials transportation safety; (iii) a railroad signalman; or (iv) a railroad maintenance-of-way employee. Additionally, this term includes an individual, employed on a full-time, part-time, or temporary basis by a hazmat employer, or who is self-employed, who during the course of employment: (i) loads, unloads, or handles hazardous materials; (ii) designs, manufactures, fabricates, inspects, marks, maintains, reconditions, repairs, or tests a package, container or packaging component that is represented, marked, certified, or sold as qualified for use in transporting hazardous material in commerce; (iii) prepares hazardous materials for transportation; (iv) is responsible for safety of transporting hazardous materials; and (v) operates a vehicle used to transport hazardous materials.

certain degree of flexibility is required to ensure continuous package delivery operations of hazardous materials between when a person is hired or starts a related job function and when they complete FAA-approved training program. This period can be as long as 30 days. Therefore, in § 108.570(h), FAA proposes to allow a person to perform a § 108.570(b) job function under the direct visual supervision of a person who is authorized by the operator to supervise that person and who has successfully completed the operator's FAA-approved initial or recurrent training program within the past 24 months. This exception is only applicable from their hire date or start of a new job function up until 30 days, when training must be completed. In addition, in § 108.570(i), FAA proposes that any operator using this exception must retain a specific record for that person taking the exception.

In § 108.570(j), FAA proposes to allow an operator who uses or assigns a person to perform or directly supervise one of the § 108.570(b) job functions to only train that person in its own policies and procedures regarding those job functions when that person also performs or directly supervises the same job function for another package delivery operator, part 121 certificate holder, or part 135 certificate holder. This exception is sometimes also referred to as "hazardous materials differences training." This exception is only authorized when (1) the operator receives written verification that the person has satisfactorily completed hazardous materials training for the specific job function and (2) the package delivery operator, part 121 certificate holder, or part 135 certificate holder who trained the person has the same authorization or equivalent operations specifications regarding the acceptance, handling, and transport of hazardous materials as the operator using this exception. FAA proposes this exception because, without this exception, a person who performs a similar job function for multiple operators or who changes employers would be required to complete hazardous materials training for each operator. FAA acknowledges that an operator's FAA-approved training program may be similar to another operator's FAA-approved training program when the two operators are authorized to conduct similar hazardous materials operations (*i.e.*, will-carry operator compared to another will-carry operator). Therefore, by proposing this exception to allow a part 108 package delivery operator to provide only differences training when the person has successfully completed a similar FAA-approved hazardous materials training program, FAA eliminates a potentially overly burdensome requirement.

Lastly, in proposed § 108.570(k), FAA provides some flexibility in when recurrent training is required. Recurrent training would be required every 24 months. However, to allow flexibility in operations FAA proposes that if the training is completed in the month before or after recurrent training is required, then the training is considered complete in the month that training was originally due. However, if a person completes recurrent training earlier than the month before it is due, then the earlier month becomes the new training anniversary month.

iii. Accepted Hazardous Materials Procedures and Information

FAA proposes that certificated package delivery operators transporting packages must have accepted hazardous materials procedures and information (often referred to as an accepted hazardous materials manual). This proposed requirement is like the current accepted hazardous materials manuals for part 135 certificate holders.

As with the approved hazardous materials training program, FAA has concluded that the accepted hazardous materials procedures and information requirements have proven to ensure that all operator personnel understand and follow procedures to ensure appropriate compliance with hazardous materials acceptance (*i.e.*, that will-carry operators appropriately accept hazardous materials, and that will-not-carry operators reject hazardous materials). Therefore, FAA proposes that these requirements apply to certificated package delivery operators.

FAA notes that certificated package delivery operators may have a combined hazardous materials training program and hazardous materials procedures and information. Likewise, the hazardous materials procedures and information and hazardous materials training program, or portions thereof, may be integrated into General Operations Manuals, General Maintenance Manuals, or other relevant manuals. Furthermore, FAA notes that the procedures and information requirement does not apply to special aircraft operations, such as agricultural operations, transporting hazardous materials in accordance with 49 CFR § 175.9(b).[131]

iv. SRA Acceptable to the Administrator

FAA is also proposing that certificated package delivery operators transporting hazardous materials (*i.e.*, will-carry operators) submit an SRA acceptable to the Administrator as a part of their authorization request. This SRA would need to be inclusive of risks to people and property on the ground resulting from the carriage of hazardous materials.

[131] Nothing in this section is intended to remove the manual content required as a condition of 49 CFR § 175.9(b)(6) when hazardous materials are to be dispensed or expended during flight for weather control, environmental restoration or protection, forest preservation and protection, flood control, avalanche control, landslide clearance, or ice jam control purposes.

An SRA is not a requirement for part 135 operators. However, because of the unique and novel characteristics of part 108 UAS transportation, the proposed hazardous materials training program and hazardous materials procedures and information requirements, coupled with HMR compliance, may not be sufficient to ensure that there is an acceptable level of safety in the NAS or for people and property on the ground. For example, shippers may not be aware of the transportation conditions associated with UAS package delivery operations—or even that their package will be transported by UAS. Conditions normally associated with the traditional air cargo environment may not be normal compared to individual operations in the UAS domain. A package attached to the outside of a UAS airframe can be subject to weather and atmospheric conditions such as precipitation, temperature, humidity, and wind/airflow not necessarily experienced inside an aircraft, unit load device, warehouse, or sort facility.

An SRA would account for many of these gaps because the certificated package delivery operator will consider the risks associated with hazardous materials transportation in their operations. In addition, the SRA serves as a critical link between the 14 CFR and 49 CFR regulatory frameworks and the certificated package delivery operator's unique operating environment. Therefore, FAA proposes to require certificated package delivery operators transporting hazardous materials to submit an SRA acceptable to FAA when seeking a will-carry authorization.

The SRA should properly assess the unique UAS-related risks associated with the certificated package delivery hazardous materials operations and that they have developed appropriate risk mitigations to reduce the risk to an acceptable level.

Furthermore, an SRA should have appropriate technical and scientific analysis to explain and address these risks.

FAA notes that certificated package delivery operations will vary depending on the types and quantities of hazardous materials being transported per flight and operations. In addition, FAA lacks the data to know the impact of different quantities and types of hazardous materials on various aircraft systems. Therefore, it is imperative that the operator, who knows their system and operations the best, conduct the appropriate analysis to understand the risks they are introducing into the NAS. In many cases, the safety of the operation will depend on what the UAS is flying over, supplemental aircraft or operator carrier mitigations, and the nature of the hazardous materials involved. For example, aircraft systems (*e.g.*, parachutes), operational considerations (*e.g.*, routing relative to people and property on the ground), localized emergency response capability, the nature and quantity of hazardous materials onboard, and novel mitigations to contain hazardous materials (*e.g.*, aircraft or operator supplemental packaging or containers) are just some of the unique variables the SRA may cover. For these reasons, FAA proposes to require the submission of an SRA acceptable to FAA for a certificated package delivery operator seeking a will-carry authorization to transport hazardous materials.

FAA has developed draft AC 108-XX, *14 CFR Part 108 Unmanned Aircraft systems (UAS) Carrying or Dropping Dangerous Goods Safety Risk Assessment*, to support the development of the SRA acceptable to the Administrator, which is included in the docket. This AC focuses on the requirements and considerations that a certificated package delivery operator should make in developing an SRA acceptable to the

Administrator. FAA requests comment on this draft AC and will issue a final version to coincide with the final rule's publication.

v. Authorization to Deliver or Unload Hazardous Materials by Releasing or Dropping such Materials Above Ground Level

In addition to a will-carry authorization, FAA proposes that will-carry certificated package delivery operators seeking authorization to intentionally release or drop hazardous materials as a form of delivery must obtain an additional FAA authorization allowing them to do so. To apply for and obtain this authorization, FAA proposes that an operator would need to have a hazardous materials training program and hazardous materials procedures and instructions and would need to submit an SRA acceptable to FAA to ensure they account for the unique characteristics for releasing or dropping hazardous materials above ground level.

Intentionally dropping hazardous materials as a part of routine operations differs from the traditional method for unloading hazardous materials from an aircraft. Before the development of UAS, except for special aircraft operations in accordance with 49 CFR § 175.9(b), unloading hazardous materials from an aircraft has traditionally been conducted by personnel physically removing the package from the aircraft. However, UAS provides operational methods of unloading packages, including hazardous materials packages, by releasing or dropping from above ground level.

As these unloading methods are not traditional, UAS operators must consider additional risks to ensure their operations are conducted safely. These risks are not limited only to people and property on the ground at the time of delivery, but to people handling the package, such as a subsequent traditional air carrier. These risks are often distinct from those identified in the considerations to accept, handle, load, or transport the hazardous material in flight, which are proposed in the will-carry authorization. Therefore, FAA believes that a will-carry certificated package delivery operator should consider the unique circumstances for intentionally dropping or releasing a package and incorporate these considerations in their hazardous materials training program, hazardous materials procedures and instructions, and SRA, as proposed in obtaining their will-carry authorization. Specifically, FAA proposes that certificated package delivery operators seeking this authorization must ensure that their hazardous material training program, hazardous materials procedures and instructions, and SRA acceptable to the administrator be inclusive of risks to people and property on the ground resulting from intentionally dropping or releasing hazardous materials. The operators should also consider the risks to other people who may subsequently transport or handle the dropped package, such as traditional air carriers, ground transportation carriers, and recipients. These considerations may be incorporated in the hazardous materials training program, hazardous materials procedures and instructions, and SRA acceptable to the Administrator used to meet the will-carry authorization requirements, as new versions for this authorization requirement, or a combination of the two.

In addition, FAA believes that the SRA should include technical information proportionate to the level of risk for each hazardous material being dropped or released above ground level. The certificated package delivery operator should fully understand the identified hazards and develop appropriate risk mitigations. For additional details on developing an SRA acceptable to the Administrator, see the discussion on the draft AC in the SRA Acceptable to the Administrator section.

FAA notes that this authorization would not be required for special aircraft operations, such as agricultural operations, to release hazardous materials during flight when operating in accordance with 49 CFR § 175.9(b).

10. Agricultural Operations (§ 108.575)

Currently, agricultural operations using UA are conducted under 14 CFR part 137, which provides rules for conducting agricultural aircraft operations. However, part 137 was written for traditional aircraft, rather than UA. As such, there are provisions in part 137 that cannot be met by UA operators. FAA has been issuing part 137 exemptions for operators conducting agricultural operations with UA. The proposed agricultural operations certificate will create regulations related to agricultural aircraft operations that are specifically tailored to the needs and risks of part 108 UAS.

In § 108.575(a), FAA proposes that an operator conducting agricultural operations with a part 108 UA that does not comply with the requirements for agricultural permitted operations must obtain an agricultural operating certificate. As described below, FAA believes operations outside of the scope of an operating permit are of a higher risk and would therefore benefit by the risk mitigations associated with obtaining an operator certificate. FAA uses the same definition of agricultural operations as is used in part 137.

In § 108.575(b) and (c), FAA proposes to prohibit dispensing operations directly over people and to limit operations to Category 3 population density areas or lower, as described in section VI.H. These proposed requirements would be consistent with existing regulatory and practical considerations for agricultural operations. Dispensing of economic poisons and any other substance intended for treatment, nourishment, propagation, pest control, preservation and pest control may be hazardous to persons if applied directly overhead. FAA must ensure the protection of persons not only in the air but on the ground, and therefore would prohibit dispensing operations directly over people, unless authorized by FAA. In addition, both manned and unmanned agricultural operations typically take place in sparsely populated areas over non-populated areas, operating close to the ground while dispensing and close to structures. Should a UA collide with the ground or a structure, persons may become vulnerable to the associated hazard from material carried on the aircraft. However, by limiting an agricultural operation to an area that is less likely to have persons nearby, the vulnerability to persons greatly decreases. Unlike agricultural operations conducted under a permit, which are limited to population densities of Category 1, certificated agricultural operations would be limited to Category 3 population densities as the certification process enhances standardization and increased operational reliability through accepted training and operational manuals as well as ongoing FAA oversight.

FAA recognizes that individual states, counties, townships etc. may have specific limitations or restrictions regarding agricultural spraying that may be more restrictive than what is proposed in this preamble. To that end, FAA proposes in § 108.575(e) that certificated agricultural operators may not dispense, or cause to be dispensed from a UA, economic poisons for use other than for which it is registered, contrary to any safety instructions or limitations as described by the product label, or in violation of any law or regulation of the United States. In addition, FAA proposes that certificated agricultural operations comply with all safety instructions or limitations on the product label as well as any applicable laws or regulations of the United States.

In § 108.575(f) FAA proposes the same relief from the requirements in paragraph (e) as currently allowed under part 137 for operators dispensing economic poisons for experimental purposes when under the supervision of a Federal or State agency authorized by law to conduct research in the field of economic poisons or when operating under a permit U.S. Department of Agriculture issued pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136).

In proposed § 108.575(g) FAA would require that operators conducting operations under an agricultural part 108 operating certificate must have and keep current a comprehensive training program that is tailored for their proposed operation. The training program would need to contain, at a minimum, knowledge requirements consisting of steps to be taken before starting operations, including survey of the area to be worked, safe handling and storage of and the proper disposal of used containers for those, the general effects of and agricultural chemicals on plants, animals, and persons, with emphasis on those normally used in the areas of intended operations; and the precautions to be observed in using poisons and chemicals, primary symptoms of poisoning of persons from, the appropriate emergency measures to be taken, and the location of poison control centers, performance capabilities and operating limitations of the aircraft to be used and, safe flight and application procedures. FAA believes that by requiring a training program with the included above areas tailored to their operation, any additional risk associated with an individual operation would be further reduced.

Finally, FAA is proposing in § 108.575(h) that no person may supervise or participate in an agricultural unmanned aircraft operation unless they have completed the operator’s training program as required in § 108.575(g). As further described in section VII.A of this preamble, FAA is not requiring airman certification for operations conducted herein. Therefore, FAA would rely on the knowledge and skill requirements discussed in section VII.C to ensure that adequate knowledge and skill has been obtained prior to operation. Completion of the training program should be comprehensive, and failure to achieve a reasonable grade or average on the training program materials would likely not demonstrate sufficient skill to conduct safe operations.

11. Aerial Surveying Operations (§ 108.580)

As described in section VIII.B.8, FAA recognizes the value of UA operations conducted for the purposes of photography, videography, mapping, inspecting, or patrolling. However, aerial surveying operations with an operating permit would be limited to an aircraft weight of no more than 110 pounds, a population density of Category 3 or lower, and fewer than 25 active aircraft.

FAA recognizes that operators may want to operate with UA for aerial surveying operations weighing more than 110 pounds, with a greater number of active aircraft, or in an area with a greater population density than what is allowed under permitted operations. To ensure these operations may still be safely conducted, FAA finds that risk is best managed through the standardization and continued oversight of the certification process. With the advancement of technology and UA design, FAA anticipates many variants, sizes, and weights of UA performing aerial surveying functions, and FAA proposes that the certification process could provide the appropriate safeguards to facilitate those operations. FAA also understands that operators for aerial surveying purposes may maintain 25 or more active UA for their operation, and therefore does not propose a limit on the number of active aircraft an operator may hold when operating under a certificate that permits aerial surveying operations.

FAA proposes to enable a pathway for aerial surveying operations to be conducted in higher than Category 3 population densities through the certification process. However, as operating weight increases, so does the overall risk to people on the ground. FAA therefore proposes in § 108.580(b) that aerial survey operations conducted with a UA weighing more than 110 pounds be limited to Category 4 population density areas, or lower. FAA believes that greater risk of higher weight UA, increased number of active aircraft, and higher population density category operations, can be mitigated by the certification process, which requires FAA evaluation, observations, and continued surveillance. An operating certificate adds various levels of risk mitigation such as FAA accepted training programs, and continued FAA oversight.

12. Civic Interest Operations (§ 108.585)

As described in section VIII.B.7, civic interest operations are operations conducted under contract for government agencies, law enforcement, and public safety entities using UA for various purposes, including forest and wildlife conservation (including wildfire recovery, wildlife conservation, and tracking climate change) and operations in support of public safety (including fire, accident, and disaster response). In addition, FAA proposes that, when operating in support of a government entity, the operator must coordinate and deconflict operations with the law enforcement or government emergency management agency responsible for the incident response in advance and throughout the duration of the operation.

Whereas permitted operations for civic interest are limited to fewer than 25 active aircraft, FAA proposes that operations conducted under a civic interest operating certificate would not be limited to a specific number of UA. Management oversight of an operation would be accomplished through an operating certification process, which ensures continued FAA oversight and would reduce risk as the entire operation is under initial and continued scrutiny of FAA by virtue of the operating certificate.

As with permitted operations, FAA proposes in § 108.585(b) that civic interest operations must be conducted by an entity contracted to a Federal, State, local, Tribal, or territorial government to be considered civic interest. These operations would be civil operations, and would not fall under the public aircraft operations statute, as further discussed in section VIII.B.7.

To further mitigate the risk associated with operations with these larger UA, FAA proposes in § 108.585(c) that operations conducted with UA with a gross weight of more than 110 pounds would be limited to Category 4 population density areas or lower. Operations within a population density of greater than Category 4 greatly increases the risk to persons on the ground as the area of operation becomes more saturated with people. FAA does not anticipate a need for civic interest certificated operation with a UA weighing more than 110 pounds to occur within greater than Category 4 population densities. However, this requirement would be subject to relief per the Administrator's authorization, should an operator make a proposal that would provide sufficient assurance that these operations could be safely conducted over a higher population density. Operations of aircraft weighing 110 pounds or less could operate in any population density. Notwithstanding the population density restrictions of this section and proposed

§ 108.185, FAA would allow operations to be conducted over any population density to the extent necessary to safeguard lives in imminent threat. Given the potential nature of these types of operations, FAA believes that an incremental increase in ground risk would be justified in life-saving operations.

IX. Maintenance and Alterations (Subpart F)

A. Applicability

In subpart F, FAA proposes rules for the maintenance and alterations of UAS operating under this part. This covers the persons authorized to perform maintenance and alterations, the performance of maintenance on the UAS, life-limited parts, batteries, repairs and alterations, and operations after maintenance or alterations.

This FAA proposes to exclude from the applicability of this subpart the maintenance or alterations of automated data service provider equipment approved under part 146 of this chapter, the maintenance or alteration of a UA and its AE that is operated and maintained in accordance with parts 43 and 91 of this chapter, and the maintenance or alterations of AE not under the direct control of the operator.

B. Persons Authorized to Perform Maintenance (§ 108.605)

Part 107 does not prescribe any maintenance requirements; however, the operational framework for proposed part 108 is predicated on the reliability of the UAS. Moreover, UAS operating under this part would be more technologically complex than most UAS operating under part 107. Because proposed part 108 would be operationally expansive by allowing larger UA to operate BVLOS in the NAS, UA reliability is a paramount risk mitigation. Having a structured system of maintenance ensures that the UAS is maintained to a standard that enhances its reliable and safe operation.

Accordingly, as stated in proposed § 108.600(a), subpart F prescribes the maintenance and alterations requirements for UAS operating under part 108.

FAA recognizes that the UAS may include AE that are not under the direct control of the operator, and FAA does not intend to make operators responsible for the maintenance of those AE elements. It is anticipated that most, if not all, of the AE outside the control of the operator are likely under the control of an automated data service provider, who would be responsible for maintaining the AE they use to provide services under proposed part 146. In addition, there may be other AE not under the direct control of the operator that is not addressed in the manufacturer's maintenance instructions in proposed § 108.720, such as the infrastructure provided by a cellular company providing data connectivity to the aircraft in flight or network servers provided by an online hosting platform that is providing the flight control software platform. It would be unreasonable to leverage an additional maintenance requirement on the UA operator to maintain that equipment. Therefore, the proposed maintenance requirements do not include requirements for the operator to maintain AE not under the operator's direct control. Furthermore, the maintenance and alterations for UAS that are operated and maintained in accordance with parts 43 and 91 of this chapter would be governed under those rule parts, and the requirements of part 108 likewise would not apply.

C. Persons Performing Maintenance and Alterations (§ 108.605)

Similar to the approach for operations personnel, FAA is not proposing certification requirements for maintenance personnel for UAS operating under this part for numerous reasons. The lower risk nature of the operations, the variability of aircraft design and characteristics in the industry, the move to design that is more heavily dependent on automation and software programming, and the rapid change and innovation in this field would all make it difficult for FAA to create a one-size-fits-all knowledge and skills certification process for those performing maintenance and alterations on these UAS. Though this proposal would not require certification, FAA recognizes that properly trained and qualified personnel that perform maintenance and alterations are vital to ensuring the continued airworthiness of the aircraft. Therefore, in § 108.605, FAA proposes requiring the operator to ensure that personnel performing maintenance and alterations on the operator's UAS are qualified, through basic skills and knowledge obtained in accordance with the training requirements in § 108.315, to perform the assigned maintenance task or alteration using the manufacturer's maintenance instructions. In addition to being qualified, FAA proposes that the operator must also specifically authorize a person to perform the maintenance or alterations on the aircraft.

FAA considered creating a new type of repairman certificate specifically for UAS, but for the reasons stated above found that this would be unnecessary and impractical at this time. As discussed in section VII, FAA has determined that airman certification is not necessary for relevant personnel conducting operations under the provisions of part 108. As with the proposed personnel requirements, FAA proposes that responsibility for maintenance rests with the operator, which in most cases would be a company.

D. Unmanned Aircraft Maintenance (§ 108.610)

Under proposed § 108.610(a), the operator must ensure its employees who perform maintenance on a UAS use the methods, techniques, and practices prescribed in the UAS manufacturer's maintenance instructions that are required by § 108.720(a). Further, the operator is obligated to ensure the UAS is in a condition for safe operation. In addition, as stated in proposed § 108.610(b), the operator would need to inspect the UAS in accordance with the manufacturer's inspection criteria found in the manufacturer's instructions.

The person performing maintenance would be required to use the methods, techniques, and practices prescribed in the manufacturer's maintenance instructions provided at the time of purchase of the UAS by the operator. Though this rule would not require the person performing maintenance to hold a mechanic or repairman certificate, it is incumbent on the operator to ensure that maintenance occurs in a manner that keeps the UAS in a condition for safe operation under part 108.

The operator must also have the UAS inspected according to the requirements in the maintenance instructions. Improperly performed maintenance or lack of inspections at the required intervals could result in loss of control and a subsequent crash of the UA.

FAA has long relied on maintenance providers' compliance with the information provided by the aircraft manufacturer to ensure aircraft remain in a condition for safe operation. For UAS operated under this part, FAA similarly expects maintenance requirements would be prescribed by the manufacturer in the maintenance instructions required by § 108.720(a). The UAS manufacturer is in the best position to know how to service and maintain the UA and its directly associated AE. In addition, under proposed § 108.40 and § 108.45, FAA would prescribe standards for maintenance record keeping and service difficulty and interruption reporting. The purpose of maintenance is to ensure continued safe operation by systematically inspecting the UAS for damage and deterioration; inspecting or replacing, as required, flight essential parts; and testing its system for proper operation. These maintenance functions have been shown to enhance the reliability of aircraft in other forms of aviation.

The BVLOS ARC final report stated that "risk is mitigated when the UAS configuration matches the original design (or as revised) and when required actions (inspections, replacements, and repairs) have been accomplished." In line with this ARC statement, FAA proposes to require in § 108.720(a)(2) that manufacturers develop operating and maintenance instructions that include identification of flight essential parts and their associated inspection criteria or life limits. It is important that the maintenance instructions include the inspection criteria to ensure the operator proactively finds wear or damage, and repairs or replaces the part before a failure can occur. Further, the maintenance instructions must include life limits for parts so that a part can be proactively replaced before it becomes worn or damaged and a failure can occur. Timely inspection or replacement of flight essential parts will further enhance reliability and mitigate risk. Under proposed § 108.610(b), operators would be required to follow the manufacturer's inspection criteria.

In addition, under proposed § 108.610(c), each operator of a UAS would be required to have all inoperative equipment and items not in a condition for safe operation repaired as prescribed in the manufacturer's maintenance instructions prior to operating the aircraft. Safety is predicated on all equipment functioning as designed. Operators certificated under the more stringent requirements of proposed subpart E would have more robust FAA oversight and certification and be able to operate with some inoperative equipment per proposed § 108.555, as discussed in section VIII.C.6 of this preamble.

E. Life-Limited Parts (§ 108.615)

Identifying, tracking, replacing, and disposing of life-limited parts once they have reached their service life limit is a cornerstone of safety in aviation and is just as crucial for UAS. FAA proposes in § 108.615 that an operator cannot operate a UA with parts that have exceeded their life limit. Further, in order to operate a UA, the operator must track the status of life-limited parts and replace them at any manufacturer-determined interval. An operator will be expected to comply with replacement intervals to ensure that the UA stays in a condition for safe operation.

As with other forms of aviation, once a life-limited part has reached the end of its life cycle, it must be properly dispositioned to ensure that it will not be reintroduced into service. This replacement and disposition process would require the operator to track the status of each life-limited part installed on the UA to ensure that the life cycle of the part is not exceeded, as stated in proposed § 108.615(b). Any tracking would need to uniquely identify the part and its removals and reinstallations. This proposal would further require the part to be dispositioned in a manner in which its status is clear to anyone who may come into possession of the part. This could be accomplished in several ways as provided in § 108.615(c), including: a method that uniquely identifies the part and its status, such as a tag, record, document, or other marking, made or attached to the life-limited part; physically separating the part from good parts; or even mutilating or destroying the part to prevent its reinstallation onto another aircraft. Tracking the status of life-limited parts is essential to ensure compliance with the replacement intervals of life-limited parts and preventing possible catastrophic failures by use of a part outside of its life limit. For the same reasons, if the part is sold, transferred, or given to someone else, the life-limited parts status must be clearly identified as described in proposed § 108.615(d).

F. Unmanned Aircraft Batteries (§ 108.620)

Many UA use batteries as a primary power source and do not have onboard generators to recharge the batteries in-flight. While this is starting to emerge in manned aviation as well, use of batteries as a primary power source is much more prevalent in the UAS industry. Most UA do not have any backup or reserve power source should the batteries fail. This poses some unique considerations about needing to ensure the health and status of the batteries.

Battery-powered UA often use lithium batteries as an inflight power source. Lithium batteries have a greater risk of fire and swelling than other technologies due to their internal chemistry. Operating a lithium battery at or beyond its limits can lead to greater internal resistance, which can lead to more heat, resulting in a thermal runaway cycle with increasing temperature escalation. As lithium batteries age, their energy capacity and ability to deliver power decreases with time and usage. Per proposed § 108.620, operators would be required to implement a battery monitoring program to ensure that each battery's state of health (SOH) is not compromised. Operators would benefit from having an SOH battery monitoring program because the program would lead to removing compromised batteries from service before failure while maximizing the service life of the batteries.

Proposed paragraph (b) would require that operators remove from service any batteries that experience significant degradation or inadequate levels of performance to prevent any safety of flight issues. Batteries that are significantly degraded or depicting inadequate levels of performance may significantly reduce the UA's range and ability to perform emergency actions. Operators unable to conduct a flight to a safe landing location due to a depleted battery that is degraded or not adequately performing would not be in compliance with this section. It is the operator's responsibility to determine at what point the battery meets these criteria and remove the battery from service prior to creating a safety of flight issue. Most charging systems for batteries have built-in monitoring that provide this functionality automatically, so FAA does not anticipate that this will be a heavy burden to implement.

G. Repairs and Alterations (§ 108.625)

Unlike other forms of aviation, FAA is proposing that part 108 repair and alteration data be authorized only by the manufacturer. Under proposed §§ 108.740 and 108.750, the manufacturer is responsible to maintain the continued operational safety for the products they produce and must have access to the design data for any repairs and alterations made to the UA to ensure that aircraft design integrity remains in compliance to the standards. Further, as required in § 108.755, the manufacturer of the UAS that has received airworthiness acceptance must authorize any repair or alteration. As recommended by the BVLOS ARC, this approach mitigates risk by ensuring the UAS remains in a configuration that meets the original or revised design requirements. For this concept to work, an operator that wants to perform a repair or alteration to the aircraft must either reference standard information already provided by the manufacturer in the maintenance instructions or ask the manufacturer to provide or approve repair data for the specific repair or alteration. An operator could develop their own repair or alteration, but the operator would need to have the manufacturer review the data and determine that the aircraft would remain in compliance with subparts G and H.

Software updates to UA, whether individual aircraft or an entire fleet, are also considered alterations. Under this proposed construct, it is the manufacturer's responsibility to ensure the software updates have been thoroughly tested and maintain the aircraft's COS as described in section X.K. This does not include configuring user-interface items or end-user flight parameters per the software provided by the manufacturer. Proper configuration and setup are still the responsibility of the UA operator.

It is important to note that, consistent with the definition of "maintenance" in 14 CFR § 1.1, under proposed § 108.625(b) the simple replacement of parts or assemblies with identical, or alternative parts or assemblies identified by the manufacturer, is not considered a repair or alteration. As such, the requirements of proposed § 108.625 would not apply.

H. Operations after Maintenance (§ 108.630)

As with other forms of aviation, FAA is proposing in § 108.630(a) that, after any maintenance or alteration, an operator can only operate the UAS after that UAS is approved for return to service by a person that the operator has authorized. In addition, the operator must ensure the record of the maintenance actions as provided for in § 108.40 is completed prior to operation of the UAS, as further detailed in section V.

Further, when a maintenance or alteration action has been accomplished that may have appreciably affected the flight characteristics or substantially affected the safe operation of a UAS, paragraph (b) proposes that an operational check of the UAS would need to be conducted prior to operation. The operational check could include power-on systems based self-checks, ground-based checks, short takeoff and hover checks, or full flight checks, depending on the nature of the repair or alteration and the assurance needed to ensure the repair or alteration was completed satisfactorily. Under proposed paragraph § 108.630(c), where the operational check would include a flight, it must not be conducted over people or moving vehicles. This helps to mitigate risk to persons and property should anything go wrong during the flight. These return-to-service operational checks would be conducted under the operator's existing permit or certificate.

X. Procedures for Unmanned Aircraft System Airworthiness (Subpart G)

A. Unmanned Aircraft System Airworthiness

FAA proposes a regulatory framework for determining the airworthiness of unmanned aircraft for proposed part 108 operations. There is a need to establish a new risk-based airworthiness process for UAS intended to be operated BVLOS under proposed part 108. Under this new process, called airworthiness acceptance, the UAS would meet performance-based design, production, and airworthiness requirements by using a means of compliance (MOC) that would consist of consensus standards accepted or approved by FAA and would show it is in a condition for safe operation. To receive airworthiness acceptance under proposed part 108 airworthiness framework, FAA would require a manufacturer to submit a DOC that its UAS design conforms to the design, test, production, and airworthiness requirements of subparts G and H of part 108 and is in a condition for safe operation. An operator would only be authorized to use a UAS that has an airworthiness acceptance.

FAA considered the safety continuum when developing requirements associated with an airworthiness acceptance. The safety continuum is one way FAA established the appropriate level of safety based on risk presented by the aircraft and its operational profile. The proposed requirements for part 108 are intended to balance the needs of the flying public, manufacturers, and operators with the societal expectation of safety.

FAA considered utilizing part 107 for these operations but found it to be insufficient due to the lack of mitigations to ensure the safety of routine BVLOS operations and only addressing small UAS. Part 107 does not have regulatory requirements that ensure the airworthiness of the UA. Unlike part 107, which only allows limited BVLOS operations under the terms of a waiver with substantial operating limitations, 108 allows for routine BVLOS operations over populations of persons on the ground without the use of visual observers or waivers. Airworthiness of the UA becomes a factor in assuring the safety of those on the ground. Consequently, FAA considers the level of FAA oversight and FAA scrutiny of part 107 UAS to be insufficient for the scope and risk of part 108 operations. Therefore, FAA proposes an airworthiness acceptance process to help mitigate that risk with UAS design standards.

FAA considered the BVLOS ARC's recommendation to develop an airworthiness framework for UAS that closely resembles special airworthiness certification of light-sport category aircraft under part 21 using industry consensus standards. In their final report, the UAS BVLOS ARC recommended FAA create a new process for qualification of UA with a mass and speed of up to 800,000 ft-lb of kinetic energy, which is representative of the existing light sport aircraft category, considering maximum weight and airspeed limits. Existing light sport aircraft have an upper weigh limit of

1,320 pounds (600 kilograms), which is approximately 800,000 ft-lbs. of kinetic energy when flying at their maximum speed of 120 knots. At an equivalent weight, light sport aircraft pose a higher risk based solely on the fact that people are always on board and any loss of control event may result in at least one fatality, regardless of what is below the aircraft. This contrasts with part 108 where a loss of control event may result in a fatality on the ground but is mitigated by operating limitations tied to population density of the overflown area and airworthiness requirements. Further, under proposed part 108, larger UA would have different operating limitations than smaller UA. Though FAA used the BVLOS ARC recommendations in developing a maximum weight for UA operating under part 108, design and operation limits were set in such a way that they are appropriate for the qualitative risk for UAS under the proposed rule as compared to that of existing light sport category aircraft. Further discussion on maximum size, weight, and speed can be found in section XI.B.

Based on the ARC's recommendations, FAA considered creating a new UAS SAC for proposed part 108 operations, which would have consisted of two categories based on the risks associated with the operating environment and the mass and speed of the UA, one for small UA (Category 1), and one for UA weighing not greater than 1,320 pounds (Category 2). By creating two categories, FAA would have established a process for issuing SACs to UAS based on existing part 21 procedures to enable BVLOS operations under part 108, depending on the operators' CONOPS. This approach would have created a means to differentiate the eligibility of classes of aircraft based on the risk posed by these operations, such as whether the UA will be operated over people or the size of the UA. The SAC process would require a higher level of initial FAA oversight than would be necessary for part 108, because it would require FAA to conduct an airworthiness inspection of each UAS produced. As discussed earlier, there are no crew members or passengers on board, and ground risk is mitigated, in part, by operating limitations tied to population density of the overflown area. The proposed airworthiness acceptance would appropriately mitigate ground risk associated with a UA failing in flight by imposing performance-based design standards that would increase the reliability of a UAS eligible to operate under part 108. Therefore, FAA considers that the level of FAA oversight and FAA scrutiny for a special airworthiness certification may not be necessary for the scope and risk of part 108 operations.

The proposed airworthiness regulations under part 108 aim to prevent loss of flight or loss of control incidents stemming from factors such as structural integrity, software and hardware functionality, performance attributes, and operational factors. The proposed design and performance standards would require the UAS to withstand all expected flight and ground loads during its operations without compromising the UAS's safe operation.

Implementing design and manufacturing processes to consensus standards in the development and production of UAS systems and components is necessary to minimize the likelihood of loss of UA performance or critical functionality. Accordingly, the UAS's design and manufacture under this proposal is intended to appropriately address these risks.

FAA therefore proposes utilizing an airworthiness acceptance process, adding subparts G and H of part 108, specifying the requirements for design, performance, testing, production, and FAA acceptance of part 108 UAS.

B. Associated Elements (§ 108.5)

To further enhance safety and operational efficiency within the NAS, FAA proposes regulating UA's AE along with the UA itself as part of the airworthiness acceptance process. AE plays a critical role in UAS operations. FAA proposes defining AE, in § 108.5, as those elements that are not directly affixed to a UA and are necessary to interact with the UA for safe flight during all normal, abnormal, or emergency flight operations.

AE is a widely used term and encompasses a wide range of components, such as ground control station, pilot interface equipment, Fleet Management systems, and cloud-based computing solutions. It also includes C2 links, which cover direct radio as well as internet and cellular/satellite communications. Equipment for launch and recovery, ground-based radars and radios, and third-party services such as weather and weather monitoring are also considered AE. Third-party services may also need to comply with proposed part 146. Depending on the level of interaction with the UAS, additional equipment such as battery chargers, landing pads, markers, and specialized containers or "hangar boxes" for data transfer and software updates may qualify as well.

Section 108.880 addresses the proposed AE design and performance requirements. The specific requirements of this section will be discussed in section XI.Q. As proposed in § 108.720, the manufacturer would be required to provide a list of all acceptable configurations of UA and AE, which would allow operators and regulators to identify the requirements and standards necessary for each component, reduce the likelihood of system failures, and improve the overall safety of UAS operations.

C. Applying for a Part 108 Airworthiness Acceptance

For purposes of the proposed part 108 airworthiness acceptance framework, the manufacturer would include any person or entity who is taking responsibility for the final design and production of the UAS. "Manufacturer" as the term is used in this proposed rule would encompass both the producers of UAS and the integrators who combine various parts, assemblies, or materials, regardless of whether these are sourced domestically or internationally. For part 108 purposes, manufacturers would include integrators and any person or entity responsible for ensuring compliance to the standards of subparts G and H of part 108. It would be their responsibility to demonstrate that every material, part, component, assembly, or system within a UAS meets the standards of subparts G and H, regardless of whether they were produced in-house or supplied by a third party.

1. Eligibility for Airworthiness Acceptance (§ 108.700)

Section 108.700(b) proposes eligibility requirements for airworthiness acceptance. All manufacturers would be required to meet the eligibility requirements prior to submitting a DOC. Proposed § 108.700(b)(1) states that for the manufacturer to be eligible to apply for a UAS airworthiness acceptance, the UAS must be manufactured in the U.S., or be manufactured in a country with a Bilateral Airworthiness Agreement addressing UAS or a Bilateral Aviation Safety Agreement with associated Implementation Procedures for Airworthiness addressing UAS; or an equivalent airworthiness agreement. As discussed in section X.L, FAA would retain oversight authority under part 108 through audits and inspections. Without the UAS being manufactured in the U.S. (barring instances where there are agreements with foreign entities), FAA cannot efficiently fulfill its oversight responsibilities, as access may be withheld or limited. Appropriate oversight is necessary to ensure the safety of the NAS.

FAA is also considering leveraging its broad statutory authority to ensure the safety of the NAS to specifically regulate the operation of foreign-manufactured UAS looking to operate in the NAS. FAA is asking for specific public comment on whether there should be any particular manufacturing restrictions on foreign manufacturers intending to manufacture UAS under this rule, such as manufacturing outsourced by a foreign manufacturer to a U.S. manufacturer or a U.S. manufacturer's production of a UAS using foreign designs or parts from a covered country. FAA is also asking for comment on whether there should be any particular restrictions on the operation of foreign-manufactured UAS by private entities beyond those already provided in law. If there should be restrictions on the foreign-manufacture or design of UAS, or on the operation of foreign-manufactured UAS, please provide suggestions for implementing the restrictions. Also, what security risks do foreign-manufactured UAS present to U.S. national interests when operated in the NAS.

FAA would rely on a manufacturer's airworthiness DOC as evidence of compliance with the requirements of subparts G and H, therefore the manufacturer's authorized representative or agent must have knowledge of the requirements and what the attestations in the DOC mean. Under proposed § 108.700(b)(2), any authorized representative or agent, who is responsible for signing and certifying the statements in the DOC, of the manufacturer would be required to be trained and certified to make the declaration. FAA expects industry to develop and implement training and certification to enable manufacturers to fully understand FAA regulatory requirements and policies applicable to airworthiness acceptance of UAS and the means necessary to meet applicable requirements. Proposed § 108.700(b)(2) would require fulfillment of this training to be eligible to submit a DOC. Further, training must be conducted by an organization that trains and certifies quality assurance staff in accordance with FAA-accepted consensus standards. To demonstrate completion of a training program for manufacturers and manufacturer's authorized representatives or agents who sign declarations of compliance, FAA would expect the training providers to issue a certificate of completion as evidence of compliance with part 108.

2. Submitting a Declaration of Compliance (§§ 108.710)

Section 108.710(a) proposes that a manufacturer requesting airworthiness acceptance would be required to submit a DOC that meets the requirements of § 108.715. The DOC is an application for airworthiness acceptance and a means to attest to FAA that the manufacturer has demonstrated compliance with all UAS design, production, test, and airworthiness requirements of part 108 using FAA-accepted or approved MOC. A manufacturer's submission of a DOC would be necessary to obtain airworthiness acceptance by FAA for the specific UAS make, model, series and serial number listed on the DOC. This would mean that each UA would need to obtain airworthiness acceptance.

The manufacturer would do this by submitting a DOC via an electronic form available on FAA's website. Recognizing that multiple identical UA will be manufactured in a single production run, FAA proposes to provide manufacturers with the ability to efficiently submit DOC documentation for up to 500 UA at once through an online portal; paper applications would not be accepted. A web-based tool would be the only method available for applying for airworthiness acceptance. The web-based tool would securely transmit the completed application and related documents, if required, to the appropriate FAA office for processing. FAA acceptance of a manufacturer's DOC establishes airworthiness acceptance, which is necessary for eligibility to obtain an operations permit or certificate to conduct operations under part 108. FAA would accept the manufacturer's DOC as an attestation that compliance to the applicable requirements has been shown. If additional information is required, the proposed record retention requirements of § 108.760 require manufacturers to make available any supporting information used to demonstrate compliance, which may include information supporting compliance with the requirements of subparts G and H, upon request by FAA. This would include a manufacturer's technical data substantiating compliance for FAA review.

D. Means of Compliance (§§ 108.705 and 108.710)

Proposed § 108.710(b) requires a manufacturer seeking airworthiness acceptance for a UAS to comply with subparts G and H of part 108 using a MOC, consisting of voluntary consensus standards, that would be accepted or approved by FAA. FAA uses the term "MOC" to refer to the means the manufacturer uses to show that its UAS is designed, produced, and tested to conduct the manufacturer designated operation(s) under part 108.

Rather than using prescriptive requirements, FAA proposes manufacturers use voluntary consensus standards as an MOC to meet performance based UAS design test, production and airworthiness requirements of subparts G and H.[132]

---

[132] FAA Order 8000.376, *Development and Use of Voluntary Consensus Standards* (Mar. 4, 2024).

An accepted MOC would provide an acceptable manner by which a UAS manufacturer can comply with specific provisions of part 108, subparts G and H, with the exception of noise requirements. An accepted MOC is reviewed by FAA, no objections are found, and its use is communicated to the public. An approved MOC would provide an acceptable manner by which a UAS manufacturer would comply with part 36 noise requirements. FAA approves, rather than accepts, an MOC for part 36 noise requirements to maintain consistency with FAA's practices used in noise certification for other aircraft, including FAA's approvals of equivalent noise testing procedures. FAA's approval of noise standards is necessary to verify that the standard meets FAA's obligations pursuant to 49 U.S.C. 44715 to limit aircraft noise.

Similarly, FAA's acceptance of voluntary consensus standards for design and production requirements allows FAA to determine if the standard meets the applicable requirements of subparts G or H. Using voluntary consensus standards accepted or approved by FAA would be the only means to show compliance to the requirements of subparts G and H, except for the noise and cybersecurity carve outs mentioned in section X.E of this preamble. Voluntary consensus standards are developed by industry organizations, in meetings open to all interested parties, and often with input from FAA. The standards produced by consensus standards bodies therefore are based on input from a broad range of perspectives.

FAA intends for industry to develop consensus standards that serve as the MOC for the specified UAS design, test, production, and airworthiness requirements to obtain airworthiness acceptance. To propose a consensus standard as an MOC to the requirements of subparts G and H of part 108, proposed § 108.705(a)(1) allows a voluntary consensus standards body to submit a voluntary consensus standard to FAA for acceptance as a means of compliance for satisfying a requirement of subpart G or H of this part. This would be done in a manner acceptable to FAA. Once a consensus standard is submitted to FAA for acceptance, § 108.705(a)(2) proposes that, if FAA determines the applicant's proposed MOC satisfies the requirements of subparts G and H, FAA would notify the applicant it has accepted the MOC. To inform the public which MOCs are available to them for demonstrating compliance with the requirements of subparts G and H of part 108, § 108.705(a)(3) proposes FAA would publish a notice in the *Federal Register* announcing acceptance of the standard to the public as proposed or with modification. This notice would provide an opportunity to the public to comment on the specific details of the MOC and to propose alternatives or enhancements to the standard for FAA review and acceptance. If FAA receives comments on the MOC, FAA will adjudicate any comments received and publish a final notice of its acceptance of the MOC, with any accepted modifications. For purposes of compliance with part 36, voluntary consensus standards bodies may develop corresponding noise consensus standards. To increase the likelihood of FAA's approval of the noise consensus standards, voluntary consensus standards bodies are encouraged to seek FAA's feedback throughout the standards development process. The process for submitting an MOC to FAA and notifying the voluntary consensus standards body for noise would parallel the general process for submitting a MOC for § 108.705, in a manner acceptable to FAA. To inform the public which MOCs are available to them for demonstrating compliance with the noise requirements, § 108.705(b)(3) proposes FAA would publish a notice of availability in the *Federal Register* announcing approval to the public and will make the noise consensus standards available on FAA.gov.

FAA's review and acceptance or approval process of an MOC is not intended to restrict industry's ability to develop consensus standards, but rather enables FAA to confirm that an industry-developed consensus standard for UAS design, operation, production, maintenance, or airworthiness complies with the proposed performance-based regulatory requirements of subparts G and H. Further, FAA seeks input on whether FAA should develop MOCs that could be used in lieu of consensus standards developed by voluntary consensus standards bodies.

E. Compliance with Design, Test, Production, Noise, and Airworthiness Requirements (§ 108.710)

Determining compliance with consensus standards is essential to enable airworthiness acceptance of a UAS for operations under part 108. Accordingly, FAA is proposing in § 108.710 that the UAS would need to be designed, tested, and produced to the requirements in subparts G and H, and this compliance must be determined by individuals who have been appropriately trained in making those determinations.

Section 108.710(b) proposes that a manufacturer would need to have a UAS that meets the design, test, production, and airworthiness requirements specified in subparts G and H using MOC approved or accepted by FAA. For the design, testing, production, and airworthiness requirements, these MOC would be voluntary consensus standards accepted by FAA. Manufacturers demonstrating compliance with part 36 would use either an FAA-approved noise consensus standard or other methods listed in proposed § 36.0. In addition, manufacturers would comply with cybersecurity requirements by using an FAA-accepted standard, which would not be required to be submitted by a voluntary consensus standard body. FAA would approve industry standards for compliance with part 36 noise requirements. However, FAA would accept industry standards for the remaining airworthiness requirements of this rule. Consensus standards must either be accepted or approved by FAA to be used as an MOC under the proposed rule. This is further explained in section X.E of this preamble.

A manufacturer would only submit an airworthiness DOC for FAA acceptance after the manufacturer has ensured their UAS meets all applicable part 108 requirements. The DOC requirement is intended to ensure that a UAS entering the airspace has met applicable airworthiness standards and that the manufacturer would be able to provide the necessary support for the UAS.

This proposal would further require development of training to enable the manufacturer to fully understand the regulatory requirements and policies applicable to the airworthiness acceptance of part 108 UA and the means necessary to meet applicable requirements. In view of the criticality of this need and FAA's primary reliance on the manufacturer's DOC, § 108.710(c) proposes that only individuals who have been trained on determining compliance with the applicable FAA-accepted or approved consensus standards would be able to make the determination that the UAS meets those consensus standards and therefore the requirements of proposed part 108. This proposed requirement emphasizes the necessity for individuals involved in determining compliance with design, test, production, and airworthiness requirements, such as engineers, quality assurance professionals, and maintenance experts tasked with making compliance findings, to undergo training. The training required for § 108.710(c) is different than what was discussed earlier in § 108.700(b). The training in proposed § 108.700(b) is meant for the individual signing the DOC so they understand the DOC process and the responsibilities included with submitting a DOC. In contrast, the training in § 108.710(c) would include a comprehensive explanation of the specific requirements of applicable consensus standards, and methodologies for accurately assessing compliance with these standards. FAA considers that training would reduce the number of inaccurate DOCs submitted. Without full knowledge and awareness of the specific requirements of subparts G and H and the MOC with these requirements, a manufacturer's agent or representative would not be able to ensure the accuracy of a DOC. FAA proposes training to ensure UAS manufacturers and those individuals determining compliance with design, testing and production requirements are fully aware of the regulatory requirements and methods of compliance increasing the integrity of the DOC system.

F. Declaration of Compliance (§ 108.715)

The DOC serves as the manufacturer's attestation that the UAS complies with the applicable requirements through use of FAA-accepted or approved MOCs. FAA proposes in § 108.715(a) to require a manufacturer submit a DOC for acceptance by FAA in a form or manner acceptable to FAA. The DOC would require the manufacturer to identify the specific UAS, designate the operation the UAS is designed to conduct, attest that the required documentation exists, demonstrate accountability, and declare compliance.

Proposed § 108.715(b)(7) through (16) would require the manufacturer to attest to the applicable compliance requirements of subparts G and H and part 89 (Remote Identification of UA). Proposed §§ 108.715(b)(1) through (6), 108.715(b)(10), and (14) are discussed below. The specific compliance requirements for paragraphs (7) through

(9), (11) through (13), (15), and (16) is explained more fully in section V of this preamble. FAA considers these attestations to be foundational for submission of a DOC for airworthiness acceptance.

1. Identification

Per proposed § 108.715(b)(1), a manufacturer would provide their name and contact information on the DOC. This contact information would include physical address, telephone, and email address and would ensure that FAA knows who the responsible entity is and how to contact them in case a noncompliance or a safety issue arises that requires FAA to visit the manufacturer or the manufacturer's facility to resolve the issue.

2. Make/Model/Series/Serial Number

Per proposed § 108.715(b)(2), the DOC would identify the UAS by make, model, series, serial number, and date of manufacture to ensure the appropriate configuration is declared compliant and tracked by the manufacturer. The UA serial number must be compliant with the Remote Identification of Unmanned Aircraft, Design and Production serial number requirements of § 89.505. Maintaining a consistent UAS make, model, and serial number configuration from flight test through production is necessary to ensure the UAS on the DOC complies with the requirements of subparts G and H of part 108. Operators would also benefit from knowing which specific UAS make, model, series, and serial number have received airworthiness acceptance, which is necessary for obtaining an operating permit or certificate.

3. Designated Operation

Section 108.715(b)(3) proposes that manufacturers seeking airworthiness acceptance for their UAS would need to designate any part 108 operational purpose the UAS is designed to conduct. The operational purpose should be stated in the UAS operating instructions as required by § 108.720(a)(1). The manufacturer is in the best position to determine if the UA has sufficient structural integrity, performance, and capability to conduct any permitted or certificated operations of § 108.400 and § 108.500. This proposed requirement is necessary to ensure UAS designated to conduct part 108 operations are designed and constructed to the appropriate consensus standards. Failure to establish and validate adequate material strength, UA performance, and design properties to accommodate a designated operation could cause loss of functionality or structural failure resulting in loss of aircraft control.

4. Consensus Standards

As stated in section X.E of this preamble, the MOC to the specified UAS design, production, and airworthiness requirements are industry consensus standards accepted or approved by FAA. Proposed § 108.715(b)(4) through (6) would require the manufacturer to specify FAA-accepted or approved consensus standards or cybersecurity standard used to determine compliance on their DOC. FAA must understand which requirements the UAS was manufactured under to address any noncompliance or safety issue that may arise. Further, as proposed in § 108.745, FAA retains authority to conduct a review of the manufacturer's technical data substantiating compliance. Having a listing of FAA-accepted or approved consensus standards used to design, test, and produce the UAS will ensure application of the appropriate standards.

5. Documents

To ensure UAS are operated and maintained appropriately and are in the proper configuration, manufacturers of UAS would be required to declare in § 108.715(b)(10) they will, upon request, make available to any registered owner, the NTSB, or FAA the documents specified in § 108.720. Proposed § 108.720 would require the manufacturer to prepare operating instructions, maintenance instructions, and a configuration control document and make them available to registered owners, NTSB, and FAA upon request. FAA intends for industry to develop consensus standards acceptable to FAA to serve as a MOC to these document requirements. The specifics of these documents and who they are made available to are described further in section X.G of this preamble.

6. Regulator Access

Proposed § 108.715(b)(14) requires manufacturers to state in their DOC that, at the request of FAA, they will provide unrestricted access to their facilities, to all data, documentation, and allow FAA to witness any tests necessary to determine compliance with § 108.715 or other applicable requirements of chapter I of title 14, or other information as requested by FAA. The DOC, when signed by the UA's manufacturer, would provide consent to FAA inspection of its facilities, and constitutes an assertion that the information contained in the document is true. To fulfill its oversight responsibilities, FAA may require access to a manufacturer's facilities or any data for the purpose of auditing compliance with applicable standards. This access enables FAA to take those actions necessary to verify unsafe conditions have been properly addressed or respond to a UA accident or incident. The affirmative requirements are proposed in § 108.745. These requirements are more fully described in section X.L of this preamble regarding inspections and audits.

7. Accountability for Persons Submitting Declarations of Compliance

Given the criticality of a manufacturer's DOC in obtaining airworthiness acceptance, FAA is proposing requirements that individuals making compliance declarations are trained in the use of consensus standards. Proposed § 108.715(c) would require the DOC to be signed by the manufacturer's authorized representative or agent who is certified and trained on the requirements associated with the issuance of a DOC by an organization that trains and certifies quality assurance staff in accordance with a consensus standard that has been accepted by FAA.

This proposal would require development of training to enable the manufacturer to fully understand the regulatory requirements and policies applicable to the airworthiness acceptance of part 108 UA and the means necessary to meet applicable requirements. A manufacturer meeting the training and certification requirements of proposed § 108.700(b)(2) for eligibility to submit an airworthiness DOC would satisfy the requirements of proposed § 108.715(c). By requiring these parties to be appropriately trained, the airworthiness acceptance process can ensure integrity in its risk-based approach. These proposed training and certification requirements of § 108.715(c) would be necessary for manufacturers to create a DOC account and submit declarations of compliance for the specific UAS make, model, and serial number.

Section 108.715(d) proposes that, if the manufacturer has demonstrated compliance with the testing requirements and other requirements of subpart G of part 108, FAA will accept the DOC and notify the manufacturer that FAA has accepted their DOC. FAA acceptance of a manufacturer's DOC means the UAS has received airworthiness acceptance. Unlike airworthiness certificates issued by FAA under 14 CFR part 21, FAA will not be issuing paper documentation to accept the airworthiness of the UAS. FAA will utilize electronic means to convey acceptance to the manufacturer. Once accepted, FAA will make details of the UAS with airworthiness acceptance available on its website to aid operators in selecting UAS with FAA airworthiness acceptance. This information would be useful to operators who wish to conduct BVLOS operations under proposed part 108 operating requirements. UAS with airworthiness acceptance would be eligible for part 108 operations either under a permit or certificate.

G. Required Documents for Airworthiness Acceptance (§ 108.720)

To ensure that operations supervisors, flight coordinators, maintenance personnel, and other interested parties have the necessary information to conduct UAS BVLOS operations in the airspace safely, § 108.720 proposes that manufacturers seeking airworthiness acceptance would be required to prepare a series of documents. Under this proposal, FAA would require operating instructions (proposed § 108.720(a)(1)), maintenance instructions (proposed § 108.720(a)(2)), and a configuration control document (proposed § 108.720(a)(3)) for each UAS. FAA expects industry consensus standards bodies to propose standards as the MOC for the development of these documents. In addition, § 108.720(b) proposes that manufacturers would need to make these documents available to any registered owner, the NTSB, or FAA upon request for any UAS with an airworthiness acceptance. The detailed requirements for these documents are described below.

Proposed § 108.720(a)(1) would require manufacturers to prepare operating instructions for each UAS when submitting a DOC for FAA airworthiness acceptance. Under proposed § 108.720(a)(1)(i), operating instructions would contain procedures and limitations to accommodate all operating conditions likely to be encountered in the UAS's intended operations, including normal, abnormal, and emergency procedures. FAA expects these operating limitations would address certain weather phenomena such as freezing precipitation, takeoff, or landing crosswind limits, hot or cold weather procedures, and other conditions likely to be encountered during its intended operation. FAA also expects any controlled airspace limitations would be included. A UAS operated in environments beyond the limits of its design could lead to loss of control of the UA leading to an incident or accident. Operating instructions that include normal, abnormal, and emergency procedures would ensure the flight coordinator is informed on how to operate the UAS and knows the steps necessary to respond to changing conditions affecting the safe operation of the UAS, reducing the likelihood of human error. Instructions and limitations that apply to all operations using the UAS would not need to be repeated for designated part 108 operations.

Proposed § 108.720(a)(1)(ii) would require manufacturers to list all the manufacturer-designated operations, as defined in §§ 108.400 and 108.500, that may be safely conducted using the UAS, including all AE, in the operating instructions. This requirement would ensure that an operator knows which operations the UAS is designed for and that those operations can be conducted within the safe operating limitations of the UAS. This would inform operations supervisors and flight coordinators which operations are within the capabilities of the UAS.

Proposed § 108.720(a)(1)(iii) would require the manufacturer to designate the ratio of UA to flight coordinators that has been designed and validated during flight testing under subpart H of part 108. This allows the operations supervisor to know the maximum ratio of flight coordinator to number of aircraft which the UAS is designed to support. Operational limitations on operating permits and certificates may ultimately reduce this ratio but may not increase it. According to proposed § 108.210(a), the default operating limitation is an operator may only conduct operations at a UA-to-flight coordinator ratio of 1:1. An operator would need to seek a higher ratio, up to the maximum UA to flight coordinator ratio designated by the manufacturer in the operating instructions, during the permitting or certification process. Furthermore, an operator may only conduct operations at a UA-to-flight coordinator ratio equal to or less than what the manufacturer has specified in the operating instructions as proposed in § 108.210(c).

Proposed § 108.720(a)(1)(iv) states that the UAS operating instructions would need to include the following statement from the manufacturer: "No determination has been made by FAA whether the noise levels of this aircraft are or should be acceptable for operation in any location." This statement, consistent with the proposed revisions of § 36.1581, would provide operators with awareness that they are solely responsible for compliance with any operational noise abatement procedures and requirements for the locations where the UA is operated. Manufacturers would also be required to indicate in the operating instructions that the aircraft has demonstrated compliance with part 36 and provide the demonstrated noise levels of the aircraft. Both statements are consistent with the requirements in proposed § 36.1581(h).

Proposed § 108.720(a)(1)(v) states that the UAS operating instructions would need to include a list of the parts and installed equipment necessary for the operation of the aircraft, or a list of equipment that is allowed to be inoperative. This information is necessary to ensure operators comply with proposed § 108.555 and to keep operators informed about the operational status of their systems.

Proposed § 108.720(a)(2) would require the manufacturer to develop maintenance instructions that include procedures necessary to ensure continued safe operation of the UA and its AE, including, but not limited to, inspection criteria, repairs, and life limits. FAA expects manufacturers would develop maintenance instructions that detail the necessary steps to perform maintenance tasks, such as replacing a battery, or to inspect a propeller for damage or wear. Maintenance instructions may contain tasks and procedures to conduct maintenance, inspections, tests, and checks that includes various elements of the UA, such as the airframe, motor, propeller, rotor, systems, and AE as applicable. These procedures are necessary to ensure the continued safe operation of the UAS.

Established maintenance and inspection intervals or life limits would ensure no component, part, or system of the UAS is used beyond its established service life, reducing the likelihood of failure. Service life would be established based on demonstrated capabilities. Extending beyond defined service life could result in a loss of flight or unrecoverable loss of UA control. Examples of unrecoverable loss of UA control could include loss of control, flyaway, or inability to maintain safe distance.

Inspection criteria typically include a schedule for performing maintenance and inspections, expressed in time in service, calendar time, number of system operations, or any combination thereof. By incorporating these elements into the maintenance instructions, the manufacturer ensures the operator of the UAS is informed on maintenance actions necessary to ensure the continued safe operation and that components are properly maintained, inspected, and managed throughout the lifecycle of the UAS. This proactive approach to maintaining the UAS contributes to the overall safety and operational reliability of the UA, reducing the likelihood of accidents or incidents caused by component wear or failures.

While it is the manufacturer's responsibility to ensure all combinations of components of the UAS have been thoroughly evaluated to function together as a system, it is also the operator's responsibility to ensure that the chosen configuration of the aircraft conform to the configuration control document. By providing a configuration control document with the UAS, the manufacturer would identify all allowable configurations of the UAS. This information would ensure flight coordinators are operating a UAS in the proper configuration for a particular operational purpose. Therefore, to ensure flight coordinators are operating a UAS in the appropriate configuration for a given operational purpose, proposed § 108.720(a)(3) would require manufacturers to create a Configuration Control Document that defines all acceptable configurations of both the UA and its AE. To satisfy this requirement, FAA expects manufacturers to create and maintain a document defining all acceptable configurations of both the UA and the AE. This configuration control document should identify all hardware by part number, identify all software by version number, and define acceptable combinations if multiple options exist. Unevaluated and untested combinations of UAS components may introduce unexpected reliability or safety risks. Configuration control also would support COS objectives by allowing an expedited survey of the fleet to identify additional configurations which may demonstrate an unsafe condition. See section X.K of this preamble for further discussion regarding COS.

Proposed § 108.720(b) would require the operating instructions, maintenance instructions, and configuration control document to be made readily available by a manufacturer to any registered owner, the NTSB, or FAA, if requested. This requirement would ensure that operators have the information necessary to operate the UAS safely and perform any required maintenance. Further, the NTSB and FAA should have the ability to review these documents to ensure compliance of UAS and verify airworthiness acceptance, especially in the event of a safety incident or accident.

H. Flight Data and Data Reporting (§ 108.725)

Under this proposal, in § 108.725(a), manufacturers of the UAS that has received airworthiness acceptance would be required to develop and maintain a system dedicated to the collection of flight data across all models of UAS produced by that manufacturer. This system would actively capture and securely store flight information, encompassing, but not limited to the data required in § 108.45(a)(2) which would include make, model, series, serial number, flight duration, altitude, speed, location, and any incidents or anomalies recorded during flight operations. The implementation of such a data collection system would serve as a cornerstone for enhancing safety, facilitating detailed post-flight analyses, and fostering continuous improvement. Traditionally, these data collection systems are already voluntarily implemented within the industry to analyze flight data and identify safety issues during developmental testing and to conduct accident investigations. Many manufacturers collect and store the information FAA proposes, driven by a blend of internal performance monitoring and engineering practices. By requiring this practice, FAA proposal not only aligns with current industry standards but also ensures uniformity of data collection across all manufacturers.

Under proposed § 108.725(b), manufacturers of the UAS that has received airworthiness acceptance would be required to preserve records of flight data for a period no less than two (2) years subsequent to the data's acquisition. This retention policy would support investigations in the event of incidents or anomalies, ensuring regulatory compliance, and supporting the ongoing enhancement of safety protocols. While UAS might be operational for periods extending beyond two (2) years, FAA anticipates configuration adjustments, software updates, and system advancements will render data older than two years obsolete. These changes are likely to render historical flight data less reflective of the current state and capabilities of the fleet. Therefore, a two (2) year retention period is considered both practical and sufficient for maintaining relevant and actionable flight data records and balancing interests in data retention.

Section 108.725(c) proposes, to safeguard the privacy and security of flight data; manufacturers of the UAS that has received airworthiness acceptance would need to implement security measures. These measures would need to ensure the confidentiality and integrity of the collected data. The implementation of such security measures is essential for protecting sensitive information from unauthorized access or breaches. Any developed flight data standards would consider these security measures.

Manufacturers of the UAS that have received airworthiness acceptance would be required to grant FAA access to the collected flight data upon request under proposed § 108.725(d). This requirement would ensure that FAA has the necessary information to perform comprehensive safety analyses, engage in regulatory oversight, and respond promptly to concerns or inquiries. Section 108.725(d) also proposes the collected flight data would be provided to FAA in a manner acceptable to FAA. Providing access to data in a format compatible with FAA systems would streamline the process of data review and facilitates effective communication between manufacturers and FAA, contributing to the overall safety and efficiency of the national airspace. FAA expects to provide guidance on acceptable methods for providing data.

I. Quality Assurance System (§ 108.730)

Section 108.730 proposes the UAS would need to be designed, produced, and tested under a manufacturer-established and documented quality assurance system to ensure that each UAS produced conforms to its design and is in a condition for safe operation. Establishing and documenting a quality assurance system would ensure that UAS meet applicable design, production, and airworthiness requirements and are manufactured and tested in accordance with identified consensus standards in a consistent manner. Meeting the proposed quality assurance requirements, using applicable FAA-accepted consensus standards, would mitigate the likelihood of using obsolete design drawings or procedures, improper materials or manufacturing techniques, and inadequate testing procedures that could result in the UAS not conforming to its design and jeopardize the safe operation of the UAS. A well-documented quality assurance system would allow manufacturers or third-party auditors to verify that the UAS is produced in accordance with established procedures and suitable for operations in the NAS.

A single defect or error in production or maintenance can have significant consequences, including equipment failure, accidents, property damage, and even loss of life. A robust quality assurance program helps to identify and prevent potential issues before they occur. Such a quality assurance program could include regular inspections, testing, and monitoring of aircraft and components to ensure that they meet established quality and safety requirements of FAA-accepted consensus standards.

A quality assurance system should include items such as product configuration control, training, document control, change control, supplier control, and material control as well as inspections, audits, and identification and handling of nonconforming material. The quality assurance system could also include a quality assurance record, which is the permanent record of quality assurance for each UA produced by the UAS manufacturer. While retaining its ability to inspect the manufacturer's facility and quality assurance system under proposed § 108.745, FAA would rely on a manufacturer's DOC and the MOC cited within as primary evidence of compliance to the requirements of § 108.730 for a quality assurance system.

J. Production Acceptance (§ 108.735)

Prior to airworthiness acceptance and sale to an operator, the manufacturer must conduct a production acceptance inspection and perform testing for each UAS produced. Section 108.735(a) and (b) proposes each manufacturer inspect and test each UAS produced under manufacturer-established and documented production acceptance procedures to demonstrate the UAS has no hazardous operating characteristics or design features; and is in a condition for safe operation. Inspection and testing are essential in validating the UAS conformance to design standards. Performing inspection and testing under a documented production acceptance procedure would verify that each aircraft does not have any unforeseen hazardous flight characteristics and would ensure that the UAS was properly constructed. This inspection and testing would ensure no product is introduced into the NAS before all safety issues are thoroughly addressed, thereby preventing deployment of potentially unsafe systems. Further, this inspection and testing would ensure that the UA's structure is of sufficient strength for its intended operations and that the interface with its AE is performing as intended. FAA recognizes that flight testing every UA produced may not be necessary for every manufacturer and production system, therefore FAA invites comment on when a documented production acceptance procedure may allow for an evaluation that does not include flight test to ensure the aircraft is in a condition for safe operation.

Manufacturers would need to obtain an operating permit for flight testing purposes prior to conducting any production testing in the NAS, per proposed § 108.470.

As stated in proposed § 108.715(b)(3), the manufacturer designates in the airworthiness DOC the specific part 108 operations the UAS is designed to conduct. The production acceptance inspection and test procedures required by proposed § 108.735(c) would need to further demonstrate that the UAS has been designed and constructed to conduct any permitted or certificated operations of proposed §§ 108.400 and 108.500 that the manufacturer designates. Production acceptance inspection and testing would validate that each UAS is capable of safely conducting a manufacturer-designated part 108 operation.

