Federal Aviation Administration

Draft Programmatic Environmental Assessment for Drone Package Delivery Operations in the United States

December 2025

Unique Identification Number: PEAX-021-12-14Y-1764664592

This page intentionally left blank.

DEPARTMENT of TRANSPORTATION

Federal Aviation Administration

Washington, D.C.

Notice of Availability, Notice of Public Comment Period, and Request for Comment on the Draft Programmatic Environmental Assessment for Drone Package Delivery Operations in the United States

The Federal Aviation Administration (FAA) is announcing the availability of and requesting comments on the draft Programmatic Environmental Assessment (PEA) that evaluates the potential environmental impacts of Unmanned Aircraft Systems (UAS) package delivery operations in the United States. The proposed action analyzed in this PEA is drone operators conducting commercial drone package deliveries under 14 Code of Federal Regulations (CFR) Part 135.

The draft PEA is submitted for review pursuant to the National Environmental Policy Act (NEPA) (42 United States Code [U.S.C.] §§ 4321 et seq.), USDOT Order 5610.1D *DOT's Procedures for Considering Environmental Impacts*, FAA Order 1050.1G *FAA National Environmental Policy Act Implementing Procedures*, Section 4(f) of the Department of Transportation Act (49 U.S.C. § 303), and Section 106 of the National Historic Preservation Act (54 U.S.C. § 300101 et seq.). The draft PEA is available to view and download electronically at https://www.faa.gov/uas/advanced_operations/nepa_and_drones/.

The public comment period for the draft PEA begins with the posting of the Notice of Availability of the draft PEA in the *Federal Register*. Comments must be submitted within 30 calendar days after publication of the Notice of Availability in the *Federal Register* and may be directed in writing to 9-FAA-Drone-Environmental@faa.gov. Please reference the draft PEA for drone package delivery in the email subject line when sending comments.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask us in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.

Posted: _____

Derek Hufty
Manager, General Aviation and Commercial Branch
Emerging Technologies Division
Office of Safety Standards, Flight Standards Service

This page intentionally left blank.

Table of Contents

Tables and Figures

Tables

Page

Figures

Page

Appendices

This page intentionally left blank.

Acronyms & Abbreviations

AAD	Average Annual Day
AGL	above ground level
APE	Area of Potential Effects
BGEPA	Bald and Golden Eagle Protection Act
BVLOS	beyond visual line of sight
CFR	Code of Federal Regulations
dB	decibel
DNL	Day-Night Average Sound Level
EA	environmental assessment
EIS	environmental impact statement
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
IPaC	Information for Planning and Consultation
LWCF	Land and Water Conservation Fund
MBTA	Migratory Bird Treaty Act
NAS	national airspace system
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act of 1969, as amended
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOTAM	Notice to Airmen
NPS	National Park Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
OpSpecs	operations specifications
PEA	programmatic environmental assessment

SEL	sound exposure level
SHPO	State Historic Preservation Officer
T&E	threatened and endangered
THPO	Tribal Historic Preservation Office
UA	unmanned aircraft
UAS	unmanned aircraft system
U.S.	United States
USDOT	U.S. Department of Transportation
U.S.C.	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
UTM	UAS Traffic Management
VLOS	visual line of sight

Chapter 1
Introduction

The National Environmental Policy Act (NEPA)[1] is the United States' basic national charter for protection of the environment. It is intended to ensure Federal agencies consider the environmental impacts of their actions in the decision-making process. The Federal Aviation Administration's (FAA) policies and procedures for compliance with NEPA are contained in USDOT Order 1050.1D *DOT's Procedures for Considering Environmental Impacts* and FAA Order 1050.1G *FAA National Environmental Policy Act Implementing Procedures*.[2]

NEPA requires Federal agencies to assess the environmental effects of proposed major Federal actions prior to making decisions. Major FAA actions include authorizations issued to operators of Unmanned Aircraft Systems (UAS) to enable unmanned aircraft (UA; also referred to as a drone) operations in the national airspace system (NAS). One type of UAS operation is using drones to deliver goods to customers (referred to as package delivery). In 2019, the FAA began issuing air carrier certificates to drone operators in accordance with 14 Code of Federal Regulations (CFR) Part 119 for operations under 14 CFR Part 135 (Part 135)[3] so that operators could conduct package delivery flights. Generally, these approvals were primarily associated with amendments to Part 135 air carrier operations specifications (OpSpecs)[4] as the operative approval. The FAA has completed 23 environmental assessments (EAs) for individual drone package delivery proposals and one programmatic environmental assessment (PEA) for drone package delivery. Each EA resulted in a finding of no significant impact (FONSI).[5]

To support the environmental review process for UAS package delivery proposals throughout the United States (U.S.), the FAA has prepared this PEA in accordance with NEPA, FAA Order 1050.1G, and USDOT Order 5610.1D. The FAA may prepare environmental documents for programmatic Federal actions, such as the adoption of new agency programs. FAA may evaluate the proposal(s) in one of the following ways: (1) geographically, including actions occurring in the same general location, such as a body of water, region, or metropolitan area; (2) generically, including actions that have relevant similarities, such as common timing, effects, alternatives, methods of implementation, media, or subject matter; or (3) by stage of technological development.[6] A programmatic document is useful in analyzing the combined impacts of a group of related actions.

[1] 42 U.S.C. §§ 4321 et seq.

[2] See: Order 1050.1G - FAA National Environmental Policy Act Implementing Procedures.

[3] The FAA grants the authority to operate on-demand, unscheduled air service in the form of a Part 135 certificate. Part 135 allows drone air carriers to deliver small packages of commercial goods. To operate under Part 135, a company needs economic authority from the Department of Transportation and a Part 135 certificate and operations specifications from the FAA.

[4] An Operations Specifications is a document that defines the scope of aircraft operations that the FAA has authorized.

[5] See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

[6] FAA Order 1050.1G, § 3.1(a).

When the proposed actions are adequately analyzed, the programmatic document can serve as the NEPA review for those actions.

A programmatic NEPA document may contain a broader, less specific analysis compared to what is performed for a specific proposed project. Programmatic documents can also be used to establish boundaries for analyses, documentation, and decisions of subsequent project-level decisions to minimize repetition and delay. Programmatic reviews and documentation can identify best management practices or mitigation measures to avoid environmental impacts on resources and alleviate the need for subsequent reviews. When a programmatic NEPA document is prepared, the FAA may still require project- or operational-specific NEPA documents for individual actions where more detailed analyses are warranted. Any subsequent NEPA analysis only needs to incorporate by reference by summarizing the issues discussed in the programmatic document, discussing the relationship between the new document and the previous review, providing access to the PEA, and concentrating the subsequent project-specific NEPA document on site-specific impacts not covered by the PEA.[7]

The FAA intends to use this PEA to comply with its NEPA requirements for subsequent requests for authorizations from individual drone operators proposing to conduct package delivery operations in areas of the U.S. Upon receiving an authorization request, the FAA will evaluate the proposal against this PEA to determine if the proposal and its potential environmental impacts fall within the scope of this PEA (see Section 1.4). If the proposal falls outside the scope of this PEA, the FAA will conduct further environmental review, which could include preparing another NEPA document that tiers[8] from this PEA.

1.1 Background

Numerous paths to operate drones exist, as shown in **Table 1**.

Table 1. Paths to Drone Operations

Operator Type	UAS Operating Authority	Types of Operation
Civil	Part 91	Research and development, crew training, and market survey
Civil	Part 107 (small)	Must be within visual line of sight, below 400 feet above ground level (AGL)
Civil	Section 44809 Exception for Limited Recreational Operations of Unmanned Aircraft (recreational)	Community-Based Organization safety guidelines and strictly recreational purposes
Civil	Part 135 (cargo delivery)	Package delivery and advanced air mobility
Civil	Part 137 Agricultural Operations	Spraying of economic poisons

[7] FAA Order 1050.1G, § 3.1(c)

[8] *Tiering* refers to the process by which an environmental document may rely on an existing and broader or more general environmental document.

Operator Type	UAS Operating Authority	Types of Operation
Public	Public Aircraft Operations	Public aircraft operations listed in Advisory Circular 00-1.1B, UAS test site operations

Part 135 certification is currently the only path for drones to carry the property of another for compensation or hire beyond visual line of sight (BVLOS).[12] Along with issuing a Part 119 certificate to a drone operator, the FAA issues OpSpecs to identify the scope of operations allowed under the certificate.

Drone package delivery operators holding air carrier certificates operate as standard Part 135 operators. This means the certificate holder does not have pre-set limits on the available size or scope of their operations. The certificate holder must apply, qualify, and be granted FAA authorization through amendments to their OpSpecs for each type and number of operation. When certificate holders change the scope of their operations—including expanding operations to add new delivery areas, using new distribution centers or takeoff and landing areas (referred to as "hubs"), modifying operation times, or other changes—the operator must apply for an amendment to its OpSpecs.

1.2 FAA Role and Federal Action

In general, Congress has charged the FAA with the safety of air commerce in the U.S. and to encourage the development of civil aeronautics.[9] The FAA provides multiple approvals associated with package delivery proposals, such as an exemption to 14 CFR § 91.113(b) to enable BVLOS operations; however, the FAA's issuance of an OpSpecs (or amended OpSpecs) to include package delivery flights in a specific operating area is the approval that ultimately enables UA operations. The FAA's issuance of an approval to operate UAS in the NAS is considered a major Federal action subject to NEPA review.

The FAA has specific statutory and regulatory obligations related to its approvals of UAS operations in the NAS. For example, under current regulations, the FAA is required to issue an air carrier operating certificate to an air carrier when it "finds, after investigation, that the person properly and adequately is equipped and able to operate safely under this part and regulations and standards prescribed under this part."[10] An air carrier operating certificate also specifies "terms necessary to ensure safety in air transportation; and (2)…the places to and from which, and the airways of the United States over which, a person may operate as an air carrier."[11] Air carrier certificates also include a stipulation that the carrier's operations must be conducted in accordance with the provisions and limitations specified in the OpSpecs.[12] The regulations also specify that a Part 135 certificate holder may not operate in a geographical area unless its OpSpecs specifically

[9] 49 U.S.C. § 40104.
[10] 49 U.S.C. § 44705.
[11] Id.
[12] 14 CFR § 119.5(g) and (l).

authorize the certificate holder to operate in that area.[13] The regulations implementing 49 United States Code (U.S.C.) § 44705 specify that an air carrier's approved OpSpecs must include, among other things, "authorization and limitations for routes and areas of operations."[14] An air carrier's OpSpecs may be amended at the request of an operator if the FAA "determines that safety in air commerce and the public interest allows the amendment."[15] After making this determination, the FAA must take an action on the OpSpecs amendment.

Since issuing the first Part 135 approval for UAS to deliver cargo for compensation or hire in 2019 (FAA 2023a), Part 135 approvals have become increasingly important in the FAA's strategy to regulate the development of commercial UAS package delivery services.

Because Part 135 approvals require a Federal action, they must undergo environmental reviews to comply with NEPA. The purpose of this PEA is to streamline the NEPA process for multiple repetitive actions by broadly analyzing reasonably foreseeable direct and indirect impacts that may occur as a result of Part 135 approvals for drone operators throughout the U.S.

Additionally, the FAA Reauthorization Act of 2024 requires the FAA to examine and integrate programmatic-level approaches to the requirements of NEPA by which the FAA can leverage an EA or environmental impact statement (EIS) for nationwide programmatic approaches for large scale distributed UA operations.[16] This PEA is intended to fulfill that requirement.

1.3 Purpose and Need

The proposed action analyzed in this PEA is drone operators conducting commercial drone package deliveries under Part 135 in the U.S., as described in **Section 2.2**. The ***purpose*** of the proposed action is to provide commercial drone package delivery service to customers, including businesses and households. The proposed action is ***needed*** to provide businesses with another option—in addition to using a car, truck, or other mode of transportation—of delivering goods and products to other businesses and consumers. The introduction of drone technology to provide package delivery services has created another transportation option.

1.4 Scope of the PEA

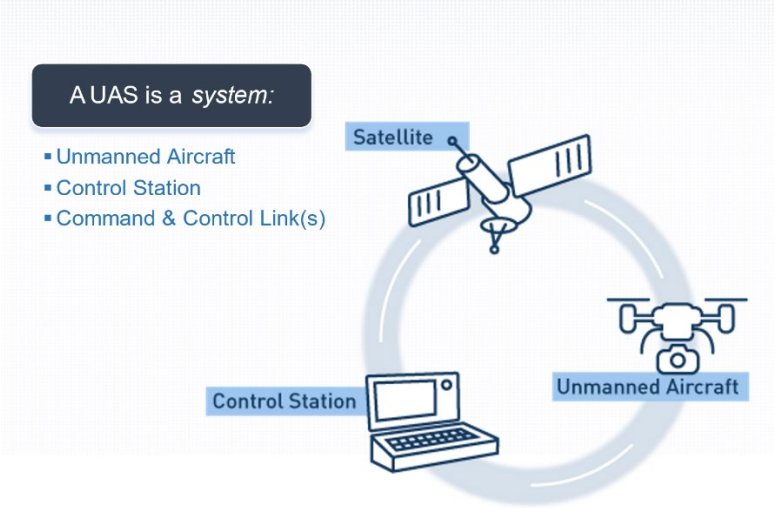
This PEA analyzes the reasonably foreseeable environmental impacts associated with UAS package delivery (see **Section 2.2**) in the U.S. on a national programmatic level in accordance with FAA Order 1050.1G. It considers the FAA-identified types and frequency of UAS activities. The purpose of this PEA is to:

[13] 14 CFR § 119.5(j).
[14] 14 CFR § 119.49(a)(6).
[15] 14 CFR § 119.51(a); see also 49 U.S.C. § 44709.
[16] Section 909(c) of the FAA Reauthorization Act of 2024.

1. Streamline the NEPA process for multiple repetitive actions related to Part 135 package delivery operations by broadly analyzing reasonably foreseeable impacts that may occur as a result of the proposed action; and
2. Provide programmatic-level recommendations for mitigation measures to avoid significant impacts, if necessary, and alleviate the need for subsequent individual reviews.

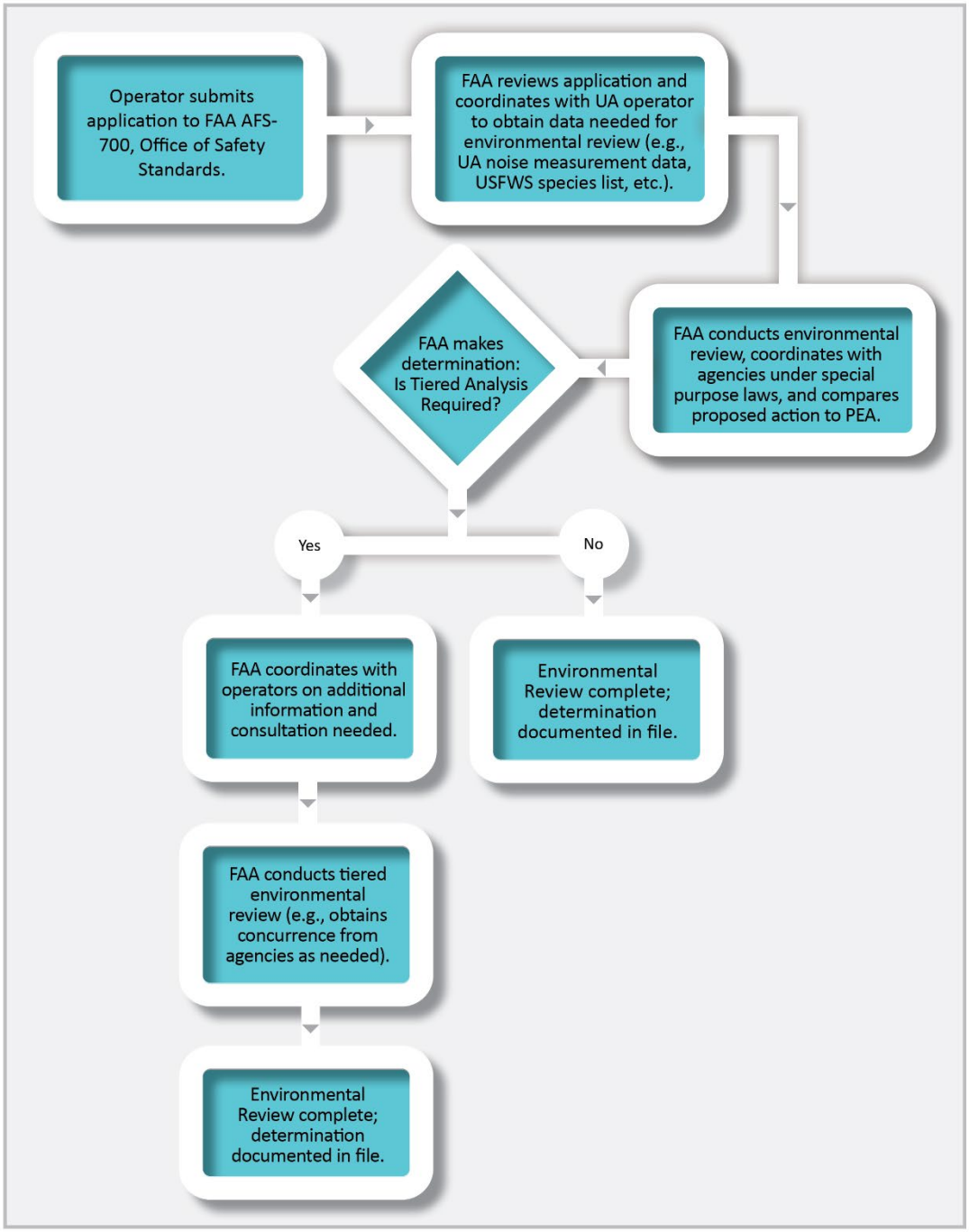
In general, the study area is the entire U.S. (including Alaska and Hawaii). Reasonably foreseeable environmental impacts from UAS package delivery operations are limited to the area surrounding operations on the ground (e.g., at the hubs and delivery locations) and the airspace in which UA are flown. **Figure 1** displays the components of a UAS that are considered in evaluating potential environmental impacts associated with drone package deliveries.

Figure 1. UAS System Components



The specific locations of Part 135 operators' proposed hubs and delivery recipients are currently unknown. When operators identify specific locations from which they propose to operate, they will submit information pertaining to their proposed operations to the FAA. This information may include, at a minimum, proposed location of hubs, delivery areas, types of UA to be used, noise data associated with the UA, and anticipated numbers of operations from each hub. The FAA will evaluate applications as they are received, compare them to the scope of the PEA, and determine whether any additional environmental review is needed. The process used to make this determination is shown in **Figure 2**. If additional environmental reviews are needed, it is anticipated that the operator would be able to "tier" off of this PEA; this is expected to streamline the NEPA process by allowing operators to focus only on the environmental resource categories that may be impacted by the specific proposed action.

Figure 2. Process for Determining Whether an Application Needs Additional Environmental Review



1.4.1 Methodology

The FAA anticipates that drone package deliveries will become more common throughout all of the U.S. as technology advances and the public becomes more accustomed to drone package deliveries. Operators' business plans typically include the siting of numerous delivery hubs throughout a particular city or metro area in order to reach the largest possible number of customers. Drone package delivery flights generally occur within 5 to 10 miles of their associated delivery hub/distribution center location. The siting of hubs is also commonly driven by delivery operators' partnerships with businesses that want their products to be available via drone delivery. For these reasons, the drone package delivery industry generally conducts operations in a physically decentralized manner when considered at the macroscale of an entire city or metro area. Delivery flights are centralized around hub locations, but hubs are dispersed throughout the service area based on business partnerships and market demand for services.

Because the specific locations of hubs and delivery recipients are currently unknown, it is not possible to evaluate the microscale (i.e., individual hubs and/or the airspace shared by multiple hubs) geographical distribution of drone package deliveries that could exist for an entire city or metro area. To evaluate the potential for environmental effects, drone operations must be quantified at the more localized microscales based on the smaller areas within which they would occur. An understanding of the density of flight operations within a geographical area is required as the quantitative basis to assess environmental effects.

For these reasons, this PEA uses a methodology based on determining the level of operations within a specified geographic area that would pose no potential for significant impacts. Because noise is the primary environmental resource category that may involve significant impacts, noise impacts were used to establish the level of operations below which significant impacts are not possible. Similar to other drone package delivery EAs prepared to date for individual operators, hubs would be sited sufficiently far away from noise sensitive land uses to prevent significant noise impacts from occurring as a result of hub activity, and deliveries would typically be spread out to the point that they are too few in number at any single location to result in significant impacts. As such, the primary remaining potential for significant impact is noise from en route flight operations within airspace that is shared by multiple hubs of different operators.

While it is not currently possible to predict the local operational density of en route drone activity within shared airspace at some future time, it is possible to define the en route activity threshold below which significant noise impacts could not occur. This is referred to as the "unit capacity threshold." Drone noise measurement data that has been collected by the FAA was used to form the basis for calculating this threshold. This approach allows the scope of this PEA to cover the operation of package delivery drones anywhere in the U.S. up to, but not exceeding, a threshold below which there exists no potential for significant noise impacts to occur. The calculation of the unit capacity threshold value is determined entirely from available UA noise data and environmental noise significance limits.

Operators wishing to use this PEA would be required to submit vehicle noise data as part of their application to the FAA. The FAA uses this noise data to compare it to the noise analysis used in the PEA to confirm that noise from the operator's proposed vehicle would not exceed that evaluated in the PEA. Operators would also have to provide data ensuring that their proposed numbers of operations would not result in exceedances of the unit capacity threshold operations value.

This approach is consistent with the approach that was recently used on the PEA for Part 135 drone package deliveries in North Carolina.

1.5 Public Involvement

The FAA created a Notice of Availability (NOA) with information about the draft PEA and announced its availability for public review via the FAA's website and social media accounts, as well as the *Federal Register*. The NOA provides information about the proposed action and requests public review and comments on this draft PEA, which is published on the FAA's website. The FAA also provided the NOA to state and Federal officials, interest groups, and federally recognized tribes.[17] An informational video regarding the PEA and its preliminary findings is also contained on the FAA's website.[18] Parties are invited to submit comments on any environmental concerns related to the proposed action. Comments must be submitted to the FAA within 30 days of publication of the NOA in the *Federal Register*.

[17] See: https://www.bia.gov/service/tribal-leaders-directory/federally-recognized-tribes.

[18] See: Public Involvement and Environmental Review for Drone Operations | Federal Aviation Administration

Chapter 2
Description of Proposed Action and Alternatives

An EA must briefly discuss alternatives as required by Section 102(2)(H) of NEPA.[19] FAA Order 1050.1G, Paragraph 6-2.1(d) states "[a]n EA may limit the range of alternatives to the proposed action and no action alternative when there are no unresolved conflicts concerning alternative uses of available resources." The FAA has not identified any unresolved conflicts concerning alternative uses of available resources associated with this proposal. Therefore, this PEA only considers the no action alternative and the proposed action.

2.1 No Action Alternative

In instances involving Federal decisions on proposals for projects, "no action" means the proposed activity would not take place, and the resulting environmental effects from taking no action are compared with the effects of authorizing the proposed activity. In the context of this PEA, the no action alternative means there would be no change to current Part 135 operations in the U.S. This alternative assumes drone operators would continue conducting drone package delivery operations in the U.S. according to existing approvals. Additional requests for approval would be reviewed on a case-by-case basis by the FAA. These reviews can take up to 12 months to complete but typically range from six to eight months. Between November 2021 and July 2025, the FAA completed 23 EAs for individual drone package delivery proposals and one PEA for drone package delivery. Each EA resulted in a FONSI.[20] States represented in previous environmental reviews for Part 135 drone package delivery include Arkansas, California, Florida, Kentucky, North Carolina, Ohio, Oregon, Texas, Utah, and Virginia. **Table 2** displays a list of drone operators that have Part 135 certificates and OpSpecs for drone package delivery operations.

[19] 42 U.S.C. § 4332(2)(H). Section 102(2)(H) states that all Federal agencies must study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.

[20] See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

Table 2. Drone Operators with Part 135 Certificates and OpSpecs for Drone Package Deliveries as of July 2025

Operator	Completed EA Location(s)
Amazon Prime Air	Tolleson, Arizona; Lockeford, California; Pendleton, Oregon; College Station, Texas
Causey Aviation Unmanned, Inc.	Holly Springs, Raeford, Pinehurst, and Winston-Salem, North Carolina; Granbury, Rowlett, and Dallas-Fort Worth, Texas
DroneUp	Dallas-Fort Worth, Texas
UPS Flight Forward, Inc.	The Villages, Florida; Winston-Salem, North Carolina; Columbus, Ohio
Wing Aviation, LLC	Dallas-Fort Worth, Frisco, and Little Elm, Texas; Christiansburg, Virginia; Central Florida; Charlotte Metro Area, North Carolina
Zipline International Inc.	Pea Ridge, Arkansas; Kannapolis, North Carolina; Salt Lake City, Utah
Drone Express	Piedmont Triad, North Carolina
Ameriflight, LLC	Charlotte Metro Area, North Carolina

The no action alternative also includes potential future Part 135 operations as defined in any future applications received by the FAA; however, because the scale and intensity of future applications are not yet defined, only existing Part 135 operations are analyzed as part of the no action for this PEA. Also, under the no action alternative, operators would be able to conduct package delivery operations according to 14 CFR Part 107,[21] which limits drone package delivery operations to visual line of sight (VLOS).

The no action alternative is carried forward for analysis in the PEA to provide a comparison of existing conditions to the proposed action. The no action alternative reflects the status quo and serves as a benchmark against which effects of the proposed action can be evaluated.

2.2 Proposed Action

The proposed action evaluated in this PEA is the operation of commercial drone package deliveries from takeoff and landing areas (referred to as “hubs” in this PEA) within the U.S. (including Alaska and Hawaii) to delivery locations within the U.S. The proposed action includes operations up to a unit capacity threshold of 1,150 Average Annual Day (AAD) deliveries from a single hub, as explained in **Sections 1.4.1, 3.3.3.2, 3.4,** and **Appendix C**.

