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**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 107**

**[Docket No.; Notice No.]**

**RIN 2120-AL26**

**Safe and Secure Operations of Small Unmanned Aircraft Systems**

**AGENCY:** Federal Aviation Administration (FAA).

**ACTION:** Advance notice of proposed rulemaking.

**SUMMARY:** The FAA is considering additional rulemaking in response to public safety and national security concerns associated with the ongoing integration of unmanned aircraft systems (UAS) into the National Airspace System (NAS). The FAA is seeking information from the public in response to the questions contained in this notice. Specifically, the FAA seeks comment on whether and in what circumstances the FAA should promulgate new rulemaking to require stand-off distances, additional operating and performance restrictions, the use of UAS Traffic Management (UTM), and additional payload restrictions. The FAA also seeks comment on whether it should prescribe design requirements and require that unmanned aircraft be equipped with critical safety systems.

**DATES:** *TO BE ANNOUNCED.*

**ADDRESSES:** *TO BE ANNOUNCED.*

**FOR FURTHER INFORMATION CONTACT:** *TO BE ANNOUNCED.*

## **SUPPLEMENTARY INFORMATION:**

*Tips for Preparing Your Comments.* The FAA seeks public comment on the areas outlined within this ANPRM. The FAA also seeks comments on how this rulemaking could be implemented to meet the objective of the proposal in a manner that maximizes benefits without imposing excessive, unjustified, or unnecessary costs.

Specific questions are included in this ANPRM immediately following the discussion of the relevant issues. The FAA asks that commenters provide as much information as possible on any questions of interest to the commenter. In some areas, the FAA requests very specific information. Whenever possible, please provide citations and copies of any relevant studies or reports on which you rely, including cost data as well as any additional data which supports your comment. It is also helpful to explain the basis and reasoning underlying your comment. Each commenting party should include the identifying number of the specific question(s) to which it is responding.

The FAA will use comments to make decisions regarding the content and direction of potential notices of proposed rulemaking (NPRM) or other future rulemakings. Some proposals for addressing national security and other concerns may exceed the FAA's authority to regulate independently and may necessitate a broader Federal Executive or Legislative action. Comments, including proposals for rulemaking, will be considered within the context of the FAA's existing statutory authority.

## **I. Authority for This Rulemaking**

This notice is promulgated pursuant to 49 U.S.C. 40103(b)(1) and (2), which charge the FAA with issuing 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 the FAA with prescribing regulations that the FAA finds necessary for safety in air commerce and national security.

The primary authority for this notice is 49 U.S.C. 44807, which directs the Secretary of Transportation to determine whether “certain unmanned aircraft systems may operate safely in the national airspace system [NAS].” Section 44807 directs the Secretary to use a risk-based approach in making such determinations and provides such determinations may occur notwithstanding the completion of the comprehensive plan and rulemaking required in other sections of the statute. Section 44807(b) directs the Secretary to consider a specific list of factors in determining which types of UAS may operate safely: the Secretary must consider size, weight, speed, operational capability, proximity to airports and populated areas, operation over people, and operation within or beyond the visual line of sight, or operation during the day or night. The Secretary must determine, based on these factors, whether operations of the UAS do not create a hazard to users of the NAS or the public.

This action also relies on other DOT and FAA statutory authorities.

## II. Executive Summary

The purpose of this advance notice of proposed rulemaking (ANPRM) is to seek comment regarding proposals for FAA rulemaking to reduce risks to public safety and national security as UAS are integrated into the NAS.

Consistent with its statutory authority, the FAA seeks to ensure that small UAS<sup>1</sup> operations will not create a hazard to users of the NAS or the public or pose a threat to national security. This ANPRM is intended to gather information from the public to help inform the FAA's efforts to assess options for reducing risks to public safety and national security associated with further integration of UAS into the NAS. The FAA may consider initiating one or more rulemaking efforts based on the comments received in response to this ANPRM.

In a separate but related rulemaking action, the Operation of Small Unmanned Aircraft Systems over People NPRM, the FAA is proposing to amend Part 107 to allow small UAS operations at night and over people. Because these operations have a potential impact on public safety and national security, the FAA does not intend to promulgate a final rule to allow these operations until a regulation finalizes the requirements regarding remote identification of small UAS, as discussed further in Related Agency Actions.

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<sup>1</sup> A small UAS is defined as a small unmanned aircraft and its associated elements (including communication links and the components that control the small unmanned aircraft) that are required for the safe and efficient operation of the small unmanned aircraft in the national airspace system (NAS). A small unmanned aircraft is defined as an unmanned aircraft weighing less than 55 pounds on takeoff, including everything that is on board or otherwise attached to the aircraft. 14 CFR 107.3.