As part of the proposed production acceptance procedure, the UAS manufacturer would conduct an inspection of the UAS to ensure that the UAS complies with the applicable standards and is in a condition for safe operation. A UAS that is not in a condition for safe operations would not be eligible for airworthiness acceptance.

The inspection would be conducted prior to submission of the airworthiness DOC, as required in § 108.715(b)(13). The goal of the inspection would be to identify issues of non-compliance that have the potential to affect the safe operation of the UAS prior to it being sold to an operator. To ensure the UAS complies with the applicable standards used to demonstrate compliance with subparts G and H of part 108, FAA would expect this inspection to include a review of the records and documents required for airworthiness acceptance.

FAA expects the inspection to include a review of the maintenance instructions, operating instructions, and configuration control documentation required in proposed § 108.720(a)(1) through (3) for completeness and accuracy. As part of this inspection, the manufacturer should verify that the maintenance inspection instructions are available for the UAS and that they apply to the make, model, series, and serial number of the UA being inspected. In addition, the manufacturer would confirm that the aircraft maintenance records show compliance with all applicable UAS manufacturer's safety bulletins at the time of declaration and a verification that the maintenance instructions include procedures for reporting in-service safety issues to support proposed § 108.740, as described in section X.H of this preamble, Flight Data and Data Reporting, in a manner acceptable to FAA. For a UAS that has a type-certificated product or article installed, the inspection would ensure any applicable Airworthiness Directives for that product or article are complied with by the UAS manufacturer before submitting an airworthiness DOC. Finally, the manufacturer would review the configuration control documentation to ensure the UAS's make, model and serial number conform to the manufacturer's approved configuration, as required by proposed § 108.720(a)(3).

FAA anticipates that industry would develop acceptable and appropriate consensus standards to comply with the performance-based requirements in proposed

§ 108.735. Production acceptance procedures would allow a UAS buyer to receive a complete UAS that conforms to the manufacturer's design data and would provide the manufacturer with an opportunity to detect and fix any missing, broken, misaligned, or improperly installed components or systems and would ensure all documents required by proposed § 108.720 are complete and accurate.

K. Continued Operational Safety Program (§ 108.740)

In the context of part 108, COS is an oversight program consisting of audits, evaluations, education, and accident/incident investigations, used to ensure UAS in-service continue to meet the safety requirements, standards, and regulations for airworthiness acceptance. A COS program is the method a manufacturer uses to support in-service safety following production acceptance and entry into service of a UAS.

FAA considers the implementation of a COS program by UAS manufacturers essential to maintaining the safety of part 108 UAS, the NAS, and people that may be impacted by UAS operations on the ground. Therefore, proposed § 108.715(b)(11) proposes that a manufacturer must declare that it will support the UAS by implementing and maintaining a documented COS program as required in proposed § 108.740.

Proposed § 108.740(a) requires the manufacturer to implement and maintain a documented COS program as declared in the DOC. This COS program would need to be in accordance with the specified FAA-accepted consensus standard.

Section 108.740(b) proposes that the COS program would need to address monitoring and resolution of in-service safety issues and identified non-compliance with subparts G and H of part 108. This must include provisions for the issuance of safety bulletins from the manufacturer to all owners and include a process for notifying FAA and all owners of the UA model at issue of safety issues and noncompliance, including their planned resolution. This must also include a process for providing advance notice to FAA and all owners of the UAS in question of a discontinuance or provider change of the COS program, which is essential for ensuring uninterrupted coverage for a manufacturer's fleet in service. FAA anticipates that the notification of safety issues to the owners could be achieved through means such as a manufacturer's website or through a product registration process with the manufacturer.

A well-documented COS program would be utilized by the manufacturer to effectively monitor and resolve in-service safety-of-flight issues. When such monitoring identifies a safety issue, manufacturers would be required to take appropriate action to resolve those issues, such as the issuance of safety bulletins to address unsafe conditions for their products.

Lastly, proposed § 108.740(c) would require manufacturers of the UAS that has received airworthiness acceptance to report any identified hazard involving their UAS models to FAA within 10 calendar days of the manufacturer becoming aware of the hazard. Such reports should include pertinent flight data to aid in the investigation and mitigation of potential safety risks, thereby enhancing the safety of UAS operations. While FAA is proposing that operators will be reporting incidents and accidents to the manufacturer, analysis of that flight data by a manufacturer may reveal previously unidentified hazards.

The combined requirements in proposed § 108.740 would facilitate communication of safety-of-flight issues to the community and would enable subsequent owners and operators to address safety-of-flight issues. Reporting safety-of-flight issues would also assist FAA in discovering product hazards, compliance issues, and identifying risks of injury. A manufacturer of the UAS that has received airworthiness acceptance reporting would be a timely and effective source of information because manufacturers often learn of potential product safety problems at an early stage of the product's life cycle. Following a discovery of noncompliance, FAA proposes in § 108.740(b)(3) the manufacturer of the UAS that has received airworthiness acceptance must develop a process for notifying FAA and all owners of all safety issues and noncompliance, including their planned resolution. The notification to FAA would describe the nature of the noncompliance and how the manufacturers of the UAS that has received airworthiness acceptance plans to address it.

Notification to owners of that UAS is a critical step in ensuring COS. Such notification could take the form of a notice on a manufacturer's website, electronic notification to owners who have registered the UAS with the manufacturer of the UAS that has received airworthiness acceptance, or an update to the software used for the UAS, which advises the operator of the change in status. Manufacturers should exercise diligence to ensure the intended audience receives communications involving any safety-of-flight issues that would impact the UA part 108 operations.

Routine BVLOS operations of UAS of various sizes and capabilities for various operational purposes are likely to reveal safety issues related to design, maintenance, and training that require resolution to ensure the safety of the NAS. Manufacturers supporting their UAS designs through implementation of a COS program are more likely to identify potential safety issues and implement effective strategies for resolving the safety issue before becoming prevalent throughout the fleet of UAS, increasing the overall safety of the NAS.

L. Inspections and Audits (§ 108.745)

While FAA would rely on a manufacturer's DOC as evidence of compliance to the design, production, test, and inspection requirements of subparts G and H of part 108, FAA proposes in § 108.745(a) that each manufacturer of the UAS that has received airworthiness acceptance must, upon request, allow FAA to inspect its facilities, technical data, reports, any manufactured UA in their possession, and any other necessary information to verify compliance with this subpart. While FAA will rely on the DOC, there may be circumstances, such as incidents or accidents, that warrant FAA to closely review the manufacturer's facilities or information. This access enables FAA to take the actions necessary to verify unsafe conditions have been properly addressed or respond to an accident or incident. In addition, this access enables FAA to ensure compliance with the part 108 airworthiness requirements.

Section 108.745(b) further proposes that any manufacturer of the UAS that has received airworthiness acceptance must allow FAA to witness tests to determine compliance with part 108. Due to the rapidly evolving nature of the UA industry, consensus standards may require new test methodologies. In an effort to verify that the methods of compliance (in this case, tests) meet the airworthiness requirements, FAA may require access to, among other things, witness these tests, evaluate their results, conduct oversight, and audit compliance with applicable standards.

Section 108.745(c) proposes that any manufacturer of the UAS that has received airworthiness acceptance must submit to independent inspections or audits by voluntary consensus standards bodies, or their delegates, who is standard the manufacturer used in submittal of the DOC, in accordance with an FAA-accepted MOC. Further, § 108.745(d) proposes that the manufacturer of the UAS that has received airworthiness acceptance must, upon request, make available the results of any independent inspections or audits to FAA.

While FAA retains the ability to inspect and witness tests, independent inspections and audits by voluntary consensus standards bodies are also necessary. Independent inspections or audit programs ensure provisions of the consensus standard comply with regulatory and procedural requirements. Submitting to independent audits ensures standards being used as MOCs are being applied in a way intended by the voluntary consensus standards bodies. Independent audits also allow a voluntary consensus standards body to assess the accuracy and effectiveness of standards being used as an MOC. If shortfalls are found in the standards themselves or in the way they are being used, the voluntary consensus standards bodies will have the information needed to effectively update their standards to ensure compliance with the regulations are being satisfactorily demonstrated.

By providing an impartial evaluation of a manufacturer's practices, and adherence to regulatory standards, these audits unveil insights into risk management, potential inefficiencies, and areas for improvement. This provides assurance that manufacturers comply with the requirements of subparts G and H. Independent audits enhance the quality of declarations of compliance and safeguard the interests of all stakeholders, which contributes to the overall safety of flight operations. Providing access to the results of these independent audits and inspections to FAA ensures that FAA can take any necessary corrective action regarding either an accepted standard or an airworthiness acceptance.

M. Design Changes (§ 108.750)

Incorporating new design elements may require a change to the UA or AE design that already has FAA airworthiness acceptance. Section 108.750(a) proposes that only the manufacturer of the UAS that has received airworthiness acceptance may make design changes to the UAS. Design changes are considered changes to the technical data that defines the UAS design, configuration, or performance. It is possible that a manufacturer would become aware of the need for design changes from a variety of sources (such as incidents, accidents, market surveys, etc.). The manufacturer must evaluate proposed design changes for effects on compliance prior to implementation of the design change. FAA expects voluntary consensus standards organizations to develop standards to provide a process for demonstrating that the change and areas affected by the change comply with the applicable requirements of part 108. Only the manufacturer has the necessary UAS technical data to determine compliance with the design, production, and test requirements of subparts G and H and is the entity that submitted the DOC with those requirements.

Any design change must result in a configuration that is shown to be compliant to the requirements of this part. To ensure design changes to the UAS are implemented properly by the manufacturer, proposed § 108.750(b) states any design change to a UAS with FAA airworthiness acceptance would need to have demonstrated compliance with the requirements of subparts G and H using an MOC.

Proposed § 108.750(c) requires all documentation affected by the design change be updated to maintain control of the configuration following the design change. Affected documentation should include the operating instructions, maintenance instructions, and the configuration control document. The manufacturer of the UAS that has received airworthiness acceptance should evaluate the level of the design change and determine how any planning, implementation, and supporting documentation will be affected by the change.

N. Repairs and Alterations (§ 108.755)

Section 108.755(a) proposed that the manufacturer of the UAS that has received airworthiness acceptance must authorize any repair or alteration under § 108.625. The manufacturer is expected, pursuant to proposed § 108.755(b), to evaluate the details of any proposed repair or alteration for effects on compliance with the applicable requirements of subparts G and H and must not authorize any repair or alteration that does not result in continued compliance with the applicable requirements. FAA maintains that under part 108, the manufacturer is uniquely positioned as the entity with comprehensive knowledge of the system and access to proprietary information, making them the only qualified entity to confirm that conformance to subparts G and H remains intact. This approach guarantees that any repairs or alterations uphold the UA's airworthiness by consistently adhering to the requirements specified in subparts G and H. Further, requiring the manufacturer of the UAS that has received airworthiness acceptance to authorize repairs or alterations could also act as a deterrent to the operator in making beneficial modifications or using third-party components that might improve performance or cost-efficiency but result in non-compliance with regulatory requirements. FAA invites comments on this approach and suggestions for potential alternatives.

Where a UAS undergoes a repair or alteration that affects the flight characteristics or demonstrated reliability, FAA proposes § 108.755(c) to ensure a UAS is tested in accordance with the testing requirements of subpart H. FAA anticipates that certain repairs and alterations will necessitate comprehensive testing, whereas others may demonstrate compliance through alternative means, such as analysis or bench testing. For example, a repair to a damaged fuselage or wing assembly may have different testing requirements then a software alteration.

Since the effects of a repair or alteration can vary, FAA cannot list all possible repairs and alterations that will affect the flight characteristics or reliability. However, a repair or alteration that does affect flight characteristics or reliability could fail to conform with subpart G and H. FAA expects industry to identify when additional developmental and function and reliability testing would be necessary to demonstrate compliance with subparts G and H in any MOC proposed for FAA acceptance.

O. Record Retention (§ 108.760)

Section 108.760(a) proposes that each manufacturer who submits a DOC would need to retain and make available to FAA, upon request, all supporting information used to demonstrate compliance with the requirements of subparts G and H. Supporting information may include, but would not be limited to, relevant documentation such as test plans, test results, compliance data, flight logs, and any other technical data used to show compliance.

Technical data could consist of the drawings and specifications necessary to define the configuration and the design features of the UAS, information on dimensions, materials, software, and processes necessary to define the structural strength of the UAS, the list of flight essential parts including maintenance and inspection instructions or life limits, and any other data necessary to determine airworthiness or noise characteristics. In the event of a safety issue, or if FAA initiated an action to address a compliance issue, this information would be critical to determine the cause, scope, and severity of the safety issue or non-compliance.

Section 108.760(b) further proposes that any manufacturer who submits a DOC for a UAS must retain the information described in proposed § 108.760(a) for two (2) years following the cessation of support for the COS of the UAS listed on the DOC. The ability to access detailed records, particularly regarding compliance and configuration control, enables swift identification and resolution of potential safety concerns or compliance issues. By providing FAA with access to this data, any investigation, audit, or review can be conducted more efficiently, ensuring rapid responses to emerging safety concerns, and maintaining the safety of the NAS. The 2-year retention policy conforms to the precedent set forth with FAA's Operations of Small Unmanned Aircraft Systems Over People final rule published January 15, 2021, which required a person who submits a DOC to retain and make available to FAA all supporting information used to demonstrate compliance for two years after the cessation of production in § 107.165. Since FAA expects UAS with airworthiness acceptance under part 108 will be used more than two (2) years following the end of production, FAA proposes for part 108 that the record retention period would extend two years from when the UAS is no longer supported by the manufacturer's COS program.

P. Rescission (§ 108.765)

Compliance is an ongoing process. As such, FAA maintains its authority to continuously evaluate that an MOC satisfies the applicable regulatory requirements and may, as a result of an audit, data analysis, reports from operators, or other information, rescind acceptance of an MOC.

Use of voluntary consensus standards bodies' processes to develop MOC to performance-based regulations provides both FAA and industry with a means to rapidly adapt to changing technology and better respond to market conditions while continuing to enable safe operations within the NAS. However, there is no assurance that a MOC, once accepted, will continue to enable safe operations within the NAS. As such, § 108.765(a) proposes a regulatory provision allowing FAA to rescind a MOC.

Under this proposal, FAA would exercise its authority to rescind its acceptance of a MOC if FAA determines that a MOC does not meet any or all of the requirements of subparts G and H. FAA does not anticipate exercising this option frequently, as FAA typically collaborates with industry in the development of acceptable standards. If FAA determines a standard no longer meets the requirements of this rule, FAA would rescind the acceptance of the MOC by publishing a notice of rescission in the Federal Register. An identified safety issue, stemming from a MOC that is deficient, could lead to a non-compliance resulting in UAS incidents or accidents. Therefore, FAA finds it critical that a process for rescinding acceptance of a MOC is included in proposed 108 rule to ensure all FAA-accepted MOC provide the most comprehensive methods of complying with the requirements of subparts G and H. Rescinding a MOC for any potential hazard or noncompliance with subparts G and H does not automatically lead to rescinding the airworthiness acceptance of a UAS, resulting in the UAS being ineligible for flight operations. The decision to rescind a MOC depends on the potential effects on safety of flight, and each case will be handled individually. If a MOC proves insufficient, FAA may proceed by rescinding airworthiness acceptances which relied on the rescinded MOC for compliance. In addition, manufacturers of UAS whose airworthiness acceptance have been rescinded, based on a rescission of a MOC, can revise their design to comply with an FAA-accepted MOC and submit a new DOC.

As routine BVLOS operations under part 108 occur, FAA may receive information of a safety issue or non-compliance through audits, data analysis, reports, from UAS operators and manufacturers, or other sources. To ensure UAS with airworthiness acceptance continue to meet design and performance requirements, FAA proposes procedural rules to govern rescission of FAA airworthiness acceptance. Section 108.765(b) identifies the reasons FAA may rescind a manufacturer's airworthiness acceptance for any non-compliance or safety concern related to the design, manufacture, or performance of any UAS declared compliant with subpart G and subpart H. Proposed § 108.765(c) states that the proposed rescission process would include FAA notifying the manufacturer of the UAS that has received airworthiness acceptance of the proposed rescission. Section 108.765(c)(1)-(4) proposes that the notice would set forth the Agency's basis for the proposed rescission and provide the manufacturer 30 calendar days to submit evidentiary information to refute the proposed rescission. FAA would initiate rescission of an airworthiness acceptance if the manufacturer's UAS no longer complies with the design and performance requirements of subpart G and subpart H, or if FAA finds any information provided by the manufacturer on their DOC is no longer true. The objective of the proposed rescission is to inform the manufacturer of the safety issue or non-compliance, provide FAA's basis for the proposed rescission, and provide an opportunity for the manufacturer to resolve it. An unresolved safety issue or non-compliance has the potential to cause incidents or accidents leading to possible injury. A manufacturer of the UAS that has received airworthiness acceptance who fails to resolve or respond to FAAs proposed rescission will have their FAA airworthiness acceptance rescinded, which rescinds airworthiness acceptance of the UAS. A UAS with a rescinded airworthiness acceptance is no longer eligible to conduct part 108 operations; therefore, it is in the manufacturer's best interest to either refute or resolve the non-compliance or safety issue within the 30-day period proposed in § 108.765(c)(2) to the satisfaction of FAA to avoid rescission of the airworthiness acceptance of the UAS. The 30-day period is established based on public comment to the Operations Over People rule, and FAA has determined the same rationale applies here.

Section 108.765(d) would also propose an emergency rescission process for an FAA airworthiness acceptance. Prior to rescission of airworthiness acceptance, FAA would typically initiate the notification process in § 108.765(c) with the manufacturer of the UAS that has received airworthiness acceptance. However, if FAA determines that an emergency exists and public safety requires an immediate rescission of an airworthiness acceptance, FAA would be able to exercise its authority under 49 U.S.C. 46105(c) to issue an emergency order rescinding an airworthiness acceptance.

Under these circumstances, rescission would go into effect immediately, without FAA initiating the notification process or the rescission procedures previously described. The order would remain in effect until the basis for issuing the order no longer exists. However, an emergency order would be considered a final agency decision; as such, a manufacturer may appeal the decision.

<u>XI. Design and Testing Requirements for Airworthiness Acceptance (Subpart H)</u>

A. General (§ 108.800)

Subpart H includes FAA's proposal related to defining performance-based design, production, and airworthiness requirements for UAS operating under this part. Subpart H is intended to provide clear direction to voluntary consensus standards bodies regarding consensus standards they will propose as a MOC to meet regulatory requirements. FAA expects that this would facilitate more rapid development of these consensus standards. It would also result in more accurate and comprehensive consensus standards that are better able to address the design, production, and airworthiness requirements for airworthiness acceptance of UAS.

To receive airworthiness acceptance under part 108, the manufacturer would be required to comply with all the requirements in subparts G and H. The only way for a manufacturer to ensure compliance with the airworthiness design and performance requirements in part 108 would be to comply with a consensus standard developed by a voluntary consensus standards body and accepted by FAA as a MOC. For compliance with noise requirements, manufacturers would be able to comply through FAA-approved consensus standards or other procedures specified in part 36. Manufacturer compliance with the performance-based design, production, and airworthiness requirements proposed in subparts G and H is necessary to ensure the safety of a wide range of UAS that may be accepted under this proposal. FAA expects that compliance with these proposed requirements would reduce the occurrence of loss of flight and loss of control, resulting in UA that are safe for their intended operations. Loss of flight means a UA's inability to complete its flight as planned, up to and through its originally planned landing. Loss of flight includes scenarios where the UA experiences controlled flight into terrain, obstacles, or any other collision, or a loss of altitude that is severe or non-reversible. Loss of control means an unintended departure of an aircraft from controlled flight. It includes control reversal or an undue loss of longitudinal, lateral, and directional stability and control. It also includes an upset or entry into an unscheduled or uncommanded attitude with high potential for uncontrolled impact with terrain. A loss of control means spin, loss of control authority, loss of aerodynamic stability, divergent flight characteristics, or similar occurrence, which could generally lead to crash. These definitions for "loss of flight" and "loss of control" are consistent with airworthiness criteria used during the Durability and Reliability type certification process.[133]

FAA proposes § 108.800 which identifies the purpose of subpart H and identifies what UAS are eligible for airworthiness acceptance. To be eligible for airworthiness acceptance, as proposed in § 108.800(b), the UAS would need to meet three criteria. First, the UAS would need to meet the requirements of subparts G and H of part 108. Second, the UA would not be able to be an airship. Third, the UA cannot be designed to allow for any person on board during operations.

---

[133] Airworthiness Criteria: Special Class Airworthiness Criteria for the Matternet, Inc. M2 Unmanned Aircraft and Airworthiness Criteria: Special Class Airworthiness Criteria for the Percepto Robotics, Ltd. Percepto System 2.4 Unmanned Aircraft

The first criteria is self-explanatory in that the UAS needs to meet the requirements of subparts G and H. This requirement mitigates common hazards associated with UAS operations and ensures a design that can operate safely in the NAS. This also ensures that the UAS complies with the noise standards applicable to that UAS.

Subpart H would not allow for airships to be eligible for airworthiness approval under part 108. This is because UA operating under part 108 would be required to cede right-of-way to other aircraft which are broadcasting ADS-B Out, per proposed § 108.195. The low speed and relatively long response times to control inputs make it unlikely that an airship would be able to maintain safe separation by avoiding detected aircraft. Finally, subpart H does not allow an aircraft to be designed for carriage of crew or passengers. FAA wished to preclude any manufacturer from using part 108 to circumvent the experimental airworthiness certification process, under part 21, for passenger carrying aircraft. If a person is aboard the aircraft, the determination and mitigation of risk changes significantly. To allow for operations as written in this part while maintaining the level of design and operational rigor defined in part 108, no person can be allowed on a UA operating under part 108.

B. Size, Weight, and Speed (§ 108.805)

FAA proposes § 108.805 which identifies size, weight, and speed design limitations for UA. To be able to obtain an airworthiness acceptance the UA design would need to meet three criteria. First, the UA's wingspan or lateral span would not be able to exceed a lateral span of 25 feet. Second, the UA would not be able to exceed a maximum weight of 1,320 pounds (600 kilograms) gross weight, including anything attached to or carried by the aircraft. Third, the UA would not be able to exceed 87 knots ground speed during normal operations.

When determining the size of UA that can safely operate in the NAS, the risk to persons and property on the ground, or ground risk, must be considered. The ground risk of an aircraft is determined by assessing the combination of aircraft reliability and consequence of failure. To limit the maximum consequence of failure, the total crash area of the aircraft must be limited. A maximum wingspan or lateral span of 25 feet was selected to limit the number of people within a potential crash area, thereby limiting ground risk. FAA is leveraging industry standards such as ASTM F3442/F3442 and RTCA MOPS for ACAS sXu when selecting the 25 feet maximum wingspan or lateral span. This span would provide consistent boundaries when defining DAA parameters.

As discussed in section X.A, FAA considered the BVLOS ARC recommendation and part 107 operations when determining weight and speed design limits for airworthiness acceptance under part 108. The maximum gross weight of an aircraft, including anything attached to or carried by the aircraft, operating under part 108 would be set at 1,320 pounds (600 kilograms), within the BVLOS ARC recommendations and JARUS limitations based on maximum kinetic energy[134]. Likewise, under part 107, UAS maximum operational speed is limited to 87 knots or less during normal operations. Positive service experience under both part 107 and under BVLOS operating exemptions has been gained for aircraft operating at ground speeds up to 87 knots. Based on this experience, and lacking data on the effects of increased speeds, FAA has determined 87

[134] JAR-DEL-SRM-PDRA-05, Pre-Defined Risk Assessment, PDRA-05, for Aerial Work Operations

knots or less would be an appropriate limitation for UAS operating under part 108. A manufacturer may seek regulatory relief from any of these UA criteria.

C. Simplified User Interaction (§ 108.810)

Simplified user interaction (SUI) aims to make flying safer, simpler, and more accessible by using automation to simplify UA operation for flight coordinators while maintaining safety. SUI automates the tasks that are most error prone, need constant practice, and can distract the flight coordinator. This automated approach offers safety and economic benefits.

SUI is intended to streamline operations, reduce loss of control incidents, and eliminate the need for advanced flight training. Based on granted exemptions and VLOS operations under part 107, FAA recognizes the increased use of SUI by industry through these existing operating approvals.[135] The proposed SUI requirements leverage current design practices to further automate UAS operations. FAA is embracing these technologies as the next path forward in integrating UAS into the NAS.

Proposed § 108.810 would require design and performance requirements for UAS to exhibit highly automated features and functions. This requirement is necessary for BVLOS as it would enhance the safety of UAS operations by replacing direct manual control of the UA with automated controls. Flight controller access is limited to high-level inputs, which are implemented by the automated control system of the UA. SUI is especially important for enabling one-to-many flight operations as the task of actively controlling multiple aircraft simultaneously would require exceptional piloting skill.

---

[135] Exemption 18339D, 19111B, 19398A, 21097, and 22003.

This requirement for SUI features would not permit “pilot in the loop” designs that rely on manual control where the flight coordinator is responsible for providing inputs through devices such as rudder pedals, a stick, yoke, or throttles, to include hand controllers with joysticks that are popular among hobbyists. Pilot in the loop controls such as push buttons, knobs, and touch screens would only be permitted to enable the flight coordinator to execute simple commands, such as changes in airspeed, altitude, and heading. Proposed § 108.810(a) would require consistent and predictable controllability, stability, and maneuverability using automated flight controls, not relying on manual flight control inputs. This consistency and predictability should be demonstrated through repeatable, smooth transitions between turns, climbs, descents, and level flight throughout the flight envelope and operating environment limits. Designs that demonstrate consistency and predictability throughout the flight envelope will enable accurate assessment of performance and reliability during testing. Further, proposed § 108.810(a) would require that controllability, stability, and maneuverability be met at all flight and ground loading configurations within the UA’s prescribed weight limits. Changes to flight and ground load configurations, such as changes to attitude, releasing payload, transitioning from VTOL to forward flight, should not cause UA controllability, stability, and maneuverability to be inconsistent or unpredictable. Furthermore, the UAS’s automated flight envelope and path protection systems should be taken into consideration when analyzing (including test conditions) compliance to the controllability and maneuverability requirements. The UA should have the necessary flight stability to prevent loss of flight during normal, abnormal, and emergency procedures shown by natural or artificial means, or a combination of both. Some examples of abnormal or emergency scenarios include collision avoidance, aborted missions, power system failures, and forced landings.

Proposed § 108.810(b) would require UA designs that are resistant to operation outside of the flight design envelope during any phase of flight. To be resistant to operations outside of the flight design envelope, the UAS should have the capability to maintain dynamic stability, regardless of external forces, under all foreseeable conditions, including failure conditions. Designs that would allow an aircraft to operate beyond its demonstrated limits could result in loss of control which could jeopardize the continued safe flight and landing of the UA.

Proposed § 108.810(c) would require prevention of loss of control of the UA due to degradation or nonavailability of external services, systems, operator input, or signals. The UAS should have capabilities and necessary features to control the aircraft in the case of a loss of external services, such as third-party services, used in communicating, controlling, or providing system inputs to the UA. The design must incorporate contingencies accounting for loss of services or functions that ensure safety of the NAS and people on the ground.

Proposed § 108.810(d) would require the UAS to have a means to discontinue flight as soon as practicable without creating a safety hazard. An operator may need to discontinue or suspend a flight for a variety of reasons such as unexpected weather conditions, a system malfunction, or the presence of other hazards such as a flock of birds or an aircraft near, or intersecting, the route of flight. Discontinuing or suspending a flight may include options such as an immediate landing, a return flight to the UA's point of departure, a diversion to an alternate landing site, a course change, or in-place hover until any hazards have passed. The UAS should be equipped with features that allow for the flight controller to interrupt, abort, or command an emergency landing during all phases of flight. This capability to discontinue flight must provide the ability to have the aircraft take appropriate action as soon as practicable while maintaining safety and not creating a possible additional safety hazard. The capability of discontinuing flight would ensure that potential damage to other aircraft, property, or people is prevented should an adverse situation arise, such as erroneous behavior of the UA. The flight discontinuation capability would allow for the UA to be redirected by the operator, in the event of an emergency, as when called upon by national and local airspace governing agencies.

To prevent a safety hazard associated with unnecessary landings, any design which discontinues flight should prevent inadvertent activation. It should also be designed such that false positives, incorrectly entered data, and other human errors do not cause inadvertent activation.

D. Signal Monitoring and Transmission (§ 108.815)

Proposed § 108.815(a) would require that the UA be designed so that it can receive from and transmit to AE all information that is required for continued safe flight and operation. The ability of a UA to engage in two-way communication with its AE is important for the safety of flight operations. This bidirectional flow of information enables real-time flight adjustments, which can be essential given the dynamic nature of the NAS. It allows UAs to respond promptly to changes in air traffic, no-fly zones, or adverse weather conditions. Continuous communication also permits remote monitoring and control by flight coordinators, who can proactively address potential issues, maintaining the UA's optimal condition and preventing safety hazards. Maintaining a two-way communication between UA and AE is foundational to ensuring their responsiveness, adaptability, and full control throughout the flight. Examples of such information may include position and location information, weather data, or aircraft health status.

Proposed § 108.815(b) would require the UAS design to execute a safe predetermined action in the event of a link timeout. During lost link events it is important for the UA to respond with an appropriate safe predetermined action, thereby minimizing risks to other users of the NAS during flight operations. This requirement ensures that the UA is equipped to handle such disruptions safely and efficiently. The operating instructions in proposed § 108.720 would address all options and capabilities of the UA for contingency responses. In the proposed MOC to these requirements, FAA expects industry to define and standardize safe predetermined actions such as return to home, loiter, continue flight, etc. a UA could execute during a link timeout event. There may be multiple acceptable safe predetermined actions, but the predetermined actions should be standardized based on the category of permitted or certified operation. Further, FAA also expects industry to define the link timeout metric as part of any proposed MOC, as it may be variable based on the type of permitted operations and associated ground and air risks. As part of this link timeout metric, FAA expects both uplink and downlink timeouts to be addressed.

E. Position, Navigation, and Timing (§ 108.820)

Proposed § 108.820 states that the UA would need to be capable of sustaining position, navigation, and timing with accuracy to maintain a safe distance from other aircraft in the airspace in which the UA operates. Position, navigation, and timing (PNT) work together as an integrated system to support safe UA operation within the NAS. A UA typically determines its position by receiving signals from satellites or ground-based systems, navigates by calculating its path and movements relative to that position, and uses precise timing to synchronize these processes. Accurate PNT is necessary for effective conformance monitoring or collision avoidance systems.

PNT data from a UA supports the safe coordination of airspace with other users of the NAS. Discrepancies in the UA's navigational data can complicate the process of deconflicting airspace, increasing the risk of close encounters with other NAS users. Furthermore, inaccuracies may lead other users, particularly those utilizing UTM systems, to underestimate the proximity of a UA, potentially resulting in unsafe situations. The UAS must further represent its PNT with a minimal margin of error because a UAS that incorrectly represents its position poses a heightened risk of colliding with other aircraft or obstacles. By ensuring PNT accuracy, a UA can maintain safe distance from other NAS users and facilitates a well-coordinated flight environment.

F. Collision Avoidance (§ 108.825)

Proposed § 108.825 will require all UAS obtaining airworthiness acceptance to have the capability to avoid aircraft in accordance with proposed § 108.195. Proposed § 108.195 provides the operating requirements for avoiding collisions with aircraft departing from or arriving at an airport or heliport or equipped and broadcasting their position using ADS-B Out or electronic conspicuity equipment.

Typically, a collision avoidance system should incorporate two aspects. First, the ability to identify a hazard should have the fidelity and range to identify heading, position, and airspeed for aircraft with sufficient time to allow action to be taken to maintain safe distance. Second, the UA should have flight performance characteristics throughout its documented flight envelope and operating environment limitations that are sufficient to maintain safe distance from those aircraft.

Providing a means of detecting aircraft is an important component in avoiding midair collisions. Any procedures associated with collision avoidance must be contained in the operating instructions required by §108.720(a)(1).

G. Anti-collision Lighting Requirements (§ 108.830)

Proposed § 108.830(a)(1) and (2) would require installation of anti-collision lighting, which, when illuminated, must be visible for at least 3 statute miles when operating at night. This intensity is aligned with current manned aviation practices and based on positive history in manned aviation, this intensity supports collision avoidance with aircraft not equipped with ADS-B Out. This requirement also aligns with the anti-collision lighting requirement in 107.29(b) for small UA. Proposed § 108.830(a)(3) would require that the anti-collision lights need to have a flash rate, colors, and fields of coverage that enhance visibility. Establishing flash rates, colors and fields of coverage would enhance the visibility of UA for other aircraft operating in the NAS. FAA is proposing that these parameters remain performance-based so adequate adjustments to the parameters can be made as technology develops to enhance visibility.

Consensus standards bodies should define consistent parameters for anti-collision lights to identify UAS operating in the airspace, distinguish from other lights in the area such as cell phone towers and streetlights, and allow for a safe distance to be maintained. These lights would serve as a key safety feature to increase the visibility of UA to other aircraft, pilots, and air traffic controllers in the vicinity. This enhanced visibility helps to prevent midair collisions, close encounters, and other incidents that could endanger both UA and manned aircraft operating in the same airspace. By providing a clear indication of the UA's presence, position, and trajectory, lighted anti-collision lighting enables other airspace users to maintain safe distance.

Section 108.830(b) proposes the design may allow for the deactivation or reduction of intensity of the anti-collision lights in accordance with proposed § 108.250(c). Allowing the operator to deactivate or adjust the intensity of anti-collision lighting is based in safety. In diverse UAS operational environments, full-intensity lighting can, at times, be counterproductive. For instance, in foggy conditions, intense lighting may cause glare, posing risks to other pilots. Similarly, during specialized operations like nighttime flights in populated areas or near wildlife, a deactivation or reduction of intensity can prevent undue disturbances.

H. Position Lighting Requirements (§ 108.835)

Section 108.835 proposes that UA with a lateral span of at least 96 inches would need to be equipped with position lights that meet certain specifications or would need to have operating instructions that include a limitation prohibiting night operations. Position lights serve a key role in ensuring an aircraft's visibility, allowing other airspace users to accurately discern its location, orientation, and trajectory during night hours. Without these lights, the risk of collisions increases, as the ability for visual identification and spatial awareness among pilots and operators can be compromised. The requirements proposed in § 108.835 are consistent with manned aviation requirements and would ensure UAS position lighting standards match all other aircraft in the NAS.

Section 108.835(a) proposes that, to ensure their effectiveness, the installation of left and right position lights would be required on both sides of the aircraft. These lights would need to be positioned as far apart as possible to maximize their visibility. When the aircraft is in its normal flying position, the red light would be on the left side, while the green light would be on the right side. This arrangement would help pilots and other airspace users identify the aircraft's direction and orientation during flight. FAA suggests that for UA with a lateral span of less than 96 inches it would be impractical to differentiate red and green position lights from each other, complicating the determination of the direction of travel. This could limit a pilot of a manned aircraft's reaction time, potentially not allowing adequate time for corrective measures to prevent a collision. FAA invites comments related to the lateral span lighting proposal.

In addition to the left and right position lights, § 108.835(a) proposes to require a white light mounted on the aft portion of the aircraft or on the wingtip. The rear position light enhances the aircraft's visibility from behind, ensuring that other airspace users can maintain proper situational awareness and avoid potential collisions.

By adhering to these positioning and color requirements, which are common to most aircraft operating in the NAS, part 108 aircraft can contribute to a safer, more coordinated, and efficient operational environment for all users in the airspace.

Section 108.835(b) proposes that, if an aircraft is not equipped with position lights, an operating limitation prohibiting night operations would need to be included in the operating instructions in proposed § 108.720(a)(1). Implementing such a limitation in the operating instructions ensures clear communication of operational boundaries. This operating limitation aims to maintain a high standard of safety in night flying conditions, safeguarding not only the UA but also the overall airspace for other users.

I. Power Generation, Storage, and Distribution System (§ 108.840)

The power generation, storage, and distribution system in a UAS plays an important role in its overall functionality and safety. This includes powering essential flight control systems, navigation aids, communication devices, associated elements, and any payload-specific equipment. The integrity of this system is vital for continuous, safe flight operations, as it ensures that all components receive the necessary power to function correctly throughout the flight. Therefore, proposed § 108.840(a) would require that the UAS be designed to provide power for all connected electrical loads.

Proposed § 108.840(b) would require that the power generation, storage, and distribution system be able to ensure that no single failure or malfunction of this system would result in loss of flight or loss of control. This requirement emphasizes the necessity for an electrical system designed with redundancies and safeguards to prevent or minimize the impact of failures or malfunctions. By ensuring the reliability of the power system, the UAS is better equipped to maintain safe operation, even in the face of unexpected failures, thereby preventing loss of flight, loss of control, or compromising safety.

J. Propulsion System (§ 108.845)

Section 108.845(a) proposes that the propulsion system would need to have the necessary reliability, durability, and endurance for safe flight without failure, malfunction, or excessive wear, throughout the expected life cycle of the propulsion system. A propulsion system failure or malfunction can lead to a sudden loss of thrust or lift, which is essential for maintaining the aircraft's forward motion and altitude. Failure of the propulsion system could result in loss of flight or loss of control. A reliable propulsion system with the durability and endurance throughout the expected life cycle reduces loss of flight occurrences and ensures safety of persons and property on the ground and other NAS users.

Section 108.845(b) proposes that the propulsion system would need to be designed not to exceed safe operating limits under normal operating conditions. Normal operating conditions and operating limits would be defined by the manufacturer in the UAS operating instructions. Operating limits that cannot be influenced by the flight coordinator, such as the maximum rotational speed of a motor, need to be determined by the manufacturer and imposed as a limit in the design of the UAS, though they may not need to appear in the operating instructions. This minimizes the risk of catastrophic failures due to overstressed components or systems.

Section 108.845(c) proposes the propulsion system must be designed so that a loss of power or a power failure does not lead to a loss of control of the UA. This ensures the UA design has a contingency for loss of power and will not result in a failure which could jeopardize the safety of the UA and surrounding environment, such as asymmetric thrust.

FAA is not proposing prescriptive propulsion requirements to promote continued development, innovation, and improved efficiency of UA propulsion systems. FAA anticipates that voluntary consensus standards bodies would develop new consensus standards for various categories of propulsion systems.

K. Fuel System (§ 108.850)

Section 108.850(a) proposes that, if the UAS is equipped with a fuel system, the fuel system design would need to provide a means for the safe removal or isolation of fuel from the rest of the UA. To prevent fuel leaking or fuel contamination, and to provide a means for safely handling and transporting the UA on the ground, it must be possible to either remove all fuel onboard or ensure it is safely isolated within tanks or lines in such a way that the fuel system minimizes the risk of fire. Section 108.850(b) proposes that UA would need to be designed to retain fuel, preventing leaking or fluid buildup, under all likely operating conditions. This will reduce the likelihood of a fire by not introducing the fuel to an ignition source. Proposed § 108.850(c) would require the UA to have ventilation and drainage where flammable fluid or vapor may exist. Proper system design accounting for fuel retention, ventilation, and drainage prevents the accumulation of flammable fluids or vapors. Changes in temperature, pressure, aircraft attitude, or acceleration loads are all examples of potential causes of leaking or pressure build-up, either of which could be a source of fire. By adhering to these requirements, potential fuel-related incidents such as leaks or spills that could result in fires or explosions are effectively minimized.

L. Fire Protection (§ 108.855)

Proposed § 108.855 would require the incorporation of design features that can sustain both static and dynamic deceleration loads without resulting in structural damage to the fuel or electrical system components or their attachments. In the event that the UA has a hard landing or crashes, the design must ensure that such an event will not result in structural damage to components of the UA likely to contribute to a post-event fire as the deceleration load shifts. Examples of components that must meet § 108.855 include fuel tanks, fuel lines and fittings, batteries, wiring harnesses, or wiring attach points. Fuel and electrical system crashworthiness involve designing and testing these systems to demonstrate fuel remains safely contained and sources of electrical current remain safely separated from the fuel as loads shift. This would ensure that fuel leaks do not reach potential ignition sources and that electrical power does not become an ignition source, resulting in a post-incident fire. By actively implementing such design features, the risk of fire-related incidents is significantly reduced, enhancing the overall safety of the UA during operation, and protecting lives and property on the ground, or safeguarding from other hazards, in the event of an accident.

M. Software (§ 108.860)

Proposed § 108.860(a) would require that all software that may affect the safe operation of the UA function properly and have dependability. Dependability means the software code produces the consequences for which it was written, without adverse effects, in the manufacturer defined environment. Essential components and functions of the UA, such as propulsion, flight control, navigation, and DAA, are controlled by software. Due to software's influence over essential components, it is important to minimize the occurrence of software errors to ensure its dependability. Therefore, software should be designed, verified, and implemented according to standards that confirm it dependably fulfills its intended purpose.

Proposed § 108.860(b) would also require manufacturers to track, control, and document any changes made to the software throughout the life cycle of the UAS within a configuration management system. A configuration management system for software is a set of practices and tools designed to manage and track changes in software development, ensuring consistency, control, and traceability of each version of software components. Such a configuration management system would enable manufacturers to maintain the integrity and consistency of the software. In addition, proposed § 108.860(c) would require manufacturers to capture and record any defects or modifications made to the software within a problem reporting system. A problem reporting system is a structured tool that facilitates the identification, documentation, and tracking of issues or defects. Such a problem reporting system would allow for a comprehensive overview of the software's status, thereby facilitating continuous improvement efforts. Thorough and continuing software development significantly reduces software errors, ultimately contributing to a safer and more reliable UAS operations and facilitates continuous improvement efforts.

N. Electronic Hardware (§ 108.865)

Proposed § 108.865(a) would require all electronic hardware in the UAS to perform its intended functions within the manufacturer-defined operating and environmental limitations. This requirement would ensure consistent system performance and safety by requiring that all electronic components operate effectively within their specified parameters, under typical usage scenarios. This predictability is essential for system integrity, as it allows for the accurate assessment and management of risks associated with electronic system failures, which could otherwise compromise the safety of the UA.

Operating limitations may include the boundaries of conditions under which the electronic systems are designed to function, including variables like voltage, current, and data processing requirements. These limitations ensure that the hardware can handle the demands of its operational tasks without failure. Operational environment limitations consider external factors such as temperature, humidity, vibration, and electromagnetic interference that the UAS may be exposed to during UA operation. By proposing that electronic hardware withstand both sets of limitations, FAA would ensure that UAS would be able to operate safely and reliably in diverse conditions, from the physical stresses of flight to variations in weather and electromagnetic environments.

Section 108.865(b) proposes that electric hardware must be designed and installed so they do not have an adverse effect on the safe operation of the UA. An adverse effect on safety would be those effects that could negatively impact the safety and airworthiness of the UA. An example of potential adverse effects includes the disruption of signal integrity through electromagnetic interference, which could stem from improper shielding or placement of electronic components. Such interference could degrade the performance of navigation and communication systems, leading to loss of flight or loss of control. By establishing design and installation standards that mitigate these risks, this ensures continued safe UAS operations, even in the presence of potential sources of electronic interference.

O. Systems and Equipment (§ 108.870)

Section 108.870(a) proposes that a UAS would need to have all systems and equipment necessary for safe flight, considering any systems or equipment necessary to operate the UAS in the intended airspace class or required for the operation. This requirement is determined by the class of airspace in which the manufacturer intends the UAS to operate and any specific operational demands. For example, § 108.180(b) proposes avoiding collisions with aircraft not broadcasting their positions using ADS-B

Out. Similarly, § 108.185(d)(5)(ii) which proposes the same requirement as § 108.180, but when operating over Category 5 population densities. This provision ensures that UAS are prepared and capable of navigating and operating safely within their designated operational environments, accounting for the complexity and variability of NAS requirements. Different classes of airspace have varying levels of traffic density, airspace restrictions, and safety considerations which may require unique equipment. By ensuring UAS are adequately equipped for their intended operational environment, this regulation aims to minimize risks of collision and ensure efficient use of airspace.

Section 108.870 (b) proposes that installed systems and equipment would need to perform their intended function within the operating limitations and environmental limitations for which the aircraft is designed. FAA emphasizes that systems and components should be evaluated to ensure that any potential failure or malfunction will not compromise the UA's control. This holistic assessment approach safeguards against systemic vulnerabilities that could lead to operational failures. FAA expects systems and components within those systems to be considered separately and in relation to each other. As with electronic hardware, systems and equipment would need to perform throughout the intended operating and environmental limitations. The same reasoning given in electronic hardware for why both types of conditions need to be accounted for is valid here.

Section 108.870(c) proposes that no probable failure shall result in a hazardous outcome. This requirement is meant to prevent unsafe outcomes stemming from individual component failures. Probable failure conditions are those failure conditions anticipated to occur one or more times during the entire operational life of each UAS.[136] These are not hypothetical or highly unlikely failures but are considered within the realm of possibility based on historical data, engineering analysis, and operational experience. Probable failures could arise from a range of sources, including wear and tear, manufacturing defects, design limitations, and other impacts.

It is important to prevent such failures from leading to a hazard such as a loss of flight or control. UAS, like all aircraft, rely on a complex interplay of systems and components to operate safely and effectively. A failure in one of these systems—be it navigation, propulsion, communication, or control—could jeopardize the UA's ability to maintain flight or be controlled, leading to potentially unsafe outcomes. This could include unintended entry into restricted airspace, collisions, or uncontrolled descent, each posing significant risks to public safety, property, and the integrity of national airspace.

The proposed requirement set forth in § 108.870(c) is designed to ensure that UAS are engineered and maintained to a standard where probable failures do not compromise the UA's core operational capabilities. This could involve robust design practices, thorough testing and evaluation of components and systems, and regular maintenance and inspection routines. The objective is to identify and mitigate risks associated with probable failures, ensuring that a single probable failure does not lead to a hazardous outcome.

In implementing this requirement, manufacturers should consider redundancy, fault tolerance, and fail-safe mechanisms in the design and operation of UAs.

---

[136] JARUS SORA v 2.5

Redundancy involves the inclusion of systems or components that prevent loss of functional capabilities in the event of a failure. Fault tolerance refers to the ability of a system to continue operating properly in the event of a failure. Fail-safe mechanisms are designed to bring the aircraft to a safe state in the event of a failure.

P. Cybersecurity (§ 108.875)

To maintain the security and airworthiness of UAS equipment, systems, and networks, proposed § 108.875 would require that UAS equipment, systems, and networks, addressed separately and in relation to other systems, be protected from unauthorized electronic interactions.

Intentional Unauthorized Electronic Interaction (IUEI) refers to "a circumstance or event with the potential to affect the aircraft due to human action resulting from unauthorized access, use, disclosure, denial, disruption, modification, or destruction of information or aircraft system interfaces. Note that this includes malware and the effects of external systems on aircraft systems but does not include physical attacks or electromagnetic jamming."[137] An adverse effect on safety would be those effects that could impact the safety and airworthiness of the UA and its operation. Protecting against IUEI involves systematically preventing, avoiding, and mitigating malicious interference with aircraft systems. Unauthorized interference with a UAS could have both safety and security impacts.

Cybersecurity protection efforts must be informed by standards acceptable to FAA. For cybersecurity, there may be acceptable standards produced by entities other

[137] *See* FAA Order 8110.107B, *Monitor Safety/Analyze Data*, page 2-2 (October 13, 2023).

than voluntary consensus standards bodies. Cybersecurity standards and guidelines, such as the Cybersecurity Framework developed by National Institute of Standards and Technology (NIST), typically promote protection by utilizing a risk assessment that demonstrates how security and safety risks associated with IUEI are identified and assessed. The risk assessment identifies which equipment, systems and networks require protection from IUEI. If a cybersecurity risk is identified that can adversely affect the safety of the UAS, the manufacturer can then develop mitigation plans and provide them to the operator. This would ensure a comprehensive and consistent approach to maintaining the safety of the UA's equipment, systems, and networks tailored to the risks commensurate with UAS. FAA expects that a standard with similar requirements to the NIST Cybersecurity Framework would be found acceptable as a MOC for cybersecurity. FAA invites comments on cybersecurity standards for UAS.

Q. Associated Elements Design and Performance Requirements (§ 108.880)

Section 108.880(a) proposes that each associated element would need to be designed to perform its intended function under all operating conditions specified in the UAS operating instructions. The intended function includes both aircraft performance and ability to successfully complete the operation for which the aircraft was designed, such as small package delivery or agricultural operations. Both the AE, as well as the UA itself, must be designed such that the UA operates as intended in all expected operating conditions, whether those conditions are encountered by the UA or the AE. The operating instructions need to include operating limitations of the UAS that address operational environment conditions, adverse weather, collision avoidance, cybersecurity, lightning, hazardous materials, weight, and balance. Operating instructions need to also include normal and abnormal procedures likely to be encountered in the intended operations. The UA and AE must be integrated in such a way that the AE does not introduce additional safety hazards in the NAS. By ensuring the AE can perform its intended function throughout its expected range of operating conditions, the proposed rule would mitigate these potential hazards. For example, if AE includes a launcher, the acceleration force imparted on the UA should not exceed its design limit. In addition, as proposed in § 108.880(b), any probable failure or malfunction of the AE or any of its components must not result in a hazard. For the purposes of this proposed rule, a hazard would be any condition that could foreseeably cause or contribute to an incident or accident. These situations must be mitigated to provide for safe operation of the UA.

Proposed § 108.880(c) requires that the AE would be designed to continuously monitor, display, and transmit information required for safe flight and operation. This may include, but would not be limited to, parameters related to energy storage, propulsion, detection systems, flight safety, signal strength, as well as flight and navigation information like airspeed, heading, altitude, and location. FAA expects an acceptable MOC to identify the relevant information that will be displayed for the designated operational purpose.

To reduce the likelihood of human error when conducting any manufacturer-designated operation, the human-machine interface should be considered in the development of the AE because AE is typically the interface between humans and the UAS. Monitoring and displaying the status of critical parameters to the flight coordinator would enable successful and efficient management of the UA's flight. These design features would contribute to a more reliable, safe, and secure operation, ultimately promoting the successful integration of UAS into the NAS.

R. Suitability and Durability of Materials (§ 108.885)

Proposed § 108.885 would require the suitability and durability of materials used in the UAS to account for the effects of all operational and operating environment conditions expected during operation. Materials used for aircraft components and structures would need to meet the loads and stresses of all operations within the UA's flight envelope for the life of the UA or defined maintenance interval. The UA should be designed and manufactured with materials that permit its structure and components to withstand those stresses likely to be encountered. Such stresses could result from wind gusts, temperature extremes, humidity extremes, or ground handling. Adhering to material specifications and considering the most adverse conditions during design would prevent structural failures, which could lead to loss of flight or loss of control, throughout its operational life.

S. Operating Environment Conditions (§ 108.890)

Proposed § 108.890(a) would require that the UAS have design characteristics to accommodate operating environment conditions likely to be encountered during its intended operations. Aircraft systems and structures may not function as intended if operating conditions are not accounted for in an aircraft's design. Such environmental conditions, such as variations in temperature, wind, rain, ice, and humidity, may alter the safe operation of a UA. Therefore, if operations are intended in these conditions, the UA design would be required to account for them. This proposed requirement is necessary to enable UA to be properly designed and constructed to conduct safe ground and flight operations in the specific operating environments for which the aircraft is designated to operate in. UA systems or structure unable to accommodate the environment in which it is operating may lead to loss of flight or loss of control.

Under proposed § 108.890(b)in lieu of the requirements of § 108.890(a), the UAS would be required to have the capability to identify and avoid or exit those conditions the UA is not designed to operate. This requirement is intended to restrict flight into known environmental conditions in which the UA is not designed to operate. This requirement also is intended to either prevent inadvertent flight into such conditions or provide a means for detecting those conditions for which the UA is not designed to operate. These requirements along with the operating instructions ensure the flight coordinator is informed about the environmental conditions in which the UAS can be utilized.

T. Lightning Protection (§ 108.895)

Proposed § 108.895 would require a UA to either incorporate design characteristics that protect the UA from loss of flight or control due to lightning strikes or have an operating limitation that explicitly prohibits flight operations in weather conditions that are conducive to lightning activity. The latter would apply when the manufacturer did not demonstrate during developmental testing that the UA can withstand lightning strikes. Lightning strikes present a significant hazard to the UAS, capable of causing immediate loss of flight or loss of control. By ensuring that UAS are inherently designed with lightning protection features, this requirement aims to safeguard against the primary risks associated with lightning, such as electrical system failures, ignition hazards, and structural damage.

Recognizing the diverse range of UA designs and operational capabilities, the proposed regulation offers an alternative for cases where it is not feasible for the manufacturer to demonstrate lightning protection. In such instances, the UA would be subject to an operating limitation, listed in the operating instructions, that explicitly prohibits flight operations in weather conditions conducive to lightning activity. This approach provides a flexible regulatory framework that accommodates the technical and economic constraints of developing lightning-protected UAS while ensuring that safety remains the paramount consideration. By restricting operations in potentially hazardous weather conditions, this operating limitation serves as a precautionary measure to minimize the risk of lightning strike incidents.

U. Flight Data Recorder (§ 108.900)

Incidents and accidents may result in serious injury or fatality for persons on the ground or onboard other aircraft. Fundamental to ensuring further incidents or accidents are mitigated is the ability to determine root cause and implement any necessary corrective actions. The inability to determine root cause and implement corrective actions may lead to further incidents and accidents with the same unidentified cause.

Therefore, proposed § 108.900(a) would require that the UA, GCS, or both, be equipped with a flight data recording system. This regulation works in tandem with the flight data requirements in § 108.725. This system must capture and record onboard system and data from initial powerup through shutdown. This proposed requirement would ensure that a system captures relevant data to recreate the flight and determine the root cause of incidents and accidents. In addition, § 108.900(b) requires the recorded data to be in a standardized format and readily accessible to FAA and NTSB, and readable without requiring proprietary software. This is to help ensure data integrity in the event of an investigation and to support regulatory analysis and oversight.

The data must be readily accessible to FAA or NTSB to provide relevant information for engineers, technicians, maintenance crews, and operators to identify root causes and resolve safety of flight issues. By analyzing this data, the manufacturer, operator, and FAA can efficiently determine the root cause of failures and monitor the UA's overall health. Furthermore, the retrievability and standardization of the data enables the NTSB to better analyze and investigate UA accidents. This comprehensive approach to data recording and accessibility ensures that relevant information, including system inputs, outputs, data bus logs, signal strength indicators, and sensor data, could be utilized in determining root cause.

V. Flight Data Analysis (§ 108.905)

Section 108.905 proposes that a UAS would need to be designed to capture and record all flight data necessary for trend analysis, failure identification, and root cause analysis. Designing a UAS to capture and record flight data is important for ensuring safety and reliability. The manufacturer of the UAS that has received airworthiness acceptance is responsible for ensuring continuing operational safety of their UAS designs. Access to the flight data identified in this section enables the manufacturer to perform a detailed analysis of incidents, identifying trends and root causes of failures, which is essential for developing preventive measures and improving design. It supports ongoing regulatory compliance, facilitates acceptance processes, and enhances operational efficiency by enabling trend analysis and targeted maintenance strategies.

Moreover, analyzing flight data can inform training programs. These training programs would serve to reduce operator errors and increase the overall safety of UAS operations.

Such data collection and analysis not only improves safety and reliability but also builds stakeholder confidence by demonstrating a commitment to rigorous safety standards. As UAS operations become more integrated into the NAS, the ability to proactively manage and mitigate risks by leveraging comprehensive data analysis is indispensable. This approach would ensure that UAS technology evolves in a manner that prioritizes the safety of both the UAS and the NAS.

W. Noise (§ 108.910)

This proposal would apply 14 CFR part 36 noise standards to part 108 UA. [138] Specifically, § 108.910 would require UA seeking airworthiness acceptance under part 108 to demonstrate compliance with part 36. The changes to part 36 propose the methods of compliance that would be available to a UA that does not conform to a type certificate. A manufacturer could demonstrate compliance using an FAA-approved industry consensus standard or, where there are no noise consensus standards, using current part 36 procedures that are appropriate for the UA or a combination of requirements approved by FAA appropriate for the UA.

This approach would provide flexibility in the methods of compliance for UA. It considers different procedures and pathways, in addition to the traditional noise certification process in part 36, that will provide for more streamlined compliance for UA requesting an airworthiness acceptance. The methods of compliance for the noise

[138] For further discussion on proposed changes to FAA noise requirements and the applicability of 14 CFR part 36, see section XII.A of this preamble.

requirements are discussed in more detail in section XII.A, Updates to Noise Requirements.

X. Placards (§ 108.915)

Section 108.915 proposes that the UAS would be required to display all placards necessary for safe handling and operation. Placards providing safety information related to hazmat marking, no-step, no hand hold, danger propeller, etc., relay vital information to operators and maintenance personnel. This requirement contributes to the safety of the personnel working with the UA, including first responders and third parties, while also helping to protect the aircraft from damage due to improper handling. The dimensions of the placard and its text would need to be adjusted based on the UA's size, ensuring legibility. FAA understands the broad range of size of aircraft that may be produced under this part and expects industry to develop standards to accommodate the different designs while ensuring this safety information is properly displayed.

Y. Identification and Marking (§ 108.920)

Proposed § 108.920 would require UA to comply with 14 CFR part 45, which provides aircraft marking requirements. Part 45 marking requirements would not be required for the control station or any other associated element of the UAS. Section 45.11 of 14 CFR requires a fireproof data plate inside the aircraft to ensure that critical information about the aircraft's construction and operation is available in case of an emergency. The data plate contains information such as the aircraft's manufacturer, model number, and serial number. It may also include information about the aircraft's fuel capacity, electrical system, and other important details. In the event of an accident or emergency, first responders and investigators need accurate and reliable information about the aircraft's construction and operation to help determine the cause of the incident and to take appropriate actions to mitigate any hazards.

As part 45 of title 14 CFR was implemented before regulation of part 108 UAS, several sections of that part need to be updated to accommodate part 108 UAS. FAA proposes to add § 45.1(a)(4) to make part 45 apply to UA operated under part 108. In addition, FAA proposes modifying § 45.10 by adding § 45.10(a)(3) to allow for the marking of UA operated under part 108.

Proposed § 45.11 would add a new paragraph to require UA manufacturers under subparts G and H of part 108 to mark each aircraft with a fireproof identification plate. Proposed § 45.11(i) would provide three requirements for the fireproof identification plate, which are all consistent with markings for other aircraft. First, the plate would need to include the information found in § 45.13 using an approved method of fireproof marking. Second, the plate would need to be secured in a manner that it will not likely be defaced or removed during normal service or lost or destroyed by accident. Third, the data plate should be securely attached to the exterior of the UA fuselage, ensuring it remains legible and easily readable from the ground when the aircraft is not being operated. This placement facilitates straightforward identification and inspection by individuals on the ground, including first responders who can view the number without handling the aircraft.

To facilitate compliance with regulations and ensure safe operation, proposed § 45.13(a)(8) would require that the data plate clearly display the "Part 108" designation, if applicable, which would differentiate the aircraft from part 107 and part 91. This information will be valuable to both operators and regulators in determining where the aircraft is authorized to operate and provide consistency and uniformity in marking requirements across products in the NAS. FAA proposes to redesignate § 45.13 (a)(8) to § 45.13 (a)(9).

Part 45 also has specific requirements for the size of markings on different types of aircraft. The size of the markings depends on the type of aircraft, the purpose of the marking, and the location of the marking on the aircraft. For example, FAA requires that aircraft registration markings, including the unique N-number, be at least 12 inches tall on large aircraft, such as commercial airliners. This is to ensure that the markings are easily visible and legible from a distance, and can be read by air traffic controllers, pilots, and other aircraft personnel. On smaller aircraft, such as GA or private aircraft, FAA requires that the registration markings be at least three inches tall.

As proposed in § 45.29 (b)(4), the registration number of the UA would need to be displayed with 12-inch markings on the external surface if the surface is large enough for 12-inch markings. If the external surface is not large enough for 12-inch markings, then the manufacturer must use 3-inch markings. FAA recognizes that not all aircraft operating under part 108 can comply with these requirements due to size. Proposed § 45.29 (i) states that, if the size of the aircraft does not allow for 3-inch markings, marks as large as practicable would need to be placed on the largest surface. The marks would need to be maintained in a condition that is legible, affixed to the UA in such a way that it will remain affixed for the duration of each operation, and displayed on an external surface of the UA.

Z. Additional Design and Performance Requirements for Operational Purposes (§ 108.925)

In addition to the other design and performance requirements in §§ 108.800 through 108.920, the UAS would need to be designed and constructed to conduct any manufacturer-designated operation as outlined in § 108.400 and 108.500 safely. Whether the UA is being used for package delivery, agricultural dispensing, inspecting powerlines, or any other type of operation, there are specific hazards involved with specific operations that manufacturers are responsible for accounting for in their UAS designs. Proposed § 108.925(a) would require that the UAS be designed to account for any operational and environmental conditions and hazards not addressed under §§ 108.800 through 108.920 for any manufacturer-designated permitted or certificated operations as defined in §§ 108.400 and 108.500.

The purpose of this requirement is to capture the unique additional design requirements associated with the specific manufacturer designated permitted or certificated operations. This proposed performance requirement is necessary to ensure that aircraft are designed and constructed to withstand foreseeable flight and ground loads associated with those manufacturer-designated operations. Failure to establish and validate adequate material strength and design properties to accommodate these permitted and certificated operations could cause structural failure resulting in loss of UA control or introduce hazards to persons on the ground due to the nature of the operations.

Section 108.925(b) proposes that, for operations involving the carriage of hazardous materials, the UA or airborne transport container or tanks would be required to have sufficient structural integrity to contain the hazardous material without allowing leakage or release of the material in the event of a hard landing or crash. Containment of hazardous materials is especially important upon a hard landing or crash where the likelihood of leakage or release is greatest. Hazardous materials, if leaked or released, have the potential to cause immediate harm to health or property. Without proper containment, the public could be harmed, and first responders could be exposed to materials that could hinder their operations or require specialized equipment or procedures to mitigate.

AA. Testing

FAA is proposing a structured test and evaluation process that manufacturers would be required to follow to validate their UAS designs and demonstrate reliable design for the operational purpose. Testing would include both the UA and any AE for each UAS make and model. The proposed structured testing process is expected to be accomplished in two phases. Phase one is developmental testing, as required by proposed § 108.930, which is intended to validate a manufacturer's UAS design for compliance with the design and performance requirements of part 108, subpart H from initial ground testing, through first flight, and eventual compliance demonstration for each new make and model of UAS. Phase two would be function and reliability testing, required by proposed § 108.935, which is intended to demonstrate the manufacturer's UAS design has the necessary reliability to operate BVLOS in the NAS for the designated purpose without creating a hazard to persons on the ground or other airspace users.

FAA expects that voluntary consensus standards bodies would propose developmental and reliability testing standards. Once accepted by FAA, these testing standards would serve as a MOC with the testing requirements of this proposed rule and would address parameters to be evaluated prior to safe introduction of the UAS into the NAS. Testing standards would also address any test, analysis, and simulation necessary to validate alterations, repairs, or changes in design to a UAS with airworthiness acceptance. These testing standards should entail a comprehensive evaluation of the UA's performance across its flight envelope and throughout all intended operational parameters. The intent of this testing is to verify and validate the expected performance of the UAS and to ensure the design and materials used in the UAs construction offer the necessary strength and durability for all operations as designated by the manufacturer. For example, to ensure that aircraft electrical and electronic systems will continue to operate safely without interruption, failure, or malfunction, an aircraft to be used for powerline inspection would be tested in a representative High Intensity Radiated Field (HIRF) environment expected in service.

Pursuant to proposed §§ 108.105(b) and 108.470(a), before commencing any tests outlined in this section, the manufacturer would be required to possess a valid flight test permit.

1. Developmental Testing (§ 108.930)

Developmental testing is the phase of design maturation when the manufacturer will validate their proposed UAS design complies with the requirements of subpart H. Proposed § 108.930(a) would require a manufacturer to conduct flight testing of the UAS to achieve or validate compliance with design and performance requirements of subpart H in an operationally representative environment and throughout the flight envelope. Developmental testing is necessary to ensure a design has been adequately validated prior to locking the configuration of the UAS and conducting function and reliability testing. Configuration lockdown refers to the process of finalizing and securing the design, settings, and options of a system, software, or AE to prevent unauthorized changes. This ensures the system design remains consistent and operates as intended by preventing modifications to its configuration during testing.

Flight testing is required to validate end-to-end functionality of the UAS in an operationally representative environment. This ensures that all components of the UAS work harmoniously under expected operational scenarios, including those that may only be theoretical or may not be fully replicable in simulated environments. Further flight testing should include testing of the aircraft at the margins of design and performance to validate the design and determine appropriate limitations.

FAA recognizes manufacturers may use simulation, analysis, component tests, ground tests, flight tests, or a combination thereof, to show compliance with this subpart. Therefore, § 108.930(b) proposes analysis may be used in combination with flight testing to validate compliance with this subpart. For certain components or systems and some designated operations, methods other than flight testing may prove to be more accurate. FAA wants to allow for use of these other methods if appropriate.

If simulation is used in an analysis to validate compliance during testing, FAA also proposes in § 108.930(b) that the simulation must be validated using an FAA-accepted MOC. Validated simulations ensure accuracy and fidelity providing a reliable representation of real-world scenarios by showing that the simulation accurately predicts the outcome of physical testing. This reliability is essential for safety, as it ensures that any derived models or conclusions accurately mirror real-world conditions and responses, minimizing the risk of unforeseen issues or discrepancies when applied in actual operations. Once validated, the manufacturer can use simulations for derivative models that fit within the simulation's parameters. Recognizing the critical safety implications, FAA expects consensus standards bodies to develop acceptable standards that include provisions for developing and validating simulations. A manufacturer would rely on these standards as acceptable means of demonstrating compliance with the requirements of subpart H.

Section 108.930(c) proposes that, before proceeding to function and reliability testing, the manufacture ensures the UAS configuration has no hazardous operating characteristics or design features and is safe for the intended operation. This step ensures that the aircraft is fully prepared for reliability assessments, and that no product is introduced into the NAS before all safety issues are thoroughly addressed. Such diligence ensures that the UAS meets the required safety standards, thereby preventing premature deployment of potentially unsafe systems.

In addition, § 108.930(d) proposes developmental testing would be required to validate that any probable failure of the UAS will not result in a loss of flight or loss of control of the UA. Probable failures, such as those related to propulsion systems, C2 link, GPS, flight control components with a single point of failure, the control station, and any AE identified by the manufacturer should be evaluated for compliance with this requirement. All components of the UAS used for testing should be operated in accordance with the UAS operating instructions and each test should occur at the critical phase and mode of flight, using the highest UA-to-flight coordinator ratio. UAS with fail-safe design features demonstrated through acceptable developmental testing standards reduce the likelihood of incidents and accidents by ensuring no probable failure of the UAS results in loss of flight or loss of control of the UA. This demonstrated functionality is necessary to show a UAS design has an acceptable level of safety to be operated for the manufacturer-designated purpose.