2.2.1 General Description of Operations

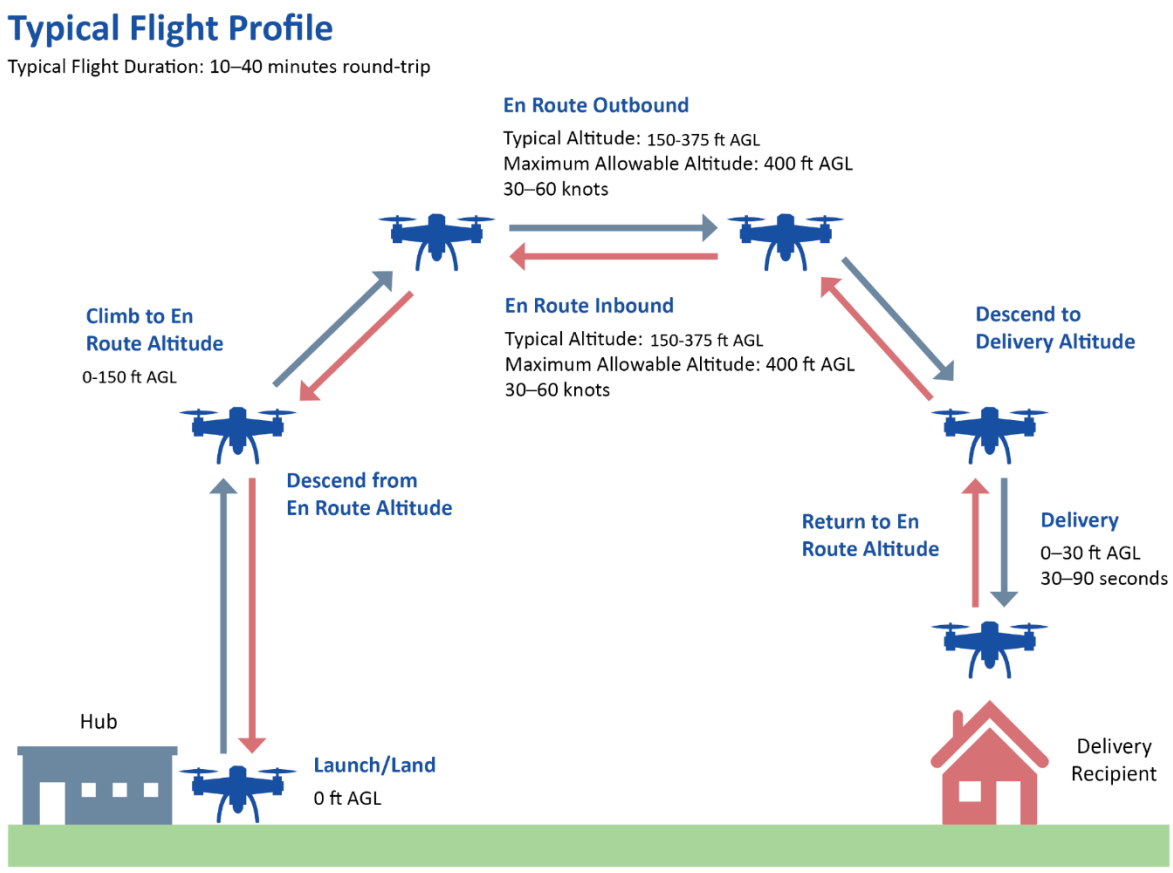
In general, based on previous proposals for drone package delivery operations, package delivery operators partner with established businesses and identify the location for a hub at the business’s parking lot, rooftop, or other area where it is not disruptive to the business and does

[21] Operation and Certification of Small Unmanned Aircraft Systems, 81 FR 42064 (June 28, 2016); Operation of Small Unmanned Aircraft Systems over People, 86 FR 4314 (January 15, 2021)

not present a safety hazard. This allows the drone operator to conduct operations with minimal infrastructure requirements.

While UA come in varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: (1) takeoff and climb, (2) en route outbound, (3) delivery, (4) en route inbound, and (5) descent and landing. Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the hub. The UA then climbs and performs aerial deliveries. After delivery, the UA returns to its hub via a pre-determined flight path. The five phases of operation for a typical multi-copter or hybrid UA are further described below. **Figure 3** shows a typical flight profile; however, certain operators may have unique operations that are not captured in the figure or this general description. For example, some operators load packages onto the UA while the aircraft hovers above the ground as opposed to loading the packages while the UA is on the ground. More details on the UA considered in this PEA are described in **Section 2.2.3**.

Figure 3. Typical Flight Profile



Drone package deliveries would occur 7 days per week. The FAA expects most deliveries would occur between the hours of 7:00 a.m. and 10:00 p.m. However, the FAA anticipates that a small percentage of deliveries may occur outside those hours; therefore, this PEA accounts for some drone package deliveries to occur 24 hours per day. For example, an operator could deliver a medical device, such as an automated external defibrillator, to a person in need or conduct other medical-related deliveries.

Launch and Climb

The launch and climb phase is described as the portion of the flight in which a fully loaded UA takes off from the hub and climbs vertically. The UA may then hover briefly as it conducts various systems checks to ensure it is functioning properly. With a multi-copter design, the UA can take off and descend vertically, as well as hover. Typical flights begin with the UA departing from a hub and ascending vertically to no more than 400 feet AGL.

En Route Outbound

The en route outbound phase is defined as the part of the flight in which the fully loaded UA flies a pre-programmed route from its hub to a delivery point. During this flight phase, typical normal cruising speeds range from 30–60 knots (35–70 miles per hour), and typical cruising altitudes range from 150–375 feet AGL.

Delivery

The delivery phase is defined by descent from the en route outbound phase to a delivery point to deliver a package. Upon arrival at the delivery point, the UA descends vertically to deliver the package. The UA may hover at an altitude that varies in height. Most current UA use a tether to lower the package from the UA to the ground while the drone hovers. Others drop the package from a low height AGL. Once the UA releases the package, it climbs vertically to the cruise altitude and begins the en route inbound phase. The delivery process typically takes 30–90 seconds, depending on the operator.

En Route Inbound

Upon completion of a delivery, the UA flies from the delivery point back to a hub. In general, the UA would use the same or similar route back to the hub that it used to reach its delivery location.

Descend and Land

Upon reaching the hub, the UA vertically descends, lands, and turns off.

2.2.2 Safety Requirements

As noted above, Part 135 certification is currently the only path for drones to carry the property of another for compensation or hire BVLOS. Drone operators wanting to conduct package

delivery must use the FAA's existing Part 135 certification process, some of which the FAA has adapted for drone operations by granting exemptions for rules that do not apply to drones, such as the requirement to carry the flight manuals on board the aircraft. All Part 135 applicants must go through the full five phases of the certification process.[22] As part of this process, the FAA conducts an extensive review of an application to ensure the applicant's proposed operations would not endanger public safety. The FAA also evaluates an applicant's proposed method of avoiding other aircraft when an exemption application is processed. In granting exemptions, the FAA includes several conditions and limitations for which the drone operator must comply with. **Appendix B** contains example conditions and limitations. Example conditions and limitations include, but are not limited to, the following:

- Prior to each operation, the operator must designate safe alternate landing areas that the UA can reach if it is unable to complete the intended flight and identify such alternate landing areas to the pilot in command operating the aircraft. The alternate landing areas must:
    - Provide for a landing without undue hazard to persons or property on the ground, and avoid structures and roads where overflight is not permitted; and
    - Be areas with a low likelihood of exposed persons, such as forested areas providing significant sheltering, farmland, or prairies.
- To ensure the safety of the operation, the operator must adhere to the following regarding takeoff, landing, and loading areas:
    - The areas must be limited to locations with access restricted to only persons participating in the operation;
    - The areas must be free of any obstructions that could pose a hazard; and
    - The distances at which non-participants must remain from the operation must be specified in the operator's accepted manuals.
- To ensure the safety of the operation, the operator must adhere to the following regarding delivery areas:
    - The areas must be free of any obstructions that could pose a hazard; and
    - The distances at which non-participants must remain from the operation must be specified in the operator's manuals.

[22] See: https://www.faa.gov/licenses_certificates/airline_certification/135_certification/cert_process.

- Prior to beginning flight operations, the pilot in command must review Notices to Airmen (NOTAMs)[23] and, if the NOTAMs indicate other UA activity or any other aviation activity in the intended operating area, ensure the operator contacts the other operator(s) to deconflict the activities. The pilot in command must ensure the UA remains clear of, and gives way to, any manned aircraft at all times, and does not get so close to any other UA as to create a collision hazard.
- In the event the operational area overlaps a Military Training Route, the operator must contact the Military Airspace Scheduling Office for the route 24 hours in advance for coordination and deconfliction of the activities.

2.2.2.1 UAS Traffic Management

The FAA, National Aeronautics and Space Administration (NASA), other Federal partner agencies, and industry are collaborating to explore concepts of operation, data exchange requirements, and a supporting framework to enable multiple BVLOS drone operations at low altitude airspace (under 400 feet AGL) where FAA air traffic services are not provided.

UAS Traffic Management (UTM) is a "traffic management" ecosystem that is separate from, but complementary to, the FAA's Air Traffic Management system. The concept of UTM is being developed to support and enable advanced, scalable, and safe BVLOS drone operations, including package delivery. Third-party services that are regulated by the FAA are intended to provide effective ways to manage communications links, coordinate flight operations amongst many drones, assist with detection of nearby conventional aircraft, and mitigate a variety of other risks.

UTM development will ultimately identify services, roles and responsibilities, information architecture, data exchange protocols, software functions, infrastructure, and performance requirements for enabling the management of low-altitude drone operations.

UTM will help drone operators manage operational risks of flights up to 400 feet AGL. UTM services will help ensure safe and scalable operations by mitigating risks (e.g., aircraft collision) and aid in managing large numbers of flights in the NAS where traditional Air Traffic Control services are not available.

2.2.3 Descriptions of UA Considered in this PEA

The type, size, and weight of aircraft used to deliver packages could vary, but the FAA anticipates multi-copter and hybrid (rotary and fixed-wing) platforms will be the primary type of UA used to deliver small packages in the foreseeable future.

[23] A NOTAM is a notice containing information essential to personnel concerned with flight operations but not known far enough in advance to be publicized by other means. It states the abnormal status of a component of the NAS.

Drone delivery distances vary. The battery duration, which can be influenced by weather and other factors, is the primary factor in how far the drone can fly on one charge. Delivery distances for a multi-copter UA typically range from 3 to 10 miles one-way or 6 to 20 miles roundtrip, with a duration of around 5 to 20 minutes one-way or 10 to 40 minutes roundtrip. However, as technology improves and batteries last longer, distances and durations are expected to increase. Longer-range hybrid or fixed-wing UA currently in development and/or operation are expected to be able to travel up to 60 miles one-way, with a duration of up to 46 minutes at maximum payload. Additionally, drones may hop from one hub to another to charge or change batteries so that they can make longer trips.

Cruising altitudes for drone package deliveries are typically 150 to 375 feet AGL and are not expected to exceed 400 feet AGL.[24] The characteristics of the UAS considered in this PEA are displayed in **Table 3**.

Table 3. UAS Characteristics

Characteristic	Criteria
Platform/Aircraft Type	Multi-copters, fixed-wing, and hybrid aircraft (vertical lift w/fixed-wing cruise)
Power	Electric motor[a]
Anti-collision Lighting	Anti-collision lights must be on for all flight operations, except when the pilot in command determines that, because of operating conditions, it would be in the interest of safety to turn the lights off
Delivery Mechanism Types	Drop off, tethered (wire/cable), customer unloads, ground drop
Maximum Aircraft Weight (including package)	110 pounds[b]
Typical Cruise Altitude	150 to 375 feet above ground level
Maximum Cruise Altitude	400 feet above ground level
Typical Hours of Operation	7:00 a.m. to 10:00 p.m.[c]
Days of Operation	7 days per week, 365 days per year
Maximum Anticipated Daily Deliveries from One Hub	1,150 deliveries

[a] The FAA has yet to receive a proposal for Part 135 UAS package delivery using a UA powered by fuel. Therefore, this PEA does not evaluate impacts associated with fuel-powered UA.

[b] All but one of the UA currently used to deliver packages weigh less than 55 pounds.

[c] The FAA expects a small percentage of operations could occur during the night (after 10:00 p.m. and before 7:00 a.m.); for example, a drone operator could deliver a medical device, such as a defibrillator, to a person in need or conduct other medical-related deliveries.

An overview of the drones that have been used to date or are currently anticipated to be used in the future for package delivery under Part 135 are presented in **Figure 4**. Most of these drones have been previously analyzed in separate noise studies supporting multiple individual EAs for package delivery operations at various locations across the Unites States. The following information is intended to give readers a general understanding of the types of drones used for package delivery operations at the time of this PEA; however, it should be noted that

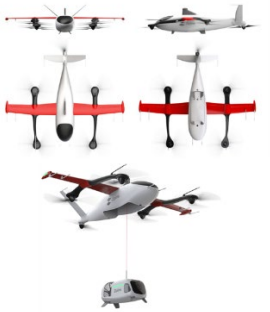
[24] Drone operators may temporarily fly UA above 400 feet AGL if the operator is temporarily transiting steep changing terrain, is operating a UA within a 400-foot radius of a structure and does not fly higher than 400 feet above the structure's immediate uppermost limit or is temporarily maneuvering up to 450 feet AGL to avoid a collision.

technology is evolving rapidly, and new drones are expected to come online that may differ slightly from those described in the **Figure 4**. If a drone is not specifically included in **Figure 4**, it does not mean that it would not be covered under this PEA.

Figure 4. UA Considered in this PEA

Image	Drone Operator/ Model	Max Takeoff and Package Weight (lb)	UA Characteristics	En Route Altitude and Speed	Package Stowage and Delivery Method
	Amazon Prime Air/MK30	83.2 / 5	• Hybrid fixed-wing/multi-copter • 6 propellers • Electric VTOL	180 to 377 ft AGL at 58 knots	• Internal fuselage • Descends, opens payload doors, and drops the package from a 13 ft hover
	Amazon Prime Air/MK27-2	91.5 / 4.9	• Hybrid fixed-wing / multi-copter • 6 propellers • Electric VTOL	160 to 180 ft AGL at 52 knots	• Internal fuselage • Decelerates, descends vertically over delivery point, and drops package from a 13 ft hover
	Causey Aviation/ Flytrex Sky II	34.2 / 8.8	• Multi-copter • 8 propellers • Electric VTOL	230 ft AGL at 29 knots	• External • Descends vertically and lowers package to ground via cable while hovering at 75 to 82 ft
	Causey Aviation/ Flytrex FTX-M600P	33.4 / 6.6	• Multi-copter • 6 propellers • Electric VTOL	230 ft AGL at 30 knots	• External • Descends vertically and lowers package to ground via cable while hovering at 82 ft

Image	Drone Operator/ Model	Max Takeoff and Package Weight (lb)	UA Characteristics	En Route Altitude and Speed	Package Stowage and Delivery Method
	Causey Aviation/ RigiTech Eiger	46.3 / 6.6	• Hybrid fixed-wing / multi-copter • 4 lift propellers • 1 push propeller • Electric VTOL	150 to 300 ft AGL at 46 to 68 knots	• Descends vertically to 60 feet and transitions to multi-copter • Lands on ground to deliver package
	DroneUp/ PRISM V2	55 / 10	• Multi-copter • 8 propellers • Electric VTOL	230 to 250 ft AGL at 27 knots	• External • Descends vertically and lowers package to ground via cable while hovering at 80 to 120 ft
	UPS Flight Forward/ Matternet M2	29 / 4.4	• Multi-copter • 4 propellers • Electric VTOL	250 to 400 ft AGL at 31 knots	• External • Descends vertically to a full stop landing
	Wing Aviation/ Hummingbird 7000W-B	14 / 2.3	• Hybrid fixed-wing/ multi-copter • 12 lift propellers • 4 pull propellers • Electric VTOL	150 to 300 ft AGL at 51 knots	• External • Descends vertically and lowers package to ground via cable while hovering at 23 ft
	Wing Aviation/ Hummingbird 8000-A	24.3 / 6.6	• Hybrid fixed-wing / multi-copter • 8 lift propellers • 4 pull propellers • Electric VTOL	150 to 300 ft AGL at 51 knots	• External • Descends vertically and lowers package to ground via retractable cable while hovering at 23 ft

Image	Drone Operator/ Model	Max Takeoff and Package Weight (lb)	UA Characteristics	En Route Altitude and Speed	Package Stowage and Delivery Method
	Zipline International/ P2 Zip	63 / 8	• Hybrid fixed-wing / multi-copter • 4 lift propellers • 1 push propeller • Electric VTOL	150 to 400 ft AGL at 41 knots	• External • Hovers at 330 ft and deploys droid from payload bay • Droid containing the package is lowered to the ground via retractable cable • Droid uses an onboard propeller to position itself onto the delivery target
	Drone Express/ TELEGRID DE-2020	23 / 4.4	• Multi-copter • 6 propellers • Electric VTOL	200 ft AGL at 30 knots	• External • Descends vertically and lowers package to ground via cable while hovering, or • Comes to a full stop landing

2.3 Typical Exclusion/No Fly Zones

In general, drone package delivery areas exclude special use airspace and fixed site facilities[25,26] where drones are prohibited. Additionally, unless otherwise approved by the Administrator, drone operators may not fly UA over open-air assemblies of people, schools during times of operation (e.g., elementary, middle, high, preschool, and daycare facilities), moving vehicles (except transitory flight operations), and roadways or highways (except transitory flight operations). UA must remain clear of known areas with increased aviation activity (e.g., ultralight areas, aerobatic boxes, or other areas with a high volume of low altitude traffic), and UA may not operate within 3 miles of any public use runway or other landing area, without suitable mitigations including outreach to the facility and communications before, during, and after operations.

2.4 Tiered Reviews

The FAA will review each action proposed by an operator to ensure that it complies with the best management practices and mitigation measures identified in **Chapter 3** of this PEA to avoid significant environmental impacts. If the operator's proposed action or undertaking does not include provisions to comply with the measures established in this PEA, then additional consultation or studies may be required. This determination will be made on a case-by-case basis. In accordance with USDOT Order 5610.1D and FAA Order 1050.1G, when a PEA has been prepared, any subsequent EA for proposed projects within the scope of the programmatic document only needs to incorporate by reference by summarizing the issues discussed in the programmatic document, discuss the relationship between the new document and the previous review, providing access to the PEA, and concentrating the subsequent project-specific EA on site-specific impacts not covered by the programmatic document. In other words, the FAA can tier off of this PEA to conduct additional environmental reviews for proposed drone operations that focus solely on the environmental impacts that were not addressed in this PEA; this is expected to streamline the environmental review process. The methodology used for determining whether tiered reviews are needed is described in more detail in **Section 1.4**, and the process used by the FAA is shown in **Figure 2**.

[25] Special use airspace consists of that airspace wherein activities must be confined because of their nature, or wherein limitations are imposed upon aircraft operations that are not a part of those activities, or both. Special use airspace areas are depicted on aeronautical charts, except for controlled firing areas, temporary military operations areas, and temporary restricted areas.

[26] Section 2209 of the FAA Extension, Safety, and Security Act allows for applicants to petition the FAA to prohibit or restrict drone operations in close proximity to a fixed site facility. A fixed site facility includes critical infrastructure (such as energy production, transmission, distribution facilities and equipment, and railroad facilities), oil refineries and chemical facilities, amusement parks, and state prisons.

Chapter 3
Affected Environment and Environmental Consequences

3.1 Introduction

This chapter provides a description of the affected environment and reasonably foreseeable direct and indirect environmental effects for the environmental impact categories that have the potential to be affected by the no action alternative and proposed action. As required by FAA Order 1050.1G, the environmental impact categories assessed in this PEA include:

- Aviation Emissions and Air Quality
- Biological Resources (including fish, wildlife, and plants)
- Coastal Resources[27]
- Department of Transportation Act, Section 4(f), and Land and Water Conservation Fund (Section 6(f))
- Farmlands
- Hazardous Materials, Solid Waste, and Pollution Prevention
- Historical, Architectural, Archeological, and Cultural Resources
- Land Use
- Natural Resources and Energy Supply
- Noise and Noise-Compatible Land Use[28]
- Socioeconomics, and Children's Environmental Health and Safety Risks
- Visual Effects (including light emissions and visual resources/visual character)
- Water Resources (including wetlands, floodplains, surface waters, groundwater, and Wild and Scenic Rivers)

The level of detail provided in this chapter is proportional to the magnitude of the proposed action and its anticipated impacts.[29] EAs are intended to be concise documents that focus on

[27] The environmental resource category, coastal resources, was inadvertently left out of FAA Order 1050.1G, but it must still be evaluated for environmental impacts and therefore remains in this PEA.

[28] Noise and noise-compatible land use is discussed as the first environmental impact category in this analysis because noise plays a large role in several other impact categories.

[29] USDOT Order 5610.1D, § 10(h)(3)

aspects of the human environment that may be affected by the proposed action. Given the programmatic nature of this assessment and the fact that specific operating areas are not currently known, the description of the affected environment is provided at a high level, and site-specific descriptions are not provided.

The FAA uses thresholds that serve as specific indicators of significant impact for some environmental impact categories (FAA Order 1050.1G, Appendix A). Proposed actions that would result in impacts at or above these thresholds require the preparation of an EIS, unless impacts can be reduced below threshold levels. The FAA has not established significance thresholds for all impact categories. For those impact categories without a significance threshold, the FAA has identified factors to consider in evaluating the significance of potential environmental impacts. If these factors exist, there is not necessarily a significant impact. After consideration of all relevant factors, the FAA determines whether there would be a significant impact.

3.2 Environmental Impact Categories Not Analyzed in Detail

FAA Order 1050.1G directs the FAA to focus its analysis on whether the environmental effects of the action or project at hand are significant.[30] This PEA does not analyze reasonably foreseeable impacts on the following environmental impact categories in detail, because the proposed action would not affect the resources included in the category, as stated below:

- **Aviation Emissions and Air Quality** – Based on FAA's forecast, the UA considered in this PEA would not generate emissions that could result in air quality impacts that would exceed the significance threshold. Electricity consumed for battery charging and operation of any hubs would be minimal. Electricity consumed for UAS operations would come from the existing power grid. Operators may have generators on-site in the event of a power outage or use generators to provide power during the initial phase of establishing operations. These emissions would be minimal and are not expected to cause pollutant concentrations to exceed one or more of the National Ambient Air Quality Standards, as established by the U.S. Environmental Protection Agency under the Clean Air Act, nor would they increase the frequency or severity of any such existing violations. The Clean Air Act also requires federal agencies to demonstrate conformity with state implementation plans for Federal actions. Projects that do not emit criteria pollutants or their precursors above the *de minimis* levels in 40 CFR § 93.153(b) are considered too small to adversely affect an area's air quality status, and the general conformity requirements would be satisfied. Upon review of an individual Part 135 application, if the FAA finds the proposal has the potential to emit criteria pollutants or

[30] FAA Order 1050.1G, § 1.5(d).

their precursors above *de minimis* levels, then a detailed analysis specific to the proposed activity would be required to evaluate the potential for noise impacts (e.g., General Conformity Determination).

- **Farmlands** – The proposed action would not involve the development or disturbance of any land regardless of use, nor would it have the potential to convert any important farmlands to non-agricultural uses. Therefore, the proposed action would not affect important farmlands, such as pastureland, cropland, and forest considered to be prime, unique, or statewide or locally important land.

- **Hazardous Materials, Solid Waste, and Pollution Prevention** –The proposed action is not expected to include any activities that would use hazardous materials or impact any resources related to hazardous materials, such as disturbance of a contaminated site. Should an applicant propose activities that involve ground disturbance, additional project-specific environmental review may be required to determine whether those ground-disturbing activities would disturb hazardous materials. The proposed operations would not generate solid waste that is an appreciably different quantity or type of solid waste, nor would it use a different method of collection that would exceed local capacity. UA are made primarily from recoverable materials, except for batteries, and operators are expected to properly manage UA at the end of their operating life in accordance with applicable laws and regulations, 14 CFR § 43.10, *Disposition of life-limited aircraft parts*. The proposed action would not violate any federal, state, tribal, or local laws or regulations regarding hazardous materials, solid waste, or pollution prevention. Operators will be required to disclose whether they would transport hazardous materials. Operators will also be required to dispose of any hazardous materials in accordance with applicable laws and regulations, including 40 CFR Part 273, *Standards for Universal Waste Management*. Therefore, the proposed action would not result in impacts related to hazardous materials, solid waste, and pollution prevention.

- **Land Use** – The proposed action does not involve any changes to existing, planned, or future land uses. Hubs are expected to be in a business's parking lot, rooftop, or other previously developed/disturbed area. Land use and zoning are typically governed by local and state laws. Operators are responsible for complying with any such applicable laws relevant to establishing their operations (e.g., siting drone hubs and related infrastructure). All hubs would be sited in accordance with all local land use ordinances and zoning requirements. Local jurisdictions in study area may vary in the scope of their review and approval of commercial operations. Drone operators would be responsible for coordinating with local municipalities to ensure that their proposed operations are compatible with existing land use and zoning; FAA does not have authority over land use and zoning regulations. Because local jurisdictions would be involved in the approval of commercial operations to ensure land use compatibility, it is anticipated that the proposed action would not affect land use.

- **Natural Resources and Energy Supply** – The proposed action would not require the need for unusual natural resources or materials, or those in short supply. The UA may replace individual personal automobile trips to retrieve small goods and therefore might reduce consumption of fuel resources. For these reasons, the proposed action would not result in impacts to natural resources and energy supply.