### III. Background

#### A. Integration of UAS into the NAS

The FAA is working to safely integrate small UAS operations into the NAS using a phased, incremental, and risk-based approach to rulemaking within the FAA's existing statutory authority.<sup>2</sup> In 2012, Congress passed the FAA Modernization and Reform Act of 2012 (Public Law 112-95). Section 333 of Public Law 112-95<sup>3</sup> directed the Secretary 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 UAS. On June 28, 2016, the FAA published the final rule for Operation and Certification of Small Unmanned Aircraft Systems (sUAS Operation and Certification final rule),<sup>4</sup> which was a first step in integrating civil small UAS operations that were not model aircraft under the statute in effect at the time of publication.<sup>5</sup>

As the next step, the FAA's regulatory plan calls for the agency to issue an NPRM that would propose to allow small UAS operations at night and over people without a waiver issued under § 107.200. During the development process, the FAA heard from a number of government and industry stakeholders expressing support for the potential increase in commercial viability of UAS operations, but also concerns over the potential impacts on public safety, national security, and law enforcement.

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<sup>2</sup> For more information regarding the operation of small unmanned aircraft, see <http://www.faa.gov/uas>.

<sup>3</sup> Section 347 of Public Law 115-254 repealed Section 333, but replaced the relevant substantive provisions, codified at 49 U.S.C. 44807.

<sup>4</sup> 81 FR 42063.

<sup>5</sup> Public Law 112-95, section 336 (Feb. 14, 2012). Section 336 was repealed by Section 349 of Public Law 115-254 (Oct. 5, 2018) and replaced with 49 U.S.C. 44809. Section 44809 provides an exception for limited recreational UAS operations, provided the operations satisfy eight specific conditions. See 49 U.S.C. 44809(a)(1)–(8).

## B. Public Safety and National Security Concerns

As technology continues to improve and new uses for small UAS are identified, the FAA anticipates an increased demand for flexibility in operational restrictions under part 107. These new types of operations may have public safety and national security risks that were not anticipated or envisioned. This ANPRM seeks public comment on existing and future operational requirements and limitations in part 107 that may be necessary to reduce risks to the public and users of the NAS in accordance with 49 U.S.C. 44807.

In addition, public safety and national security entities have expressed a need to distinguish between small UAS that may pose a threat and those that do not, especially when operating in close proximity to large public gatherings, critical infrastructure or certain other facilities and assets.<sup>6</sup> In light of this, the FAA is constantly assessing the ability of the regulations to ensure that small UAS operations do not pose a threat to public safety or national security.

## C. Related Agency Actions

### **1. Operation of Small Unmanned Aircraft Systems over People NPRM**

The Operations of Small UAS over People rulemaking would promulgate performance-based standards applicable to manufacturers of small UAS, as well as some requirements applicable to operators. The rule proposes three operational categories.<sup>7</sup> Category 1 would limit the weight of the small unmanned aircraft. Categories 2 and 3 would limit the severity of

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<sup>6</sup> The Departments of Defense, Energy, Homeland Security, and Justice have authority to address threats posed by UAS under certain circumstances to certain facilities and assets identified by statute. 10 U.S.C. 130i; 50 U.S.C. 2661; and section 1602 of Pub. L. 115-254 (to be codified at 6 U.S.C. 124n).

<sup>7</sup> The 3 categories proposed for civil small UAS operations over people are unrelated to the Department of Defense UAS categories which are divided into 5 groups that distinguish UAS by weight and other characteristics.

potential injuries based on impact kinetic energy thresholds and exposed rotating parts limitations. For operations of small UAS at night, the rule would require the remote pilot in command to complete a knowledge test or the appropriate training prior to operating at night and would require that the small UAS be equipped with anti-collision lighting visible for at least 3 statute miles.

## **2. Remote Identification and Tracking Aviation Rulemaking Committee**

Section 2202 of the FAA Extension, Safety, and Security Act of 2016 (FESSA) required the FAA Administrator, in consultation with the Secretary of Transportation, the President of RTCA, Inc., and the Director of the National Institute of Standards and Technology, to convene industry stakeholders to facilitate the development of consensus standards for remotely identifying operators and owners of unmanned aircraft systems and associated unmanned aircraft.

FESSA required that, as part of any standards developed, the Administrator shall consider requirements for remote identification of unmanned aircraft systems; appropriate requirements for different classifications of unmanned aircraft systems operations, including public and civil; and the feasibility of the development and operation of a publicly accessible online database of unmanned aircraft and the operators thereof, and any criteria for exclusion from the database.