2. Function and Reliability Testing (§ 108.935)

Proposed § 108.935(a) would require each manufacturer to perform function and reliability testing for each UAS make, model, and configuration. This requirement is intended to demonstrate that the specific configuration of each make and model produced by a manufacturer has the necessary reliability to conduct operations in the NAS for the manufacturer-designated purpose. Each serial number or ranges of serial numbers of a particular make and model would not require reliability testing. Once a particular make, model, and configuration has demonstrated compliance with function and reliability testing requirements, compliance with Quality Assurance § 108.730 and Production Acceptance § 108.735 requirements ensure each serial number of a particular make, model, and configuration produced by a manufacturer complies with the requirements of subpart H.

Section 108.935(b) proposes each UAS make, model and configuration complete no less than 150 failure-free flight test hours. A failure-free flight test is one where the UAS is operated and flown without experiencing any failures that could lead to a loss of flight, loss of control, non-conformance with UAS traffic management, loss of safe distance, or results in an unplanned landing. An unplanned landing is one that was previously unscheduled during the test or is necessitated due to failures that result in loss of function or redundancy for safe operation.

The occurrence of any of these outcomes resulting from a probable UAS failure condition increase the likelihood of an incident or accident which could result in injury or property damage. The minimum of 150 flight hours is based 14 CFR § 21.35(f)(2) requirements, which are the flight test requirements for part 21 certificated aircraft. By demonstrating a UAS design does not have any of these occurrences over a minimum of 150 flight hours, the manufacturer would show their UAS has the necessary reliability to be operated in the NAS, increasing the likelihood of a safe operation.

Only UAS with acceptable reliability, demonstrated though acceptable means, would achieve airworthiness acceptance, which is necessary to operate in the NAS. FAA expects function and reliability testing to be conducted in accordance with consensus standards accepted by FAA.

Section 108.935(c) proposes testing must be conducted in an operationally representative environment, as defined in §§ 108.400 and 108.500, and as designated by the manufacturer. Before entering the NAS, the UAS must establish a baseline for function and reliability in its operational environment. Function and reliability testing within the representative environment of the intended operations properly demonstrates that baseline before entering the NAS. This further ensures the manufacturer's designated UAS operational purpose may be conducted safely and reliably. FAA expects any voluntary consensus standards to encompass a specified minimum number of operational cycles for both UA and AE. The primary objective is to verify that the UAS reliability meets the expected minimum performance characteristics. Any supplementary design features needed for specific operations should be rigorously evaluated to confirm their reliability and suitability for the intended purposes. In addition, design features should demonstrate the appropriate reliability for the flight and ground loads expected in service. A UAS that is unable to withstand the ground loads expected in service, such as crew handling, loading, unloading, or servicing could fail due to unexpected fatigue and wear resulting in loss of flight or loss of control.

To ensure UAS designs continue to have acceptable reliability following the completion of testing proposed in § 108.935(b), § 108.750(b) proposes the manufacturer of the UAS that has received airworthiness acceptance must demonstrate compliance with the requirements of subparts G and H of this part for any design change to a UAS. Without this requirement, a design change such as replacing an existing servo actuator or speed controller with a new manufacturer's part number would likely have an effect on flight characteristics of the UA, thereby affecting its reliability. Only through thorough function and reliability flight testing of the new design can the demonstrated reliability of the UAS be maintained. Industry is well-suited to determine best practices for evaluating a design change that would have an effect on the demonstrated reliability of the UAS. Therefore, FAA expects industry to develop consensus standards to determine the appropriate number of function and reliability flight testing hours necessary to ensure any changes in design are thoroughly evaluated and the new UAS configuration continues to have no hazardous operating characteristics or design features; and is in a condition for safe operation.

XII. Corresponding Regulatory Updates

A. Updates to Noise Requirements

In the MOSAIC NPRM, FAA proposed to amend the applicability of 14 CFR part 36 to include noise requirements for aircraft that do not conform to a type certificate.[139] Specifically, FAA proposed to add § 36.0 to address such aircraft. This separation of § 36.0 from the remainder of part 36 was intended to keep the requirements of aircraft requiring a type certificate clearly separated from those which do not.

This proposal extends the MOSAIC NPRM's § 36.0 approach to UAS as part of airworthiness acceptance under part 108. Similar to the proposal in MOSAIC, manufacturers would demonstrate compliance with part 36 noise requirements through either FAA-approved noise consensus standards or other methods provided for in § 36.0. Under proposed part 108, manufacturers would attest to compliance with part 36 as proposed in subparts G and H of part 108.

1. Noise Certification Background

Pursuant to its authorizing legislation in 49 U.S.C. 44715, FAA has the responsibility to "protect the public health and welfare from aircraft noise." This responsibility came with broad authority to adopt regulations and noise standards to carry out this mandate. When promulgated in the 1970s, the statute mandated that noise regulations be created and required the application to aircraft seeking new type certificates. At that time, FAA applied the part 36 noise certification regulations when the agency issued type certificates. This represented the provision in 44715(a)(3) that acts as the "floor" for FAA's duty to exercise its authority. The agency's much broader authority over aircraft noise remains discretionary.

The MOSAIC NPRM proposed an expansion of applicability of part 36 to aircraft that had not received type certificates. FAA explained that it had initially determined that

[139] *See* 88 FR 47650.

there was little value in assessing the noise from aircraft that did not receive type certificates as the aircraft were low in number and in many cases may have been a single aircraft of its kind. More recently, FAA found there were larger numbers of these aircraft operating that did not conform to a type certificate, overtaking those historical presumptions. As such, FAA indicated in MOSAIC that it could no longer justify the exclusion of these aircraft, including light sport aircraft in 14 CFR 21.190 and some experimental aircraft subcategories under 14 CFR 21.19, and their noise impact on communities under its statutory responsibility. The MOSAIC NPRM provided an opportunity to recognize and address the noise created by these aircraft. The NPRM explained that the proposed expansion of the applicability of part 36 to these aircraft acknowledges that noise certification was part of the overall certification scheme for aircraft and appropriate for modernization.

FAA has the statutory obligation to regulate noise under 49 U.S.C. 44715, and discretionary authority to apply noise standards for aircraft with or without type certificates. FAA is proposing to use a similar noise regulatory approach for UAS operating under part 108 as FAA proposed for MOSAIC aircraft. In both cases, these aircraft would not have type design certificates, but rather special airworthiness certificates (*i.e.*, MOSAIC) or an airworthiness acceptance (as proposed in this rule).

FAA proposes to approach regulating noise for part 108 aircraft in the same manner that FAA proposed regulating noise for light sport aircraft in the MOSAIC NPRM. Like the MOSAIC proposal for light sport aircraft, this proposed rule does not call for type certification of aircraft to be operated under part 108. The regulatory approach for noise that was proposed in the MOSAIC NPRM, described herein, is being considered for this rulemaking. As described in section III.A.6, FAA uses the safety continuum to determine the appropriate level of regulatory oversight over a variety of aircraft. Because FAA finds that proposed part 108 operations falls between part 107 operations and light sport aircraft operations on the safety continuum, and because these two classes of aircraft similarly would not have type certificates, FAA is proposing to extend the MOSAIC regulatory framework to part 108 operations as it applies to noise. FAA requests comments on its proposed use of the MOSAIC approach for regulating noise to UA operating under part 108. FAA also requests comments and feedback on other possible approaches that could be taken for FAA to use its discretionary authority to regulate, or not regulate, noise produced by UA operating under proposed part 108.

In comparison to conventional aircraft operating from airports and in the NAS, UAS will frequently operate in closer proximity to noise sensitive areas. These UAS operations may occur with a higher tempo of operations and with noise signatures that tend to be time-varying and disruptive to persons on the ground. Operations using these UAS were not contemplated when FAA initially promulgated its noise regulations. Even though these aircraft would not go through a traditional type certification process, FAA acknowledges that these aircraft and their potential noise impact on communities are within its statutory responsibility.

When FAA adopted part 107 in 2016, which allowed certain small UAS operations without requiring airworthiness certification or any exemption, waiver, or certificate of authorization, FAA chose not to apply the noise certification standards of part 36. This decision was based on the limited aircraft size and restricted operating environment prescribed in part 107.

Since the promulgation of part 107, several UAS models have demonstrated compliance with part 36, with several more UAS models currently in the process. In addition, there has been a significant increase in the number of UAS and UAS operators and a rapid advancement of UAS technologies.

Experience with UAS operations has revealed that these aircraft operations are significantly different from those of the conventional aircraft. These different operations include package delivery or infrastructure inspection. The UAS aircraft are expected to operate at lower altitudes and in much closer proximity to persons that are not participating in the flight but who are exposed to its effects. Further, these aircraft are of unconventional design and incorporate newer technologies, such as distributed propulsion, electric battery power, and unique VTOL capabilities. Researchers have not yet determined how these new features and unique noise characteristics affect people's responses to their noise. The current noise limits and test criteria in part 36 do not consider these characteristics or operating environments because the standards and regulations were written to address traditional manned aircraft designs. For these reasons and as UAS operations expand significantly and as airworthiness standards are developed, such as those for vehicles operating under proposed part 108, FAA sees the need to propose noise regulations for these UA.

2. Noise Certification: Current Status

The primary emphasis in noise certification is on controlling aircraft noise. That is done by assessing noise at its source, the aircraft itself, rather than its operations generally. For traditional aircraft, this assessment occurs when noise is measured at the time of type certification. Through the creation of noise limits for various aircraft types and the development of measurement procedures and methods that are relevant to day-to-day operation, FAA meets its primary statutory obligation to protect the public health and welfare by assessing the noise profiles of aircraft as they are developed and by setting a defined noise limit with which an aircraft must not exceed before it is given a type certificate and permitted to operate. The limits are set based on weight, design, and means of propulsion. There are a set of standards and limits for fixed wing small airplanes, one for jets, one for helicopters, and one for tiltrotors. As new aircraft designs are developed, FAA gathers the appropriate data to determine what is acceptable for noise production by the aircraft type to fulfill the agency's statutory responsibilities. These standards, limits, and their adoption into regulations are how FAA meets its obligation to protect public health and welfare from aircraft noise and how that obligation is appropriately and consistently administered.

Traditionally, noise certification has been required only for aircraft that conform to a type certificate, though it is considered an airworthiness characteristic of an individual aircraft. As discussed earlier, the expansion of the domestic fleet to include routine operations of UAS that are not type certificated has caused FAA to consider its statutory responsibility regarding these aircraft and address noise from both type certificated and non-type certificated aircraft. As is required by FAA's statutory mandate, the existing limits and procedures for noise certification have been developed in a manner that considers the economic reasonableness, technological practicability, and appropriateness for the aircraft to which it would apply.[140] These criteria also guided the expansion of the noise requirements proposed here.

Currently, noise certification is a performance-based two-step process used to test an individual aircraft (or model) using the procedures of part 36. The first step is to measure the noise levels created by an aircraft at different operating points. The second step is to determine whether the noise levels measured during testing are at or below the regulatory noise limit, demonstrating that the aircraft complies with part 36. Since it does not require any specific technology or equipment be installed on an aircraft, part 36 functions as a performance standard; the test shows that as configured, an aircraft is below or above the regulatory limit. Notably, the noise regulation process does not itself create operational restrictions.

This overall proposed modernization of airworthiness qualifications and categories in part 21 and airworthiness acceptance in part 108 present a unique opportunity for FAA to modernize its noise responsibilities within the framework of the various aircraft certification and airworthiness processes that allow operation with or without type certificates. FAA is aware that type certification has long been avoided in part to skirt the noise regulations.

As noise requirements would expand to cover aircraft that do not have type certificates, FAA is open to consideration of different procedures and paths that will both meet its statutory obligations and allow for more streamlined compliance for those UAS receiving airworthiness acceptance. Those compliance mechanisms are proposed in

---

[140] 49 U.S.C. 44715(b).

§ 36.0. Nothing about these proposed regulations may be interpreted to alter the current noise certification limits or test requirements for type-certificated aircraft.

3. Applicability to Part 108

Proposed § 36.0 would apply to all aircraft for which an applicant seeks an airworthiness acceptance in accordance with part 108. Proposed § 36.0(a) lists the compliance requirements for aircraft that do not conform to a type certificate. Section 36.0(a)(1) contains the language that was proposed in the MOSAIC NPRM. This proposal would add § 36.0(a)(2) and require that the noise regulations of part 36 apply at the time an applicant submits an application for airworthiness acceptance of an aircraft. Further, as described in section IX.G, Repairs and Alterations, if there would be any repairs or alterations to a UAS with airworthiness acceptance, the proposal would require that the UAS maintain compliance with the requirements of subparts G and H of part 108, including compliance with the part 36 requirements.

This proposal would include all the requirements proposed in MOSAIC for this section in § 36.0(b)(1). It would also identify the aircraft subject to these requirements. This proposal would add § 36.0(b)(2) and require that for UAS going through an airworthiness acceptance process under part 108, the applicant must be able to document their compliance with part 36 prior to submitting the DOC required in § 108.715(b). First, an applicant would demonstrate the UAS, usually in its noisiest operating configuration, does not exceed the noise limit specified for an aircraft of its kind and weight, which is specified in part 36, the applicable consensus standard, or the requirements determined by FAA to be appropriate for the aircraft. The number that results from the test is called the aircraft's noise level and it must be no louder than the applicable noise limit required by part 36. The second part of demonstrating compliance concerns the test procedures and analyses that may be required (depending on the aircraft), and documenting that they conform to the requirements in part 36 for the aircraft. FAA anticipates that this provision would be applicable to certain UAS that may be similar to aircraft covered by an existing appendix in part 36. Those UAS may choose to comply with the applicable appendix.

Proposed §§ 36.0(c) and (d) would provide options to demonstrate compliance with part 36 requirements ranging from using part 36 appendices applicable for aircraft design when the design fits into existing categories, using FAA-approved noise consensus standards when they are available, or a combination of requirements as approved by FAA. FAA has previously acknowledged that existing part 36 standards and procedures may not be adequate to address noise certification of certain types of UA.[141] When no appropriate noise standards exist in part 36 for an aircraft, FAA has developed limits and procedures that apply to an individual aircraft model, in the form of rules of particular applicability (RPA) as an interim approach to noise certificate aircraft before a generally applicable standard is developed. FAA has been gaining knowledge and experience on UAS noise through working with stakeholders, including industry, academia, and NASA. Further, FAA has been actively engaged at ICAO and working with noise experts from other civil aviation authorities in developing a generally applicable, internationally harmonized noise standard for UAS designs. Once such standard is developed at ICAO into Annex 16, FAA expects to go through the regulatory process to incorporate that standard into part 36 if it is deemed appropriate. A general

[141] *Noise Certification Standards: Matternet Model M2 Aircraft* final rule; rule of particular applicability, 87 FR 55878 (Sept. 12, 2022).

noise standard for UAS is unlikely to be available until after the publication of this proposal.

As proposed in the MOSAIC NPRM, § 36.0(c) lists the first method of compliance that would be available to an aircraft that does not conform to a type certificate: the use of a noise consensus standard. FAA expects the industry to develop noise consensus standards for use by manufacturers of aircraft and by individuals. Before a consensus standard could be used to demonstrate compliance with part 36 for an aircraft that does not conform to a type certificate, the standard would have to be approved by FAA and based on part 36 noise limits. FAA expects that any consensus standards would not be limited to physical measurements of noise taken during test flights. They might instead be based on empirical data or analytical modeling if the underlying noise prediction methods are found to be robust.

In evaluating new noise consensus standards to be used to demonstrate compliance with § 36.0 for part 108 UAS, FAA expects to consider the following factors, which are similar to the factors described in the MOSAIC NPRM:

(1) The methods in the standard, whether based in physical noise testing or through validated and/or generally accepted noise prediction methods, are environmentally responsible, economically reasonable, technologically practicable, and appropriate for the aircraft to which it would apply (see 49 U.S.C. 44715(b)(4));

(2) The standard must consider developments in other associated fields (such as research programs into quantification and control of aircraft noise) and participation by stakeholders;

(3) The noise levels generated from using the prediction methods must be within 90 percent of confidence limits and must be within +/−3 A-weighted decibels (dBA) when compared to results from using the full noise measurement procedures in the corresponding appendix of part 36 or an FAA-published RPA for a UAS; and

(4) The standard must clearly document all assumptions used in the development, validation, results, and limitations of the methods presented.

FAA expects that these factors would be different in certain regards from what was described in the MOSAIC NPRM because these consensus standards would address a relatively new technology that is designed and operates differently than a traditional manned aircraft. In particular, the third factor uses a +/−3 dBA difference in the confidence limit instead of the +/−2 dBA proposed in MOSAIC. This difference accounts for the evolving prediction methods for UAS. Further, under this third factor, the consensus standard would be compared to the prediction methods either in part 36 or in an FAA-adopted RPA for UA, whereas under MOSAIC, the consensus standard would only be compared to the procedures in the applicable appendix in part 36.

A modeling-based consensus standard would be expected to reduce the cost of noise compliance. Not only would there not be a need to physically test every model (or aircraft), but consensus standards would also allow manufacturers to use the predictive capabilities of those standards to guide and support aircraft design decisions in earlier phases, avoiding costly redesign or modifications.

Accordingly, proposed § 36.0(c) would allow the use of a consensus standard for an aircraft that does not conform to a type certificate when the standard has been approved by FAA, and FAA finds that the standard is appropriate for the aircraft and applies to the specific design. FAA anticipates that manufacturers of aircraft will work to develop such noise consensus standards as an added value for their products, and to facilitate compliance with noise requirements at an early stage.

If there is no approved noise consensus standard available and appropriate to the UA, another means of demonstrating compliance with part 36 would be required. As proposed in MOSAIC, § 36.0(d) lists the methods of compliance with part 36 available for an aircraft that does not have an applicable noise consensus standard. The first determination is whether the aircraft is found by FAA for noise purposes to be the same as or sufficiently similar to a type-certificated aircraft covered by § 36.1. If it is the same or similar, FAA expects to document this determination as part of its existing noise certification process. As with MOSAIC, in proposed § 36.0(d)(1)(i) for part 108 UA, if FAA finds there is such a type-certificated aircraft, then the applicant for airworthiness acceptance may choose to retest its aircraft using the same part 36 standards that apply to the type-certificated aircraft, or adopting the noise levels for the type-certificated aircraft that are the same or sufficiently similar in design to the aircraft when the aircraft has not been altered to result in an acoustical change. FAA expects that § 36.0(d)(1)(ii) only would apply where the UA would be the same or sufficiently similar in design to a type certificated aircraft such that the noise levels are the same. The part 108 aircraft would need to be able to demonstrate the same noise levels as the type-certificated aircraft.

Alternatively, if FAA finds that the applicant's aircraft is not the same or similar to an aircraft noise certificated under § 36.1, the applicant would be able to demonstrate noise compliance using the noise requirements determined by FAA to be appropriate for the aircraft. This provision, proposed § 36.0(d)(2), is intended to allow the agency the maximum flexibility in finding an acceptable combination of requirements that are appropriate for the aircraft presented. FAA would be able to build a noise compliance basis for an aircraft using parts of current regulations in part 36, regulations in part 36 that are no longer used for new certifications, accepted noise compliance standards that are not published in part 36 (such as those applicable to single aircraft model), and portions of accepted noise consensus standards. The noise limits established in part 36 would still apply, but the method of compliance would consist of tests or analyses that work for a particular aircraft, while allowing for the whole of the noise compliance basis to be assessed according to the statutory mandate for economic reasonableness and technological practicability. This kind of flexibility is not available under § 36.1 for type-certificated aircraft. It is designed to assist applicants for airworthiness acceptance, especially for new aircraft designs that do not fit neatly into historical categories.

As an example, FAA has adopted RPA to provide requirements for specific aircraft.[142] Those noise requirements have included modifications to the part 36 test procedures, reference conditions, and noise limits for the specific aircraft. FAA may provide similar noise requirements for aircraft under part 108.

4. Exceptions to Noise Applicability

Section 36.0(e) provides exceptions from demonstrating compliance with the requirements of part 36 for certain aircraft. Paragraphs (e)(1)–(3) were proposed as part of the MOSAIC NPRM. FAA does not anticipate that these paragraphs would apply to

---

[142] FAA has published several in the Federal Register. The first: Noise Certification Standards: Matternet Model M2 Aircraft, 87 FR 55878 (Sept. 12, 2022). Several have followed, as listed here: www.faa.gov/about/office_org/headquarters_offices/apl/aee/noise/uas_noise_certification.

part 108 UAS because these exceptions are specific to aircraft with certificates under part 21.

For purposes of part 108, FAA proposes in § 36.0(e)(4) that UAS designed and used exclusively for agricultural UA operations under part 108 would be excepted from meeting the noise requirements of part 36. Certain aircraft that historically have been designated exclusively for agricultural aircraft operations (as defined in 14 CFR § 137.3), have been excepted from the requirements of part 36 (see § 36.1(a)), subject to some conditions. FAA is proposing to extend this exception in part 36 for agricultural operations for part 108 UA that are specifically designed for these operations and have an airworthiness acceptance that limits the purpose and use of these aircraft to agricultural operations. As agricultural operations occur largely over non-populated or rural areas, the imposition of noise standards would not result in enough public benefit to justify imposing the costs of compliance.

FAA requests comment on whether any other categories of aircraft should or should not be subject to part 36 noise requirements, including any technical or economic data that support the comment.

The process of noise certification for an aircraft that does not conform to a type certificate is intended to be simpler, with lower costs for manufacturers and owners that introduce significant alterations to their aircraft. The traditional processes of demonstrating compliance to noise requirements can be complex, requiring technical skills and experience with acoustic measurement that most aircraft owners do not have. Conducting such testing using accredited professional services can also be expensive. Moreover, the best noise performance is often achieved by informed decisions early in the design process rather than by later design additions or modifications. Like the noise certification basis for type-certificated aircraft, FAA must approve the applicable noise compliance standards for an aircraft before it is tested, or the applicant risks the tests and data being deemed unusable for demonstrating compliance with part 36. But the addition of consensus standards and the application of other methods of demonstrating compliance proposed here are all intended to create a simpler, less restrictive process while maintaining FAA's mandate to protect the public health and welfare.

5. Other Changes to Noise Certification

As in the MOSAIC NPRM, FAA proposes to amend other sections of part 36 (*i.e.*, § 36.1) to include references to aircraft that do not conform to a type certificate where the requirements would apply.

The MOSAIC NPRM proposed to amend § 36.3, Compatibility with airworthiness requirements, by breaking the applicability into two paragraphs for type-certificated aircraft and aircraft that do not conform to a type certificate. This proposal would add a new paragraph (c) to specifically address part 108 UAS. This new paragraph would maintain the requirements currently in § 36.3, but tailor the requirements to the airworthiness acceptance process that is described in subparts G and H of part 108. No changes to the existing requirements of the section are proposed.

Building on the MOSAIC proposal, § 36.1501, Procedures, noise levels, and other information, would be amended by adding a sentence indicating that the operating instructions for aircraft under part 108 would have to include the noise levels achieved during airworthiness acceptance. This proposal would be consistent with the requirements for other aircraft subject to part 36. No changes to the existing requirements of the section are proposed.

This proposal also builds on the MOSAIC NPRM proposal to amend § 36.1581, Manuals, markings, and placards, by adding a new paragraph (h) to describe the requirements for an aircraft that does not conform to a type certificate. This proposal would add text to the introductory language in paragraph (h) indicating that for aircraft subject to part 108, compliance with part 36 must be documented as described in § 108.720. A parallel requirement is in proposed § 108.720(a)(1), which would require that the operating instructions include the statements of compliance required under § 36.1581(h). As proposed, the operating instructions would include a statement that the aircraft has demonstrated compliance with part 36 and the demonstrated noise levels of the aircraft. In addition, paragraph (h) also would state that no operating limitations are prescribed as part of part 36 certification, and that part 36 does not affect any operating limitations designated for an aircraft by other regulations. The actual operating limitations statement is included in the new paragraph (h) because the current paragraph of § 36.1581 where it appears applies only to type-certificated aircraft.

B. Updates to Other Operating Rules

1. Part 43 – Maintenance, Preventive Maintenance, Rebuilding, and Alteration

FAA proposes to amend the applicability in § 43.1 to provide that part 43 does not apply to aircraft being operated under part 108. As with part 107, the regulations proposed in part 108 would govern maintenance and alterations of UAS receiving airworthiness acceptance and conducting operations within the United States under part 108. As such, the maintenance and alteration requirements in part 43 would not apply to these UAS. However, the maintenance and alterations for UAS that are operated under part 91 are maintained in accordance with part 43 of this chapter as applicable, and the requirements of part 108 likewise would not apply.

2. Part 45 – Identification and Registration Marking

FAA is proposing changes to the applicability of part 45 as well as conforming amendments to §§ 45.10, 45.11, 45.13, and 45.29. These additions are fully discussed in section X.Y of this preamble.

3. Part 48 – Registration and Marking Requirements for Small Unmanned Aircraft

FAA proposes to amend the applicability of part 48 in § 48.1 to provide that part 48 does not apply to aircraft being operated under part 108. This change is fully discussed in section VI.A.2 of this preamble.

FAA is also proposing to change the requirement in 14 CFR § 48.110(a)(7) to allow the serial number of a remote identification broadcast module to be listed on more than one Certificate of Aircraft registration only when the applicant information required in §§ 48.110 (a)(1)-(a)(4), is the same on all Certificates of Aircraft Registration. This change will allow remote identification broadcast modules to be more easily shared between small unmanned aircraft owned by the same person or entity. This change primarily affects owners of unmanned aircraft that are issued a certificate of aircraft registration pursuant to § 48.100 for small unmanned aircraft operated for any purpose other than exclusively limited recreational operations. Currently, owners of small unmanned aircraft operated for any purpose other than exclusively limited recreational operations must delete and then re-enter the remote identification serial number information on a Certificate of Aircraft Registration when a remote identification broadcast module is moved from one small unmanned aircraft to another owned by the same person or entity. This change will eliminate this burden, while still ensuring that the remote identification broadcast information can be associated with the registered owner or entity.

4. Part 89 – Remote Identification

FAA is proposing the addition of § 89.511 as well as conforming amendments to § 89.505 and § 89.515. These additions are fully discussed in section VI.K of this preamble.

5. Part 91 – General Operating and Flight Rules

i. Applicability

FAA proposes to amend the applicability of § 91.1 to describe that, except as provided in § 108.180, part 91 does not apply to aircraft being operated under part 108. As with part 107, the regulations proposed in part 108 would govern operations of UAS conducted BVLOS within the United States. As such, the requirements in part 91 would not apply to those operations. However, corresponding changes to §§ 91.113 and 91.225 are needed, as discussed below, to accommodate the proposed updates to right of way requirements for aircraft operations under part 91.

ii. Right-of-way rules: Except water operations.

FAA proposes to amend § 91.113 to inform operators operating under part 91 of the new right-of-way construct proposed with the issuance of part 108. Specifically, that a UA conducting operations under part 108 of this chapter would have the right-of-way over other aircraft in flight unless the other aircraft is operating in a Category 5 population density area as described in § 108.185, operating in Class B or C airspace as described in § 108.180(b), or departing from or arriving at an airport or heliport. Manned aircraft also have right-of-way if they are equipped and broadcasting their aircraft's location using ADS-B Out equipment that meets the requirements of § 91.227, or electronic conspicuity equipment that meets the performance requirements of § 108.195(a)(2)(ii). FAA proposes to make these conforming updates in part 91 to establish that the change to the right-of-way rules is generally applicable. For further discussion on the proposed changes to right-of-way requirements, see section VI.J.

iii. Automatic Dependent Surveillance-Broadcast (ADS-B) Out equipment and use

FAA further proposes to amend § 91.225 to except ADS-B Out equipment from operating in the transmit mode when operated solely to meet the conspicuity requirements as proposed in the revised § 91.113 and proposed § 108.195. As discussed in section VI, equipment operated per proposed § 91.225(f)(3) will not meet the requirements of ADS-B Out equipment operated to comply with either § 91.225 or § 91.227, nor is it intended to be used for air traffic. The equipment operated to meet conspicuity requirements would only be used to make a UA aware of the presence of a manned aircraft that the UA must yield to. Therefore, FAA is proposing that the use of this equipment would be at the discretion of the individual operator.

6. Part 107 – Small Unmanned Aircraft Systems

i. Applicability

FAA proposes amending § 107.1(b)(3) by removing the reference to section 333 of Pub. L. 112-95. Section 333 was replaced by 49 U.S.C. 44807 in the 2018 FAA Reauthorization Act. The last exemptions issued under section 333 were issued in 2018 and had 2-year durations, therefore expiring in 2020. As there are no longer any section 333 exemptions, it is unnecessary to include the reference in the regulation any longer.

FAA proposes amending § 107.1(b)(4) by striking the words "that has been issued an airworthiness certificate." This simplifies the applicability of part 107 by simply referencing aircraft that are operating under part 91, whether or not they have an airworthiness certificate. This amendment accounts for any aircraft that are operating under part 91 with a determination made under 49 U.S.C. 44807 that an airworthiness certificate is not needed for the operation.

FAA proposes adding § 107.1(b)(5) to state that part 107 does not apply to the operation of UAS BVLOS operations. As proposed part 108 is specifically intended to cover all BVLOS operations, it is logical to explicitly state that BVLOS operations would not be covered by part 107, in order to avoid any confusion.

FAA proposes adding § 107.1(b)(6) to state that part 107 does not apply to the carriage of property or packages by aircraft for compensation or hire. This amendment to § 107.1 would reflect the proposed amendments to part 107 rules relating to air carriers. For more information, refer to section XII.B of this preamble.

<u>ii. Aviation Safety Reporting Program</u>

FAA proposes to add § 107.8, which would prohibit FAA Administrator from using reports submitted to NASA under the Aviation Safety Reporting Program (or information derived therefrom) in any enforcement action except information concerning accidents or criminal offenses, which are wholly excluded from the Aviation Safety Reporting Program. As discussed in section V.B.4, adding this prohibition to part 107 would be consistent with how such reports are protected and used for part 91 pilots and other airspace users who are subject to FAA regulations. FAA and NASA have recognized the benefit of having accurate, candid, and timely reports of unsafe (or potentially unsafe) conditions in the NAS, and this would create that same consistency within part 107.

iii. Prohibition on interference with a remote pilot in command

FAA proposes to add § 107.10, which would codify that no person may assault, threaten, intimidate, or interfere with a remote pilot in command or visual observer in the performance of their duties regarding the operation of a UA. As discussed in section V.B.2, this requirement is necessary to protect the safety or efficiency of the NAS. Bad actors who interfere with UAS operations may endanger public safety and persons or property – both in the air or the ground – which is anathema to FAA's obligation to ensure the safe and efficient use of the NAS.

iv. Updates to certain areas within controlled airspace at or below 400 feet AGL

FAA proposes to amend § 107.41 to enable the same access to certain areas within controlled airspace at or below 400 feet AGL as part 108 operators. Under this amendment, airspace authorization would only be required in those portions of Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E airspace designated for an airport that FAA specifically designates as requiring authorization.

Currently, operators under part 107 must obtain an authorization from FAA to access any area within controlled airspace on a case-by-case basis. This is accomplished by using either FAADroneZone or a LAANC service provider.

LAANC and FAADroneZone collect data about the operator, including contact information, location and altitude of operation, date of operation, and time of operation. Once the operator has authorization through LAANC or FAADroneZone, they usually do not have any other interaction with FAA prior to accessing the airspace. FAA is currently reviewing the requirement to collect this data considering no air traffic services are being given to UAS operating 400' AGL and below.

Designated airspace requiring prior authorization would be compiled annually in FAA Order JO 7400.[XX], which FAA would incorporate by reference into § 107.41. FAA would then publish periodic designation updates for airspace requiring prior authorization in the *Federal Register* and seek public comment through an NPRM. After considering comments and making any appropriate adjustments, FAA would publish the adopted designation updates in a final rule. At the end of the year, FAA would apply the updates to FAA Order JO 7400.[XX+1] and then incorporate the new version of the Order by reference. The currently incorporated version of FAA Order JO 7400.[XX] would be available on FAA's website, along with any periodic updates. In addition to making these designations available on its website, the agency anticipates making electronic information available for service providers to incorporate into their UAS information service offerings. Finally, FAA recognizes that, under certain circumstances, it could need to designate additional controlled airspace as requiring authorization, on an immediate or temporary basis. Accordingly, FAA proposes that, to maintain safety or security of aircraft operations, the Administrator may designate additional controlled airspace as requiring authorization under this section.

<u>v. Technical amendment to remove airspace waiver</u>

FAA is also proposing a technical amendment to § 107.205 that would eliminate paragraph (h) of that section and no longer allow the waiver of § 107.41 (Operation in certain airspace). Section 107.41 generally prohibited small UAS from operating in controlled airspace unless authorized by ATC. FAA made that provision waivable because it anticipated that among the many requests to operate in controlled airspace, there would be some premised on the technical capabilities of the small UAS operation and that the safety analysis would prove burdensome to ATC. However, since the rule, FAA made it possible for small UAS operators to easily and efficiently request for authorization to operate in controlled airspace online (e.g., LAANC or FAADroneZone) and for FAA to grant or deny the authorizations without overly taxing ATC. As a result, FAA has the ability to process all small UAS airspace authorization requests through these online tools without having to use the waiver process. Indeed, FAA no longer uses the waiver process for this purpose. For that reason, FAA is proposing to make this technical amendment to eliminate a provision that is no longer used that may cause confusion for small UAS operators.

vi. Updates to rules governing BVLOS and operations for compensation or hire.

FAA proposes to amend § 107.1 to remove the applicability of part 107 to the operation of UAS beyond the VLOS of the operator. Since part 108 will be the rule set that governs the operation of UA BVLOS of the operator, it no longer makes sense to provide waivers to the part 107 rules for this type of activity. Any relief sought should be done under the auspices of part 108.

FAA proposes to further amend § 107.1 and § 107.205 to restrict the carriage of any property or packages by aircraft for compensation or hire. This had previously been allowed under part 107 in limited circumstances, primarily as long as the delivery was within line of sight of the remote pilot in command. Coupled with other restrictions in part 107, such as the prohibitions from operating over people and the restrictions on the carriage of hazmat, this was not intended to be a widespread activity and was not intended for large commercial ventures. The risk structure of part 107, which does not require any type of UAS design assurance, nor any form of operator qualifications, does not align with the risks posed with large commercial ventures. Therefore, FAA intends to remove the applicability for the carriage of property or packages by aircraft for compensation or hire from part 107 and restrict that activity to part 108, which is more risk appropriate. Part 108 will require all UA to have design assurance and an airworthiness acceptance issued by the manufacturer of the aircraft. Furthermore, the operator will have to attest to their capability to conduct safe operations and receive either an operating permit or operating certificate to conduct operations. Operators will also have to receive approvals for each area they intend to operate in, which will give FAA more visibility of where operations are occurring and provide for better ability to oversee these types of activities.

7. Part 119 – Certification: Air Carriers and Commercial Operators

FAA proposes to amend the applicability of § 119.1 to describe that part 119 does not apply to aircraft operated under part 108. When promulgating part 107, FAA noted that the time was not then appropriate for creating a process for air carriers for UAS operations.[143]As discussed in the 2016 Final Rule, the Department has continued to assess

[143] 81 FR 42036, 42076 (June 28, 2016).

if the requirements for air carriers are appropriate for UAS operations, including the need for air carrier certificates issued under part 119 and the operating regulations of part 135 or part 121.

In developing the proposed regulations for part 108, FAA concluded that it is not necessary to include part 108 operations within part 119, as proposed part 108 incorporates the relevant aspects of part 119 in a manner that is appropriate for UAS that can be operated under this part. For more details, please refer to section IX.B.1.

8. Part 133 – Rotorcraft External-Load Operations

FAA proposes to amend the applicability of § 133.1 to state that part 133 does not apply to aircraft operated under part 108. Part 133 prescribes the requirements for external load rotorcraft operations. As with part 107 operations, FAA has determined that the requirements for external load operations are not analogous to part 108 operations. The proposed design requirements of part 108, combined with the operational limitations proposed in part 108 obviate the associated risk of external load operations.

9. Part 135 – Operating Requirements: Commuter and on Demand Operations and Rules Governing Persons on Board Such Aircraft

FAA proposes to amend the applicability of § 135.1 to state that part 135 does not apply to aircraft operated under part 108. Part 108 is a fully contained set of operating requirements necessary for the safe conduct of BVLOS operations in the United States. Therefore, the operating requirements in part 135 would not be applicable to these operations and would only result in confusion if applied to part 108 BVLOS operations. In addition, BVLOS UA operations currently being conducted under part 135 are expected to transition to part 108 within a reasonable timeframe after the rule becomes effective. FAA understands that, to make that transition, existing operators will need time to update their fleets with UA that conform to the airworthiness requirements of the rule and meet other regulatory obligations. However, FAA does not intend for these operations to continue under part 135 for an indefinite amount of time.

10. Part 137 – Agricultural Aircraft Operations

FAA proposes to amend the applicability of § 137.1 to state that part 137 does not apply to aircraft operated under part 108. As further discussed in sections VIII.B and VIII.C, this rule proposes requirements for agricultural operations conducted with UAS. These proposed requirements are specific to the operating profile of UAS, unlike the regulations in part 137, which were developed and implemented for traditional manned aviation. In the course of issuing exemptions from various part 137 regulations for UAS, FAA has determined what the appropriate requirements are for UAS agricultural operations, as captured in this proposed part 108, and thus it is not necessary to apply the requirements of part 137 to these types of operations. In addition, BVLOS UA operations currently being conducted under part 137 are expected to transition to part 108 within a reasonable timeframe after the rule becomes effective. FAA understands that, to make that transition, existing operators will need time to update their fleets with UA that conform to the airworthiness requirements of the rule and meet other regulatory obligations. However, FAA does not intend for these operations to continue under part 137 for an indefinite amount of time.

XIII. Part 146: Automated Data Service Providers

A. Introduction

FAA recognizes the pressing need to enable UTM services, which help manage risks for BVLOS UAS operations.[144] Facilitating the use of automated data services is an important step in realizing UTM services that could optimize NAS safety, security, and efficiency. Through this rulemaking, FAA proposes to create a regulatory framework that would enable the development, growth, and continued innovation of automated data services, beginning with those in support of the UTM ecosystem.

Data automation is a method of data management that relies on technology to collect, process, analyze, and transform raw data into usable information. Typically, automated data service providers use a distributed computational system—essentially a network—to gather raw data, process it, and then provide it in a usable format to the data recipient or user. FAA proposes a new part 146 to regulate those providers who use data automation systems to support certain UTM services necessary for BVLOS operations. The automated data service providers subject to regulation under proposed part 146 may, or may not, be directly involved in the aircraft operation. Nonetheless, they would provide flight services to help operators conduct their operations safely and efficiently. As such, FAA anticipates that most BVLOS operations would rely on automated data services to meet operational requirements proposed in part 108. Other operators may also rely on automated data service to fulfill their operational requirements, which are further discussed later in this proposed rule.[145]

[144] The term "UTM" refers to a set of automated data services provided by a federated, distributed network of providers and an all-encompassing framework for managing multiple UAS operations. UTM system relies on NAS users and service providers to provide the services that collectively form the UTM ecosystem. The ecosystem will eventually include services for flight planning, communications, collision avoidance, and weather, among other capabilities.

[145] See section XIII.F.3 for a further discussion on the breakdown of operations that may be supported via automated data services provided through part 146.

Automated data services may fulfill a variety of purposes depending on their exact functionality. Nonetheless, as discussed later in this preamble, FAA is only interested in automated data services that support operators in fulfilling their operational obligation without compromising the safety or efficiency of the NAS. In other words, only automated data services that are used by operators to mitigate additional risk that may be introduced in the NAS as a result of their aircraft operation would be subject to this rulemaking, *i.e.*, part 146 requirements.

FAA anticipates many benefits from enabling the provision of automated data services. For example, automated data services that provide strategic deconfliction of UAS operations would reduce the risk of midair collision between UA, thereby reducing the risk of harm to people and property on the ground. Other kinds of automated data services may support operators' DAA responsibilities, which would include providing surveillance information or avoidance maneuvering instructions. Automated data services may also help operators avoid flight into terrain or dangerous weather, or loss of flight control, by providing operators with specialized data before and during flight operations to manage a variety of risk factors. These data service providers will play an important role in addressing safety concerns and in mitigating risk inherent in BVLOS operations. Because of this key role, these data service providers warrant FAA oversight to help ensure the continued safety and efficiency of the airspace.

Some stakeholders may be more familiar with the concept of automated data service provider under other names. For example, "third-party service provider", "UAS service supplier (USS)", or "Supplemental Data Service Provider (SDSP)" are concepts familiar to many stakeholders active in the UA industry. This is because operators often outsource complex data functions that support unmanned flight operations to these third parties with the appropriate technological expertise, equipment, and scaled networks. Under proposed part 146, all these services and providers of those services that would fall within the umbrella term *automated data service provider*.

Whether the automated data services are self-provided or outsourced to a third-party, any entity that provides an automated data service which FAA requires to be certified under part 146 would be subject to proposed part 146 regulations.[146] As stated earlier, not every automated data service provider would necessarily fall within the scope of proposed 146. Only those that provide the automated data services to support an aircraft operators' ability to comply with an FAA regulation would be subject to part 146. Put simply, if an operator is using the automated data service provider to do something for which FAA requires a certified service provider, then the provider, as well as the automated data service that the operator uses, will be subject to part 146 requirements. For example, an entity providing strategic deconfliction services for BVLOS operations in controlled airspace under part 108 would be subject to proposed part 146. This is because certificated strategic deconfliction is a requirement for those operations. Conversely, an entity providing automated data services to monitor the temperature of perishable cargo such as food deliveries or blood samples would not be subject to part 146 requirements. This is because though important to the operator, monitoring this

[146]By mentioning self-provisioned automated data services, FAA means automated data provided in-house by the operator to support their own aircraft operations. In this scenario, the operator would still be subject to undergoing the part 146 certification and service authorization process to provide their own automated data service. FAA is taking this approach to ensure that any automated data service introduced into the NAS, regardless of the service being provided by a third-party vendor or self-provisioned by the operator, that FAA must first vet the service.

is not an aviation safety or efficiency concern regulated by this chapter. And as proposed in this rule, FAA would require automated data services to be services that promote NAS safety and efficiency, as well as support an operator's ability to comply with an FAA requirement, to fall within the scope of part 146. Services that meet these requirements would be eligible, but not required, to obtain a 146 certificate, if the service they offer is not required to be provided by a 146 certified provider.

The emergence of automated data service providers presents FAA with an opportunity to consider FAA's oversight role in a way that is responsive to the pace of technological advances and the safety and efficiency of the airspace. Recent and ongoing innovations in the aviation market are expected to bring various benefits, but also present corresponding risks. To keep pace with these technological advances, while maintaining the safety and efficiency of the NAS, FAA is taking an incremental approach toward regulating automated data services. This proposed rule would focus on services that enable operations under proposed part 108; however, it could be scaled to support more complex unmanned and manned aircraft data services including through future rulemaking(s) that enable services to support operations by aircraft with a pilot on board. Automated data service providers may eventually provide services that would support larger and more complex aircraft operations, such as those that would support the advanced air mobility (AAM) market.[147] While FAA has considered how automated data services can support operations under the particularities of a part 108 operational paradigm developed for unmanned aircraft operating in limited airspace areas and below 400 feet, it has not considered under what conditions these services could be applied in established operational constructs for traditional manned or AAM aircraft. Importantly, the services themselves are in a nascent stage and will evolve quickly as part 108 operations increase. As the automated data service industry matures, FAA will undoubtedly consider ways to leverage the services to benefit other aviation sectors.[148]

There are inherent challenges associated with regulating technology services. FAA recognizes that prescriptive requirements or technical specifications could be outdated or obsolete before it can complete the rulemaking process. To balance the need to enable innovative services, maintain the safety and efficiency of the NAS, and be nimble enough to accommodate rapid technological changes, FAA proposes flexible, performance-based requirements that can evolve as technology advances in this dynamic operating environment. FAA proposes a risk-based regulatory approach that draws on FAA's long history and experience managing risk in the NAS, but also incorporates

[147] FAA Reauthorization Act of 2024 (Pub. L. 118-63, section 951) defines AAM as a transportation system that uses manned or unmanned aircraft that is comprised of urban air mobility (the movement of passengers or property by air between two points in different cities or two points within the same city using an airworthy aircraft that has advanced technologies, such as distributed propulsion, vertical takeoff and landing, powered lift, nontraditional power systems, or autonomous technologies; and has a maximum takeoff weight of greater than 1,320 pounds), and regional air mobility (the movement of passengers or property by air between two points using an airworthy aircraft that has advanced technologies, such as distributed propulsion, vertical takeoff and landing, powered lift, nontraditional power systems, or autonomous technologies; a maximum takeoff weight of greater than 1,320 pounds; and is not urban air mobility).

[148] For these reasons and more, which are discussed in the following section of this preamble, FAA does not intend to limit services provided by automated data service providers to those that only support UAS operations, even if it is anticipated that proposed part 146 would predominantly be used to support UAS BVLOS operations under proposed part 108, at this time.

novel elements appropriate for the dynamic nature of the technology sector. For these reasons and consistent with this proposed rule's overall approach, FAA proposes to leverage the work and expertise of voluntary consensus standard bodies as it evaluates the safety and effectiveness of automated data service providers. FAA would rely on industry-led consensus standards and capitalize on the adaptability they offer. Parties applying to operate as an ADSP would still need to meet FAA requirements and any public interest requirements.

Aircraft traffic management for BVLOS operations under proposed part 108 is fundamentally distinct and separate from traditional ATM. For traditional aviation, FAA engages in both ATC and ATM. The primary responsibility of ATC is the separation of aircraft. They control traffic in and around airports, in the terminal, and through en route airspace. Controllers speak directly with pilots, notifying them of traffic or weather statuses in their vicinity. Pilots depend on the instructions they receive from ATC to travel safely and efficiently. In contrast, air traffic managers facilitate a "system approach" to managing traffic that considers the impact of individual actions on the whole system. Managing disruptions in airspace capacity (for example caused by bad weather, traffic overloads, or emergencies) requires consideration of who or what may be impacted by events, and a coordinated mitigation effort to ensure safety and efficiency in the delivery of air traffic services. These services are critical to ensuring the safety and efficiency of the NAS.

FAA has preliminarily concluded that the traditional model of ATM is not proportional, relative to the low level of risk BVLOS operations under part 108 would introduce to the NAS. This is especially true because, as proposed, FAA places operational requirements as well as aircraft airworthiness requirements—including SUI—on the UAS to mitigate the inherent risk associated with conducting BVLOS operations under part 108.[149] Taking a risk-based approach, FAA does *not* propose to manage either separation of aircraft or the system-wide efficiency of part 108 operations through its ATC and ATM functions. Instead, to address the likely risk these operations may pose to other emerging entrants, traditional aviation, people and property on the ground, and the overall efficiency of the NAS, FAA proposes to create a regulatory framework under which operators can rely on automated data service providers to aggregate and disseminate information about operations—especially to appropriately deconflict BVLOS operations. Service providers will still be subject to FAA oversight and review to ensure their services are conducted adhering to principles the public has come to expect from existing air traffic services, including the ability to access public airspace.

Under this proposal, UTM would essentially be a federated network of information to provide all users with situational awareness of other operations in the airspace. Instead of FAA playing a centralized role in separation and efficiency of UA flights, the automated data service providers would provide information that operators would need to deconflict and manage the efficiency of their own operations. As a result, the term "unmanned traffic management" may be a misnomer. More accurately, the UTM system FAA proposes to adopt is better described as providing the information operators need to manage their own operations safely and efficiently.

[149] As stated earlier in this preamble, the aircraft airworthiness requirements proposed under part 108 aim to prevent loss of flight or loss of control incidents stemming from factors such as structural integrity, software and hardware functionality, performance attributes, and operational factors. The design and performance standards would require the UAS to withstand all expected flight and ground loads during its operations without compromising the UAS's safe operation.

Moreover, FAA concluded that it would be neither practical nor efficient for FAA to model UTM services on traditional ATM. First, FAA could not effectively provide ATM-like services for UAS using existing equipment and technologies. Air traffic surveillance systems were designed to identify aircraft large enough to carry people on board. As a result, radar and other surveillance systems do not reliably detect UAS, which are usually significantly smaller than aircraft that transport people. While other objects, such as birds, are sometimes detected on radar, this is not consistent or predictable because the efficacy of finding these objects depends on terrain and other local conditions. As such, FAA surveillance systems are not suitable to reliably track small and highly maneuverable objects such as UAS. These systems were designed to help controllers identify, track, and separate manned aircraft that primarily operate above 400 feet AGL. At lower altitudes, differences in terrain can interfere with accurate radar returns. For example, there are many areas within U.S. controlled airspace that feature hills, valleys, mountains, and other natural features that radar cannot penetrate. In addition, FAA surveillance systems must filter out false targets generated by phenomena such as trucks driving on bridges. Densely populated areas may also have man-made structures that serve as obstacles interfering with the efficacy of radar and other surveillance tools. In sum, FAA does not currently have the minimum tools and technology to provide consistent or reliable ATM-like services for UAS operating at 400 feet AGL and below.

Second, even if FAA could acquire the appropriate tools and technology to identify and track UAS operating 400 feet AGL and below, FAA would nonetheless face challenges staffing these operations.[150] FAA could not add these responsibilities to existing air traffic controllers because they would direct controllers' attention away from managing the rest of the traffic in the NAS and could thereby introduce a new hazard to traffic management for manned aircraft operating at higher altitudes. Accordingly, to provide ATM-like services, FAA would have to find a way to staff ATM operations at each of its 520 ATC tower facilities and 147 Terminal Radar Approach Control (TRACON) facilities.[151] Such an increase in responsibilities would require an exponential increase in the existing air traffic controller workforce.[152] FAA does not currently have the resources to sufficiently support that effort.

Since ATM services are not tailored to the needs of UA operating in the NAS,[153] other types of services are necessary to ensure BVLOS operations are safe and efficient. For the purposes of enabling BVLOS operations proposed in this rule, UTM services

[150] FAA is both the civil aviation authority and the air navigation service provider (ANSP) for the United States. FAA has statutory responsibilities to set standards and certify aircraft, airmen, and facilities per sections 106(g) and 40101 of 49 U.S.C. In addition, per 106(g) and 40103 of 49 U.S.C., FAA is responsible for ensuring the safe and efficient use of navigable airspace. FAA carries out its responsibilities by developing air traffic rules, assigning the use of airspace, and controlling air traffic through a complex network of air traffic control towers, terminal radar approach control facilities, air route traffic control centers, and flight service stations. Each day, FAA is responsible for serving tens of thousands of commercial and private aircraft operating in 29 million square miles of airspace. Through its ATM system, FAA coordinates the movements of these aircraft to ensure they operate at safe distances from each other and to manage disruptions to normal air traffic flow. FAA's ability to manage air traffic in the airspace of the United States is predicated on the Agency knowing who is operating in the airspace and, if necessary, on being able to communicate with those airspace users. About 45,000 flights are handled by FAA ATC per day. FAA estimates 858,000 commercial drones will be registered by 2026; if 5% of those flew in a given day, and ATC provided services to those flights, it would double the number of flights covered.

[151] *Available at* www.faa.gov/air_traffic/by_the_numbers.

[152] Pang, Y., et al. Air Traffic Controller Workload Level Prediction using Conformalized Dynamical Graph Learning (2023), *available at* arxiv.org/pdf/2307.10559.pdf.

[153] Unlike the ATM system that is managed by FAA, the UTM system relies on NAS users and service providers to provide the services that collectively form the UTM ecosystem.

would have to include strategic deconfliction and conformance monitoring.[154] In addition, FAA will have to create conditions for stakeholders to innovate and develop other technological solutions to enhance aircraft operations and mitigate risk. For this type of crowd-sourced data or network to work, everyone contributing data or other information services to the UTM system must be reliable and consistent. All stakeholders must have confidence that each service provider meets the same minimum standards, and that there is no "weak link" in the interdependent system. Proposed part 146 would meet this need by establishing the minimum standards and oversight responsibilities necessary to enable a successful, stakeholder-driven UTM system. FAA will also need to assess the procedures and operations of networks to ensure that they are consistent and adhering to FAA regulation and policy.

B. Legal Authority to Regulate Automated Data Service Providers

Prior to FAA Reauthorization Act of 2024, Pub. L. 118-63, section 932, which directs FAA Administrator to establish procedures, including rulemaking, to approve third-party service suppliers—discussed in section II.B of this preamble—Congress has long focused on directing FAA's incremental approach to regulating automated data service providers and their services. First, Congress directed FAA to develop a comprehensive plan for UAS integration in FAA Modernization and Reform Act of 2012 (Pub. L. 112-95), codified at 49 U.S.C. 44802. Subsequently, Congress updated section 44802 in the Reauthorization Act of 2018, directing FAA to consider "the potential use of UTM and other technologies to ensure the safe and lawful operation of

[154] See proposed § 108.190 regarding the requirements for strategic deconfliction and conformance monitoring when conducting certain operations under part 108.

unmanned aircraft in the NAS."[155] Furthermore, Congress specifically directed FAA to create a UTM Implementation Plan.[156] Congress contemplated that UTM systems would be "privately operated" and directed FAA to "outline the roles and responsibilities of industry and government in establishing UTM services," while also "recognizing the primary private sector role in the development and implementation of […] future expanded UTM services."[157] In addition, Congress requested the development of safety standards related to UTM services applicable to unmanned aircraft operations below 400 feet AGL.[158]

Second, FAA has authority to regulate air agencies under chapter 447 of 49 U.S.C. Under statute, FAA may issue certificates to air agencies (49 U.S.C. 44702) as well as "examine and rate" air agencies (49 U.S.C. 44707). Congress defined air agencies to include certain aviation schools (§ 44707(1)), repair stations (§ 44707(2)), and "other air agencies the Administrator decides are necessary in the public interest" (§ 44702(3)). FAA proposes to regulate automated data service providers that support aircraft operations using a distributed computational system under this authority to regulate air agencies.[159] Regulation of these automated data service providers is necessary in the public interest. In 49 U.S.C. 40101(d), Congress identified the following matters for FAA to consider as being in the public interest: "assigning, maintaining, and enhancing safety and security" and "encouraging and developing civil aeronautics, including new aviation

---

[155] *See* Pub. L. 115-254, § 342(b)(1) (2018).

[156] *Id.* at § 376(c).

[157] *Id.* at §§ 360(b)(6) and 376(c)(2).

[158] *Id.* at § 376(d).

[159] *See* 49 U.S.C. chapter 447.

technology." Enabling automated data services to mitigate the potential risk that BVLOS operations could pose to the NAS would enhance aviation safety and aid in the development of new aviation technology.

Lastly, and most recently, FAA Reauthorization Act of 2024 directs FAA Administrator to establish procedures, including rulemakings, to approve third-party service suppliers, including those who supply UTM services to support the safe integration and commercial operation of UAS.[160, 161] In accordance with this provision, FAA Administrator must ensure, to the maximum extent practicable, that industry consensus standards are included as an acceptable MOC in the approval process for third-party services. Further, in establishing this approval process, Congress directs FAA Administrator to "define and implement criteria and conditions for the approval and oversight of third-party service suppliers that (A) could have a direct or indirect impact on air traffic services in the NAS and (B) require FAA oversight".[162] In addition, the Administrator "shall establish procedures by which UAS can use the capabilities and services of third-party service suppliers to support operations."[163]

In response to these congressional directions, FAA would establish the regulatory framework and the requirements for regulating automated data service providers as well

---

[160] Per § 932(f) of Pub. L. 118-63, third-party service supplier means "an entity other than FAA that provides a distributed service that affects the safety or efficiency of the national airspace system, including UAS service suppliers, supplemental data service providers, and infrastructure providers, such as providers of ground-based surveillance, command-and-control, and information exchange to another party." FAA's proposal for defining automated data service provider, who are also referred to as third-party service suppliers, is in alignment with this definition.

[161] *See* Pub. L. 118-63, § 932.

[162] *Id.* at § 932(c)(1).

[163] *Id.* at § 932(c)(2).

as their service in proposed part 146. Automated data service providers would be regulated as air agencies; and FAA would rely on the use of industry standards, to the maximum extent practicable, to develop requirements of those services.

C. BVLOS ARC Recommendations

In 2021, the BVLOS ARC issued recommendation TP 2.1, stating that "FAA should adopt a regulatory scheme for third-party services to be used in support of UAS BVLOS." The BVLOS ARC further recommended that FAA issue certificates to "third-party service providers" (including UTM service providers) that fall into one of seven categories based on the functionality of the service that is being provided. At a high level, proposed part 146 is based on this recommendation; however, the specifics of part 146 differ from the ARC recommendations in a few key areas.

The BVLOS ARC recommended that FAA follow a MOC and DOC approach for certificating automated data services, similar to the process FAA adopted for broadcast Remote Identification (ID) under 14 CFR part 89. FAA agrees that some automated data service providers should be able to use a DOC to comply with regulatory requirements; however, fundamental differences between UTM services and remote identification mean that FAA cannot rely wholly on the DOC process to address safety and efficiency concerns.

FAA promulgated the Remote ID rule in response to concerns about public safety and security. The remote identification data elements provide information to government officials and other people on the ground or in the air about UA operations. The information can be used to distinguish compliant airspace users from those potentially posing a safety or security risk. A failure of a broadcast Remote ID module affects a single UAS, and such a failure is unlikely to cause an unsafe condition beyond that which may already exist. In contrast, automated data services may support or manage hundreds or thousands of UAS at once. A service failure may have cascading impacts on other services and on many UAS in different parts of the NAS. In this interdependent system, a small failure could have outsized consequences. FAA does not believe the DOC and MOC model is responsive to the type of risk an automated data service failure could present to the UTM ecosystem. As a result, FAA determined that in some, but not all, circumstances, the potential consequences of failure demand a higher level of oversight and scrutiny from FAA.

The BVLOS ARC also recommended that anyone should be able to apply to FAA to receive an automated data service provider certification—with minimal information about how the provider is structured. FAA determined that such an approach is inconsistent with how the Agency regulates other users. To determine that the automated data service provider can reliably and consistently provide an automated data service, FAA needs access to information about the automated data service provider, its overall operating practices, and how the provider addresses data management, cybersecurity, and quality systems, etc. As such, FAA proposes to require automated data service providers obtain part 146 certificates. As a part of the certification process, FAA would establish procedures to verify the organizational capability of that provider and their ability to comply with FAA requirements. These proposed certification requirements are further discussed later in this preamble.

Another BVLOS ARC recommendation was for FAA to create regulatory text to recognize specific UTM services.[164] Specifically, the ARC recommended identifying the following service providers: networked remote identification, strategic deconfliction, constraints services, conformance monitoring, operational planning, C2, and DAA. Based on previous experience, FAA is concerned that such an approach would unintentionally hinder automated data service providers that wish to innovate or provide a service that adds value but that does not fit into one of those seven pre-defined categories. Accordingly, FAA does not propose to limit automated data service providers to specific pre-defined services. Instead, FAA would leverage the use of industry standards and the safety objective of each automated data service's standards to regulate automated data service providers under proposed part 146.

D. Overview of Proposed Part 146

FAA proposes a new part 146, titled Automated Data Service Providers, in title 14 of the CFR. This part would establish the process by which FAA would regulate automated data service providers as well as their services and associated networks. The purpose of part 146 is to provide a regulatory framework for appropriate government oversight of automated data services that support aircraft operations. At the same time, the framework is designed to be flexible enough to accommodate the natural evolution and development of the technologies and systems on which these services are based upon. Through proposed part 146, FAA seeks to balance the need to ensure the safety and efficiency of the airspace without impeding the development of new and innovative

[164] *See* BVLOS ARC Report, p. 157.

services that could otherwise bring services that enhance the safety of operations and offer new economic opportunities.

Under proposed part 146, a person may obtain a certificate and authorization to provide automated data services using a distributed computational system for the purpose of showing compliance with the requirements under this chapter.[165] While the certificate is meant to address the service provider's holistic ability to provide automated data services of a certain caliber, the service authorization is meant to address the individual service's capability as well as the provider's ability to provide that specific service—thereby integrating the service into the NAS for it to be used by aircraft operators. The person would need to submit an application to FAA for review. If FAA determined that the person has met FAA's requirements, FAA would then issue their requested part 146 certification and service authorization. Under this proposed rule, FAA proposes the application process for automated data services providers seeking part 146 certification and service authorization. FAA also proposes the requirements automated data service providers would be required to comply with to maintain their part 146 certificate. FAA anticipates the creation of an electronic platform for processing applications under proposed part 146. This platform for managing part 146 applicants and automated data service providers would be available on FAA's website, upon finalization of this rulemaking effort.

To maximize flexibility without sacrificing safety, FAA proposes a two-part approval process patterned after —but not identical to — other FAA regulatory

[165] As discussed later in this preamble, FAA would define a distributed computational system to mean a system that relies on one or multiple piece(s) of software, running simultaneously on one or multiple computer(s), to provide a set of functions.

constructs. This process requires the data services provider to obtain a certificate at the organizational level and then obtain authorizations for the individual services it provides. This is comparable to the way FAA regulates part 145 repair stations. Under that construct, the organization must seek a certificate to operate as a repair station but must also hold the specific ratings necessary to perform a particular type of repair. Proposed part 146 is substantially similar in that FAA would evaluate the service provider's qualifications both at the organizational level and at the individual service level. FAA proposes to categorize services into three levels—Service Level 1, 2, or 3—which are described in greater detail in the sections that follow.[166]

The issuance of a certificate enables FAA to provide regulatory oversight of the applicant—corporation, organization, etc.—that intends to deploy the service. The certificate would indicate that the applicant is capable of reliably providing data services of a specific tier or service level. As part of the certification process, applicants would be required to submit information proving their ability to comply with the requirements of proposed part 146.[167]

The automated data service provider would also have to obtain an FAA authorization to provide specific services. This construct enables FAA to provide regulatory oversight over each service an applicant seeks to introduce into the NAS. As part of the process for seeking such authorization, the service provider would have to

[166] See section XIII.F.3 of this preamble for further discussion on the three service levels and their corresponding level of oversight.

[167] Per § 146.115, the appropriate certification information to submit to FAA would range from declarations of compliance to providing substantial data and evidence proving the applicant's capability to provide their service. This would depend on the service level that the applicant is seeking certification for.

demonstrate why their service is needed to support UAS operations. As a part of this process, certificated service providers would also have to show that any new service they seek to introduce into the NAS is designed in accordance with an FAA-accepted industry consensus standard or standards. This is because safety remains FAA’s top priority; as a result, FAA will not approve experimental or unproven technologies. FAA must be reasonably confident that any service that will be introduced into the NAS has been vetted and tested by industry and other stakeholders to ensure that the technology is mature and interoperable with other UTM technologies. Requiring services to meet applicable standards is meant to streamline this process. By facilitating collaboration—including but not limited to automated data service providers and aircraft operators working together—FAA would be able to confidently maintain the safety and efficiency of the NAS.

After FAA issues a part 146 certificate and authorizes a specific service, the service provider may begin providing the service. Under proposed part 146, FAA anticipates that most applicants would go through the process of applying for a certificate just one time. Once certificated as automated data service providers, those certificated providers may seek additional service authorizations as they plan to deploy additional services. In most situations, the certificated service provider would not need to adjust their certificate. However, if the certificated service provider seeks to provide services in a higher category, they may need to upgrade their certificate. In this scenario, FAA would not revisit the provider’s certificate holistically. Instead, FAA would only address the additional requirements the provider would need to meet to obtain a higher-level certificate.[168]

E. Subpart A—General

Subpart A of proposed part 146 lays out the general requirements for complying with part 146. This proposed subpart describes the framework under which FAA would regulate service providers and their services. First time applicants would go through parallel FAA review processes to determine that the service provider, as an organization, and the services it seeks to provide meet FAA minimum requirements. This subpart also proposes the applicability of part 146 and defines common terms used. Lastly, this subpart discusses the proposed FAA requirement that prohibits anyone from engaging in fraudulent or deceptive practices in connection with proposed part 146.

1. Applicability (§ 146.1)

FAA proposes that part 146 would apply to anyone using or seeking to use a distributed computational system to provide automated data services to support an aircraft operator's ability to comply with FAA regulatory requirements.[169] FAA anticipates that most part 146 providers would be third-party organizations that provide their services under contract to operators. However, FAA does not refer to these services broadly as "third-party services" because some organizations may choose to provide these services in-house instead of contracting with a third-party. For example, a UAS operator with an operating component dedicated solely to providing an automated data

[168] For further discussion on the categories of service levels, see section XIII.F.3 of this preamble.

[169] A distributed computational system takes the commonly accepted meaning in the software industry: a system that relies on one or multiple pieces of software, running simultaneously on one or multiple computer(s), to provide a set of functions.

service to fulfil that company's need to support BVLOS operations would be required to comply with part 146. For these reasons, part 146 requirements would apply to automated data services, irrespective of whether they are provided in-house or by a third-party.

Proposed part 146 would exclude certain services that FAA regulates through other means. This is because FAA does not intend for proposed part 146 to replace, duplicate, or create redundancies with existing certification, authorization, or approval programs. Specifically, part 146 would exclude those services FAA regulates as a part of the aircraft certification process under 14 CFR part 21. Services that meet a regulatory requirement for aircraft, airframe, or parts certification in subchapter C would continue to be evaluated through existing processes and regulations for their respective certifications. Similarly, proposed part 146 would not apply to the requirements under 14 CFR subchapter J, including the requirements for regulating navigational aids under that subchapter. Those services, which pertain to ATC equipment and non-federal navigation systems, have an existing approval process, and therefore would not be subjected to part 146.[170]

Additional exceptions to the applicability of proposed part 146 include services provided to airspace users through LAANC UAS USS. In qualifying a USS to be a LAANC service provider, FAA uses its "other transaction" acquisition authority to enter into a Memorandum of Agreement (MOA) with such USS. Through an onboarding process with FAA, LAANC service providers become qualified as well as agree to abide by a set of documented terms and conditions regarding the technical administration of the

[170] AC 146-1, titled Automated Data Services, which is included with this docket, provides additional guidance for the limited subset of persons affected by this delineation.

service and how it is administered to the public.[171] LAANC USS are fully responsible for the development and operation of their software applications. Proposed part 146 would create a redundant set of provisions for LAANC USS, and for this reason, FAA proposes that services provided through LAANC would not be subject to part 146 requirements.