- **Socioeconomic Impacts and Children's Environmental Health and Safety Risks** – The proposed action would not induce economic growth in an area, disrupt or divide the physical arrangement of an established community, cause relocation of residents or community businesses, disrupt local traffic patterns or reduce the levels of service of roads, or produce a change in the community tax base. Therefore, the proposed action would not result in socioeconomic impacts.

  Executive Order (EO) 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, requires federal agencies to ensure children do not suffer disproportionately from environmental or safety risks. The proposed action would not affect products or substances that a child would be likely to come into contact with, ingest, use, or be exposed to, and would not result in environmental health and safety risks that could disproportionately affect children. The FAA does not anticipate the proposed action poses a greater health and safety risk to children than package delivery by other means (e.g., truck, mail, personal automobile trips). To date, drone operators have not sited hubs near schools and restrict operations near schools (Monday – Friday) during school hours, thereby limiting the potential for environmental health or safety impacts to children. Operators are also required to identify areas where open air gatherings of people typically occur, such as open-air concert venues and school yards, to avoid flying over these properties. Further, the proposed action might result in a reduction in miles driven locally by automobiles, which might reduce noxious emissions and improve road safety, both of which are appreciable concerns for children. Therefore, the proposed action would not result in disproportionate environmental health and safety risks to children.

- **Water Resources (Wetlands, Floodplains, Surface Waters, and Groundwater)** – The proposed action would not result in the construction of facilities and would therefore not encroach upon areas designated as navigable waters, wetlands, or floodplains. Any overflight of these resources would not affect them. Drones will be required to cross rivers, streams, or other linear waterbodies in a perpendicular fashion. Flight paths shall not be allowed to run parallel to or along a stream, river, or other waterbody. The proposed action would not result in any changes to existing discharges to water bodies, create a new discharge that would result in impacts to surface waters, or modify a water body. The proposed action would not degrade water quality or contaminate public drinking water supply. The proposed action does not involve activities that would withdraw groundwater from underground aquifers or reduce infiltration or recharge to

groundwater resources through the introduction of new impervious surfaces. Therefore, the proposed action would not affect wetlands, floodplains, surface waters, and groundwater. **Section 3.7** addresses Wild and Scenic Rivers and rivers on the Nationwide Rivers Inventory.

3.3 Noise and Noise-Compatible Land Use

3.3.1 Definition of Resource and Regulatory Setting

Noise is considered any unwanted sound that interferes with normal activities (such as sleep, conversation, student learning) and can cause annoyance. Aircraft noise is often the most noticeable environmental effect associated with any aviation project. Several federal laws, including the Aviation Safety and Noise Abatement Act of 1979, as amended[31] regulate aircraft noise. The FAA regulates noise from aircraft through 14 CFR Part 36.

FAA Order 1050.1G, Appendix C, Paragraph C-1.3 requires the FAA to identify the location and number of noise sensitive areas that could be significantly impacted by noise. A noise sensitive area is an area where noise interferes with normal activities associated with its use. Normally, noise sensitive areas include residential, educational, health, and religious structures and sites, and parks, recreational areas, areas with wilderness characteristics, wildlife refuges, and cultural and historical sites.

Sound is measured in terms of the decibel (dB), which is the ratio between the sound pressure of the sound source and 20 micropascals, which is nominally the threshold of human hearing. Human perception of noise depends on a number of factors, including overall noise level, number of noise events, the extent of audibility above the background ambient noise level, and acoustic frequency content (pitch). Various weighting schemes have been developed to collapse a frequency spectrum into a single dB value. The A-weighted decibel, or dBA, corresponds to human hearing accounting for the higher sensitivity in the mid-range frequencies. UA noise generally has acoustic high-frequency content, which can often be more discernable from other typical noise sources.

To comply with NEPA requirements, the FAA has issued requirements for assessing aircraft noise in FAA Order 1050.1G, Appendix C. FAA's primary noise metric for aviation noise analysis is the Day-Night Average Sound Level (DNL) metric with the average calculated annually. The DNL noise metric is used to reflect a person's cumulative exposure to sound over a 24-hour period. It is expressed as the noise level for the AAD which represents average daily operations based on total annual operations. The DNL takes into account both the amount of noise from each aircraft operation as well as the total number of operations flying throughout the day and applies an additional 10 dB weighting for nighttime flights between 10 p.m. and 7 a.m.

[31] 49 U.S.C. §§ 47501–47507.

FAA Order 1050.1G, Appendix A, states noise impacts would be significant if the action would increase the DNL by 1.5 dB or more for a noise sensitive area that is exposed to noise at or above DNL 65 dB, or that will be exposed to DNL values at or above 65 dB due to an increase of DNL 1.5 dB or greater, when compared to the no action alternative for the same timeframe. For example, an increase of the DNL from 65.5 dB to 67 dB is considered a significant impact, as is an increase from 63.5 dB to 65 dB.

For an increase of 1.5 dB or more to occur from an existing DNL of 63.5 dB, the added noise on its own must be at least a DNL 59.7 dB (i.e., 59.7 dB + 63.5 dB = 65 dB). The decibel level of additional noise that is required to result in an increase of 1.5 dB to any existing noise level can be determined by subtracting 3.8 from the value of the existing noise level (e.g., 63.5 - 3.8 = 59.7).

More information about this environmental impact category is presented in Chapter 11 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.3.2 Affected Environment

The study area consists of the entire U.S. (including Alaska and Hawaii). Noise sensitive areas include residential, educational, health, and religious structures, parks, recreational areas, cultural and historic sites, and waterfowl and wildlife refuges.

The ambient (or background) sound level in areas varies and depends on the uses in the immediate vicinity. For example, the ambient sound level in an urban center is higher than the ambient sound level within a residential neighborhood. Existing sound sources in the operating areas are primarily those from anthropogenic sources associated with commercial, industrial, transportation (e.g., highways, rail, and air travel), and residential land uses in an urban and city environment (e.g., vehicles, construction equipment, and aircraft). Except for areas close to airports, existing aviation noise levels in most areas are expected to be well below the FAA's threshold for significant noise exposure (DNL 65 dB).

3.3.3 Environmental Consequences

The FAA analyzed the proposed action's potential noise exposure to determine whether it would cause a significant impact to any residential land use or noise sensitive area within the study area.

3.3.3.1 No Action Alternative

The no action alternative assumes drone operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone package deliveries in multiple states resulted in FONSIs (see **Section 2.1**). Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are

those from Amazon, Causey, DroneUp, UPS Flight Forward, Wing, and Zipline. In general, the maximum noise levels generated by UA package delivery operations occur at the delivery hubs due to those locations having the greatest concentration of flight activity. Based on the noise analyses conducted for those operators, the DNL 65 dB for those delivery hubs would extend to a very limited range from the landing and takeoff pads and would likely be fully contained within the facility property.

The no action alternative also includes potential future Part 135 drone package delivery operations as defined in future applications. Potential noise impacts from these operations are expected to be similar as those previously disclosed in the previous EAs; however, at this time, the FAA cannot identify the context and intensity of potential future operations. Since drone operators can mitigate potential significant noise impacts (e.g., by moving the location of the hub or reducing the number of operations at a hub), future drone package delivery operations under the no action alternative are not expected to result in significant impacts related to noise or noise-compatible land use. If an operator is unwilling to mitigate a significant noise impact identified in a future environmental review of a Part 135 application, an EIS would be required.

3.3.3.2 Proposed Action

The proposed action considered in this PEA assumes that deliveries could occur up to seven days per week, during both daytime and nighttime hours, for a conservative total of 365 days per year. However, some operators may not operate on holidays or on days with severe weather, resulting in potentially less than 365 days of operations per year. Additionally, nighttime operations are expected to be infrequent relative to daytime operational levels. The FAA developed a methodology to evaluate the potential noise exposure that could result from the proposed action (**Appendix C**) considering a unit capacity threshold of up to 1,150 AAD deliveries (419,750 annual deliveries) from a single hub.

Estimation of potential noise exposure resulting from the proposed action is based on data sets consisting of the noise data collected by FAA for all UA that have been proposed for operation under Part 135 to date. Most of these UA have already been evaluated as part of individual operator and location-specific EAs. The UAs that have been included in approved Part 135 package delivery EAs are the Amazon Prime Air MK27-2 and MK30, Wing Hummingbird 7000W-B and 8000-A, Causey Flytrex FTX-M600P and Sky II, UPS Flight Forward Matternet M2, DroneUp Prism v2, Drone Express DE-2020,and Zipline P2 Zip. The FAA previously analyzed each of these UA in separate noise studies as part of EAs, presented in **Table 4**, for package delivery operations at various locations across the U.S.[32] Additionally, the FAA has obtained noise data for the RigiTech Eiger in anticipation of future operations under Part 135.

[32] See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

Table 4. Part 135 UA Package Delivery Environmental Assessments

Operator	UA	MTOW (lbs)	Environmental Assessment or Relevant Source	Date	Noise Study Section
Wing	Hummingbird 7000W-B & 8000-A	14 & 24.3	Final Environmental Assessment for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Central Florida	May 2025	Appendix D
Wing	Hummingbird 7000W-A/B	14	Final EA and FONSI/ROD for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Dallas–Fort Worth, Texas	November 2023	Appendix D
Wing	Hummingbird 7000W-A/B	14	Final EA and FONSI/ROD Wing Aviation Drone Package Delivery Operations Frisco and Little Elm, TX	February 2022	Appendix C
Wing	Hummingbird 7000W-A/B	14	FONSI/ROD for EA for Wing Aviation Drone Package Delivery Operations Christiansburg, Virginia	December 2021	Appendix C
Causey	RigiTech Eiger	46.3	Noise measurement data files provided to FAA by Rigitech	July 2025	N/A
Causey	Flytrex FTX-M600P & SKY II	33.1 & 34.2	Final EA and FONSI/ROD Causey Aviation Unmanned Inc. Drone Package Delivery Operations in the Dallas-Fort Worth Area, including Granbury and Rowlett, Texas	December 2024	Appendix C
Causey	Flytrex FTX-M600P	33.1	Final EA and FONSI/ROD Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Granbury and Rowlett, Texas	August 2023	Appendix B
Causey	Flytrex FTX-M600P	33.1	Final EA and FONSI/ROD for Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Fayetteville, Holly Springs, Raeford, and Pinehurst, North Carolina	November 2022	Appendix C
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations Columbus, Ohio	March 2023	Appendix C
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations Winston-Salem, NC	December 2022	Appendix C
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations The Villages, FL	November 2022	Appendix C
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Flight Training Operations at Fisherville, KY	August 2022	Appendix B

Operator	UA	MTOW (lbs)	Environmental Assessment or Relevant Source	Date	Noise Study Section
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward Drone Package Delivery Operations Wake Forest Baptist Health (WFBH) Routes, Winston-Salem, NC	December 2021	Appendix C
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward Drone Package Delivery Operations Lake Sumter Landing Route, Villages, FL	November 2021	N/A
Amazon	MK27-2	91.5	Final EA and FONSI/ROD Amazon Prime Air Drone Package Delivery Operations in College Station, Texas	December 2022	Appendix C
Amazon	MK27-2	91.5	Final EA and FONSI/ROD Impact/Record of Decision Amazon Prime Air Drone Package Delivery Operations in Lockeford, California	November 2022	Appendix C
Amazon	MK27-2	91.5	EA for Amazon Prime Air Drone Package Delivery Test Operations in Pendleton, Oregon	November 2022	Appendix C
Amazon	MK30 (as MK27-2)	83.2	Final Environmental Assessment and Finding of No Significant Impact/Record of Decision for Environmental Assessment for Drone Package Delivery in Tolleson, Arizona	November 2024	Appendix E
Amazon	MK30	83.2	Draft EA…? Prime Air Noise Measurement Report MK30 Unmanned Aircraft Technical Report	March 2025	N/A?
DroneUp	Prism v2	55	Final EA and FONSI/ROD for DroneUp, LLC Proposed Drone Package Delivery Operations in Dallas–Fort Worth, Texas	October 2024	Appendix J
Zipline	P2 Zip	63	Draft Environmental Assessment for Zipline International Inc. Proposed Drone Package Delivery Operations in Dallas–Fort Worth, Texas	June 2025	Appendix D
Drone Express	TELEGRID DE-2020	23	Noise Assessment for DE-2020	December 2024	N/A

UA package delivery operations considered in this EA could be from any combination of the previously evaluated UA or other UA with similar characteristics and operating procedures as those described in **Section 2.2**. Because of this, noise exposure estimates are based on an aggregate representation of all package delivery UA for which FAA has collected noise data to date. This aggregate representation was developed by determining the maximum Sound

Exposure Levels (SEL)[33] generated by any of the UA during direct overflight of a receiver during approach to and departure from hubs and delivery locations, as well as along en route flight paths. Individual UA overflight SELs were compared at distances ranging from 0 feet to 4,500 feet from hub and delivery locations. The distance of 33 feet was the closest common distance for which measurement data was available for most UA. For the UA with the highest en route SEL, that noise level was reached at a distance 611 feet from a hub (i.e., the distance at which hub takeoff and landing noise no longer contributes to the overall SEL). As such, noise exposure from hubs is evaluated from 33 feet to 611 feet from the hub takeoff and landing pad and assumes all operations use the same pad for departure and arrival. Additionally, all noise exposure estimates assume all flight activity occurs on the same inbound and outbound flight paths, representing the maximum potential noise exposure for a given number of delivery operations. Further details regarding the development of aggregate noise exposure data for the UA are presented in **Appendix C**.

The FAA used the noise analysis methodology detailed in **Appendix C** to estimate both the distances from takeoff and landing locations and the number of AAD package delivery overflights that a noise sensitive receiver location could be exposed to without resulting in a potential for significant noise impacts to occur. Noise levels were calculated for each flight phase and are presented in the following subsections: noise exposure for hub operations, noise exposure for en route operations, and noise exposure for delivery operations.

Noise Exposure for Hub Operations

The noise exposure for delivery hub operations includes the noise generated by all UA flight activity occurring at and around the hub. The flight activity includes takeoff, landing, and transitions to and from en route flight. The estimated noise exposure values assume the UA passes directly over the receiver during all flight activity except vertical ascent and descent. The highest number of proposed AAD deliveries from a single hub location in any of the individual operator EAs listed in **Table 4** is 500. The FAA recognizes that there is potential for future average daily deliveries to exceed that number in areas where sufficient market demand and operator capacity exist. The estimated maximum extents of DNLs under the flight path for any single delivery hub are provided in Table 4-1 of **Appendix C** and summarized in **Table 5** for 45 dB through 65 dB for 100 to 1,150 AAD deliveries. In addition to the standard 5 dB increments typically reported, the extent of DNL 59.7 dB is also included in **Table 5**, as that is the DNL

[33] Sound Exposure Level is a single event metric that takes into account both the noise level and duration of the event, referenced to a standard duration of one second.

threshold below which significant noise impacts resulting from 1.5 dB or more increases to existing aviation noise cannot occur (see **Section 3.3.1**).

Table 5. Estimated Maximum DNL Noise Exposure for Delivery Hub Locations

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	45 DNL Extent Feet	50 DNL Extent Feet	55 DNL Extent Feet	59.7 DNL Extent Feet	60 DNL Extent Feet	65 DNL Extent Feet	70 DNL Extent Feet	75 DNL Extent Feet	80 DNL Extent Feet
≤100	≤36,500	>611	476	282	156	149	71	<33	<33	<33
≤500	≤182,500	>611	>611	>611	363	352	202	95	42	<33
≤1,000	≤365,000	>611	>611	>611	490	476	282	149	71	<33
≤1,150	≤ 419,750	>611	>611	>611	593	507	302	164	77	<33

Notes:
DNL Equivalent Deliveries = AAD Daytime Deliveries + (10 x AAD Nighttime Deliveries)
">611": Refer to en route noise DNL table for distances greater than 611 feet in Appendix C.
"<33": Limit of available data, see Appendix C.

Noise Exposure for En Route Operations

For noise estimation under en route conditions, the UA are conservatively assumed to fly the same outbound flight path between the hub and the delivery point and inbound flight path back to the hub. Therefore, each location under the en route path would be overflown twice for each delivery served by the respective overhead en route path. Among different operators, the actual en route flight path procedures could vary, and the same locations may not be overflown multiple times. En route flight for UA must be below 400 feet AGL,[34] and, based on the UA evaluated to date, would typically range from approximately 150 feet to 375 feet AGL.

For the proposed action, the exact location of all potential delivery hubs and their applicable delivery ranges is not known. This analysis evaluates the maximum potential noise exposure resulting from a range of 100 to 1,150 AAD deliveries overflying a single location using the highest en route SEL (approximately 78 dB) of all currently operating Part 135 package delivery UA. The maximum number of AAD delivery overflights that could occur over any single noise sensitive receiver location without potential for causing significant noise impacts resulting from 1.5 dB or more increases to existing aviation noise is 1,150. The potential en route overflight noise exposure is provided in Table 4-2 of **Appendix C** and summarized in **Table 6**.

[34] Condition & Limitation No. 27 in Exemption No. 18163E issued by FAA states that UAS must not exceed 400 feet AGL.

Table 6. Estimated Maximum DNL Noise Exposure for Under En Route Flight Paths

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	Estimated Maximum DNL Under Flight Path
≤100	≤36,500	49.0
≤500	≤182,500	56.0
≤1000	≤365,000	59.0
≤1,150	≤419,750	59.6

Note: DNL Equivalent Deliveries = AAD Daytime Deliveries + (10 x AAD Nighttime Deliveries)

Due to the generally expected limitations of UA delivery area ranges and required collision avoidance plans,[35] it is highly unlikely that 1,150 AAD deliveries (2,300 overflights) would occur over any single noise sensitive receiver location. Table 4-2 of **Appendix C** provides estimated DNL for average daily overflights ranging from 1 to 1,150 for different UA SELs.

Noise Exposure for Delivery Location Operations

The noise exposure for delivery location operations includes the noise exposure for all flight activity occurring at and around the delivery point. The flight activity includes the UA approaching at en route altitude, descending for delivery, delivering the package, ascending back to en route altitude, and departing the area. The estimated noise exposure values assume the UA passes directly over the receiver during all flight activity except vertical ascent and descent. The maximum potential number of daily deliveries to individual delivery locations is unknown, but most deliveries would be of goods and products to residential locations and other businesses. As a result, the FAA expects that more than one or two deliveries to the same location per day over the course of a year would be atypical. Thus, this analysis conservatively assumes five deliveries per day at the same delivery location. The noise exposure for any one delivery point is provided in Table 4-3 of **Appendix C** and summarized in **Table 7** for various distances.

Table 7. Estimated DNL Noise Exposure for Delivery Locations

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	Estimated Delivery DNL at 33 Feet	Estimated Delivery DNL at 50 Feet	Estimated Delivery DNL at 75 Feet	Estimated Delivery DNL at 100 Feet	Estimated Delivery DNL at 125 Feet
≤5	≤1,825	55.8	53.9	51.2	49.2	47.6

Note: DNL Equivalent Deliveries = AAD Daytime Deliveries + (10 x AAD Nighttime Deliveries)

[35] Condition & Limitation No. 33 in Exemption No. 18163E issued by the FAA requires operators to prepare a collision avoidance plan that specifics how the operator will manage conflicts with other UA. Condition & Limitation No. 41 requires the operator to maintain a conflict management capability to ensure the UA remains clear of any manned aircraft and other UA.

3.3.4 Mitigation

The FAA would request that operators *locate their hubs at sufficient setback distances from noise-sensitive land use* to prevent increases of the DNL by 1.5 dB or more from occurring within existing 65 dB or resulting in new DNL 65 dB. Based on all currently available UA package delivery noise data, hubs conducting up to 1,150 AAD deliveries would be sited a minimum of 600 feet from any noise sensitive land use, ensuring that such land use would be beyond the maximum possible extent of DNL 59.7 dB from the hub. Similarly, en route operations over any noise sensitive land use would not exceed 1,150 AAD deliveries (i.e., 2,300 overflights), ensuring that noise exposure from en route overflights would be less than DNL 59.7 dB.

These criteria account for any potential cumulative effects of aviation noise from nearby airports as drone package delivery noise less than a DNL 59.7 dB cannot result in increases of 1.5 dB or more in combination with any existing aviation noise equal to or greater than a value of DNL 63.5 dB. For individual UA generating lower SELs than the aggregate maximum and/or for UA operating at sufficiently far distances from airports, higher numbers of deliveries may be possible without any potential for significant noise impacts. However, the exact location of the DNL 63.5 dB contour from an airport will generally not be identifiable without conducting an airport noise study. For hubs with fewer than 1,150 daily deliveries, lesser setback distances would be required and are presented in Table 4-1 of **Appendix C**. For circumstances in which an operator may wish to conduct more than 1,150 AAD deliveries and/or place a hub within the distances indicated in Table 4-1 of **Appendix C** for the relevant number of AAD deliveries, a more detailed analysis specific to the proposed activity would be required to evaluate the potential for noise impacts.

Drone operators may also establish hubs close enough to each other that their respective delivery ranges overlap, allowing for certain areas to be accessible from multiple hub locations. The degree to which different operators would operate within areas of shared airspace is entirely dependent on the operators, their specific business use cases, and their ability to deconflict with one another in the overlapping delivery areas with shared customers.

Information shared by various operators indicates that some would try to minimize overlap in their own hubs' delivery ranges while others plan to allow for inter-hub flights and therefore may plan for overlap within their own operations. In cases where a single operator's hubs would have overlapping delivery ranges, most operators have stated they do not expect such circumstances to have additive effects that would result in increased package deliveries to those areas. The primary reason given for this is that the services provided by different hubs would generally be redundant, or at least similar, and, as such, customer demand for those services would be unaffected by the number of hubs within delivery range of the same area. In cases where different operators' hubs would have overlapping delivery ranges, some additive effect could occur within those areas depending on customer demand for the various types of package delivery services being provided by each operator. From a business perspective, it is

anticipated that operators would make every effort to minimize overlapping operations with other operators to the extent practicable and/or would implement necessary deconfliction measures that would mitigate the potential for flight path concentration over any single location.

The FAA would evaluate existing authorized UA activity in an area as part of the review process for approving new applicants to operate in the same area. Should a potential for the combined operations from separate hubs exceed 1,150 AAD deliveries (2,300 overflights) within any shared airspace be identified, a more detailed analysis specific to the proposed activity would be required to evaluate the potential for noise impacts.

Based on the noise analysis and implementation of the above-listed mitigation measures, the proposed action would not have a significant noise impact.

3.4 Visual Effects

3.4.1 Definition of Resource and Regulatory Setting

Visual effects deal broadly with the extent to which the project would either: (1) produce light emissions that create annoyance or interfere with activities; or (2) contrast with, or detract from, the visual resources and/or the visual character of the existing environment. Visual effects can be difficult to define and assess because they involve subjectivity. Proposed aerospace actions do not commonly result in adverse visual effects, but these effects may occur in certain circumstances.

For clarity and uniformity, visual effects are broken into two categories: (1) light emission effects and (2) visual resources and visual character. *Light emissions* include any light that emanates from a light source into the surrounding environment. Examples of sources of light emissions include UA safety lighting during nighttime operations. *Visual resources* include buildings, sites, traditional cultural properties, and other natural or manmade landscape features that are visually important or have unique characteristics. In unique circumstances, the nighttime sky may be considered a visual resource. *Visual character* refers to the overall visual makeup of the existing environment where the project would be located. For example, areas near densely populated areas generally have a visual character that could be defined as urban, whereas less developed areas could have a visual character defined by the surrounding landscape features, such as open grass fields, forests, mountains, and deserts.

Some visual resources are protected under federal, state, or local regulations. Protected visual resources generally include, but are not limited to, federal, state, or local scenic roadways/byways; Wild and Scenic Rivers; national scenic areas; scenic easements; trails protected under the National Trails System Act or similar state or local regulations; biological resources; and features protected under other federal, state, or local regulations.

Although there are no federal special purpose laws or requirements specific to light emissions and visual effects, there are special purpose laws and requirements that may be relevant. Laws protecting resources that may be affected by visual effects include Section 106 of the National Historic Preservation Act (NHPA), Section 4(f) of the USDOT Act, the Wild and Scenic Rivers Act, the Coastal Zone Management Act, and state and regional coastal protection acts.

More information about this environmental impact category is presented in Chapter 13 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.4.2 Affected Environment

The proposed action would take place over urban and suburban residential areas, rural farmland, natural areas, and commercially developed properties, with most operations occurring in and immediately surrounding metro areas between the hours of 7:00 a.m. and 10:00 p.m. Nighttime lighting in the operating areas varies, depending on the land use. Existing light emissions are greatest at the hubs (businesses), with less light emissions occurring in areas beneath the UA's flight path and at individual residences. Visually sensitive historic properties and Section 4(f) properties are discussed in **Sections 3.5 and 3.6**, respectively.

3.4.3 Environmental Consequences

The FAA has not established a significance threshold for light emissions or visual resources/visual character. FAA Order 1050.1G includes factors to consider when assessing the significance of potential visual effects, including the degree to which the action would have the potential to:

- Create annoyance or interfere with normal activities from light emissions.
- Affect the visual character of the area due to the light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources.
- Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources.
- Contrast with the visual resources and/or visual character in the study area.
- Block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations.

3.4.3.1 No Action Alternative

The no action alternative assumes drone operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone package delivery in multiple states resulted in FONSIs (see **Section 2.1**). Currently approved Part

135 package delivery operations forecast to continue under the no action alternative are those from Amazon, Causey, DroneUp, UPS Flight Forward, Wing, and Zipline. Due to the limited number of operations allowed under the existing approvals and the fact that the operations approved to date do not occur during nighttime hours, no significant light emissions or visual effects have been identified as a result of the no action alternative.

3.4.3.2 Proposed Action

Drone package delivery flights would occur over urban and suburban residential areas, rural farmland, natural areas, and commercially developed properties primarily between the hours of 7:00 a.m. and 10:00 p.m. Visual effects could occur during all flight phases. A six-foot radius clear of obstacles is required for delivery, such as a driveway, parking lot, field, common area, patio, or clear spaces surrounding multi-family dwellings, as determined during the delivery request process.