The FAA convened the UAS Identification and Tracking Aviation Rulemaking Committee (ARC) to make recommendations for the identification and tracking of small UAS. The FAA has reviewed the ARC recommendations and initiated a separate rulemaking (RIN



2120-AL31) to propose remote identification requirements for UAS.<sup>8</sup> As previously explained, the FAA does not intend to promulgate the Operations of Small UAS over People final rule until the remote identification rulemaking is finalized.

### **3. Section 2209 Process for UAS-Specific Airspace Restrictions**

Section 2209 of FESSA requires the Secretary of Transportation to establish a process to allow certain fixed-site facility owners or operators to petition the FAA to prohibit or restrict the operation of unmanned aircraft in close proximity to certain facilities, such as national security sites, critical infrastructure, amusement parks and other locations that warrant such a restriction. That process is currently under development.<sup>9</sup>

## **IV. Discussion and Questions Concerning Proposal Under Consideration**

This ANPRM is intended to gather information from the public to help inform the FAA's efforts to assess options for reducing risks to public safety and national security associated with further integration of UAS into the NAS, including options for additional rulemaking. Examples of subjects for additional rulemaking may include operating limitations, such as stand-off distances, payload restrictions, altitude, airspeed and performance limitations.

### **A. Stand-off Distances**

Small UAS have the capability to operate in locations that are inaccessible to manned aircraft as well as operate at reduced horizontal and vertical stand-off distances from people and structures compared to manned aircraft. This capability is a major benefit of small UAS

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<sup>8</sup> A copy of the report is available at [https://www.faa.gov/regulations\\_policies/rulemaking/committees/documents/media/UAS%20ID%20ARC%20Final%20Report%20with%20Appendices.pdf](https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/UAS%20ID%20ARC%20Final%20Report%20with%20Appendices.pdf)

<sup>9</sup> See RIN 2120-AL33.

operations to both the public and private sectors, but also presents unique safety and security concerns. Because small UAS can operate in places that manned aircraft cannot, such as in confined locations, under bridges, or close to buildings, they are capable of capturing useful information for inspection, investigation, and other purposes. In certain cases, small UAS may be able to observe people, structures, and areas on the ground from a vantage point that cannot be achieved by manned aircraft or by persons on the ground. On the other hand, when small UAS are operated too close to sensitive locations; critical infrastructure; certain mobile assets, including vessels and ground vehicle convoys; government activities, such as firefighting, search and rescue operations; certain law enforcement activities; over large gatherings of people; or near manned aircraft, it raises safety and security concerns within the NAS.

Stand-off distances are the amount of space between a small UAS and the closest person or object. They can have a horizontal component, a vertical component, or be measured directly using a slant range. Stand-off distances are sometimes referred to as minimums, such as in a minimum separation or minimum stand-off distance, and are typically measured in feet. They may help to ensure a small UAS does not pose a hazard to people on the ground or assess whether a UAS poses a threat to national security.

Currently, small UAS operated under part 107 do not have any prescriptive horizontal or vertical stand-off distances from people or structures. Rather, remote pilots must comply with performance-based rules that reduce risk by ensuring that small UAS will pose no undue hazard to people, aircraft, or property in the event of a loss of control of the small unmanned aircraft for any reason (§ 107.19(c)) and avoiding operations over any person who is not directly involved in the flight operation unless that person is under an appropriate covered structure or inside a vehicle (§ 107.39).

In a separate rulemaking action, specifically the Operation of Small Unmanned Aircraft Systems over People NPRM, the FAA is proposing to amend § 107.39 to allow certain small UAS to operate over people under specific conditions. Those small UAS would be required to meet safety thresholds that ensure the small UAS will not cause a serious injury to people if an impact occurs, and while the subject of stand-off distances is addressed, the rule does not propose to establish any specific stand-off requirements.

As discussed in the final rule for part 107, the FAA considered requiring minimum stand-off distances, but ultimately determined that, due to the wide range of possible small unmanned aircraft and small UAS operations, a prescriptive numerical stand-off distance requirement would be more burdensome than necessary for some operations while not being stringent enough for other operations. This decision by the FAA provided flexibility to small UAS operators to determine the appropriate stand-off distance, if any, for low-risk operations, but the FAA notes that as UAS operations continue to expand and the FAA works to integrate them into the NAS, stand-off distances may be considered to reduce public safety and national security hazards presented by higher-risk UAS operations.

While part 107 currently does not contain any prescriptive stand-off distances, there are examples of small UAS regulations from other countries that include stand-off distances. For example, in the United Kingdom, small UAS must be operated at least 150 feet away from people and property and 500 feet away from large crowds and built-up areas, unless given special permission.<sup>10</sup> In addition, proposed rules from Canada and EASA both include prescriptive stand-off distances for small UAS operations.