FAA views this proposed rule as an incremental step toward integrating UA and other emerging technologies into the NAS, with the current primary objective of enabling routine UAS BVLOS operations. To focus on this objective, FAA anticipates that part 146 will primarily support proposed part 108 operations at this time. Accordingly, FAA proposes to except the use of automated data services provided under part 146 for aircraft operations with an onboard pilot in command.[172] FAA added this exception because aircraft operations conducted with an onboard pilot in command may not share operational environments, nor the technology, of those that would scale operations under proposed part 108. On the other hand, FAA anticipates that the technological evolution of automated data services supporting proposed part 108 operations may easily transition to support aircraft operations, such as AAM, given common technical environment and operator involvement of such operations.[173] FAA may revisit this decision to include the use of automated data service under proposed part 146 to support manned operations as aviation technology advances and automated data service providers become essential to

[171] *See* 49 U.S.C. §§ 106(l) and (m).

[172] FAA recognizes that there may be a need to use automated data service to support aircraft operations conducted outside of part 108. FAA discusses this proposal further in section XIII.F.4 of this preamble per the proposed requirements in § 146.115.

[173] *See* FAA's Urban Air Mobility (UAM) Version 2.0 Concept of Operations, *available at* www.faa.gov/sites/faa.gov/files/Urban%20Air%20Mobility%20%28UAM%29%20Concept%20of%20Operations%202.0_0.pdf. This ConOps describes FAA's vision in potentially implementing UAM—a subset of Advanced Air Mobility (AAM).

other types of NAS users. Under those circumstances, FAA would engage in additional notice and comment rulemaking to address specific issues associated with the new technology.

Finally, FAA does not intend to use part 146 to regulate any services that support general business functions. In addition to promoting safety or efficiency of the NAS, only services used by aircraft operators, enabling them to comply with FAA regulatory requirements, would fall within proposed part 146. For example, distributed computation system services that support general office functions, such as payroll, accounting, or word processing would not fall within proposed part 146. Nor would it apply to services that manage an organization's ground transportation or non-aviation-related supply chain services.

2. Definitions (§ 146.5)

Proposed part 146 would bring a new population of air agencies under FAA's regulatory umbrella. These new organizations bring with them concepts and terminology that have not historically been part of FAA's lexicon. Accordingly, many of the terms frequently used in proposed part 146 are not currently used in other FAA regulations. Many of these terms relate to software engineering generally, or to automated data service provisioning, capabilities, and specific functions. Defining these terms will facilitate consistent use of a common lexicon and thereby assist part 146 applicants or any persons involved in providing or procuring automated data services. As such, FAA proposes the following definitions in § 146.5:

FAA proposes to define the term *authorized services* to mean those services a certificated automated data service provider is authorized to provide under part 146. FAA anticipates that authorized services could include but are not limited to: strategic deconfliction services for identifying flight path conflicts before takeoff and managing collision risk between UA; conformance monitoring to provide time-sensitive alerts so that the UAS operator maintains their flight path; DAA services, which provide surveillance information or avoidance maneuvering instructions to operators; or micro-weather forecasting services that are not available from conventional NAS weather sources.

FAA proposes that *automated data service provider* means a person using a distributed computational system to provide automated data services that support aircraft operations. Automated data service providers would encompass persons who provide their own services for their own operations (often referred to as vertically integrated companies) as well as persons who provide distributed services as a third-party provider. FAA anticipates automated data service providers will be comprised of companies, governmental entities, or other organizations.

FAA proposes that a *distributed computational system* means a system that relies on one or multiple piece(s) of software, running simultaneously on one or multiple computer(s), to provide a set of functions. Automated data services would be provided through these systems to support aircraft operations. An example of a distributed computational system is the infrastructure used by an entity that provides strategic deconfliction services to part 108 operators. In this example, the computer server operated by the entity that supplies the information or data processing to the part 108 operator is the distributed computational system.

FAA proposes that *major update* means a change to the software version that includes substantial changes to the application programming interface (API), or the features and functionality, such that the new version is not backward compatible with previous versions. Major updates include a new API endpoint or signature. They constitute significant revisions and may fundamentally change what the service does or how it supports operators. An aircraft operator who does not make the required changes to support the new version of a major software update would lose functionality of the service after the update.

FAA proposes that *minor update* means a change to the software version that changes the API, may include new features or functionality, and remains backward compatible. As a minor update may substantively change a service's features and functionality, users may be required to make changes to their aircraft and AE to integrate the minor version update properly. An aircraft operator who does not make the required changes would remain unaffected by the minor software update while operating on the older version.

FAA proposes that *patch update* means a change to the software version that does not change the API and is used for backward-compatible bug fixes and performance improvements. Patch updates often improve performance, fix bugs, or address security vulnerabilities but do not change the overall functionality or features of the service.

FAA proposes that *third-party vendor* means an entity that provides a distributed software capability necessary for a certificated service provider to meet the requirements of this part but for which the certificated service provider does not have direct control over the personnel, software code, or organizational processes. Examples of third-party vendors, as defined by FAA in this part, would include cloud storage providers, cloud database infrastructure providers, and cloud-based network monitoring tools. When appropriate, certificated service providers may leverage third-party vendors to develop, deploy, update, or repair authorized services. The distinction between an automated data service provider and a third-party vendor is significant under part 146. Whereas the former is subject to regulatory oversight by FAA because it directly affects the safety and efficiency of the NAS, the latter refers more broadly to software and tools that entities regularly rely on to provide business support functions that are not aviation specific.

3. General Requirements (§ 146.10)

Proposed § 146.10 establishes the framework under which FAA would regulate automated data services as well as providers of those services. That framework would consist of two primary regulatory functions. The first would require entities providing automated data services to obtain a certificate from FAA. The second would require those certificated entities to obtain authorization from FAA to provide individual services. Proposed § 146.10 would lay the foundation for the rest of part 146 by establishing the requirement that only certificated entities can provide services and that those services they provide require FAA authorization.

4. Falsification, Reproduction, Alteration, or Omission (§ 146.15)

For FAA to properly perform its oversight role, it must receive candid and truthful communications from regulated parties. Proposed § 146.15 would require truthful and candid submissions in applications, records, or reports used to comply with part 146. Failure to do so by for example, purposefully falsifying, reproducing, altering, omitting information from FAA could lead FAA to deny, suspend, or revoke a certificate or authorization or issue a civil penalty.

Automated data services must be properly and transparently regulated as they support operations affecting the U.S. airspace's safety and efficiency. FAA requires factual and accurate information to effectively conduct regulation and ensure safety. As such, FAA proposes, in § 146.15(a), to prohibit the act of any fraudulent or intentionally false entries in any application, record, or report made under this part, as well as any reproduction or alteration of such documents for fraudulent purposes. In addition, FAA proposes in § 146.15(b) to prohibit persons from knowingly concealing a material fact in any application or record used to show compliance with FAA requirements. This would apply to applications and records related to both provider certificates and service authorizations, and any other information a person submits to FAA under proposed part 146.

Lastly, to hold persons accountable for actions specified in proposed § 146.15(a) and (b), FAA proposes in § 146.15(c) that any such fraudulent or prohibited act or omissions conducted with regards to proposed part 146 to be subject to FAA penalties. Those penalties include the suspension or revocation of any certificate, approval, or authorization issued by FAA, a civil penalty, or the denial of an application for part 146 certification and service authorization. By enforcing penalties due to non-compliance with the candor and truthfulness requirements, FAA anticipates that it would increase compliance with the requirements proposed under part 146 and therefore ensure the safety and efficiency of the U.S. airspace.

Of note, while proposed § 146.15 authorizes FAA to take action for a regulated party's failure to meet its duty of candor and truthfulness in interactions with FAA, FAA may take certificate actions for other reasons. All NAS participants play a role in ensuring safe and efficient operations that are consistent with the public interest. In the age of advanced aviation, those participants will notably include automated data service providers who must, to contribute to a safe and efficient airspace, comply with rules and be held accountable for their actions. For that reason, it is worth highlighting that 49 U.S.C. 44709(b) authorizes FAA to amend, modify, suspend, or revoke any part of certificate when it decides that safety in air commerce or air transportation along with the public interest requires that action.

F. Subpart B—Certificate

Part 146 would establish a new type of air agency requiring an FAA-issued certificate for certain automated data service providers that support aircraft operations using a distributed computational system. Many of the advanced UAS operations in this proposed rule would rely on automated data services to help ensure the safety and efficiency of those operations. Furthermore, these advanced UAS operations would rely on the existence of an integrated and cooperative ecosystem of services. FAA anticipates that the data service providers would provide services to their specific end users, creating an information exchange between those with privity of contract. However, to be successful, the ecosystem would also have to rely on other data service providers exchanging information continuously with each other to provide operators with the information they need about the operating environment for safe and efficient operations. Collectively, the service providers would create a federated, non-centralized network in which each data service provider contributes information that other data service providers rely on to service their own individual users. In this operating environment, as proposed, each provider would rely on others in the network to provide accurate and reliable information; together automated data service providers would be able to provide accurate and reliable information to their users. Though the quality of the network relies on these individual contributions, as peer participants, the individual service providers have no authority to hold one another accountable for providing accurate and reliable information. To help address this problem, FAA proposes to set minimum requirements to help ensure that only qualified automated data service providers can participate in these networks. Proposed subpart B establishes those requirements and describes how to obtain a certificate to provide automated data services under proposed part 146.

1. Application (§ 146.100)

FAA proposes in § 146.100 that each person seeking to be certificated as an automated data service provider would be required to submit an application in a form and manner acceptable to the Administrator. The applicant would be required to provide all the information identified in subpart B, which is described in the following section of this preamble. FAA anticipates establishing a web-based application process that applicants could use to provide their materials electronically. FAA would provide instructions for submitting an application in guidance or other reference materials. [174]

2. Applicant Information (§ 146.105)

---

[174] AC 146-1, Automated Data Services, would provide applicants with the process for obtaining a part 146 certification and service authorization. This AC is available in this rulemaking docket.

Proposed § 146.105 would require the applicant to provide general business information about the organization seeking a part 146 certificate.

Proposed § 146.105(a) would require the applicant to submit the name, address of principal place of business, telephone number, and email address for the person seeking a certificate. FAA would use this standard contact information to identify, locate, and communicate with the organization. This information is necessary so that FAA can expeditiously reach the service provider to conduct oversight activities, as well as to follow up with requests for information when reviewing certification and authorization requests.

Proposed § 146.105(b) would require the applicant to submit documentation related to their ownership structure. Corporate applicants would provide information identifying anyone who owns five percent or more of the total voting stock. If that stockholder is not the sole beneficial owner, the applicant would also provide the name and address of the beneficial owners. For purposes of this section, stock owned directly or indirectly by an individual's spouse, child, grandchild, or parent is attributed to the individual. This means that the aggregate stock of the individual and any of these relatives would be considered together for purposes of determining whether the individual owned at least five percent of the stock. An individual could not avoid the disclosure requirement in this paragraph by distributing stock among the relatives identified in this section in an effort to lower their ownership level below the reporting threshold. For non-corporate entities, FAA requests information about anyone with a financial interest in the organization.

An important part of determining whether an applicant is qualified to hold a certificate is understanding who controls or influences the organization and determining whether they are capable of complying with FAA's proposed requirements. In the case of corporate entities, FAA decided to set the voting stock ownership reporting requirement at 5 percent or more because it considers that anyone below the 5 percent threshold is likely unable to exert control or influence over the organization. This information serves several purposes. First, FAA would use this information to determine whether the organization or one of the beneficial owners thereof previously held an ownership or management position with a part 146 certificated service provider. As explained in the sections that follow, information related to individuals or entities with ownership interests and individuals holding management positions in the applicant's organization is relevant to FAA's application evaluation. If any of these people contributed materially to circumstances that resulted in FAA taking adverse action against a previous certificated service provider, FAA may deny the application.[175] Requiring the applicant to identify the individuals and entities that would exercise some kind of control over the organization would help prevent an unqualified applicant from disguising their ownership structure to "reincarnate" into a new organization.

Second, this (Ownership) information would help FAA understand whether those exercising control over the organization were otherwise unqualified because of prohibitions on their ability to do business in the U.S.

[175] *See* discussion of proposed § 146.120 in section XIII.F.5 of this preamble.

Proposed paragraph (c) would require the applicant to provide the name of an accountable executive that exercises authority over the organization's operations. For purposes of this section, the term accountable executive would take the same meaning as in 14 CFR § 5.25. As discussed later in this preamble, FAA proposes to require part 146 certificated service providers to incorporate certain SMS provisions per the requirements in 14 CFR part 5. One such requirement is to identify an accountable executive, per § 5.25.

In paragraph (d) of this section, FAA would require the applicant to demonstrate that they are authorized to conduct business in the United States. If the individuals or entities exercising control over the organization are prohibited or otherwise unable to do business in the United States, FAA would not issue them a certificate. FAA is cognizant that the automated data services contemplated under this rule would contain a trove of digital information about American citizens, patterns of life, and commercial activities that criminal organizations and foreign adversaries could seek to exploit. The information FAA seeks about authorization and ownership would help prevent someone prohibited from doing business in the United States from disguising themselves as a legitimate organization.

Proposed paragraph (e) would require applicants provide any other relevant documentation the Administrator deems necessary to verify their identity, corporate ownership, and authority to conduct business in the United States. FAA would use this documentation to verify that the certificated service provider is the person permitted to conduct business in the United States. This information is also important because FAA expects foreign U-Space and UTM companies to seek reciprocal certification in the U.S.

Under this provision, FAA would provide a means to verify such applicants and determine whether they are capable of doing business in the United States, if applicable.

3. Service Levels (§ 146.110)

FAA proposes a risk-based approach to the service provider certification process that is based on the operation the provider seeks to support. As stated earlier in this preamble, FAA developed the proposed aircraft, personnel, and operational requirements to primarily address the risk BVLOS operations could introduce to the NAS. These requirements include important risk mitigations designed to help ensure the safety and efficiency of the NAS, but also the safety and security of people and property on the ground. FAA's oversight role in proposed part 146 would be to help ensure that the automated data service an operator uses to meet their part 108 requirements is provided by a provider that is qualified by FAA. It follows, then, that FAA does not intend for part 146 to provide a redundant set of provisions to mitigate the risk already included in the proposed part 108 requirement. Instead, proposed part 146 would address the residual risk that is not already addressed through part 108 provisions. Because proposed part 108 operator and aircraft requirements provide for many safety mitigations, part 108-compliant aircraft and operations therefore pose a relatively small residual risk profile.[176]

FAA proposes to regulate part 146 service providers that support part 108 operations in a way that is commensurate with the residual risk these aircraft and operations are assumed to pose to the NAS. Therefore, FAA proposes in § 146.110(b)(1)

[176] Consistent with this risk-based approach, operations conducted under part 107 are considered lower risk than those under part 108.

to categorize services that support part 108 operations as Service Level 1.[177] FAA anticipates, however, that some aircraft manufacturers and operators may seek regulatory relief to deviate from the requirements in proposed part 108. As discussed in the preceding paragraphs, FAA's balance of risk mitigations depends on compliance with all of FAA's part 108 regulations. Operations that rely on regulatory relief may disrupt this balance and, as a result, increase the residual risk associated with those operations. As such, in proposed § 146.110(b)(2), FAA would identify these operations that require regulatory relief from part 108 as those that require services categorized as Service Level 2.[178]

Any services that do not meet the requirements of Service Levels 1 or 2 would fall within Service Level 3. Service Level 3 would be reserved for operations with the highest level of residual risk – for example BVLOS operations conducted outside 14 CFR part 108.[179] FAA anticipates that not all operators will seek to operate under proposed part 108. In the absence of the proposed part 108 mitigations designed to address risk associated with BVLOS operations, these operations may present unmitigated risks to the

[177] Subsequently, in proposed § 146.115(a), FAA would allow Service Level 1 providers to demonstrate compliance with the applicable certificate requirements using a declaration of compliance. Filing a declaration of compliance represents a relatively low burden for the applicant to demonstrate compliance. FAA determined that this lower burden would be an appropriate way to address the residual risk compliant operations could pose. Proposed § 146.115(a) is discussed in more detail in the following section.

[178] Consistent with FAA's risk-based approach, FAA proposes that this increase in risk warrants additional scrutiny and verification of the service provider's applications. Accordingly, FAA proposes in § 146.115(b), discussed in more detail in the following section, to require the service provider submit documentation describing how the applicant meets the requirements. This means that a Service Level 2 provider would not be able to rely on a declaration of compliance. The increased risk profile would mean that the application would have to submit documentation describing what it will do to meet application requirements. Whereas a Service Level 1 applicant could submit an attestation that they comply, a Service Level 2 applicant would submit an attestation with explanations explaining how they comply.

[179] As stated earlier in this preamble, FAA proposes a risk-based approach to the service provider certification process that is based on the operation the provider seeks to support.

NAS. As such, FAA proposes in § 146.110(b)(3) to identify these services as Service Level 3. Under these circumstances, FAA would reserve the right to apply the highest level of review—including FAA oversight and regulatory requirements—to an applicant's qualifications for Service Level 3 certification.[180]

As part of the application process for part 146, applicants would be required to identify the service level for which they seek certification. Specifically, FAA proposes to require each applicant to identify whether they seek certification for the provision of services categorized as Service Levels 1, 2, or 3. This service level identification is meant to guide applicants through the application process for part 146 certification and subsequent service authorization. By identifying their service level, the applicants would then be prompted to substantiate their application package with the appropriate certification requirements, per proposed § 146.115 which is discussed further in the following section. Based on projected demand for BVLOS operations, FAA anticipates that the majority of applicants will seek a Service Level 1 certification, a modest number of applicants will seek Service Level 2 certification, and few, if any, applicants will seek a Service Level 3 certification. Though FAA does not anticipate significant demand for Service Level 3 certificates, FAA decided to propose this level to ensure that, as operations and support services evolve, there would be a regulatory path in place to certify providers of new or unforeseen capabilities.

[180] Consistent with FAA's risk-based approach, FAA would require in proposed § 146.115(c) that applicants for Service Level 3 certification to submit documentation and supporting data demonstrating that the applicant meet applicable requirements. Whereas a Service Level 2 provider would be required to describe how they meet the requirements, a Service Level 3 provider would have to provide data that proves that they meet the requirements. FAA anticipates that this could include technical specifications, test results, and other data and documentation showing the effectiveness of the applicant's system. Proposed § 146.115(c) is discussed in more detail in the following section.

Table 5 presents a summary of the provisions FAA proposes in § 146.110, which describe the service levels and their corresponding operational envelope. FAA proposes this risk-based framework to provide a level of oversight that is proportionate to the complexity of the operation supported by the automated data service provided under proposed part 146. FAA seeks comment on this proposed framework for categorizing service levels under part 146. Specifically, the Agency invites comment to determine whether this triage of service levels— based on mitigating any residual risk that may be added to the NAS due to the aircraft operation—is the best way to incrementally introduce automated data service providers as well as their services into the NAS.

Table 5. Service Levels

Service Level	Type of part 108 Operations
Level 1	Services to support part 108 operations without regulatory relief.
Level 2	Services to support part 108 operations with regulatory relief.
Level 3	Services that do not fall within Service Levels 1 or 2, that support operations that are not conducted under part 108 of this chapter.

4. Certification Requirements (§ 146.115)

Proposed § 146.115 describes the necessary information applicants need to submit to FAA to determine their qualification for part 146 certification. After applicants identify their service level for certification under proposed § 146.110, applicants would then be prompted under proposed § 146.115 to substantiate their application package by submitting the appropriate qualification information, corresponding to the identified service level. [181] This substantiated information the applicant provides must be submitted in a form and manner acceptable to the Administrator, which would correspond with the service level of each service. Under this construct, automated data service providers applying for multiple service authorizations along with their part 146 certificate would submit their certification information to correspond to the highest service level they seek to be certificated under.[182]

Proposed § 146.115(a) would require applicants for a Service Level 1 certificate to submit a DOC, attesting to their ability to meet the requirements of subparts D and E of proposed part 146, both of which are discussed in more detail below. As stated earlier, proposed part 108 operations would have many existing mitigations in place, therefore rendering Service Level 1 services appropriate to support part 108 operations. FAA would allow Service Level 1 providers to demonstrate their compliance with the applicable certificate requirements using a DOC. Filing a DOC represents a relatively low burden for the applicant to demonstrate compliance. FAA determined that this lower burden would be an appropriate way to address the residual risk that compliant part 108 operations could pose to the NAS. As such, for providing Service Level 1 services, the

---

[181] As stated earlier in this preamble, FAA believes that structuring this parallel application process supports FAA vision in efficiently reviewing application for part 146 certification and service authorization. Under this parallel process, applicants would be able to undergo the application process in a more efficient manner. This application structure would also reduce the likelihood of expending unnecessary time and resources, by both FAA and the applicant, on an application for a certificate without an associated application for an automated service, only to later discover that the applicant may not even be able to market or deploy the requested service. For further discussion on subpart C, service authorization requirements, see section XIII.G of this preamble.

[182] FAA intends on publishing an AC titled Automated Data Service Provider Certification and Service Authorization, AC 146-1, to guide potential service providers through the application process for part 146 certification and service authorization. This AC would inform applicants on the proper information that would be required to accompany their application, per the requested certificate service levels (service level 1, 2, or 3) and specific service. FAA invites public comments on this AC, which accompanies this proposed rulemaking, and is available on FAA's docket.

applicant would be required to establish their compliance with proposed part 146 requirements by declaring to FAA that they have systems and processes in place that meet the requirements of subparts D and E of proposed part 146. The requirements for proposed subparts D and E are described in detail in subsequent sections.

Proposed § 146.115(b) would require applicants for a Service Level 2 certificate to submit documentation to supplement the declarations of compliance to FAA describing their ability to meet the requirement of subparts D and E of proposed part 146. As stated earlier, Service Level 2 services are those that may be used to support part 108 operations that require the use of regulatory relief; such operations may introduce additional risk to the NAS. As a result of this increased risk, a service provider seeking to support such operations would also have to substantiate their application. This means the service provider would have to submit an application that includes documentation describing what the applicant would do to meet part 146 requirements. Whereas a Service Level 1 applicant would have to submit an attestation stating that they comply with part 146 requirements, a Service Level 2 applicant would have to submit an attestation explaining how they will comply with part 146 requirements.

For these reasons, FAA would require applicants for Service Level 2 certification to substantiate their application with a description of how they will comply with part 146 requirements. To demonstrate their ability to comply with subpart D, the applicant would be required to provide a declaration as well as a description explaining how they are able to comply with each requirement in that subpart. Similarly, to demonstrate their ability to comply with subpart E, the applicant would be required to provide a declaration as well as a description explaining how they are able to comply with each requirement in that subpart. The requirements for proposed subparts D and E are described in detail in subsequent sections.

Lastly, applicants seeking a Service Level 3 certification would be required to supplement their declarations of compliance with the submission of certain documentation or supporting data to demonstrate their ability to comply with subparts D and E of proposed part 146. FAA would require providers of Service Level 3 services to significantly substantiate their application package with evidentiary data to demonstrate their capability to comply. Whereas a Service Level 1 provider would be required to declare they meet the requirements, and a Service Level 2 provider would be required to declare and describe how they meet the requirements, a Service Level 3 provider would have to declare and provide data that proves they meet the requirements. FAA anticipates that substantiating data could include technical specifications, test results, and other data and documentation showing the effectiveness of the applicant's system. The requirements for proposed subparts D and E are described in detail in subsequent sections.

Special provisions would apply to applicants seeking a proposed part 146 certificate for the first time. Proposed § 146.115(d) would require anyone seeking a certificate for the first time to simultaneously submit an application for their first service authorization as well. Under this provision, FAA would issue a certificate only to those applicants who demonstrate that they are ready to provide services. FAA would not devote resources toward issuing a certificate to an entity that is unprepared to begin providing services.

As a global leader in aviation safety and efficiency, FAA is also a strong proponent of international harmonization. In § 146.115(e), FAA proposes to provide an avenue for qualifying foreign-based certificated service providers to operate in the United States. Specifically, FAA proposes that a service provider who presents proof of an authorization to provide automated data services from a country with which the United States has a bilateral safety agreement covering the provision of data services comparable to those in part 146, may be deemed to meet the application requirements in § 146.115.[183] Proof of an authorization should include corporate documents establishing ownership and control of the entity. For example, in 2022, the European Aviation Safety Agency (EASA) began drafting regulations for U-Space Service Providers (USSP) providing automated data services in the European Union. Those regulations were effective as of 2023. Under those regulations, USSP gain certification from any European Union Member State or from EASA and deploy their services in U-Space airspace regions authorized by their certificate. Reciprocity would markedly simplify and streamline the introduction of foreign-based certificated service providers into the U.S. airspace, while ensuring FAA has sufficient oversight.

FAA would facilitate the creation of a reciprocal certification process. FAA and many other civil aviation authorities already have processes in place to recognize each other's certifications for aircraft, avionics, and other systems through existing bilateral aviation safety agreements. By way of a similar bilateral aviation safety agreement, FAA may find a foreign-based service provider's certification to be in alignment with part 146 requirements. That said, foreign qualification does not guarantee that FAA would determine the foreign-based certificated service provider meets all requirements in proposed part 146. FAA reserves the right to consider the certificated foreign-based service provider’s ability to comply with all the proposed part 146 requirements.

By enabling the process of reciprocity, FAA would incentivize the introduction of foreign-based services that have been proven successful — so long as they meet all proposed requirements in part 146. Proposed § 146.115(e) would allow FAA to continue its global harmonization efforts.

5. Evaluation of Application (§ 146.120)

Proposed § 146.120 would establish the terms under which FAA would evaluate a part 146 certificate application. Once an applicant submits all the required information for part 146 certification, proposed paragraph (a) would authorize FAA to review the application and decide whether to approve or deny the application. To facilitate the evaluation, proposed paragraph (a) would also allow FAA to request supplemental information from the applicant at any time during the application process.

Proposed paragraph (b) would authorize FAA to issue a part 146 certificate to an applicant that demonstrates they meet the requirements for obtaining a certificate—these are identified in proposed § 146.115 and discussed in the preceding sections. Paragraph (b) would also authorize FAA to place conditions or limitations on the certificate as necessary.

Proposed paragraph (c) lists the bases on which FAA may deny a request for a certificate, including:

1) the applicant does not meet the requirements of proposed part 146;

2) the applicant holds a part 146 certificate that is under suspension or is in the process of being revoked or suspended;

3) the applicant previously held a part 146 certificate that was revoked;

4) the applicant has filled or is intending to fill a management position with an individual who exercised control over or who held the same or a similar position with a certificated service provider under this part whose certificate was revoked or suspended, or is in the process of being revoked or suspended, and that individual materially contributed to the circumstances resulting in the revocation or suspension;

5) an individual who will have control over or substantial ownership interest in the applicant had the same or similar control or interest in a certificated service provider whose certificate was revoked or suspended, or is in the process of being revoked or suspended, and that individual materially contributed to the resulting revocation or suspension; or

6) for failing to comply with other applicable legal requirements. FAA is responsible for maintaining the safety and efficiency of the NAS. If FAA believes that an applicant is not reliable or could otherwise introduce a hazard into the NAS, then FAA would deny the application. FAA would also look to ensure that an automated data service provider from another country is authorized or is not otherwise prohibited from conducting business in the United States. None of these factors is dispositive; however, they provide valuable information for FAA to consider when evaluating whether the applicant is willing and able to comply with proposed part 146. Though FAA could deny the application based on any of these factors, FAA maintains its discretion to make its decision in the interest of safety.

6. Obligation to Update (§146.125)

To ensure that a certificate application is based on accurate and relevant information, proposed § 146.125 would require an applicant to keep their materials up to date until they receive a decision from FAA. This applicant may be an automated data service provider submitting their application for FAA certification and service authorization for the very first time, or they may be a certificated service provider submitting an application to amend their part 146 certification. Under this provision, FAA would provide applicants with the opportunity to amend their application prior to FAA issuing its decision.

For example, an applicant may have a change in ownership structure; or an applicant might upgrade their system in a way that changes the way the system interfaces with other systems. In such instances, proposed § 146.125 would require the automated data service provider to provide information about the change to FAA. In order to make accurate decisions about an applicant's ability to comply with proposed part 146, FAA must have the most current information available at the time it makes its decision. As such, FAA would require the applicant to report any changes to their application in a form and manner acceptable to the Administrator. This is crucial for FAA to be aware of the statuses and dealings of persons under the Agency's purview. As such, FAA would require that the applicant, whether it be a first time or returning applicant, to report their changes to FAA within 10 days of being aware of the change. FAA anticipates that 10 days would provide the certificated provider or applicant with sufficient time to report their changes to FAA.

7. Term of a Part 146 Certificate (§ 146.130)

Under proposed § 146.130(a), a part 146 certificate would remain valid until it is either surrendered by the service provider or revoked or suspended by FAA. In other words, a certificate issued under proposed part 146 would not have an expiration date. Nonetheless, FAA may revoke or suspend a certificate if it finds that the certificated service provider is not in compliance with FAA requirements.

FAA proposes for a part 146 certificate to remain in effect indefinitely, with no requirement to renew or reissue the certificate after a set time, because there is no safety basis for FAA to levy such a requirement. Once a certificate is issued, the certificated service provider has an ongoing obligation to maintain their certification; this means they would be required by proposed part 146 to continue to operate in ways consistent with the privileges of the certificate. This includes maintaining an SMS, having change management procedures, reporting certain off-nominal behaviors to FAA, and addressing service difficulty reports from operators.[184] The totality of these ongoing certificate requirements places the certificated service provider in a position of being responsible for proactively managing risk and remaining accountable to FAA for compliance.

In practice, FAA expects to have ongoing contact with certificated service providers through separate processes defined in subpart E as authorized services go through routine software update cycles. For example, certificated service providers would notify or seek approval from FAA when making certain software updates, which is described in subpart E. Such software update notifications, which would happen periodically based on the service provider's deployment timeline rather than arbitrary

[184] FAA's proposed provisions for each of these requirements are further discussed in section XIII.H of this preamble; the corresponding regulatory text is in subpart D of proposed part 146.

FAA-defined intervals, would give FAA opportunities to verify continued compliance with the service provider's certificate requirements. Conversely, an absence of software update notifications over a long period—at least a year, given the typical pace of software development lifecycles—may signal to FAA the need to initiate an inspection under its regulatory authority to verify whether the service provider complies with its certificate requirements. This approach enables FAA to provide a risk-proportionate degree of oversight and reduces unnecessary inspection and certificate review activities when there is no evidence that may indicate a safety or compliance issue.

A previously certificated automated data service provider that seeks to offer services of a higher service level than allowed under its original certificate (for example, seeking to provide Service Level 2 services, when it was certificated for Service Level 1 services) would need to submit a new application for certification per the provisions of proposed § 146.130(b). However, the operator would only need to provide information relevant to the new or amended service. For example, if an automated data service provider is initially certificated for Service Level 1 services and then decides that it also wants to deploy Service Level 2 services, the automated data service provider would need to submit only the necessary information that is relevant for FAA to evaluate and determine whether the automated data service provider is qualified to be certificated as a Service Level 2 service provider, along with the associated level 2 service authorization request.

Lastly, proposed paragraph (c) would prohibit an automated data service provider from transferring its certificate to another person without FAA's express approval. This would include the prohibition of transfers in the event an automated data service provider sells or transfers its assets to another entity. In such cases, the new person would be required to apply for a part 146 certificate; this allows FAA to verify that the person meets part 146 requirements. FAA proposes to prohibit the transfer of part 146 certificates from one organization to another—including the transfer of a certificate in the event of bankruptcy—without approval from the Administrator. By doing so, FAA seeks to prevent the creation of loopholes, which could have allowed persons to circumvent FAA application and evaluation process proposed under part 146.

G. Subpart C—Service Authorizations

FAA proposes that an automated data service provider would have to demonstrate its qualifications in two ways. The first would be by obtaining a certificate, as discussed in the preceding subpart. The second would be by obtaining FAA authorization to provide a specific service or services. Subpart C proposes the requirements for obtaining these service authorizations. The following sections describe the process by which automated data service providers may request and be issued an FAA service authorization under proposed subpart C of part 146.

1. Request for Authorization (§ 146.200)

Proposed § 146.200 lays out the general requirements to obtain an authorization to provide a service under proposed part 146. This is to help ensure that a specific automated data service meets a defined set of technical and performance capabilities based on an industry consensus standard. The authorization process would also ensure that the applicant is capable of providing that service in accordance with part 146 requirements. To verify an applicant's ability to comply with proposed service authorization requirements, FAA proposes in paragraph (a) that any person seeking authorization to provide an automated data service under part 146 would be required to submit the information identified in subpart C in a form and manner acceptable to the Administrator.

In addition, proposed paragraph (b) would prohibit anyone from obtaining a service authorization without a valid service provider certificate. This reiterates FAA's proposed requirement that only service providers that already hold a certificate or service providers applying to obtain a certificate, may apply for a service authorization. For first-time applicants, this means that FAA processes the certificate and the initial service authorization application together. The process is designed to help ensure that FAA focuses its resources on evaluating only those service providers with valid part 146 certificates (or in the process of applying for certificates).

In the subsequent sections of this preamble, FAA discusses the proposed process for requesting a service authorization, the specific requirements, and FAA's evaluations of those requests.

2. Authorization Requirements (§ 146.205)

Proposed § 146.205 would establish the requirements for obtaining a service authorization. The purpose of these requirements would be to provide a minimum level of information FAA would need to verify that the service is designed to meet minimum performance requirements, and that the service provider is capable of providing the service at its respective service level.[185]

[185] See sections XIII.F.3 and XIII.F.4 of this preamble for the discussion on the various service levels and the information the applicant would need to submit to FAA, per the identified service level, in accordance with proposed §§ 146.110 and 146.115.

Proposed paragraph (a) provides an overview of the application process. This paragraph establishes five principal steps an applicant must take to apply for a service authorization under part 146. First, the applicant must establish the minimum performance requirements for the service they seek to provide. Proposed paragraph (b) describes how to set those minimum performance requirements. Second, the applicant must demonstrate that they are capable of meeting those minimum performance requirements. Proposed paragraph (c) describes how the applicant would do this. Third, the applicant must demonstrate that the service meets the automated data exchange requirements and software update requirements in proposed subpart E. Fourth, the applicant must show that the service would support an aircraft operator's ability to comply with an FAA operating requirement. Finally, the applicant must demonstrate that the automated data service is designed in accordance with a published industry consensus standard. These five principal steps are discussed in more detail as follows.

<u>i. Establish minimum performance requirements</u>

FAA is taking a flexible approach in regulating automated data services. This includes allowing applicants to identify and establish the minimum performance requirements for each automated data service they seek to provide, within certain parameters. The minimum performance requirements must be based on an industry consensus standard and support compliance with FAA operating requirements. Proposed paragraph (b) provides additional information on how to establish the minimum performance requirements. Under that provision, the applicant would be required to submit the following information.

First, the applicant must submit an overview describing the service and its intended use. This would include identifying the service, explaining what it does, and what kind of operations the service would support. By requiring an applicant to describe the automated data service and its intended use, FAA would identify and verify the specific type of service the applicant seeks to deploy. Using this information, FAA would be able to determine whether the automated data service is within the scope of services FAA may authorize under proposed part 146. If the service is not within the scope of part 146, FAA could provide this feedback to the applicant prior to them unnecessarily devoting additional resources to the application.

Second, the applicant must provide FAA with all representations it makes to service users regarding the capabilities, quality-of-service, limitations, and responsibilities of the service provider and responsibilities of the service user related to the authorized service. Representations to service users refers to advertisements the automated data service provider uses to procure business with aircraft operators for the authorized service. FAA would use the service provider's representations to service users to set baseline expectations for how the service should perform. Other minimum requirements, such as interoperability with other national systems and FAA regulations may apply. FAA anticipates that users will rely on data services to meet other requirements in FAA's regulations. Users—and by extension the UTM ecosystem—rely on those representations to conduct BVLOS operations safely and efficiently. As a part of the authorization process, FAA would verify that the data service capabilities meet the provider's safety and efficiency representations. FAA would need this information to validate the service's capability and functionality during the application process. FAA would also use these representations to set the baseline at which it would hold the service provider accountable for meeting its own minimum performance standards.

Third, the applicant must submit technical specifications describing the service's system architecture and functionality. FAA would use this information to understand the service and its functions, as well as how it is represented as part of the UTM network—*i.e.*, how the service interacts with other automated data service providers or participants of the UTM ecosystem. In addition, FAA would use the technical specifications to perform these validation activities regarding a service's function, capabilities, and limits, which are discussed in the prior paragraph.

ii. Demonstrating Applicant's Capability

Proposed paragraph (c) of § 146.205 requires the applicant to submit specific data and documentation regarding their service to demonstrate their capability of meeting the minimum performance requirements established in paragraph (b) of § 146.205. The way an applicant demonstrates their capability and the type of data and documentation would depend on the service level of the automated data service, which must be submitted in a in a form and manner acceptable to the Administrator. As such, in accordance with § 146.115, the applicant would be required to provide FAA with the following information to demonstrate their ability to provide an automated data service in accordance with proposed part 146 requirements.[186]

For services categorized as Service Level 1, *i.e.*, services to support part 108 operations, the applicant would be required to provide FAA the following three

[186] Proposed § 146.115 provides a breakdown of the type of data and documentation an applicant needs to provide FAA for them to adequately demonstrate their ability to provide a service at a specific service level.

declarations: first, a declaration describing the service's intended use; second, a declaration stating that the applicant has records documenting all representations to service users regarding the capabilities, quality-of-service, limitations, and responsibilities of the service provider and service user related to the service; and third, a declaration that the applicant has records documenting the service's technical specifications, including its system architecture and functionality. By making these declarations, the applicant is affirming their understanding of part 146 requirements and is attesting their continued obligation to comply with FAA requirements for providing these services, as declared.

For services categorized as Service Level 2, *i.e.*, services to support part 108 operations requiring regulatory relief, the applicant would be required to supplement their declarations with the provision of a summary or description of the service they seek to deploy under proposed part 146. This would include a description of the service and its intended use; all representations to service users regarding the capabilities, quality-of-service, limitations, and responsibilities of the service provider and service user related to the authorized service; and technical specifications of the service describing the service's system architecture and functionality. By providing these descriptions, the applicant is demonstrating to FAA their understanding of how the service they seek to provide would support an aircraft operation. They would also describe what the service user's roles and responsibilities would be for continuing to use the service.

For services categorized as Service Level 3, *i.e.*, services to support aircraft operations beyond the scope of part 108, the applicant would be required to supplement their declarations of compliance with the provision of evidentiary data and documentation to FAA demonstrating their capability to provide the service. The submission of data or documentation includes providing FAA with a copy of service provider's documentation describing the service and its intended use; copy of the service provider's agreement containing all representations of the service to the users regarding the service's capabilities, quality-of-service, limitations, and responsibilities of the service provider and the service user as it relates to the authorized service; and a copy of the service provider's technical specifications of the service's system architecture and functionality. These submissions would include copies of the applicant's testing and evidentiary data of the service's performance, in addition to providing evidence of the applicant's capability to provide that Level 3 service. Because services categorized as Service Level 3 may support aircraft operations with a higher residual risk than part 108 operations, FAA would require service providers supporting such operations to prove their capability to support such operations. FAA would review the evidentiary data and documentation of these services to verify that the results of those services are capable of supporting complex BVLOS operations that are beyond the scope of part 108.

iii. Demonstrating the Automated Data Service Meets Subpart E of Proposed Part 146

To demonstrate that the automated data service meets FAA proposed requirements in subpart E, applicants would be required to demonstrate that their automated service meets the automated data exchange requirements in proposed § 146.400, as well as the software update requirement in proposed § 146.405. To do so, FAA would require applicants to submit certain data and documentation to FAA for review. Similar to the discussion in section XIII.G.2.ii of this preamble, the type of data and documentation would depend on the service level of the automated data service the applicant seeks to deploy. This in turn would prompt applicants to submit documentation commensurate to the complexity of the aircraft operation the service would support. The type of documentation each applicant would be required to provide is as follows.

For services categorized as Service Level 1, *i.e.*, services to support part 108 operations, the applicant would be required to provide FAA declarations, ensuring FAA that the applicant's automated data services meet the automated data exchange requirements proposed in § 146.400. Those include declarations attesting that the automated data service is interoperable, employs safeguards, contains an authentication method, and uses a non-repudiation method. These requirements are described in more detail in the sections that follow. With regards to software updates, the applicant would be required to submit declarations affirming that they have methodologies to verify that their software updates would perform in accordance with § 146.405.

For services categorized as Service Level 2, *i.e.*, services to support part 108 operations requiring regulatory relief, the applicant would be required to supplement their declarations of compliance with submissions of summaries or descriptions of how the applicant's automated data service meets the automated data exchange requirements proposed in § 146.400. This would entail the submission of documentation to FAA describing how the automated data service is interoperable, employs safeguards, contains an authentication method, and uses a non-repudiation method. Similarly, to demonstrate their ability to comply with § 146.405, the applicant would be required to submit a summary describing the applicant's software updates and testing methodology, assuring FAA that they are capable of releasing software updates that would not adversely affect a person's ability to operate safely in the airspace.

Lastly, for services categorized as Service Level 3, *i.e.*, services to support aircraft operations beyond the scope of part 108, the applicant would be required to supplement their declarations of compliance by providing evidentiary data and documentation demonstrating that the automated data service meets the proposed automated data exchange requirements of subpart E. This includes providing FAA with copies of the automated data service's test results, assuring that the automated data service has been proven to be interoperable, employs safeguards, contains an authentication method, and uses a non-repudiation method. Similarly, FAA would require the applicant to submit data and documentation demonstrating that their software updates and testing methodology can be released without adversely affecting aircraft operations that would rely on their service.

iv. Demonstrating the Automated Data Service Authorization Supports Operator Compliance with FAA Regulations

To scope the type of automated data service that may be provided under proposed part 146, FAA would require applicants to demonstrate to FAA how the automated data service they seek to deploy would support aircraft operator compliance with FAA regulations. As stated earlier in this preamble, not every automated data service provider would need a part 146 certificate. FAA would issue certificates for only those automated data services that operators can use to meet a regulatory requirement.

For example, under proposed part 108, operators who want to conduct UAS BVLOS operations in certain controlled airspace would be required to have capabilities in place for strategic deconfliction and conformance monitoring as proposed in

§ 108.180.[187] Both strategic deconfliction and conformance monitoring are automated data services that may be provided under proposed part 146. In contrast, an entity providing automated data services to monitor the temperature of perishable cargo such as food deliveries or blood samples would not be subject to part 146 requirements. This is because though important to the operator, monitoring this is not an aviation safety or efficiency concern regulated by this Chapter.

v. Demonstrating the Automated Data Service meets an Industry Consensus Standard

Further, as stated in proposed § 146.205(a)(5), basing an automated data service on an industry consensus standard would facilitate FAA's effort of ensuring that an automated data service would support an aircraft operation—by either promoting its safety or efficiency. This is due to the fact that standard setting organizations are comprised of various stakeholders including aircraft operators, manufacturers, and automated data service providers. By sheer participation of these diverse audiences and the representation of their viewpoints, FAA anticipates that it would promote innovative development of automated data services that reflect an operational need. [188]FAA's approach to enabling BVLOS operations leverages stakeholder engagement to help provide solutions to the challenges of safely and efficiently integrating UAS into the NAS. As a key part of this approach, service providers would have to show that any new service they seek to introduce into the NAS is based on an industry consensus standard or

[187] See section VI.G of this preamble.

[188] Consensus standards bodies consist of potential automated data service providers as well as users of those services, which include aircraft operators, manufacturers, etc. Within this context, service providers and service users would work together with FAA, communicating industry needs for automated data services that would promote the expansion of complex operations, while maintain the safety and efficiency of operations in the NAS.

standards. FAA proposes this approach to find the right balance between encouraging innovation and industry-led solutions, while at the same time ensuring that the NAS does not become a test bed for unproven technology. Safety remains FAA's top priority; as a result, FAA will not approve experimental or unproven technologies for unmitigated or routine use in the NAS. FAA must be reasonably confident that any service that will be introduced into the NAS has been independently vetted and tested by industry stakeholders to help ensure that the technology is mature and interoperable with other UTM technologies. FAA believes that requiring services to meet an industry consensus standard or standards strikes the appropriate balance between innovation and safety concerns.[189]

3. Evaluation of Request (§ 146.210)

Proposed § 146.210 describes the process FAA would use to approve or deny a service authorization request. Proposed paragraph (a) states that FAA would evaluate the information, materials, or any supporting documentation submitted by the applicant seeking authorization for deploying a specific automated data service. FAA would review the applicant's submission to help ensure that they meet the authorization requirements in proposed § 146.205, which are discussed in the preceding section. In addition, FAA may request supplemental information during the application process to support its evaluation process.

[189] This approach is in line Congress' direction in the FAA Reauthorization Act of 2024, Pub. L. 118-63, section 932. Per that section, "the Administrator shall ensure that, to the maximum extent practicable, industry consensus standards, such as ASTM International Standard F3548–21, titled 'UAS Traffic Management (UTM) UAS Service Supplier (USS) Interoperability', are included as an acceptable means of compliance for third-party services."

Proposed paragraph (b) would authorize FAA to issue an authorization if the applicant meets the requirements in proposed § 146.205. However, that authorization could come with conditions. Proposed § 146.210(b) would also authorize FAA to place limits or conditions on the authorization to the extent necessary in the interest of safety. FAA anticipates that there will be unknown variables associated with the novel services that could be deployed by part 146 certificated automated data service providers. The authority to place tailored limits or conditions on service authorizations would provide FAA more flexibility to approve services, so long as appropriate mitigations are in place. This serves to both enable innovation and simultaneously protect the safety and efficiency of the NAS.

Proposed paragraph (c) would provide for FAA to deny a request for authorization if one of several conditions is not met. These include if the applicant does not hold a certificate (or is not simultaneously applying for a valid certificate per proposed 146.115(d)), or the applicant does not meet all of the requirements of proposed § 146.205.

Proposed paragraph (d) would prohibit the transfer of an authorization from one service provider to another. This provision would ensure that a service continues to operate in accordance with its minimum performance requirements, as the applicant would establish, per § 146.205(b). Per that requirement, the applicant for service authorization is responsible for establishing the minimum requirements of services they seek to deploy under part 146—so long as the services meet certain baseline requirements proposed by FAA. Therefore, through this provision, FAA would maintain the integrity of the automated data service's capability and functionality, as established. In addition, FAA would prohibit transfers of authorized automated data services in the event the automated data service provider sells or transfers its assets to another entity. In such cases, the new person would be required to apply for a part 146 certificate and subsequent service authorization to receive an FAA approval to operate under part 146. This allows FAA to verify that the person with an FAA-issued service authorization meets part 146 requirements. Lastly, by doing so, FAA would prevent the creation of loopholes by prohibiting persons from circumventing FAA application and evaluation processes as proposed under part 146.

H. Subpart D—Certificated Service Providers

Proposed subpart D contains requirements for certificated service providers to comply with once they have obtained a part 146 certificate. As stated earlier in the preamble, to operate under part 146, automated data service providers would be required to obtain a certificate at the organizational level in accordance with subpart B, and then obtain authorizations for the individual services it provides in accordance with subpart C. To certificate the automated data service provider at the organizational level, they must demonstrate to FAA that they are capable of meeting the requirements of this subpart D of part 146. These subpart D requirements, which relate to cybersecurity, quality management systems, training, reportable occurrences, and data retention, are described in the sections that follow. Further, once certificated, the automated data service provider has an ongoing obligation to continue compliance with these requirements in order to maintain their part 146 certification.

1. Minimum Requirements (§ 146.300)

Proposed § 146.300 would establish the requirements applicable to certificated service providers providing services regulated under part 146. A certificated service provider would be required to remain in compliance with these requirements in order to maintain their certificate.

Unless otherwise authorized by the Administrator, proposed paragraph (a) would require the certificated service provider to remain in compliance with the terms of their certificate. Similarly, proposed paragraph (b) would require the certificated service provider to comply with the terms of an FAA-issued service authorization. These provisions unequivocally establish the certificated service provider's legal obligation to comply with the terms of their certificate and with service authorizations on an ongoing basis. In addition, these provisions provide a regulatory basis for FAA to bring an enforcement action against the certificated service provider for failure to comply with the terms of either the certificate, the service authorization, or both. FAA does not foresee situations where the certificated service provider is unable to comply with the terms of their part 146 certificate or service authorization. Nonetheless, FAA understands that circumstances may occur when the automated data service provider may request regulatory relief from those requirements. For this reason, FAA proposes to allow certificated service providers to deviate from complying with the terms of their certificate or authorization, if authorized by the Administrator.

Proposed paragraph (c) would require a certificated service provider to maintain their facilities, equipment, software, and data necessary to comply with the terms of the certificate and service authorizations issued under proposed part 146. Certificate requirements would include cyber and data security requirements per proposed

§ 146.305; quality management system requirements per proposed § 146.310; change management requirements per proposed § 146.315; training requirements per proposed § 146.320; reporting requirements per proposed § 146.325; record retention requirements per proposed § 146.330; automated service data exchange requirements per proposed § 146.400; and software update requirements per proposed § 146.405. Both the certificate and service authorizations requirements are discussed in the sections that follow.

FAA anticipates that many, if not all, certificated service providers will rely on third-party vendors to support their operations and, in some cases, service offerings. Proposed paragraph (d)(1) explains that third-party services that are not specific to an aviation safety function would not require FAA approval. For example, many companies outsource their human resources and personnel recruiting services to external parties. FAA does not expect these external parties, or third-party vendors, to be held responsible for compliance with proposed part 146 if their job function is not linked to any services issued under proposed part 146.

In contrast, proposed paragraph (d)(2) would require the third-party vendor to hold a service provider certificate and obtain a service authorization if the vendor's service is specific to an aviation safety function. For example, consider the scenario under which a certificated service provider deems it necessary to outsource some of their authorized services software maintenance responsibilities to a third-party. This third-party could be providing a crucial function in conducting the authorized service software updates, which FAA would otherwise regulate under proposed § 146.405 (described in subsequent sections). To prevent creating loopholes or regulatory gaps under which someone could outsource safety-critical responsibilities to someone over which FAA does not exercise oversight, FAA would require those vendors to also comply with the certificate and service authorization requirements issued under proposed part 146. In this way, FAA would ensure that essential services affecting aviation safety remain subject to proposed part 146. Proposed paragraph (d)(2) would help ensure that only those entities who have demonstrated their capability to FAA under this proposed part can introduce services —with the risks and mitigations associated with them — into the NAS.

Proposed paragraph (e) would require that a certificated service provider under this part to provide their automated data service to users in a reasonable and non-discriminatory manner, as applicable. FAA emphasizes that automated data service providers do not have the authority to provide operators with access to the NAS, as that authority resides solely within FAA. However, certain services—such as strategic deconfliction—have the capability to coordinate its user's operational intent with others in the network, and therefore may prevent other operators from operating in that space for a specific time. This may result in a certificated service provider's anticompetitive treatment of the airspace. Under this provision, FAA highlights that a certificated service provider must abstain from providing its users with preferential treatment, thereby providing reasonable and non-discriminatory access to the airspace.[190]

Proposed paragraph (f) would require certificated service providers to be authorized to conduct business in the U.S. and otherwise be in compliance with

[190] As the regulatory entity responsible for the efficient use of airspace under 49 U.S.C. 40103(b), requiring impartiality facilitates FAA efforts in ensuring optimized use of the NAS. Additionally, FAA recognizes the need to establish a priority of operations schema, which would guide service providers as well as operators in identifying priorities of operations and provide guidance to service providers on resolving conflicts when they exist among operators of the same priority level. FAA's priority schema, for applicable automated data services, is addressed in AC 146-1, which is available in the public docket for comment.

applicable law, including but not limited to those relating to data privacy and security. The purpose of this proposed provision is to make clear that the certificates and authorizations contemplated under proposed part 146 in no way override or supersede other applicable legal requirements. FAA does not intend to affect any legal obligation a service provider must abide by to operate in the U.S. Under this proposed requirement, FAA would require any certificated service provider to uphold their legal obligation to remain in compliance with any applicable U.S. government laws and regulations, not just those within FAA's purview. Those legal obligations could include, but are not limited to, any laws or regulations related to data privacy, security, use of spectrum, and restrictions on import or export of technology.

2. Cybersecurity (§ 146.305)

Proposed § 146.305 would require certificated service providers to take certain actions to maintain their cybersecurity. FAA recognizes that malicious attempts to disrupt the automated data service systems regulated under proposed part 146 have the potential to impact the safety and efficiency of the NAS. Bad actors may wish to disrupt services with the intent of extorting a ransom, or simply to wreak havoc and cause damage. Personal or proprietary information may be sought for financial gain of the attacker. To prevent or mitigate the occurrences of such events, it is in the interest of both FAA and all involved entities to help ensure that appropriate cyber and data securities are in place for all connected systems. Preventing and mitigating negative outcomes from a malicious actor infiltrating systems protects the safety and efficiency of the NAS by ensuring the integrity and reliability of the information exchanged between service providers and, ultimately, their users. As such, FAA proposes the following requirements in § 146.305

in order to mitigate risk to the NAS associated with a service provider's vulnerability to potential cyber or data security threats.[191]

Proposed paragraph (a) would require certificated service providers to develop and implement cybersecurity policies and processes to protect networks, devices, and data from unauthorized access and to help ensure integrity, accuracy, and reliability of the services provided to the customer or service user. By proposing this cybersecurity policy requirement, FAA would facilitate protection and mitigation against the aforementioned security threats. This would include, but not be limited to, cyber threats that could adversely affect the authenticity or integrity of data that could affect the safety and efficiency of the NAS.

More specifically, under proposed paragraph (b), FAA would require each certificated service provider under proposed part 146 to develop the following cybersecurity policies for the protection of data, including processes for:

(1) protecting software, hardware, and network computing infrastructure necessary to protect the authorized service from unauthorized access;

(2) ensuring the certificated service provider's employee access privileges are limited to those necessary to fulfill normal job duties;

(3) preparing for, responding to, and mitigating the impact of cyber attacks;

(4) collecting and analyzing data to measure the effectiveness of the cybersecurity policy and processes; and

---

[191] As a common industry practice, FAA would recognize ISO 27001:2022 as an acceptable means of compliance with proposed § 146.305. An applicant may declare, describe, or present its certification with this standard to show that it meets those regulatory requirements—depending on the part 146 certification's service level.

(5) revising the cybersecurity policy.

These proposed requirements are based on the Cybersecurity and Infrastructure Security Agency's "Secure by Design" best practices. FAA encourages service providers to engage in best practices for cyber and data security; however, FAA determined that it was in the interest of public and aviation safety, to propose these particular elements as requirements. By proposing these requirements as performance-based requirements, FAA believes it would encourage the continuous improvement of the automated data service provider's cybersecurity policy. FAA does not believe it would be effective to prescribe cybersecurity requirements by rule because service providers must be able to rapidly adjust cybersecurity measures to keep pace with the pace at which new cybersecurity threats are introduced.[192] FAA anticipates that service providers may be able to demonstrate compliance with this provision by relying on industry consensus standards. For example, FAA would consider ISO 27001 to be one way, but not the only way, to demonstrate compliance with proposed § 146.305.

3. Quality Management System (§ 146.310)

Proposed § 146.310 would require certificated service providers to have a quality management system in place to help ensure that the provision of authorized services continue to meet the minimum requirements of this proposed part on an ongoing basis. The safety and efficiency of the NAS requires NAS participants to remain in compliance with FAA requirements as well as improve their existing processes.

---

[192] *Available at* www.cisa.gov/securebydesign.

Quality management systems are regularly used in both the aviation and software industries. An abundance of globally recognized standards for quality management exists and may serve as resources. The proposed requirements for a quality management system are intended to help ensure certificated service providers have the processes and monitoring systems in place to identify the risk of a service failure preemptively – either those provided on their own or subcontracted services – and have the means to manage that risk proactively. The ultimate objective is for the certificated service providers to engage proactively preventing failures that could introduce risk or hazards into the NAS. As such, FAA would require certificated service provider to have the following quality management system procedures for each authorized service. These include procedures for an SMS per 14 CFR part 5; software update procedures; oversight procedures for third-party vendors affecting the authorized services; testing and verification procedures; and procedures receiving reports of any service difficulties.

Proposed paragraph (a) would require each certificated service provider to develop, implement, and document a quality management system acceptable to the Administrator. By doing so, FAA would help ensure that the services provided by the certificated service provider, or any services provided by third-party vendors that the certificated service provider relies on, has an appropriate method in place for identifying and addressing risk proactively. FAA views having a quality management system as a critical aspect to help ensure that each service provider continues to provide services that are safe, reliable, and are provided in accordance with the requirements of their FAA-issued certificate and service authorizations.

Proposed paragraph (b) would require the certificated service provider's quality management system meet certain provisions of FAA's SMS regulations in 14 CFR part 5 to leverage its existing safety management processes and principles into the quality management system proposed under this part.[193] FAA determined that applying existing SMS requirements—that many aviation industry stakeholders are already familiar with—would be a better approach than to create new quality management requirements that would duplicate or potentially conflict with existing safety management process or protocols.

FAA recognizes, however, that not every provision in 14 CFR part 5 could apply to automated data service providers. This is because many of the provisions are tailored to aircraft operators and manufacturers. Accordingly, proposed paragraph (b) would not require certificated service providers to comply with §§ 5.7, 5.9, 5.11, 5.13, 5.15, 5.27, and 5.71(c). Each of these part 5 provisions are tailored to apply to aircraft manufacturers or operators and are provisions with which part 146 certificated service providers could not comply. The certificated service provider would have to comply with part 5 requirements, including but not limited to, documenting and implementing a plan to address their safety policy, safety risk management, safety assurance, and safety promotion.[194] FAA anticipates that it would provide additional guidance to assist certificated service providers so they can familiarize themselves with the core principles of SMS and implement compliant programs.

---

[193]*See* 14 CFR part 5.

[194] For more information about SMS, *see* www.faa.gov/about/initiatives/sms.

Proposed paragraph (c) would require the quality management system to include a process for managing software updates in a way that reduces the risk of introducing a hazard to the services authorized under proposed part 146. Proposed § 146.405—described in section XIII.I.2 of this preamble—identifies specific provisions applicable to each particular software update. In contrast, proposed § 146.310(c) directs the certificated service provider to have a procedure that applies broadly at the organizational level. FAA anticipates that certificated service providers will leverage industry best practices or consensus standards to design and implement effective procedures to comply with this proposed requirement.

Proposed paragraph (d) would require certificated service providers to manage risk when they use third-party vendors for essential service capabilities. FAA understands that certificated service providers will almost always depend on third-party vendors for essential capabilities such as cloud storage, databases, platform management, and other software development tools. FAA does not propose to regulate those other parties; however, FAA does propose to require the certificated service provider to take appropriate steps to help ensure that the services they rely on are performing correctly, as these services can be essential to the overall functionality of the certificated service provider's authorized automated data service. For instance, FAA expects a certificated service provider to promptly update any third-party vendor's software that they rely on to help ensure the software is performing correctly, as outdated software could disrupt the certified service provider's ability to maintain uptime for its users. As previously expressed, a networked UTM ecosystem requires confidence that each participant is delivering reliable services and can uphold the high level of safety the public expects from anyone operating in the NAS. For the overall UTM ecosystem to operate effectively and efficiently, a certificated service provider must not only function correctly but also ensure that the third-party vendor services they depend on are also functioning correctly.

Proposed paragraph (d) would require certificated service providers to monitor their third-party vendors' services to detect failures or other performance issues that could adversely impact the certificated service provider's ability to meet the requirements of this part. If the certificated service provider's offering to users relies on availability or performance of these third parties, the service provider would need to be aware of issues with the third-party to be able to appropriately inform users of potential system degradation or downtime.

Proposed paragraph (e) would require the certificated service provider to develop, implement, and document procedures to test and verify that authorized services continue to meet requirements applicable to those services. The processes must identify the frequency of testing and the criteria the certificated service provider will apply to determine whether those services comply with this part. The certificated service provider must make all documentation of the testing and verification under this section to the Administrator upon request. FAA proposes these provisions for two reasons. The first is to mandate that the certificated service provider remain vigilant in its oversight of its own service. The second is to help ensure that FAA, in discharging its own oversight responsibilities, has sufficient documentation to determine whether the certificated service provider remains in compliance.

Proposed paragraph (f) would require part 146 certificated service providers to create a system so that their users could submit reports about service issues that create or could create a risk to operations. Specifically, certificated service providers would be required to have a means for users to submit reports related to the failure, malfunction, or defect in an authorized service when that problem has endangered or may endanger the safe operation of an aircraft. FAA acknowledges that the certificated service provider cannot monitor every aspect of every service it provides at all times. For this reason, many of the provisions in this proposed rule are designed to create systems to identify and bring problems to the certificated service provider's attention without FAA's involvement. In essence, these processes and procedures are force multipliers that allow the certificated service providers to benefit from the vigilance and observations of everyone who participates in or benefits from the networked services. To this end, FAA wants to help assure users so they can relay this information effectively and efficiently so that certificated service providers can identify and address anomalies that could affect the safe operation of UA.

To facilitate users reporting service problems, FAA proposes that the certificated service provider make the reporting system easily available to users and provide users with notice of the system. Ultimately, FAA intends for certificated service holders to evaluate and address, if appropriate, these reports in accordance with their SMS (as required under proposed § 146.310). However, FAA proposes that the certificated service provider would be required to produce the reports—as well as documentation showing corrective action, if any—in response to a request from FAA.

4. Change Management (§ 146.315)

FAA proposes change management requirements to establish processes by which a certificated service provider would successfully effectuate changes within their organization. This would involve the process of establishing a successful feedback loop within an organization to help ensure that anyone working for a certificated service provider, whether employed directly or under contract, have the same foundational knowledge regarding their internal policies as it relates to the provision of automated data services under proposed part 146. Change management policies are designed to help ensure that a service provider has a systematic process for developing and implementing a change to their services. For example, consider a certificated service provider that changes their software coding platform. If not implemented properly within the organization that would include providing proper training on this new coding platform, persons involved in maintaining an automated data service's code may inadvertently affect the quality of that service, thereby affecting the conformity or quality of the authorized service as initially approved by FAA. A change management policy would include provisions to avoid this outcome by making sure that updates, amendments, or other changes a certificated service provider applies to their authorized automated data service's software or technology does not adversely affect the performance level of the service under proposed part 146.

Accordingly, in proposed § 146.315(a) FAA would require certificated service providers to develop, implement, and document a change management policy. Further, in proposed paragraph (b), FAA would require certificated service providers to notify FAA, in writing, of any change to its software or technology that may affect the provider's ability to meet the authorized service requirements of part 146. FAA recognizes that proposed paragraph (b) and proposed § 146.405 both require the certificated service provider to report software updates and that, in certain circumstances, this reporting could be redundant. Accordingly, proposed § 146.315(b) would not apply when a certificated service provider complies with the reporting requirements of proposed § 146.405.[195]

Proposed paragraph (c) would allow FAA to review a certificated service provider's change management documentation supporting a change to their authorized service. The purpose of proposed paragraph (c) is to help ensure that FAA, in discharging its own oversight responsibilities, has sufficient documentation to determine whether the certificated service provider remains in compliance with the requirements of proposed part 146.

5. Training Program (§ 146.320)

Proposed § 146.320(a) would require each certificated service provider to establish a training program so that anyone who performs functions related to the development or performance of authorized services has the knowledge and skills necessary to help ensure the certificated service provider's compliance with this part. The proposed training requirement would apply both to the certificated service provider's direct employees and to anyone else the certificated service provider engages to perform these functions. FAA anticipates that many certificated service provider's employees will have software industry experience; however, they might not have extensive knowledge or experience with aviation safety. To help bridge this potential knowledge gap and ensure

[195] For further discussion on this topic, see section XIII.I.2 of this preamble. In that section, FAA proposes that each certificated service provider perform any software updates to their authorized service in accordance with proposed § 146.405, which includes its own set of requirements for releasing software changes and notifying FAA of those changes.

that personnel remain knowledgeable and current with relevant aviation safety and efficiency topics, FAA proposes that certificated service providers be required to provide those individuals with initial and recurrent training.

To that end, FAA proposes in § 146.320(b) the minimum training topics that should be included in a certificated service provider's training program. Specifically, FAA proposes that the training would need to cover the following topics at a minimum: best practices in distributed software development; applicable regulations and Advisory Circulars relating to automated data service providers, airspace classification, operating requirements, and flight restrictions; aviation safety culture concepts; and best practices in the provision of automated data services for aviation users.

Proposed § 146.320(c) would require the training program to include recurrent training elements for all applicable workers, including individual contractors that impact the authorized service's development and performance. Certificated service providers would be required to provide this recurrent training at least once per calendar year. Recurrent training would help individuals remain proficient in their job duties—as it relates to the development and performance of authorized automated data services.

6. Reportable Occurrences (§ 146.325)

FAA has an ongoing obligation to maintain the safety and efficiency of the NAS. To do so, FAA needs to be aware of occurrences or incidents that jeopardize NAS safety and efficiency. FAA proposes to require certificated service providers to report certain events, specifically those with an adverse effect on their services. This reporting requirement is designed to inform FAA of accidents, incidents, and precursor safety events and occurrences in the NAS.

Proposed § 146.325 would require certificated service providers to report the following incidents in a form and manner acceptable to the Administrator: unscheduled service outages; security breaches that result in unauthorized access to the certificated service provider's networks, devices, or data, irrespective of whether it affects the integrity, accuracy, or reliability of the services provided to the service recipient; and any other occurrence that is specifically identified as a reportable occurrence in the service provider's certificate or service authorization.

Reportable occurrences constitute a vital data source that FAA and certificated service providers may use for proactive and generative safety assurance. This data would be helpful for multiple reasons, including but not limited to providing crucial insights into the reliability of authorized services that FAA uses to inform its safety oversight functions. Automated data service providers are fairly new participants in the NAS; this information would provide valuable insight into the strengths and weaknesses of the aviation ecosystem as FAA continues to work to integrate UAS into the NAS. In addition, FAA would use the information to help with the iterative process of identifying market trends and the direction UAS innovation is going. This information helps FAA prepare today for the operations of tomorrow. Lastly, through these reports, FAA would support FAA's safety oversight functions.

7. Record Retention (§ 146.330)

Proposed § 146.330 would require certificated service providers to maintain certain records so that FAA can hold the provider accountable for complying with part 146 requirements. Specifically, proposed paragraph (a) would require each certificated service provider to retain data and documentation submitted to FAA in support of their certificate application for the duration of their certificate, plus an additional 24 months. Proposed paragraph (b) would require each certificated service provider to retain service specific information for the duration of their service authorization, plus an additional 24 months. This service-specific information would include: (1) documentation and data submitted to the Administrator in support of their application for an authorized service; (2) records of testing required under subpart E of this proposed part[196]; (3) any service difficulty or supplemental reports submitted to the certificated service provider about a failure, malfunction, or defect in an authorized service.