When making a delivery, the UA would depart from a hub and travel en route at an altitude less than 400 feet AGL and therefore could be visible by someone looking for a drone in the sky (see **Figure 3**). The duration of delivery from the time the customer approves the delivery to the transition back to en route flight mode is expected to range from 30 to 90 seconds, which limits the potential for visual effects to occur from overflights. While the density of deliveries in any given area is currently unknown, most package deliveries would be to residences. More than one or two package deliveries to the same location each day would be atypical. Therefore, the potential for visual effects to occur at any given delivery location is limited.

Each operator uses flight planning software to vary flight paths to minimize overflights of any given location and to deconflict paths that might overlap with other aircraft. The highest concentrations of overflights would occur in proximity to each hub, which would be primarily located in commercial areas, such as parking lots and commercial buildings, that have high amounts of ambient lighting. UA are required to have operable anti-collision lights that are on for all flight operations.[36] These lights will be more visible during twilight and nighttime hours compared to daytime hours. However, because hubs are expected to be in areas that are not visually sensitive, operations at the hub are not expected to affect the nature of the visual character of the area or contrast with visual resources and/or the visual character of these developed areas. Additionally, hub operations would not block or obstruct the views of visual resources given the small size of the UA.

As noted in **Sections 3.5** and **3.6**, some historic resources and public parks could be valued for aesthetic attributes within the study area. The OpSpec for each drone operator would require operators to avoid overflights of large open-air gatherings of people, which may include public parks and other public properties covered under Section 4(f).

[36] Condition & Limitation No. 60 in Exemption No. 18163E issued by FAA.

Based upon FAA OpSpec requirements to avoid overflights of large open-air gatherings of people (which may include public parks or other Section 4(f) properties),[37] as well as restrictions imposed by the National Park Service (NPS), USFS, and local parks and recreation departments on UA operations in public parks (see **Section 3.6** for more details on these policies), several limitations are in place to reduce potential impacts. These include requirements to locate UA hubs at least 0.5 miles away from the "most sensitive" historic properties, such as battlefields, memorials, cemeteries, landmarks, museums, places of worship, and sites with an associated cultural/natural/scenic landscape. In addition, overflights of any given location must be minimized, UA visibility to an observer on the ground would be limited due to their short duration overhead, and the en route altitude would occur below 400 feet AGL. Given these constraints, the proposed action is not expected to create annoyance or interfere with normal activities from light emissions, nor is it expected to affect the visual character of the area due to light emissions or affect the nature of the visual character of the area. Given the relatively small size of the UA, the en route altitude of less than 400 feet AGL, and the fact UA will operate within airspace that already contains various light sources, the proposed action is not expected to contrast with the visual resources and/or visual character in the study area, nor is it expected to block or obstruct the views of visual resources. Therefore, the proposed action is not expected to result in significant visual effects.

3.4.4 Mitigation

As discussed in **Sections 3.5.4** and **3.6.4**, operators would be required to place hubs at least 0.5 miles away from the "most sensitive" historic resources, which ensures they takeoff, land, and climb sufficient distances away from these sensitive resources to avoid or minimize visual effects on battlefields, memorials, cemeteries, landmarks, museums, places of worship, and sites with an associated cultural/natural/scenic landscape.

3.5 Historical, Architectural, Archeological, and Cultural Resources

3.5.1 Definition of Resource and Regulatory Setting

Cultural resources encompass a range of sites, properties, and physical resources relating to human activities, society, and cultural institutions. Such resources include past and present expressions of human culture and history in the physical environment, such as prehistoric and historic archaeological sites, structures, objects, and districts that are considered important to a culture or community. Cultural resources also include aspects of the physical environment,

[37] Condition & Limitation No. 27 in Exemption No. 18163E issued by FAA prohibits overflying open-air assemblies of people.

namely natural features and biota that are a part of traditional ways of life and practices and are associated with community values and institutions.

The major law that protects cultural resources is the NHPA. Cultural resources listed on or determined eligible for the National Register of Historic Places (NRHP) are properly known as *historic properties*. Section 106 of the NHPA requires a federal agency to consider the effects of its action (referred to as the *undertaking*)[38] on historic properties. The Section 106 process is outlined in 36 CFR Part 800. Compliance with Section 106 requires consultation with the State Historic Preservation Officer (SHPO), Indian tribes, Tribal Historic Preservation Officer (if the undertaking occurs on or may affect historic properties on any tribal lands), and any other interested parties. Major steps in the Section 106 process include identifying the Area of Potential Effects (APE),[39] identifying and evaluating any historic properties within the APE, and assessing the effect of the undertaking on any historic properties. If a historic property would be adversely affected by the undertaking, the Section 106 process includes continuing consultation to resolve adverse effects.

The FAA's authorization tied to drone package delivery is considered an undertaking under Section 106 of the NHPA. Section 106 requires Federal agencies to take into account the effects of their undertakings on historic properties. The Section 106 process seeks to accommodate historic preservation concerns with the needs of federal undertakings through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties, commencing at the early stages of project planning.

Just as the FAA is attempting to streamline the NEPA review of individual Part 135 applications by preparing this PEA, the FAA is also interested in streamlining the Section 106 process for individual Part 135 applications. The Section 106 regulations (36 CFR Part 800) offer program alternatives through which agencies can tailor the standard Section 106 review process for a group of undertakings or an entire program that may affect historic properties. The FAA has initiated consultation with SHPOs to develop programmatic agreements for Part 135 drone package deliveries in the following states: Arizona, Florida, Georgia, Kansas, Michigan, Missouri, North Carolina, and Texas. These programmatic agreements are not expected to be complete prior to the completion of this PEA. The FAA will continue to work with SHPOs in other states to develop programmatic agreements to streamline the consultation process by identifying drone package delivery operations that will or will not require consultation with state SHPOs to satisfy Section 106.

More information about this environmental impact category is presented in Chapter 8 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

[38] *Undertaking* means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with Federal financial assistance; and those requiring a federal permit, license, or approval. (36 CFR § 800.16(y))

3.5.2 Affected Environment

Because the operating areas are not currently known, identification of an APE is not currently possible. The FAA will review applications from individual operators, develop an APE for each application, and conduct Section 106 consultation on a case-by-case basis as appropriate, until programmatic agreements with state SHPOs are in place. It should be noted that consultation with tribes will still be required if proposed operations would occur over tribal lands, even if programmatic agreements with state SHPOs have been developed.

Based on previous consultations with SHPOs for individual Part 135 EAs to date, the FAA has identified the following types of historic resources as likely to be "most sensitive" to drone package delivery operations:

- Battlefields
- Memorials
- Cemeteries
- Landmarks
- Museums
- Places of worship
- Sites with an associated cultural/natural/scenic landscape, in particular those with minimum modern disturbances in their present viewsheds and generally associated with the nineteenth century or earlier.

The FAA has initiated government-to-government consultation with all federally recognized tribes in the U.S. This consultation was initiated by letter dated August 25, 2025 (see **Appendix D**).

3.5.3 Environmental Consequences

The FAA has not established a significance threshold for historical, architectural, archeological, and cultural resources. FAA Order 1050.1G includes factors to consider when assessing the significance of potential impacts on these resources, including whether the action would result in a finding of *adverse effect* through the Section 106 process. However, an adverse effect finding does not automatically trigger preparation of an EIS (i.e., a significant impact).

3.5.3.1 No Action Alternative

The no action alternative assumes drone operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone

package delivery resulted in FONSIs (see **Section 2.1**). No adverse effects to Section 106 resources were identified as part of the no action alternative.

3.5.3.2 Proposed Action

Given the size of the UA and predicted sound levels, UA operations would not produce vibrations that could impact the architectural structure or contents of any historic property in the APE. While the UA is not expected to generate significant noise levels at or within any historic property, the FAA considered drone delivery noise and potential visual effects on historic properties where a quiet setting or visually unimpaired sky might be a key attribute of the property's significance. The highest concentration of flights would occur around hubs where drones take off and land. As a result, noise and visual impacts are expected to be the highest near hubs.

To avoid effects on historic properties, drone operators would not place a hub within 0.5 miles of historic properties likely to be "most sensitive" to drone package delivery operations when siting a hub. Given that hubs would be located in business districts, drones are not likely to be visible from a historic property 0.5 miles away due to the small size of the UA and structures obstructing the view. Noise levels from the maximum proposed 1,150 daily deliveries at a hub would be less than DNL 59.7 dB at distances of 600 feet or more. The additional buffer would allow for greater dispersion of drone flight paths and potential noise levels to be further reduced (see **Appendix D**). With this avoidance measure in place, operations at the hub would not affect historic properties identified as "most sensitive" to the proposed action. For these reasons and based on previous effects determinations from EAs for drone package deliveries, the FAA has determined that the proposed action would have *no adverse effect* on historic properties.

3.5.4 Mitigation

To avoid effects on historic properties, operators would not locate a hub within 0.5 miles of a historic property considered to be "most sensitive" to drone package delivery operations to avoid or minimize noise impacts and visual effects associated with takeoffs and landings, which is where most disturbance would occur. Should an operator want to locate a hub within the 0.5-mile buffer of a historic property considered to be "most sensitive" to drone package delivery operations, additional consultation with the SHPO would be required.

If a hub is attached to a building, it will be sited on a building that is less than 45 years old. If the building is more than 45 years old, it must have been determined to be ineligible for the NRHP within the last 10 years.

If a hub is proposed within tribal lands where a Trible Historic Preservation Office (THPO) has assumed SHPO responsibilities, consultation with the THPO will be required to identify appropriate mitigation measures to avoid adverse effects.

Additional mitigation measures and best management practices may be identified through project-specific consultation with the appropriate SHPO, including THPOs who have assumed SHPO responsibilities, on a case-by-case basis once the APE is known. The FAA will work with the applicant to consult with the SHPO having jurisdiction over resources within the APE.

3.6 Department of Transportation Act Section 4(f), and Land and Water Conservation Fund, Section 6(f)

3.6.1 Definition of Resource and Regulatory Setting

Section 4(f) of the USDOT Act[40] protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites. Section 4(f) provides that the Secretary of Transportation may approve a transportation program or project requiring the *use* of publicly owned land of a public park, recreation area, or wildlife or waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance, only if there is no feasible and prudent alternative to using that land and the program or project includes all possible planning to minimize harm resulting from the *use*.

The term *use* includes both direct or physical and indirect or *constructive* impacts to Section 4(f) resources. Direct use is the physical occupation or alteration of a Section 4(f) property or any portion of a Section 4(f) property. A *constructive use* does not require direct physical impacts or occupation of a Section 4(f) resource. A *constructive use* would occur when a proposed action would result in substantial impairment of a resource to the degree that the protected activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished. The determination of use must consider the entire property and not simply the portion of the property used for a proposed project.

Section 4(f) resources where a quiet setting is a generally recognized feature or attribute receive special consideration.

Section 6(f) of the Land and Water Conservation Fund (LWCF) Act of 1965 provides matching funds to states and municipalities for improvement or acquisition of outdoor recreational facilities. Section 6(f) is independent from Section 4(f) but must be considered during Section 4(f) compliance.

More information about this environmental impact category is presented in Chapter 5 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

[40] 49 U.S.C. § 303(c).

3.6.2 Affected Environment

Public parks, recreation areas, historic properties, wildlife refuges, and waterfowl refuges exist throughout the U.S. Because the operating areas are not currently known, identification of Section 4(f) and Section 6(f) resources that may exist within an operating area is not possible at this time. Applicants will be required to disclose a list of Section 4(f) resources and Section 6(f) LWCF lands within their proposed operating areas as part of their applications to the FAA.

3.6.3 Environmental Consequences

FAA Order 1050.1G states that a significant impact would occur if the proposed action involves more than a minimal physical use of a Section 4(f) resource or constitutes a *constructive use* based on an FAA determination that the aviation project would substantially impair the Section 4(f) resource.

A significance threshold has not been established for Section 6(f) lands.

3.6.3.1 No Action Alternative

The no action alternative assumes drone operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone package delivery in multiple states resulted in FONSIs (see **Section 2.1**). Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are those from Amazon, Causey, DroneUp, UPS Flight Forward, Wing, and Zipline. The approvals issued to date have found that the no action alternative would not result in physical use of Section 4(f) resources, nor would it result in a *constructive use* of Section 4(f) resources. No impacts to Section 6(f) lands have been identified in approvals issued to date.

3.6.3.2 Proposed Action

The proposed action would not result in a physical use of any Section 4(f) property because there would not be any physical occupation or alteration of a Section 4(f) property or any portion of a Section 4(f) property. Hubs are generally located in commercial or business areas and not anticipated to be located within a Section 4(f) property. Any increase in sound level at a Section 4(f) property or potential visual effect from a drone flying over or near a Section 4(f) property would be minimal and only last seconds as the drone flies by en route to or from a hub. Also, repeated daily overflights of a Section 4(f) property are not expected because operators vary their flight paths. As described in **Section 3.3**, noise levels from drone operations are not expected to have a significant impact.

Existing policies in place by agencies such as the NPS, USFS, and state and local parks and recreation departments/agencies would limit drone operations within or over Section 4(f) properties. The NPS prohibits launching, landing, or operating UAS from or on lands and waters

within the boundaries of properties administered by the NPS unless the operator has approval in writing from the NPS superintendent.[41] It should be noted that if a drone operator has written approval from the NPS superintendent to operate within a publicly-owned park, the applicant must disclose this approval during the application process so that the FAA can review the proposed action to determine whether it would result in a significant impact to a Section 4(f) property since the NPS is not a USDOT agency and therefore does not have the authority to authorize actions that may result in Section 4(f) impacts. The USFS prohibits launching UAS within 100 meters of wildlife and overflights of wildlife; requires UAS to stay away from populated and noise-sensitive areas, such as campgrounds, trail heads, and visitor centers; and prohibits overflights of congressionally-designated wilderness and/or primitive areas.[42] Some state agencies prohibit UAS from launching or recovering any UAS from state property without consent or permits, and some municipalities have restrictions for UAS operations within public parks and recreation areas. Given the limited duration that a drone would be seen or heard from a Section 4(f) property and existing federal, state, and local policies that limit drone operations within the boundaries of Section 4(f) properties, the proposed action is not expected to result in substantial impairment of a Section 4(f) resource to the degree that the protected activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished.

Additionally, as part of the application process, operators will be required to identify areas where open air gatherings of people typically occur, such as public parks, and avoid these properties. To avoid these areas, drone operators use route planning software to create static keep-out areas via route planning software, which prepares an optimized flight path from the hub to each designated delivery site. The software ensures that each route integrates and respects all of the restrictions entered into the database, including avoidance of Section 4(f) properties, which can be automatically avoided based on the time of day and other factors. Additionally, if, upon review of an individual Part 135 application, the FAA finds the proposal has the potential to result in a constructive use of a Section 4(f) property, the FAA would consult the official with jurisdiction over that property to identify ways to avoid, minimize, or mitigate impacts such that a constructive use would not occur.

The FAA has determined that the noise and visual effects resulting from proposed action would not result in more than a minimal physical use of any Section 4(f) property, nor would it substantially diminish the activities, features, or attributes of any Section 4(f) property that contribute to its significance or enjoyment. Therefore, the FAA has made a preliminary determination that the proposed action is not expected to result in a *use*, including a *constructive use*, of a Section 4(f) property and therefore would not result in a significant impact on Section 4(f) properties.

[41] NPS Reference Manual #60: Aviation Management, dated September 2024.

[42] See: https://www.fs.usda.gov/visit/know-before-you-go/recreational-drone-tips.

As part of evaluating an operator's Part 135 application, the FAA will review applications for potential effects to Section 4(f) properties. If the FAA determines there is a potential for *constructive use* of a Section 4(f) property, the FAA will consult with the official(s) having jurisdiction over the property to address the effects, determine whether any feasible and prudent avoidance alternatives exist, evaluate whether all possible planning to avoid and/or minimize harm was conducted, and determine whether the use that would occur could be considered *de minimis*.[43,44] If the FAA determines a *constructive use* would occur, and the impacts cannot be mitigated such that the property would not be substantially impaired, an EIS would be required for that particular application.

3.6.4 Mitigation

In accordance with NPS Reference Manual #60: Aviation Management, dated September 2024, launching, landing, or operating an uncrewed or remotely piloted aircraft from or on lands and waters administered by the NPS is prohibited except as approved in writing by the superintendent. Drone operators will not launch, land, or operate UAS from or on lands and waters within the boundaries of properties administered by the NPS unless the operator has approval in writing from the NPS superintendent and the FAA has determined that the proposed action would not result in use or constructive use under Section 4(f).

Drone operators will abide by USFS guidance related to UAS operations within USFS property boundaries. These restrictions include, but are not limited to, not launching UAS within 100 meters of wildlife; not overflying wildlife; keeping UAS away from populated and noise-sensitive areas, such as campgrounds, trail heads, and visitor centers; and not overflying congressionally-designated wilderness and/or primitive areas where people seek opportunities for solitude and quiet.

Drone operators will comply with state and local policies regarding consent or permit requirements to launch, operate, and/or recover drones within areas managed by state and/or local entities.

As described in **Section 3.3.4**, the maximum noise exposure levels are associated with hub operations, where DNL 59.7 dB and greater could occur at distances within approximately 600 feet of the hub. To avoid significant noise impacts on noise-sensitive areas, which can include Section 4(f) properties, delivery hubs would be located at setback distances of at least 600 feet

[43] See https://www.ecfr.gov/current/title-23/chapter-I/subchapter-H/part-774/section-774.17

[44] For historic sites, *de minimis* impact means that the Administration has determined, in accordance with 36 CFR part 800 that no historic property is affected by the project or that the project will have "no adverse effect" on the historic property in question. For parks, recreation areas, and wildlife and waterfowl refuges, a *de minimis* impact is one that will not adversely affect the features, attributes, or activities qualifying the property for protection under Section 4(f).

from noise-sensitive land use to prevent increases of DNL 1.5 dB or more from occurring within existing DNL 65 dB or resulting in new DNL 65 dB.

3.7 Water Resources (Wild and Scenic Rivers)

3.7.1 Definition of Resource and Regulatory Setting

The primary federal law governing Wild and Scenic Rivers is the Wild and Scenic Rivers Act.[45] This Act was created by Congress to preserve rivers with these characteristics in a free-flowing condition for the enjoyment of present and future generations. The Act established the National Wild and Scenic River System (National System), which consists of those rivers and river segments deemed by Congress to have one or more "outstandingly remarkable" scenic, recreational, geologic, fish and wildlife, historic, or cultural values. Rivers in the system are classified based on the degree of development present along the river, and whether the river is wild, scenic, or recreational. The National Rivers Inventory (NRI) contains a list of rivers that are eligible or potentially eligible for inclusion in the National System.

Federal agencies with a project that could affect an NRI river segment must coordinate with the respective agency that has jurisdiction over that river, regardless of whether the river is listed on the National System. Consultation with the National Park Service is only necessary for water resources projects that could impact an NRI river segment.

More information about this environmental impact category is presented in Chapter 14 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.7.2 Affected Environment

The NRI, which is maintained by the NPS, lists more than 4,500 rivers or river segments that may be eligible for listing on the National System based on their free-flowing status and resource values.[46]

3.7.3 Environmental Consequences

The FAA has not established a significance threshold for Wild and Scenic Rivers. FAA Order 1050.1G includes factors to consider when assessing the significance of potential impacts on Wild and Scenic Rivers, including whether the action would have an adverse impact on the values for which a river was designated (or considered for designation) through:

- Destroying or altering a river's free-flowing nature,

[45] Public Law 90-542; 16 U.S.C. §§ 1271-1287.

[46] Available at: https://www.nps.gov/subjects/rivers/nationwide-rivers-inventory.htm

- A direct and adverse effect on the values for which a river was designated (or under study for designation),
- Introducing a visual, audible, or other type of intrusion that is out of character with the river or would alter outstanding features of the river's setting,
- Causing the river's water quality to deteriorate,
- Allowing the transfer or sale of property interests without restrictions needed to protect the river or the river corridor (which cannot exceed an average of 320 acres per mile, which, if applied uniformly along the entire designated segment, is one-quarter of a mile on each side of the river), or
- Any of the above impacts preventing a river on the NRI or a Section 5(d) river that is not included in the NRI from being included in the Wild and Scenic River System or causing a downgrade in its classification (such as from wild to recreational).

3.7.3.1 No Action Alternative

The no action alternative assumes drone operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone package delivery in multiple states resulted in FONSIs (see **Section 2.1**). Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are those from Amazon, Causey, DroneUp, UPS Flight Forward, Wing, and Zipline. Currently, UA operations can occur over these river segments under existing regulatory authorities. However, flights conducted under the no action alternative would not overfly NRI river segments at an intensity that could cause detrimental impacts to the values of these resources.

3.7.3.2 Proposed Action

The proposed action would not physically impact a designated Wild and Scenic River, study river, or a river or river segment on the NRI. UA might fly over a designated Wild and Scenic River, study river, or NRI river segments during package delivery operations. However, UA would not overfly such rivers at an intensity that could cause any detrimental impacts to the character or values of these resources. Typical cruise altitude is 150 to 375 feet AGL. At these altitudes, a drone en route to or from a hub may not be detected by an observer recreating at a river; if it is detected, the duration for which the drone would be visible would be limited.

The proposed action would not destroy or alter a river's free-flowing nature; would not result in a direct and adverse effect on the values for which a river was designated (or under study for designation); would not introduce a visual, audible, or other type of intrusion that is out of character with the river or alter outstanding features of the river's setting; would not cause the river's water quality to deteriorate; would not allow the transfer or sale of property interests

without restrictions needed to protect the river or the river corridor; and would not result in impacts preventing a river on the NRI or a Section 5(d) river that is not included in the NRI from being included in the National System or cause a downgrade in its classification (such as from wild to recreational). Therefore, the proposed action would not result in significant impacts to Wild and Scenic Rivers or rivers on the NRI.

3.8 Biological Resources

3.8.1 Definition of Resource and Regulatory Setting

Biological resources include fish, wildlife, plants, and their respective habitats. They are valued for their intrinsic, aesthetic, economic, and recreational qualities. Typical categories of biological resources include terrestrial and aquatic plant and animal species, game and non-game species, special status species (state or federally listed threatened or endangered species, marine mammals, or species of concern, such as species proposed for listing, candidate species, and migratory birds, including bald and golden eagles), and environmentally sensitive or critical habitats.

Section 7(a)(2) of the Endangered Species Act (ESA)[47] requires that each Federal agency—in consultation with the U.S. Fish and Wildlife Service (USFWS) or National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS)—ensures that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. The FAA is required to consult the USFWS or NMFS if an action may affect a federally listed species or critical habitat.

The Migratory Bird Treaty Act (MBTA)[48] protects migratory birds by prohibiting the taking, killing, or possessing of migratory birds (including their eggs, nests, and feathers). The MBTA applies to migratory birds identified in 50 CFR § 10.13 (referred to hereafter as “migratory birds”). Each drone operator is responsible for compliance with the MBTA.

The Bald and Golden Eagle Protection Act (BGEPA) prohibits anyone from “taking” a bald or golden eagle, including their parts, nests, or eggs, without a permit issued by the USFWS. Implementing regulations (50 CFR Part 22) and USFWS guidelines as published in the National Bald Eagle Management Guidelines (USFWS 2007), provide for additional protections against “disturbances.” Similar to take, "disturb” means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, injury to an eagle or causes either a decrease in its productivity or nest abandonment due to a substantial interference with breeding, feeding, or sheltering. A permitting process provides limited exceptions to BGEPA’s prohibitions (50 CFR

[47] 16 U.S.C. § 1531 et seq.
[48] 16 U.S.C. §§ 703–712.

Part 22). Permits are only needed when avoidance of incidental take is not possible. According to the National Bald Eagle Management Guidelines, if conservation measures can be implemented such that no aircraft are flown within 1,000 feet of a nest, incidental take of bald eagles is unlikely to occur, and no permit is needed. Each drone operator is responsible for compliance with BGEPA.

More information about this environmental impact category is presented in Chapter 2 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.8.2 Affected Environment

The U.S. supports thousands of species of wildlife (birds, mammals, fish, reptiles, amphibians, and invertebrates), including both resident species and migratory species. Approximately 1,682 species (744 animal species and 938 plant species) are federally listed threatened and endangered (T&E) species in the U.S.[49] **Table 8** contains a summary of T&E species by group.

Table 8. Summary of Federally Listed Threatened and Endangered Species

Group	Endangered	Threatened	Total Listings
Birds	67	26	93
Mammals	68	30	98
Fishes	91	77	168
Reptiles	18	31	49
Amphibians	25	18	43
Invertebrates[50]	226	67	293
Plants	766	172	938

When a species is proposed for listing as endangered or threatened under the ESA, the USFWS designates specific areas that are essential to the species' conservation as "critical habitat." These designations only affect only federal agency actions or federally funded or permitted activities, meaning that federal agencies cannot authorize funding or permits for actions that would adversely affect designated critical habitat without consulting with the USFWS prior to issuing an approval. The USFWS currently has 107,534,610.67 acres of final critical habitat and 3,635,612.44 acres of proposed critical habitat in the U.S. In addition, they have designated 36,061.23 miles as final critical habitat and 179.50 miles of proposed critical habitat.

[49] USFWS, Summary of Listed Species Listed Populations and Recovery Plans as of Wednesday, 15 October 2025. Available at: https://ecos.fws.gov/ecp/report/boxscore

[50] Includes insects, crustaceans, arachnids, mollusks, echinoderms, annelids, and protozoans

Over 1,100 migratory birds are protected from capture, pursuit, hunting, or removal from natural habitat under the MBTA,[51] and 269 individual bird taxa were listed in the Birds of Conservation Concern 2021 report.