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<sup>10</sup> <https://www.caa.co.uk/Consumers/Unmanned-aircraft-and-drones/>

**Questions for the Public:** The FAA is considering rulemaking to address public safety and national security concerns associated with small UAS and invites input from the public as follows—

A1.If the FAA were to establish specific horizontal or vertical stand-off distances for all small UAS operations, what should those stand-off distances be and why?

A2.If the FAA were to establish horizontal or vertical stand-off distances for only certain types of small UAS operations, what types of operations should require a stand-off distance, what should the stand-off distance be, and why? Examples of types of operations include, but are not limited to, night operations, operations in controlled airspace under an ATC authorization, and beyond-visual-line-of-sight operations.

A3.What types of operations, if any, should be excluded from a proposed stand-off distance requirement and why?

A4.How would a horizontal or vertical stand-off distance requirement help reduce hazards to public safety and national security?

A5.What are the incremental costs<sup>11</sup> of introducing a stand-off distance requirement compared to how operations are conducted today?

A6.Does requiring a minimum stand-off distance necessitate additional instrumentation? If yes, provide costs and other relevant information.

A7.If minimum stand-off distances are required, would training or testing be necessary? If yes, provide estimate of time and cost.

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<sup>11</sup> For the purposes of this ANPRM, the FAA is requesting incremental costs, which is the difference between current and future operations.

## B. Altitude, Airspeed, and other Performance Limitations

Due to their potential small size, light weight, and propulsion capabilities, small UAS can have relative performance that far exceeds that of conventional manned aircraft. These capabilities allow for operations that manned aircraft are not capable of or cannot conduct safely. Some small UAS are capable of speeds in excess of 150 knots (172 mph), altitudes of 10,000 feet or more, and climb rates in excess of 6,000 feet per minute. Some can accelerate from 0 to 60 mph in less than 1 second. They can have extreme maneuverability and the capability to hover for extended periods of time. These performance capabilities provide considerable benefits and advantages to UAS operations but also create unique safety and security concerns.

Because of their performance capabilities, small UAS can operate in confined areas with speed and agility and, with their maneuverability, are capable of operating in close proximity to buildings, vehicles, and people, which allows for the gathering of imagery and data that cannot otherwise be obtained from the air or ground. However, with their capability for speed, maneuverability, and extreme acceleration, both horizontally and vertically, they can pose a hazard to other aircraft or persons on the ground. Also, those performance capabilities could lead to risks when operating in close proximity to sensitive government locations, large gatherings of people, law enforcement activities, search and rescue operations, and other aircraft.

Currently, small UAS operated under Part 107 are limited to a maximum groundspeed of 87 knots (100 mph) and a maximum altitude of 400 feet above ground level, unless operated within a 400-foot radius of a structure, in which case the limit is 400 feet above the structure's uppermost limit. As discussed in the part 107 final rule, a small UAS travelling at high speed poses a higher risk to persons, property, and other aircraft than one traveling at a lower speed. The rule also noted that a speed limit would have safety benefits outside of a loss-of-positive-

control scenario because a small unmanned aircraft traveling at a lower speed is generally easier to control. Also, the rule states that the speed and altitude limitations reduce the risk of collision with other aircraft. As stated in the part 107 final rule, a maximum speed limit of 87 knots is appropriate because the remote pilot in command will have to implement mitigations commensurate with the risk posed by his or her specific small UAS operation, such as operating at a speed less than 87 knots. Section 107.51 also includes limitations on flight visibility and cloud clearances, but does not have any operating limitations for vertical climb or descent rates or rates of acceleration.

As new uses for small UAS are identified and new types of operations are introduced into the NAS, the FAA continues to assess possible performance limitations, such as airspeed and altitude, to mitigate potential hazards.

**Questions for the Public:** The FAA is considering rulemaking to address public safety and national security concerns associated with small UAS and invites input from the public as follows—

B1.If the FAA were to establish additional operating or performance limitations for small UAS, what should those operating or performance limitations be and why?

B2.If the FAA were to establish additional operating or performance limitations for only certain types of small UAS operations, what types of small UAS operations should require additional operating or performance limitations, what should they be, and why?

B3.How would additional operating or performance limitations help to reduce risks to public safety or national security?

B4. What types of current small UAS operations would be impacted by establishing additional operating or performance limitations?

B5. What are the incremental costs of altitude, airspeed, and other performance limitations?

### C. Unmanned Traffic Management (UTM) Operations

Small UAS pose a unique public safety and security risk to other aircraft and persons and property on the ground because they can operate more readily in sensitive areas and it can be difficult to identify non-compliant operations. Applying more structure to the airspace and operations may reduce public safety or national security risks in the NAS by removing the anonymity of the operations and establishing operating norms, which can then be used to highlight anomalous activity that may indicate malicious intent.