The proposed time periods for retaining service and certificate information would provide FAA with access to crucial information, particularly regarding organizational compliance and potential service defects. With regards to the retention of documentation supporting the certification and service authorization of the service provider, FAA anticipates that this information is usually retained by the grantee for the duration of their organization or service operation. This information would be used to demonstrate proof of the certificated service provider's part 146 certificate and service authorization, and proof of compliance with FAA requirements in accordance with this proposed part. With regards to retaining individual service testing or difficulty reports, the proposed records retention requirement would enable FAA to access historical records in the event of a service issue that jeopardizes aircraft operation in the NAS. FAA understands that

[196] As proposed in § 146.405(c), FAA would require a certificated automated data service provider to test any software changes they want to apply to their automated data service prior to releasing the updated service to their users. The certificated service provider would be required to maintain records of this testing—determining that the software changes were successful—in accordance with proposed § 146.330(a) for the duration of their part 146 certificate, plus an additional 24 months.

aviation technology, including software development in support of these automated data services, is evolving at an accelerated rate. The accelerated technological evolution may cause a failed service update or a service difficulty report. By requiring service providers maintain such data for an additional 24 months past such incident(s), FAA would be able to access historical data and identify potential safety concerns or compliance issues that might not be readily apparent from more recent documentation. In addition, through these records, any FAA investigation, audit, or review could be conducted more efficiently, ensuring rapid responses to emerging safety concerns, and maintaining the safety of the NAS.

Proposed paragraph (c) would authorize the Administrator to request the certificated service provider to retain additional data, as necessary, in the interest of safety, efficiency, and fair access. FAA proposes this provision because the regulations of automated data service providers is a fairly new regulatory framework. As this industry evolves, FAA may find it necessary to require the retention of additional records, especially if they would be necessary for safety or efficiency of the airspace. FAA seeks comments on what other kinds of data would be crucial to require potential service providers to retain, and the length of time that would be a sufficient retention period. Further, FAA recognizes the value of certain information exchanged between service providers to national security Departments and Agencies. FAA seeks comments on what information may be shared regarding operations and operators to help national security Departments and Agencies to determine if they are being conducted safely, securely, and responsibly. In addition, FAA seeks comments on how this type of information could be shared with those national security partners.

Proposed paragraph (d) would require certificated service providers to keep records of the data exchanged with service users or other airspace users. This would apply to all data exchanged, including but not limited to server logs and notice of service downtime (these information requirements are described in the discussion of proposed § 146.405(c) in the following sections). This proposed provision is consistent with the data retention policies regarding FAA-provided air traffic decision support tools, surveillance, and other equipment. Once an automated data service has been authorized in accordance with this proposed part, FAA would require certificated providers to maintain all data exchanged with service users for a minimum of six months from the time of the data exchange. This data retention period gives FAA enough time to become aware of whether a safety related event occurred and to gain access to the necessary data to investigate the incident. FAA seeks comment on whether six months is sufficient time for FAA to obtain and review records of data exchanged between service providers and service users under this part.

Proposed § 146.330(e) would require a certificated provider to retain records of training given to its personnel for a minimum of two (2) years following completion of that training. In the event of an employer-employee separation, FAA would require the certificated service provider to retain record of that employee's training for 12 months after their separation from employment. The certificated service provider would be responsible for ensuring that its personnel have met the training requirement under proposed part 146. To hold the certificated service provider accountable for complying with these requirements, FAA would need to review the training records—be it an existing or previous employee for the automated data service provider.

Lastly, FAA proposes in § 146.330(f) that if FAA requests any of the required records retained under this proposed part, the certificated service provider would be required to provide those requested records to FAA within a reasonable timeframe after receiving the request. FAA proposes this requirement so that in the event of an FAA investigation or analysis, FAA may obtain the necessary information to reassess a certificated service provider's certificate or authorization. Further, under this provision, FAA could effectively investigate and verify a certificated provider's compliance with and conformance to their obligations under this part. In the event of nonconformance based on an FAA inspection of the certificated service provider's records, FAA could initiate the appropriate suspension or revocation actions. FAA does not define a specific time period in which to produce the records. What constitutes a reasonable time would depend on the nature of the documentation, how it is kept, and the volume of data stored. Nonetheless, FAA invites comments on whether to require the production of records within a specific timeframe after receiving a request, and if so, what would be considered a reasonable timeframe to produce the required records.

I. Subpart E—Authorized Service Requirements

Proposed part 146 would create a regulatory framework to enable automated data service providers to participate in a federated, non-centralized network. One defining characteristic is for data shared in this network to meet a minimum set of requirements so that the information exchanged is accessible among data service providers or individual users that rely on that data. And in certain cases, the providers rely on each other in the network to holistically provide accurate and reliable information.[197]

This type of industry-led and managed network has many benefits for participants and end users; however, one significant drawback is that service providers participate as peers without authority to hold one another accountable for providing accurate and reliable information. To remedy this problem, proposed subpart E would establish minimum requirements applicable to authorized services. This would include requirements for how each authorized service would exchange data as well as the requirements for updating a data service through software updates.

1. Authorized Service Data Exchange Requirements (§ 146.400)

The quality of the network depends on the quality of the data exchanged within it. FAA proposes to set minimum requirements for the authorized services that facilitate the exchange of that data. The purpose of these requirements is to mitigate the risk of corrupted, unreliable, or inaccurate data within the network. To that end, proposed § 146.400 would require services authorized under this part to be interoperable, employ

[197] FAA acknowledges that there are automated data service providers, such as SDSP, whose services are only meant be shared with its users. Such service providers would therefore not need to share their data with other automated data service providers to comply with proposed part 146. In contrast, automated data service providers, such as USS, are expected to exchange information not only with the service users, but also with similar automated data service providers in the network for the services to function optimally. FAA anticipates that information regarding each individual service's characteristics and system architecture services—*e.g.*, a DAA service provided by an SDSP versus a strategic deconfliction service provided by a USS—would be required to be provided to FAA under proposed § 146.205 for FAA to determine whether to authorize the service under proposed part 146. FAA clarifies, however, that all automated data services—be they services provided by USS or SDSP—are required to meet the minimum data exchange requirements of proposed § 146.400 to comply with proposed part 146 requirements.

safeguards, use an authentication method, and use a non-repudiation method. These requirements are described in the paragraphs that follow.[198]

Proposed paragraph (a), which addresses interoperability, would require the certificated service provider to be able to exchange data automatically and securely with both their service users or with other certificated service providers when necessary for provision of the service, irrespective of the user's or other provider's digital platform.[199] By requiring the interoperability of authorized services, FAA would facilitate the use of common machine-readable data formats and industry-accepted data transfer methods. Further, this provision would facilitate the ability for separate systems to share crucial information in a compatible manner, reducing friction and information loss as data is exchanged between service users or other certificated service providers.

Proposed paragraph (b) would require the certificated service provider to employ safeguards and other measures to help ensure the integrity, accuracy, and reliability of data exchanged with their own service users or subscribers that may include other certificated providers. This provision would help ensure data services that are being provided or exchanged among certificated providers and service users would contain true, accurate, and reliable information. Safeguarding an authorized automated data service

[198] In accordance with the terms in proposed subpart C of part 146, applicants would submit documentation to support their compliance with these requirements. FAA anticipates that applicants will choose to rely on industry consensus standards to meet these requirements.

[199] FAA recognizes that not all automated data services are required to exchange their services with their users as well as other automated data service providers. For example, automated data service providers of strategic deconfliction services are required to share their data with USSs in the network for the service to function optimally. In contrast, automated data service providers providing DAA services are only required to provide their services to the service users or operators. FAA clarifies that this provision is intended to explain whether the automated data services fall under a USS or SDSP, the service must be provided and accessible to all service recipient(s)—be it the end user only or the user as well other automated data service providers in the network—for the service to function optimally.

under proposed part 146 would make it so that the data received by an aircraft operator would accurately reflect the information provided by the certificated service provider. Similarly, the data transmitted back to the certificated service provider would accurately reflect the correct operator information. Safeguards that prevent interception, modification, and retransmission of this data are critical to ensure that false data, modified by an outside force, is not presented as the genuine version. Otherwise, operators or service users may rely on inaccurate or false data, which could compromise the aircraft operation, and therefore the safety or efficiency of the NAS. For example, if a UA that strayed from its intended flight path had its location data intercepted, modified, and retransmitted such that the UA appeared to be following its intended path, the operator may not be aware of a flyaway event occurring, which could introduce a collision risk.

Proposed paragraph (c) would require the certificated service provider to use an access and authentication method that prevents unauthorized access to or interference with data exchanged with service users that may include other certificated service providers. This would help ensure that the data exchanged under proposed part 146 is protected from unauthorized access or interference and would help prevent data from being manipulated by a malicious actor. While no data security provisions are entirely impervious to bad actors, this provision would assure service users or aircraft operators of a level of protection from an external entity attempting to maliciously inject erroneous data into their system.

Proposed paragraph (d) would require the certificated service provider to use a validation and verification method that provides assurance of the integrity and origin of the data exchanged with their service users or subscribers. In the software development industry, this concept is often referred to as "non-repudiation" and is often implemented as message signing. While data authentication protects the information, non-repudiation would assure service users, or aircraft operators, that the data exchanged is coming from a trusted source. This would allow the service users to trust that a certificated automated data service provider provided the data source. Through this provision, one can be assured that the data exchanged has reached the intended user. In other words, it provides assurance that the data user or the aircraft operator is who they say they are, and the source of the data, or the service provider, cannot deny they were the one who sent the data. This provision facilitates the importance of establishing trust and traceability from the service provider and service user.

Proposed paragraph (e) would require that a certificated service provider under this part to provide their automated data service to users in a reasonable and non-discriminatory manner, as applicable. FAA emphasizes that automated data service providers do not have the authority to provide operators with access to the NAS, as that authority resides solely within FAA. However, certain services—such as strategic deconfliction—have the capability to coordinate their user's operational intent with others in the network, therefore may prevent other operators from operating in that space for a specific time. This may result in certificated service providers' non-equitable treatment of the airspace. Under this provision, FAA highlights that a certificated service provider must abstain from providing its users with preferential treatment, thereby providing reasonable and non-discriminatory access to the airspace.

2. Software Updates (§ 146.405)

An automated data service provider likely will update or change the software that its service runs on many times over the lifetime of the service. There could be a number of different reasons for this. A service provider could decide to make changes to modernize or improve the efficiency or quality of its service. Or, it could decide to offer new services or add new features to existing services. In other circumstances, the service provider might want to make remedial changes to help ensure the security of their systems. For example, proposed subpart D includes security requirements that include maintaining cyber and data security processes, quality management systems, and change management systems so it can identify potential vulnerabilities and take remedial action in a timely manner. Usually, remedial action takes the form of a software update to prevent the vulnerability from interfering with the quality of the service or to prevent someone from exploiting those vulnerabilities to the detriment of the users or the network itself.

In addition to identifying vulnerabilities and appropriate remediation(s), the service provider must also ensure that the software update does not introduce any new vulnerabilities or exacerbate any existing problems. Each time a service provider deploys an update to correct an error, there is risk that it will not function properly. To minimize this risk, which could potentially affect all participants in the network, FAA proposes certain requirements related to the development, testing, and deployment of software updates.

Proposed paragraph (a) would require a certificated service provider to verify that prior to releasing any software changes to their FAA-authorized service, those changes would not adversely affect the person using the service. This provision would minimize the risk of software updates inadvertently impacting the authorized services' users, and therefore affecting their ability to operate safely in the U.S. airspace. For purposes of this section, FAA proposes to describe "person" to include customers of the certificated service provider as well as other airspace users or services that rely on exchanging data with the authorized service.

Proposed paragraph (b) would require a certificated service provider to use a generally accepted industry standard for assigning version numbers to any software changes to their authorized automated data service. As stated earlier, a certificated service provider may perform a software update to their authorized service for a number of reasons, including but not limited to, improving the efficiency or quality of their authorized service. To track updates, software developers assign version numbers to the updated version of the software; those updates include performing a patch, minor update, or major update.[200] Currently, there are existing versioning standards for software updates. Whenever software changes are made, software developers assign version numbers to their software changes according to those existing standards. Therefore, rather than establish new versioning procedures, FAA intends on leveraging the use of existing consensus standards for the maintenance of authorized automated data services under proposed part 146.

Proposed paragraph (c) would require that a certificated service provider conduct testing prior to releasing any software changes. This is to verify that the changes do not adversely affect the authorized service's ability to meet the requirements of proposed

---

[200] *See* proposed § 146.405(f), discussed later in this section of this preamble.

part 146.[201] In addition, all documentation of testing and verification of software changes must be readily available to FAA, and made available no later than 24 hours after receiving a written request from FAA.[202] FAA anticipates certificated service providers will engage in best business practices including documenting all of their product testing—in this case, software update testing. FAA's main objective is to help ensure the safety of each software change prior to introducing an updated service into the NAS. FAA does not intend to impose an administrative burden of requiring automated data service providers to provide FAA with proof of each test conducted in accordance with this proposed part. However, FAA retains its authority to require certificated service providers to show proof of their software testing once they receive a written request from FAA, in the interest of safety.

Lastly, FAA proposes that FAA may request the certificated service provider to conduct additional testing or verification to demonstrate that their authorized services meet the minimum performance requirements of part 146. FAA would do so to verify that the testing conducted is sufficient, and the software changes are safe to introduce, or re-introduce, into the NAS. With regards to conducting additional testing or verification, FAA would require those to be conducted as soon as practicable after receiving an FAA written request. For the sake of promoting flexible regulatory requirements, FAA does not intend to set a specific timeframe for when the certificated service provider should

[201] Those requirements include the data exchange requirements per proposed § 146.400. In accordance with § 146.400, FAA proposes that each authorized service under proposed part 146 contains the following requirements: interoperability, safeguards, authentication, and non-repudiation.

[202] As proposed in § 146.330(a)(2), record retention requirements, FAA would require certificated service providers to retain records of testing required under subpart E of part 146, which would include software updates testing, for the duration of the service provider's part 146 certificate plus an additional 24 calendar months.

conduct their additional testing or verification after receiving an FAA request. Instead, FAA anticipates that each certificated service provider would conduct their additional testing or verification as soon as they are able to do so, to provide their service users with their latest updates, therefore promoting their own business ventures.

Proposed paragraph (d) would require certificated service providers to provide reasonable notice to all service users prior to any software change or anticipated service downtime as a result of the software update. This notice would include the date, time, and expected downtime duration of that service. Proposed paragraph § 146.405(d)(2) would require the service provider notify users in advance of a software change in order for the user to have adequate time to determine if the change to the service affects the user, and if so, make the required adjustments due to the change. In addition, as proposed in § 146.405(d)(3), each notice would provide a description of the software change, including: (1) the version identifier; (2) an explanation regarding the nature of the change; (3) identification of differences in service features, functionality, or user experience; and (4) explanation of any actions the user must take to ensure the authorized service is performing as intended following the change. This information would be crucial for service users to understand the scope and impact of the software change and anticipated downtime duration as well as whether the changes could affect operations.

In addition, proposed paragraph (d) would require certificated service providers to keep a record of each software update or changes under this section for not less than two years from the date the update was released. FAA may rely on this information to investigate potential non-compliances in the event of any service malfunction; this duration would provide FAA with sufficient time to determine whether to take enforcement action.

Rather than prescribe a set requirement for what would be considered reasonable notice, each certificated service provider should have a thorough understanding of their authorized service, and the potential disruption that may take place in the event of a software update. Apart from FAA notification requirements explained in the following paragraph, in most cases the certificated provider would be in the best position to determine what would be considered reasonable notice regarding any scheduled downtime. Reasonable notice would allow service users to properly evaluate the potential effects of the downtime on their operations, as well as make any necessary operational adjustments. FAA welcomes comment on whether there is a specific timeframe that should be considered reasonable notice.

Proposed paragraph (e) would establish FAA notification requirements for releasing software updates to automated data services based on the type of software changes. These types of updates are —patch, minor update, and major update.[203] FAA proposes requirements for these three types of service software updates commensurate with the potential risk the update could present to the safety of the operation that relies on that service. This potential risk would also depend on the service level of the service that is undergoing a software update. As such, proposed paragraph (f) would establish approval requirements for releasing software updates. The proposed notification and FAA approval processes are each explained in the paragraphs that follow.

---

[203] Proposed definitions for path, minor, and major software updates are in § 146.5 and are discussed in this preamble in section XIII.E.2.

First, patch updates are version changes to a software that address bugs or performance improvements internal to the service. Patch updates often improve performance, fix bugs, or address security vulnerabilities. They do not change the overall functionality or features of the service and the version is backward compatible. In addition, the application programming interface (API) endpoint remains unchanged. An API is a software feature that allows two different applications to interface or "talk to each other." The API endpoint is the place where the API receives requests to access functionality and data. Typically, the endpoint is a web address. In the case of a patch update, the web address would not change.

Ultimately, service users can upgrade or downgrade from the patch incrementally without having to make changes to how they use the service. Regardless of the service level of the service undergoing the patch update, because the software change would not alter the service's functionality, API, and compatibility, FAA determined the risk to aviation safety to be extremely low. For these reasons, patch updates can be released by certificated service providers without the need for providing prior notice to FAA, nor receiving an FAA approval for the release of such update. As discussed in § 146.405(d)(4) (in the preceding paragraphs), FAA proposes to require certificated service providers to document and maintain a record of the patch update for two years.

Second, minor updates are version changes to software that add new features and generally create a new API endpoint for that version. In the case of an API endpoint update, typically the previous API endpoint remains fully functional, which means that the user can continue to use legacy functionality without doing anything, or they can upgrade and take advantage of the new features or functionality. When the user upgrades their service, per the software update, they may need to make changes to their aircraft or its AE to properly integrate the minor update. In either case, the service would typically maintain backward compatibility with the aircraft or AE that is relying on the service. This is important because, irrespective of whether the user chooses to upgrade or not, backward compatibility means they would still be able to access legacy functionality of the service.

Because minor updates may substantively change the features and functionality of the service, FAA assesses the safety risk of these software changes to be higher than those associated with patch updates. This is because the minor update would change the service's API, and therefore the service information may not be accessed the same way as initially developed. This could lead to a service user's inability to access information that may be necessary for the aircraft operation. The impact of minor updates on the service's performance would also depend on the service level of the service.[204] Accordingly, FAA proposes in § 146.405(e)(1) that certificated service providers must notify FAA—via a portal on FAA's website—prior to releasing a minor update. Specifically, prior to releasing a minor update, certificated service providers would be required to notify FAA at least one (1) business day prior to release of a Service Level 1 service, at least three (3) business days prior to release of a Service Level 2 service, and at least five (5) business days prior to release of a Service Level 3 service. This provides FAA an opportunity to review documents from the certificated service provider to help ensure that the change to

---

[204] The higher the service level, the higher the residual risk that may be introduced into the NAS because of the operation that relies on that service.

the service will continue to comply with its authorization and will not create a new unsafe condition or hazard for aircraft operators using the service.

Finally, major updates would be significant revisions or a redesign of the software. These changes are not backward compatible and fundamentally change what the service does or how it works. Major updates to a software substantively change the API, which may result in a new API endpoint or signature.[205] FAA believes that these changes could create hazards to safe operations and thus the risk is high enough to warrant FAA approval. As a result, FAA proposes in § 146.405(f) to require certificated service providers to obtain FAA approval prior to releasing a major software update to Service Level 2 or Service Level 3 services.[206] This is because major updates would significantly change the software, and therefore the service's features and functionality, all of which could lead to compatibility issues between versions. The effects and magnitude of the changes would be unknown until tested.[207]

In addition, because major updates would constitute such significant changes to the software, FAA proposes in § 146.405(g) that, unless otherwise authorized by the Administrator, the certificated service provider would be required to have procedures in place to transition service users from the older software to the updated one safely, rather

---

[205] An API signature is a method used to secure and authenticate API communications.

[206] Service Level 1 services are considered to pose the lowest residual risk to the NAS as they support aircraft operations with multiple mitigations in place, rendering changes to these services as non-critical to safety of the operation. As such, FAA does not consider major updates to service level 1 services to require FAA approval prior to release. However, service level 1 service providers are required to notify FAA at least five (5) business days before releasing any major software updates.

[207] AC-146-1, available in the docket associated with this rulemaking, as proposed includes guidance to the public regarding how to submit documentation to FAA requesting Agency approval prior to releasing a major update to a service. This documentation may include traceability matrices, and test results to FAA for major updates to Service Levels 2 and 3.

than suddenly discontinuing the superseded software versions. In order to transition safely, FAA proposes to require the certificated service providers to: (1) maintain the most recent previous version of the authorized service with full functionality for a minimum of 60 days from the release date; and (2) notify service users a minimum of seven (7) calendar days prior to removing full functionality of the prior version of the authorized service.

Nonetheless, FAA understands that there may be exceptions to discontinuing superseded software versions as proposed in § 146.405(g), especially with regards to maintaining a preceding version of a service if it is no longer in operation. For this reason, FAA proposes in § 146.405(h) that the provision of § 146.405(g)(1) may not apply if the authorized service is provided by more than one certificated provider, and the major software update would need to take place in a coordinated, planned, or simultaneous manner to maintain its interoperability.

For example, certain automated data services would need interoperability to function optimally. As such, automated data service providers that provide a specific service relying on interoperability may need to update their software in a coordinated manner; this is to guide their service users into using the latest version of the automated data service. Through this coordinated effort of enrolling their service users into using the latest version of their software, the older version of the software would be rendered obsolete—especially because all parties would be using the latest version. For this reason, FAA determined to except automated data service providers from maintaining the most recent previous version of the authorized service with full functionality for a minimum of

60 days from the release date. Nonetheless, a seven (7)calendar day minimum notice from § 146.405(g)(2) would be required under the proposal.

To clarify the proposed provisions for issuing notifications and requesting approvals in accordance with this proposed section, FAA summarizes the necessary requirements for patch, minor updates, and major updates, depending on each service's service level in table 6. Similar to the continuum framework of service levels and residual risk, FAA developed this framework for notifying and approving software updates to be proportional to the impact of software updates on the authorized service. The rationale for this differentiation is to set the level of FAA review (if any) proportional to the severity of hazards that could be introduced by the update to the service. In most cases, the certificated service provider need not wait for explicit approval from FAA prior to issuing a software update. In many cases, certificated service providers would issue software updates iteratively to fix bugs, add features, or improve overall functionality (*e.g.*, to increase the total number of operators it could support simultaneously). FAA also understands that cybersecurity vulnerabilities must be addressed quickly and that undue delays could be detrimental to users or the network. The required notification interval enables FAA to prioritize how it manages changes to services, with time to provide limited review as needed. In the event a potential problem is identified, and in the event of a major software update to Service Level 2 or Service Level 3 services, this notification requirement would allow FAA to delay the release of the software update while it conducts further review.

Table 6. Software Updates Notice, Approval, and Retention Requirements

		Service Level 1	**Service Level 2**	**Service Level 3**
Patch	FAA Notification?	No	No	No
	FAA Approval?	No	No	No
	Record Retention	2 years since update		
Minor	FAA Notification?	at least 1 business day prior to release	at least 3 business days prior to release	at least 5 business days prior to release
	FAA Approval?	No	No	No
	Record Retention	2 years since update		
Major	FAA Notification?	at least 5 business days prior to release	N/A	N/A
	FAA Approval?	No	Yes	Yes
	Record Retention	2 years since update		

J. Subpart F—Due Process

FAA proposes subpart F of part 146 to define conditions under which FAA may revoke or suspend the issuance of an automated data service authorization. Proposed subpart F would also address stipulations for reconsideration, including conditions under which an applicant may petition FAA to reconsider the denial, suspension, or revocation of an authorization issued under part 146. FAA does not intend for this subpart to apply to the process of appealing FAA decisions to suspend or revoke a part 146 certificate issued in accordance with this part. FAA does not intend to create a redundant set of provisions with regards to the Agency's appeal process. FAA has an existing set of provisions for the process of appealing FAA initiated decisions to modify an already issued certificate—including suspending or revoking a part 146 certificate—in 14 CFR part 13. As such, the existing process of appealing FAA decisions with regards to an FAA initiated certificate action in 14 CFR part 13 would also apply to certificates issued under part 146. Nonetheless, if FAA issued a decision to deny an application for part 146 certification, including a denial to amend a returning applicant's certificate's service level, the applicant may petition FAA to reconsider such decision under proposed part 146.

1. Revocations and Suspension (§ 146.500)

Each certificate or authorization issued under this part is subject to ongoing review by the Administrator. However, while FAA has an existing set of provisions in part 13 of 14 CFR governing the process of FAA initiated actions with regards to certificates issued under part 146, this process does not apply to automated data services authorization issued under part 146. As such, FAA proposes in § 146.500(a) that the Administrator may revoke or suspend an authorization issued under this part upon a determination that the certificated service provider is not in compliance with this part. Certificated service providers in non-compliance may impact NAS safety and efficiency. As the government authority responsible for maintaining the safety and efficiency of the U.S. airspace, FAA has authority to oversee compliance with FAA requirements. FAA may exercise this authority to require certificated service providers to comply with the proposed part 146 certification and service authorization requirements in order to maintain their certificate or service authorization.

As an alternative to revoking a service authorization, FAA proposes in § 146.500(c) that the Administrator may suspend an automated data service authorization issued under this part without prior notice or opportunity to cure if the Administrator determines it is in the interest of safety to immediately remove that service from participating in the NAS. FAA recognizes that errors may occasionally happen and could impact an operator's ability to conduct safe aircraft operations. These errors could be a result of a service issue but also could be a result of an operator's mistake. Rather than simply revoke the certificated service provider's authorization, this provision provides FAA with the ability to suspend the service authorization while investigating the cause for error. Furthermore, it provides the certificated service provider with the opportunity to remediate the issue of non-compliance instead of having FAA exercise its revocation authority. However, per proposed § 146.500(b), if the certificated service provider does not fix the problem of non-compliance, FAA could revoke the certificated service provider's part 146 service authorization in the interest of safety.

2. Petition to Reconsider (§ 146.505)

FAA endeavors to enable the integration of complex UAS operations such as BVLOS operations in the NAS, while ensuring measures are in place to integrate those operations safely. FAA wishes to engage NAS stakeholders to enable more complex UAS operations in a safe, efficient, and equitable manner. FAA believes it can do so by approving technologies that enable complex UAS BVLOS operations. Because FAA's highest priority is the safety and efficiency of the NAS, FAA also intends to promote and enforce compliance with its regulations. Balancing fairness with FAA's responsibility to enforce its regulations, FAA proposes to offer automated data service providers impacted by a revocation, suspension, or denial with the opportunity to correct any identified insufficiencies with their service. However, FAA's mission is to provide the world's safest, most efficient airspace. If an automated data service provider jeopardizes NAS safety or efficiency, FAA would exercise its oversight authority to prevent them from adversely affecting the safety and efficiency of the NAS.

To that end, FAA proposes in § 146.505(a) that any applicant or service authorization holder may submit a petition to FAA to reconsider its decision to deny, suspend, or revoke a part 146 service authorization issued under this proposed part. Similarly, an applicant may petition FAA to reconsider its decision to deny an application for part 146 certification, including applications to amend the certificate's service level. FAA proposes that such petitions must be submitted by the applicant or certificated service provider in a form and manner acceptable to the Administrator. Applications must be submitted to FAA within 60 calendar days of FAA-issued denial of a certificate, or FAA-issued denial, revocation, or suspension of a service authorization issued in accordance with this part.

FAA proposes in § 146.505(b) that the applicant or previously certificated service provider's petition for reconsideration must demonstrate that FAA issued the denial, revocation, or suspension in error. Further, the petition to FAA must include one of the following elements: a material fact exists that was not previously presented to the Administrator; the Administrator relied on a material error of fact in issuing the decision; or the Administrator did not correctly interpret a law, regulation, or precedent. To issue its final decision, FAA will consider the information in the submitted petition to determine whether to withdraw or keep its decision issued in accordance with proposed part 146.

K. Proposed Advisory Circulars

FAA proposes to publish the AC 146-1, Automated Data Services, to provide guidance to automated data service providers seeking certification and authorization to provide a service in accordance with proposed part 146. AC 146-1 would provide guidance for automated data service providers, including guidance for applying for part 146 certification, and the use of certain standards as a means to comply with proposed part 146 requirements.[208] AC 146-1 would also provide guidance for demonstrating capability to be granted FAA authority to provide an authorized automated data service in accordance with proposed part 146. Lastly, AC 146-1 would provide guidance on the materials to provide to FAA in relation to automated data services data exchange requirements and software update semantics.

As part of this guidance, FAA would reference the use of certain automated data services that may be used by operators to comply with FAA operating requirements. These services would be used to mitigate any residual risks associated with an ongoing operational need. These automated data services may be based on published industry consensus standards as a whole or may represent certain aspects of a standard (or standards). To guide the public through the process of leveraging the use of these services to comply with FAA requirements, FAA would issue appendices to AC 146-1. Each appendix would comprise a service provider standard order (SPSO), which would represent one way but not the only way to demonstrate compliance with the performance-based regulations under proposed part 146. A list of appendices, comprising each SPSO that FAA anticipates publishing in association with this rule follows:

1. Appendix A, SPSO-1a: Strategic Deconfliction (Strategic Conflict Detection & Resolution, and Aggregate Conformance Monitoring).
2. Appendix B, SPSO-2a: Conformance monitoring

[208] *See, e.g.*, ISO 23629-12

FAA seeks comments on whether additional guidance or procedures are needed to expand operations using automated data service providers.

XIV. Regulatory Notices and Analyses

A. Regulatory Impact Analysis

Executive Orders 12866 ("Regulatory Planning and Review") requires agencies to regulate in the "most cost-effective manner," and to make a "reasoned determination that the benefits of the intended regulation justify its costs." The Office of Management and Budget has determined that this proposed rulemaking is a significant regulatory action as defined in section (3)(f)(4) of Executive Order (E.O.) 12866. Accordingly, the following sections provide analysis of the regulatory impact of the proposal, including the applicable baseline, potential costs and benefits, and uncertainties.

1. Baseline for the Analysis

The baseline for the analysis includes the existing regulatory framework and practices for conducting BVLOS operations, the affected entities and operations under this framework, and existing risks of these activities.

i. Regulatory Framework

As described in section III, FAA currently authorizes BVLOS and larger and more complex operations through waivers and exemptions. Part 107 provides safety regulations for small UAS weighing less than 55 pounds. Waiver authority in part 107 accommodates new technologies and unique circumstances if the Administrator finds that proposed operation can be conducted safely in terms of the waiver. The waiver application generally must outline how the operator intends to conduct the operation safely, including risk mitigation strategies, and FAA includes terms and conditions in the waiver issued.[209]

Part 107 only applies to UAS that weigh less than 55 pounds at takeoff. Not only is there a maximum weight, but there is also a limitation on what rules can be waived.[210] To fly a UA that exceeds the maximum weight limit of part 107 or obtain relief from the nonwaivable provisions of part 107, the UA operator must petition for an exemption. The exemption petition must describe how the operator will safely conduct the operation, and FAA will include conditions and limitations in the exemption issued. In addition, an exemption requires justification on how the petition is in the public interest and when precedent setting, petitions for exemptions are made available for public notice and comment in the Federal Register. FAA publishes the petitions for exemptions and the decision document in response to those requests to the public docket.[211]

ii. Affected Entities and Operations

The proposed rule would affect certain UA manufacturers and operators, and entities seeking authorization to provide automated data services. Manufacturers of UA used in BVLOS operations would have new requirements. UA operators would be able to apply to conduct BVLOS operations for the following activities: package delivery,

---

[209] Part 107 waivers issued, and the sections waived, are *available at* www.faa.gov/uas/commercial_operators/part_107_waivers/waivers_issued.

[210] Types operations that are waivable under part 107 include operations from a moving vehicle (§ 107.25), daylight (§ 107.29), VLOS (§ 107.31), with visual observers (§ 107.33), multiple small UAS (§ 107.35), yielding right of way (§ 107.37(a)), over people (§ 107.39) and in other airspaces (§ 107.41) and removing certain other limitations (§ 107.51).

[211] These dockets are *available at* www.regulations.gov.

agriculture, aerial surveying, civic interest[212], UA operations training, demonstration, recreation, and flight testing. Companies that provide data, processing capacity, or other software support for UAS could become an automated data service provider.

Previously granted waivers and exemptions provide insight on the potentially affected entities.[213] There are 9 operators with exemptions that currently authorize BVLOS operations for UA over 55 pounds, including in package delivery operations and operations to support infrastructure inspection.[214] There are also approximately 230 additional (unique) operators that hold waivers indicative of BVLOS operations with UA up to 55 pounds.[215] These entities span a wide range of industry categories, such as agriculture, mapping, photography, and conservation. There are also about 30 U.S.-based manufacturers of the UA used under these waivers and exemptions.[216] Current LOAs provide information on entities that may provide automated data services. Table 7 summarizes the potentially affected entities. Table 8 shows the number of part 119 UAS package delivery operators operating under part 135 through exemptions. Table 9 shows BVLOS operations tracked within FAA's partnership programs.

Table 7. Potentially Affected Entities[1]

Category	Count
Operators[1]	239
Manufacturers[1]	30

[212] Includes forest and wildlife conservation, including wildfire recovery, wildlife conservation, and tracking climate change, and operations in support of public safety, including fire, accident, and disaster response.

[213] FAA has also denied requests for waivers and exemptions. The extent to which these denials represent entities that would continue to pursue acceptable BVLOS terms and conditions is unclear.

[214] The docket numbers are: FAA-2023-1827 and FAA-2022-0124; FAA-2022-0921; FAA-2019-0628; FAA-2020-0499; FAA-2019-0573; FAA-2018-0835; FAA-2022-0268; FAA-2020-0620; FAA-2021-0746.

[215] For this analysis, the waived sections include: §§ 107.31, 107.33, 107.35, and 91.113. Based on waivers as of January 1, 2024.

[216] Based on waivers of § 107.31 from May 2023 to May 2024 and the current exemptions for BVLOS.

Table 7. Potentially Affected Entities[1]

Category	Count
Automated data service providers	2[2]

1. Based on waivers and exemptions for BVLOS operations as of May 2024.
2. As described in section VII.I.2, FAA has issued LOAs associated with an operational waiver or exemption for strategic deconfliction service provision to two entities. Automated data services will be required for certain BVLOS operations.

Table 8. UAS Package Delivery Operators

Operator	Location of Operations[1]
Drone Express	NC
DroneUp, LLC	Dallas/Fort Worth, TX
Causey Aviation Unmanned	NC
Zipline	Salt Lake City, UT, with expansion plans in progress for Dallas/Fort Worth, TX and Seattle, WA
Amazon	Phoenix, AZ and Tolleson, CA
UPS Flight Forward, Inc.	Winston-Salem, NC
Wing Aviation, LLC	Primarily in TX and VA, with expansion plans

Source: FAA (see: https://www.faa.gov/uas/advanced_operations/package_delivery_drone)
1. Current operations are limited by the need for case-by-case environmental assessments which take about one year. By the final rule, FAA anticipates having a nationwide assessment which will expand locations.

Table 9. BVLOS Flights, 2024[1]

Category	Count[2]	Hours
Environmental survey	6	3
Infrastructure inspection (linear)	583	192
Infrastructure inspection (non-linear)	197	44
Package delivery	80,955	9,309
Public safety	4,337	526
Research	103	18
Total	86,181	10,092

Source: FAA data (includes BEYOND and Partnership for Safety Program, exemptions, and waivers).
1. Operational BVLOS flights (with and without observers) and flights using multiple UA.
2. Count of single leg (one-way) flights.

Additional examples of BVLOS operations in these categories that have developed under the current regulatory structure include the following[217]:

[217] Industry materials provided to the Office of Information and Regulatory Affairs, Office of Management and Budget, *available at*: www.reginfo.gov.

- Routine and supplemental inspections. For example, BNSF Railway began inspecting 150-mile segments of railway track in New Mexico by late 2015.
- Three state Departments of Transportation (KS, ND, NC) were in FAA's Integrated Partnership Program. OH DOT, with partners, is developing SkyVision, a ground-based detect and avoid system.
- After Hurricane Milton in FL, Florida Power and Light used UAS to assess damage. Georgia Power implemented a pilot program utilizing drones for comprehensive aerial inspections.
- Public safety agencies employ UAS for search and rescue operations, disaster response and recovery, law enforcement, firefighting, and traffic accident and crime scene investigation.

The proposed rule may also attract new operators, manufacturers, and automated data service providers compared to operating under the existing framework. For example, some entities may find the proposed rule requirements easier to navigate compared to describing how they will operate safely in a waiver or exemption request. Other entities may commence operations due to increased demand for BVLOS services. The types of affected entities are also likely to expand as technologies and use cases develop over time. In addition, entities holding waivers and exemptions from rules other than part 107 (*e.g.*, agricultural operation under part 137) may be able to operate under part 108. [218]

[218] Exemptions for UAS that provide relief from provisions within 14 CFR part 137 reflect UAS which are too heavy to fly under part 107. Since proposed rule permits heavier aircraft, these operators may transition to operate under part 108.

Finally, part 91 operators not equipped with ADS-B Out or EC equipment may be affected in terms of losing right-of-way to UAS.

iii. Risks

The greatest risks posed by current BVLOS operations include collision with manned aircraft, UA, and structures on the ground, that could result in property damage and fatalities or injuries to persons on the ground.[219] While there are risks under the existing part 107 framework[220], the BVLOS ARC found that there have been no fatalities and only one serious injury attributable to BVLOS operations under pilot programs.[221]

Commenters on current exemptions have also described considerations related to noise, privacy, and security from BVLOS operations, and impacts on the environment from package delivery operations.[222] For example, as FAA summarized, some commenters expressed concerns with the annoyance, stress, and emotional or physical discomfort caused by increased auditory and visual noise attributed to UA operations and UA intrusions on personal space. Other commenters were concerned with noise pollution, stating that UAs make an irritating noise, and that this would multiply as other companies begin or increase operating. These concerns continue to be present. In 2024, residents in College Station, Texas expressed concern regarding noise levels associated with drone deliveries to the City Council; the Mayor then wrote a letter to FAA regarding the

---

[219] *See, e.g.*, comments from the National Agricultural Aviation Association and the Helicopter Association International on petition to amend Exemption No. 18601, *available at* www.regulations.gov/document/FAA-2019-0573-0078.

[220] *See, e.g.,* NTSB accident report ERA24LA079, *available at* data.ntsb.gov/carol-main-public/basic-search.

[221] BVLOS ARC Report, at 11 (Mar. 10, 2022).

[222] *See, e.g.*, summary of comments regarding intrusiveness and privacy and environmental concerns on Exemption No. 18601, *available at* www.regulations.gov/document/FAA-2019-0573-0059.

operator's request to expand the service.[223] The letter acknowledged that the operator's intent to use a newer quieter drone should have a positive effect on the perceived noise levels.

iv. Uncertainties

A key uncertainty in the baseline for the analysis is the extent to which BVLOS operations are constrained by the current regulatory framework versus other factors that may affect each use case including technological, logistical, and financial considerations. That is, industry growth is occurring in the absence of the rule. For example, with its part 135 certification, DroneUp states it will have authorization to fly BVLOS up to five miles allowing a 300% increase in serviceable households and will continue to work with FAA to expand operations.[224] Flytrex also states its service is growing fast and it is working to expand operations while adhering to the latest regulations.[225] Seven UAS operators have now obtained part 135 certification to operate as air carriers (as shown in table 8) and FAA has received additional applications. Similarly, there is uncertainty regarding operational risks that would emerge with continued BVLOS operations via waivers and exemptions.

2. Impact of the Rule

As described in the baseline, FAA is already approving BVLOS operations, and operations using UA over 55 pounds, through waivers and exemptions. With the

---

[223] City of college Station, *Letter to FAA Regarding Amazon Drones* (Jul. 15, 2024), *available at* www.cstx.gov/news/archived_news/letter_to_f_a_a_regarding_amazon_drones.

[224] DroneUp, *DroneUp Secures FAA Part 135 Certification, Revolutionizing Drone Delivery for All* (Dec. 3, 2024), *available at* www.droneup.com/news/part135.

[225]*See generally*, FlyTrex, *available at* www.flytrex.com/.

proposed rule, FAA would be codifying streamlined processes for these approvals that it has developed over the past few years. The proposed rule would provide a repeatable and consistent process in regulation and would eliminate the need for individual waivers and exemptions.

For manufacturers, the proposed rule relies on industry consensus standards for UA design. Once developed and approved, however, the proposed rule would require operations under part 108 to use UA that meet the standards. This may represent an incremental cost to operators (depending on the price differential with current UA) and a market opportunity for US manufacturers. The proposed rule would provide certainty for manufacturers in both the standards and requirement for US manufactured UA.

For operations, there may be little incremental impact because the proposed rule codifies existing processes. For example, FAA streamlined the approval process for part 137 agricultural operators to operate UA over 55 pounds. Agricultural operators typically operate in visual line of sight but with heavier UA needed for agricultural tasks, specifically spraying pesticides and herbicides. Proposed part 108 provides for permitted or certificated (depending on the overflown population density) agricultural operations with UA over 55 pounds, replacing the streamlined exemption process. Similarly, for package delivery, the process for initial part 119 UAS operators operating under part 135 originally took years whereas more recent operators have obtained certification much quicker. Proposed part 108 would reflect this more recent experience and provide a dependable process. FAA has also streamlined the process for police departments (and other emergency services) to obtain a waiver to use detect and avoid technology to operate UA BVLOS; the proposed rule provides regulatory structure to eliminate the need for these waivers.

For automated data services, the proposed rule again relies on industry consensus standards. Once approved, however, the proposed rule would establish requirements for use of such services, which represents a cost for operators and a new market for providers. The main impact of the proposed rule in this sector relates to low altitude deconfliction of UA. While there has not been a need yet for these services because of the limited operations with multiple operators in the same geographic area, there is a need for this deconfliction with scaled BVLOS operations. The proposed rule provides a regulatory structure under which service providers can operate at scale; as of June 2025, FAA and industry are testing this technology at one location.

3. Benefits

The benefits of the proposed rule are the incremental values that result from the increased integration of UAS into the NAS, specifically BVLOS operations. These benefits would derive from increased regulatory certainty and efficiency in the process for initiating and continuing applicable operations under the proposed rule, such that benefits accrue sooner compared to the current process for enabling these operations. The proposed regulatory framework is also likely to enable a scale of operations not achievable under the current approach. For example, the BVLOS ARC found that regulatory changes are necessary to support industry growth. FAA Reauthorization Act of 2024 (and 2018), as well as the Agency's own experience trying to tailor existing regulations to UAS operations are also indicative of industry constraints under the existing framework. The proposed rule may also result in benefits that would not occur under the current process, such as those associated with an automated data service provider certification and service authorization.

i. Types of Benefits

The BVLOS ARC identified broad categories of societal benefits that may be achieved through BVLOS operations including economic, safety, and health (table 10). These categories represent incremental impacts of BVLOS operations in general, and the magnitude of benefits would depend on the extent to which operations scale under the rule compared to the existing regulatory framework.

Table 10. Categories of Benefits of UAS BVLOS Operations

Category	Description
Economic	Use cases that provide an economic benefit such as cost savings and expanded market opportunities
Safety	Operations that result in improved safety such as replacing risk in manned aviation operations and public safety use cases or monitoring the perimeter of a large critical infrastructure facility
Health	Operations could potentially lead to opportunities to improve both individual and community health, such as delivery of vaccines or important medications
Source: BVLOS ARC Report (March 2022)	

a. Economic Benefits

Economic benefits arise from the range of use cases through new and expanded market opportunities and cost savings. For example, to the extent that sales of various products or services increase under the rule above and beyond what would occur under the current regulatory framework (*i.e.*, not simply offsetting existing sales), this represents new economic activity and thus benefits. The rule will also increase the market for and providers of automated data services.

New economic activity may also enhance health and the availability of services to growing communities. Enabling BVLOS operations could also have a transformative impact on logistics and a variety of infrastructure inspections. Automated data services may provide a cost-effective, safe, and scalable means for those UAS operators to meet some of their regulatory requirements. FAA anticipates that a market would develop to provide these services following the implementation of this rule.

b. Safety Benefits

Safety benefits would accrue to the extent that a variety of operations could be executed more safely, and on a greater scale than currently conducted. As shown in table 9, many operations, such as infrastructure inspections are already being conducted with UAS beyond VLOS. The proposed rule may amplify these operations beyond or sooner than what would occur under the existing framework. Safety benefits could accrue through modifying existing activity, such as replacing traditional methods (*e.g.*, manned aviation or truck delivery) with UAS, or through new activity (additional public safety operations).

For example, for package delivery, safety benefits are influenced largely by how many of the UA operations would be replacing traditional delivery methods, and how many would be in addition to traditional delivery methods. A delivery that replaces traditional delivery methods can be expected to result in significant safety increases. As discussed above, FAA has not observed any fatalities due to BVLOS UAS use, but traffic fatalities remain a leading cause of death in the United States so substitution toward UA and away from delivery trucks is likely to lead to a reduction in fatalities.

Conversely, if the flights represent new sales, then there would be minimal impact on safety benefits. In addition, though there have been no observed fatalities due to BVLOS UAS operations, it is conceivable that a dramatic increase in the number of operations could reveal such a risk. However, it is also possible that the processes and standards laid out in proposed part 146 would result in lower risk with greater adoption due to network effects such as UAS sharing data and well-defined roles and rules.

Similarly, in agriculture, the potential for incremental aviation safety benefits[226] depends on the extent to which those operators still conducting manned operations switch to UAS. The proposed rule would not obligate any changes. Manned aircraft also have larger yields and operators may not have any incentive to switch to a fleet of UAS if they do not have the capital to buy multiple UAS.

The ARC also identified that UAS operated BVLOS could result in benefits to include monitoring critical infrastructure. Critical infrastructure is also an area where unauthorized UA pose a security threat. Benefits would be attributable to the rule to the extent that more such operations, or more timely operations, are enabled through the permitted or certificated process under the rule.

c. Health Benefits

BVLOS operations could have a transformative impact on logistics such as for the timely delivery of health care products (*e.g.*, medications). Benefits would accrue to the extent that such services reach a greater percentage of the population compared to under the existing framework. Further, these benefits could especially impact rural communities where health access is limited.

ii. Magnitude of Benefits

[226] Based on data from NTSB Accident and Incident Database/Incidents from FAA Accidents and Incident Database (A/IDS), in 2024 there were 13 fatal accidents, eight (8) accidents resulting in serious injury, and eight (8) accidents resulting in minor injuries among agricultural operations under part 137.

Estimating the magnitude of benefits of the rule would require forecasting BVLOS operations and associated impacts with and without the rule and estimating the value of the incremental changes. Because BVLOS operations are still developing under the existing regulatory framework and the regulatory environment represents only one potential impediment to scaling these operations, there is substantial uncertainty in doing so. FAA currently does not identify BVLOS operations separately in its UAS forecast[227]; with the completion of a final rule, part 108 activity can be specifically identified in future forecasts.

Nonetheless, industry has commissioned studies to estimate the benefits of UAS, including BVLOS operations, that foresee values in the hundreds of millions of dollars. These studies illustrate the motivation behind desired investments in BVLOS technologies. Benefits attributable to the rule would be the portion of this value, if achieved, that can be directly tied to removing regulatory impediments through the rule.

Given the uncertainty, FAA has not quantified the benefits of the rule. Indeed, societal values may also change over time, in either direction, since the range of logistical and environmental outcomes have only been experienced on a limited or pilot scale. Technological or changes on other fronts may also affect the future and values.

With this caveat, the studies show how benefits may scale under specific scenarios. For example, one study of package delivery operations[228] showed that in five years, in a single U.S. metropolitan area, UAS delivery could recover up to $582.5

---

[227] *Available at* www.faa.gov/data_research/aviation/aerospace_forecasts/unmanned_aircraft_systems.pdf.

[228] Virginia Tech Office of Economic Development and the Grado Department of Industrial and Systems Engineering, *Measuring the Effects of Drone Delivery in the United States* (2020), *available at* vtechworks.lib.vt.edu/items/ab84e0fb-a204-44e9-a51b-99e237d60293.

million per year in total time savings for consumers;[229] generate up to $284,000 per year in new annual sales for a participating local business;[230] assist as many as 66,000 residents who lack access to a vehicle and 22,000 with mobility challenges to obtain their prescription medication; avoid up to 294 million miles per year in road use and up to 580 car crashes per year; and reduce up to 113,900 tons of carbon dioxide emissions per year.[231]

For this scenario, FAA would value reduced fatalities and injuries resulting from car crashes using the value of statistical life (VSL) and the Maximum Abbreviated Injury Scale (MAIS)[232]. For example, reduction in the risk of one fatality generates benefits equal to the VSL (approximately $12.5 million). Reduction in the risk of serious injury generates benefits equal to the fraction of the VSL associated with MAIS level 3 (.105), or approximately $1.3 million (.105 × $12.5 million). Similarly, the value of reduced emissions can be estimated using the social cost of greenhouse gases.[233]

These results are specific to the three representative metropolitan areas (Christiansburg, VA; Austin, TX; and Columbus, OH) chosen to represent cities with

---

[229] In communities with greater distances between commercial centers and residences, consumers may benefit more through time saved whereas in denser communities with high costs of living, consumers may benefit more from the value of time saved.

[230] *See* Measuring the Effects of Drone Delivery in the United States, *supra* at n. 228 (2020) (Local business included restaurants, pharmacies, retail businesses that use traditional parcel delivery, and retailers of smaller items who currently do not offer delivery).

[231] The BVLOS ARC Report also references a study by Levitate Capital that provides estimates of the market for drones by use case and notes impacts of limitations on BVLOS, *see infra* n. 237.

[232] U.S. Department of Transportation, Treatment of the Value of Preventing Fatalities and Injuries in Preparing Economic Analyses (2021), https://www.transportation.gov/resources/value-of-a-statistical-life-guidance.

[233] *E.g.*, the value of the reduced emissions cited would be $19.6 million annually based on a value of $190 per metric ton in 2020 and a 2 percent discount rate; *see* EPA Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances, table ES-1, *available at* www.epa.gov/environmental-economics/scghg.

varying population densities and transportation challenges. They also reflect existing drone capabilities as well as assuming drone delivery can match or exceed existing delivery services for cost and convenience. Therefore, the extent to which the results can be extrapolated more widely or the extent to which implementation will occur in the absence of the rule is uncertain.

Zipline also provides references to studies of the positive health impact of its UAS package delivery operations in foreign countries[234], suggesting the potential for gains in rural areas of the United States. Zipline also asserts its flights reduce the carbon emissions of deliveries by 97 percent compared to gas cars. Again, based on the social costs of greenhouse gases, the value of reduced emissions could be significant. As with the previous study, the ultimate adoption and extent to which it would not occur in the absence of the rule is uncertain.

The magnitude of benefits shown in these examples would be reduced by any disbenefits from increased risks that accompany new or scaled BVLOS operations, including noise, annoyance, and privacy intrusions, as well as any increased safety risks from drone interactions with manned aviation or persons and property on the ground. Technological advancements and rule requirements may alleviate the potential for some effects (*e.g.*, deconfliction and avoidance reducing potential for collisions) but not all (*e.g.*, increased operations enabled by quieter drones may increase annoyance from flying objects). Again, given the limited scale of BVLOS deployment to date, the extent to

[234] *See* www.regulations.gov/document/FAA-2024-1317-0004.

which existing concerns and any early incidents can be extrapolated under the rule is uncertain.

In summary, benefits would be attributable to the proposed rule to the extent BVLOS operations are constrained under the current regulatory framework or accrue sooner under the proposed rule. For example, the BVLOS ARC maintained that regulatory predictability and certainty are important to provide the marketplace with stability. Though granting individual exemption petitions may enable UAS operators to meaningfully scale operations[235], the pace may be much accelerated under a rulemaking framework. Realizing benefits sooner is significant considering the social rate of time preference (*e.g.*, discounting future benefits by 3 percent annually). New entrants due to increased demand for BVLOS services under the simplified regulatory structure would also represent new economic activity attributable to the proposed rule. Subtracted from these positive impacts would be any negative values from any increases in risks that accompany new or scaled BVLOS operations.

iii. Uncertainties

The key uncertainty in the analysis of benefits is the rate and extent to which affected entities and new entrants take advantage of the proposed rule to increase BVLOS operations. Uncertainty also relates to the effectiveness of the proposed requirements in not increasing risks in the NAS.[236] In the event of any accidents or incidents (*e.g.*, encounters with manned aircraft), reactions could slow growth of BVLOS operations to a pace more similar to that under the current regulatory framework. There are also

[235] *See* www.regulations.gov/document/FAA-2024-1317-0004.

[236] The role of SMS in reducing risks.

uncertainties with respect to the impacts of different use cases. For example, one study noted that "instead of accelerating the retirement of surveying and mapping professionals, drones have proven to be practical tools that enhance the quantity and quality of services that existing professionals provide."[237]

Given uncertainties regarding the extent of new economic activity, associated effects such as impacts on emissions are also uncertain. For example, reductions in emissions would be driven by using electrically powered UA instead of gasoline or diesel-powered land vehicles.[238] The electricity would still result in some emissions being created, as it must be generated. The quantity of those emissions depends on the type of power generation plant used to produce electricity, which in turn depends on the location of the UAS being charged. However, power generation facilities are generally more efficient than vehicle engines at extracting energy from fuel and can implement more rigorous filtering of exhaust, and so the emissions would potentially be reduced regardless of the location.

Finally, there is also uncertainty with respect to some of the less desirable impacts of drones, including noise, annoyance, and privacy impacts, and the effect of any increases in reducing the magnitude of benefits or realizing the economic gains. A variety of factors and the ultimate BVLOS deployment scenarios will influence the magnitude of these effects.

4. Costs

---

[237] *See* Levitate Capital, The Future of the Drone Economy (Dec. 2020), *available at* levitatecap.com/levitate/wp-content/uploads/2020/12/Levitate-Capital-White-Paper.pdf.

[238] While UA are powered by batteries, the batteries are rechargeable which occurs through the electric grid.

The proposed rule may result in incremental costs to comply with requirements for design and production, and operations compared to under the existing regulatory framework. The sections below discuss these considerations as well as the cost implications to become an automated data service provider.

i. Design and Production

The proposed rule would establish performance-based design, production, and airworthiness requirements for part 108-compliant UAS. Voluntary consensus standards bodies would then develop consensus standards for FAA acceptance or approval that they will propose as a MOC to meet regulatory requirements. Manufacturers can then design and produce UA in compliance with the consensus standards. Manufacturers must also comply with requirements for: finding of compliance, DOC, quality assurance system, operational safety program, production acceptance testing, COS program, flight test data storage, developmental testing, function and reliability testing, cybersecurity protection, airworthiness acceptance application, inspections and audits, and documenting design changes.

FAA reviewed conditions placed on existing manufacturers of UAS for BVLOS to identify the extent to which the proposed requirements would represent incremental requirements.[239] Since the consensus standards are not yet available, the extent of any design changes is uncertain. However, as reflected in current exemptions, manufacturers already update and revise designs for new technology and capabilities.[240] The designs of

---

[239] *See e.g.*, dockets FAA-2019-0573, FAA-2020-0499, and FAA-2022-0268.

[240] *See e.g.*, a December 2023 petition to amend exemption to enable operation of the operator's latest drone system in commercial package delivery operations, *available at* www.regulations.gov/document/FAA-2019-0573-0079.

UAS used by existing part 135 operators conducting package delivery also may not need any major design changes. For example, some proposed standards reflect existing requirements for those operators (*e.g.*, anti-collision lights).

Many other proposed requirements also reflect existing processes and procedures, for example, quality assurance, production inspection and testing, cybersecurity[241], and manuals and instructions.[242, 243] Others likely involve only minimal expenditure. For example, submitting a DOC, required for each individual UA manufactured in accordance with a MOC, could be done in batches of up to 500 aircraft at a time in a few minutes of time.

Some requirements may result in incremental expenditures depending on the extent to which manufacturers are not already performing similar activities. Table 11 describes these proposed requirements and potential cost considerations. For example, FAA assumes that the incremental cost associated with data storage comes entirely from the cost of renting a server to hold the data. Because the data can be gathered automatically, FAA assumes that the cost of gathering the data will be minimal. However, with respect to airworthiness acceptance, existing processes have included type certification, special airworthiness certification, and obtaining FAA approval for any changes to the type of UA used.[244] Therefore, the proposed process for airworthiness

---

[241] *See, e.g.*, the security protocol DJI drones provide to prevent hijacking by third parties, *available at* enterprise.dji.com/data-security.

[242] *See e.g.*, the previously referenced petition, *available at* https://www.regulations.gov/document/FAA-2019-0573-0079.

[243] The Skydio production process includes inspection and flight testing of every UA, *available at* www.youtube.com/watch?v=NHumG_QsFZ0.

[244] *See e.g.*, www.regulations.gov/document/FAA-2019-0628-0052, www.regulations.gov/document/FAA-2023-1827-0012, and www.regulations.gov/document/FAA-2024-1317-0004.

acceptance may not represent an incremental level of expenditure (and may represent a cost savings compared to existing processes).[245]

Table 11. Potential Incremental Costs: Manufacturers

Category	Description	Unit Cost Information
Airworthiness acceptance	Documentation of MOC with accepted or approved consensus standards	Potential cost saving compared to type certification or special airworthiness certification; No data available
COS program	Monitoring and resolution of in service safety issues and identified non-compliance	Dependent on number of designs; No data available
Data storage	Storage of model flight data for 2 years	$6,000 per year[1]

COS = continued operational safety
MOC = means of compliance
1. Based on $500 monthly costs. *See, e.g.*: www.liquidweb.com/products/dedicated/.

For example, data storage costs for the 30 manufacturers may cost in the range of $180,000 annually ($0.2 million annualized using discount rates of 3 and 7 percent over a 5-year period). FAA does not have data on COS program costs which may depend on the manufacturer's size. However, large manufacturers may already be implementing COS as standard practice. FAA requests comments and data relevant to UA manufacturers.

ii. Operations

Operators must apply for an operating permit or operating certificate. Applications for an operating permit must include a description of the type and area of

[245] There is significantly less FAA involvement in proposed process. From an airworthiness perspective, the time and effort required to develop issue papers, negotiate airworthiness requirements, and approve and witness test plans and reports would be notably reduced. These steps are typically part of establishing the certification basis, which can take several years (and has for an existing manufacturer). In contrast, under the proposal, there would be no need for negotiated compliance, as manufacturers design their systems to meet accepted industry consensus standards. This approach results in cost savings for both FAA and the applicant.

operations, company manual, recordkeeping plan, and reporting procedures. Applications for an operating certificate must include a description of the type and area of operations, company manual, recordkeeping plan, reporting procedures, training program, communications and ground risk assessment, SMS, hazardous materials program, inoperable equipment plan, and rest and duty plan. Operating permits must be renewed every two years while operating certificates will not need renewal. In addition, the proposed requirements include strategic deconfliction capability and conformance monitoring (for certain operations), alerting capability, validation testing (certificated operators), mandatory staff positions, STAs of covered persons, and security programs under 49 CFR part 1544.

FAA reviewed conditions placed on existing operators to conduct BVLOS operations to identify the extent to which the proposed requirements would represent incremental requirements. To large extent, the proposed requirements reflect conditions in existing waivers and exemptions. For example, existing waivers require specific approved UA, UA performance standards (*e.g.*, anti-collision lighting specifications), specific personnel (including qualifications and TSA vetting), operations manuals, tracking revisions to manuals, training of personnel involved in UAS operations, notifications of operations, and maintenance requirements and logs. Existing part 135 certificate holders conducting package delivery operations under exemptions have similar existing requirements, as well as hazardous materials procedures and training.[246]

---

[246] For example, requirements include: personnel positions and qualifications, manuals, training, notifications, strategic deconfliction conformance monitoring, ground risk assessment, communications service monitoring and lost link procedures, UA maintenance requirements, and recordkeeping and reporting (*see* www.regulations.gov/document/FAA-2019-0573-0078 and www.regulations.gov/document/FAA-2019-0573-0079).

Similarly, part 135 certificate holders are already required to develop and implement an SMS under part 5.[247, 248] Other requirements may be different but not represent incremental expenditures (*e.g.*, existing staff taking on a required position such as operations supervisor) or minimal (*e.g.*, strategic deconfliction and conformance monitoring costs).

However, some requirements may result in one time and recurring expenditures, depending on the operator. Table 12 describes these proposed requirements and potential cost considerations.

Table 12. Potential Incremental Costs: Operators

Category	Description	Unit Cost Information
Operations manual updates	Updates would include the personnel required and their duties and responsibilities, and procedures for complying with the recordkeeping and reporting requirements	Dependent on company size and operations; $500 (8 hours) to $1,850 (32 hours)[1]
SMS (certificated operations only)	Develop, implement, and keep current an SMS (14 CFR part 5)[1]	Scalable based on size and complexity; $8,100 - $41,180 one-time, $4,730 - $42,580 annual[3]
Limited TSA security program (package delivery operators)	Program to prevent or deter carriage of unauthorized packages and unauthorized access to operations	Costs will vary depending on the specific security program. Components could include chain of custody and operational controls, security coordination, training, and reporting.
Vetting/STAs	Covered persons must undergo TSA STA, up to a Level 3 STA,	There is an opportunity cost of time to undergo vetting (estimated at approximately

[247] Proposed rule includes exceptions from the part 5 elements of: safety policy, including employee reporting of safety hazards or issues; safety accountability and authority; designation and responsibilities of required safety management personnel; coordination of emergency response planning; safety performance monitoring and measurement, including a confidential employee reporting system; safety communication; and records.

[248] FAA has also required SMS as condition for waiver (*see* https://www.faa.gov/sites/faa.gov/files/107W-2024-00828_Eric_Schwartz_CoW.pdf).

Table 12. Potential Incremental Costs: Operators

Category	Description	Unit Cost Information
	prior to assuming certain security-sensitive duties	1.5 hours), and an estimated initial enrollment fee of $87, in-person renewal fee of $76, online renewal of $51, and comparability determination fee of $30. For a Level 2 STA (which is not proposed), the initial in-person enrollment and in-person renewal fee is $66, the online renewal fee is $41, and the comparable STA fee is $30[4]

SMS = safety management system; STA = security threat assessment
1. Based on the extent of changes needed and an average wage rate increased to account for benefits ($64/hour). Average wage based on the mean for Aerospace Engineering and Operations Technologists and Technicians ($39.08; updated to $39.74 for inflation using the Consumer Price Index for All Urban Consumers) divided by the percent of total employer costs of employee compensation represented by wages (62%) to account for benefits (38%). Wages and benefits information available at: https: https://www.bls.gov/oes/2023/may/oes173021.htm and https://www.bls.gov/news.release/ecec.t04.htm#ect_table4.f.1.
2. Except the following 14 CFR part 5 requirements: §§ 5.21(a)(4), 5.21(a)(5), 5.21(c), 5.23(a)(2), 5.23(a)(3), 5.23(b), 5.25(b)(3), 5.25(c), 5.27(a), 5.27(b), 5.71(a)(7), 5.93, and 5.97(d).
3. Estimates reflect part 135 certificate holders with 1-9 crewed aircraft based on the regulatory impact analysis accompanying the SMS final rule (89 FR 33068 published 4/26/24; table 26). FAA does not have data specific to UA operations. One-time costs reflect gap analysis, SMS development, training, documentation, and other (e.g., safety promotion) activities; annual costs reflect data collection and analysis, SMS review and evaluation, software, training, documentation, and other (e.g., ongoing safety promotion) activities.
4. TSA estimates the time and fees based on the methodology and fees from the TSA Security Vetting of Certain Transportation Workers NPRM. *See* NPRM: Surface Vetting Preliminary Regulatory Impact Analysis and Initial Regulatory Flexibility Analysis, Document ID TSA-2023-0001-0004, p. 73 (May 25, 2023) *available at* https://www.regulations.gov/document/TSA-2023-0001-0004. For example, they estimate approximately 1.5 hours of time and an initial enrollment fee of $87 for a Level 3 STA. These costs may change over time.

For example, if all 239 operators (nine exemption holders and 230 unique waiver holders) incur initial expenditures for manual updates equal to the high estimate in table 11 and annual expenditures equal to the low estimate, one-time costs would be $488,769 and annual costs would be $122,192 ($0.2 million annualized using discount rates of 3 and 7 percent over a 5-year period). Similarly, if the four exemption holders that are currently not part 135 certificate holders or otherwise have already implemented SMS become certificated operators under part 108, one-time SMS costs could be in the range of $66,160 and annual costs in the range of $75,700 ($0.1 million annualized using discount rates of 3 and 7 percent over a 5-year period) based on the midpoint of the cost ranges in table 12. However, for any new certificated operators conducting package delivery, these costs would be offset by not incurring costs to obtain a part 135 certificate.[249]

In addition, operators must use part 108-compliant UA. The extent to which the proposed rule affects price levels of UA compared to under existing waivers and exemptions is unknown, but likely to change with industry growth over time. Operators must also use strategic deconfliction and conformance monitoring capabilities provided by an automatic data service provider in certain airspace and over certain populations. Therefore, in some cases, operators would need to either become certificated to provide services with those capabilities or obtain the service from some other certificated automated data service provider.

Finally, to obtain the benefits from scaling operations, operators would incur costs from business expansion and increased risks not mitigated by the proposed rule requirements (*e.g.*, potential insurance cost increases, replacement parts, replacement UA). FAA does not have data to estimate these costs.

<u>iii. Automated Data Service Provision</u>

[249] As it stands today, operating under part 135 requires a lengthy exemption process for UAS operators because they cannot comply with the regulations as written. As a result, they must identify and document all exemptions that they need, and FAA must issue the exemptions before they can issue an operating certificate. FAA and the few UAS operators currently operating under part 135 have spent substantial resources on this process. Because it is new and novel, these costs may not be exemplary of those that future applicants would incur in the absence of the rule. However, the cost savings associated with the streamlined provisions contained in part 108 are likely significant.

The proposed rule would not require that any entities become automated data service providers. However, because operators must obtain strategic deconfliction and conformance monitoring capability from an automated data service provider to operate in controlled airspace, or a capability for strategic deconfliction to operate over Category 3, 4, or 5 population densities, one or more automated data service providers will be needed for certain BVLOS operations under the proposed rule. Entities choosing to become an automated data service provider must: obtain a certificate for one of three service levels (Level 1, 2, or 3, depending on the complexity of the operation that the automated data service supports), including documentation how it meets applicable proposed part 146 requirements, provide cyber and data security, develop and implement an SMS, have a change management process, have a training program, report incidences, retain records, meet data exchange requirements including non-repudiation, and meet software update requirements for versioning, testing, user notification, and FAA notification and approvals, depending on service levels.

Many of the proposed requirements represent standard business practices among data and software providers (*e.g.*, records of data exchanged with service users). However, some proposed requirements may result in one-time and recurring expenditures, depending on the entity. Table 13 describes these proposed requirements and potential cost considerations. FAA does not have data on the incremental costs of non-repudiation services and seeks comment on this issue.