Bald eagles can be found throughout the U.S., except for Hawaii, usually near large bodies of water, while golden eagles are typically found in western states and nest in cliffs (Wildlife Informer 2021; The Cornell Lab of Ornithology n.d.).

Because specific operating (or action) areas for the proposed action are currently unknown, it is not possible to identify which T&E species may exist where deliveries by drone may occur. This PEA discusses the groups of species that are most likely to encounter drone activity and identifies commitments and recommendations to avoid impacts to biological resources based upon consultation with the USFWS on previous EAs, as well as programmatic consultation with the USFWS that is currently underway for this PEA.

The FAA is actively engaged with the USFWS to develop a programmatic agreement that will streamline Section 7 consultation requirements. Until a programmatic agreement is developed between the FAA and USFWS, each drone operator will be required to obtain a resource list from the USFWS Information for Planning and Consultation (IPaC) system and submit it to the FAA with its application for Part 135 approvals. As part of the environmental review process, FAA will conduct project-specific consultation for the applicant's action area with the USFWS, if required.

3.8.3 Environmental Consequences

FAA Order 1050.1G states that a significant impact on biological resources would occur if the USFWS or NMFS determines the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated critical habitat. The FAA has not established a significance threshold for non-listed species. FAA Order 1050.1G includes factors to consider when assessing the significance of potential impacts on biological resources, including whether the action would have the potential for:

- A long-term or permanent loss of non-listed plant or wildlife species (e.g., extirpation of the species from a large project area, such as from a new commercial service airport),
- Adverse impacts on special status species or their habitats,
- Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations, or

[51] CFR Part 10.13-2023. Available at: https://www.fws.gov/media/list-birds-protected-migratory-bird-treaty-act-2023

- Adverse impacts on a species' reproductive success rates, natural mortality rates, non-natural mortality (e.g., road kills and hunting), or ability to sustain the minimum population levels required for population maintenance.

3.8.3.1 No Action Alternative

The no action alternative assumes drone operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are those associated with Amazon, Causey, DroneUp, UPS Flight Forward, Wing, and Zipline. Operations would occur in predominantly urban or suburban environments, where consumer demand would support drone delivery service. Given the short duration of increased noise levels, operations are not expected to significantly influence wildlife in the area. Takeoff and delivery timeframes would be short in duration, and drones would operate between 150 and 375 feet AGL well above the tree line and away from sensitive habitats. Based on these considerations, the likelihood of interactions between drones and federally listed species is low.

The previous EAs for Part 135 commercial drone package delivery in Arizona, Arkansas, California, Florida, North Carolina, Ohio, Oregon, Texas, Utah, and Virginia resulted in findings of *no effect* on fishes and plants, and findings of *may affect, but not likely to adversely affect* birds, mammals, reptiles, amphibians, and invertebrates. None of the operations that would continue under the no action alternative were found to result in adverse effects on federally listed species or critical habitat.

3.8.3.2 Proposed Action

Hubs are expected to be in a commercial parking lot, rooftop, or other previously developed or disturbed area. Deliveries would occur at residences or other places of business. Therefore, the proposed action is not expected to alter any wildlife habitat. Activities evaluated in this PEA do not consider ground-disturbing activities; therefore, if an operator's proposed action would result in ground disturbance, additional environmental review and/or consultation with the USFWS may be required on a case-by-case basis.

UA noise, visual presence, and the potential for airborne strikes with flying species are the proposed action's potential stressors or threats to wildlife. Flight operations would take place mostly in an urban or suburban environment, within airspace, and typically remain well above the tree line while en route to and from a hub. The duration of exposure by wildlife on the ground to visual or noise impacts from the UA would be of very short duration (less than 60 seconds during takeoff/landing, up to 90 seconds during delivery, and a few seconds during the en route phase as the UA flies by).

Strikes: The proposed action would involve operating drones from 0 feet at takeoff and landing to a maximum cruising altitude of 400 feet AGL (with nominal cruising altitude ranging from 150 to 375 feet AGL); therefore, the potential for a drone to strike a bird or bat species exists. The FAA has maintained a Wildlife Strike Database since 1990 that contains all recorded wildlife strikes,[52] but strike reporting is voluntary. As of October 1, 2023, there have been thousands of commercial drone small package delivery flights throughout the country. The FAA Wildlife Strike Database does not have documented reports of drone package delivery operations striking wildlife in the U.S.; though, as noted, strike reporting is voluntary.

Although public data is lacking for this airframe (small drones) specifically, it is important to evaluate available wildlife strike data because the flight profile of the UA will place operations in similar altitudes that have been evaluated by the FAA since 1990. The FAA produces an annual serial report in cooperation with the U.S. Department of Agriculture, Wildlife Services that analyzes reported wildlife strike data from 1990 through 2022. Roughly 70 percent of bird strikes occurred at or below 500 feet AGL during this timeframe for commercial transport and general aviation aircraft (Dolbeer et al. 2023). Most local movements of birds occur below 500 feet AGL, as birds take the lowest altitude available to them to expend the least amount of energy.

Visual Presence: In addition to a potential strike, studies have shown varying responses from animals to the presence of drones. Some have shown changes in behavior such as fleeing, changing foraging or course (McEvoy et al. 2016), aggression (Rebolo-Ifrán et al. 2019), and temporary or permanent nest or young abandonment (Cantu de Leija et al. 2023). Studies showing nest abandonment were using drone technology for wildlife population surveys, animal detection, and animal behavior survey and subsequent response to drone presence (Mo & Bonatakis 2022). Type of drone, size, and wing attachment were all found to affect disturbance to wildlife as well, with fixed-wing drones being more likely to elicit a response due to their shape and shadow resembling predators and larger drones causing more disruption (Rebolo-Ifrán et al. 2019; McEvoy et al. 2016; Kuhlmann et al. 2022). One study found that, in most instances, drones within four meters of birds did not cause a behavioral response (Vas et al. 2015). In another study, drones barely elicited behavioral responses in terrestrial mammals (Mulero-Pázmány et al. 2017).

Visual presence of the UA will be greatest at the hubs, where the UA takeoff, land, and charge. Hubs are expected to be in commercial business areas or parking lots, areas unlikely to sustain abundant wildlife populations. The delivery locations will be residential houses (yards, sidewalks, driveways, or other cleared areas) or other businesses (parking lots, rooftops, or other cleared areas at the business) where wildlife is least likely to exist.

Noise: Wildlife could be exposed to UA noise during all flight phases. A wide range of studies have been conducted concerning noise effects on animals (Manci et al. 1988; Dufour 1980;

[52] See: https://wildlife.faa.gov/home.

McKechnie & Gladwin 1993; Bradley et al. 1990; Lee & Fleming 2002; Bowles 1995). Natural factors which affect reaction include season, group size, age and sex composition, on-going activity, motivational state, reproductive condition, terrain, weather, and temperament (Bowles 1995). Individual animal responses to a given noise event or series of events also vary widely due to a variety of factors, including time of day, physical condition of the animal, physical environment, the experience of the individual animal with noises, and whether other physical stressors (e.g., drought) are present (Manci et al. 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the Manci et al. (1988) literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appear to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci et al. (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

A noise descriptor for noise effects on wildlife has not been universally adopted, but some research indicates SEL is the most useful predictor of responses. Characteristic of the bulk of research to date has been lack of systematic documentation of the source noise event. Many studies report "sound levels" without specifying the frequency spectrum or duration. A notable exception is a study sponsored by U.S. Air Force that identifies SEL as the best descriptor for response of domestic turkey poults to low-altitude aircraft overflights (Bradley et al. 1990). This study identified a threshold of response for disturbance of domestic turkeys ("100 percent rate of crowding") as SEL 100 dB. As noted in **Section 3.3**, the estimated maximum SEL for all flight phases package delivery UA is 98 dB occurring at 33 feet[53] from a hub or delivery point. The maximum en route SEL of 78 dB would occur approximately 600 and 700 feet from hubs and delivery locations, respectively. For context, the noise level of a diesel truck at 50 feet or a noisy urban environment during the day is estimated between 80 to 90 dB; the sound level of an air conditioning unit at 100 feet is approximately 60 dB.

Wildlife (Non-Listed Species)

Given operations would occur mostly in an urban and suburban environment, UA would cruise at an altitude of less than 400 feet AGL, any increase in sound levels experienced by wildlife from drones would be low and in short duration, and the low likelihood of a UA striking an individual animal, the proposed action is not expected to adversely affect wildlife populations in the study area. The proposed action is not expected to result in a long-term or permanent loss of wildlife species; substantial loss, reduction, degradation, disturbance, or fragmentation of

[53] Measurement data indicates SELs of up to 101.5 dB are possible for some UA at distances less than 33 feet from hub and delivery locations, but these higher noise exposure levels would occur directly beneath the UA during takeoff.

native species' habitats or their populations; or adverse impacts on a species' reproductive success rates, natural mortality rates, non-natural mortality, or ability to sustain the minimum population levels required for population maintenance. Therefore, the proposed action is not expected to result in significant impacts on non-listed (common) wildlife species.

3.8.3.3 Federally Listed Species

Birds

The FAA has determined that the proposed action *may affect, but is not likely to adversely affect* bird species based on the following considerations: (1) operations will occur in predominantly urban and developed areas, (2) the altitude at which the drone flies in the en route phase (150 to 375 feet AGL), (3) the expected low sound levels experienced by bird species, (4) the short duration of any increases in ambient sound levels, (5) the low probability of a listed bird species occurring in an action area, (6) the low likelihood that any one individual would experience multiple overflights given the mobility of birds, and (7) the low likelihood of the drone striking a bird. Any effects would be extremely unlikely to occur (discountable) or not able to be meaningfully measured, detected, or evaluated (insignificant).

Mammals

The FAA has determined that the proposed action *may affect, but is not likely to adversely affect* mammals based on the following considerations: (1) operations will occur in predominantly urban and developed areas, (2) the altitude at which the drone flies in the en route phase (150 to 375 feet AGL), (3) the expected low sound levels experienced by mammals, (4) the short duration of any increases in ambient sound levels, (5) the low probability of a listed mammal species occurring in an action area, (6) the low likelihood that any one individual would experience multiple overflights given the mobility of mammals, and (7) the low likelihood of the drone striking a mammal. Any effects would be extremely unlikely to occur (discountable) or not able to be meaningfully measured, detected, or evaluated (insignificant).

Fishes

Given that the proposed action would not include any habitat modification, there is no mechanism of effect to federally listed fishes. Therefore, The FAA has determined that the proposed action *may affect, but is not likely to adversely affect* fishes.

Reptiles

The FAA has determined that the proposed action *may affect, but is not likely to adversely affect* reptiles based on the following considerations: (1) operations will occur in predominantly urban and developed areas, (2) the altitude at which the drone flies in the en route phase (150 to 375 feet AGL), (3) the expected low sound levels experienced by reptiles, (4) the short duration of any increases in ambient sound levels, (5) the low probability of a listed reptile species occurring in an action area, (6) the low likelihood that any one individual would

experience multiple overflights given the mobility of reptiles, and (7) the low likelihood of the drone striking a reptile. Any effects would be extremely unlikely to occur (discountable) or not able to be meaningfully measured, detected, or evaluated (insignificant).

Amphibians

The FAA has determined that the proposed action *may affect, but is not likely to adversely affect* reptiles based on the following considerations: (1) operations will occur in predominantly urban and developed areas, (2) the altitude at which the drone flies in the en route phase (150 to 375 feet AGL), (3) the expected low sound levels experienced by amphibians, (4) the short duration of any increases in ambient sound levels, (5) the low probability of a listed amphibian species occurring in an action area, (6) the low likelihood of the drone striking an amphibian. Any effects would be extremely unlikely to occur (discountable) or not able to be meaningfully measured, detected, or evaluated (insignificant).

Invertebrates

The FAA has determined that the proposed action *may affect, but is not likely to adversely affect* invertebrates based on the following considerations: (1) operations will occur in predominantly urban and developed areas, (2) the altitude at which the drone flies in the en route phase (150 to 375 feet AGL), (3) the expected low sound levels experienced by invertebrates, (4) the short duration of any increases in ambient sound levels, (5) the low probability of a listed invertebrate species occurring in an action area, and (6) the low likelihood of the drone striking an invertebrate. Any effects would be extremely unlikely to occur (discountable) or not able to be meaningfully measured, detected, or evaluated (insignificant).

Plants

The proposed action would not alter vegetation and therefore would have *no effect* on plant species.

Consultation

The FAA has initiated consultation with the USFWS regarding the proposed effects determinations.

3.8.3.4 Critical Habitat

Operators would be prohibited from placing hubs within property designated as critical habitat or proposed for critical habitat designation. Therefore, the FAA determined that the proposed action would have *no effect* on designated critical habitat and critical habitat proposed for designation.

3.8.3.5 State Species of Concern

State-listed species, special concern species, and/or Species of Greatest Conservation Need may occur within a proposed operating area. However, these operating areas are currently unknown.

Studies show terrestrial species react differently to drones; some escape, attack, curiously approach or observe on high alert (Rebolo-Ifran 2019; Mo & Bonatakis 2022), while others found drone approach towards certain waterfowl produced no behavioral response (McEvoy et.al. 2016; Vas et al. 2015). In contrast, a specific study on a small whiptail lizard showed a potential physiological stress response to low-flying military aircraft (Kepas et al. 2023).

UA operations are limited to commercial hubs and delivery locations and in-flight operations will stay between 150 and 375 feet AGL. Increases in ambient sound levels would be short in duration. Drone activity would be concentrated primarily over developed areas where there is consumer demand for drone delivery service (and where habitat for species is less likely to exist). Any increase in ambient sound levels would be short in duration. Based on these factors, the probability of drone/wildlife interactions would be low, especially when combined with the implementation of mitigation measures and environmental commitments listed in **Section 3.8.4**.

3.8.3.6 Migratory Birds

The MBTA makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird species, including feathers or other parts, nests, eggs, or products, without prior authorization by the USFWS. Disturbance that causes nest abandonment and/or loss of reproductive effort (e.g., killing or abandoning eggs or young) may also be considered a “take” under the MBTA. Birds experiencing disturbance would be expected to leave the area and return once the disruption ends. Studies demonstrating nest abandonment or reduced reproductive success due to UAs have been associated with drone usage intended for bird population assessment and bird surveys, not package delivery services.

While there is potential that UA operations could impact eagles or migratory birds, due to the short duration of potential nuisance and small chance of strike, it is unlikely. Migratory bird species may display disturbance behaviors towards drones, such as fleeing or attacking maneuvers (Rebelo-Ifran et al. 2019.). Due to the limited scale of operations, the altitude of overflights (cruising at less than 400 feet AGL), and minimal anticipated noise and visual impacts from the action, no significant impacts to migratory bird species are expected under the proposed action. The proposed action would not result in long-term or permanent loss of wildlife species, would not result in substantial loss, reduction, degradation, disturbance, or fragmentation of native species’ habitats or populations, and would not have adverse impacts on reproductive success rates, natural mortality rates, non-natural mortality, or ability to sustain the minimum population levels.

3.8.3.7 Bald and Golden Eagles

The BGEPA, as amended, prohibits taking or harming bald and golden eagles, their eggs, nests (both active and inactive), or young without a permit. Any actions that are likely to cause injury to an eagle, decrease its productivity, or cause nest abandonment are prohibited under the BGEPA. Disturbance of nesting bald or golden eagles may result in nest abandonment, flushing of adults, or premature flushing of nestlings (USFWS 2007).

Birds experiencing disturbance from drone package deliveries would be expected to leave the area and return once the disruption ends. Studies demonstrating nest abandonment or reduced reproductive success due to UAs have been associated with bird surveys, with drones focused on assessing bird populations, not package-delivery services. While there is potential that UA operations could impact eagles or migratory birds, due to the short duration of potential nuisance and small chance of strike, the proposed action is anticipated to comply with the BGEPA and USFWS requirements for bald and golden eagles.

3.8.4 Mitigation Measures

The FAA will inform drone operators about the potential presence of federally listed species and each operator's obligation to comply with environmental laws (e.g., ESA, Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act, etc.) as part of its environmental review process after an operator has submitted an application. The following mitigation measures shall be implemented by the operator to comply with federal and state laws. The operator is responsible for complying with all mitigation measures.

3.8.4.1 Mitigation Measure: Coordination Efforts

- Drone operators will generate a USFWS IPaC resource list for the project area to identify a list of federally listed species and designated critical habitat. The list will be submitted with the operator's application and reviewed by the FAA on a case-by-case basis to help determine if the project falls outside the parameters of this programmatic document and therefore requires a project-specific consultation with the USFWS.
- Drone operators will coordinate with appropriate land managers to identify wildlife concerns and avoidance or minimization measures if they propose drone package delivery operations that would occur on or over a unit of the National Wildlife Refuge System, National Fish Hatchery, NPS, or other Federal lands, as indicated on the IPaC list generated for a specific project area.
- Drone operators will avoid placement of hubs within designated critical habitat.
- If ground disturbance will occur as part of an applicant's proposal, additional environmental review and consultation with the appropriate USFWS Field Office will be required.

3.8.4.2 Mitigation Measure: Migratory Birds

- Drone operators will avoid conducting operations within 200 feet (vertically or horizontally) of a known breeding or roosting colony or other known high-density nesting area of federally listed or proposed birds or migratory birds, as indicated by the IPaC list generated for a specific project area.
- Drone operators will coordinate with USFWS Field Office to determine if there is a known breeding colony or high-density nesting area for migratory birds within an operating area. If a known breeding colony or high-density nesting area exists, operators will be required to avoid siting a hub in proximity to those areas and will not fly over those areas.

3.8.4.3 Mitigation Measure: Bald Eagles

- Drone operators will periodically check online tools, such as iNaturalist, to identify eagle nests that may occur within an operating area.
- If a bald eagle nest is identified, the drone operator will establish an avoidance area to maintain a 1,000-foot vertical and horizontal separation distance between the drone's flight path and the nest. This avoidance area will be maintained through the end of breeding season or until a qualified biologist indicates the nest has been vacated.

3.8.4.4 Mitigation Measure: Bats

- The FAA will request data from the USFWS Field Office with jurisdiction over the proposed operating area regarding known maternity roost trees and hibernacula within a proposed operating area as part of the applicant's application package.
- If known roost trees are identified within the proposed operating area, the FAA will require each operator to commit to applying a 150-foot buffer restricted zone for flights around known bat roosts, including roost trees, bridges, and culverts, and a 0.25-mile buffer around hibernacula. No hovering or takeoff/landing activities shall occur within these buffers.
- Drone operators will not be allowed to place hubs near known hibernacula or mass roosting sites.

3.8.4.5 Mitigation Measure: Manatees

- Drone operators operating along coastal areas will be directed to conduct en route flights at an altitude of at least 350 feet over potential manatee habitat during the months of June through October.

- If manatees are on the Official Species List provided as part of an application to the FAA, the operator will be required to coordinate with the USFWS to identify where potential manatee habitat is located and measures to avoid potential impacts.

3.8.4.6 Mitigation Measure: Strike Reporting

- The FAA will instruct each drone operator to contact the FAA and USFWS if a drone strikes any species. The FAA and USFWS will coordinate with the drone operator to determine the species. Reports must be directed to the following parties: (1) USFWS Field Office based on the project location (https://www.fws.gov/locations) and (2) FAA Wildlife Biologist.

3.8.5 Environmental Commitments

The following environmental commitments have been identified by the FAA in consultation with the USFWS. Operators should implement these commitments to comply with Federal and state laws and regulations and to avoid or minimize impacts to biological resources.

Education

- The FAA recommends that each drone operator provide an environmental awareness briefing to all personnel as part of its operational plans for purposes of advising personnel about the potential presence of federally listed species in the operating area and identifying where such species may be present in the operating area.

Bat and Bird Species Best Management Practices

- Where possible, it is recommended that drones cross rivers, streams, or other linear waterbodies in a perpendicular fashion.

Chapter 4
List of Preparers and Reviewers

List of Preparers and Reviewers

Table 9 lists the individuals who prepared the PEA. **Table 10** lists the individuals who reviewed the PEA and contributed to its content.

Table 9. List of Preparers

Name	Organization	Experience	Role
Erin Greenfield Technical Writer/Editor	HMMH	10 years of technical writing/editing experience	Technical Editor, Section 508 Compliance
Michael Hamilton Senior GIS Specialist	HMMH	31 years of CAD/GIS experience	GIS Lead
Scott Polzin Principal Consultant	HMMH	26 years of NEPA experience	NEPA Support and QA/QC
Brandon Robinette Principal Consultant – Federal Programs	HMMH	20 years of acoustical experience	Noise/Acoustics Lead
Missi Shumer Principal Consultant – NEPA	HMMH	25 years of NEPA experience	NEPA Lead

Table 10. List of Reviewers

Name	Organization	Experience
Rachel Carlstrom Air Transportation Branch Manager Emerging Technologies Division AFS-740	FAA	14 years of experience in NEPA, policy, and document review
Christopher Couture Environmental Protection Specialist Aviation Safety (AVS)	FAA	19 years of experience in NEPA, policy, and document review
Jonathan “Zack” DeLaune Environmental Protection Specialist Emerging Technologies Division, AFS-752	FAA	18 years of NEPA experience
Joseph Hemler Manager AFS-752 Emerging Technologies Division	FAA	2 years in AFS-700/AVS Policy
Christopher Hobbs General Engineer Noise Division, AEE-100	FAA	28 years of experience measuring and estimating sound levels as applied to research in physical acoustics, environmental studies, and solving noise problems
Christopher Hurst, REM Environmental Protection Specialist Emerging Technologies Division, AFS-752	FAA	20 years of NEPA experience

Name	Organization	Experience
Jodi Jones Environmental Analyst	AVS Contractor at Primcorp, LLC	13 years of experience in NEPA, policy, research, and document review
Sheri Lares Environmental Protection Specialist Office of Policy and Strategic Engagement (APL) Office of Environment and Energy, AEE-400	FAA	Over 35 years of NEPA experience
Andrew Pieroni Environmental Protection Specialist Air Traffic/Operations Support	FAA	32 years of experience with expertise in NEPA and Section 106
Susumu Shirayama Environmental Protection Specialist Noise Division, AEE-100	FAA	25 years of acoustical analysis experience
Rachel Stephenson Environmental Protection Specialist Office of Airports (ARP)	FAA	7 years of experience in NEPA and environmental policy
Ryan Weller Environmental Protection Specialist Environmental Policy Division, AEE-400	FAA	25 years of experience in NEPA and environmental policy

APPENDIX A

REFERENCES

This page intentionally left blank.

References

Bowles, A.E. 1995. Responses of wildlife to noise. Pages 109–156 in R.L. Knight and K.J. Gutzwiller, eds. Wildlife and Recreationists: Coexistence through Management and Research. Island Press, Washington, DC.

Bradley, F., C. Book, and A.E. Bowles. 1990. Effects of Low-Altitude Aircraft Overflights on Domestic Turkey Poults. Report No. HSD-TR-90-034, U.S. Air Force Systems Command, Noise and Sonic Boom Impact Technology Program, June.

Cantu de Leija, A., R.E. Mirzadi, J.M. Randall, M.D. Portmann, E.J. Mueller, and D.E. Gawlik. 2023. A meta-analysis of disturbance caused by drones on nesting birds. *Journal of Field Ornithology* 94(2):3.

Cornell Lab of Ornithology (Cornell Lab). No Date. *All About Birds: Bald Eagle* [Internet]. Available: https://www.allaboutbirds.org/guide/Bald_Eagle/overview. Accessed: October 31, 2023.

Dolbeer, R.A., M.J. Begier, P.R. Miller, J.R. Weller, and A.L. Anderson. 2023. Wildlife Strikes to Civil Aircraft in the United States, 1990–2022. Federal Aviation Administration, National Wildlife Strike Database, Serial Report Number 29. Report of the Associate Administrator of Airports, Office of Airport Safety and Standards, Airport Safety & Certification, Washington, DC. June. Available: https://www.faa.gov/sites/faa.gov/files/Wildlife-Strike-Report-1990-2022.pdf.

Dufour, P. 1980. Effects of Noise on Wildlife and Other Animals: Review of Research Since 1971. U.S. Environmental Protection Agency, Report 550/9-80100, July.

FAA. 2023a. *Order 1050.1 Desk Reference.* Version 3, October 2023. Available: https://www.faa.gov/media/71921.

FAA. 2023b. *Package Delivery by Drone (Part 135)* [Internet]. Last revised: March 17, 2023. Available: https://www.faa.gov/uas/advanced_operations/package_delivery_drone. Accessed: March 17, 2023.

FAA. 2022. *Unmanned Aircraft Systems (UAS) or Drone Operations* [Internet]. Last revised: December 1, 2022. Available: https://www.faa.gov/hazmat/air_carriers/operations/drones#:~:text=14%20CFR%20Part%20107%2C%20known%20as%20the%20Small,all%20times%20and%20is%20not%20subject%20to%20waiver. Accessed: February 1, 2023.

FAA. 2020. *Types of 14 CFR 135 Operations* [Internet]. Last revised: May 11, 2023. Available: https://www.faa.gov/licenses_certificates/airline_certification/135_certification/general_info#:~:text=Standard%20Part%20135%20A%20standard%20part%20135%20operator,each%20type%20of%20operation%20they%20wish%20to%20conduct. Accessed: February 1, 2023.

Kepas, Megen E., L. Sermershein, S. Hudson, A. Lehmicke, S. French, and L. Aubry. 2023. Behavior, stress, and metabolism of a parthenogenic lizard in response to flyover noise. *Frontiers in Amphibian and Reptile Science (1:1129253).*

Lee, C.S.Y, and G. Fleming. 2002. General Health Effects of Transportation Noise. U.S. Department of Transportation, Federal Railroad Administration, DTS-34-RR297-LRZ, June.

Manci, K.M., D.N. Gladwin, R. Villella, and M.G. Cavendish. 1988. Effects of aircraft noise and sonic booms on domestic animals and wildlife: a literature synthesis. U.S. Fish and Wildlife Service National Ecology Research Center, Ft. Collins, CO., Report NERC-88/29.