Many entities in both the public and private sector are developing a decentralized communication architecture identified as UAS Traffic Management (UTM), which could support more structured airspace and operations for small UAS without active control from the FAA's Air Traffic Organization. Increased communication between operators on planned and actual flight paths, deconfliction capability, additional information sources, and new service suppliers are intended to allow for optimized flight paths with increased safety. While UTM is focused on managing the safe and efficient operation of an increasing number of UAS operating in the NAS, especially beyond visual line of sight (BVLOS), there may be opportunities to mitigate public safety and national security risks at the same time.

Section 2208 of the FESSA directed the FAA to conduct research and establish a pilot program with NASA regarding UTM, both of which are currently underway with the ultimate goal of informing future rulemaking. Further, in conjunction with completing the pilot program

required by FESSA, Section 376 of Pub. L. 115-254 requires the FAA, in coordination with NASA and industry stakeholders, to develop an implementation plan for UTM services that expand operations beyond visual line of sight, have full operational capability, and ensure the safety and security of all aircraft. The UTM implementation plan, which must address safety standards among other matters and delineate the roles and responsibilities of public and private actors, is to be completed within one year of the conclusion of the UTM pilot program.

In the part 107 rulemaking, the FAA found the risk to public safety and national security acceptable without requiring any type of UTM coordination, even considering the inherent structure it would provide. Because operations under part 107 (conducted without a waiver) are limited to visual line of sight and small UAS must yield the right-of-way to all other aircraft, the FAA determined that a certificated remote pilot can operate a small UAS safely without the need to coordinate its flight path with other operators. Consistent with the direction in Section 376, however, as UAS operations in the NAS continue to evolve and increase in number, the FAA anticipates there will be a need for additional airspace coordination and management to ensure those operations do not pose a risk to public safety or national security.

**Questions for the Public:** The FAA is considering rulemaking to address public safety and national security concerns associated with small UAS and invites input from the public as follows—

C1. How can additional information sharing (e.g. intended flight path, operational boundary) via UTM help reduce risks to public safety and national security? What suite of capabilities should UTM have?



C2. What types of small UAS operations should be subject to UTM requirements? Should any be excluded? Should the requirement be based on geographical location, the type of operation, or other factors? Please provide data or explanations to justify your response.

C3. For small UAS subject to UTM requirements, what type of information should be available to the general public? What type of information should be available to security personnel?

C4. What are the initial nonrecurring investment costs associated with establishing a UTM architecture? Once implemented, what are the annual recurring operation and maintenance costs?

C5. For questions C.1., C.2., and C.3., please include information in your response identifying the costs that would be necessary to equip small UAS to comply with UTM requirements.

C6. Would additional testing or training be required for a remote pilot to safely operate a small unmanned aircraft subject to UTM requirements? Please explain.

C7. What would be the costs for information sharing if UAS operations are subject to UTM requirements?

#### D. Payload Restrictions

Small UAS are readily available for purchase in home electronic and general merchandise stores by individuals who may have little or no familiarity with the civil aviation regulations that are applicable to them. Some of these small UAS have very small visual, radar, and acoustic signatures, which may make them more difficult to detect, identify, and track compared to manned aircraft. On the other hand, small UAS that weigh close to 55 pounds could carry a significant amount of internal or external payload. If a small UAS is determined to present a threat to public safety or national security, currently there are limited ways to mitigate

the threat. As a result, the increased integration of UAS operations in the NAS poses unique public safety and national security concerns.

Given their size, propulsion systems, and navigational capabilities, small UAS can operate in close proximity to buildings, persons, vehicles and other objects without anyone's awareness. With the current and expected improvements in technical capabilities available on small UAS, they can circumvent measures used to protect security-sensitive sites and operations, which, if accessed or damaged, could threaten national security or introduce hazards to public safety. The FAA is aware of situations where small UAS have been used to conduct illegal surveillance and industrial espionage; to deliver contraband to prison inmates; to deliver incendiary, explosive, chemical and radiological payloads; to damage or disrupt critical infrastructure, including communications networks; and to conduct malicious cyber activity. There have been instances in which small UAS were used in ways that interfere with law enforcement, firefighting, and aviation operations.