Table 13. Potential Incremental Costs: Automated Data Service Providers

Category	Description	Unit Cost Information
SMS	Develop, implement, and document an SMS (14 CFR part 5)[1]	Scalable based on size and complexity, $8,100 - $28,140 one-time and

Table 13. Potential Incremental Costs: Automated Data Service Providers

Category	Description	Unit Cost Information
		$540 - $10,940 annually[2]
Non-repudiation	Services must use a validation and verification method that provides assurance of the integrity and origin of the data exchanged with the user	No data
Training	Includes best practices in distributed software development; applicable regulations and ACs relating to automated data services, airspace classification, operating requirements, and flight restrictions; aviation safety culture concepts; and best practices in the provision of automated data services for aviation users	Dependent on company size, $1,400 per person annually[3]

AC = Advisory Circular
1. Except the following 14 CFR part 5 requirements: §§ 5.7, 5.9, 5.11, 5.13, 5.15, 5.27, and 5.71(c).
2. Estimates reflect part 21 type and production certificate holders with 1-99 employees based on the regulatory impact analysis accompanying the SMS final rule (89 FR 33068 published 4/26/24; table 24). FAA does not have data specific to potential automated data service providers.
3. Estimated based on time (20 hours) valued at average loaded hourly wage rate ($58) plus $250 course cost based on typical training courses to obtain part 107 UA pilot license (*e.g.*, www.flyingmag.com/best-drone-pilot-course/). FAA does not have data specific to training for automated data service providers.

For example, entities choosing to become automated data service providers could incur costs to develop and implement an SMS if they have not already done so under FAA's SMS voluntary program or required under part 5 (part 135 certificate holders and aircraft design and manufacturers holding a type certificate and production certificate for the same product). SMS costs could be in the range of $28,000 one-time and $11,000 annually for a company of 99 employees ($0.02 million annualized using discount rates of 3 and 7 percent over a 5-year period). For the same size company, training costs could be in the range of $138,600 annually (99 × $1,400; $0.1 million annualized using discount rates of 3 and 7 percent over a 5-year period). Total industry costs would depend on the mix of sizes and types of potential automated data service providers. For example, for an existing part 135 certificate holder (*e.g.*, conducting package delivery under an exemption) to become an automated data service provider, incremental costs would not include SMS. Also, due to the airspace and population density around their typical operating environments, agricultural operators are not likely to require use of these services. FAA requests comments regarding the likely use and provision of automated data services.

iv. Uncertainties

The key uncertainty in the analysis of costs relates to the incremental nature of the proposed requirements (*i.e.*, compared to existing practices in a wide variety of industries and BVLOS operations via waivers and exemptions). This uncertainty affects who is likely to take advantage of BVLOS in the future (including, for operators, through a permit or certificate) affecting both benefits and costs. Also, impacts of the proposed rule that are dependent on consensus standards are uncertain because the standards are currently not available. In addition, changes in response to the proposed rule may lower unit costs through industry-developed solutions aimed at cost-effective compliance (similar to tools developed to assist with a part 5 compliant SMS). Entities with scaled operations (*i.e.*, certificated) may also be cost-effective service providers for individual operators (*i.e.*, compared to continuing under a permit).

Finally, there is uncertainty with respect to the impact on part 91 operators not equipped with ADS-B or EC equipment. These operators may incur costs to add equipment or as a result of loss of right-of-way. However, right-of-way impacts would be very site and situation specific and thus very difficult to estimate.

5. Comparison of Benefits and Costs

FAA is unable to quantify the benefits of the proposed rule. However, existing studies are indicative of the types and potential magnitude of benefits. When considered in the context of the myriad of potential applications and locations nationwide, FAA anticipates that the benefits from scaled BVLOS are significant. To the extent risks of scaled operations are successfully mitigated, and the scale or pace of scaling could not occur under the existing framework, benefits are attributable to the proposed rule. Given that the proposed rule includes requirements that mirror current BVLOS exemptions, while also proposing new requirements to mitigate risks inherent in expanded BVLOS operations, there are few incremental costs, and FAA anticipates that the benefits would likely exceed costs.

6. Alternatives

FAA does not have data to quantify the benefits and costs of the alternatives to the proposed rule. Table 14 provides qualitative evaluation of the potential impacts. For design and manufacturing, FAA considered requiring a special airworthiness certification rather than proposed airworthiness acceptance. Section X.A. describes the differences in these two approaches. FAA determined the alternative would not increase safety. As noted in table 14, the proposed approach may represent cost savings compared to obtaining special airworthiness certification. For example, under the alternative, the applicant would need to host FAA airworthiness inspection and document review. The alternative would also increase Agency costs, including to inspect aircraft and review documentation.

For operations, FAA considered requiring package delivery operators to obtain a part 119 air carrier certificate and certificating each type of personnel involved in the control of a UA. Section VIII.A.1 describes the differences between obtaining an air carrier certificate and the proposed permits and certificates for UAS operators. Section VII.A.1 discusses the differences regarding personnel between manned aviation and UAS, and FAA's rationale for selecting the proposed approach. FAA determined that these alternatives would have little impact on safety and would increase costs. The extra administrative process and structure in these alternatives is not optimized to UAS, necessitating a lot of waivers and exemptions. Waivers and exemptions lead to additional costs without affecting benefits.

For automated data service providers, FAA considered a traditional ATM model approach and different approaches discussed by the BVLOS ARC. FAA determined that these alternatives would potentially increase risks in the NAS and the ATM model would increase FAA costs.

Table 14. Alternatives

Alternative	Description	Impact on Benefits and Costs
Design and Production		
Special airworthiness certification	Resemble certification of light-sport category aircraft under part 21 using industry consensus standards, FAA inspection of every UAS	Increase FAA costs and potentially manufacturers'; no change in safety (benefits)
Operations		
Part 119 certification for package delivery	Require package delivery operators to obtain a part 119 air carrier certificate	Increase costs for new package delivery operators (no impact on existing); no change in safety (benefits)
Personnel certification	Certificating each type of personnel involved in the control of a UA	Increase operator costs; marginal safety assurances
Automated Data Service Provision		
Air traffic management	FAA manage separation of UAS and system-wide efficiency of part 108 operations	Increase FAA costs; potentially increase risks to the NAS
BVLOS ARC recommendations	MOC and DOC for certification; requiring minimal information on	Unclear impact on costs; potential increase in risks

Table 14. Alternatives

Alternative	Description	Impact on Benefits and Costs
	provider; and recognizing specific UTM services	

B. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) of 1980, Pub. L. 96–354, 94 Stat. 1164 (5 U.S.C. 601–612), as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (Pub. L. 104–121, 110 Stat. 857, Mar. 29, 1996), and the Small Business Jobs Act of 2010 (Pub. L. 111–240, 124 Stat. 2504 Sept. 27, 2010), requires Federal agencies to consider the effects of the regulatory action on small business and other small entities and to minimize any significant economic impact. The term ‘‘small entities’’ comprises small businesses and not-for-profit organizations that are independently owned and operated and are not dominant in their fields, and governmental jurisdictions with populations of less than 50,000.

FAA and TSA are publishing this Initial Regulatory Flexibility Analysis (IRFA) to aid the public in commenting on the potential impacts to small entities from this proposal. FAA and TSA invite interested parties to submit data and information regarding the potential economic impact that would result from the proposal. FAA and TSA will consider comments when making a determination or when completing a Final Rule.

C. Regulatory Flexibility Analysis.

An IRFA must contain the following:

(1) A description of the reasons why the action by the agency is being considered;

(2) A succinct statement of the objective of, and legal basis for, the proposed rule;

(3) A description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply;

(4) A description of the projected reporting, recordkeeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;

(5) An identification, to the extent practicable, of all relevant Federal rules that may duplicate, overlap, or conflict with the proposed rule; and

(6) A description of any significant alternatives to the proposed rule which accomplish the stated objectives of applicable statutes, and which minimize any significant economic impact of the proposed rule on small entities.

1. Reasons the Action is Being Considered

As described elsewhere in this preamble, the proposed rule addresses the rapid advancement of UAS technology, and the lack of regulation which specifically addresses, allows, and ensures the safety of operations with said technology when operated BVLOS or at large scale. This is discussed in section IV.A of this preamble.

2. Objectives and Legal Basis of the Proposed Rule

As described elsewhere in this preamble, the objective of the proposed rule is to allow UAS to operate for commercial and recreational purposes beyond the VLOS of operators and at low altitudes in the NAS. This is done with the intent to enable a greater number and size of operations while still ensuring the safety of the NAS. Section I.A of this preamble discusses this in greater detail. The legal authority for the proposed rule is described in section II of this preamble.

3. Description and Estimate of the Number of Small Entities

FAA used the definition of small entities in the RFA for this analysis. The RFA defines small entities as small businesses, small governmental jurisdictions, or small organizations. In 5 U.S.C. 601(3), the RFA defines "small business" to have the same meaning as “small business concern” under § 3 of the Small Business Act. The Small Business Act authorizes the Small Business Administration (SBA) to define "small business" by issuing regulations.

SBA has established size standards for various types of economic activities, or industries, under the North American Industry Classification System (NAICS). These size standards generally define small businesses based on the number of employees or annual receipts. Table 15 shows the SBA size standards for example industrial classification codes relevant for the proposed rule. Note that the SBA definition of a small business applies to the parent company and all affiliates as a single entity.

Table 15. Small Business Size Standards: BVLOS Operations

NAICS Code	Description	Size Standard
Exemptions		
336411	Aircraft Manufacturing	1,500 employees
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	1,350 employees
481111	Scheduled Passenger Air Transportation	1,500 employees
481211	Nonscheduled Chartered Passenger Air Transportation	1,500 employees
482111	Line Haul Railroads	1,500 employees
492110	Couriers and Express Delivery Services	1,500 employees
459999	All Other Miscellaneous Retailers	$11.5 million
541370	Surveying and Mapping (except Geophysical) Services	$19.0 million
Waivers[1]		

Table 15. Small Business Size Standards: BVLOS Operations

NAICS Code	Description	Size Standard
221210	Natural Gas Distribution	1,150 employees
236115	New Single-family Housing Construction (Except For-Sale Builders)	$45.0 million
327211	Flat Glass Manufacturing	1,100 employees
333111	Farm Machinery and Equipment Manufacturing	1,250 employees
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	1,350 employees
334516	Analytical Laboratory Instrument Manufacturing	1,000 employees
336411	Aircraft Manufacturing	1,500 employees
423990	Other Miscellaneous Durable Goods Merchant Wholesalers	100 employees
481219	Other Nonscheduled Air Transportation	$25.0 million
512110	Motion Picture and Video Production	$40.0 million
513120	Periodical Publishers	1,000 employees
541330	Engineering Services	$25.5 million
541370	Surveying and Mapping (except Geophysical) Services	$19.0 million
541519	Other Computer Related Services	$34.0 million
541990	All Other Professional, Scientific and Technical Services	$19.5 million
611310	Colleges, Universities and Professional Schools	$34.5 million
711219	Other Spectator Sports	$16.5 million

NAICS = North American Industrial Classification System
1. Based on a sample of 25 waivers.

Under exemptions, FAA identified three entities that may be small operators (one of which is also a manufacturer, and two of which also operate under a waiver). Under waivers, to estimate the number of small entities, FAA examined 51 randomly selected waivers to obtain a sample of 25 entities for which business data could be obtained.[250] Of the 51 waivers examined, 12 represent individuals, 3 represent government entities, 11 represent entities under the SBA for which no data could be obtained, and 25 represented entities under the SBA for which NAICS and information to compare to the size standard could be determined. Of the sample of 25, 72 percent (18 entities) represent small entities under the SBA. If this ratio holds for the whole population of 232 among waivers and exemptions, 166 would be small entities (72 percent × 229 waivers = 165 + 1 unique small entity under an exemption = 166).

As described in section XIV.A, approximately 30 U.S.-based manufacturers may be affected by proposed rule (table 16 shows the SBA size standards for the manufacturers). FAA used a similar process as for waivers (see footnote 30) to obtain data for a sample of 15. Five manufacturers are also operators under an exemption. Ten of the entities in the sample may be small businesses under the SBA. Thus, if this ratio holds for the population of manufacturers, a total of 20 manufacturers (10 × 2) may be small businesses.

[250] FAA used the following process: first, it assigned each entry a random value using the RAND function in Excel and sorted by the random value. It then examined each entry in sequence and removed individuals and governmental entities. For remaining entries, a Google search of NAICS code, revenue and employee count data was performed. If any of these data could not be found, the entry was discarded. If the data could be found, the entry was included in the sample. This process was repeated until 25 entries were added to the sample.

Table 16. Small Business Size Standards: Manufacturers[1]

NAICS Code	Description	Size Standard
333310	Commercial and Service Industry Machinery Manufacturing	1,000 employees
335311	Power, Distribution and Specialty Transformer Manufacturing	800 employees
336411	Aircraft Manufacturing	1,500 employees
459999	All Other Miscellaneous Retailers	$11.5 million
518210	Computing Infrastructure Providers, Data Processing, Web Hosting, and Related Services	$40 million
541370	Surveying and Mapping (except Geophysical) Services	$19 million
541512	Computer Systems Design Services	$34 million
541513	Computer Facilities Management Services	$37 million
541715	Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology) 11	1,000 employees

NAICS = North American Industrial Classification System
1. Based on a sample of 15 manufacturers.

No entities are currently operating as an automated data service provider, as the rules defining an automated data service provider do not currently exist.

4. Projected Reporting, Recordkeeping and Other Compliance Requirements,

Section XIV.E, of this preamble details the recordkeeping and reporting requirements of proposed rule. Section XIV.A discusses other compliance requirements and costs. For this analysis, if FAA assumes that all entities are certificated, they will incur costs from updating their operator manual and from implementing SMS. FAA uses the highest costs for both these categories, as shown in table 17.

Table 17. Screening-level Compliance Costs: Operators

Requirement	Cost[1]
Operations manual updates	$1,850
SMS	$42,580
Total	$44,430

1. See table 12 for details.

Under these costs, only 12 percent of entities could face costs greater than 2 percent of estimated revenues. These are all small entities. Extrapolating to the whole population, and including exemptions, FAA would estimate that 28 small entities could face costs greater than 2 percent of revenues. However, this method assumes all operators will be certificated. The intent of the rule is to allow smaller operations to conduct business under a permit, which does not involve SMS costs. These small entities are likely to qualify for a permit, and thus are unlikely to be required to meet the certificated requirements. Furthermore, it is unlikely that an entity would choose to obtain a certification if they would face significant adverse impacts. Thus, FAA relies on permitted costs.

Under the cost for a permit rather than a certificate, entities would face only the operations manual update cost. Under these costs, no entities would face costs greater than 2 percent of estimated annual revenue. Thus, FAA estimates that, among operators, small entities will not face significant adverse impacts under proposed rule.

Manufacturers face costs as described in section XIV.A.3. As described in table 10, the only cost which can be estimated is the data storage cost, which is estimated to be $6,000 per year per manufacturer. Under this estimate, no manufacturers would face costs greater than 2 percent of estimated annual revenue. This includes manufacturers that are also operators, which face the $6,000 data storage cost as well as the $44,430 certificated operator costs described in table 11.

There are not any currently operating automated data service providers. Because no entities are currently operating as automated data service providers, no extant entities would be required to comply with this rule. As such, any entity that opts to become an automated data service provider will have done so because it perceives the benefit to be greater than the cost. Nonetheless, entities will need the services of an automated data service provider to operate in certain locations and over certain population densities under proposed rule. However, the costs and potential impacts from use of third-party automated data service providers cannot be determined until a market for such services develops.

5. All Federal Rules That May Duplicate, Overlap, or Conflict

There are no relevant Federal rules that may duplicate, overlap, or conflict with proposed rule.

6. Significant Alternatives Considered

As described in section X.A, FAA considered an alternative for determining UA airworthiness based on existing part 21 procedures to enable BVLOS operations under part 108. Section X.A describes the alternative and rationale for the approach in proposed rule. Proposed rule approach may also lessen any adverse impacts on small manufacturers. As described in section XIV.A.5, FAA considered requiring package delivery operators to obtain an air carrier certificate under part 119, and as described in section VII.A, FAA considered requiring personnel certification. In comparison to these alternatives, proposed approach may lessen any adverse impacts on small operators. FAA also considered two alternatives to proposed requirements for automated data service providers. These alternatives, and the rationale for selecting proposed rule, are described in section XIII.

C. International Trade Impact Assessment

The Trade Agreements Act of 1979 (Pub. L. 96-39), as amended by the Uruguay Round Agreements Act (Pub. L. 103-465), prohibits Federal agencies from establishing standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Pursuant to these Acts, the establishment of standards is not considered an unnecessary obstacle to the foreign commerce of the United States, so long as the standard has a legitimate domestic objective, such as the protection of safety and does not operate in a manner that excludes imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

FAA and TSA recognize that many other countries have adopted standards with regard to UAS manufacture, operation, and provisioning of automated data services in their respective airspace that may or may not align with this new framework. FAA will leverage Bilateral Aviation Safety Agreements, or equivalent agreements, to acknowledge commensurate standards that enable foreign commerce and reduce unnecessary obstacles. FAA and TSA invite comments on this approach and any additional information that would support future alignment.

D. Unfunded Mandates Assessment

The Unfunded Mandates Reform Act of 1995 (2 U.S.C. 1531-1538) governs the issuance of Federal regulations that require unfunded mandates. An unfunded mandate is a regulation that requires a State, local, or Tribal government or the private sector to incur direct costs without the Federal government having first provided the funds to pay those costs. FAA determined that proposed rule will not result in the expenditure of $187,000,000 or more ($100,000,000 adjusted for inflation using the most current Implicit Price Deflator for the Gross Domestic Product) by State, local, or Tribal governments, in the aggregate, or the private sector, in any one year.

E. Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that agencies consider the impact of paperwork and other information collection burdens imposed on the public. According to the 1995 amendments to the Paperwork Reduction Act (5 CFR § 1320.8(b)(2)(vi)), an agency may not collect or sponsor the collection of information, nor may it impose an information collection requirement unless it displays a currently valid Office of Management and Budget (OMB) control number.

This action contains the following proposed amendments to the existing information collection requirements previously approved under OMB Control Numbers 2120-0663, Service Difficulty Reports, and 2120-0705, Hazardous Materials Program Requirements. As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), FAA has submitted these proposed information collection amendments to OMB for its review.

This action contains the following new information collection requirements; (1) for part 108 MOC and DOC (OMB Control Number 2120-XXXX), (2) part 108 operators (OMB Control Number 2120-XXXX), and (3) for automated data service providers certificated under part 146 (OMB Control Number 2120-XXXX). As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), FAA has submitted these new proposed information collections to OMB for its review.

1. Part 108 Permitted and Certificated Operators

Summary: This collection includes application and ongoing burdens for both permitted and certificated operators. Unless otherwise specified, burdens under subparts A, B, C, and F apply to both permitted and certificated operators. Burdens under subpart D apply only to permitted operators (or applicants thereof). Burdens under subpart E apply only to certificated operators (or applicants thereof). DOT requests that this information collection approval include all information that is either required to be reported, kept as record, or disclosed for any operator operating under part 108. This collection would also be used in instances where an operator is seeking authorization to deviate from certain regulations where available pursuant to the regulatory text.

Use: These collections will be used to permit or certificate operators safely and to provide adequate oversight to promote safety assurance.

Respondents (including number of): Permitted and certificated operators under part 108. FAA estimates there be over 200 operators within the first three years after part 108 goes into effect.

Frequency: Permit applications are to be submitted every 24 months. Certificate applications are one-time collections that remain valid so long as the operator maintains currency. Ongoing recordkeeping, disclosing, and most reporting requirements are to be provided as needed. Reporting requirements under §§ 108.45(a) and (b) are to be provided to FAA once every 12 months. Information provided to obtain an authorization to deviate from any operating regulation which permits such a deviation would be provided on an ad hoc basis.

Annual Burden Estimate: FAA estimates that complying with the reporting, recordkeeping, and disclosing requirements to be imposed on permitted and certificated operators under proposed part 108 will cost annually, on average, $1,013,479 in wages during each of the first three years of the rule's effectiveness.[251] In cases where authorization to deviate is sought, FAA estimates that such application for authorization would take one (1) hour.

2. Part 108 Means of Compliance and Declaration of Compliance

Summary: This information collection includes collections that are required by FAA for voluntary consensus standards bodies proposing a means of compliance for UAS that can operate under part 108, as well as manufacturers of UAS that can operate under part 108 manufactured to standards set by an accepted or approved MOC and manufactured pursuant to a DOC. The purpose of this collection of information is to help FAA ensure that UAS operated under part 108 meet the minimum performance requirements of proposed rule. The MOC and DOC concepts are critical components of the framework of proposed rule to ensure UAS meet the performance-based requirements for BVLOS operations.

Use: This collection will be used to collect standards to be used as a MOC for part 108 UAS manufacturers, if accepted or approved by FAA. This collection will also be used to collect information and artifacts for DOC in accordance with a MOC that will be submitted by the UAS manufacturers. This collection will also be used for additional

[251] FAA estimated labor burdens as follows: for general recordkeeping and reporting tasks, FAA used Bureau of Labor Statistics (BLS) wage rate data for "Aircraft Mechanics and Service Technicians", job series 49-3011 (estimated nominal wage rate of $36.66 per hour with a load factor of 1.51 to account for benefits) *available at* www.bls.gov/oes/current/oes_nat.htm; for tasks requiring legal expertise, FAA used BLS data on "Lawyers", job series 23-1011, in the Management of Companies and Enterprises industry (estimated nominal wage rate of $114.12 per hour with a load factor of 1.51 to account for benefits) *available at* www.bls.gov/oes/current/oes231011.htm ; for expertise on training programs, FAA used BLS data on commercial pilots, job series 53-2012 (estimated nominal wage rate of $66.35 per hour with a load factor of 1.51 to account for benefits) *available* at www.bls.gov/oes/current/oes532012.htm.

disclosing, recordkeeping, and reporting requirements that are imposed on manufacturers of the UAS that has received airworthiness acceptance.

Respondents (including number of): Respondents to this collection for the MOC will be voluntary consensus standards bodies. Respondents for DOC (and any additional paperwork burdens on manufacturers) will be manufacturers of UAS that are designed and built to operate under part 108. There are 35 elements that would require a MOC in subparts G and H of proposed rule. There will need to be at least one FAA-accepted (or FAA-approved) MOC for each of these 35 elements. Therefore, FAA estimates at least 35 MOC will be approved within the first three years upon part 108 going into effect. There will be ongoing burdens on manufacturers of the UAS that have received airworthiness acceptance; FAA anticipates that there will be approximately 30 manufacturers that produce at least one UAS manufactured under a DOC and thus charged with the associated ongoing paperwork reduction act burdens.

Frequency: Collections are required on an "as needed" basis. It is envisioned that submissions for MOC approval will occur as needed as voluntary consensus standards bodies develop adequate standards ready for approval by FAA. Each individual UA manufactured in accordance with a MOC requires its own DOC, but submissions will be "one-time" for each DOC. To mitigate excess burden caused by repetitive submissions, submissions for DOCs can be made in batches of up to 500 aircraft at a time. Under § 108.760, all supporting documentation for the DOC must be retained by the manufacturer for two (2) years following the cessation of support for the COS of the UAS listed on the DOC. If the manufacturer makes any design changes, they must demonstrate that those design changes demonstrate compliance with the MOC under

§ 108.750(b). Flight data required to be kept as record under § 108.725 shall be kept by the manufacturer of the UAS that has received airworthiness acceptance for a minimum of two (2) years.

Annual Burden Estimate: 241 hours annually (on average), and $226,591 annually from costs (including labor).[252]

3. Part 146 Automated Data Service Providers

Summary: Proposed part 146 provides a regulatory framework for appropriate government oversight of automated data services that support aircraft operations. DOT requests this information collection approval include all information that is either required to be reported, kept as record, or disclosed by any automated data service provider. This includes the information that a service provider must submit to FAA to become authorized and certificated. This also includes information that the service provider must provide to FAA on an ongoing or as-needed basis, and disclosures to their user base.

Use: These collections will be used to authorize and certify automated data service providers and provide adequate oversight of these services to promote safety assurance.

Respondents (including number of): Respondents for this collection are the automated data service providers. FAA cannot estimate without speculating the number of automated data service providers that will enter this market.

---

[252] FAA estimated labor burdens using BLS statistics including rates for *Aerospace Engineering Operations Technologists and Technicians*, job series 17-3021 and 17-2011 (estimated wage rate of $39.08 per hour with a load factor of 1.51 to account for benefits for an aeronautical technician for general tasks and estimated wage rate of $64.74 per hour with a load factor of 1.51 for an aeronautical engineer for tasks requiring engineering subject matter expertise) *available at* www.bls.gov/oes/current/oes_nat.htm.

Frequency: Authorization and certification are one-time collections. Reporting requirements are as-needed.

Annual Burden Estimate: FAA estimates the paperwork burden on service providers to be commensurate with the service level they are offering – service suppliers with offerings in higher service levels are required to provide more information to FAA as part of their applications, and therefore are estimated to have larger paperwork burdens.[253] FAA estimates that Service Level 1 service providers will have a burden of (approximately) $365 in their first year to obtain their certificate and first service authorization. FAA estimates that Service Level 2 service providers will have a burden of (approximately) $800 in their first year to obtain their certificate and first service authorization. FAA estimates that Service Level 3 service providers will have a burden of (approximately) $1,824 in their first year to obtain their certificate and first service authorization. These would be one-time expenses; obtaining additional authorizations to offer additional services would also have one-time costs that would be in line with the costs for the first authorization and would also be dependent on service level. However, for simplicity, the PRA analysis assumes 1 service authorization per entity. FAA estimates that data exchange and recordkeeping requirements for service providers of any service level will cost approximately $6,000 per year to account for data storage.[254] FAA estimates a *de minimis* net burden for required notifications to customers, such as alerting

[253] FAA estimated labor burdens using BLS statistics including rates for Project Management Specialist within "Executive Secretaries and Executive Administrative Assistants", job series 43-6011, in the Computing Infrastructure Providers, Data Processing, Web Hosting, and Related Services industry group (estimated nominal wage rate of $55.74 per hour and a load factor of 1.51 to account for benefits) *available at* www.bls.gov/oes/current/oes436011.htm.

[254] *See, e.g.*, https://www.liquidweb.com/products/dedicated/.

a service provider's customer base of a software update, noting that these are already customary and usual business practices.

4. Hazardous Materials Program Requirements (OMB Control No. 2120-0705)

Summary: This current OMB Control Number accounts for the information collected from 14 CFR part 121, 135, and 145 operators associated with hazardous materials-specific regulatory requirements. This includes information collection from hazardous materials procedures and information, training programs, and notification requirements. Proposed part 108 includes similar requirements for part 108 permitted and certificated package delivery operators to be included in this collection.

Use: This collection is used to authorize, certify, and ensure compliance with hazardous materials-specific requirements associated with proposed part 108 operators and existing part 121, 135, and 145 operators.

Respondents (including number of): Respondents for this collection are proposed part 108 operators and existing part 121, 135, and 145 operators. FAA does not estimate an increase in total respondents. While FAA estimates an increase in part 108 certificated package delivery operator respondents, this increase is offset by a subsequent decrease in part 135 certificate holder respondents. In addition, FAA does not currently estimate any part 108 permitted package delivery operators but still accounts for these respondents to allow for an increase as new entrants emerge.

Frequency: Certificate applications are one-time collections that remain valid so long as the operator maintains currency but are submitted for additional review with any change. Training reporting and recordkeeping are created and updated initially and every 24 months following employee recurrent training.

Increase in Annual Burden Estimate: FAA estimates an overall increase of two (2) annual burden hours. The increase accounts for proposed requirement in § 108.570(l) for a part 108 certificated package delivery operator to develop and submit an SRA as a part of the will-carry § 108.570(a) authorizations. The other proposed increases in annual burden for part 108 certificated package delivery operators are offset by the subsequent decrease in annual burden for part 135 certificate holders. In addition, there is no annual burden estimated for part 108 permitted package delivery operators because FAA does not estimate any part 108 permitted package delivery operator respondents.[255] However, FAA will account any annual burden for part 108 permitted package delivery operators as new entrants emerge.

5. Service Difficulty Reports (OMB Control No. 2120-0663)

Summary: This current OMB Control Number accounts for the information collected as part of a service difficulty report. Under proposed § 108.45(d), certificated operators would have to report to the unmanned aircraft manufacturer any failure, malfunction, or defect in an unmanned aircraft system that causes momentary or permanent loss of control or communication of the unmanned aircraft if it has endangered, or may endanger, the safe operation of the unmanned aircraft.

Use: Under the existing Information Collection Number 2120-0663, service difficulty report information is collected, collated by FAA, and used to determine service

[255] FAA would estimate the increased burden using BLS data *Occupational Employment and Wages*, May 2023. Cargo and Freight Agents NAICS Code 43-5011 *available at* www.bls.gov/oes/current/oes435011.htm. Hourly wage rate is $25.22. For private industry, BLS data shows that 34% of compensation is from benefits *available at* www.bls.gov/news.release/ecec.t04.htm#ect_table4.f.1. Therefore, to account for benefits: $25.22*1.34 = $33.79.

performance of aeronautical products. Regulations calling for the submission of Service Difficulty Reports enhance air safety by collecting additional and timelier data pertinent to critical aircraft or aeronautical components. Under proposed rule, this information would be directly reported to the manufacturer (and not FAA) so that the manufacturer can address this critical user feedback without delay and analyze the service performance of their own aeronautical products.

Respondents (including number of): Respondents for this collection are proposed part 108 certificated operators, in addition to those respondents already accounted for in OMB Information Collection Number 2120-0663.

Frequency: Service difficulty reports would be submitted on an as-needed basis.

Increase in Annual Burden Estimate: Information collection Number 2120-0663 estimates that each service difficulty report takes .667 hours to produce and submit. FAA believes that this a good estimate of the time that it would take for the service difficulty reports required under proposed §108.45(d). This proposed regulation only applies to certificated operators, not permitted operators, and FAA does not have the information needed to estimate the number of certificated operators, nor the information to estimate the number of service difficulty reports that would be submitted by that pool of respondents each year for the first three years of the rule. For these reasons, FAA cannot yet estimate the total increase in burden.

FAA is soliciting comments to—

(1) Evaluate whether proposed information requirement is necessary for the proper performance of the functions of FAA, including whether the information will have practical utility;

(2) Evaluate the accuracy of FAA's estimate of the burden;

(3) Enhance the quality, utility, and clarity of the information to be collected; and

(4) Minimize the burden of collecting information on those who are to respond, including by using appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology.

Individuals and organizations may send comments on the information collection requirement to the address listed in the ADDRESSES section at the beginning of this preamble by *[INSERT DATE XX DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]*. Comments also should be submitted to the OMB, Office of Information and Regulatory Affairs, Attention: Desk Officer for FAA, New Executive Office Building, Room 10202, 725 17th Street, NW, Washington, DC 20053.

F. International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to conform to ICAO SARPS to the maximum extent practicable. FAA has reviewed the corresponding ICAO SARPS and has identified no differences with these proposed regulations.

G. Environmental Analysis

FAA Order 1050.1F identifies FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act (NEPA) in the absence of extraordinary circumstances. FAA has determined this rulemaking action qualifies for the categorical exclusion identified in paragraph 5-6.6f for regulations and involves no extraordinary circumstances because it is in an NPRM. TSA has concluded that this action is covered by categorical exclusion number A3(a) and (d) in DHS Instruction Manual 023-01-001-01, Revision 01, Implementation of the National Environmental Policy Act (NEPA), which guides TSA compliance with NEPA.

H. Regulations Affecting Intrastate Aviation in Alaska

Section 1205 of FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the Administrator, when modifying 14 CFR regulations in a manner affecting intrastate aviation in Alaska, to consider the extent to which Alaska is not served by transportation modes other than aviation, and to establish appropriate regulatory distinctions. Because this proposed rule would apply to UAS operations for various applications expected in Alaska (*e.g.*, aerial surveying, civic interest, etc.), it could, if adopted, affect intrastate aviation in Alaska. FAA, therefore, specifically requests comments on whether there is justification for applying proposed rule differently in intrastate operations in Alaska.

<u>XV. Executive Order Determinations</u>

A. Executive Order 13132, Federalism

FAA and TSA have analyzed this proposed rule under the principles and criteria of Executive Order 13132, Federalism. FAA and TSA have determined that this action would not have a substantial direct effect on the States, or the relationship between the Federal Government and the States, or on the distribution of power and responsibilities among the various levels of government, and, therefore, would not have federalism implications.

B. Executive Order 13175, Consultation and Coordination with Indian Tribal Governments

Consistent with Executive Order 13175, Consultation and Coordination with Indian Tribal Governments,[256] and FAA Order 1210.20, American Indian and Alaska Native Tribal Consultation Policy and Procedures,[257] FAA ensures that Federally Recognized Tribes (Tribes) are given the opportunity to provide meaningful and timely input regarding proposed Federal actions that have the potential to affect uniquely or significantly their respective Tribes. At this point, FAA has not identified any unique or significant effects, environmental or otherwise, on Tribes resulting from this proposed rule.

C. Executive Order 13211, Regulations that Significantly Affect Energy Supply, Distribution, or Use

FAA and TSA analyzed this proposed rule under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use. FAA and TSA have determined that it would not be a "significant energy action" under the Executive Order and would not be likely to have a significant adverse effect on the supply, distribution, or use of energy.

D. Executive Order 13609, Promoting International Regulatory Cooperation

Executive Order 13609, Promoting International Regulatory Cooperation, promotes international regulatory cooperation to meet shared challenges involving health, safety, labor, security, environmental, and other issues and to reduce, eliminate, or prevent unnecessary differences in regulatory requirements. FAA and TSA have analyzed this action under the policies and agency responsibilities of Executive Order 13609 and

[256] 65 FR 67249 (Nov. 6, 2000).

[257] FAA Order No. 1210.20 (Jan. 28, 2004), www.faa.gov/documentLibrary/media/1210.pdf.

have determined that this action would have no effect on international regulatory cooperation.

E. Executive Order 14192, Unleashing Prosperity Through Deregulation

This proposed rule, if finalized as proposed, is expected to be an E.O. 14192 deregulatory action as it is an enabling rule.

XVI. Incorporation by reference.

This NPRM proposes to incorporate by reference the final version of FAA Order JO 7400.[XX], currently available in draft form. A detailed discussion of the Order is located in section VI of this preamble. During the comment period of this NPRM, FAA Order JO 7400.XX, the draft of FAA Order JO 7400.[XX] is available at/by/through [GIVE INSTRUCTIONS ON HOW/WHERE TO FIND THE DRAFT ORDER FOR REVIEW].

In addition, ANSI/CTA-2063-A, which appears §89.505 in the proposed amendatory text of this document, was previously approved for that section. No change is proposed to the incorporation by reference (IBR) material.

XVII. Privacy

With regard to the information persons may submit in accordance with this proposed rule's requirements, FAA conducted a privacy impact assessment (PIA) under section 522(a)(5) of division H of the FY 2005 Omnibus Appropriations Act, Pub. L. 108-447, 118 Stat. 3268 (Dec. 8, 2004) and section 208 of the E-Government Act of 2002, Pub. L. 107-347, 116 Stat. 2889 (Dec. 17, 2002). The PIA found that proposed regulatory requirements that affect privacy include: Application information, training, and personnel information, UAS ownership data, and UAS location data.

As part of the PIA, FAA analyzed the effect this proposed rule might have on collecting, storing, and disseminating personally identifiable information of the public and UAS operators. FAA also examined and evaluated protections and alternative information-handling processes in developing proposed rule to mitigate potential privacy risks. A copy of the draft PIA is posted in the docket for this rulemaking.[258]

Any vetting conducted by TSA and the security threat assessments proposed in this NPRM are covered by a current Department of Homeland Security system of records titled, "Department of Homeland Security/Transportation Security Administration--002 Transportation Security Threat Assessment System of Records." This system of records allows TSA to collect and maintain records related to security threat assessments, employment investigations, and evaluations that TSA conducts on certain individuals for security purposes. For example, individuals who apply for a Transportation Worker Identification Credential or a Hazardous Materials Endorsement must undergo a security threat assessment, and records associated with the assessment are covered by this system.

XVIII. Additional Information

A. Comments Invited

FAA is managing the docket for this rulemaking. FAA and TSA invite interested persons to participate in this rulemaking by submitting written comments, data, or views. The most helpful comments reference a specific portion of the proposal, explain the reason for any recommended change, and include supporting data. To ensure the docket does not contain duplicate comments, commenters should submit only one time if

[258] Upon finalization, PIAs are posted on the Department of Transportation's Privacy Program page, *available at* www.transportation.gov/individuals/privacy/privacy-impact-assessments#Federal%20Aviation%20Administration%20(FAA).

comments are filed electronically, or commenters should send only one copy of written comments if comments are filed in writing.

FAA will file in the docket all comments it receives, as well as a report summarizing each substantive public contact with FAA personnel concerning this proposed rulemaking. Before acting on this proposal, FAA and TSA will consider all comments they receive on or before the closing date for comments. FAA and TSA will consider comments filed after the comment period has closed if it is possible to do so without incurring expense or delay. FAA and TSA may change this proposal in light of the comments it receives.

Privacy: In accordance with 5 U.S.C. 553(c), DOT solicits comments from the public to better inform its rulemaking process. DOT posts these comments, without edit, including any personal information the commenter provides, to https://www.regulations.gov, as described in the system of records notice (DOT/ALL-14 FDMS), which can be reviewed at https://www.dot.gov/privacy.

B. Confidential Business Information and Sensitive Security Information (SSI)

Confidential Business Information (CBI) is commercial or financial information that is both customarily and actually treated as private by its owner. Under the Freedom of Information Act (FOIA) (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to this preamble contain commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to this preamble, it is important that you clearly designate the submitted comments as CBI. Please mark each page of your submission containing CBI as "PROPIN." FAA will treat such marked submissions as confidential under the FOIA, and they will not be placed in the public docket of this preamble. Submissions containing CBI should be sent to the person in the **FOR FURTHER INFORMATION CONTACT** section of this document. Any commentary that FAA receives which is not specifically designated as CBI will be placed in the public docket for this rulemaking.

Comments containing sensitive security information should be appropriately marked as containing such information and submitted by mail to the address listed in the **FOR FURTHER INFORMATION CONTACT** section. FAA will not place comments containing SSI in the public docket and will handle them with applicable safeguards and restrictions on access.

C. Electronic Access and Filing

A copy of this preamble, all comments received, any final rule, and all background material may be viewed online at https://www.regulations.gov using the docket number listed above. A copy of this proposed rule will be placed in the docket. Electronic retrieval help and guidelines are available on the website. It is available 24 hours each day, 365 days each year. An electronic copy of this document may also be downloaded from the Office of the Federal Register's website at https://www.federalregister.gov and the Government Publishing Office's website at https://www.govinfo.gov. A copy may also be found at FAA's Regulations and Policies website at https://www.faa.gov/regulations_policies.

Copies may also be obtained by sending a request to FAA, Office of Rulemaking, ARM-1, 800 Independence Avenue SW, Washington, DC 20591, or by calling (202) 267-9677. Commenters must identify the docket or notice number of this rulemaking.

All documents FAA considered in developing this proposed rule, including economic analyses and technical reports, may be accessed in the electronic docket for this rulemaking.

D. Small Business Regulatory Enforcement Fairness Act

The Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 requires FAA and TSA to comply with small entity requests for information or advice about compliance with statutes and regulations within its jurisdiction. A small entity with questions regarding this document may contact its local FAA official, or the person listed under the **FOR FURTHER INFORMATION CONTACT** heading at the beginning of the preamble. A small entity with questions for TSA may contact Craig Mosford, Industry Engagement Manager-Airports, Policy, Plans, and Engagement (PPE), Transportation Security Administration, at Craig.Mosford@tsa.dhs.gov. To find out more about SBREFA on the Internet, visit https://www.faa.gov/regulations_policies/rulemaking/sbre_act/.

List of Subjects

14 CFR Part 36

Agriculture, Aircraft, Noise control.

14 CFR Part 43

Aircraft, Aviation safety, Maintenance, Preventive maintenance, Rebuilding, and Alteration, Reporting and recordkeeping requirements.

14 CFR Part 45

Aircraft, Exports, Signs and symbols.

14 CFR Part 48

Aircraft, Reporting and recordkeeping requirements, Signs and symbols.

14 CFR Part 89

Incorporation by reference, Remote identification of unmanned aircraft, Reporting and recordkeeping requirements.

14 CFR Part 91

Air traffic control, Aircraft, Airmen, Aviation safety, Reporting and recordkeeping requirements, Security measures.

14 CFR Part 107

Aircraft, Airmen, Aviation safety, Incorporation by reference, Security measures.

14 CFR Part 108

Aircraft, Airmen, Aviation safety, Incorporation by reference, Reporting and recordkeeping requirements, Security measures.

14 CFR Part 119

Administrative practice and procedure, Air carriers, Aircraft, Aviation safety, Charter flights, Reporting and recordkeeping requirements.

14 CFR Part 133

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 135

Aircraft, Airmen, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 137

Agriculture, Agricultural aircraft operations, Aircraft, Aviation safety, Reporting and recordkeeping requirements.

14 CFR Part 146

Automated data service providers, Aviation safety, Computer technology, Data Exchange, Reporting and recordkeeping requirements.

49 CFR 1540

Air carriers, Airports, Aviation safety, Law enforcement officers, Reporting and recordkeeping requirements, Security measures.

49 CFR 1544

Air carriers, Aircraft, Airmen, Airports, Arms and munitions, Aviation safety, Explosives, Freight forwarders, Law enforcement officers, Reporting and recordkeeping requirements, Security measures.

The Proposed Amendment

In consideration of the foregoing, FAA proposes to amend chapter I of title 14, Code of Federal Regulations, and TSA proposes to amend chapter XII of title 49, as follows:

Title 14 – Aeronautics and Space

PART 36—Noise Standards: Aircraft Type and Airworthiness Certification

1. The authority citation for part 36 continues to read as follows:

Authority: 42 U.S.C. 4321 et seq.; 49 U.S.C. 106(g), 40113, 44701-44702, 44704, 44715; sec. 305, Pub. L. 96-193, 94 Stat. 50, 57; E.O. 11514, 35 FR 4247, 3 CFR, 1966-1970 Comp., p. 902.

2. Add § 36.0 to read as follows:

§ 36.0 Applicability; aircraft that do not conform to a type certificate.

(a) *General applicability*. Except as provided in paragraph (e) of this section,

(1) For an aircraft described in § 21.190, § 21.191, § 21.193(h), or part 22 of this chapter, that does not conform to a type certificate, the requirements of this part apply at

the time of application for a first airworthiness certificate, or when an aircraft previously issued an airworthiness certificate incorporates an alteration that would result in an acoustical change.

(2) For an aircraft described in part 108 of this chapter that does not conform to a type certificate, the requirements of this part apply at the time of application for an airworthiness acceptance.

(b) *Compliance requirements*. Compliance with this part requires—

(1) For an aircraft described in § 21.190, § 21.191, § 21.193(h), or part 22 of this chapter that does not conform to a type certificate,

(i) A determination that the applicable noise limits specified in this part are not exceeded for any configuration, flight profile, or reference condition required for an aircraft to demonstrate compliance; and,

(ii) When applicable, a determination that any test procedures and analyses contained in a related appendix to this part have been met for any configuration, flight profile, or reference condition required.

(2) For aircraft described in part 108 of this chapter, the applicant, prior to submitting the declaration of compliance required in § 108.715, must document that:

(i) The applicable noise limits required by this part are not exceeded for any configuration, flight profile, or reference condition required for an aircraft to demonstrate compliance; and,

(ii) When applicable, any test procedures and analyses contained in a related appendix to this part have been met for any configuration, flight profile, or reference condition required.

(c) *Use of a noise consensus standard*. An aircraft that does not conform to a type certificate may demonstrate compliance using a noise consensus standard that meets the following conditions:

(1) The noise consensus standard has been approved by FAA; and

(2) The noise consensus standard has been determined by FAA to be appropriate for the aircraft and applicable to the aircraft's specific design.

(d) *No noise consensus standard available*. For an aircraft that does not conform to a type certificate, and for which no noise consensus standard has been approved or determined by FAA to be appropriate for the aircraft, the following apply:

(1) *Aircraft similar to a type-certificated aircraft.* An aircraft that is determined by FAA for noise purposes to be the same as or sufficiently similar in design to a type-certificated aircraft described in § 36.1 may demonstrate compliance with this part by—

(i) Using the same requirements as the type-certificated aircraft that is the same or sufficiently similar in design to the aircraft; or

(ii) Adopting the noise levels for the type-certificated aircraft that is the same or sufficiently similar in design to the aircraft when the aircraft has not been altered to result in an acoustical change.

(2) *Aircraft with no similar type-certificated aircraft*. If FAA determines that for noise purposes, there is no type-certificated aircraft of the same or sufficiently similar design described in § 36.1, an applicant may demonstrate compliance with this part using the noise requirements determined by FAA to be appropriate for the aircraft.

(e) *Exceptions*. The following aircraft that do not conform to a type certificate are excepted from demonstrating compliance with the requirements of this part:

(1) Aircraft issued an experimental airworthiness certificate in accordance with § 21.191(a) through (h) or (k) of this chapter;

(2) Aircraft which, if type-certificated, would not be required to demonstrate compliance with this part;

(3) Aircraft issued an experimental airworthiness certificate in accordance with § 21.191(i)(1) of this chapter on or before January 31, 2008, for the purpose of operating a light-sport aircraft; and

(4) Aircraft designed for agricultural unmanned aircraft operations under part 108 of this chapter that are issued an airworthiness acceptance for the purpose and exclusive use of agricultural aircraft operations.

3. Amend § 36.1 by adding reserved paragraph (a)(6) and paragraph (a)(7) to read as follows:

§ 36.1 Applicability and definitions.

(a) * * *

(6) [Reserved]

(7) Aircraft that do not conform to a type certificate, in accordance with § 36.0.

* * * * *

4. Revise § 36.3 to read as follows:

§ 36.3 Compatibility with airworthiness requirements.

(a) Each applicant for certification under this part must demonstrate that:

(1) For type certificated aircraft, that the aircraft complies with the airworthiness regulations in this chapter that constitute the type certification basis of the aircraft under all conditions in which compliance with this part is shown; or

(2) For aircraft without a type certificate, that the aircraft complies with all airworthiness requirements in this chapter applicable to the design of the aircraft under all conditions in which compliance with this part is shown.

(b) Each applicant for certification under this part must show that any procedure used to demonstrate compliance with this part, and any procedure and information for the flight crew developed under this part, are consistent with the requirements of paragraph (a)(1) or (2) of this section.

(c) Each applicant for airworthiness acceptance under part 108 of this chapter must:

(1) demonstrate that the aircraft complies with all airworthiness regulations in this chapter applicable to the design of the aircraft under all conditions in which compliance with this part is shown.

(2) show that any procedure used to demonstrate compliance with this part, and any procedure and information for the operator developed under this part, are consistent with the requirements of paragraph (c)(1) of this section.

5. Amend § 36.1501 by revising paragraph (a) to read as follows:

§ 36.1501 Procedures, noise levels and other information.

(a) All procedures, weights, configurations, and other information or data employed for obtaining the certified noise levels prescribed by this part, including equivalent procedures used for flight, testing, and analysis, must be developed by the applicant and approved by FAA. For type certificated aircraft, noise levels achieved during type certification must be included in the aircraft's approved flight manual. For aircraft without a type certificate, noise levels achieved during airworthiness certification must be included in the Pilot's Operating Handbook. For aircraft subject to part 108 of this chapter, the noise levels declared during airworthiness acceptance must be included in the operating instructions.

*   *   *   *   *

6. Amend § 36.1581 by adding paragraph (h) to read as follows:

§ 36.1581 Manuals, markings, and placards.

*   *   *   *   *

(h) For aircraft subject to § 36.0, no noise operating limitations are prescribed under this part, and this part does not affect any operating limitations for these aircraft described elsewhere in this chapter. Noise compliance with this part must be documented as specified in § 21.190(e), § 21.191, or § 108.720 of this chapter, as applicable. The noise information must:

(1) State that the aircraft has demonstrated compliance with this part;

(2) Include the demonstrated noise levels of the aircraft; and

(3) Include the following statement: No determination has been made by FAA whether the noise levels of this aircraft are or should be acceptable for operation in any location.

PART 43— MAINTENANCE, PREVENTIVE MAINTENANCE, REBUILDING, AND ALTERATION

7. The authority citation for part 43 continues to read as follows:

Authority: 42 U.S.C. 7572; 49 U.S.C. 106(f), 106(g), 40105, 40113, 44701-44702, 44704, 44707, 44709, 44711, 44713, 44715, 45303.

8. Amend § 43.1 by adding paragraph (b)(4) to read as follows:

§ 43.1 Applicability

* * * * *

(b) * * *

(4) Any aircraft that is operated under part 108 of this chapter.

* * * * *

PART 45— IDENTIFICATION AND REGISTRATION MARKING

9. The authority citation for part 45 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40103, 40113-40114, 44101-44105, 44107-44111, 44504, 44701, 44708-44709, 44711-44713, 44725, 45302-45303, 46104, 46304, 46306, 47122.

10. Amend § 45.1 by adding paragraph (a)(4) to read as follows:

§ 45.1 Applicability

* * * * *

(a) * * *

(4) a part 108 airworthiness acceptance.

* * * * *

11. Amend § 45.10 by revising paragraph (a)(2) and adding paragraph (a)(3) to read as follows:

§ 45.10 Marking.

* * * * *

(a) * * *

(2) For export to the United States under the provisions of an agreement between the United States and another country or jurisdiction for the acceptance of products and articles; or

(3) Under part 108, subpart G and H of this chapter; and

*   *   *   *   *

12. Amend § 45.11 by adding paragraph (i) to read as follows:

§ 45.11 Marking of products.

*   *   *   *   *

(i) **Unmanned aircraft.** A manufacturer of an unmanned aircraft complying with subparts G and H of part 108 of this chapter must mark each aircraft by attaching a fireproof identification plate that-

(1) Includes the information specified in § 45.13 using an approved method of fireproof marking;

(2) Must be secured in such a manner that it will not likely be defaced or removed during normal service, or lost or destroyed by accident; and

(3) Must be secured to the aircraft fuselage exterior so that it is legible and readable from the ground when the unmanned aircraft is not being operated.

13. Amend § 45.13 by:

a. Revising paragraph (a) introductory text;

b. Redesignating paragraph (a)(8) as paragraph (a)(9), and

c. Adding a new paragraph (a)(8).

The revision and addition read as follows:

§ 45.13 Identification data.

(a) The identification required by § 45.11 (a) through (c) and (i) must include the following information:

*   *   *

(8) Part 108 designation, if any.

*   *   *   *   *

14. Amend § 45.29 by revising paragraph (b) introductory text and adding paragraph (b)(4) to read as follows:

§ 45.29 Size of marks.

*   *   *   *   *

(b) *Height.* Except as provided in paragraph (h) of this section, the nationality and registration marks must be of equal height and on—

*   *   *

(4) Part 108 aircraft must be at least 12 inches high except that:

(i) If the external surface is not large enough for 12-inch markings, marks must be at least 3 inches in height.

(ii) If the size of an unmanned aircraft does not allow for 3-inch markings, marks as large as practicable shall be placed on the largest external surface.

*   *   *   *   *

PART 48—REGISTRATION AND MARKING REQUIREMENTS FOR SMALL UNMANNED AIRCRAFT

15. The authority citation for part 48 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40101, 40103, 40113-40114, 41703, 44101-44103, 44105-44106, 44110-44113, 44809(f), 45302, 45305, 46104, 46301, 46306.

16. Amend § 48.1 by revising paragraph (c) to read as follows:

§ 48.1 Applicability.

*   *   *   *   *

(c) Small unmanned aircraft intended to be operated under part 108 of this chapter, issued an airworthiness certificate, operated outside of the territorial airspace of the United States, or registered through a trust or voting trust, must be registered in accordance with subparts A and B of part 47 of this chapter and satisfy the identification and registration marking requirements of subparts A and C of part 45 of this chapter.

17. Amend § 48.110 by revising paragraph (a)(7) to read as follows:

§ 48.110 Application.

* * * * *

(a)(7) For any unmanned aircraft equipped with a remote identification broadcast module, the serial number issued by the manufacturer of the remote identification broadcast module in accordance with the design and production requirements of part 89 of this chapter. An applicant may submit the serial number of more than one remote identification broadcast module as part of the application for aircraft registration under § 48.105. The serial number of a remote identification broadcast module provided in this application must not be listed on more than one Certificate of Aircraft Registration at the same time unless the applicant information in paragraphs (a)(1) through (a)(4) of this section is the same.

* * * * *

PART 89— REMOTE IDENTIFICATION OF UNMANNED AIRCRAFT

18. The authority citation for part 89 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40101(d), 40103(b), 44701, 44805, 44809(f); Section 2202 of Pub. L. 114-190, 130 Stat. 629.

19. Amend § 89.305 by amending the introductory paragraph as follows:

§ 89.305 Minimum message elements broadcast by standard remote identification unmanned aircraft.

Except as provided in § 108.200 for operations conducted under part 108 of this chapter, a standard remote identification unmanned aircraft must be capable of broadcasting the following remote identification message elements:

*   *   *   *   *

20. Revise § 89.505 to read as follows:

§ 89.505 Serial Numbers.

Serial number required. No person may produce a standard remote identification unmanned aircraft under § 89.510, § 89.511, or § 89.515 or a remote identification broadcast module under § 89.520, unless the producer assigns to the unmanned aircraft or remote identification broadcast module a serial number that complies with ANSI/CTA-2063-A. ANSI/CTA-2063-A, *Small Unmanned Aerial Systems Serial Numbers* (September 2019) is incorporated by reference into this section with the approval of the Director of the Office of the Federal Register under 5 U.S.C. 552(a) and 1 CFR part 51. All approved material is available for inspection at FAA's Office of Rulemaking (ARM-1), 800 Independence Avenue, SW, Washington, DC 20590 (telephone 202-267-9677) and is available from Consumer Technology Association (CTA), 1919 South Eads Street, Arlington, VA 22202, CTA@CTA.tech, 703-907-7600 or at https://www.cta.tech. It is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, visit www.archives.gov/Federal-register/cfr/ibr-locations or email fr.inspection@nara.gov.

21. Add § 89.511 to read as follows:

§ 89.511 Production requirements for unmanned aircraft produced under an airworthiness acceptance issued under part 108 of this chapter.

No person may produce an unmanned aircraft for operation in the airspace of the United States under an airworthiness acceptance issued under part 108 of this chapter unless:

(a) All applicable requirements of part 108 of this chapter are met; and

(b) The unmanned aircraft is designed and produced to meet the minimum performance requirements for standard remote identification of unmanned aircraft established in § 89.310 in accordance with an FAA-accepted means of compliance.

22. Amend § 89.515 by amending the section heading and the lead-in paragraph as follows:

§ 89.515 Production requirements for unmanned aircraft without design approval or production approval issued under part 21 of this chapter or airworthiness acceptance under part 108 of this chapter.

Except as provided in § 89.510 and § 89.511, after September 16, 2022, no person may produce an unmanned aircraft for operation in the airspace of the United States unless—

*   *   *   *   *

PART 91— GENERAL OPERATING AND FLIGHT RULES

23. The authority citation for part 91 continues to read as follows:

Authority: 49 U.S.C. 106(f), 40101, 40103, 40105, 40113, 40120, 44101, 44111, 44701, 44704, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46504, 46506-46507, 47122, 47508, 47528-47531, 47534; Pub. L. 114-190, 130 Stat. 615 (49 U.S.C. 44703 note); Sec. 828 of Pub. L. 118-63, 138 Stat. 1330 (49 U.S.C. 44703 note); articles 12 and 29 of the Convention on International Civil Aviation (61 Stat. 1180), (126 Stat. 11).

24. Amend § 91.1 by revising paragraph (a) and adding paragraph (g) to read as follows:

§ 91.1 Applicability.

(a) Except as provided in paragraphs (b), (c), (e), (f), and (g) of this section and §§ 91.701 and 91.703, this part prescribes rules governing the operation of aircraft within the United States, including the waters within 3 nautical miles of the U.S. coast.

*   *   *   *   *

(g) Except as provided in § 108.180 of this chapter, this part does not apply to any aircraft governed by part 108 of this chapter.

25. Amend § 91.113 by adding paragraph (h) to read as follows:

§ 91.113 Right-of-way rules: Except water operations.

*   *   *   *   *

(h) *Unmanned aircraft*. An unmanned aircraft conducting operations under part 108 of this chapter has the right-of-way over other aircraft in flight unless—

(1) That aircraft is operating in a Category 5 population density area as described in § 108.185 of this chapter;

(2) That aircraft is operating in Class B or C airspace as described in § 108.180(b) of this chapter;

(3) That aircraft is departing from or arriving at an airport or heliport; or

(4) That aircraft is equipped and broadcasting their aircraft's location using—

(i) ADS-B Out equipment that meets the requirements of § 91.227; or

(ii) electronic conspicuity equipment that meets the performance requirements of § 108.195(a)(2)(ii) of this chapter.

26. Amend § 91.225 by revising paragraph (f) to read as follows:

§ 91.225 Automatic Dependent Surveillance-Broadcast (ADS-B) Out equipment and use.

*	*	*	*	*

(f) Except as prohibited in paragraph (h)(2) of this section, each person operating an aircraft equipped with ADS-B Out must operate this equipment in the transmit mode at all times unless—

(1) Otherwise authorized by FAA when the aircraft is performing a sensitive government mission for national defense, homeland security, intelligence or law enforcement purposes and transmitting would compromise the operations security of the mission or pose a safety risk to the aircraft, crew, or people and property in the air or on the ground; or

(2) Otherwise directed by ATC when transmitting would jeopardize the safe execution of air traffic control functions; or

(3) The equipment is operated in accordance with § 108.195 of this chapter and operated solely to meet the conspicuity requirements in § 91.113(h)(2).

PART 107—SMALL UNMANNED AIRCRAFT SYSTEMS

27. The authority citation for part 107 continues to read as follows:

Authority: 49 U.S.C. 106(f), 40101 note, 40103(b), 44701(a)(5), 46105(c), 46110, 44807.

28. Amend § 107.1 by revising paragraphs (b)(3) and (4) and adding paragraphs (b)(5) and (6) to read as follows:

§ 107.1 Applicability.

*	*	*	*	*

(b) *	*	*

(3) Any operation that the holder of an exemption issued in conjunction with a determination under 49 U.S.C. 44807 elects to conduct pursuant to the exemption, unless otherwise specified in the exemption;

(4) Any operation that a person elects to conduct under part 91 of this chapter with a small unmanned aircraft system;

(5) Operation of unmanned aircraft systems beyond the visual line of sight of the operator; or

(6) Carriage of property or packages by aircraft for compensation or hire.

29. Add § 107.8 to read as follows:

§ 107.8 Aviation Safety Reporting Program: Prohibition against use of reports for enforcement purposes.

The Administrator of FAA will not use reports submitted to the National Aeronautics and Space Administration under the Aviation Safety Reporting Program (or information derived therefrom) in any enforcement action except information concerning accidents or criminal offenses which are wholly excluded from the Program.

30. Add § 107.10 to read as follows:

§ 107.10 Prohibition on interference with a remote pilot in command or visual observer.

No person may assault, threaten, intimidate, or interfere with a remote pilot in command or visual observer in the performance of their duties regarding unmanned aircraft operations.

31. Revise § 107.41 to read as follows:

§ 107.41 Operations in certain airspace.

(a) No person may operate an unmanned aircraft under this part in Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E airspace designated for an airport unless all the following conditions are met:

(1) The unmanned aircraft is operated 400 feet above ground level or below;

(2) The unmanned aircraft is operated in compliance with this part.

(b) No person may conduct operations under this section in any airspace designated by the Administrator as requiring prior authorization, except in accordance with that authorization.

(c) An operator may deviate from any provision of this section under the terms of an authorization issued by the Administrator.

(d)(1) A list of airspace designated by the Administrator as requiring prior authorization prior to operating under this section can be found in FAA Order JO 7400.[XX], Unmanned Aircraft System Airspace Designations, dated [TBD]. FAA Order JO 7400.[XX] is incorporated by reference with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. The approval to incorporate by reference FAA Order JO 7400.XX is effective [Month, XX, 202X], through [Month, XX, 202X+1]. This IBR material is available for inspection at FAA and at the National Archives and Records Administration (NARA). Contact FAA at: Rules and Regulations Group, Federal Aviation Administration, 800 Independence Avenue SW, Washington, DC 20591, (202) 267–8783. An electronic version of FAA Order JO 7400.[XX] is available on FAA's website at www.faa.gov/air_traffic/publications. For information on the availability of this material at NARA, visit www.archives.gov/federalregister/cfr/ibr–locations or email fr.inspection@nara.gov.

(2) Before updating FAA Order JO 7400.[XX], FAA will publish any proposed changes to designated airspace, in full text, as proposals in the *Federal Register*, unless there is good cause to forgo notice and comment rulemaking, followed by publication of associated final rules in the *Federal Register*. FAA will then integrate these updates into the next edition of FAA Order JO 7400.12. FAA will request that the Director of the Federal Register approve the IBR of the next edition of the order as of [MM/DD/YYYY+1].

(e) Unmanned aircraft systems operations are prohibited from flying in Security Sensitive Airspace, unless authorized.

§ 107.205 [Amended]

32. Amend § 107.205 by removing the last sentence in paragraph (a) and removing and reserving paragraphs (c) and (h).

33. Add part 108 to subchapter F to read as follows:

PART 108— OPERATIONS OF UNMANNED AIRCRAFT SYSTEMS BEYOND VISUAL LINE OF SIGHT

Subpart A—General

Sec.
108.1 Applicability.
108.5 Definitions.
108.10 Reproduction or alteration.
108.15 Prohibition in interference with unmanned aircraft operations personnel.
108.20 Inspection, testing, and demonstration of compliance.
108.25 Aviation safety reporting program: prohibition against use of reports for enforcement purposes.
108.30 Base of operations.
108.35 Operator identification.
108.40 Operator recordkeeping requirements.
108.45 Operator reporting requirements.

Subpart B—Operating Rules

Subpart C—Operations Personnel

Subpart D—Permitted Operations

108.420 Denial, suspension, or revocation of operating permits.
108.425 Amendment of permits.
108.430 Display of permit.
108.435 Cybersecurity.
108.440 Package delivery operations.
108.445 Agricultural operations.
108.450 Aerial surveying operations.
108.455 Civic interest operations.
108.460 Unmanned aircraft operations training.
108.465 Demonstration operations.
108.470 Flight test operations.
108.475 Recreational permit operations.

Subpart E—Certificated Operations

Sec.
108.500 Operations under a certificate.
108.505 Applications for operating certificates.
108.510 Duration of certificates.
108.515 Issuance of an operating certificate.
108.520 Denial, suspension, or revocation of operating certificates.
108.525 Amendment of certificates.
108.530 Recency of operations.
108.535 Cybersecurity.
108.540 Training program.
108.545 Validation tests.
108.550 Communication and ground risk assessments.
108.555 Inoperative equipment.
108.560 Safety management system.
108.565 Package delivery operations.
108.570 Hazardous materials.
108.575 Agricultural operations.
108.580 Aerial surveying operations.
108.585 Civic interest operations.

Subpart F—Maintenance and Alterations

Sec.
108.600 General.
108.605 Persons performing maintenance and alterations.
108.610 Unmanned aircraft maintenance.
108.615 Life-limited parts.
108.620 Unmanned aircraft batteries.
108.625 Repairs and alterations.
108.630 Operation after maintenance or alterations.

Subpart G—Procedures for Unmanned Aircraft System Airworthiness Acceptance

Subpart H—Design and Testing Requirements for Airworthiness Acceptance

Authority: 49 U.S.C. 106(f), 40101 note, 40103(b), 44701(a)(5), 46105(c), 46110, 44807.

SUBPART A—General

§ 108.1 Applicability.

(a) Except as provided in paragraph (b) of this section, this part applies to any person who—

(1) Conducts, or intends to conduct, unmanned aircraft system beyond visual line of sight operations in the U.S. airspace;

(2) Requests FAA issuance of an operating permit or certificate to operate an unmanned aircraft system in accordance with this part;

(3) Performs maintenance on an unmanned aircraft system that has received an airworthiness acceptance issued in accordance with this part;

(4) Designs, manufactures, or produces an unmanned aircraft system for operation under this part;

(5) Holds or applies for airworthiness acceptance of an unmanned aircraft system in accordance with subparts G and H of this part; or

(6) Submits a voluntary consensus standard for acceptance or approval by the Administrator as a means of compliance for any provision of this part.

(b) This part does not apply to any of the following:

(1) Unmanned aircraft operation conducted in accordance with part 107 of this chapter.

(2) Unmanned aircraft operation conducted in accordance with part 91 of this chapter.

(3) Unmanned aircraft systems operation conducted under the provisions of 49 U.S.C. 44809.

(4) An aircraft with any person on board during operations.

§ 108.5 Definitions.

The following definitions apply to this part. If there is a conflict between the definitions of this part and the definitions specified in § 1.1 of this chapter, the definitions in this part control for the purposes of this part:

Associated Elements means those elements that are not directly affixed to an unmanned aircraft and are necessary to interact with the unmanned aircraft for safe flight during all normal, abnormal, or emergency flight operations.

Command and Control Link means the command and control data link which connects the unmanned aircraft and the ground control station for the purposes of managing the flight.

Conformance monitoring means the real-time ability to determine whether an unmanned aircraft is flying in accordance with its operational intent, and to share situational awareness data with relevant airspace users when off-nominal or contingent situations occur.

Detect and avoid means the ability for an unmanned aircraft system to see, sense, or detect aircraft or other hazards and to make a flight adjustment to avoid a collision hazard.

Flight coordinator means an individual who monitors an unmanned aircraft system operating under this part and that can control, initiate emergency actions, or issue commands to the unmanned aircraft during flight.

Ground control station means the associated element that communicates with and controls the unmanned aircraft.

Hazardous material means a material as defined in 49 U.S.C. 5102(2) and 49 CFR 171.8.

Life-limited part means any part for which a mandatory replacement limit is specified by the manufacturer of the unmanned aircraft and is documented in the maintenance instructions.

Operational intent means a volume-based representation of airspace encapsulating the intended flight path for an unmanned aircraft operation, comprising one or more overlapping or contiguous 3-dimensional volumes of airspace combined with a beginning and ending time for each volume.

Operations personnel means a person who is performing a safety function employed by, or used by, an operator under this part.

Operator means a person that conducts operations under this part.

Package delivery means the delivery of goods, materials, or supplies from a business or commercial location to a residential or business end user.

Safe distance means the minimum distance that is necessary to avoid a collision hazard with another aircraft.

Strategic deconfliction means the use of an interoperable strategic conflict detection and resolution capability to mitigate the risk of collision between participating unmanned aircraft.

Strategic conflict detection means the process of identifying overlapping operational intents among unmanned aircraft.

Strategic conflict resolution means the process of resolving overlapping operational intents among unmanned aircraft.