McEvoy, J.F., G.P. Hall, and P.G. McDonald. 2016. Evaluation of Unmanned Aerial Vehicle Shape Flight Path and Camera Type for Waterfowl Surveys: Disturbance Effects and Species Recognition. *PeerJ* (1831).

McKechnie, A.M., and D.N. Gladwin. 1993. Aircraft Overflight Effects on Wildlife Resources. U.S. National Park Service, NPOA Report No. 93-8, November.

Mo, M. and K. Bonatakis. 2022. An examination of trends in the growing scientific literature on approaching wildlife with drones. *Drone Systems and Applications* 10(1):111–139.

Mulero-Pázmány, M., S. Jenni-Eiermann, N. Strebel, T. Sattler, J. José Negro, and Z. Tablado. 2017. Unmanned Aircraft Systems as a New Source of Disturbance for Wildlife: A Systematic Review. *PloS One* 12(6).

NPS (National Park Service). 2025. *Nationwide Rivers Inventory* [Online Map]. Available: https://www.nps.gov/maps/full.html?mapId=8adbe798-0d7e-40fb-bd48-225513d64977. Accessed: June 30, 2025.

Rebolo-Ifrán, N., M.G. Grilli, and S.A. Lambertucci. 2019. Drones as a Threat to Wildlife: YouTube Complements Science in Providing Evidence about Their Effect. *Environmental Conservation* 46(3):205–210.

USFWS (U.S. Fish and Wildlife Service). 2007. National Bald Eagle Management Guidelines. Available: https://www.fws.gov/media/national-bald-eagle-management-guidelines. Accessed: June 30, 2025.

Vas, E., A. Lescroel, O. Duriez, G. Boguszewski, and D. Gremillet. 2015. Approaching Birds with Drones: First Experiments and Ethical Guidelines. Biology Letters (The Royal Society).

APPENDIX B

EXAMPLE EXEMPTION

This page intentionally left blank.

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave
Washington, DC 20591

Exemption No. 18163G
Regulatory Docket No. FAA-2018-0835

Mr. Chris Jackman
Wing Aviation LLC
3400 Hillview Avenue
Palo Alto, CA 94304

Dear Mr. Jackman:

This letter is to inform you that the Federal Aviation Administration (FAA) has granted your request for an amendment to Exemption No. 18163F. This letter transmits the FAA's decision, explains the basis for the decision, and provides the conditions and limitations of the exemption, including the date the exemption ends.

The Basis for the FAA's Decision
On April 15, 2025, you petitioned the FAA on behalf of Wing Aviation LLC (Wing) for an amendment to Exemption No. 18163F. That exemption from §§ 61.23(a)(2)(ii), 61.3(a), 61.3(c)(1), 91.7(a), 91.109(a), 91.113(b), 91.119(b), 91.119(c), 91.121, 91.151(a), 91.155, 135.21(f), 135.25(a), 135.63(c), 135.63(d), 135.65(a), 135.65(d), 135.79(a)(2), 135.95(a), 135.143(c), 135.149(a), 135.161(a), 135.203(a), 135.205, 135.209(a), 135.243(b)(1), 135.243(b)(2), 135.243(b)(3), 135.267, 135.323 135.337(b)(1), 135.338(b)(1), 135.339(e)(3), 135.339(e)(4), 135.340(e)(3), and 135.340(e)(4) of Title 14, Code of Federal Regulations (14 CFR) allows the petitioner to conduct Part 135 air carrier operations for commercial package delivery using an unmanned aircraft system (UAS).

You requested an amendment to provide relief from §§ 91.205(c) and 91.209(a)(1) to allow you to remove position lighting and the electric landing light. You further requested revision to Conditions and Limitations Nos. 9, 39, 43, 44, 53, 66, and 82. Finally, you requested to remove Conditions and Limitations Nos. 16, 45, 51, and 92.

The FAA has previously issued a grant of exemption in circumstances similar in material respect to those presented in your petition. In Grant of Exemption No. 19111D[1], the FAA found that a grant of exemption was in the public interest, that the proposed operations' UAS safety features and the limitations under which the Operator would operate were sufficient mitigations that ensured the proposed commercial package delivery operations would not adversely affect safety.

[1] Exemption No. 19111D is available at https://www.regulations.gov/document/FAA-2020-0499-0049.

AFS-25-01838-E

Having reviewed your situation, I find that:

- They are similar in all material respects to relief previously requested in Grant of Exemption No. 19111D;
- The reasons stated by the FAA for granting Grant of Exemption No. 19111D also apply to your situation; and
- A grant of exemption is in the public interest.

The FAA has made several changes to the conditions and limitations to conform to current policy, as well as editorial revisions. The FAA has granted and addressed your amendment request through this grant of exemption, as originally granted Exemption No. 19111D. You are highly encouraged to carefully review the below conditions and limitations, as they have replaced all conditions and limitations previously issued. Analysis supporting the FAA's decision to grant or deny specific relief requested follows below. The definitions listed in Table 2 applies to the below analysis to the conditions and to the limitations of this exemption.

The FAA's Analysis and Disposition of Changes

Table 1 – Summary of Changes Related to Other Conditions and Limitations in the Prior Exemption

18163G Condition and Limitation	19111D Condition and Limitation	Topic	FAA Initiated	Decision
No. 1	No. 1	Applicability	X	Revised
No. 7	No. 7	Domestic/Foreign Operations	X	Revised
X	No. 10	Customer Notification	X	Removed
X	No. 16	Unmanned Traffic Management (UTM) outage reporting	X	Moved
X	No. 17	UTM outage reporting	X	Moved
No. 17	No. 20	Monthly Report	X	Revised
No. 18	No. 21	Ground Risk	X	Revised
No. 19	No. 22	Safe Alternate Landing Areas	X	Revised
No. 20	No. 23	Distance from Non-participants	X	Revised
No. 22	No. 25	Area of Operations Plan	X	Revised
No. 23	No. 26	Communication Services Assessment	X	Revised
No. 24	No. 27	Ground Risk Assessment	X	Revised
No. 25	No. 28	Collision Avoidance Plan	X	Revised

18163G Condition and Limitation	19111D Condition and Limitation	Topic	FAA Initiated	Decision
X	No. 29	Required Personnel Plan	X	Moved
No. 30	No. 34	Anti-Collison Lights	X	Revised
No. 31	No. 35	Parachute use	X	Revised
No. 42	No. 46	AE error reporting	X	Revised
X	No. 47	MEL use	X	Removed
X	No. 48	Maintenance Inspections	X	Removed
No. 46	No. 52	Collision Avoidance Capability	X	Revised
No. 47	No. 53	Approval for use of Collision Avoidance System	X	Revised
No. 50	No. 56	NOTAM filing	X	Revised
No. 52	No. 58	Preflight Action	X	Revised
No. 57	No. 63	Visibility Requirement	X	Revised
X	No. 70	Non-essential communications	X	Removed
X	No. 89	Color Vision Requirement	X	Removed
No. 86	No. 94	VO Training	X	Revised

Table 2 – Definitions[2]

Term	Definition
Intervention	An unplanned event with a potential impact on pilot workload beyond normal operating procedures, to include Pilot in Command (PIC)-initiated: airborne holds for other than air traffic; return to base; mission abort because of abnormal flight/system behavior; or use of an emergency procedure.
Incident	An occurrence other than an accident, associated with the operation of an unmanned aircraft system, which affects or could affect the safety of operations
Accident	An occurrence associated with the operation of an unmanned aircraft system that takes place between the time that the system is activated with the purpose of flight and the time that the system is deactivated at the conclusion of its mission, in which: (1) Any person suffers death or serious injury; or

[2] These definitions apply to the terms as used in this exemption only.

Term	Definition
	(2) The aircraft sustains substantial damage.
Land Now	The capability of the UA to perform an immediate landing to exit the airspace on command or automatically.
Ground Control Station	The means used by the pilot to monitor the status of the UA and control the UA during flight.
Required Personnel	Operator personnel who directly participate in the flight operation. [3]
Collision Avoidance Maneuver	A maneuver or series of maneuvers accomplished to avoid an aircraft during a single encounter.
"Accepted by" the FAA	The item at issue must be submitted to the FAA for review and acceptance prior to use.[4]

FAA-Initiated Changes

Changes to Conditions and Limitations

The FAA is making changes in this exemption that are generally related to ensuring no adverse impact on safety. Several conditions and limitations have been improved stylistically or in a few cases, restructured to improve readability and usability of the document. These changes are also noted below and described as organizational changes and clarifications or textual improvements.

Condition and Limitation No. 1 in Exemption No. 19111D

Condition and Limitation No. 1 is amended to include "authorized in" as some operators with a very large number of aircraft may be authorized to maintain a list of aircraft that is referred to in the Opspec D085.

Condition and Limitation No. 7 in Exemption No. 19111D

Condition and Limitation No. 7 is amended to enable the operator to apply for international operations following the standard air carrier process by removing the previous restrictive language from the exemption.

Condition and Limitation No. 10 in Exemption No. 19111D

This requirement is removed from the exemption as it was included in error and is duplicative of Condition and Limitation No. 9 in Exemption No. 19111D which remains Condition and Limitation No. 9 in this exemption.

Condition and Limitation No. 16 in Exemption No. 19111D

This requirement was moved from Condition and Limitation No. 16 in Exemption No. 19111D and is now Condition and Limitation No. 17 in this exemption. This move shifts this requirement

[3] For purposes of this exemption, the term "required crewmember" does not have the same meaning as it does when required by regulation or type certificate. Under this exemption, minimum required crew is set forth in the conditions and limitations, but the operator may, for example, assign additional personnel who would be required to complete training as if they are required crewmembers.
[4] FAA Order 8900.1 Volume 3, Chapter 1, Section 1, Paragraph 3-1, Item 2.

from a 24-hour notice to the monthly report as UTM system outage information does not require any immediate FAA action.

Condition and Limitation No. 17 in Exemption No. 19111D

This requirement was moved from Condition and Limitation No. 20 in Exemption No. 19111D and is now Condition and Limitation No. 17 in this exemption. This move shifts this requirement from a 24-hour notice to the monthly report as UTM system outage information does not require any immediate FAA action.

Condition and Limitation No. 20 in Exemption No. 19111D (Monthly Report)

Condition and Limitation No. 20 is now Condition and Limitation No. 17 in this exemption. This changed the 6000 feet horizontal distance and 500 feet vertical distance reporting requirement to 2000 feet horizontal distance and 250 feet vertical distance as this has been determined to be a better metric to measure the actual risk. UTM outage reports was added from Condition and Limitation Nos. 16 and 17 in Exemption No. 19111D. C2 lost link reporting has been revised based on revision of C2 assessment requirements in Condition and Limitation No. 23 in this exemption.

Condition and Limitation No. 21 in Exemption No. 19111D

Condition and Limitation No. 21 now Condition and Limitation No. 18 in this exemption. The requirement to not overfly "Schools during times of operation" is being removed. It has been determined that during operation most people are indoors, and the risk would be similar to any other public area. Any outdoor risk due to a large assembly at a school would be mitigated by the requirement to not overfly open air assemblies of people. The reference to the "Area of Operations (AOO) Plan" has been changed to "Collision Avoidance Plan" reflecting the movement of local airport information from the AOO Plan to the Collision Avoidance Plan."

Condition and Limitation No. 22 in Exemption No. 19111D

Condition and Limitation No. 22 is now Condition and Limitation No. 19 in this exemption. Language was added enabling the use of perception systems capable of determining safe alternate landing areas.

Condition and Limitation No. 23 in Exemption No. 19111D

Condition and Limitation No. 23 is now Condition and Limitation No. 20 in this exemption. Language was added enabling the use of perception systems capable of maintaining a safe distance from non-participants.

Condition and Limitation No. 25 in Exemption No. 19111D (Area of Operations Plan)

Condition and Limitation No. 25 is now Condition and Limitation No. 22 in this exemption. "Submitted for approval" has been revised to "accepted by" the FAA. (*See,* definition in Table 2) Additional information the FAA has determined to be required has been added to provide a

complete picture of the area requested including addresses of the operations bases and control centers, and the details of the related airspace. Validation information has been moved from the collision avoidance plan to the AOO plan as the FAA may require validation of operations in a new area for reasons other than collision avoidance.

Condition and Limitation No. 26 in Exemption No. 19111D (Communications Services Assessment)

Condition and Limitation No. 26 is now Condition and Limitation No. 23 in this exemption. The name "Communications Services Assessment" has been renamed to "C2 Link System Assessment" to better reflect the intent of the assessment. The items required in the assessment have been modified to align the assessment with the appropriate industry standards regarding command-and-control link systems.

Condition and Limitation No. 27 in Exemption No. 19111D (Ground Risk Assessment)

Condition and Limitation No. 27 is now Condition and Limitation No. 24 in this exemption. The term "at regular intervals" has been added to item "c" to ensure any changes to terrain or obstacles are recognized in a timely manner.

Condition and Limitation No. 28 in Exemption No. 19111D (Collision Avoidance Plan)

Condition and Limitation No. 28 is now Condition and Limitation No. 25 in this exemption. A reference has been added to GSC survey intervals in Condition and Limitation No. 67 in this exemption. DAA safety case information has been moved from Condition and Limitation No. 22 in this exemption (Area of Operations Plan) to Condition and Limitation No. 25 (Collision Avoidance Plan). The information moved is related to collision avoidance and is better suited in Condition and Limitation No. 25. Validation information has been moved to No. 22 in this exemption (AOO plan) as discussed above.

Condition and Limitation No. 29 in Exemption No. 19111D (Required Personnel Plan)

"Required Personnel Plan" information has been moved to Condition and Limitation No. 25 in this document. The required personnel plan information is specifically related to collision avoidance and is better suited in Condition and Limitation No. 25.

Condition and Limitation No. 34 in Exemption No. 19111D

Condition and Limitation No. 34 is now Condition and Limitation No. 30 in this exemption. Clarification language "when unobstructed by weather" has been added to show this is a design requirement and not an operational requirement.

Condition and Limitation No. 35 in Exemption No. 19111D

Condition and Limitation. No. 35 is now Condition and Limitation No. 31 in this exemption. The reference to advancing standards transforming markets (ASTM) standard has been revised to the current version.

AFS-25-01838-E

Condition and Limitation No. 46 in Exemption No. 19111D

Condition and Limitation No. 46 is now Condition and Limitation No. 42 in this exemption. This requirement is being revised to remove a link to the reporting website as the link may change.

Condition and Limitation No. 47 in Exemption No. 19111D

This requirement is being removed as it is duplicative of 14 CFR § 91.213.

Condition and Limitation No. 48 in Exemption No. 19111D

This requirement is being removed, because Condition and Limitation No. 2 requires a continuous airworthiness maintenance program (CAMP) in which the applicable maintenance and inspection requirements are established as outlined in 14 CFR §§ 135.411(a)(2).

Condition and Limitation No. 52 in Exemption No. 19111D

Condition and Limitation No. 52 is now No. 46 in this exemption. The term "conflict management" has been revised to "collision avoidance" to clarify and align the term with other uses of it in the exemption. Clarifying language has been changed from "if approved "to "for use" as these systems are not approved by the FAA.

Condition and Limitation No. 53 in Exemption No. 19111D

Condition and Limitation No. 53 is now Condition and Limitation No. 47 in this exemption. The term "conflict management" has been revised to "collision avoidance" to clarify and align the term with other uses of it in the exemption. Clarifying language has been changed from "if approved" to "for use" as these systems are not approved by the FAA.

Condition and Limitation No. 56 in Exemption No. 19111D

Condition and Limitation No. 56 is now Condition and Limitation No. 50 in this exemption. The requirement to file the Notice to Airmen (NOTAM) no later than 24-hours from the beginning of the operation has been revised to 8-hours to reduce the burden on the operator that resulted in occasional lapses in operations due to the inability to meet the 24-hour requirement.

Condition and Limitation No. 58 in Exemption No. 19111D

Condition and Limitation No. 58 is now Condition and Limitation No. 52 in this exemption. The reference "Required Personnel Plan" has been changed to "Collision Avoidance Plan" and "for the area" to reflect the combining of the two requirements.

Condition and Limitation No. 63 in Exemption No. 19111D

Condition and Limitation No. 63 is now Condition and Limitation No. 57 in this exemption. "Operational" visibility requirement has been added to clarify there may be an operational need for a required visibility such as when visual observers are used. Removed reference to Class G

airspace to clarify this relief is applicable in all airspace unless restricted in a COA issued by the Administrator for a specific area of Class B, C, D, or E airspace.

Condition and Limitation No. 70 in Exemption No. 19111D

This requirement is removed as it is duplicative of 14 CFR §135.100.

Condition and Limitation No. 89 in Exemption No. 19111D

This requirement is removed as a medical certificate is no longer required for the operation and Condition and Limitation No. 69 in this exemption states a similar requirement.

Condition and Limitation No. 94 in Exemption No. 19111D

Condition and Limitation No. 94 is now Condition and Limitation No. 86 in this exemption. The reference to the Unmanned Flight Manual has been removed, as the procedures mentioned would be documented in the company manual.

Clarification/Standardization/Correction

Section 91.205(c)(4) was inadvertently removed from the granting paragraph in Exemption No. 18339E. This exemption was subsequently used as the basis for summary grant exemptions of which Exemption No. 18163F was derived. This provided relief from the requirement to have a landing light. The relief is being reinstated in this exemption to correct the error.

All references to Part 135 manual system, General Operations Manual (GOM), or accepted manuals was renamed to "company manual" for standardization.

All references of a ratio of the PIC to a UA, Operating Base, or Flight Instructor were reversed to reflect industry terminology. Example: "UA-to-PIC" is now "PIC-to-UA."

There are stylistic changes to Condition and Limitation No. 9.

The FAA's Decision

In consideration of the foregoing, a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. §§ 106(f), 40113, 44701, 44807, and 44808 delegated to me by the Administrator, Wing Aviation, LLC, is granted an exemption from 14 CFR §§ 61.23(a)(2)(ii), 61.3(a), 61.3(c)(1), 91.7(a), 91.109(a), 91.113(b), 91.119(b), 91.119(c), 91.121, 91.151(b), 91.155, 91.205(c)(2), 91.205(c)(4), 91.209(a)(1), 135.25(a), 135.63(c), 135.63(d), 135.65(a), 135.65(d), 135.79(a)(2), 135.95(a), 135.143(c), 135.149(a), 135.161(a), 135.203(a), 135.205, 135.209(a), 135.243(b)(1), 135.243(b)(2), 135.243(b)(3), 135.267, 135.337(b)(1), 135.338(b)(1), 135.339(e)(3), 135.339(e)(4), 135.340(e)(3), 135.340(e)(4), and 135.437(b) to the extent necessary to allow Wing to conduct Part 135 air carrier operations for commercial package delivery using an unmanned aircraft system, subject to the conditions and limitations listed below.

AFS-25-01838-E

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave
Washington, DC 20591

Conditions and Limitations

I. General

1. This exemption from provisions of Parts 61, 91, and 135 applies only to UA that are authorized in or listed in the operator's operations specifications (OpSpecs). This exemption may be utilized only in conjunction with an air carrier certificate issued by the Administrator.

2. UA operating under this exemption shall be maintained under a continuous airworthiness maintenance program (CAMP) as outlined in §§ 135.411(a)(2), 135.415, 135.417, and 135.423 through 135.443.

3. The operator shall not make any updates or revisions to its company manuals that would affect the basis upon which the FAA granted this exemption, unless in accordance with a petition to amend this exemption.

4. Proposed changes to the size, scope or complexity of the operation, or the number or type of UA used must be submitted to the FAA certificate management team (CMT) for review. The FAA will determine whether validation testing or an amendment to the exemption is required prior to changes being implemented.

5. All documents used by the operator to ensure the safe operation and flight of the UA, including this exemption as well as any documents required under 14 CFR §§ 91.9, 91.203, and 135.65 must be available to the PIC any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

6. If a discrepancy exists between the conditions and limitations in this exemption, the procedures outlined in the operator's company manuals, the aircraft manufacturer's manuals, or any provisions issued under a waiver to any Part 91 requirement, the operator must comply with the most restrictive provision.

7. This exemption is not valid for operations conducted outside of the United States, unless authorized in the operator's operations specifications and operational permission is obtained from the Civil Aviation Authority of the foreign country.

8. Operations conducted under this exemption must be conducted in Class G

airspace unless the operator has prior authorization from the Administrator to operate in Class B, Class C, Class D, or Class E airspace.

9. The operator must provide each delivery customer with information about the delivery method and provide the customer with instructions to remain clear of the unmanned aircraft during delivery by a distance sufficient to minimize the risk of injury.

10. The operator's company manual must include procedures for the retrieval of missing or overdue aircraft. After conducting an initial search, if unable to locate a missing or overdue aircraft, the company manual must have procedures for the timely notification of an FAA facility.

11. Remote pilot duty stations must be physically located within the United States and the locations must be provided to the FAA prior to operations at any new location.

12. The operator must maintain a record of the total payload carried on each flight. This record must be kept for at least 30 days and be made available to the FAA upon request.

13. The operator is responsible for maintaining the following data and providing the data to the FAA upon request:
    a. Date, name, and certificate numbers of all required personnel for each flight;
    b. The length of the rest period prior to each duty period for each of the required personnel; and
    c. Total hours on duty per calendar day for each of the required personnel.

14. For flights that involved any encounters with a manned aircraft where the separation distance from the UA was less than 100 feet vertical and 500 feet horizontal, within 24 hours of the occurrence, the operator must send a report to the responsible Flight Standards Office including closest point of approach, date, time, location and altitude of the encounter, ADS-B out cooperative status, and avoidance maneuver taken, if any.

15. In the event of any intervention, incident, or accident, the operator must submit an initial event report within 24 hours of the event. This report must be submitted to the responsible Flight Standards office, or as otherwise directed by the FAA, and provide the information listed below:
    a. Description of the event, including operational and environmental factors;
    b. Description of the initial, known contributing factors for the event; and
    c. Names of the crewmembers involved in the operation and their respective roles.

16. Following an intervention, incident, or accident, the operator must perform

an investigation and submit a final event report with the results of the investigation to the responsible Flight Standards Office, or as otherwise directed by the FAA. This report must address:

a. Causal factors for the intervention, incident, or accident;
b. Planned corrective actions to prevent recurrence of the event, including a timeline for implementation of the corrective actions.

17. The operator must submit an operations report, in a manner acceptable to the FAA, for each calendar month by the 10th day of the following month. This report must be submitted to the responsible Flight Standards Office or as otherwise directed by the FAA and provide the information listed below:
    a. Total number of UA flights and flight hours per month delineated by operating part;
    b. Number of flights that had any intervention, incidents, or accidents and provide status updates of those events;
    c. If the operator has initiated any corrective actions to any previous interventions, incidents, or accidents, the specifics of such actions;
    d. Number of "Land Now" performed automatically or manually, and provide details of those events;
    e. Number of rejected loads;
    f. Number of encounters identified where a UA operated less than 2000 feet horizontal distance and less than 250 feet vertical distance of a manned aircraft. Each report must include the closest point of approach between the two aircraft in horizontal distance, and vertical distance, and ADS-B cooperative status, if known;
    g. Number of UA operations delayed or cancelled automatically by the system due to other aircraft within the vicinity of the planned departure, enroute, delivery, or landing area;
    h. Number of collision avoidance maneuvers performed automatically when utilizing onboard DAA systems, if applicable;
    i. Number of collision avoidance maneuvers (land now, return home, pause, climb, descend, turn, etc.) performed manually because of information derived from the use of any system used to detect ADS-B cooperative and ADS-B non-cooperative traffic (ground-based radar, ADS-B receivers, etc.), if applicable; and
    j. Number and duration of each occurrence where the lost C2 link decision time was exceeded, and a lost C2 link procedure was executed. For the purpose of this requirement, the "lost C2 link decision time" is the period of time from when a loss of C2 is detected to when the UA initiates a lost C2 link procedure.
    k. In the event of an unscheduled outage of the operator's strategic conflict detection and conformance monitoring service that impacts the operator's flight operations, report the loss of the service and the time to restore.

l. In the event of a malfunction of the operator's strategic conflict detection and conformance monitoring service, report the nature of the malfunction and the time to restore normal operation of the service.

II. Areas of Operation

18. The operator must adhere to the following regarding general operations, unless otherwise authorized by the administrator:
    a. Flight operations must minimize ground risk and not overfly the following:
        i. Power plants;
        ii. Open-air assemblies of people;
        iii. Moving vehicles, except transitory flight operations;
        iv. Roadways or highways, except transitory flight operations; and
        v. Any other area deemed high risk by the operator during the flight route design process.
    b. Airspace Avoidance Areas:
        i. The UA must avoid known areas with increased aviation activity (e.g., ultralight areas, aerobatic boxes, or other areas with a high volume of low altitude manned traffic); and
        ii. The UA may not operate within 3 nautical miles of any public use runway or landing area, without suitable mitigations that are described in the **Collision Avoidance Plan**, which should include outreach to the airport facility prior to starting operations, or an agreement between the operator and airport facility management.

19. Unless the aircraft is equipped with a perception system capable of determining safe alternate landing areas, prior to each operation, the operator must designate safe alternate landing areas that the UA can reach if it is unable to complete the intended flight and identify such alternate landing areas to the PIC operating the aircraft. The description of use of the perception system must be specified in the company manual. The alternate landing areas must
    a. Provide for a landing without undue hazard to persons or property on the ground, and avoid structures and roads where overflight is not permitted; and
    b. Be areas with a low likelihood of exposed persons, such as forested areas providing significant sheltering, farmland, or prairies.

20. To ensure the safety of the operation, the operator must adhere to the following regarding planned takeoff, landing, and loading areas:
    a. The areas must be limited to locations with access restricted to only persons participating in the operation;
    b. The areas must be free of any obstructions that could pose a hazard; and

c. The distances at which non-participants must remain from the operation or the description of use of a perception system capable of keeping the aircraft a safe distance from non-participants must be specified in the operator's company manual.