Recently, Congress enacted section 363 of Pub. L. 115-254, responding to several payload and installed equipment concerns. Unless authorized by the Administrator, section 363 prohibits a person from operating a UAS equipped or armed with a dangerous weapon as defined in 18 U.S.C. 930(g)(2).<sup>12</sup>

Further, § 107.36 prohibits the carriage of hazardous materials as defined in 49 CFR 171.8. This definition includes many types of hazardous substances, such as chemicals or hazardous waste, but does not address all types of payloads or sensors that could pose a threat to

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<sup>12</sup> The term "dangerous weapon" as defined in 18 U.S.C. 930(g)(2) means a weapon, device, instrument, material, or substance, animate or inanimate, that is used for, or is readily capable of, causing death or serious bodily injury, except that such term does not include a pocket knife with a blade of less than 2 ½ inches in length.

public safety or national security. Part 107 does allow for the transportation of property for compensation or hire, but only if the aircraft, including its attached systems, payload, and cargo weigh less than 55 pounds total; the flight is conducted within visual line of sight and not from a moving vehicle or aircraft; and the flight occurs wholly within the bounds of a State and does not involve transport between (1) Hawaii and another place in Hawaii through airspace outside Hawaii; (2) the District of Columbia and another place in the District of Columbia; or (3) a territory or possession of the United States and another place in the same territory or possession.

**Questions for the Public:** The FAA is considering rulemaking to address public safety and national security concerns associated with small UAS and invites input from the public as follows—

- D1. Should the prohibition from carrying hazardous materials in § 107.36 be expanded to include other types of payloads or installed equipment that could pose a threat to public safety or national security? If yes, what types of payloads should be prohibited and why?
- D2. Should the FAA consider rulemaking to restrict the use of certain types of small UAS payloads or installed equipment? If yes, what types of payloads should be restricted, under what conditions should they be restricted? Should there be exceptions or special provisions applicable to certain conditions or other factors such as location, time, population density, or purpose? Please provide data or explanations to justify your response.
- D3. What types of operations would be affected if additional restrictions are placed on the type of payloads and equipment that can be installed on a small UAS? Would there be any costs or lost revenues associated with those restrictions?

#### E. Small UAS critical system design requirements

Public safety and national security concerns have been raised regarding the potential failure of critical systems on small UAS, which could result in the loss of control of the aircraft and increase the risk to persons and property on the ground and other users of the airspace. One way of designing critical systems on small UAS that has the potential to address these concerns from both a public safety and national security perspective is the use of redundancy. From a safety standpoint, redundancy helps to mitigate the risk of critical single-point system failures. For example, a battery failure on a UA with only one battery might result in a crash landing. If the UA was built with a redundant power system (multiple batteries or a backup), the UA could switch to the alternate power source and maintain safe flight. Another approach to increase safety is the use of fail-safe design features. A small UAS that has a fail-safe command and control (C2) link would improve the safety of the small UAS if a lost-link event occurs.

From a national security standpoint, redundancy of critical systems plays a more indirect role. Failure of some functions on an unmanned aircraft may lead to unplanned airspace or security violations. For example, a loss of navigation or lost-link could lead to an unmanned aircraft entering unauthorized airspace. Having a redundant navigation system or a fail-safe C2 system could reduce the risk of this happening. Additionally, critical systems could be a piece of a larger security strategy ensuring a robust capability to strengthen the overall security of the system. An example would be having redundant positioning solutions (e.g. GPS, inertial) to ensure a high availability to broadcast the unmanned aircraft's position, if required.

Currently, small UAS operated under 14 CFR part 107 are not required to have an airworthiness certificate. Furthermore, they do not have any prescribed design standards or required system redundancies. As a result, many small UAS operating today, especially those

with relatively small size, do not have redundancies in their design. However, the FAA, through policy, may condition the grant of waiver from certain operational limitations in part 107 on equipage with redundant systems. For example, § 107.31 – Visual line of sight aircraft operations and § 107.39 – Operation over people, are both subject to waiver as prescribed in §§ 107.200 and 107.205. In evaluating waiver requests for §§ 107.31 and 107.39, the FAA may consider the need for design requirements, including redundancy, for critical UAS systems based upon the nature of the request and the need to mitigate any risks associated with the proposed operation.

In a related rulemaking action, specifically the Operation of Small Unmanned Aircraft Systems over People NPRM, the FAA is proposing to amend § 107.39 to allow small UAS to operate over people if they are tested and shown to fulfill certain safety standards intended to limit the severity of injuries to people on the ground. While manufacturers of small UAS qualified to operate over people may choose to have redundancy for critical systems in their designs, it is not required by the proposed rule.

**Questions for the Public:** The FAA is considering rulemaking to address public safety and national security concerns associated with small UAS and invites input from the public as follows—

E1. For small UAS operations beyond the visual line of sight of the remote pilot, should the FAA establish design requirements, such as redundancy, for systems critical to safety of flight? If yes, what should these requirements be and why? Are there other means the FAA should consider to address public safety and national security risk for BVLOS operations?