Target average conformance means the process of monitoring an operator's ability to fly in accordance with its operational intents over a defined period of time.

§ 108.10 Reproduction or alteration.

(a) No person may make or cause to be made—

(1) Any fraudulent or intentionally false record or report that is required to be made, kept, or used to show compliance with any requirement under this part.

(2) Any reproduction or alteration, for fraudulent purpose, of any permit, certificate, authorization, record, or report required or issued under this part.

(b) The commission by any person of an act prohibited under paragraph (a) of this section is a basis for any of the following:

(1) Denial of an application for an operating permit or certificate.

(2) Denial of a waiver.

(3) Denial of a declaration of compliance.

(4) Suspension or revocation of any permit, certificate, waiver, airworthiness acceptance, declaration of compliance issued, or similar held by that person.

(5) A civil penalty.

§ 108.15 Prohibition on interference with unmanned aircraft operations personnel.

No person may assault, threaten, intimidate, or interfere with the operations personnel of an unmanned aircraft in the performance of their duties related to unmanned aircraft operations.

§ 108.20 Inspection, testing, and demonstration of compliance.

(a) An operator of an unmanned aircraft system must—

(1) Have the authorization to operate and identification readily accessible when operating.

(2) Present the operating authorization and identification for inspection upon a request from any of the following:

(i) The Administrator.

(ii) An authorized representative of the National Transportation Safety Board.

(iii) Any Federal, State, or local law enforcement officer.

(3) Make available, upon request, to the Administrator or any authorized representative of the National Transportation Safety Board any document, record, or report required to be kept under the regulations of this chapter.

(b) The operator of an unmanned aircraft system must, upon request, allow the Administrator to witness any test or make inspection of the unmanned aircraft system, including—

(1) Any aspect of the operation of an unmanned aircraft system;

(2) Access to the operations area for the unmanned aircraft; and

(3) If applicable, the automated data services utilized to determine compliance with this part.

(c) Each employee of, or person used by, the operator who is responsible for maintaining the operator's records must make those records available to the Administrator.

(d) Failure by any operator to make available to the Administrator upon request any required record, document, or report is grounds for suspension of all or any part of the operator's permit or certificate.

§ 108.25 Aviation safety reporting program: prohibition against use of reports for enforcement purposes.

The Administrator will not use reports submitted to the National Aeronautics and Space Administration under the Aviation Safety Reporting Program (or information derived therefrom) in any enforcement action, except information concerning accidents or criminal offenses, which are wholly excluded from the program.

§ 108.30 Base of operations.

(a) Each operator must maintain a principal base of operations in the United States and submit that information in accordance with § 108.405 or § 108.505, as appropriate.

(b) If different from the principal base of operations, the operator shall provide a U.S. physical address that shall serve as the primary point of contact for correspondence with FAA.

(c) At least 30 days before changing the location of its principal base of operations, an operator must provide written notification to the Administrator.

(d) An operator may perform operations at locations other than the principal base of operations, as authorized by the Administrator.

§ 108.35 Operator identification.

(a) Unless otherwise authorized by the Administrator, an operator may not operate or advertise services of an unmanned aircraft under this part using a business name other than a business name listed on the operating permit or certificate.

(b) No operator may operate an unmanned aircraft under this part unless the identity of the unmanned aircraft operator is displayed on the exterior of the unmanned aircraft in a manner acceptable to the Administrator.

§ 108.40 Operator recordkeeping requirements.

Each operator shall keep records of the items listed in paragraphs (a) through (e) of this section per the timelines specified in paragraph (f) of this section and must provide access or copies to the Administrator upon request in a manner acceptable to the Administrator.

(a) *Unmanned Aircraft*. Each operator must maintain records on each unmanned aircraft used in operations under this part, including:

(1) The total time in service of each unmanned aircraft.

(2) The status of any life-limited parts.

(3) Records of each flight performed under this part which includes—

(i) The time, date, and duration of the flight;

(ii) The unmanned aircraft registration number;

(iii) The type of operation;

(iv) The individual flight paths of each flight including origin, destination, and altitude(s);

(v) The name of the designated operations personnel assigned to each flight;

(vi) Landing locations (if different from takeoff origin or destination locations);

(vii) For package delivery operations, the pickup points and delivery locations for the flight; and

(viii) For agricultural operations, the name and address of each person for whom agricultural unmanned aircraft services were provided, the date of the service, and the name and quantity of the material dispensed.

(b) *Personnel*. Each operator shall maintain records on each operations personnel required by the company operations manual and used in operations under this part, including—

(1) The full name of the individual;

(2) The individual’s qualifications in sufficient detail to determine their ability to participate in operations under this part;

(3) The individual’s current duties and the date of assignment to those duties;

(4) Any information concerning the individual's release from employment for cause; and

(5) For operators holding an operating certificate pursuant to subpart E of this part—

(i) The dates and times of operations personnel assigned work shifts,

(ii) The length of the rest period prior to each duty period for each of the required operations personnel, and

(iii) Total hours on duty per calendar day for each of the required operations personnel.

(c) *Mechanical Irregularities*. Each operator shall provide a log for operations personnel to record mechanical irregularities for the unmanned aircraft and its associated elements.

(1) Each operations person shall enter, or cause to be entered, each mechanical irregularity in the log for the unmanned aircraft and its associated elements that comes to the person's attention.

(2) Each operations personnel who takes corrective action concerning a reported or observed failure or malfunction for the unmanned aircraft or its associated elements shall enter, or have entered, the action taken in the log.

(d) *Maintenance*. Each operator shall ensure that it maintains records of the unmanned aircraft inspection status and for each maintenance or alteration activity to the unmanned aircraft or its associated elements.

(1) The records must include the current inspection status of the unmanned aircraft and, for each maintenance or alteration activity performed by operations personnel on the unmanned aircraft or its associated elements, a record that includes—

(i) A general description of the work performed;

(ii) The completion date of the work;

(iii) The identification of the person performing, or who performed, the work; and

(iv) The approval for return to service.

(2) An operator need not comply with the requirements of paragraph (d)(1) of this section for the removal and replacement of unmanned aircraft batteries designed for frequent, toolless swapping if the operator has other means of tracking battery use, life, and performance.

(3) An operator need not comply with the requirements of paragraph (d)(1) of this section for the removal and replacement of unmanned aircraft components that are designed for toolless removal and reinstallation if the operator has procedures for ensuring that any part that is removed is inspected for serviceability prior to being reinstalled and—

(i) The parts are reinstalled on the same unmanned aircraft; or

(ii) The parts are not subject to time limits; or

(iii) The operator has other means of tracking installation and use.

(e) *Training*. Each operator must maintain a record of all initial and recurrent training taken by each person required to receive training under this part.

(1) The record shall contain, at a minimum:

(i) The person's name and assigned job function,

(ii) The date of hire or start of a related job function,

(iii) The most recent training completion date,

(iv) A description, copy, or reference to training materials used to meet the training requirement,

(v) The name and address of the organization providing the training, and

(vi) A copy of the certification issued when the individual was trained, which shows that a test has been completed satisfactorily.

(2) Training records required to be kept under this section include:

(i) Records of the initial and recurrent training required under § 108.315.

(ii) Records of the initial and recurrent training for the recognition of hazardous materials required under § 108.440.

(iii) Records of the initial and recurrent hazardous materials training taken by each person who performs or directly supervises a job function specified in § 108.570(b).

(iv) Records of the training received for agricultural operations in accordance with the training required under §§ 108.445(i) and 108.575(g).

(f) *Timeframes*. Records required under this paragraph shall be kept per the following timeframes.

(1) *Unmanned Aircraft*. Records required under paragraphs (a)(1) and (2) of this section must be maintained for the life of the unmanned aircraft. Data required under paragraph (a)(3) of this section must be maintained for a minimum of 24 months.

(2) *Personnel*. Records required under paragraphs (b)(1) through (3) of this section must be maintained for the length of employment of that individual plus 12 months after separation. Data required under paragraph (b)(4) of this section must be maintained for 12 months after the separation from employment of that individual. Records required under paragraph (b)(5) of this section must be maintained for three (3) months.

(3) *Mechanical Irregularities*. Records required under paragraph (c) of this section must be maintained for a minimum of 24 months.

(4) *Maintenance*. Records required under paragraph (d) of this section must be maintained for a minimum of 24 months.

(5) *Training*. Records required under paragraph (e) of this section must be maintained for the length of employment of that individual plus 12 months after separation.

§ 108.45 Operator reporting requirements.

(a) *Flight Data*. The operator must maintain a flight data collection system that collects data related to the usage and reliability of the unmanned aircraft.

(1) The operator must report to FAA aggregate flight data consisting of the total number of flight hours operated for each unmanned aircraft, including the make/model/series and registration number, used in operations under this part, in a form and manner acceptable to the Administrator.

(2) The operator must share, or allow the aircraft manufacturer to collect, data related to the unmanned aircraft reliability for each aircraft operated by the operator. At a minimum, that data must consist of:

(i) Make, model, series, and serial number,

(ii) Flight duration,

(iii) Altitude,

(iv) Speed,

(v) Location, and

(vi) Any incidents or anomalies encountered during flight operations.

(b) *Unmanned Aircraft*. Each operator must report to FAA the registration and serial numbers of each unmanned aircraft used in operations under this part, in a form and manner acceptable to the Administrator. Compliance with this requirement can be combined with the reporting of flight data under paragraph (a) of this section, as applicable.

(c) *Interruption reports*. Each operator shall provide FAA a summary of occurrences, in a form and manner acceptable to the Administrator, that resulted in—

(1) An unplanned or precautionary landing away from the normally designated landing location; or

(2) A change or diversion in the unmanned aircraft's planned route caused by a known or suspected mechanical difficulty or malfunction.

(d) *Service difficulty reports*.(1) Each operator certificated under subpart E of this part shall report to the unmanned aircraft manufacturer any failure, malfunction, or defect in an unmanned aircraft system that causes momentary or permanent loss of control or communication of the unmanned aircraft if it has endangered, or may endanger, the safe operation of the unmanned aircraft. The information must contain:

(i) The date.

(ii) The affected unmanned aircraft, including the type and manufacturer's serial number.

(iii) The nature of the failure, malfunction, or defect.

(iv) Identification of the part and system involved, including available information pertaining to designation of the major component.

(v) Apparent cause of the failure, malfunction, or defect (*e.g.*, wear, crack, design deficiency, or personnel error).

(vi) The corrective actions taken.

(2) Each operator who uses an authorized service approved under part 146 of this chapter shall report to the automated data service provider any failure, malfunction, or defect in an authorized service if it has endangered or may endanger the safe operation of the unmanned aircraft. The information must contain:

(i) The date and time.

(ii) The affected unmanned aircraft, including the type and identification number.

(iii) The nature of the failure, malfunction, or defect.

(iv) Identification of the authorized service involved, including its version.

(v) Apparent cause of the failure, malfunction, or defect (*e.g.*, contingent State, interface issue, data issue, time delay/latency issue, operational response).

(vi) The corrective actions taken.

(3) Operators must also provide the reports, information, and data associated with paragraphs (d)(1) and (2) to FAA upon request.

(e) *Security Occurrences*. Each operator shall report to FAA the following security incidents in a form and manner acceptable to the Administrator:

(1) A security breach that results in loss of control of the unmanned aircraft;

(2) A security breach that results in unauthorized access to the operator's facilities, aircraft, loading areas, hazardous materials, or goods to be transported; and

(3) A security breach that results in unauthorized access to the operator's networks, devices, and or data irrespective of whether it affects the integrity, accuracy, or reliability of unmanned aircraft operations.

(4) The information must contain:

(i) The date and time of the incident.

(ii) The nature and scope of the incident.

(iii) Identification of any vulnerabilities that led to loss of control or unauthorized access.

(iv) The corrective actions taken.

(5) Operators must also provide other pertinent information and data associated with the security breach to FAA upon request.

(f) *Emergency conditions*. Each operator who, under the provisions of § 108.215, deviates from a rule of this part shall, within 10 days after the deviation, excluding Saturdays, Sundays, and Federal holidays, provide a report of the aircraft operation and a description of the deviation and reasons for it, in a manner acceptable to the Administrator.

(g) *Event reporting*. Operators must report to the Administrator, in a form and manner acceptable to the Administrator, any operation of an unmanned aircraft involving damage to any property, other than the unmanned aircraft, that exceeds $500, and any malfunction or failure of any system that leads to operations into an unauthorized area. The report shall contain, at a minimum—

(1) The date, time, and location of the event;

(2) Description of the event, including operational and environmental factors, including whether use, failure, malfunction, or defect of an automated data service provider was a factor; and

(3) Description of the known contributing factors for the event.

(h) *Timeframes*. Each report required under this section must be provided as follows:

(1) *Flight Data*. Aggregate flight data must be provided to FAA, and unmanned aircraft reliability data must be provided to the manufacturer, or allow the manufacturer to access the data, at a minimum of once each calendar month.

(2) *Unmanned Aircraft*. A list of unmanned aircraft registration and serial numbers used in operations must be provided to FAA a minimum of at least once each 12 calendar months.

(3) *Interruption reports*. A summary of occurrences must be provided no later than the end of the 10th day of the following month in which the occurrence took place.

(4) *Service difficulty reports*. Reports of failures, malfunctions, or defects must be submitted to the manufacturer not later than seven (7) days after the occurrence. When additional information becomes available, including information from other persons, operators must submit it as a supplement to the first report.

(5) *Security Occurrences*. Reports of security-related occurrences must be submitted to FAA not later than 96 hours after the occurrence. When additional information becomes available, including information from other persons, operators must submit it as a supplement to the first report within a reasonable timeframe.

(6) *Emergency Conditions*. Reports of deviations from the regulations due to emergency conditions must be submitted to FAA within 10 days of the deviation.

(7) *Event reporting*. Reports of events required under paragraph (g) of this section must be submitted to FAA not later than 10 days after the event.

SUBPART B—Operating Rules

§ 108.100 General.

(a) Operations under this part require:

(1) Applying for and operating under the provisions of an operating permit issued by the Administrator under the provisions of subpart D of this part; or

(2) Applying for and operating under the provisions of an operating certificate issued by the Administrator under the provisions of subpart E of this part.

(b) No operator may advertise or otherwise offer to perform an operation subject to this part unless that operator holds the appropriate operating certificate or permit under this part to conduct that operation.

§ 108.105 Unmanned aircraft.

(a) The unmanned aircraft and its associated elements must be in condition for safe operation.

(b) Unmanned aircraft used under this part must have received an airworthiness acceptance in accordance with subparts G and H of this part, except for operations under a flight test permit pursuant to § 108.470.

(c) Unmanned aircraft used under this part must meet the equipage requirements of subpart H of this part.

§ 108.110 Unmanned aircraft lighting.

(a) Unmanned aircraft must be equipped with an anti-collision lighting system that meets the requirements of § 108.830. Except as provided in paragraph (c) of this section, the anti-collision lights must be used during all flight operations.

(b) If an unmanned aircraft is equipped with position lights per the requirements of § 108.835, the operator must use the lighted position lights during any night operations.

(c) The flight coordinator may reduce the intensity of, or turn off the unmanned aircraft lighting, if the flight coordinator determines that, because of operating conditions, it would be in the interest of safety to do so.

§ 108.115 Registration.

No operator may operate a civil unmanned aircraft under this part unless the unmanned aircraft has an effective U.S. registration certificate issued to its owner as required pursuant to part 47 of this chapter.

§ 108.120 General operating requirements.

(a) Operations must be conducted with an unmanned aircraft, and associated elements, that are in a condition for safe operation. If the operator knows or has reason to know that the unmanned aircraft, or associated elements, are no longer in a condition for safe operation, the operator may not initiate or continue the flight.

(b) Operations must be conducted in accordance with the manufacturer's operating instructions or other procedures acceptable to the Administrator.

(c) Except for operations conducted under a flight test permit under § 108.470 or in accordance with § 108.555, operations must be conducted with properly installed and operational instruments and equipment that are identified as being required by the manufacturer's operating instructions.

(d) The operations supervisor, as required under § 108.305, is directly responsible for, and is the final authority as to, the safe and secure operation of all unmanned aircraft under their purview and ensuring that the operator complies with all applicable regulatory requirements and the company operations manual, as required under § 108.135.

§ 108.125 Careless or reckless operation.

(a) No person may operate an unmanned aircraft in a careless or reckless manner that endangers the life or property of another.

(b) No person may allow an object to be dropped from an unmanned aircraft in a manner that creates an undue hazard to persons or property of another.

(c) No person may operate an unmanned aircraft in a manner that creates a collision hazard with persons, an aircraft with one or more persons on board, vehicles, structures, other unmanned aircraft, or the property of another.

§ 108.130 Manuals and instructions.

(a) Operators shall ensure that the following documents are available and readily accessible during relevant operations:

(1) The manufacturer's operating instructions as provided in § 108.720(a)(1).

(2) The manufacturer's maintenance instructions as provided in § 108.720(a)(2).

(3) The manufacturer's configuration and control document as provided in § 108.720(a)(3).

(4) The company operations manual.

(b) The operator must ensure that all operations personnel have access to the documents that pertain to their duties and responsibilities during the performance of their duties.

§ 108.135 Company operations manual.

(a) Each operator shall prepare and keep current a company operations manual that sets forth the operator's procedures and policies acceptable to the Administrator.

(b) The company operations manual may be in the form of one or more documents.

(c) The manual must be made available to the Administrator upon request.

(d) The manual must not be contrary to any applicable Federal regulations, the operator's operating certificate or permit, or any authorizations held.

(e) The information and instructions contained in the manual must be displayed clearly and be retrievable in the English language.

(f) The revision status must be controlled in such a way a person can immediately ascertain the information is the most current.

(g) The manual must address the following—

(1) The operations personnel required under § 108.300 and their assigned area of responsibility, duties, responsibilities, and authority;

(2) The number and positions of operations personnel required for safe operations under § 108.300 and their responsibilities;

(3) Preflight procedures;

(4) Unmanned aircraft weight and balance procedures;

(5) Accident notification procedures;

(6) Procedures for determining and communicating unmanned aircraft condition to appropriate operations personnel;

(7) Procedures for complying with the recordkeeping and reporting requirements as required under §§ 108.40 and 108.45;

(8) Access to and use of unmanned aircraft maintenance procedures and inspection criteria;

(9) Procedures for developing and implementing emergency procedures;

(10) Procedures for the retrieval of unmanned aircraft that fail to return to their intended landing location;

(11) Unmanned aircraft loading procedures, as applicable; and

(12) Procedures for the identification and disposition of hazardous materials.

§ 108.140 Aircraft performance.

(a) Operations must be conducted at a speed equal to or less than those prescribed in the manufacturer's operating instructions, unless operating conditions exist that require a higher minimum safe speed.

(b) Operations must be conducted at a weight equal to or less than specified for the type of permit or certificate operated in accordance with this part.

§ 108.145 Weather conditions.

Operations must not be conducted in weather conditions, or with frost, ice, or snow adhering to the unmanned aircraft prior to takeoff, other than as provided in the manufacturer's operating instructions.

§ 108.150 Operating location.

(a) Operations must be conducted from locations that are pre-designated and access-controlled and ensure any persons who are not directly participating in the operation are safely segregated from flight operations.

(b) All operations of unmanned aircraft under this part must be monitored and controlled from a location that is physically located within the United States.

(c) Each operator must develop and implement physical security policies and processes, including, but not limited to, processes for preventing unauthorized access to the operation's facilities as described in paragraph (a), and protecting other controlled access areas, as applicable.

§ 108.155 Unmanned aircraft tracking.

The operator must be able to determine the geographic location and altitude of each unmanned aircraft at all times during flight operations.

§ 108.160 ADS-B and transponder use.

Unless otherwise authorized by the Administrator, operations must not be conducted—

(a) With Automatic Dependent Surveillance-Broadcast Out equipment in transmit mode; or

(b) With a transponder in transmit mode.

§ 108.165 Area of operations.

For each operating area, the operator is responsible for all of the following:

(a) Obtaining approval from FAA, in a manner acceptable to the Administrator, for the area of intended operations prior to beginning initial operations in the area.

(b) Designating safe alternate landing areas that the unmanned aircraft can reach if it is unable to complete its intended flight operation. The alternate landing areas must meet all of the following conditions:

(1) Avoid areas where overflight is not permitted.

(2) Provide for a landing without undue hazard to persons or property on the ground.

(c) Designating appropriate takeoff, landing, and loading areas that are—

(1) Access-restricted to only persons participating in the operation;

(2) Free of any obstructions that could pose a hazard; and

(3) Adequate for the operation, considering such items as size, surface, obstructions, and lighting.

(d) Ensuring adequate communications coverage and availability, and appropriate lost link procedures.

(e) Ensuring that the planned operations minimize risk to persons and property on the ground as appropriate and consider terrain and obstacles that the operator intends to overfly.

§ 108.170 Preflight requirements.

Prior to operating an unmanned aircraft under this part, the operator must—

(a) Ensure weather conditions are appropriate for the intended operation, are determined in a manner acceptable to the Administrator, and are in accordance with the unmanned aircraft limitations specified by the manufacturer;

(b) Be familiar with any airspace and flight restrictions along the entire route of flight;

(c) Ensure the population density to be overflown complies with § 108.185;

(d) Identify the locations of ground obstacles and hazards;

(e) Ensure the unmanned aircraft system is in a condition for safe operation;

(f) Ensure there are sufficient personnel for the operation;

(g) If required by § 108.180 or § 108.185, ensure that a strategically deconflicted operational intent is accepted by the automated data service provider prior to takeoff;

(h) Ensure the reserve power recommended by the manufacturer is satisfied, and that there is enough available power or fuel, considering wind and forecast weather conditions, for the unmanned aircraft system to operate for the intended operational time with sufficient reserves such that the unmanned aircraft can land without posing an undue risk to unmanned aircraft or people and property on the ground;

(i) Ensure that operations will be conducted within the weight and balance limitations defined by the unmanned aircraft manufacturer;

(j) Ensure that any object attached to, or carried by, the unmanned aircraft is secure and does not adversely affect the flight characteristics or controllability of the unmanned aircraft; and

(k) Ensure the unmanned aircraft navigation and communication systems are working properly.

§ 108.175 Operating restrictions.

(a) No operator may operate an unmanned aircraft under this part higher than 400 feet above the ground level unless the operator is operating in class G airspace and—

(1) Is temporarily transiting steeply changing terrain;

(2) Is operating an unmanned aircraft within a 400-foot radius of a structure and does not fly higher than 400 feet above the structure's immediate uppermost limit; or

(3) Is temporarily maneuvering up to 450 feet above the ground level to avoid a collision.

(b) An operator operating under this part must comply with the provisions of §§ 91.133, 91.137 through 91.145, and 99.7 of this chapter.

(c) Operators should notify the controlling agency for any operations planned within a military operating area (MOA) or on a military training route (MTR). Operators must always exercise extreme caution and remain vigilant of all MTRs and or non-regulatory SUAs.

(d) No operator may operate an unmanned aircraft under this part in a manner that interferes with operations or traffic patterns at any airports, heliports, seaplane bases, space launch facilities, or any facilities used for VTOL aircraft landing and takeoffs.

§ 108.180 Operation in controlled airspace.

(a) *Requirements*. Unless otherwise authorized by the Administrator, no operator may operate an unmanned aircraft under this part in Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E airspace designated for an airport unless all the following conditions are met:

(1) The operation is conducted at 400 feet above ground level or below.

(2) The operation is conducted using an approved method for strategic deconfliction and conformance monitoring in accordance with the requirements of § 108.190.

(b) *Detect and avoid*. Unless otherwise authorized by the Administrator, no operator may operate an unmanned aircraft under this part in Class B or C airspace unless the unmanned aircraft system is able to detect and avoid an aircraft not broadcasting its location in accordance with the requirements of § 108.195(a)(2) or § 91.225 of this chapter.

(c) *Prohibition*. No operator may conduct operations under this section in any airspace designated in paragraph (d) of this section without an authorization issued by the Administrator.

(d) *Airspace Designations*.

(1) Any operator operating under this part must obtain authorization from the Administrator prior to accessing airspace designated in FAA Order JO 7400.[XX], Unmanned Aircraft System Airspace Designations.

(2) To maintain operational safety or security, the Administrator may prohibit, on a temporary basis, any operator from conducting operations under this section in certain airspace without an authorization issued by the Administrator.

(e) Incorporation by reference.

(1) The incorporation by reference of FAA Order JO 7400.[XX], Unmanned Aircraft System Airspace Designations, dated [TBD] was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. The approval to incorporate by reference FAA Order JO 7400.XX is effective [Month, XX, 202X] through [Month, XX, 202X+1]. This incorporation by reference material is available for inspection at FAA and NARA. Contact FAA at: Rules and Regulations Group, Federal Aviation Administration, 800 Independence Avenue S.W., Washington, DC 20591, (202) 267–8783. An electronic version of FAA Order JO 7400.XX is available on FAA's website at www.faa.gov/air_traffic/publications. For information on the availability of this material at NARA, visit www.archives.gov/federalregister/cfr/ibr–locations. or email fr.inspection@nara.gov.

(2) Before updating FAA Order JO 7400.[XX], FAA will publish any proposed changes to designated airspace, in full text, as proposals in the *Federal Register*, unless there is good cause to forgo notice and comment rulemaking, followed by publication of associated final rules in the *Federal Register*. FAA will then integrate these updates into the next edition of FAA Order JO 7400.12. FAA will request that the Director of the

Federal Register approve the IBR of the next edition of the order as of [MM/DD/YYYY+1].

§ 108.185 Operation over people.

(a) *Prohibition*. No operator may operate an unmanned aircraft under this part over people except in accordance with the requirements of this section, unless otherwise authorized by the Administrator.

(b) *Open-Air Assemblies*. Unless otherwise authorized by the Administrator, no operator may operate an unmanned aircraft under this part over open-air assemblies of persons.

(c) *Operating categories*. The requirements under this section depend on the highest category of population density over which an operation is taking place. Categories 1 through 5 are calculated using the appropriate day or night data from Oak Ridge National Laboratory's LandScan USA population distribution data as of August 1st of each year determined as follows:

(1) Category 1: Farther than 1 statute mile from any cell of 10 people or higher.

(2) Category 2: Within 1 statute mile of a cell of 10 people or higher, and not within a Category 3, 4, or 5 area.

(3) Category 3: Within 1 statute mile of a cell of 25 people or higher, and not within a Category 4 or 5 area.

(4) Category 4: Within 0.5 statute miles of a cell of 100 people or higher, and not within a Category 5 area.

(5) Category 5: Within 0.5 statute miles of a cell of 2,500 people or higher.

(d) *Operating requirements*. All operations over people must avoid operating where such operations may cause undue hazard to people on the ground. In addition, the following requirements apply:

(1) Category 1: Operations must be conducted at least 50 feet away from any exposed, non-participating persons, unless otherwise authorized by the Administrator.

(2) Category 2: Operations must not be conducted using a command and control link that utilizes radio frequency devices operating in accordance with 47 CFR part 15.

(3) Category 3: Operators must:

(i) Meet the requirements of Category 2 operations; and

(ii) Conduct the operation using an approved method for strategic deconfliction in accordance with the requirements of § 108.190.

(4) Category 4: Operators must:

(i) Meet the requirements of Category 3 operations; and

(ii) Hold an operating certificate in accordance with subpart E.

(5) Category 5: Operators must:

(i) Meet the requirements of Category 4 operations; and

(ii) Ensure that the unmanned aircraft system is able to detect and avoid an aircraft not broadcasting its location in accordance with the requirements of § 108.195(a)(2).

§ 108.190 Use of strategic deconfliction and conformance monitoring.

(a) Unless otherwise authorized by the Administrator, the following operations must be conducted with strategic deconfliction:

(1) Operations in controlled airspace pursuant to § 108.180(a)(2).

(2) Operations in a Category 3 or higher operating category pursuant to § 108.185.

(b) Unless otherwise authorized by the Administrator, operations in controlled airspace pursuant to § 108.180(a)(2) must be conducted with conformance monitoring.

(c) A strategic deconfliction capability must meet the following requirements:

(1) Perform strategic conflict detection and resolution prior to takeoff, and in relation to other unmanned aircraft operations that are discoverable at that time; and

(2) Maintain a target average conformance to all activated operational intents.

(d) A conformance monitoring capability must meet the following requirements:

(1) Provide immediate alerts to operations personnel when the unmanned aircraft exits its operational intent, consistent with criteria or parameters established prior to takeoff; and

(2) Communicate information to other airspace users and FAA about the alert in paragraph (d)(1) of this section via a means acceptable to the Administrator.

(e) Unless otherwise authorized by the Administrator, the requirements in paragraphs (a) and (b) must be achieved through operational use of an authorized service provided by an appropriately certificated automated data service provider under part 146 of this chapter.

§ 108.195 Operation near aircraft; low altitude right-of-way rules.

(a) Unless operating in a shielded area as specified in § 108.205, each operator of an unmanned aircraft must yield the right-of-way to all aircraft—

(1) departing from or arriving at an airport or heliport; or

(2) equipped and broadcasting their aircraft's location using—

(i) ADS-B Out equipment that meets the design and performance requirements of § 91.227 of this chapter; or

(ii) Electronic conspicuity equipment that broadcasts a signal on Universal Access Transceiver Operating on the Radio Frequency 978 Megahertz, containing the following information, in a message format that meets the requirements of § 91.227 of this chapter. For the purposes of this paragraph, the definitions from § 91.227 are used:

(A) An indication of the aircraft's latitude and longitude

(B) An indication of the aircraft's geometric altitude

(C) An indication of the aircraft's velocity

(D) An indication of the aircraft assigned ICAO 24-bit address, except when the pilot has not filed a flight plan, has not requested ATC services, and is using a TSO-C154c or TSO-C154d self-assigned temporary 24-bit address

(E) A Navigation Integrity Category value of less than 0.5 nm

(F) A System Design Assurance value of <1 x 10^-3 per flight hour

(G) A Source Integrity Level (SIL) value of <1 x 10^-3 per flight hour or sample

(b) When yielding right-of-way, the unmanned aircraft may not pass over, under, or ahead of the aircraft being yielded to unless at a safe distance. Safe distance must be determined in accordance with a method acceptable to the Administrator.

§ 108.200 Operational status broadcast.

(a) *Remote Identification.* Unless otherwise authorized by the Administrator, no operator may operate an unmanned aircraft under this part unless all the following requirements are met:

(1) *Standard remote identification.* The unmanned aircraft must meet the requirements for a standard remote identification unmanned aircraft under part 89 of this chapter.

(2) *Message Elements*. The unmanned aircraft must be capable of broadcasting the message elements required under § 89.305 of this chapter except that the control station location as required under § 89.305(b) and (c) is not required if the unmanned aircraft is being operated without a flight coordinator in accordance with § 108.310.

(3) *Additional operational message elements.* In addition to the message elements required under paragraph (a)(2) of this section, the unmanned aircraft remote identification message must include the following message elements:

(i) A status which indicates whether the unmanned aircraft is being operated beyond visual line of sight.

(ii) A status which indicates that the unmanned aircraft is being operated without a flight coordinator in accordance with § 108.310, if applicable.

(iii) The takeoff location of the unmanned aircraft.

(4) *Range of broadcast.* The remote identification message including the operational status must be broadcast from the unmanned aircraft at a range sufficient to provide situational awareness to others in the vicinity of the unmanned aircraft.

(b) *Means of compliance.* A standard remote identification unmanned aircraft used for operations under this part must meet the requirements of an FAA-accepted means of compliance for standard remote identification that includes the operational status message element described in this section.

§ 108.205 Operation in shielded areas.

No operator may operate an unmanned aircraft as a shielded operation except in areas where no manned aircraft are expected to operate. Shielded areas include—

(a) Areas within 50 feet of powerlines and substations, railroad tracks, bridges, and pipelines, when permission from the infrastructure owner is obtained; or

(b) Any other area designated by the Administrator.

§ 108.210 Operation of multiple unmanned aircraft.

(a) An operator may only conduct operations at an unmanned aircraft-to-flight coordinator ratio of 1:1, except in accordance with a method acceptable to the Administrator.

(b) When operations are conducted at an unmanned aircraft-to-flight coordinator ratio greater than 1:1 in accordance with paragraph (a) of this section, an operator may not allow a flight coordinator to operate, monitor, or otherwise be responsible for the operations of more unmanned aircraft than the flight coordinator is capable of handling during normal, abnormal, and emergency conditions, determined in a method acceptable to the Administrator.

(c) Pursuant to paragraph (a) of this section, an operator may only conduct operations at an unmanned aircraft-to-flight coordinator ratio equal to or less than what the manufacturer has specified in the operating instructions.

§ 108.215 Emergency conditions.

(a) An operator may request deviation authority from FAA from any current authorizations or limitations for the protection of life or property if those conditions necessitate the expeditious conduct of those operations.

(b) In an in-flight emergency requiring immediate action, the flight coordinator may deviate from any rule of this part to the extent required to meet that emergency.

(c) The operator must comply with the reporting requirements in § 108.45(f) of this part following any emergency deviation.

§ 108.220 Unmanned aircraft flight restriction.

No operator may operate an unmanned aircraft under this part within an unmanned aircraft flight restriction established in accordance with part 74 of this chapter, unless allowed pursuant to part 74, as appropriate.

SUBPART C—Operations Personnel

§ 108.300 General.

(a) Operations personnel includes persons identified by the operator in the company operations manual as persons required for the safe operation of the unmanned aircraft and its associated elements, including, but not limited to, performing the following roles or tasks—

(1) Operations supervisor;

(2) Flight coordinator;

(3) Unmanned aircraft maintenance or alterations;

(4) Ground handling;

(5) Loading and unloading of the unmanned aircraft;

(6) Servicing or upkeep of systems, including associated elements, or

(7) Establishing flight paths, emergency procedures, and operational parameters.

(b) No operator may allow a person to perform multiple roles concurrently if doing so could affect the safety of the operation.

§ 108.305 Operations supervisor.

(a) Each operator must have one or more persons serving in the role of an operations supervisor who is qualified through training, experience, or expertise.

(b) The operator must notify FAA within 10 days of any change in personnel assigned to the operations supervisor position.

(c) The person who serves as the operations supervisor must—

(1) Be knowledgeable of the company policies and procedures; and

(2) To the extent of their responsibilities, have a full understanding of the following material with respect to the operation—

(i) Aviation safety standards and safe operating practices;

(ii) Practices for maintaining a secure facility and operations area; and

(iii) The regulatory requirements of this part.

§ 108.310 Flight coordinator.

(a) If the manufacturer's operating instructions require a flight coordinator, the operator must designate a flight coordinator prior to each flight.

(b) No operator may allow a person to direct an unmanned aircraft during flight unless that person is appropriately qualified and authorized by the operator as a flight coordinator, except as provided in paragraph (e) of this section for the purpose of obtaining operating experience.

(c) The operator may transfer control from one flight coordinator to another flight coordinator during flight if the operator has appropriate handoff procedures in its company operations manual.

(d) Operations personnel assigned as flight coordinator must—

(1) Take appropriate actions to prevent the unmanned aircraft from posing undue hazard to people, aircraft, or property, within their control; and

(2) Maintain situational awareness of the unmanned aircraft and direct the unmanned aircraft to maintain compliance with the applicable provisions of this chapter.

(e) No operator may allow a person to serve as a flight coordinator of any unmanned aircraft under this part unless that person has at least 5 hours of operating experience in the specific make and model of unmanned aircraft to be operated. The operating experience must be acquired under the direct supervision of—

(1) A fully qualified flight coordinator;

(2) An operations supervisor; or

(3) A person qualified and designated by the operator to ensure operations personnel are appropriately trained.

(f) No operator may allow a person to continue to serve as a flight coordinator of any unmanned aircraft unless, within the preceding 12 calendar months, that person has served as the flight coordinator for at least 5 hours of operating experience of an unmanned aircraft of the same make and model in which that person is to serve.

(g) If a flight coordinator's recency of experience lapses, they must be requalified by the operator prior to performing the duties of a flight coordinator for that make and model of unmanned aircraft.

§ 108.315 Personnel knowledge and training.

(a) Each operator must ensure that all operations personnel have completed the applicable training required under this part and that they possess the knowledge and skills required to conduct their duties specific to their areas of responsibility safely.

(b) All operations personnel must have general knowledge and skills training relevant to their areas of responsibility that covers the following subject areas, as applicable:

(1) Regulations relating to flight operations under this part.

(2) Airspace classification, operating requirements, and flight restrictions affecting unmanned aircraft operations.

(3) Aviation weather sources and effects of weather on unmanned aircraft performance.

(4) Crew resource management.

(5) Communication procedures.

(6) Safe distance criteria.

(7) Principles of strategic deconfliction and conformance monitoring.

(8) Determining the performance of unmanned aircraft.

(9) Physiological effects of drugs and alcohol.

(10) Aeronautical decision-making and judgment.

(11) Airport and heliport operations.

(12) Operations at night.

(13) Assignment and transfer of control.

(14) Beyond visual line of sight operation strategic and tactical risk mitigation strategies and approaches.

(15) Multi-aircraft operations.

(16) Command and control system characteristics, functionality, and spectrum considerations.

(17) Contingency management and UA recovery procedures.

(18) Population density considerations.

(19) Air traffic control procedures.

(c) All operations personnel must have knowledge and skills training specific to the make and model of unmanned aircraft to be operated relevant to their areas of responsibility that covers the following subject areas, as applicable:

(1) Unmanned aircraft general and operating limitations.

(2) System configuration and setup.

(3) Normal and abnormal procedures.

(4) Emergency procedures.

(5) Ground handling.

(6) Loading.

(7) Maintenance and inspection procedures.

(8) Preflight procedures.

(9) Navigation systems appropriate to the operation.

(10) Detect and avoid procedures.

(11) Lost link procedures.

(12) Operations of multiple unmanned aircraft.

(d) The training required under paragraphs (b) and (c) of this section must have been accomplished within the previous 24 calendar months for any operations personnel to conduct the assigned responsibilities in the listed subject areas. If such training is completed in the calendar month before or after the month in which that training is required, the person is considered to have completed it in the calendar month in which it was required.

§ 108.320 Medical condition.

No person may serve or attempt to serve, and no operator may allow or continue to allow a person to serve, in an operations personnel position if the person or the operator knows or has reason to know the person has a physical or mental condition that would interfere with the safe operation of the unmanned aircraft or make the person unable to perform the duties required of their position safely.

§ 108.325 Alcohol or drugs.

(a) No person may serve or attempt to serve in an operations personnel position—

(1) Within 8 hours after the consumption of any alcoholic beverage;

(2) While under the influence of alcohol;

(3) While using any drug that affects the person's faculties in any way contrary to safety; or

(4) While having an alcohol concentration of 0.04 or greater in a blood or breath specimen. Alcohol concentration means grams of alcohol per deciliter of blood or grams of alcohol per 210 liters of breath.

(b) During any period in which a person is serving, ready to serve, or immediately available to serve in an operations personnel position, the person must, on request of a law enforcement officer, submit to a test to indicate the alcohol concentration in the blood or breath, or the presence of any drugs in the body, when—

(1) The law enforcement officer is authorized under State or local law to conduct the test or to have the test conducted; and

(2) The law enforcement officer is requesting submission to the test to investigate a suspected violation of State or local law governing the same or substantially similar conduct prohibited by paragraph (a) of this section.

(c) Whenever FAA has a reasonable basis to believe that a person may have violated paragraph (a) of this section and on request of the Administrator, that person must furnish to FAA the results of any alcohol or drug test in their possession taken within 4 hours after serving or attempting to serve in an operations personnel position, or authorize any clinic, hospital, or doctor, or other person or entity to release the results to FAA.

(d) No operator may allow or continue to allow a person to serve in an operations personnel position when—

(1) The operator has actual knowledge that the person is in violation of paragraph (a);

(2) The person refuses to test in accordance with paragraph (b) of this section; or

(3) The person refuses to furnish or authorize the release of test results requested by the Administrator in accordance with paragraph (c) of this section.

§ 108.330 Duty and rest requirements.

(a) Operations personnel are limited to a maximum 14-hour duty day, and to a maximum 50-hour duty week.

(b) Operations personnel must take a minimum 10-hour continuous rest period within the 24 hours prior to reporting for duty.

(c) Operations personnel must receive a minimum of one day of continuous rest, free of all responsibility for work or duty on behalf of the operator, per week, each week in which the operator schedules them for duty.

§ 108.335 Security threat assessment for certain personnel.

(a) Except as provided in paragraph (c) of this section, a covered person described in paragraph (b) of this section must undergo a Transportation Security Administration (TSA) security threat assessment (STA) consistent with the standards set forth in 49 CFR 1572.103 through 1572.107 and the procedures in 49 CFR 1572.9 through 1572.11, before conducting the described functions or allowed the specified access. A covered person is excepted from completing a new STA if they hold an STA or security clearance TSA deems comparable to the STA required in this paragraph.

(b) For purposes of this section, a covered person is an individual:

(1) Who performs the functions of an operations supervisor described in § 108.305;

(2) Who performs the functions of a flight coordinator described in § 108.310;

(3) With unescorted access to the aircraft;

(4) With unescorted access to the cargo loaded for transport on the aircraft; or

(5) Who has access to the control, or the flightpath, of the aircraft.

(c) Applicants for operating permits or certificates must make a positive declaration in their application that covered persons have successfully completed the STA required in paragraph (a)(1) or (b) of this section and provide documentation substantiating such declaration.

(d) The covered person must renew their TSA STA according to the renewal life cycle of their selected mode of vetting.

(e) If the covered person does not renew the STA, or if TSA revokes the covered person's STA, the applicant must remove that person from the position and update their application accordingly.

(f) Failure to remove a covered person who does not hold a valid TSA STA consistent with this section may result in revocation of the operating permit or operating certificate, as applicable.

(g) A covered person may seek redress for an adverse STA using the procedures

SUBPART D—Permitted Operations

§ 108.400 Operations under a permit.

(a) Operators may conduct the following operations using an FAA-issued operating permit in accordance with this subpart:

(1) Package delivery.

(2) Agriculture.

(3) Aerial surveying.

(4) Civic interest.

(5) Unmanned aircraft operations training.

(6) Demonstration.

(7) Recreational.

(8) Flight test.

(b) Operators must conduct operations under an operating permit in compliance with the requirements of this part and in accordance with any authorizations and limitations associated with that permit.

(c) The Administrator may authorize any other type of operation that does not fall under one of the categories listed in paragraph (a) of this section.

(d) Operators are prohibited from transporting hazardous materials as defined in 49 CFR 171.8 with an operating permit unless operating in accordance with 49 CFR 175.9(b).

(e) Except for flight test permits, an operator may only hold one permit per type of operation listed in paragraph (a) of this section.

(f) Operators are limited to the types of operations that are prescribed by the manufacturer in the operating instructions in accordance with § 108.720.

§ 108.405 Applications for operating permits.

(a) An applicant for an operating permit must provide an application for an operating permit to FAA in a form and manner acceptable to the Administrator.

(b) The applicant must describe the operation it seeks to conduct under this part. The application includes questions, data, and documentation requests that verify the applicant's ability to operate in compliance with the applicable requirements of this part. The application must include the following:

(1) The applicant's name and contact information (physical address, email address, telephone number, and name of individual who serves as the point of contact).

(2) Address of the principal base of operations, if different from the address provided for contact information, in accordance with § 108.30.

(3) Name of the individual(s) who serve(s) as operations supervisor, in accordance with § 108.305, unless operating under a recreational permit in accordance with § 108.475.

(4) The intended type of UAS operation(s), in accordance with § 108.400(a).

(5) The intended area(s) of operations, in accordance with § 108.165.

(6) Company manual(s), as required under § 108.135.

(7) A recordkeeping process as required under § 108.40.

(8) Operator reporting procedures, as required under § 108.45.

(9) The type(s) of unmanned aircraft to be used in operations, that comply with the requirements of § 108.105.

(10) Additional information the Administrator may determine is necessary to evaluate the application.

§ 108.410 Duration of permits.

(a) Unless surrendered, suspended, or revoked earlier, a permit issued under this part expires at the end of the 24 months from the month in which it is issued.

(b) Applications for new permits must be made in a form and manner acceptable to the Administrator and submitted sufficiently in advance to allow adequate processing times to prevent lapses of approval.

(c) Application for new permits may be made up to 120 days in advance of the expiration date of the exiting permit. New permits issued during this time period will be valid for a period of 2 years beyond the expiration date of the existing permit.

(d) Permits issued under this part are non-transferrable.

§ 108.415 Issuance of an operating permit.

(a) The Administrator will evaluate an application for an operating permit and may request additional information, documentation, or demonstration as needed, to supplement the application.

(b) FAA will issue the operating permit if the Administrator finds the applicant has demonstrated its ability to comply with the applicable requirements of this part through the application process.

(c) An FAA-issued operating permit includes the following information:

(1) The operator's name.

(2) The location of the operator's principal base of operations.

(3) The permit number.

(4) The effective date of the permit.

(5) The expiration date of the permit.

(6) Type of operation.

§ 108.420 Denial, suspension, or revocation of operating permits.

An application for an operating permit may be denied, or an operating permit may be suspended or revoked, if the Administrator finds that—

(a) The applicant or operator does not meet the requirements of this part;

(b) The applicant or operator is not properly or adequately equipped or is not able to conduct safe operations under this part;

(c) The applicant or operator previously held an operating permit, operating certificate, or any other FAA certificate which was revoked;

(d) The applicant or operator intends to fill or fills a key management position listed in § 108.300 with an individual who exercised control over or who held the same or similar position with an operator whose permit or certificate was revoked, or is in the process of being revoked, and that individual materially contributed to the circumstances causing revocation of the certificate or permit or causing the revocation process of the certificate or permit;

(e) An individual who will have control over or have a substantial ownership interest in the operator had the same or similar control or interest in an operator whose certificate was revoked, or is in the process of being revoked, and that individual materially contributed to the circumstances causing revocation or causing the revocation process; or

(f) The applicant or operator engaged in any violation of this part.

§ 108.425 Amendment of permits.

(a) The Administrator may amend any permit or any FAA authorizations and limitations issued under this part if—

(1) The Administrator determines that, under 49 U.S.C. 44709 and part 13 of this chapter, safety and public interest requires the amendment; or

(2) The operator applies for the amendment and the Administrator determines that safety and public interest allows the amendment.

(b) When the Administrator proposes to issue an order amending, suspending, or revoking all or part of any certificate, the procedure in § 13.19 of this chapter applies.

(c) The operator may request to amend an operating permit issued under this part by revising an application submitted in accordance with § 108.405.

(d) Within 30 days of receiving an amendment initiated by the Administrator, or a denial of an operator's application for amendment, the operator may petition the Administrator to reconsider the amendment or denial.

§ 108.430 Display of permit.

No operator may operate an unmanned aircraft under this subpart unless evidence of having a valid permit under which the operation is conducted is available at the point of unmanned aircraft operations control and presented upon the request of the Administrator or any Federal, State, or local law enforcement officer.

§ 108.435 Cybersecurity.

(a) Each operator must develop and implement cybersecurity policies and processes, in order to protect networks, devices, and data from unauthorized access and to ensure integrity, accuracy, and reliability of the operations.

(b) The cybersecurity policy required under this section must include, at a minimum, processes for—

(1) Protecting software, hardware, and network computing infrastructure necessary to protect operations from unauthorized access;

(2) Ensuring the operator's employee network access privileges are limited to those necessary to fulfill normal job duties;

(3) Preparing for, responding to, and mitigating the impact of cyber-attacks; and

(4) Ensuring access privileges are turned off and removed for former employees.

(c) The operator must review the cybersecurity policies at least annually and revise or update as necessary to reflect changing circumstances.

§ 108.440 Package delivery operations.

(a) Except as provided in subpart E, no operator may conduct package delivery operations with an unmanned aircraft under this part without, or in violation of, a package delivery permit issued in accordance with this subpart.

(b) Operators performing package delivery under this subpart must ensure any person performing or directly supervising any of the following job functions involving any item for transport on board an unmanned aircraft: acceptance, rejection, handling, storage incidental to transport, packaging of company materials, or loading—

(1) Has initial and recurrent training in the recognition of hazardous materials acceptable to the administrator; and

(2) Completes hazardous materials recognition training every 24 calendar months.

(c) Operators must ensure that the payload in, on, or suspended from the unmanned aircraft is properly secured and does not adversely affect the flight characteristics or controllability of the unmanned aircraft.

(d) The operator must provide information about the delivery method to each customer and provide the customer instructions to remain clear of the unmanned aircraft during delivery by a distance sufficient to minimize the risk of injury.

(e) The operator must ensure proposed delivery areas are free of any obstructions that could pose a hazard.

(f) Package delivery operations must be conducted with fewer than 100 active unmanned aircraft, including those directly under the control of the operator, or conducted through lease agreements with other persons, subcontractors, or subsidiaries.

(g) The unmanned aircraft, and anything attached to or carried by the unmanned aircraft, must not have a combined total weight greater than 55 pounds.

(h) Operations are limited to Category 3 population density areas or lower, in accordance with § 108.185.

(i) Operators must request and obtain a limited security program from the Transportation Security Administration under 49 CFR 1544.101(g) before conducting unmanned aircraft system operations.

§ 108.445 Agricultural operations.

(a) Except as provided in subpart E in this part, no operator may conduct agricultural operations involving aerial seeding, dusting, spraying, fertilizing, crop improvement, or pest control with an unmanned aircraft under this part without, or in violation of, an agriculture permit issued in accordance with this subpart.

(b) Operations must be conducted with fewer than 10 active unmanned aircraft either directly under the control of the operator, through lease agreements with other persons, subcontractors, or subsidiaries.

(c) Unmanned aircraft and anything attached to or carried by the unmanned aircraft must not have a combined total weight greater than 1,320 pounds.

(d) Dispensing operations must not be conducted directly over people, unless otherwise authorized by the Administrator.

(e) Operations are limited to Category 1 population density areas, in accordance with § 108.185, unless otherwise authorized by the Administrator.

(f) No operator may dispense, or cause to be dispensed, from an unmanned aircraft, any material or substance in a manner that creates a hazard to persons or property on the surface.

(g) No operator may dispense, or cause to be dispensed, from an unmanned aircraft, any economic poison that is registered with the U.S. Department of Agriculture under the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 135–135k)—

(1) For a use other than that for which it is registered;

(2) Contrary to any safety instructions or use limitations on its label; or

(3) In violation of any Federal, State, or local law or regulation.

(h) Paragraph (g) of this section does not apply to any person dispensing economic poisons for experimental purposes under—

(1) The supervision of a Federal or State agency authorized by law to conduct research in the field of economic poisons; or

(2) A permit from the U.S. Department of Agriculture issued pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 135 and 135k).

(i) Operators conducting agricultural operations under this subpart must have and keep current a comprehensive training program that is tailored for their proposed operation and contains, at a minimum:

(1) Steps to be taken before starting operations, including survey of the area to be worked.

(2) Safe handling and storage of economic poisons and the proper disposal of used containers for those poisons.

(3) The general effects of economic poisons and agricultural chemicals on plants, animals, and persons, with emphasis on those normally used in the areas of intended operations; and the precautions to be observed in using poisons and chemicals.

(4) Primary symptoms of poisoning of persons from economic poisons, the appropriate emergency measures to be taken, and the location of poison control centers.

(5) Performance capabilities and operating limitations of the unmanned aircraft to be used.

(6) Safe flight and application procedures.

(j) Operators must ensure that all operations personnel supervising or participating in an agricultural unmanned aircraft operation have satisfactorily completed the operators training program required pursuant to paragraph (i) of this section.

§ 108.450 Aerial surveying operations.

(a) Except as provided in subpart E, no operator may conduct photography, videography, mapping, inspecting, or patrolling operations with an unmanned aircraft under this part without, or in violation of, an aerial surveying permit issued in accordance with this subpart.

(b) Operations must be conducted with fewer than 25 active unmanned aircraft either directly under the control of the operator, through lease agreements with other persons, subcontractors, or subsidiaries.

(c) Unmanned aircraft and anything attached to or carried by the unmanned aircraft must not have a combined total weight greater than 110 pounds.

(d) Operations are limited to Category 3 population density areas or lower, in accordance with § 108.185.

§ 108.455 Civic interest operations.

(a) Except as provided in subpart E of this part, no operator may conduct operations in support of civic interest with an unmanned aircraft under this part without, or in violation of, a civic interest permit issued in accordance with this subpart. Civic interest operations consist of—

(1) Forest and wildlife conservation, including wildfire recovery, wildlife conservation, and tracking climate change; and

(2) Operations in support of public safety, including fire, accident, and disaster response where the operator has coordinated and deconflicted operations with the law enforcement or government emergency management agency responsible for the incident response in advance and throughout the duration of the operation.

(b) Operations must be conducted with fewer than 25 active unmanned aircraft either directly under the control of the operator, through lease agreements with other persons, subcontractors, or subsidiaries.

(c) Unmanned aircraft and anything attached to or carried by the unmanned aircraft must not have a combined total weight greater than 110 pounds.

(d) Operations must be conducted by an entity contracted to a Federal, State, local, Tribal, or territorial government for the performance of the civic interest operation.

(e) Operations are limited to Category 3 population density areas or lower, in accordance with § 108.185, unless otherwise authorized by the Administrator.

(f) Notwithstanding the restrictions in paragraphs (e) of this section and § 108.185, operations may be conducted over any population density to the extent necessary to safeguard lives in imminent threat.

§ 108.460 Unmanned aircraft operations training.

(a) No operator may conduct unmanned aircraft operations training with an unmanned aircraft under this part without, or in violation of, an unmanned aircraft operations training permit issued in accordance with this subpart except that an unmanned aircraft operations training related to another permit type may be conducted under that permit. If unmanned aircraft operations training is conducted under a permit for another type of operation, the requirements of that permit apply to the unmanned aircraft operations training in the same manner and to the same extent as they apply to the operation itself.

(b) Unmanned aircraft and anything attached to or carried by the unmanned aircraft must not have a combined total weight greater than 1,320 pounds, unless otherwise authorized by the Administrator.

(c) Operations must be conducted with fewer than 10 active unmanned aircraft either directly under the control of the operator, through lease agreements with other persons, subcontractors, or subsidiaries, unless otherwise authorized by the Administrator.

(d) Operations are limited to Category 1 population density areas, in accordance with § 108.185, unless otherwise authorized by the Administrator.

§ 108.465 Demonstration operations.

(a) No operator may conduct aerial performances such as air races, air shows, sales demonstrations, and exhibitions or the practice and preparations for related events, with an unmanned aircraft under this part without, or in violation of, a demonstration permit issued in accordance with this subpart.

(b) Operations must be conducted with fewer than 50 active unmanned aircraft, unless otherwise authorized by the Administrator.

(c) Unmanned aircraft and anything attached to or carried by the unmanned aircraft must not have a combined total weight greater than 110 pounds, unless otherwise authorized by the Administrator.

(d) Operations are limited to Category 2 population density areas or lower, in accordance with § 108.185, unless otherwise authorized by the Administrator.

(e) Operations must be conducted at least 500 feet away from any non-participating persons, unless otherwise authorized by the Administrator.

§ 108.470 Flight test operations.

(a) No operator may conduct operations involving flight tests of new unmanned aircraft designs, modifications, or other development-related operations with an unmanned aircraft under this part without, or in violation of, a flight test permit issued in accordance with this subpart.

(b) Flight test operations may only be conducted by unmanned aircraft manufacturers qualified under subpart G of this part or accredited educational institutions.

(c) Operations are limited to Category 1 population density areas, in accordance with § 108.185, unless otherwise authorized by the Administrator.

(d) Unmanned aircraft and anything attached to or carried by the unmanned aircraft must not have a combined total weight greater than 1,320 pounds, unless otherwise authorized by the Administrator.

(e) Section 108.105(a) does not apply to operations conducted under a flight test permit.

§ 108.475 Recreational permit operations.

(a) No person may conduct non-commercial or recreational operations with an unmanned aircraft under this part without, or in violation of, a recreational permit issued in accordance with this subpart.

(b) Operations are limited to Category 3 population density areas or lower, in accordance with § 108.185.

(c) Unmanned aircraft and anything attached to or carried by the unmanned aircraft must not have a combined total weight greater than 55 pounds, unless otherwise authorized by the Administrator.

(d) Flights must not exceed 10 nautical miles from the flight coordinator.

(e) Operations must be conducted with only one active unmanned aircraft.

(f) Operations under a recreational permit do not have to comply with the following provisions of this part—

(1) The requirement to hold a company operations manual pursuant to §§ 108.130(a)(4) and 108.135;

(2) The experience requirements specified in § 108.310(e) and (f);

(3) The requirement to have a principal base of operations pursuant to § 108.30, except that the operator shall provide a permanent mailing address (including ZIP code), or if the permanent mailing address includes a post office box number, then the person's current residential address;

(4) The requirement to designate an operations supervisor pursuant to § 108.305;

(5) The requirement to develop and implement cybersecurity policies pursuant to § 108.435; and

(6) The duty and rest requirements of § 108.330.

SUBPART E—Certificated Operations

§ 108.500 Operations under a certificate.

(a) Operators can conduct the following operations using an FAA-issued operating certificate in accordance with this subpart:

(1) Package delivery.

(2) Agriculture.

(3) Aerial surveying.

(4) Civic interest.

(b) Operators must conduct operations with an operating certificate in compliance with the requirements of this part and in accordance with any authorizations and limitations associated with that certificate.

(c) Any type of operation that does not fall under one of the categories listed in paragraph (a) of this section can be authorized by the Administrator, subject to any limitations issued by the Administrator in conjunction with the certificate.

(d) Operators may only conduct operations for the types of operations that are prescribed by the manufacturer in the operating instructions in accordance with § 108.720.

§ 108.505 Applications for operating certificates.

(a) An applicant for an operating certificate must provide an application for an operating certificate to FAA in a form and manner acceptable to the Administrator.

(b) The applicant must describe the operation it seeks to conduct under this part. The application includes any questions, data, demonstration, and documentation requests from FAA that verify the applicant's ability to operate in compliance with the applicable requirements of this part. The application must address the following:

(1) The applicant's name and contact information (physical address, email address, and telephone number).

(2) Address of the principal base of operations, if different from the address provided for contact information, in accordance with § 108.30.

(3) Name of the individual who serves as operations supervisor, in accordance with § 108.305.

(4) The intended type of UAS operations, in accordance with § 108.500(a).

(5) The intended area(s) of operation, in accordance with § 108.165.

(6) Company manual(s), as required under § 108.135.

(7) A recordkeeping plan as required under § 108.40.

(8) Operator reporting procedures, as required under § 108.45.

(9) The type(s) of unmanned aircraft to be used in operations that comply with the requirements of § 108.105.

(10) A training program, as required under §§ 108.540 and 108.315.

(11) Communication and ground risk assessments, as required under § 108.550.

(12) Safety management systems, as required under § 108.560.

(13) Hazardous materials procedures, information, and training program, as required under § 108.570.

(14) Procedures permitting the use of inoperative equipment, pursuant to § 108.555.

(15) Plan for complying with duty and rest requirements, pursuant to § 108.330.

(16) For those operators proposing to engage in package delivery, documentation of their citizenship status.

(17) Additional information the Administrator may determine is necessary to evaluate the application.

§ 108.510 Duration of certificates.

(a) Unless suspended or revoked, an operating certificate issued under this part is effective until the operator surrenders it to FAA, or the operator fails to meet the requirements of § 108.530.

(b) Operating certificates issued under this part are non-transferrable.

§ 108.515 Issuance of an operating certificate.

(a) The Administrator will evaluate each application for an operating certificate and may request additional information, documentation, or demonstration as needed, to supplement the application.

(b) An applicant may be issued an operating certificate if the Administrator—

(1) Finds that the applicant has demonstrated their ability to comply with the applicable requirements of this part; and

(2) Determines the applicant is properly and adequately equipped and can conduct safe operations.

(c) An FAA-issued operating certificate includes all the following information:

(1) The operator's name.

(2) The location of the operator's principal base of operations.

(3) The certificate number.

(4) The effective date of the certificate.

(5) Type(s) of operations.

(d) An operator may be authorized to conduct multiple types of operations under a single operating certificate issued under this subpart.

§ 108.520 Denial, suspension, or revocation of operating certificates.

An application for an operating certificate may be denied, or an operating certificate may be suspended or revoked, if the Administrator finds that—

(a) The applicant or operator does not meet the requirements of this part;

(b) The applicant or operator is not properly or adequately equipped or is not able to conduct safe operations under this part;

(c) The applicant or operator previously held an operating permit, operating certificate, or any other FAA certificate which was revoked;

(d) The applicant or operator intends to or fills a key management position listed in § 108.300 with an individual who exercised control over or who held the same or similar position with an operator whose permit or certificate was revoked, or is in the process of being revoked, and that individual materially contributed to the circumstances causing revocation of the certificate or permit or causing the revocation process of the certificate or permit;

(e) An individual who will have control over or have a substantial ownership interest in the operator had the same or similar control or interest in an operator whose certificate was revoked, or is in the process of being revoked, and that individual materially contributed to the circumstances causing revocation or causing the revocation process; or

(f) The applicant or operator engaged in any violation of this part.

§ 108.525 Amendment of certificates.

(a) The Administrator may amend any certificate or any FAA authorizations and limitations issued under this part if—

(1) the Administrator determines that, under 49 U.S.C. 44709 and part 13 of this chapter, safety in air commerce and the public interest requires the amendment; or

(2) the operator applies for the amendment and the Administrator determines that safety in the public interest allows the amendment.

(b) When the Administrator proposes to issue an order amending, suspending, or revoking all or part of any certificate, the procedure in § 13.19 of this chapter applies.

(c) The operator may request to amend an operating certificate issued under this part by revising an application submitted in accordance with § 108.505.

(d) Within 30 calendar days of receiving an amendment initiated by the Administrator, or a denial of an operator's application for amendment, the operator may petition the Administrator to reconsider the amendment or denial.

§ 108.530 Recency of operation.

(a) Unless otherwise authorized by the Administrator, no operator may conduct an operation for which it is authorized to perform under their certificate unless the operator has conducted that operation within the preceding 12 calendar months.

(b) If an operator does not conduct an operation for which it is authorized within 12 calendar months, the operator must receive authorization from FAA to resume operations. In providing authorization to resume operations, FAA may require inspections or reexaminations to determine whether the operator remains properly and adequately equipped and able to conduct a safe operation.

§ 108.535 Cybersecurity.

(a) Each operator must develop and implement cybersecurity policies and processes, in order to protect networks, devices, and data from unauthorized access and to ensure integrity, accuracy, and reliability of the operations.

(b) The cybersecurity policy required under this section must include, at a minimum, processes for—

(1) Protecting software, hardware, and network computing infrastructure necessary to protect operations from unauthorized access;

(2) Ensuring the operator's employee network access privileges are limited to those necessary to fulfill normal job duties;

(3) Preparing for, responding to, and mitigating the impact of cyber attacks;

(4) Ensuring access privileges are turned off and removed for former employees.

(c) The operator must review the cybersecurity policies at least annually and revise or update as necessary to reflect changing circumstances.

§ 108.540 Training program.

(a) Each operator must establish and implement a training program, acceptable to the Administrator, that satisfies the requirements of subpart C of this part and submitted in accordance with § 108.505(b)(10). The training program must include initial and recurrent training in accordance with § 108.315 that ensures operations personnel remain proficient in each unmanned aircraft, position, and type of operation in which they serve.

(b) The operator must ensure the training facilities, personnel, training material, forms, instructions, and procedures used to conduct the training required by this part are appropriate and current.

(c) The training facilities, personnel, training material, forms, and instructions required under this section may be satisfied using contracted personnel or services.

(d) The operator must designate a person or persons who are responsible for ensuring, and qualified to determine, operations personnel are appropriately trained. The designated person must certify as to the proficiency and knowledge of the operations personnel being trained or evaluated and that certification be made a part of the operations person's record in accordance with § 108.45.

(e) If the Administrator finds that revisions are necessary for the continued adequacy of a training program that has been accepted, the operator must, after notification by the Administrator, make any changes in the program deemed necessary by the Administrator.

(f) Within 30 calendar days after the operator receives a notice pursuant to paragraph (e) of this section, the operator may file a petition to reconsider the notice with the Administrator. The filing of a petition to reconsider stays the notice pending a decision by the Administrator. If the Administrator finds that there is an emergency that requires immediate action in the interest of safety, the Administrator may, upon a statement of the reasons, require a change effective without stay.

§ 108.545 Validation tests.

(a) Each operator must show they can conduct operations safely and in compliance with applicable regulatory standards. Unless otherwise authorized by the Administrator, validation tests are required—

(1) During the application process for authority to conduct operations for an operating certificate under this subpart;

(2) For the addition of a new make or model of an unmanned aircraft if an unmanned aircraft of the same make and model or similar design has not been previously validated in operations under this part;

(3) For special performance or unique operational authorizations as determined by the Administrator; and

(4) For demonstrations of operations of unmanned aircraft-to-flight coordinator ratio greater than 1:1, in accordance with § 108.210.

(b) All validation tests must be conducted under the appropriate operating and maintenance requirements of this part that would apply if the applicant were fully certificated.

(c) Validation tests may be performed under a temporary authorization issued by the Administrator for the purposes of conducting validation testing.

§ 108.550 Communication and ground risk assessments.

(a) Operations under this subpart must be conducted in accordance with a communication assessment acceptable to the Administrator that includes a command and control analysis for the area of operations, to include coverage and availability, a monitoring plan, and lost link procedures. This communication assessment must be submitted in accordance with § 108.505(b)(11).

(b) Operations under this subpart must be conducted in accordance with a ground risk assessment acceptable to the Administrator that includes pedestrian and moving vehicle analysis and consider terrain and human-made obstacles that the operator intends to overfly. This ground risk assessment must be submitted in accordance with § 108.505(b)(11).

§ 108.555 Inoperative equipment.

(a) No operator may conduct an operation under this part with an unmanned aircraft system with inoperative equipment or equipment that has failed its initial performance checks unless all the following requirements are met:

(1) The inoperative equipment is not—

(i) Indicated as necessary by the manufacturer of the unmanned aircraft pursuant to the manufacturer's operating instructions;

(ii) Required by subpart H of this part; or

(iii) Required for specific operations under this part.

(2) The inoperative equipment is removed from the unmanned aircraft, deactivated, or otherwise determined not to interfere with the safe operation of the unmanned aircraft.

(3) A determination is made by a person who is authorized by the operator to perform maintenance on the unmanned aircraft that the inoperative equipment does not constitute a hazard to the unmanned aircraft.

(4) Information identifying the inoperable equipment is made available to the appropriate operations personnel.

(b) The operator's procedures permitting the use of inoperative equipment must be submitted in accordance with § 108.505(b)(14).

§ 108.560 Safety management system.

(a) *General*. Operators authorized to conduct operations as a certificated operator under this subpart must develop, implement, and keep current a safety management system that meets the requirements of part 5 of this chapter. This safety management system must be submitted in accordance with § 108.505(b)(12).