21. To ensure the safety of the operation, the operator must adhere to the following regarding planned delivery areas:
    a. The areas must be free of any obstructions that could pose a hazard; and
    b. The distances at which non-participants must remain from the operation must be specified in the operator's company manual.

22. For all current operations areas and prior to conducting operations in a new area, or modification of an existing area, the operator must submit an **Area of Operations (AOO) Plan** accepted by the FAA. The operator must receive a determination from the FAA if validation of the operation in the area is required prior to initiating operations. The AOO Plan must include:
    a. Geocoordinates and map detail
        i. Sectional chart image depicting the area of operations and all base locations;
        ii. Addresses for all operating bases; and
        iii. Operating area geocoordinates, if requested.
    b. Operations Center locations
        i. Location(s) of Remote Pilots in Command (RPICs)
    c. Airspace description
        i. Airspace classes within the boundary of the area of operations.
        ii. Indicate any Certificate of Authorization (COA) for controlled airspace issued for the AOO.

23. For all current operations areas and prior to conducting operations in a new area, the operator must complete a **C2 Link System Assessment** and submit it to the FAA for acceptance. The assessment must include, at a minimum:
    a. A description of the C2 Link System minimum performance requirements. The C2 Link System performance parameters may be those specified in RTCA DO-377B for small UAS package delivery operations (i.e., RLP Latency, RLP Transaction Expiration Time, RLP Availability, etc.), or other appropriate performance parameters established by the operator;
    b. An analysis of the C2 Link System to ensure that established C2 Link System performance requirements can be achieved in the planned operating area;
    c. A description of how C2 Link System performance is monitored during flight, including what information is displayed to the pilot, and how C2 Link System performance issues are managed;
    d. A description of the lost C2 link procedures, including how the lost C2 link decision time (lost link timer) was established and what information is provided to the pilot during the lost C2 link procedure;

e. For C2 Link Systems that utilize Cellular C2 links, the process outlined in "Aerial Connectivity Joint Activity – Work Task #2: Reference Method for assessing Cellular C2 Link Performance and RF Environment Characterization for UAS (Oct 2022)" (ACJA-WT#2), or similar, should be followed. For C2 Link Systems that do not utilize cellular C2, the ACJA-WT#2 assessment method should be tailored accordingly for the specific C2 Link System characteristics; and,
f. The report described in Section 2.6 of ACJA-WT#2, or similar, shall be submitted to the FAA on a quarterly basis at the end of the month following the end of the quarter (April 30, July 31, Oct 31, Jan 31).

24. For all current operations areas, and prior to conducting operations in a new area, the operator must complete a G**round Risk Assessment** and submit it to the FAA for acceptance. The assessment must, at a minimum, include all the following:
    a. Consideration of the provisions of Condition and Limitation Nos. 18, 19, 20, and 21;
    b. Pedestrian and moving vehicle analysis that will consider possible flight paths with the least presence of people and moving vehicles, during the planned time of operation;
    c. Terrain and Man-made Obstacle Analysis. For all terrain and man-made obstacles that the operator intends to overfly, the maximum height of such obstructions must be verified at regular intervals by the operator or a third party, utilizing methods acceptable to the Administrator;
    d. Known weather hazards in the area; and
    e. Consideration of the implications of an unintended release of the types and quantities of hazardous materials authorized to be transported by the operator's Dangerous Goods Procedures Manual and OpSpec A055.

25. For all current operations areas, and prior to conducting operations in a new area, the operator must prepare a **Collision Avoidance Plan** and submit the plan to the FAA for acceptance. The plan must specify:
    a. Use of a Detect and Avoid (DAA) system;
    b. For operations using DAA:
        i. Operator to provide their safety case for expansion comprised of an airspace analysis below 500 ft., including cooperative/non-cooperative traffic, and community outreach plan; and
        ii. Operator to provide the expected rate per month of avoidance maneuvers, rate for return to home actions, rate for urgent landings and any other detect and avoid actions deemed applicable.
    c. How the operator will manage conflicts with other UA;
    d. If a strategic conflict detection and conformance monitoring service is used, a description of the back-up plan if the service is interrupted or unreliable.

AFS-25-01838-E

e. If a Third-Party Service Provider (3PSP) is used, the plan must ensure that the 3PSP's level of service meets the operational requirements, including the time required to respond to 3PSP information and guidance and the impact of UAS system latencies and latencies in the C2 link;
f. Use of VOs and GSCs;
g. If VOs or GSCs are used the plan must ensure that:
    i. Sufficient VOs are used;
    ii. VOs are properly positioned for airspace observation based on obstructions and spaced based on ceiling and visibility;
    iii. VOs are able to give the PIC sufficient notice to keep the UA clear of all manned aircraft and other UA;
    iv. GSC area survey intervals are sufficient; and
    v. VOs or GSCs can detect obstacles, and detect any unforecasted weather affecting the operating area, to ensure the safety of the operation.
h. Local affected airspace users:
    i. Outreach and communications information and details.
i. Nearby Airports, Heliports, Seaplane Bases, and other areas of increased aviation activity.

26. The altitude of the aircraft must not exceed 400 ft. above ground level (AGL) unless the operator acting in accordance with their accepted **Collision Avoidance Plan** is:
    a. Transitioning steeply changing terrain;
    b. Operating an unmanned aircraft within a 400-foot radius of a structure and does not fly higher than 400 ft above the structure's immediate uppermost limit; or
    c. Temporarily maneuvering to avoid a collision, only to the extent necessary, and not to exceed 500 ft AGL.

27. The operator must:
    a. Ensure the aircraft is operated at an altitude that would not cause a hazard to persons or property on the surface; and
    b. Consider all equipment limitations (such as parachutes) when determining such altitudes.

III. Unmanned Aircraft System, Including Maintenance

28. The UA must have a flight control system with "land now" capability.

29. The UA must include a direct means and associated procedures for the UA to detect propulsion system failures and allow the RPIC or the UA to respond to associated failures.

30. The UA must have an anti-collision light system as an additional means of collision mitigation. For civil twilight and night operations they must be

visible from 3 statute miles when unobstructed by weather.

31. For operations over non-participants, if the aircraft has a parachute recovery system installed it must be operational, and the UA must be operated at or above the Minimum Flight Altitude (MFA) which shall be no less than the Minimum Deployable Altitude Rating (MDAR) of the Parachute Recovery System (PRS) as determined by testing in accordance with ASTM F3322-24a. Testing Standards of Deployable Parachutes, except when necessary for takeoff, landing, loading or delivery.

32. Communications capability must be sufficient for the PIC to communicate effectively during operations with required personnel, as well as outside entities as needed. The following are also required:
    a. Required personnel must be provided with enough devices for effective communications;
    b. All devices must provide for real-time communications;
    c. A secondary method of communication must be available and acceptable to the FAA; and
    d. A telephone must be available for communications with Air Traffic Control (ATC).

33. The ground control station must display at least all the following information from the UA in real time: altitude, position, direction of flight information, and flight mode. All the information identified in this condition and limitation must be available at all times to the RPIC when conducting flight operations.

34. The ground control station must display all information required for continued safe flight and operation. The information required to appear on the ground control station display must be described in the operator's company manual.

35. The ground control station must provide access to meteorological information. The device providing meteorological information and its installation must be acceptable to the Administrator, and the information be readily available to the PIC while at the normal duty station.

36. The ground control station must provide an audible and visual alert of any degraded system performance, UA malfunction, or loss of Command-and-Control link with the UA that may impact continued safe flight. This information must be available at all times to the RPIC when conducting flight operations.

37. Any flights required to assess the correct operation of the UAS after any scheduled or unscheduled maintenance must be conducted at a safe distance from non-participants. Any alterations or system changes of any associated

elements (AE) that could appreciably affect the operation or flight characteristics of the UA must be validated in accordance with procedures set forth in the operator's company manual prior to conducting further operations under this exemption. If the validation includes a flight, this flight must be conducted at a safe distance from non-participants. When determining a safe distance, the operator must consider flight testing factors such as type of UAS, flight altitude, airspeed, and kinetic energy.

38. The operator must maintain a UA and AE configuration control document (CCD) in accordance with the processes and procedures described in the operator's company manual. At a minimum, the CCD must list the following: identification of all hardware by part number; identification of all software by part number and version number; and the acceptable combination of components when multiple options exist.

39. The operator must manage all changes to the UA and AE in accordance with the processes and procedures described in the operator's company manual.

40. The operator must document and adhere to policies and procedures to assure that all AE of the UAS are capable of meeting the AE's intended function prior to and during each operation.

41. The operator must describe in its company manual any training and qualification requirements necessary for personnel who maintain each of the AE.

42. The operator must implement an AE error reporting, evaluation, and mitigation program. The operator must evaluate any failures, anomalies, or other in-service problems to ensure that they do not represent a system deficiency that could cause an unsafe condition or result in a subsequent noncompliance with regulations or conditions and limitations. If a failure, anomaly, or in-service problem may result in subsequent noncompliance, the operator must correct the issue to prevent that non-compliance and must report the issue and correction to the FAA via the UAS Service Difficulty Reporting system.

43. The operator must comply with 14 CFR Part 43 with respect to any maintenance, rebuilding and alterations of the UA, as if the aircraft has a standard airworthiness certificate. For purposes of this exemption, including compliance with this condition and limitation "airworthy" means the UA is in a condition that meets the configuration described in the UA Configuration Control Document, and is in a condition for safe operation.

44. Any major repair, major alteration, or major configuration change to the UAS must be accomplished in accordance with the processes and procedures described in the operator's company manual.

AFS-25-01838-E

45. The operator shall not dispose of its life-limited parts in a manner that would lead to them being installed on a type-certificated aircraft without the recipient having knowledge of the accumulated time on the part.

46. The operator must maintain collision avoidance capability to ensure that the PIC is able to keep the UA clear of any manned aircraft and other UA.
    a. For management of conflict with manned aircraft, this capability may include use of a DAA system, if approved for use by the FAA, in accordance with Condition and Limitation No. 4747. In operating locations where DAA is not used or is not available, use of VOs is required to maintain the capability;
    b. For management of conflict with other UA, the operator may use technical means of strategic deconfliction and conformance monitoring, including services provided by a 3PSP, if approved for use by the FAA in accordance with Condition and Limitation No. 4747; and
    c. The capability must include maintenance of data necessary to support the data reporting requirements stated in this exemption.

47. For FAA approval for use of a system to support collision avoidance, the operator must complete the following process:
    a. Submit the following to the FAA:
        i. Information detailing the system's conformity with pertinent sections of industry standards related to collision avoidance systems, ground-based surveillance systems, and detect and avoid systems; and
        ii. A declaration, and provide evidence supporting its declaration, that its system has been tested and determined to meet these requirements. This evidence should include documentation of the testing, including the specific encounter sets used in the tests, to verify system's performance; and
    b. Once these documents have been submitted, an operational suitability evaluation may be required; and
    c. Once the system is evaluated, an operational validation may be required under Part 135 prior to authorization for use of the system and define the permitted operational areas where the system may be used.

IV. Preflight

48. The PIC is prohibited from beginning a flight unless considering wind and forecast weather conditions:
    a. There is enough available power for the UA to conduct the intended operation and to operate after that with at least:
        i. The minimum power reserve to ensure a remaining charge sufficient to facilitate a descent and landing without undue hazard to persons or property on the surface; or

ii. The UA manufacturer's stated minimum power reserve, whichever is greater; and

b. The operator has contingency plans acceptable to the FAA in the case of battery depletion greater than anticipated.

49. Prior to beginning flight operations, the PIC must review Notices to Airmen (NOTAMS) and, if the NOTAMS indicate other UA activity or any other aviation activity in the intended operating area, ensure that the operator contacts the other operator(s) that are not participating in strategic deconfliction and conformance monitoring services to deconflict the activities.

50. The operator must request that a distant NOTAM (D) be issued by contacting the Flight Services NOTAM line at 1-877-4-US-NTMS (1-877-487-6867) not more than 72 hours in advance, but not less than 8 hours prior to the operation. The area of operation defined in the NOTAM must only be for the actual area to be flown for each day and defined by a point and the minimum radius required to conduct the operation.

51. In the event the operational area overlaps a Military Training Route, the operator must contact the Military Airspace Scheduling Office for the route 24 hours in advance for coordination and deconfliction of the activities. Military Airspace Scheduling Office contact information, including both commercial (C) and Defense Switched Network (DSN) phone numbers, for each route can be found in "Area Planning, Military Training Routes, North and South America (AP/1B)," which is available at https://www.daip.jcs.mil/pdf/ap1b.pdf.

52. Prior to beginning flight operations, the PIC must verify that there are sufficient personnel available in accordance with the operator's **Collision Avoidance Plan** for the area, taking current conditions into account. The PIC must also:

a. Ensure that all required personnel have been briefed on the following:
   i. Designated positions, physical locations, responsibilities, and crew resource management;
   ii. Planned operations area;
   iii. Current and forecasted weather conditions;
   iv. Takeoff, landing, loading, and delivery areas;
   v. Ground risks;
   vi. Alternate landing sites;
   vii. Verification of flight profile and course;
   viii. Procedures for avoidance of other aircraft; and

b. Be familiar with all the content from the briefing.

53. The PIC must verify that the ground control station is configured to control

the intended UA before flight.

V. Flight Operations

54. The operator may only conduct operations at a PIC-to-UA ratio of 1:1 unless otherwise authorized by the FAA. If the FAA determines validation testing is necessary, the operator must successfully complete validation testing conducted by the FAA for an increase in the PIC-to-UA ratio.

55. The operator may only conduct operations at a PIC-to-Operations Base ratio of 1:1 unless otherwise authorized by the FAA. If the FAA determines validation testing is necessary, the operator must successfully complete validation testing conducted by the FAA for an increase in the PIC-to-Operations Base ratio.

56. Flights under special visual flight rules (SVFR) or instrument flight rules (IFR) are not authorized.

57. For operations conducted under this exemption there is no minimum visibility or cloud distance requirement. System and operational visibility requirements must be maintained. The operator's methods and procedures to maintain any required visibility and cloud clearance requirements must be accepted by the FAA and documented in the operator's company manual.

58. The anti-collision lights must be on for all flight operations, except when the PIC determines that, because of operating conditions, it would be in the interest of safety to turn the lights off.

59. The PIC must ensure that the UA remains clear of, and give way to, any manned aircraft at all times, and does not get so close to any other UA as to create a collision hazard.

60. The PIC may not operate the UA from any moving vehicle or aircraft.

61. The PIC must monitor the ground control station to maintain situational awareness of aircraft under that PIC's control.

62. The PIC must abort the flight operation if unpredicted circumstances or emergencies that could potentially degrade the safety of persons or property arise. The PIC must terminate flight operations without causing undue hazard to persons or property in the air or on the ground.

63. The PIC must immediately notify ATC of any flyaway or loss of control that has resulted in a loss of situational awareness or could cause a hazard to other aviation activities.

AFS-25-01838-E

64. PICs and other required personnel may not leave their duty station during the operation of a flight unless they have been replaced in accordance with the procedures described in the operator's company manual. If a replacement is not possible, the following requirements apply:
    a. For a PIC, all UA being operated in the PIC's area must return to the Operations Base in accordance with the procedures specified in the operator's company manual; or
    b. For other required personnel, all UA must remain clear of, or vacate, any affected sectors, loading areas, takeoff areas, landing areas, or delivery areas.

65. If communications are lost between the PIC and other required personnel, all UA must remain clear of, or vacate, any affected airspace sectors, loading areas, takeoff areas, landing areas, or delivery areas, until communications are restored.

66. VOs, when used for the operation, must continuously scan their area(s) of responsibility, maintain communication with the PIC at all times, and immediately notify the PIC whose areas of operations are affected whenever they observe:
    a. Conflicting air traffic;
    b. Any new obstruction not plotted on the obstruction map or obstruction database;
    c. The erection of an obstruction that begins during the course of a shift;
    d. Any other obstruction or hazard identified during the flight operation;
    e. Any open-air assemblies of people;
    f. Any weather condition that could interfere with the operation of the aircraft or exceed the required weather minimums; or
    g. Any weather condition that causes the VO to be unable to view the assigned airspace.

67. GSCs, when used for the operation, must conduct a visual survey of their area(s) of responsibility at designated intervals as determined by the **Collision Avoidance Plan** and notify the PIC whose areas of operations are affected whenever they observe:
    a. Any new obstruction not plotted on the obstruction map or obstruction database;
    b. The erection of an obstruction that may begin during operations;
    c. Any other obstruction or hazard, that may pose a risk to the operation;
    d. Any open-air assemblies of people; or
    e. Any weather condition that could interfere with the operation of the aircraft or exceed the required weather minimums.

VI. Required Personnel

68. No person may serve in more than one operational role concurrently.

69. No person may act as a PIC or other required personnel, or serve as a flight instructor, check pilot, or direct participant in the operator's Part 135 operation 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 the aircraft.

70. No PIC may conduct operations at a PIC-to-UA ratio greater than that authorized by the FAA for that individual PIC.

71. No PIC may conduct operations at a PIC-to-Operations Base ratio greater than that authorized by the FAA for that individual PIC.

72. Required personnel must be sufficient to minimize ground and air hazards.
    a. When the operator's approved DAA system is used during a flight operation, GSCs must be used. If any GSC duties are to be accomplished using technology, this must be described in the operator's company manual; or
    b. When the operator's approved DAA system is not available or becomes inoperable, VOs must be used, or the operation must be discontinued. If VO duties not related to airspace deconfliction are to be accomplished using technology, this must be described in the operator's company manual.

VII. Training, Certification and Duty

73. The operator is responsible for ensuring all persons responsible for the loading of its aircraft have been trained on the operator's loading procedures.

74. The operator must provide training on this exemption and any applicable exemptions, waivers, or authorizations that the operator may hold, to all persons whose duties and responsibilities are impacted by these documents.

75. Flight instructors and check pilots must remain in the immediate vicinity of a person being trained or checked.

76. The ratio of flight instructor-to-PIC must be listed in the approved training program.

77. A check pilot may not evaluate more than one applicant at a time.

78. Required personnel are limited to a maximum 14-hour duty day, and to a

maximum 50-hour duty week.

79. Required personnel must take a minimum 10-hour continuous rest period within the 24 hours prior to reporting for duty.

80. Required 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.

81. Each PIC, check pilot, flight instructor and VO must hold a remote pilot certificate issued in accordance with 14 CFR Part 107 and remain current in accordance with 14 CFR § 107.65.
    a. When serving as a required crewmember in an operation, each PIC, VO, flight instructor, and check pilot must have the remote pilot certificate and a government-issued photo ID in their possession and make such documents available upon request from the Administrator; and
    b. The operator must keep in its records a copy of any pilot certificates that each person holds in accordance with 14 CFR § 135.63(a)(4)(ii).

82. PICs must be trained in accordance with the FAA-approved training program. The training must include representative airports and routes, representative collision avoidance scenarios, and scenarios with the maximum PIC-to-UA ratio and PIC-to-Operations Base ratio sought for the individual pilot.

83. Initial and recurrent pilot testing conducted to meet the requirements of § 135.293, and line checks conducted to meet the requirements of § 135.299, must include representative airports and routes, representative collision avoidance scenarios, and scenarios with the maximum PIC-to-UA ratio and PIC-to-Operations Base ratio sought for the individual pilot.

84. Completion of the checking requirements required by §§ 135.293 and 135.299 does not satisfy recent experience requirements of §§ 61.56(d)(1) and 107.65(c).

85. VOs and GSCs must complete recurrent training every twelve calendar months in accordance with § 135.343.

86. VOs must be trained in accordance with the FAA-approved training program and evaluated by an approved check pilot or a designated FAA Operations Aviation Safety Inspector. For the evaluation, the grace month provision stated in § 135.301 applies. The operator must document the completion of these requirements in each of the VO's records. The evaluation must include the following areas:
    a. Duties and responsibilities as defined in the company manual to include normal and abnormal procedures;

b. Use of checklists;
c. Preflight inspection, if performed by the VO;
d. Communication and coordination procedures (i.e., crew resource management) with the PIC and other operations personnel as described in the company manual;
e. General meteorology focused on cloud types and associated weather conditions that may be hazardous to the aircraft;
f. Use of scanning techniques and the ability to identify and report to the pilot(s) any airspace hazards, aircraft distance from clouds, and any other reportable information as described in the company manual;
g. Knowledge of the operational environment (e.g., airports, active helipads/routes, hospitals) and the ability to maintain situational awareness for the operation; and
h. If the VO is qualified in a VO role for the operator outside of Part 135, knowledge of operational differences between Part 135 operations and any other authorized operations that pertain to his or her responsibilities.

87. GSCs must be trained in accordance with the FAA-approved training program and evaluated by an approved check pilot or a designated FAA Operations Aviation Safety Inspector. For the evaluation, the grace month provision stated in § 135.301 applies. The operator must document the completion of these requirements in each of the GSC's records. The evaluation must include the following areas:
    a. Duties and responsibilities as defined in the company manual to include normal and abnormal procedures;
    b. Use of checklists;
    c. Preflight inspection, if performed by the GSC;
    d. Communication and coordination procedures (i.e., crew resource management) with the PIC and other operations personnel as described in the company manual;
    e. General meteorology focused on cloud types and associated weather conditions that may be hazardous to the aircraft;
    f. The ability to identify and report to the pilot(s) any airspace hazards, aircraft distance from clouds, and any other reportable information as described in the company manual; and
    g. Knowledge of the operational environment (e.g., airports, active helipads/routes, hospitals) and the ability to maintain situational awareness for the operation.

88. Records of each VO and GSC, by full name and the date when the VO or GSC training was completed, must be maintained by the operator, and made available to the Administrator upon request.

89. Each VO must be able to see all potential hazards with vision that is unaided by any device other than corrective lenses.

AFS-25-01838-E

90. If personnel other than the PIC perform preflight inspections, these personnel must have, and maintain in their possession, either of the following:
   a. A valid Remote Pilot Certificate with completed training and F
   b. A Repairman Certificate issued by the operator with authorization to perform preflight tasks.

The Effect of the FAA's Decision

The FAA's decision amends and combines Exemption No. 18163F to 18163G and changes the termination date to June 30, 2027, unless sooner superseded or rescinded.

To request an extension or amendment to this exemption, please submit your request by using the Regulatory Docket No. FAA-2018-0835 (http://www.regulations.gov). In addition, you should submit your request for extension or amendment no later than 120 days prior to the expiration listed above, or the date you need the amendment, respectively.

Any extension or amendment request must meet the requirements of 14 CFR § 11.81.

Sincerely,

Hugh J Thomas

Digitally signed by Hugh J Thomas
Date: 2025.06.24 09:53:51 -04'00'

Hugh J. Thomas
Acting Deputy Executive Director, Flight Standards Service

AFS-25-01838-E

This page intentionally left blank.

APPENDIX C

NOISE

This page intentionally left blank.

Draft

Noise Assessment for Package Delivery Operations with Unmanned Aircraft in the United States

In Support of U.S. Code of Federal Regulations Title 14, Part 135

November 2025

Prepared for:

Federal Aviation Administration
Unmanned Aircraft Systems Integration Office (AUS)
Unmanned Aircraft System (UAS) Environment Review
697DCK-22-D-00004

Prepared by:

Brandon Robinette

Harris Miller Miller & Hanson Inc.
700 District Ave, Suite 800
Burlington, MA 01803

HMMH Report No: 03-13090.004.001

This page intentionally left blank.

Table of Contents

Figures

Tables

Acronyms and Abbreviations

AAD	Average Annual Day
AGL	Above Ground Level
CNEL	Community Noise Equivalent Level
dB	Decibel(s)
CFR	Cod of Federal Regulations
DNL	Day-Night Average Sound Level
EA	Environmental Assessment
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
MTOW	Maximum Takeoff Weight
N/A	Not Applicable
NAS	National Airspace System
NEPA	National Environmental Policy Act
OpSpecs	Operations Specifications
PEA	Programmatic Environmental Assessment
ROD	Record of Decision
SEL	Sound Exposure Level
UA	Unmanned Aircraft
UAS	Unmanned Aircraft Systems

This page intentionally left blank.

1. Introduction and Background

This document presents the methodology for and estimation of noise exposure related to the operation of Unmanned Aircraft (UA) for package delivery operations within the United States (including Alaska and Hawaii) under Title 14 Code of Federal Regulations (CFR) Part 135 (herein referred to as "Part 135").

NEPA requires federal agencies to assess the environmental effects of proposed major federal actions prior to making decisions. Major Federal Aviation Administration (FAA) actions include authorizations issued to operators of Unmanned Aircraft Systems (UAS) to enable UA (also referred to as a drone) operations in the national airspace system (NAS). One type of UAS operation is using drones to deliver goods to customers (referred to as package delivery). In 2019, the FAA began issuing air carrier certificates to UAS operators in accordance with 14 CFR Part 135 (Part 135)[1] so that operators could conduct package delivery flights. Generally, these approvals were primarily associated with amendments to Part 135 air carrier operations specifications (OpSpecs)[2] as the operative approval. To date, the FAA has completed 23 environmental assessments (EAs) for individual drone package delivery proposals and one programmatic environmental assessment (PEA) for drone package delivery. Each EA resulted in a finding of no significant impact (FONSI) (FAA 2025a).

To support the environmental review process for UAS package delivery proposals throughout the United States, the FAA is preparing a PEA in accordance with NEPA, FAA Order 1050.1G, and USDOT Order 5610.1D. The FAA may prepare environmental documents for programmatic federal actions, such as the adoption of new agency programs. FAA may evaluate the proposal(s) in one of the following ways: (1) geographically, including actions occurring in the same general location, such as a body of water, region, or metropolitan area; (2) generically, including actions that have relevant similarities, such as common timing, effects, alternatives, methods of implementation, media, or subject matter; or (3) by stage of technological development (FAA 2025b, § 3.1a). A programmatic document is useful in analyzing the cumulative impacts of a group of related actions. When the proposed actions are adequately analyzed, the programmatic document can serve as the NEPA review for those actions. Programmatic documents may also be useful in providing the basis for subsequent project-level specific environmental reviews. A programmatic NEPA document may contain a broader, less specific analysis compared to what is performed for a specific proposed project.