- E2. For small UAS operations over people that exceed the NPRM safety thresholds indicated above and therefore still must seek a waiver to §107.39 to operate over people, should the FAA establish design requirements, such as redundancy, for systems critical to safety of flight? If yes, what should these requirements be and why? Are there other means the FAA should consider to address public safety and national security risk for operations over people?
- E3. Are there other types of small UAS operations besides BVLOS and operations over people that the FAA should establish design requirements for, such as redundancy, to address public safety and national security risk?
- E4. What are the costs and benefits to incorporate redundant systems critical to safety of flight for BVLOS operations or operations over people that exceed the NPRM safety thresholds indicated above?

## **V. Regulatory Requirements and Executive Order Determinations**

The FAA will address the following requirements in future small UAS safety and security rulemakings. Please provide comments that would assist the FAA in its consideration and analyses of these requirements.

### **A. Executive Order 12866, Executive Order 13563, and DOT Regulatory Policies and Procedures**

This ANPRM is considered a significant regulatory action under section 3(f) of Executive Order 12866 and was reviewed by the Office of Management and Budget (OMB). It is

considered a significant regulatory action under the Regulatory Policies and Procedures order issued by the Department of Transportation. 44 FR 11034 (Feb. 26, 1979).

Executive Orders 12866, “Regulatory Planning and Review,” 58 FR 51735 (Oct. 4, 1993), and 13563, “Improving Regulation and Regulatory Review,” 76 FR 3821 (Jan. 21, 2011), require agencies to regulate in the “most cost-effective manner,” to make a “reasoned determination that the benefits of the intended regulation justify its costs,” and to develop regulations that “impose the least burden on society.” Executive Order 13610, “Identifying and reducing Regulatory Burdens,” 77 FR 28469 (May 14, 2012), urges agencies to conduct retrospective analyses of existing rules to examine whether they remain justified and whether they should be modified or streamlined in light of changed circumstances, including the rise of new technologies.

Additionally, Executive Orders 12866, 13563, and 13610 require agencies to provide a meaningful opportunity for public participation. Accordingly, FAA invites comments on these considerations, including any cost or benefit figures or factors, alternative approaches, and relevant scientific, technical and economic data. These comments will help FAA evaluate whether regulatory action is warranted and appropriate.

#### B. Executive Order 13771

On January 30, 2017, President Trump signed Executive Order 13771 (EO 13771), “Reducing Regulation and Controlling Regulatory Costs.” Under Section 2 of this Executive Order, unless prohibited by law, whenever an executive department or agency publicly proposes for notice and comment or otherwise promulgates a new regulation, it must identify at least two existing regulations to be repealed and offset any new incremental costs associated with new

regulations by the elimination of existing costs associated with at least two prior regulations. FAA will need to determine if a future rulemaking is an EO 13771 regulatory or deregulatory action.

C. Executive Order 13132

Executive Order 13132, “Federalism,” 64 FR 43255 (Aug. 10, 1999), requires agencies to assure meaningful and timely input by State and local officials in the development of regulatory policies that may have “substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.” FAA invites State and local governments with an interest in this rulemaking to comment on any effect that may result.

D. Executive Order 13175

Consistent with Executive Order 13175, “Consultation and Coordination with Indian Tribal Governments,” and FAA Order 1210.20, “American Indian and Alaska Native Tribal Consultation Policy and Procedures,” the 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 uniquely or significantly affect their respective Tribes. At this point, the FAA has not identified any unique or significant effects, environmental or otherwise, on tribes resulting from this advance notice of proposed rulemaking. As it contemplated in the sUAS Operation and Certification final rule, the FAA has conducted outreach to tribes and responded to those tribes seeking information about small UAS operations conducted within



their territory to see how their concerns can be addressed within the broader UAS integration effort.<sup>13</sup>

Since publication of the sUAS Operation and Certification final rule, the FAA has conducted outreach to tribes to ensure that they are familiar with the rules' provisions and how they might apply in Indian country, and that they are aware of FAA's plans for additional rulemakings to integrate UAS into the NAS. As part of that outreach the FAA has:

- Provided material on the sUAS Operation and Certification final rule to participants at the mid-year conference of the National Congress of American Indians (Spokane, WA, June 27-30, 2016);
- Presented at a workshop at the National Tribal Transportation Conference (Anaheim, CA October 4, 2016);
- Responded to inquiries from the Shoshone-Bannock Tribes and Muscogee (Creek) Nation regarding use of UAS;
- Presented information on UAS at a meeting of the Tribal Transportation Self-Governance Program Negotiated Rulemaking Meeting (Shawnee, OK October 18, 2016); and
- Provided information to The Choctaw Nation of Oklahoma, which is participating in the UAS Integration Pilot Program.<sup>14</sup> Through this program, the FAA will work with The Choctaw Nation to ensure safe UAS operations for the purposes of agriculture, public safety, and infrastructure inspections. Such operations may include operations over people and operations at night.