(b) *Exceptions.* Organizations with a sole individual performing all necessary operations functions in the conduct and execution related to the safe operation of the unmanned aircraft are not required to comply with the following provisions: §§ 5.21(a)(4) and (5), 5.21(c), 5.23(a)(2) and (3) and (b), 5.25(b)(3) and (c), 5.27(a) and (b), 5.71(a)(7), 5.93, and 5.97(d) of this chapter.

(c) *Availability*. An operator must make available to the Administrator, upon request, all necessary information and data that demonstrates that the operator has a safety management system that meets the requirements set forth in part 5 of this chapter.

§ 108.565 Package delivery operations.

(a) Except as provided in subpart D of this part, no operator may conduct package delivery operations with an unmanned aircraft under this part without, or in violation of, a package delivery certificate issued in accordance with this subpart.

(b) Operators must ensure that the payload in, on, or suspended from the unmanned aircraft is properly secured and does not adversely affect the flight characteristics or controllability of the unmanned aircraft.

(c) The unmanned aircraft, and anything attached to or carried by the unmanned aircraft, must not have a combined total weight greater than 110 pounds.

(d) The operator must ensure proposed delivery areas are free of any obstructions that could pose a hazard.

(e) The operator must provide information about the delivery method to each customer and provide the customer instructions to remain clear of the unmanned aircraft during delivery by a distance sufficient to minimize the risk of injury.

(f) Operators must request and obtain a limited security program from the Transportation Security Administration under 49 CFR 1544.101(g) before conducting UAS operations.

§ 108.570 Hazardous materials.

(a) Each operator conducting package delivery operations under this subpart must receive from the Administrator—

(1) An authorization permitting, or prohibiting, the acceptance, handling, and transporting of hazardous materials; and

(2) An authorization to unload hazardous materials by releasing or dropping such materials above ground level if the operator wishes to conduct this type of operation.

(b) Each operator conducting package delivery operations under this subpart must have procedures and information to assist each person performing or directly supervising any of the following job functions involving any item for transport on board an unmanned aircraft:

(1) Acceptance of an item for transport.

(2) Rejection of an item for transport.

(3) Handling of an item for transport.

(4) Storage incidental to transport.

(5) Packaging of an item for transport.

(6) Loading of an item for transport.

(c) The procedures and information required in paragraph (b) of this section must include—

(1) Procedures for identifying packages that are marked or labeled as containing hazardous materials or that show signs of containing undeclared hazardous materials;

(2) Procedures for rejecting packages that do not conform to the Hazardous Materials Regulations in 49 CFR parts 171 through 180 or that appear to contain undeclared hazardous materials;

(3) Procedures for complying with the hazardous materials incident reporting requirements of 49 CFR 171.15 and 171.16, and discrepancy reporting requirements of 49 CFR 175.31;

(4) Procedures for complying with paragraph (d) of this section; and

(5) For an operator with an authorization in paragraph (a)(1) of this section to permit the acceptance, handling, and transportation of hazardous materials, the procedures and information must also include—

(i) Procedures to ensure that packages containing hazardous materials are properly offered and accepted in compliance with 49 CFR parts 171 through 180;

(ii) Procedures to properly handle, store, package, load, and carry packages containing hazardous materials on board an unmanned aircraft in compliance with 49 CFR parts 171 through 180;

(iii) Procedures to properly handle, package, and transport aircraft replacement parts, consumable materials, or other items regulated by 49 CFR parts 171 through 180; and—

(iv) Procedures for compliance with the notice requirements of 49 CFR 175.33.

(d) The operator must ensure each person authorized in subpart F of this part to maintain, repair, and alter the unmanned aircraft is notified of whether any materials they handle are hazardous materials.

(e) Each operator conducting package delivery operations under this subpart must establish and implement a hazardous materials training program approved by the Administrator. The training program must be designed to ensure that each person performing or directly supervising any of the job functions listed in paragraph (b) of this section is trained to comply with all applicable requirements of this subpart, including hazardous materials package recognition, and 49 CFR parts 171 through 180.

(f) Each operator conducting package delivery operations under this subpart must provide initial hazardous materials training and recurrent hazardous materials training to each person performing or directly supervising any of the job functions specified in paragraph (b) of this section.

(g) No person, including independent contractors, subcontractors, and direct employees of the operator, may perform or directly supervise the job functions listed in paragraph (b) of this section on behalf of the operator unless that person has satisfactorily completed the initial operator's hazardous materials training program within 30 days from the date of hire or start of a related job function, and recurrent training every 24 calendar months thereafter.

(h) A person who has not yet satisfactorily completed the required initial operator's hazardous materials training program within 30 days from the date of hire or start of a related job function listed in paragraph (b) of this section, may perform those job functions for not more than 30 days from the date of hire or start of a related job function, if the person is under the direct visual supervision of a person who is authorized by the operator to supervise that person and who has successfully completed the operator's FAA-approved initial or recurrent training program within the past 24 months.

(i) Each operator using a person under the exception in paragraph (h) of this section must maintain a record for that person. The records must be available upon request at the location where the trained person performs or directly supervises the job function specified in paragraph (b) of this section. The record must include—

(1) A signed statement from an authorized representative of the operator authorizing the use of the person in accordance with the exception;

(2) The date of hire or change in job function;

(3) The person's name and assigned job function;

(4) The name of the supervisor of the job function; and

(5) The date the person is to complete hazardous materials training in accordance with the operator's approved hazardous materials training program.

(j) An operator that uses or assigns a person to perform or directly supervise a job function specified in paragraph (b) of this section, when that person also performs or directly supervises the same job function for another package delivery operator under this subpart, part 121 certificate holder, or part 135 certificate holder, need only train that person in its own policies and procedures regarding those job functions, if all of the following are met:

(1) The operator using this exception receives written verification from the person designated to hold the training records representing the other package delivery operator, part 121 certificate holder, or part 135 certificate holder that the person has satisfactorily

completed hazardous materials training for the specific job function under the other package delivery operator, part 121 certificate holder, or part 135 certificate holder's FAA approved hazardous material training program.

(2) The package delivery operator, part 121 certificate holder, or part 135 certificate holder who trained the person has the same part 108 authorization in paragraph (a) of this section, equivalent part 121 operations specification, or equivalent part 135 operations specifications regarding the acceptance, handling, and transport of hazardous materials as the operator using this exception.

(k) A person who satisfactorily completes recurrent hazardous materials training in the calendar month before, or the calendar month after, the month in which the recurrent training is due, the subsequent calendar renewal month will remain the same. If the person completes this training earlier than the month before it is due, the month of the completion date becomes their new anniversary month.

(l) Each operator must develop and maintain processes to conduct safety risk assessments, as outlined in §5.55 of this chapter, in support of an authorization or amendments thereto, permitting the acceptance, handling, and transportation of hazardous materials in paragraph (a)(1) of this section and, when appropriate, the authorization in paragraph (a)(2) of this section. Safety risk assessments must be submitted to FAA and be acceptable to the Administrator. Safety risk assessments must also be inclusive of risks to people and property on the ground resulting from the carriage of hazardous materials.

§ 108.575 Agricultural operations.

(a) Except as provided in subpart D of this part, no operator may conduct agricultural operations with an unmanned aircraft under this part without, or in violation of, a certificate issued in accordance with this subpart. Agricultural operation means the operation of an aircraft for the purpose of—

(1) Dispensing any economic poison;

(2) Dispensing any other substance intended for plant nourishment, soil treatment, propagation of plant line, or pest control; or

(3) Engaging in dispensing activities directly affecting agriculture, horticulture, or forest preservation, but not including the dispensing of live insects.

(b) Dispensing operations must not be conducted directly over people, unless otherwise authorized by the Administrator.

(c) Operations are limited to Category 3 population density areas or lower, in accordance with § 108.185, unless otherwise authorized by the Administrator.

(d) No operator may dispense, or cause to be dispensed, from an unmanned aircraft, any material or substance in a manner that creates a hazard to persons or property on the surface.

(e) No operator may dispense, or cause to be dispensed, from an unmanned aircraft, any economic poison that is registered with the U.S. Department of Agriculture under the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 135 and 135k)—

(1) For a use other than that for which it is registered;

(2) Contrary to any safety instructions or use limitations on its label; or

(3) In violation of any Federal, State, or local law or regulation.

(f) Paragraph (e) of this section does not apply to any operator dispensing economic poisons for experimental purposes under—

(1) The supervision of a Federal or State agency authorized by law to conduct research in the field of economic poisons; or

(2) A permit from the U.S. Department of Agriculture issued pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 135 and 135k).

(g) Operators conducting agricultural operations under this subpart must have and keep current a comprehensive training program that is tailored for their proposed operation and contains, at a minimum—

(1) Steps to be taken before starting operations, including survey of the area to be worked;

(2) Safe handling and storage of economic poisons and the proper disposal of used containers for those poisons;

(3) The general effects of economic poisons and agricultural chemicals on plants, animals, and persons, with emphasis on those normally used in the areas of intended operations; and the precautions to be observed in using poisons and chemicals;

(4) Primary symptoms of poisoning of persons from economic poisons, the appropriate emergency measures to be taken, and the location of poison control centers;

(5) Performance capabilities and operating limitations of the unmanned aircraft to be used; and

(6) Safe flight and application procedures.

(h) Operators must ensure that all operations personnel supervising or participating in an agricultural unmanned aircraft operation have completed the operator's training program required pursuant to paragraph (g) of this section.

§ 108.580 Aerial surveying operations.

(a) Except as provided in subpart D of this part, no operator may conduct photography, videography, mapping, inspecting, or patrolling operations with an unmanned aircraft under this part without, or in violation of, an aerial surveying certificate issued in accordance with this subpart.

(b) Operations at a gross weight of more than 110 pounds are limited to Category 4 population density areas or lower, in accordance with § 108.185, unless otherwise authorized by the Administrator.

§ 108.585 Civic interest operations.

(a) Except as provided in subpart D of this part, no operator may conduct operations in support of civic interest with an unmanned aircraft under this part without, or in violation of, a civic interest certificate issued in accordance with this subpart. Operations in the civic interest operations consists of—

(1) Forest and wildlife conservation, including wildfire recovery, wildlife conservation, and tracking climate change; and

(2) Operations in support of public safety, including fire, accident, and disaster response where the operator has coordinated and deconflicted operations with the law enforcement or government emergency management agency responsible for the incident response in advance and throughout the duration of the operation.

(b) Operations must be conducted by an entity contracted to a Federal, State, local, Tribal, or territorial government for the performance of the civic interest operation.

(c) Operations at a gross weight of more than 110 pounds are limited to Category 4 population density areas or lower, in accordance with § 108.185, unless otherwise authorized by the Administrator.

(d) Notwithstanding the restrictions in paragraph (c) of this section and § 108.185, operations may be conducted over any population density to the extent necessary to safeguard lives in imminent threat.

SUBPART F—Maintenance and Alterations

§ 108.600 General.

(a) This subpart prescribes rules for the maintenance and alterations of unmanned aircraft systems operating under this part.

(b) This subpart does not apply to—

(1) The maintenance or alterations of automated data service provider equipment approved under part 146 of this chapter;

(2) The maintenance or alteration of an unmanned aircraft and its associated elements that is operated and maintained in accordance with parts 43 and 91 of this chapter; or

(3) The maintenance or alterations of associated elements not under the direct control of the operator.

§ 108.605 Persons performing maintenance and alterations.

No person may perform maintenance or alteration to an unmanned aircraft system with an airworthiness acceptance until the operator has—

(a) Determined the person is qualified, through basic skills and knowledge obtained in accordance with § 108.315 to perform the maintenance or alteration; and

(b) Authorized the person to perform the maintenance or alteration.

§ 108.610 Unmanned aircraft maintenance.

(a) Each operator authorizing or performing maintenance on unmanned aircraft system must ensure the methods, techniques, and practices prescribed in the unmanned aircraft manufacturer's maintenance instructions, as provided in § 108.720(a)(2), are used and ensure the unmanned aircraft system remains in a condition for safe operation.

(b) Each operator of an unmanned aircraft must have the unmanned aircraft system inspected in accordance with the methods, and at the intervals, prescribed in the unmanned aircraft manufacturer’s inspection criteria in the maintenance instructions.

(c) Except as provided in § 108.555, prior to operating the unmanned aircraft system each operator of an unmanned aircraft system must have any inoperative equipment and any items not in a condition for safe operation repaired as prescribed in the manufacturer’s maintenance instructions.

§ 108.615 Life-limited parts.

(a) No person may operate an unmanned aircraft with parts installed that have exceeded the life limits specified in the manufacturer’s maintenance instructions.

(b) The operator must track the status of life-limited parts using a system that uniquely identifies the part and tracks the associated life-limiting factor of the part, through removals and reinstallations.

(c) When a life-limited part is removed that has reached its life limit or is not intended to be re-installed, the operator must disposition the part in a manner that clearly identifies the part’s life-limited status or prevents its reinstallation. This includes, but is not limited to the following:

(1) Any method that uniquely identifies the part and its status, such as a tag, record, document, or other marking, that is made or attached to the life-limited part.

(2) Segregation of the life-limited part by physically storing it separately from other parts that are eligible for installation.

(3) Mutilation of the life-limited part that renders the part beyond economical repair and incapable of being reworked to appear to be in a condition for safe operation.

(d) An operator who removes a life-limited part and later sells or otherwise transfers that part must transfer the part with the tag, record, document, or other marking that clearly identifies the life-limited status of the part, unless the part is mutilated before it is sold or transferred.

§ 108.620 Unmanned aircraft batteries.

(a) Each operator using batteries as a required in-flight power source must have a battery monitoring program.

(b) Operators must remove from service any batteries that indicate significant degradation or inadequate levels of performance.

§ 108.625 Repairs and alterations.

(a) The operator must accomplish repairs or alterations to unmanned aircraft systems under this part in accordance with procedures authorized by the manufacturer as provided in § 108.755.

(b) The replacement of parts or assemblies with identical or alternative parts or assemblies specified by the manufacturer is not considered a repair or alteration for the purposes of this section.

§ 108.630 Operation after maintenance or alterations.

(a) No person may operate any unmanned aircraft system that has undergone maintenance or alteration unless—

(1) The unmanned aircraft system has been approved for return to service by a person authorized by the operator; and

(2) The operator ensures the maintenance record entry required by 108.40(d) is completed.

(b) No person may operate an unmanned aircraft system that has been maintained or altered in a manner that may have appreciably changed the flight characteristics or substantially affected the operation of the unmanned aircraft system until an operational check of the unmanned aircraft has been performed and it is found to be in a condition for safe operation.

(c) Flights performed as part of an operational check under paragraph (b) may be conducted under the operator's existing permit or certificate but must not be conducted over people or moving vehicles.

SUBPART G—Procedures for Unmanned Aircraft System Airworthiness Acceptance

§ 108.700 Airworthiness acceptance generally.

(a) *Purpose*. This subpart prescribes procedures and standards for airworthiness acceptance of unmanned aircraft systems under this part.

(b) *Eligibility*. To be eligible to apply for airworthiness acceptance, the manufacturer—

(1) Must be a manufacturer of an unmanned aircraft system in—

(i) The United States; or

(ii) A country with which the United States has a Bilateral Airworthiness Agreement addressing unmanned aircraft systems or Bilateral Aviation Safety Agreement with associated Implementation Procedures for Airworthiness addressing unmanned aircraft systems, or an equivalent airworthiness agreement; and

(2) The manufacturer's authorized representative or agent must be trained and certified on the requirements associated with the declaration of compliance by an organization that certifies and trains quality assurance staff in accordance with an FAA-accepted consensus standard.

§ 108.705 Means of compliance.

(a) *Means of compliance generally*.

(1) A voluntary consensus standards body may submit a voluntary consensus standard to FAA for acceptance as a means of compliance for satisfying a requirement of this subpart or subpart H of this part other than requirements pertaining to noise.

(2) If the Administrator determines the voluntary consensus standards body's proposed means of compliance satisfies the requirements of this subpart and subpart H of this part for which it has been submitted, the Administrator will notify the voluntary consensus standards body that the means of compliance has been accepted.

(3) The Administrator will publish a document in the *Federal Register* announcing the acceptance of the means of compliance, as proposed or with modification, to the public.

(b) *Means of compliance for noise.*

(1) A voluntary consensus standards body may submit a voluntary consensus standard to FAA for approval as a means of compliance for satisfying the applicable noise requirements of this part and part 36 of this chapter.

(2) If the Administrator determines the voluntary consensus standards body's means of compliance satisfies the requirements of part 36 of this chapter, the Administrator will notify the voluntary consensus standards body that the means of compliance for noise is approved.

(3) The Administrator will publish a document in the *Federal Register* announcing approval of the noise means of compliance to the public.

§ 108.710 Compliance with design, test, production, noise, and airworthiness requirements.

(a) To seek airworthiness acceptance for an unmanned aircraft system, a manufacturer must comply with this subpart and subpart H of this part and must submit a declaration of compliance to the Administrator that meets the requirements of § 108.715.

(b) To receive airworthiness acceptance, an unmanned aircraft system must meet the following requirements:

(1) Except as otherwise provided in this section, the requirements of this subpart and subpart H of this part must be met through the use of an FAA-accepted means of compliance.

(2) The noise requirements of part 36 of this chapter and this part may be met by either the use of an FAA-approved means of compliance or other applicable methods specified in part 36.

(3) The cybersecurity requirements of § 108.875 may be met either by the use of an FAA-accepted means of compliance or by any other standard acceptable to the Administrator for purposes of meeting the requirements of that section.

(c) The individual who determines compliance with the applicable consensus standards must be trained to determine whether a manufacturer's unmanned aircraft system demonstrates compliance with the provisions of any applicable FAA-accepted or approved consensus standards.

§ 108.715 Declaration of compliance.

(a) To apply for airworthiness acceptance, a manufacturer must submit a declaration of compliance for FAA acceptance in a form or manner acceptable to the Administrator.

(b) A declaration of compliance must include the following:

(1) The manufacturer's name, physical address, telephone number, and email address.

(2) The unmanned aircraft make, model, series, serial number, and date of manufacture.

(3) The operations the manufacturer has specified may be safely conducted using the unmanned aircraft system.

(4) The means of compliance used to determine the unmanned aircraft system's compliance with design, test, production, and airworthiness requirements of this subpart and subpart H of this part.

(5) The means of compliance for noise or other method of compliance specified in part 36 of this chapter used for compliance used to determine the unmanned aircraft system's compliance with noise requirements.

(6) The standard used, if another standard acceptable to the Administrator is used to meet the cybersecurity requirements of § 108.875.

(7) A declaration that the unmanned aircraft system meets the requirements of § 108.710.

(8) A declaration that the determination required by paragraph (b)(7) of this section was made by an individual who meets the requirements of § 108.710(c).

(9) A declaration that the unmanned aircraft system conforms to the manufacturer's design data and that the manufacturer used a quality assurance system that meets the requirements of § 108.730.

(10) A declaration that the manufacturer will make available to any registered owner, the National Transportations Safety Board, or the Administrator the documents specified in § 108.720 upon request.

(11) A declaration that the manufacturer will support the unmanned aircraft systems after airworthiness acceptance by implementing and maintaining a documented continued operational safety program as required in § 108.740.

(12) A declaration that the manufacturer will monitor and correct safety-of-flight issues through the issuance of safety bulletins following airworthiness acceptance.

(13) A declaration that the manufacturer has inspected the unmanned aircraft system in accordance with § 108.735.

(14) A declaration that at the request of the Administrator, the manufacturer will provide unrestricted access to its facilities and to all data and documentation and allow the Administrator to witness any tests necessary to determine compliance with this section or other applicable requirements of this chapter, or other information as requested by the Administrator.

(15) A declaration that the manufacturer has established and will maintain a quality assurance system that meets the requirements of § 108.730.

(16) A declaration that the unmanned aircraft system complies with subpart F of part 89 of this chapter.

(c) The declaration of compliance must be signed by the manufacturer's authorized representative or agent who is trained and certified on the requirements associated with the declaration of compliance by an organization that certifies and trains quality assurance staff in accordance with an FAA-accepted means of compliance.

(d) If the manufacturer has successfully met the applicable requirements of this subpart and subpart H of this part, the Administrator will accept the declaration of compliance and notify the manufacturer of the acceptance.

§ 108.720 Documents.

(a) The manufacturer of an unmanned aircraft system with, or seeking, an airworthiness acceptance must prepare and retain the following documents.

(1) Operating instructions that include but are not limited to:

(i) Procedures and limitations to accommodate environmental conditions likely to be encountered in the unmanned aircraft system's intended operations, including normal, abnormal, and emergency procedures.

(ii) A listing of the manufacturer-designated operations, as defined in §§ 108.400 and 108.500, that may be safely conducted using the unmanned aircraft system.

(iii) The manufacturer-designated ratio of unmanned aircraft to flight coordinator.

(iv) A statement that the aircraft has demonstrated compliance with part 36 of this chapter, the demonstrated noise levels of the aircraft, and the following statement: "No determination has been made by the Federal Aviation Administration whether the noise levels of this aircraft are or should be acceptable for operation in any location."

(v) A list of parts and installed equipment necessary for the safe operation of the aircraft, or a list of equipment that is allowed to be inoperative.

(2) Maintenance instructions that include procedures necessary to ensure continued safe operation, including but not limited to inspection criteria, repairs, and life limits, of the unmanned aircraft and its associated elements.

(3) A configuration control document that defines all acceptable configurations of both the unmanned aircraft and associated elements.

(b) The manufacturer of an unmanned aircraft system with an airworthiness acceptance must make these documents readily available to any registered owner, the National Transportation Safety Board, or the Administrator upon request.

§ 108.725 Flight data.

Each manufacturer of an unmanned aircraft system with an airworthiness acceptance must:

(a) Establish and maintain a flight data collection system for all unmanned aircraft system models produced subject to the requirements of this part. This system must include the capture and storage of flight data provided by the aircraft operator per § 108.45(a)(2).

(b) Retain flight data records for a minimum of 2 years after the collection of the data.

(c) Implement adequate security measures to protect the confidentiality and integrity of collected flight data.

(d) Upon request from the Administrator, provide access to the collected flight data in a manner acceptable to the Administrator.

§ 108.730 Quality assurance system.

The unmanned aircraft system must be designed, produced, and tested under a manufacturer-established and documented quality assurance system that demonstrates each unmanned aircraft system produced conforms to its design and is in a condition for safe operation.

§ 108.735 Production.

Each manufacturer must inspect and test each unmanned aircraft system under manufacturer-established and documented production procedures to demonstrate that—

(a) The unmanned aircraft system has no hazardous operating characteristics or design features;

(b) The unmanned aircraft system is in a condition for safe operation; and

(c) The unmanned aircraft can safely conduct any permitted or certificated operations in §§ 108.400 and 108.500 for which the unmanned aircraft is intended, as designated by the manufacturer.

§ 108.740 Continued operational safety program.

(a) Each manufacturer of an unmanned aircraft system that has received airworthiness acceptance must implement and maintain a documented continued operational safety program.

(b) The continued operational safety program must include—

(1) Requirements monitoring for, identifying, and resolving in-service safety issues or noncompliance with this subpart and subpart H of this part, including

implementing any airworthiness directives pertaining to type-certificated products or appliances, if installed;

(2) Provisions for the issuance of safety bulletins;

(3) A process for notifying the Administrator and all owners of the unmanned aircraft system of all safety issues, including their planned resolution; and

(4) A process for providing advance notice to the Administrator and all owners of unmanned aircraft system of a continued operational safety program discontinuance or provider change.

(c) A manufacturer of an unmanned aircraft system that has received airworthiness acceptance must report any identified hazard involving its unmanned aircraft system models to the Administrator within 10 calendar days, accompanied by the relevant flight data.

§ 108.745 Inspections and audits.

Each manufacturer, with a valid flight test permit or who submits a declaration of compliance, of an unmanned aircraft system for airworthiness acceptance must:

(a) Upon request, allow the Administrator to inspect its facilities, technical data, reports, any manufactured unmanned aircraft system in its possession, and any other necessary information to determine compliance with this part.

(b) Upon request, allow the Administrator to witness any tests to determine compliance with this part.

(c) Submit to independent inspections or audits conducted by the voluntary consensus standards body, or its delegate, that submitted a means of compliance the manufacturer used to meet the requirements of this subpart and subpart H of this part.

(d) Upon request, make available to the Administrator results from independent inspections and audits completed under paragraph (c) of this section.

§ 108.750 Design changes.

(a) Only the manufacturer of the unmanned aircraft system that has received airworthiness acceptance may make design changes to the unmanned aircraft.

(b) The manufacturer must demonstrate compliance with the requirements of this subpart and subpart H of this part for any design change to an unmanned aircraft system that has received airworthiness acceptance.

(c) Each manufacturer of the unmanned aircraft system that has received airworthiness acceptance must update all documentation affected by the design change, including the operating instructions, maintenance instructions, and configuration control document required by § 108.720.

§ 108.755 Repairs and alterations.

Each manufacturer of an unmanned aircraft system with an airworthiness acceptance must do the following:

(a) Authorize any repair or alteration under § 108.625.

(b) Ensure the repaired or altered unmanned aircraft system continues to comply with the requirements of this subpart and subpart H of this part.

(c) Conduct testing required by §§ 108.930 and 108.935 for any repair or alteration that affects the flight characteristics or demonstrated reliability.

§ 108.760 Record retention.

(a) *Retention requirement*. Each manufacturer of an unmanned aircraft system that has received airworthiness acceptance must retain and make available to the

Administrator, upon request, all supporting information used to demonstrate compliance with the requirements of this subpart and subpart H of this part.

(b) *Duration.* Each manufacturer who submits a declaration of compliance for an unmanned aircraft system must retain the information described in paragraph (a) of this section for as long as it supports the continued operational safety of the unmanned aircraft system listed on the declaration of compliance and for 2 years following any cessation of support for the continued operational safety program.

§ 108.765 Rescission.

(a) *Rescission of Means of Compliance.* The Administrator may rescind its acceptance of a means of compliance if the Administrator determines that a means of compliance does not meet any of the requirements of this subpart and subpart H of this part.

(b) *Rescission of Airworthiness Acceptance.* The Administrator may rescind airworthiness acceptance for an unmanned aircraft system if the Administrator determines the unmanned aircraft system presents safety concerns related to design or performance, or if the manufacturer of the unmanned aircraft system that has received airworthiness acceptance has not complied with the requirements of this subpart and subpart H of this part.

(c) *Notification of Rescission of Airworthiness Acceptance.* The Administrator will notify the manufacturer of the unmanned aircraft system that has received airworthiness acceptance of proposed rescission in the following manner:

(1) The Administrator will issue notice setting forth the Agency's basis for proposed rescission.

(2) The manufacturer of the unmanned aircraft system that has received airworthiness acceptance will have 30 calendar days to submit evidentiary information to refute proposed rescission.

(3) The Administrator will consider the manufacturer's response to proposed rescission, and may request any necessary additional information, stay rescission, or issue a notice rescinding the declaration of compliance.

(4) If the Administrator does not receive the response from the manufacturer of the unmanned aircraft system that has received airworthiness acceptance within 30 calendar days from the date of the issuance of proposed notice, the Administrator may issue a notice rescinding the declaration of compliance.

(d) *Emergency rescission of airworthiness acceptance.* (1) If the Administrator determines an emergency exists and public safety requires an immediate rescission of airworthiness acceptance, the Administrator may issue an order rescinding a declaration of compliance without initiating the process in paragraph (c) of this section.

(2) The rescission would remain in effect until the basis for issuing the rescission no longer exists.

SUBPART H—Design and Testing Requirements for Airworthiness Acceptance

§ 108.800 General.

(a) *Purpose*. This subpart prescribes design and performance standards for airworthiness acceptance of unmanned aircraft systems under this part.

(b) *Eligibility*. To be eligible for airworthiness acceptance, an unmanned aircraft system must—

(1) Meet the requirements of subpart G and this subpart,

(2) Not be an airship; and

(3) Not be designed to allow for any person on board during operations.

§ 108.805 Size, weight, and speed.

The unmanned aircraft must, unless otherwise authorized by the Administrator—

(a) Have a wingspan or lateral span not to exceed 25 feet (7 meters);

(b) Not have a combined total weight greater than 1,320 pounds (600 kilograms), including anything attached to or carried by the aircraft; and

(c) Be limited not to exceed 87 knots ground speed.

§ 108.810 Simplified user interaction.

The unmanned aircraft system must possess simplified user interaction design features during all phases of flight that meet the following:

(a) The unmanned aircraft must be consistently and predictably controllable, stable, and maneuverable with automated flight controls, without manual flight control being necessary or available, at all flight and ground loading configurations within the unmanned aircraft's prescribed weight limits.

(b) The unmanned aircraft must be resistant to operation outside of the flight design envelope.

(c) The unmanned aircraft must not lose control due to the degradation or nonavailability of external services, systems, operator input, or signals.

(d) The unmanned aircraft system must have the ability to discontinue the flight as soon as practicable and in a manner that does not create a safety hazard.

§ 108.815 Signal monitoring and transmission.

(a) The unmanned aircraft must be designed to receive from and transmit to the associated elements all information required for safe flight and operation.

(b) The unmanned aircraft must be designed to execute a safe predetermined action when reaching the link timeout.

§ 108.820 Position, navigation, and timing.

The unmanned aircraft system must be capable of sustaining position, navigation, and timing with accuracy to maintain safe distance in the airspace in which the unmanned aircraft operates.

§ 108.825 Collision avoidance.

The unmanned aircraft system must be designed with the capability to avoid aircraft as required in accordance with § 108.195.

§ 108.830 Anti-collision lighting.

(a) Anti-collision lights must—

(1) Be installed on the aircraft.

(2) Have intensities that, when operating at night, are visible for at least 3 statute miles; and

(3) Have flash rate, colors, and fields of coverage to enhance visibility.

(b) Consistent with operating requirements in § 108.110, the design may allow for the deactivation or reduction of intensity of the anti-collision lights.

§ 108.835 Position lighting.

If the unmanned aircraft has a wingspan or lateral span equal to or greater than 96 inches, the unmanned aircraft must—

(a) Be equipped with position lights that include a red light on the left side of the aircraft, a green light on the right side of the aircraft, spaced laterally as far apart as practicable, and a white light facing aft, located on an aft portion of the aircraft or on the wing tips; or

(b) Have operating instructions that include a limitation prohibiting night operations.

§ 108.840 Power generation, storage, and distribution system.

(a) The unmanned aircraft system must be designed to provide power for all connected electrical loads.

(b) No single failure or malfunction of the unmanned aircraft power generation, storage, and distribution system shall result in a loss of flight or loss of control.

§ 108.845 Propulsion system.

(a) The propulsion system must possess the necessary reliability, durability, and endurance for safe flight without failure, malfunction, or excessive wear, throughout the expected life cycle of the propulsion system.

(b) The propulsion system must be designed not to exceed safe operating limits under normal operating conditions.

(c) The propulsion system must be designed so that a loss of power or a power failure does not lead to loss of control of the unmanned aircraft.

§ 108.850 Fuel system.

If equipped, the unmanned aircraft fuel system must:

(a) Provide a means to remove or isolate the fuel stored in the system from the rest of the aircraft safely.

(b) Be designed to retain fuel under all likely operating conditions.

(c) Have ventilation and drainage where flammable fluid or vapor may exist.

§ 108.855 Fire protection.

The unmanned aircraft must be designed to sustain static and dynamic deceleration loads without causing structural damage to the fuel or electrical system components or their attachments.

§ 108.860 Software.

(a) All software that may affect the safe operation of the unmanned aircraft system must function properly and have dependability.

(b) All software changes made throughout the life cycle of the unmanned aircraft system must be tracked, controlled, and documented through a configuration management system.

(c) All software defects and modifications must be captured and recorded through a problem reporting system.

§ 108.865 Electronic hardware.

(a) Unmanned aircraft system electronic hardware must perform its intended function throughout the intended operating and environmental limitations.

(b) Unmanned aircraft system electronic hardware must be designed and installed so their operation does not have an adverse effect on the safe operation of the unmanned aircraft.

§ 108.870 Systems and equipment.

(a) The unmanned aircraft system must have all systems and equipment necessary for safe flight, taking into account any systems or equipment necessary to operate the unmanned aircraft in the intended airspace class or that are required for the operation.

(b) Installed systems and equipment must perform their intended function within the intended operating and environmental limitations.

(c) No probable failure shall result in a hazard.

§ 108.875 Cybersecurity.

The unmanned aircraft system equipment, systems, and networks, addressed separately and in relation to other systems, must be protected from unauthorized electronic interactions.

§ 108.880 Associated elements design and performance requirements.

(a) Each associated element, addressed separately and in relation to the unmanned aircraft and any other associated elements, must be designed to perform its intended function under all operating conditions specified in the unmanned aircraft system operating instructions.

(b) Any probable failure or malfunction of an associated element or component thereof must not result in a hazard.

(c) The associated element must be designed to continuously monitor, display, and transmit information required for safe flight and operation.

§ 108.885 Suitability and durability of materials.

The suitability and durability of materials used in the unmanned aircraft system must account for the effects of all operational and environmental conditions expected in service.

§ 108.890 Operating environment conditions.

(a) The unmanned aircraft must have design characteristics to accommodate environmental conditions likely to be encountered during its intended operations; or

(b) The unmanned aircraft system must have the capability to identify and avoid or exit those environmental conditions in which the unmanned aircraft is not designed to operate.

§ 108.895 Lightning protection.

(a) The unmanned aircraft system must be capable of maintaining continued flight and control in the event of a lightning strike; or

(b) The operating instructions must include an operating limitation explicitly prohibiting flight operations in weather conditions that are conducive to lightning activity.

§ 108.900 Flight data recorder.

(a) The unmanned aircraft system must be equipped with a flight data recorder system that captures and records onboard systems and flight data from initial power up through shutdown.

(b) The recorded data must be in a standardized format and readily accessible to the Administrator or National Transportation Safety Board, and readable without requiring proprietary software.

§ 108.905 Flight data analysis.

The unmanned aircraft system must be designed to provide the manufacturer of the unmanned aircraft system that has received airworthiness acceptance with captured and recorded data from flight operations in order to conduct trend analysis, failure identification, and root cause analysis.

§ 108.910 Noise.

The unmanned aircraft must meet the applicable noise requirements of part 36 of this chapter.

§ 108.915 Placards.

The unmanned aircraft system must display all placards necessary for safe handling and operation.

§ 108.920 Identification and marking.

The unmanned aircraft identification and registration marking must comply with the requirements of part 45 of this chapter.

§ 108.925 Additional design and performance requirements for specific operational purposes.

(a) The unmanned aircraft system must be designed to account for any operational and environmental conditions and hazards, for any manufacturer-designated permitted or certificated operations as defined in §§ 108.400 and 108.500.

(b) For unmanned aircraft designed for the carriage of hazardous materials, the unmanned aircraft or transport container must have sufficient structural integrity to contain the hazardous material without allowing leakage or release of the material in the event of a hard landing or crash.

§ 108.930 Developmental testing.

(a) Each manufacturer must conduct flight tests of the unmanned aircraft system to achieve or validate the design and performance requirements of this subpart in an operationally representative environment and throughout the flight envelope.

(b) Analysis may be used in combination with flight testing to validate compliance with this subpart. Any simulations used for testing must be validated using an FAA accepted means of compliance.

(c) Before proceeding with function and reliability testing under § 108.935, the manufacturer must ensure the unmanned aircraft system's configuration has no hazardous operating characteristics or design features and is safe for the intended operation.

(d) Testing must validate that a probable failure of the unmanned aircraft system will not result in a loss of flight or control of the unmanned aircraft.

§ 108.935 Function and reliability testing.

(a) Each manufacturer must perform function and reliability testing for each unmanned aircraft system make, model and configuration.

(b) The make, model, and configuration of each unmanned aircraft system must perform at least 150 flight hours without experiencing any failure leading to—

(1) Loss of flight,

(2) Loss of control,

(3) Non-conformance with unmanned aircraft system traffic management,

(4) Loss of safe distance; or

(5) Results in an unplanned landing.

(c) Testing must be conducted in an operationally representative environment, of §§ 108.400 and 108.500, as designated by the manufacturer.

PART 119—CERTIFICATION: AIR CARRIERS AND COMMERCIAL OPERATORS

34. The authority citation for part 119 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40101, 40102, 40103, 40113, 44105, 44106, 44111, 44701-44717, 44722, 44901, 44903, 44904, 44906, 44912, 44914, 44936, 44938, 46103, 46105; sec. 215, Pub. L. 111-216, 124 Stat. 2348.

35. Amend § 119.1 by adding paragraph (e)(12) to read as follows:

§ 119.1 Applicability.

* * * * *

(e) * * *

(12) Unmanned aircraft system operations conducted under part 108 of this chapter.

PART 133— ROTORCRAFT EXTERNAL-LOAD OPERATIONS

36. The authority citation for part 133 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701-44702.

§ 133.1 [Amended]

37. Amend § 133.1 by adding the words “or 108” after the words “part 107” in the introductory text.

PART 135— OPERATING REQUIREMENTS: COMMUTER AND ON DEMAND OPERATIONS AND RULES GOVERNING PERSONS ON BOARD SUCH AIRCRAFT

38. The authority citation for part 135 continues to read as follows:

Authority: 49 U.S.C. 106(f), 40113, 41706, 44701-44702, 44705, 44709, 44711-44713, 44715-44717, 44722, 44730, 45101-45105; Pub. L. 112-95, 126 Stat. 58 (49 U.S.C. 44730)

§ 135.1 [Amended]

39. Remove the period at end of paragraphs (a)(1) and (a)(7) and in its place add the phrase ", except when those operations are conducted under the provisions of part 108 of this chapter."

PART 137— AGRICULTURAL AIRCRAFT OPERATIONS

40. The authority citation for part 137 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40103, 40113, 44701-44702.

§ 137.1 [Amended]

41. Amend § 137.1 by adding the phrase "Except for aircraft subject to part 108 of this chapter," at the beginning of the introductory text of paragraph (a).

42. Add part 146 to subchapter H of chapter I to read as follows:

PART 146— AUTOMATED DATA SERVICE PROVIDERS

Subpart A—General

Sec.
146.1 Applicability.
146.5 Definitions.
146.10 General requirements.
146.15 Falsification, reproduction, alteration, or omission.

Subpart B—Certificate

Sec.
146.100 Application.
146.105 Applicant information.
146.110 Service levels.
146.115 Certification requirements.
146.120 Evaluation of application.
146.125 Obligation to update.
146.130 Terms.

Subpart C—Service Authorizations

Sec.
146.200 Request for authorization.
146.205 Authorization requirements.
146.210 Evaluation of request.

Subpart D—Certificated Service Providers

Sec.
146.300 Minimum requirements.
146.305 Cyber and data security.
146.310 Quality management system.
146.315 Change management.
146.320 Training program.
146.325 Reportable occurrences.
146.330 Record retention.

Subpart E—Authorized Service Requirements

Sec.
146.400 Authorized service data exchange requirements.
146.405 Software updates.
146.500 Revocations and suspension.
146.505 Petition to reconsider.

Subpart F—Due Process

Sec.
146.500 Revocations, Emergency Suspensions, and Requests for Reconsideration.
146.505 Petition to reconsider.

Authority: 49 U.S.C. 106(f), 106(g), 40101, 40103(b), 44701(a)(5), 44702, 44707, 46105(c), 46110, 44802. Pub. L. 115-254 sec. 342, sec. 360, sec. 376. Pub. L. 118-63 sec. 932.

Subpart A—General

§ 146.1 Applicability.

(a) *General*. This part applies to anyone who seeks a certificate to provide automated data services that support aircraft operations using a distributed computational system for the purpose of showing compliance with requirements in this chapter.

(b) *Exceptions*. This part does not apply to—

(1) Services used to comply with requirements in part 21 of this chapter;

(2) Services used to comply with requirements in subchapter J of this chapter;

(3) Services that are provided through the Low Altitude Authorization and Notification Capability (LAANC); and

(4) Services provided to aircraft with an onboard pilot in command.

§ 146.5 Definitions.

The following definitions apply to this part. If there is a conflict between the definitions of this part and the definitions specified in § 1.1 of this chapter, the definitions in this part control for purposes of this part:

Authorized services means those services a certificated automated data service provider is authorized to provide under this part.

Automated data service provider means a person using a distributed computational system to provide automated data services that support aircraft operations.

Distributed computational system means a system that relies on one or multiple piece(s) of software, running simultaneously on one or multiple computer(s), to provide a set of functions.

Major update means a change to the software version that includes substantial changes to the application programming interface (API), or the features and functionality, such that the new version is not backward compatible with previous versions.

Minor update means a change to the software version that changes the application programming interface (API), may include new features or functionality, and remains backward compatible.

Patch update means a change to the software version that does not change the application programming interface (API) and is used for backward-compatible bug fixes and performance improvements.

Third-party vendor means a person that provides a distributed software capability that is necessary for a certificated service provider to meet the requirements of this part but for which the certificated service provider does not have direct control over the personnel, software code, or organizational processes.

§ 146.10 General requirements.

A person may obtain a certificate to provide automated data services using a distributed computational system for the purpose of showing compliance with the requirements under this chapter. Only those automated data services authorized in accordance with subpart C of this part may be used to show compliance with requirements under this chapter.

§ 146.15 Falsification, reproduction, alteration, or omission.

(a) *Prohibited acts*. No person may make or cause to be made any fraudulent or intentionally false entry in—

(1) Any application under this part (including in any document used in support of that application);

(2) Any record or report that is made, kept, or used to show compliance with any requirement under this part;

(3) Any reproduction, for fraudulent purpose, of any application (including any document used in support of that application), record, or report under this part; or

(4) Any alteration, for fraudulent purpose, of any application (including any document used in support of that application), record, or report under this part.

(b) *Prohibited omissions*. No person may, by omission, knowingly conceal or cause to be concealed, a material fact in—

(1) Any application made under this part (including in any document used in support of that application); or

(2) Any record or report that is made, kept, or used to show compliance with any requirement under this part.

(c) *Penalties*. The commission by any person of an act prohibited under paragraphs (a) or (b) of this section is a basis for any one or any combination of the following:

(1) Suspending or revoking any certificate, approval, or authorization issued by FAA and held by that person.

(2) A civil penalty.

(3) The denial of a certificate, approval, or authorization.

Subpart B—Certificate

§ 146.100 Application.

Any person seeking to obtain a certificate to provide automated data services using a distributed computational system to comply with requirements under this chapter must submit the information identified in this subpart in a form and manner acceptable to the Administrator.

§ 146.105 Applicant information.

(a) *Contact information*. The applicant must provide the name, address of principal place of business, telephone number, and email address for the person seeking a certificate.

(b) *Ownership structure*.

(1) Corporate applicants must submit documentation identifying the name and address of each stockholder who owns 5 percent or more of the total voting stock of the corporation, and if that stockholder is not the sole beneficial owner of the stock, the name and address of each beneficial owner. An individual is considered to own the stock owned, directly or indirectly, by or for a spouse, children, grandchildren, or parents.

(2) Non-corporate applicants must submit documentation identifying the name and address of each person having a financial interest in the entity.

(c) *Accountable executive*. The applicant must provide a name, address, telephone number, and email address for the accountable executive, as defined in part 5 of this chapter.

(d) *Authorization to do business*. The applicant must provide documentation demonstrating its authority to conduct business in the United States.

(e) *Other*. The applicant must provide any other relevant documentation the Administrator deems necessary to verify the entity's identity, corporate ownership, and authority to conduct business in the United States.

§ 146.110 Service levels.

(a) *General*. An applicant may be certificated at a service level described in this section.

(b) *Service levels*.

(1) Level 1: Services that support operations conducted under part 108 of this chapter and does not rely on regulatory relief to operate under that part.

(2) Level 2: Services that support operations conducted under part 108 of this chapter but rely on regulatory relief to operate under that part.

(3) Level 3: Services that are neither Service Level 1 nor Service Level 2, supporting operations that are not conducted under part 108 of this chapter.

§ 146.115 Certification requirements.

(a) *Service Level 1*. An applicant seeking a Service Level 1 certificate must provide, in a form and manner acceptable to the Administrator—

(1) a declaration of compliance that the applicant meets all applicable requirements in subpart D of this part; and

(2) A declaration of compliance that the applicant meets the requirements to provide at least one authorized level 1 service in accordance with subpart E of this part.

(b) *Service Level 2*. An applicant seeking a Service Level 2 certificate must provide, in a form and manner acceptable to the Administrator—

(1) A declaration of compliance and documentation describing how the applicant meets all applicant requirements in subpart D of this part; and

(2) A declaration of compliance and documentation describing how the applicant meets the requirements to provide at least one authorized level 2 service in accordance with subpart E of this part.

(c) *Service Level 3.* An applicant seeking a Service Level 3 certificate must provide, in a form and manner acceptable to the Administrator—

(1) A declaration of compliance, documentation, and supporting data demonstrating that the applicant meets all applicable requirements in subpart D of this part;

(2) A declaration of compliance, documentation, and supporting data demonstrating that the applicant meets the requirements to provide at least one authorized level 3 service in accordance with subpart E of this part; and

(3) Documentation and supporting data demonstrating that the applicant's service meets the reliability, availability, latency, or other quality of service metrics necessary to provide the service.

(d) *Initial applicants*. An applicant seeking an initial certificate must also submit an application for authorization to provide at least one service, in accordance with subpart C of this part. The Administrator will issue a certificate to provide services only to applicants that can obtain approval to provide at least one authorized service.

(e) *Foreign-qualified applicants*. An applicant submitting proof of an active authorization to provide data services from a country that the United States has a bilateral aviation safety agreement covering automated data services comparable to those in this part, may be deemed to meet the application requirements in this section.

§ 146.120 Evaluation of application.

(a) *Evaluation*. The Administrator will evaluate the information the applicant submits and any other relevant information to determine whether the applicant meets the minimum qualifications of this part. The Administrator may request that the applicant provide supplemental information at any time during the application process.

(b) *Issuance*. Except as provided in paragraph (c) of this section, the Administrator may issue a person who meets the requirements of this part a certificate to use a distributed computational system to provide automated data services that the applicant demonstrated it was qualified to provide, as described in § 146.115. The Administrator may place limits or conditions on the certificate as are necessary in the interest of safety.

(c) *Denial*. FAA may deny an application for a certificate under this part if FAA finds that—

(1) The applicant does not meet the requirements of this part;

(2) The applicant holds a certificate under this part that is under suspension or is in the process of being revoked or suspended;

(3) The applicant previously held a certificate under this part that was revoked;

(4) The applicant fills or intends to fill a management position with an individual who exercised control over or who held the same or a similar position with a certificated service provider under this part whose certificate was revoked or suspended, or is in the process of being revoked or suspended, and that individual materially contributed to the circumstances resulting in the revocation or suspension;

(5) An individual who will have control over or substantial ownership interest in the applicant had the same or similar control or interest in a certificated service provider whose certificate was revoked or suspended, or is in the process of being revoked or suspended, and that individual materially contributed to the circumstances resulting in the revocation or suspension; or

(6) For failure to comply with other applicable legal requirements.

§ 146.125 Obligation to update.

A person seeking an initial or amended certificate under this part has an ongoing obligation to update information submitted during the application process until the Administrator either grants or denies the application. The applicant must report this updated information to the Administrator within 10 days of becoming aware of the change in a form and manner acceptable to the Administrator.

§ 146.130 Terms.

(a) *Duration*. A certificate issued under this section remains valid until surrendered by the holder, or until revoked or suspended by FAA.

(b) *Application to provide additional services*. A certificated service provider seeking to provide services for additional service levels must apply in accordance with the provisions of this subpart, except that the applicant need only submit information relevant to the new or amended service level.

(c) *Non-transferable*. No certificate issued under this section may be transferred to another organization without the Administrator's express approval. For the purposes of this section, a change in ownership structure in § 146.105(b) constitutes a transfer that requires the Administrator's express approval.

Subpart C—Service Authorizations

§ 146.200 Request for authorization.

(a) *General*. Any person seeking authorization to provide an automated data service using a distributed computational system under this part, must submit the information identified in this subpart in a form and manner acceptable to the Administrator.

(b) *Certificate required*. No person may obtain authorization to provide services under this part without being in compliance with a certificate issued under subpart B of this part.

§ 146.205 Authorization requirements.

(a) *Requirements*. An applicant seeking to provide an authorized service under this part must—

(1) Establish the minimum performance requirements for the service, in accordance with paragraph (b) of this section;

(2) Demonstrate that the applicant is capable of meeting the minimum performance requirements, in accordance with paragraph (c) of this section;

(3) Demonstrate that the service meets the requirements of subpart E of this part, in accordance with paragraph (d) of this section;

(4) Demonstrate that the service supports an aircraft operator's ability to comply with requirements in this chapter; and

(5) Demonstrate that the service is designed in accordance with an industry consensus standard or consensus standards.

(b) *Establishing minimum performance requirements.* An applicant establishes the minimum performance requirements for the service by submitting data and documentation in a form and manner acceptable to the Administrator that includes—:

(1) An overview describing the service and its intended use;

(2) All representations to service users regarding the capabilities, quality-of-service, limitations, and responsibilities of the service provider and service user related to the authorized service; and

(3) Technical specifications describing the service's system architecture and functionality.

(c) *Demonstrating applicant's capability*. In a form and manner acceptable to the Administrator, the applicant must demonstrate that they are capable of meeting the minimum performance requirements as follows:

(1) An applicant seeking authorization to provide a level 1 service must provide, in a form and manner acceptable to the Administrator, a declaration of compliance that the applicant meets all applicable requirements of paragraph (b) of this section.

(2) An applicant seeking authorization to provide a level 2 service must provide, in a form and manner acceptable to the Administrator, a declaration of compliance and documentation describing how the applicant meets all applicable requirements of paragraph (b) of this section.

(3) An applicant seeking authorization to provide a level 3 service must provide, in a form and manner acceptable to the Administrator, a declaration of compliance, documentation, and supporting data demonstrating that the applicant meets all applicable requirements of paragraph (b) of this section.

(d) *Demonstrate that the service meets the requirements of subpart E of this part*. In a form and manner acceptable to the Administrator, the applicant must demonstrate that their automated data service meets the software updates and data exchange requirements of subpart E of this part as follows:

(1) An applicant seeking authorization to provide a level 1 service must provide, in a form and manner acceptable to the Administrator, a declaration of compliance that the service meets the requirements in subpart E of this part.

(2) An applicant seeking authorization to provide a level 2 service must provide, in a form and manner acceptable to the Administrator, a declaration of compliance and documentation describing how the service meets the requirements in subpart E of this part.

(3) An applicant seeking authorization to provide a level 3 service must provide, in a form and manner acceptable to the Administrator, a declaration of compliance, documentation, and supporting data demonstrating that the service meets the requirements in subpart E of this part.

§ 146.210 Evaluation of request.

(a) *Evaluation*. The Administrator will evaluate the information the applicant submits and any other relevant information to determine whether the applicant meets the requirements of § 146.205. The Administrator may request that the applicant provide supplemental information at any time during the evaluation process.

(b) *Authorization*. Except as provided in paragraph (c) of this section, the Administrator may authorize the applicant to provide a requested service if the applicant meets the requirements of § 146.205. The Administrator may place limits or conditions on the authorization as are necessary in the interest of safety.

(c) *Denial*. FAA may deny a request for authorization for a service under this part if FAA finds that —

(1) The applicant does not hold a valid certificate under this part; or

(2) Does not meet all requirements of § 146.205.

(d) *Non-transferable*. No authorization to provide services issued under this section may be transferred to another organization without the Administrator's express approval.

Subpart D—Certificated Service Providers

§ 146.300 Minimum requirements.

(a) *Certificate*. Unless otherwise authorized by the Administrator, a certificated service provider providing services under this part must comply with the terms of the certificate issued under subpart B of this part.

(b) *Authorized services*. Unless otherwise authorized by the Administrator, a certificated service provider providing services under this part must comply with the terms of the authorization issued under subpart C of this part.

(c) *Facilities, equipment, software, and data*. A certificated service provider must maintain the facilities, equipment, software, and data necessary to meet the minimum requirements required to comply with the terms of the certificate and service authorizations in this part, except as provided in paragraph (d) of this section. Those requirements include the following:

(1) Cyber and data security requirements in accordance with § 146.305.

(2) Quality management system requirements in accordance with § 146.310.

(3) Change management requirements in accordance with § 146.315.

(4) Training requirements in accordance with § 146.320.

(5) Reporting requirements in accordance with § 146.325.

(6) Record retention requirements in accordance with § 146.330.

(7) Automated service data exchange requirements in accordance with § 146.400.

(8) Software update requirements in accordance with § 146.405.

(d) *Third-party vendor*. A certificated service provider may rely on services provided by a third party to meet the requirements of this part if:

(1) The service is not specific to an aviation safety function; or

(2) The third party holds a certificate and service authorization under this part.

(e) *Impartiality.* A certificated service provider under this part must provide their service to users in a reasonable and non-discriminatory manner, as applicable.

(f) *Compliance with applicable laws*. A certificated service provider providing services under this part must be authorized to conduct business in the United States and otherwise be in compliance with applicable law, including but not limited to those relating to data privacy and security.

§ 146.305 Cybersecurity.

(a) *Cybersecurity policy required*. A certificated service provider must develop and implement cybersecurity policies and processes to protect networks, devices, and data from unauthorized access and to ensure integrity, accuracy, and reliability of the services provided to the customer.

(b) *Contents of policy*. The cybersecurity policy required under this section must include processes for—

(1) Protecting software, hardware, and network computing infrastructure necessary to protect the authorized service from unauthorized access;

(2) Ensuring the certificated service provider's employee access privileges are limited to those necessary to fulfill normal job duties;

(3) Preparing for, responding to, and mitigating the impact of cyber attacks;

(4) Collecting and analyzing data to measure the effectiveness of the cybersecurity policy and processes; and

(5) Revising the cybersecurity policy.

§ 146.310 Quality management system.

(a) *General*. A certificated service provider must develop, implement, and document a quality management system acceptable to the Administrator to ensure that the services provided by the certificated service provider, or any third-party vendor's services that the certificated service provider relies on, meet the minimum requirements of this part.

(b) *Safety management system*. The quality management system must meet the requirements of part 5 of this chapter; except the certificated service provider is not required to comply with the following provisions: §§ 5.7, 5.9, 5.11, 5.13, 5.15, 5.27, and 5.71(c) of this chapter.

(c) *Software update procedures*. A certificated service provider's quality management system must include a process for managing software updates that reduces the risk of introducing a hazard into the services authorized under this part, including but not limited to the requirements in § 146.405.

(d) *Third-party vendor requirements*. A certificated service provider must develop, implement, and document a process to monitor services provided by third parties, to detect failures or other performance issues that would adversely impact the certificated service provider's ability to meet the requirements of this part.

(e) *Testing and verification*.

(1) A certificated service provider must develop, implement, and document procedures to test and verify that the authorized services continue to meet the requirements of this subpart. The procedures must include the frequency of testing and the criteria the certificated service provider will apply to determine whether those services comply with this part.

(2) A certificated service provider must make all documentation of its testing and verification procedures available to the Administrator upon request.

(f) *Service difficulty reports*. A certificated service provider must—

(1) Have a readily available means to accept reports about the failure, malfunction, or defect in an authorized service that has endangered or may endanger the safe operation of an aircraft;

(2) Notify their users of that means to submit these reports; and

(3) Upon request, provide to the Administrator these reports, related data, and documentation of any corrective actions taken by the certificated service provider.

§ 146.315 Change management.

(a) *General*. A certificated service provider must develop, implement, and document a change management policy to ensure updates, amendments, or other changes to its software and technology do not adversely affect the performance level of the authorized services it provides under this part.

(b) *Notice*. A certificated service provider must notify FAA in writing of any change to its software or technology that may affect the certificated service provider's ability to meet the authorized service requirements of this part, except as provided in § 146.405.

(c) *Review*. The Administrator may review the change management documentation supporting any change to a service authorized under this part.

§ 146.320 Training program.

(a) *General*. A certificated service provider must establish a training program to ensure anyone who performs, either directly or under contract, functions related to the development or performance of authorized services has the knowledge and skills necessary to ensure the organization's compliance with this part.

(b) *Topics*. The training program must cover, at a minimum—

(1) Best practices in distributed software development;

(2) Applicable regulations and Advisory Circulars relating to automated data services, airspace classification, operating requirements, and flight restrictions;

(3) Aviation safety culture concepts; and

(4) Best practices in the provision of automated data services for aviation users.

(c) *Recurrence*. The training program must include recurrent training elements that are provided not less than once per calendar year.

§ 146.325 Reportable occurrences.

A certificated service provider must report the following incidents in a form and manner acceptable to the Administrator—

(a) An unscheduled service outage;

(b) A security breach that results in unauthorized access to the certificated service provider's networks, devices, or data irrespective of whether it affects the integrity, accuracy, or reliability of the services provided to the service recipient; and

(c) Any other occurrence specifically identified in a certificate or authorization issued under subparts B or C of this part.

§ 146.330 Record retention.

(a) *Certificate*. A certificated service provider must retain data and documentation submitted to the Administrator in support of their application for certification for the duration of their certificate plus an additional 24 months.

(b) *Authorized Service*. A certificated service provider must retain the following for the duration of their service authorization plus an additional 24 months:

(1) Documentation and data submitted to the Administrator in support of service authorization.

(2) Records of testing required under subpart E of this part.

(3) Service difficulty reports and supplemental reports submitted to the certificated service provider about the failure, malfunction, or defect in an authorized service.

(c) *Additional Information*. The Administrator may request that the certificated service provider retain certain additional information, as necessary, in the interest of safety, efficiency, and fair access.

(d) *Authorized service data exchange*. The certificated service provider must preserve and maintain all data exchanged with customers or other airspace users as a part of providing an authorized service under this part for a minimum of 6 months from the time of the data exchange.

(e) *Training*.

(1) The certificated service provider must retain records of training given to its personnel for a minimum of 2 years following completion of training.

(2) In the event of a personnel-employer separation, the certificated service provider must retain records of the individual's training for 12 months after the separation from employment.

(f) *Audits and Inspection*. The certificated service provider must provide records kept under this part to the Administrator within a reasonable time after a request.

Subpart E—Authorized Service Requirements

§ 146.400 Authorized service data exchange requirements.

(a) *Interoperability*. Services authorized under this part must be able to exchange data automatically and securely with both the user and other authorized service providers when necessary for provision of the service, irrespective of the user's or other provider's digital platform.

(b) *Safeguards*. Services authorized under this part must contain safeguards and other measures to ensure the integrity, accuracy, and reliability of the data exchanged with the user including, but not limited to, those required in this section.

(c) *Authentication*. Services authorized under this part must use an access and authentication method that prevents unauthorized access to or interference with data exchanged with the user.

(d) *Non-repudiation*. Services authorized under this part must use a validation and verification method that provides assurance of the integrity and origin of the data exchanged with the user.

(e) *Equitability.* A certificated service provider under this part must provide their service to users in a reasonable and non-discriminatory manner, as applicable.

§ 146.405 Software updates.

(a) *General*. Prior to releasing changes to an authorized service's software, a certificated service provider must verify that the change does not adversely affect a person's ability to operate safely in the airspace. For the purposes of this section, a person includes the certificated service provider's customer as well as other airspace users or services that rely on data exchanges with the authorized service.

(b) *Versioning*. The certificated service provider must use a generally accepted industry standard for assigning version numbers to software changes. (c) Testing required.

(1) Prior to releasing any software change, the certificated service provider must conduct testing to verify that the change does not adversely affect the authorized service's ability to meet the requirements of this part.

(2) A certificated service provider must make all documentation of the testing and verification under this section available to the Administrator as soon as possible, but in no case later than 24 hours, after receiving a written request from the Administrator.

(3) The Administrator may request that a certificated service provider conduct additional testing or verification to demonstrate that authorized services meet the performance requirements of this part. A certificated service provider must conduct the testing or verification as soon as practicable after receiving a written request from the Administrator.

(d) *User notification.*

(1) The certificated service provider must provide reasonable notice to all users prior to any anticipated downtime, including the date, time, and expected duration of the downtime.

(2) Prior to releasing changes to an authorized service's software, including patch updates, the certificated service provider must provide reasonable notice to enable the user to evaluate potential effects on operations and make necessary operational adjustments.

(3) User notice must provide a description of the change, including—

(i) Providing the new version identifier;

(ii) Explaining the nature of the change;

(iii) Identifying differences in features, functionality, or user experience; and

(iv) Explaining any actions the user must take to ensure the authorized service meets the required performance levels following the change.

(4) The certificated service provider must keep a record of each update under this section for not less than two years from the date the update was released, including the information required by paragraph (d)(2) of this section.

(e) *FAA notification*. The certificated service provider must provide notice of minor and major updates to software used to deliver an authorized service in a form and manner acceptable to the Administrator as follows:

(1) Minor update:

(i) Service Level 1: the certificated service provider must notify the Administrator at least one business day prior to release;

(ii) Service Level 2: the certificated service provider must notify the Administrator at least 3 business days prior to release;

(iii) Service Level 3: the certificated service provider must notify the Administrator at least 5 business days prior to release.

(2) Major update: Service Level 1: the certificated service provider must notify the Administrator at least 5 business days prior to release.

(f) *FAA approval required*. The certificated service provider must obtain approval in a form and manner acceptable to the Administrator prior to releasing the major updates to software used to deliver an authorized service at Service Levels 2 and 3.

(g) *Discontinuing superseded software versions*. Unless otherwise authorized by the Administrator, when releasing a major update to an authorized service, the certificated service provider must—

(1) Maintain the most recent previous version of the authorized service with full functionality for a minimum of 60 days from the release date; and (2) Notify customers a minimum of 7 calendar days prior to removing full functionality of the prior version of the authorized service. (h) *Exceptions*. Paragraph (g)(1) of this section does not apply if a set of authorized services provisioned by more than one automated data service provider must be updated in a coordinated, planned, or simultaneous manner in order to maintain interoperability.

Subpart F—Due Process

§ 146.500 Revocations, Emergency Suspensions, and Requests for Reconsideration.

(a) *Revocation*. The Administrator may revoke a service authorization issued under this part to preserve the safety in air commerce and the public interest.

(b) *Process*. Except as provided in paragraph (c) of this section, the Administrator will follow the following procedure to revoke a service authorization:

(1) The responsible FAA office notifies the authorization holder in writing of the proposed revocation.

(2) The written notification sets a reasonable period (but not less than 7 days) within which the authorization holder may submit written information, views, and arguments on the revocation.

(3) After considering all material presented, the responsible FAA office notifies the certificate holder of the revocation decision or withdrawal of the proposed revocation.

(4) If the responsible FAA office decides to revoke the service authorization, it becomes effective within 15 days after the authorization holder receives notice of the decision unless the FAA issues an emergency suspension under paragraph (c) of this section or the certificate holder petitions for reconsideration under § 146.505.

(c) *Emergency suspension of a service authorization*. The FAA may immediately suspend a service authorization if it finds that an emergency exists requiring immediate action to ensure safety in air commerce or transportation that makes the procedures set out in this section impracticable or contrary to the public interest, notifying the authorization holder:

(1) Of the immediate suspension of the service authorization effective on the date the notification is sent.

(2) Of the basis for the FAA's finding that an emergency exists requiring immediate action with respect to safety in air transportation or air commerce or that

makes it impracticable or contrary to the public interest to stay the effectiveness of the emergency suspension.

§ 146.505 Petition to reconsider.

(a) *General*.

(1) Any applicant for service authorization or the holder of a service authorization provider may submit a petition in a form and manner acceptable to the Administrator within 60 calendar days of an application denial, revocation, or emergency suspension of an authorization issued under this part.

(2) Any applicant or certificated service provider may submit a petition in a form and manner acceptable to the Administrator within 60 calendar days of a denial of a certificate issued under this part.

(b) *Error*. The petition must demonstrate that the Administrator issued their decision in error, resulting in the denial of an application for a certificate or authorization, or the revocation, or suspension of an authorization, by showing one of the following:

(1) A material fact exists that was not previously presented to the Administrator.

(2) The Administrator relied on a material error of fact.

(3) The Administrator did not correctly interpret a law, regulation, or precedent.

(c) *Decision*. The Administrator will consider the information submitted under this section and determine whether to withdraw the denial, revocation, or suspension, as applicable.

Title 49—Transportation

Chapter XII-Transportation Security Administration, Department of Homeland Security

Subchapter C---Civil Aviation Security

PART 1540—CIVIL AVIATION SECURITY: GENERAL RULES

43. The authority citation for part 1540 continues to read as follows:

Authority: 49 U.S.C. 114, 5103, 40113, 44901-44907, 44913-44914, 44916-44918, 44925, 44935-44936, 44942, 46105.

44. Amend § 1540.5 by adding, in alphabetical order, the terms "unmanned aircraft" and "unmanned aircraft system", to read as follows:

§ 1540.5 Terms used in this subchapter.

* * * * *

Unmanned aircraft means an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.

Unmanned aircraft system (UAS) means an unmanned aircraft and associated elements (including communication links and the components that control the unmanned aircraft) that are required for the operator to operate safely and efficiently in the national airspace system.

PART 1544—AIRCRAFT OPERATOR SECURITY: AIR CARRIERS AND COMMERCIAL OPERATORS

45. The authority citation for part 1544 continues to read as follows:

Authority: 49 U.S.C. 114, 5103, 40113, 44901-44905, 44907, 44913-44914, 44916-44918, 44932, 44935-44936, 44942, 46105.

46. Amend § 1544.1 by revising paragraph (a)(1) to read as follows:

§ 1544.1 Applicability of this part.

(a) This part prescribes aviation security rules governing the following:

(1) The operations of aircraft operators holding operating certificates under 14 CFR part 119 for scheduled passenger operations, public charter passenger operations, private charter passenger operations; the operations of aircraft operators holding operating certificates under 14 CFR part 119 operating aircraft with a maximum certificated takeoff weight of 12,500 pounds or more; UAS operators permitted or certificated under 14 CFR part 108; and other aircraft operators adopting and obtaining approval of an aircraft operator security program.

*   *   *   *   *

47. Amend § 1544.101 by revising paragraph (g) to read as follows:

§ 1544.101 Adoption and implementation.

*   *   *   *   *

(g) *Limited program:* In addition to paragraph (d) of this section, if applicable, TSA may approve a security program after receiving a request by an aircraft operator holding a certificate under 14 CFR part 119, other than one identified in paragraph (a), (b), (d), or (f) of this section, or a UAS package delivery operator permitted or certificated under 14 CFR part 108. The aircraft operator must—

*   *   *   *   *

Proposed amendments to title 14 CFR chapter I issued under authority provided by 49 U.S.C. 106(f), 40103(b), 44701(a)(5), 44807, 44808, 44811, and Sec. 932 of Pub. L. 118-63 in Washington, DC.

Bryan Bedford,
Administrator, Federal Aviation Administration.

Proposed amendments to 49 CFR chapter XII issued under authority provided by 49 U.S.C. 114, 44901, and 44903.

Ha Nguyen McNeill,
Acting Administrator, Transportation Security Administration.