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<sup>13</sup> 81 FR 42063 at 42189.

<sup>14</sup> Federal Aviation Administration UAS Integration Pilot Program (May 7, 2018), available at [https://www.faa.gov/uas/programs\\_partnership/uas\\_integration\\_pilot\\_program/](https://www.faa.gov/uas/programs_partnership/uas_integration_pilot_program/).

The FAA will continue to respond to tribes expressing interest in or concerns about UAS operations, and will engage in government-to-government consultation with tribes as appropriate, in accordance with Executive Orders and FAA guidance.

E. Regulatory Flexibility Act, Executive Order 13272, and DOT Policies and Procedures

Under the Regulatory Flexibility Act of 1980, 5 U.S.C. 601, et seq., FAA must consider whether a rulemaking would have a “significant economic impact on a substantial number of small entities.” “Small entities” include small businesses, not-for-profit organizations that are independently owned and operated and are not dominant in their fields, and governmental jurisdictions with populations under 50,000.

Any future rulemaking would be developed in accordance with Executive Order 13272, “Proper Consideration of Small Entities in Agency Rulemaking,” 68 FR 7990 (Feb. 19, 2003), and DOT’s procedures and policies to promote compliance with the Regulatory Flexibility Act to ensure that potential impacts on small entities of a regulatory action are properly considered.

F. Paperwork Reduction Act

In accordance with the Paperwork Reduction Act, 44 U.S.C. 3501 et seq., 5 CFR § 1320.8(d) requires that FAA provide interested members of the public and affected agencies an opportunity to comment on information collection and recordkeeping requests. This ANPRM does not impose new information collection requirements. FAA would have to consider information collection requirements for future rulemakings.

G. Unfunded Mandates Reform Act of 1995

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's having first provided the funds to pay those costs. The FAA will need to determine if this rulemaking would result in costs of \$155 million or more, adjusted for inflation, to either state, local, or tribal governments, in the aggregate, or to the private sector in any one year.

#### H. National Environmental Policy Act

The National Environmental Policy Act of 1969, 42 U.S.C. 4321-4375, requires that Federal agencies analyze proposed actions to determine whether the action will have a significant impact on the human environment. The Council on Environmental Quality (CEQ) regulations require Federal agencies to conduct an environmental review considering (1) the need for the proposed action, (2) alternatives to the proposed action, (3) probable environmental impacts of the proposed action and alternatives, and (4) the agencies and persons consulted during the consideration process. See 40 CFR 1508.9(b). FAA welcomes any data or information related to environmental impacts that may result from any future rulemaking.

#### I. Privacy Act

Anyone is able to search the electronic form of any written communications and comments received into any of our dockets by the name of the individual submitting the document (or signing the document, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the Federal Register published on April 11, 2000, see 65 FR 19477, or you may visit <http://www.regulations.gov>.

#### J. Executive Order 13609 and International Trade Analysis

Under Executive Order 13609, “Promoting International Regulatory Cooperation,” 77 FR 26413 (May 4, 2012), agencies must consider whether the impacts associated with significant variations between domestic and international regulatory approaches are unnecessary or may impair the ability of American businesses to export and compete internationally. In meeting shared challenges involving health, safety, labor, security, environmental, and other issues, regulatory approaches developed through international cooperation can provide equivalent protection to standards developed independently while also minimizing unnecessary differences.

Similarly, 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 any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. For purposes of these requirements, Federal agencies may participate in the establishment of international standards, so long as the standards have a legitimate domestic objective, such as providing for safety, and do not operate to exclude 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 welcomes any data or information related to international impacts that may result from future rulemaking.

#### K. Executive Order 13211

Executive Order 13211, 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare a Statement of Energy Effects for any “significant energy action.” Under the executive order, a “significant energy action” is defined as any action by an agency (normally published in the Federal Register) that promulgates, or is expected to lead to the promulgation of, a final rule

or regulation (including a notice of inquiry, ANPRM, and NPRM) that (1)(i) is a significant regulatory action under Executive Order 12866 or any successor order and (ii) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (2) is designated by the Administrator of the Office of Information and Regulatory Affairs as a significant energy action. The FAA would have to consider this executive order for future rulemaking.

Issued under the authority provided by 49 U.S.C. 106(f), 40101 note, and 44807, in Washington, DC on

Daniel K. Elwell,  
Acting Administrator, Federal Aviation Administration.