To support the analysis of noise and noise compatible land use for the PEA, this document proposes a methodology for determining potential noise exposure resulting from UA package delivery operations in terms of the Day-Night Average Sound Level (DNL) metric based on available data from prior individual UA package delivery EAs.

The methodology proposed in this document provides quantitative guidance to FAA Environmental Specialists to inform environmental decision making on UA noise exposure from proposed package delivery operations. The methods presented here are suitable for review of federal actions under the requirements of NEPA and

[1] The FAA grants the authority to operate on-demand, unscheduled air service in the form of a Part 135 certificate. Part 135 allows drone air carriers to deliver small packages of commercial goods. To operate under Part 135, a company needs economic authority from the Department of Transportation and a Part 135 certificate and operations specifications from the FAA.

[2] An Operations Specifications is a document that defines the scope of aircraft operations that the FAA has authorized.

other applicable environmental special purpose laws or other federal environmental review requirements at the discretion and approval of the FAA. In particular, this report is intended to function as a nonstandard equivalent methodology under FAA Order 1050.1G, and as such, requires written approval from FAA's Office of Environment and Energy for the project for which a NEPA determination is sought.[3]

The methodology has been developed with data provided by current Part 135 UA package delivery operators and the FAA to date. Results of the noise analysis are presented in terms of the Yearly DNL based on varying levels of potential operations for areas at ground level below each phase of the flight. The methodology and analysis presented herein was developed specifically to evaluate the FAA proposed action for UA package deliveries in the United States. As such, the applicability of this document is limited to supporting analysis of the relevant environmental resource categories for the associated PEA.

Section 2 of this document describes the relevant noise and operations data provided by the FAA and various Part 135 UA package delivery operators. **Section 3** describes the methodology to develop noise exposure estimates for the various UA flight phases associated with typical operations using available data. **Section 4** presents the estimated DNL levels for various flight phases based on varying levels of typical operations as described to date. **Section 5** discusses the consideration of cumulative noise exposure resulting from multiple sources of aviation noise. **Section 6** provides a list of references used throughout the document.

[3] Discussion of the use of "…another equivalent methodology…" is discussed in FAA Order 1050.1G, June 30, 2015, Appendix C, Section C-1.2, available online at https://www.faa.gov/documentLibrary/media/Order/FAA_Order_1050.1G.pdf

2. Unmanned Aircraft Delivery Operations and Noise Data Set Descriptions

The type, size, and weight of aircraft used to deliver packages could vary, but the FAA anticipates multi-copter and hybrid (rotary and fixed-wing) platforms will be the primary type of UA used to deliver small packages in the foreseeable future.

Drone delivery ranges vary depending on design characteristics, power requirements, and power supply capacity. For battery-powered UAs, the battery capacity, which can be influenced by weather and other factors, is the primary factor in how far the drone can fly on one charge. Delivery distances for a multi-copter UA typically range from 3 to 10 miles one-way or 6 to 20 miles roundtrip, with a duration of around 5 to 20 minutes one-way or 10 to 40 minutes roundtrip. However, as technology improves and batteries last longer, distances and durations are expected to increase. Longer-range hybrid or fixed-wing UA currently in development and/or operation are expected to be able to travel up to 60 miles one-way, with a duration of up to 46 minutes at maximum payload. Additionally, drones may hop from one hub to another to charge or change batteries so that they can make longer trips. Cruising altitudes for drone package deliveries are typically 150 to 375 feet above ground level (AGL) and are not expected to exceed 400 feet AGL.

2.1 Operations Methodology, Flight Paths, and Flight Profile Data

Evaluation of potential noise exposure from UA package delivery operations requires information on numbers of annual UA package deliveries, where those UA will operate, and the flight profiles (i.e., procedures) used when transporting packages between locations. While the specifics of these factors can vary for each Part 135 operator, general commonalities do exist and are presented in this section. The following subsections present the methodology for determining the numbers of annual UA package delivery operations evaluated in this analysis, the geographic distribution of those operations, and a generalized description of a typical delivery flight profile.

2.1.1 Operations Methodology

The proposed action assumes that deliveries could occur up to seven days per week, during both daytime and nighttime hours, for a conservative total of 365 days per year. However, some operators may not operate on holidays or on days with severe weather, resulting in potentially less than 365 days of operations per year. The FAA expects most deliveries would occur between the hours of 7:00 AM and 10:00 PM; however, a small percentage of deliveries may occur outside those hours. Nighttime operations are expected to be infrequent relative to daytime operational levels.

The FAA anticipates that drone package deliveries will become more common throughout all of the United States as technology advances and the public becomes more accustomed to drone package deliveries. Due to the limited range of most small package delivery drones, operators' business plans typically include the siting of

numerous delivery hubs throughout a particular city or metro area in order to reach the largest possible number of customers. Drone package delivery flights generally occur within 3 to 10 miles of their associated delivery hub/distribution center location. The siting of hubs is also commonly driven by delivery operators' partnerships with businesses that want their products to be available via drone delivery. For these reasons, the drone package delivery industry generally conducts operations in a physically decentralized manner when considered at the macroscale of an entire city or metro area. Delivery flights are centralized around hub locations, but hubs are dispersed throughout the service area based on business partnerships and market demand for services.

Because the specific locations of hubs and delivery recipients are currently unknown, it is not possible to evaluate the microscale (i.e., individual hubs and/or the airspace shared by multiple hubs) geographical distribution of drone package deliveries that could exist for an entire city or metro area. To evaluate the potential for environmental effects, drone operations must be quantified at the more localized microscales at which they would occur. An understanding of the density of flight operations within a geographical area is required as the quantitative basis to assess environmental effects.

For these reasons, this noise analysis uses a unit capacity threshold approach based on determining the level of operations within a specified geographic area that would pose no potential for significant impacts. Similar to other drone package delivery EAs prepared to date for individual operators, hubs would be sited sufficiently far away from noise sensitive land uses to prevent significant impacts from occurring as a result of hub activity noise. As such, the primary remaining potential for significant impact is noise from en route flight operations within airspace that is shared by multiple hubs of different operators.

While it is not currently possible to predict the local operational density of drone activity within shared airspace at some future time, it is possible to define the activity threshold below which significant noise impacts could not occur. This is referred to as the "unit capacity threshold." Drone noise measurement data that has been collected by the FAA was used to form the basis for calculating this threshold. This approach allows the results of this analysis to cover the operation of package delivery drones anywhere in the United States up to, but not exceeding, a threshold below which there exists no potential for significant noise impacts to occur. The calculation of the unit capacity threshold value is determined entirely from available UA noise data and environmental noise significance limits.

Operators wishing to use the PEA would be required to submit vehicle noise data as part of their application to the FAA ensuring that noise from their vehicle would not exceed that evaluated in this analysis. Operators would also have to provide data ensuring that their proposed numbers of deliveries would not result in exceedances of the unit capacity threshold value.

2.1.2 General Flight Paths and Profiles

In general, based on previous proposals for drone package delivery operations, package delivery operators partner with established businesses and identify the location for a hub at the business's parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard. This allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities.

While UA come in varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: (1) takeoff and climb, (2) en route outbound, (3) delivery, (4) en route inbound, and (5) descent and landing. Prior to takeoff, packages are loaded onto the UA at the hub. The UA then climbs and performs aerial deliveries. After delivery, the UA returns to its hub via a pre-determined flight path. The five phases of operation for a typical multi-copter or hybrid UA are further described below. **Figure 2-1** shows a typical flight profile; however, certain operators may have unique operations that are not captured in the figure or this general description. For example, some operators load packages onto the UA while the aircraft hovers above the ground as opposed to loading the packages while the UA is on the ground.

Launch and Climb

The launch and climb phase is described as the portion of the flight in which a fully loaded UA takes off from the hub and climbs vertically. The UA may then hover briefly as it conducts various systems checks to ensure it is functioning properly. With a multi-copter design, the UA can take off and descend vertically, as well as hover. Typical flights begin with the UA departing from a hub and ascending vertically to no more than 400 feet AGL.

En Route Outbound

The en route outbound phase is defined as the part of the flight in which the fully loaded UA flies a pre-programmed route from its hub to a delivery point. During this flight phase, typical normal cruising speeds range from 30 to 60 knots (35 to 70 miles per hour), and typical cruising altitudes range from 150 to 377 feet AGL.

Delivery

The delivery phase is defined by descent from the en route outbound phase to a delivery point to deliver a package. Upon arrival at the delivery point, the UA descends vertically to deliver the package. The UA may hover at an altitude that varies in height. Most current UA use a tether to lower the package from the UA to the ground while the drone hovers. Others drop the package from a low height AGL. Once the UA releases the package, it climbs vertically to the cruise altitude and begins the en route inbound phase. The delivery process typically takes 30–90 seconds, depending on the operator.

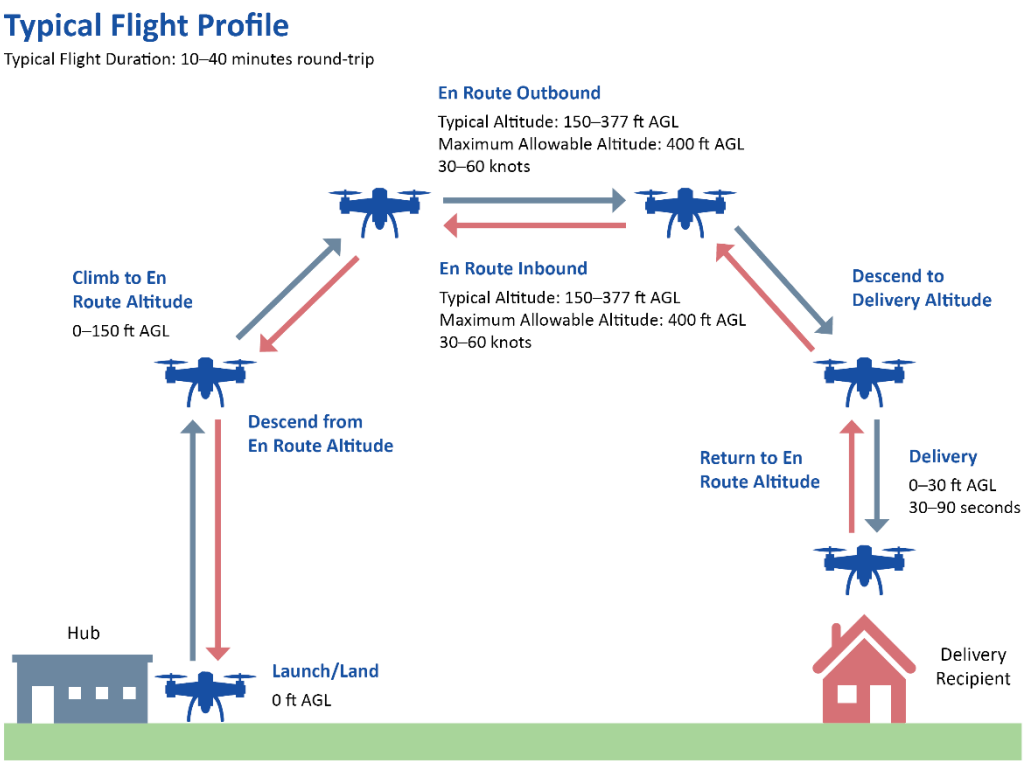
En Route Inbound

Upon completion of a delivery, the UA flies from the delivery point back to a hub. In general, the UA would use the same or similar route back to the hub that it used to reach its delivery location.

Descend and Land

Upon reaching the hub, the UA vertically descends, lands, and turns off.

Figure 2-1. Typical UA Package Delivery Flight Profile



2.2 Package Delivery Unmanned Aircraft

An overview of the UA that have been used to date or are currently anticipated to be used in the future for package delivery under Part 135 are presented in **Table 2-1**. Most of these UA have been previously analyzed in separate noise studies supporting multiple individual EAs for package delivery operations at various locations across the Unites States. The following information is intended to give readers a general understanding of the types of UA used for package delivery operations at the time of this analysis; however, it should be noted that technology is evolving rapidly, and new UA are expected to come online that may differ slightly from those described in **Table 2-1**. If a UA is not specifically included in **Table 2-1**, it does not mean that it would not be covered under this PEA.

Table 2-1. Overview of Package Delivery Unmanned Aircraft

Image	Drone Operator/ Model	Max Takeoff and Package Weight (lb)	UA Characteristics	En Route Altitude and Speed	Package Stowage and Delivery Method
	Amazon Prime Air/MK30	83.2 / 5	• Hybrid fixed-wing/multi-copter • 6 propellers • Electric VTOL	180 to 377 ft AGL at 58 knots	• Internal fuselage • Descends, opens payload doors, and drops the package from a 13 ft hover
	Amazon Prime Air/MK27-2	91.5 / 4.9	• Hybrid fixed-wing / multi-copter • 6 propellers • Electric VTOL	160 to 180 ft AGL at 52 knots	• Internal fuselage • Decelerates, descends vertically over delivery point, and drops package from a 13 ft hover
	Causey Aviation/ Flytrex Sky II	34.2 / 8.8	• Multi-copter • 8 propellers • Electric VTOL	230 ft AGL at 29 knots	• External • Descends vertically and lowers package to ground via cable while hovering at 75 to 82 ft
	Causey Aviation/ Flytrex FTX-M600P	33.4 / 6.6	• Multi-copter • 6 propellers • Electric VTOL	230 ft AGL at 30 knots	• External • Descends vertically and lowers package to ground via cable while hovering at 82 ft

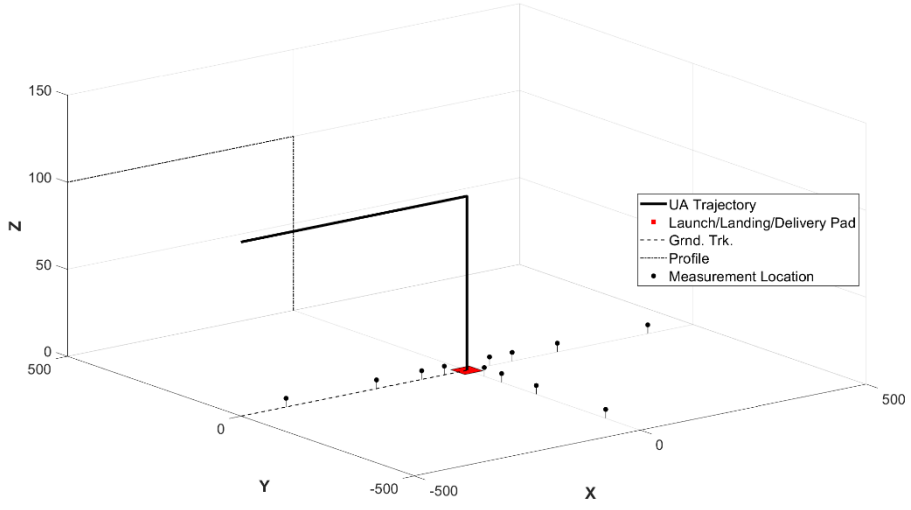
Image	Drone Operator/ Model	Max Takeoff and Package Weight (lb)	UA Characteristics	En Route Altitude and Speed	Package Stowage and Delivery Method
	Causey Aviation/ RigiTech Eiger	46.3 / 6.6	• Hybrid fixed-wing / multi-copter • 4 lift propellers • 1 push propeller • Electric VTOL	150 to 300 ft AGL at 46 to 68 knots	• Descends vertically to 60 feet and transitions to multi-copter • Lands on ground to deliver package
	DroneUp/ PRISM V2	55 / 10	• Multi-copter • 8 propellers • Electric VTOL	230 to 250 ft AGL at 27 knots	• External • Descends vertically and lowers package to ground via cable while hovering at 80 to 120 ft
	UPS Flight Forward/ Matternet M2	29 / 4.4	• Multi-copter • 4 propellers • Electric VTOL	250 to 400 ft AGL at 31 knots	• External • Descends vertically to a full stop landing
	Wing Aviation/ Hummingbird 7000W-B	14 / 2.3	• Hybrid fixed-wing/ multi-copter • 12 lift propellers • 4 pull propellers • Electric VTOL	150 to 300 ft AGL at 51 knots	• External • Descends vertically and lowers package to ground via cable while hovering at 23 ft
	Wing Aviation/ Hummingbird 8000-A	24.3 / 6.6	• Hybrid fixed-wing / multi-copter • 8 lift propellers • 4 pull propellers • Electric VTOL	150 to 300 ft AGL at 51 knots	• External • Descends vertically and lowers package to ground via retractable cable while hovering at 23 ft

Image	Drone Operator/ Model	Max Takeoff and Package Weight (lb)	UA Characteristics	En Route Altitude and Speed	Package Stowage and Delivery Method
	Zipline International/ P2 Zip	63 / 8	• Hybrid fixed-wing / multi-copter • 4 lift propellers • 1 push propeller • Electric VTOL	150 to 400 ft AGL at 41 knots	• External • Hovers at 330 ft and deploys droid from payload bay • Droid containing the package is lowered to the ground via retractable cable • Droid uses an onboard propeller to position itself onto the delivery target
	Drone Express/ TELEGRID DE-2020	23 / 4.4	• Multi-copter • 6 propellers • Electric VTOL	200 ft AGL at 30 knots	• External • Descends vertically and lowers package to ground via cable while hovering, or • Comes to a full stop landing

2.3 Acoustic Data

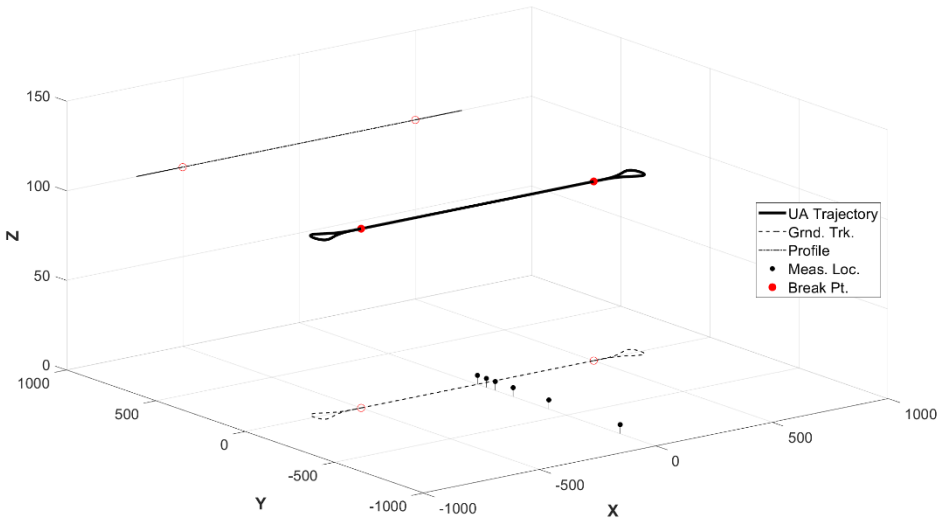
Acoustic data for each UA included in this analysis were collected through various separate measurement efforts. The FAA implemented a draft noise measurement protocol for environmental review of package delivery UA operations in October 2023 (FAA 2023). The type and detail of noise data available for UA having undergone environmental reviews prior to that date varies somewhat, since no specific protocols for UA noise measurements to support environmental reviews had yet been established. Noise measurements occurring after October 2023 have all collected data in accordance with the FAA's protocol. The protocol includes measurement of UA noise at multiple distance positions along axes undertrack, lateral to, and behind the point from which the UA takes off, lands, and delivers a payload. For en route flight, the protocol includes measurement at multiple distance positions beginning directly under track and extending laterally outward from flight path direction. **Figure 2-2** and **Figure 2-3** depict the general measurement setups for simulated hub activity, package deliveries, and en route over flights. For a typical test setup, each measurement axis includes six sound level meters positioned from the takeoff, landing, and delivery location out to 800 feet. The standard measurement positions for the hub and delivery measurements are located at 50 feet, 100 feet, 200 feet, 400 feet, and 800 feet, with the nearest location inside of 50 feet being based on the minimum participant safety distance for the UA's takeoff, landing, and delivery procedures. The same distances are used for en route measurements, with the nearest position always being at 0 feet directly under the flight path. It should be noted that this noise analysis uses only data from the undertrack positions of hub and delivery location measurements.

Figure 2-2. General Noise Measurement Setup for Takeoff, Landing, and Delivery



Source: FAA, October 2023

Figure 2-3. General Noise Measurement Setup En Route Overflight



Source: FAA, October 2023

The measurement data is processed and analyzed to calculate estimated noise levels as a function of distance from hubs, delivery locations, and en route overflights. Each measurement includes the entire associated flight activity profile of the UA, including the noise from en route flight in both directions from a location, all vertical ascent/descent, and time hovering during package delivery. The average A-weighted Sound Exposure Level (SEL) is the metric used to represent the total noise received at each measurement position over the entire duration of each phase of a delivery flight.

Estimation of potential noise exposure resulting from the proposed action is based on 11 data sets consisting of the noise data collected by FAA for all UA that have been proposed for operation under Part 135 to date. The majority of these UA have already been evaluated as part of individual operator and location specific EAs. The UA that have been included in approved Part 135 package delivery EAs are the Amazon Prime Air MK27-2 and MK30, Wing Hummingbird 7000W-B and 8000-A, Causey / Flytrex FTX-M600P and Sky II, UPS Flight Forward / Matternet M2, DroneUp Prism v2, and Zipline P2 Zip. The FAA previously analyzed each of these UA in separate noise studies as part of EAs, presented in **Table 2-2**, for package delivery operations at various locations across the United States. Additionally, the FAA has obtained noise data for the RigiTech Eiger and Drone Express DE-2020, in anticipation of future operation under Part 135. **Table 2-2** lists the source documents containing the relevant UA package delivery noise data used in this analysis. The available noise data for all included UA was collected based on FAA's 2023 measurement protocol, except the Flytrex FTX-M600P and Matternet M2. Regardless of the measurement method employed, all UA noise analyses were based on development of the SEL as a function of distance along the UA flight paths for operations at hubs, package delivery locations, and during en route flight. Full detail on the development of the noise data for each UA can be found in the referenced noise study documents available on the FAA's NEPA and Drones webpage (FAA 2025a).

Table 2-2. Source Documents for Package Delivery UA Acoustic Data

Operator	UA	MTOW (lbs)	Environmental Assessment or Relevant Source	Date	Noise Study Section	Measure-ment Protocol
Wing	Hummingbird 7000W-B & 8000-A	14 & 24.3	Final Environmental Assessment for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Central Florida	May 2025	Appendix D	FAA 2023
Wing	Hummingbird 7000W-A/B	14	Final EA and FONSI/ROD for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Dallas–Fort Worth, Texas	November 2023	Appendix D	FAA 2023
Wing	Hummingbird 7000W-A/B	14	Final EA and FONSI/ROD Wing Aviation Drone Package Delivery Operations Frisco and Little Elm, TX	February 2022	Appendix C	FAA 2023
Wing	Hummingbird 7000W-A/B	14	FONSI/ROD for EA for Wing Aviation Drone Package Delivery Operations Christiansburg, Virginia	December 2021	Appendix C	FAA 2023
Causey	RigiTech Eiger	46.3	Noise measurement data files provided to FAA by Rigitech	July 2025	N/A	FAA 2023
Causey	Flytrex FTX-M600P & SKY II	33.1 & 34.2	Final EA and FONSI/ROD Causey Aviation Unmanned Inc. Drone Package Delivery Operations in the Dallas-Fort Worth Area, including Granbury and Rowlett, Texas	December 2024	Appendix C	FAA 2023 (SKY II), Other (FTX-M600P)
Causey	Flytrex FTX-M600P	33.1	Final EA and FONSI/ROD Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Granbury and Rowlett, Texas	August 2023	Appendix B	Other
Causey	Flytrex FTX-M600P	33.1	Final EA and FONSI/ROD for Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Fayetteville, Holly Springs, Raeford, and Pinehurst, North Carolina	November 2022	Appendix C	Other
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations Columbus, Ohio	March 2023	Appendix C	Other
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations Winston-Salem, NC	December 2022	Appendix C	Other

Operator	UA	MTOW (lbs)	Environmental Assessment or Relevant Source	Date	Noise Study Section	Measure-ment Protocol
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations The Villages, FL	November 2022	Appendix C	Other
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Flight Training Operations at Fisherville, KY	August 2022	Appendix B	Other
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward Drone Package Delivery Operations Wake Forest Baptist Health (WFBH) Routes, Winston-Salem, NC	December 2021	Appendix C	Other
UPS Flight Forward	Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward Drone Package Delivery Operations Lake Sumter Landing Route, Villages, FL	November 2021	N/A	Other
Amazon	MK27-2	91.5	Final EA and FONSI/ROD Amazon Prime Air Drone Package Delivery Operations in College Station, Texas	December 2022	Appendix C	FAA 2023
Amazon	MK27-2	91.5	Final EA and FONSI/ROD Impact/Record of Decision Amazon Prime Air Drone Package Delivery Operations in Lockeford, California	November 2022	Appendix C	FAA 2023
Amazon	MK27-2	91.5	EA for Amazon Prime Air Drone Package Delivery Test Operations in Pendleton, Oregon	November 2022	Appendix C	FAA 2023
Amazon	MK30 (as MK27-2)	83.2	Final Environmental Assessment and Finding of No Significant Impact/Record of Decision for Environmental Assessment for Drone Package Delivery in Tolleson, Arizona	November 2024	Appendix E	FAA 2023
Amazon	MK-30	83.2	Draft EA…? Prime Air Noise Measurement Report MK30 Unmanned Aircraft Technical Report	March 2025	N/A?	FAA 2023
DroneUp	Prism v2	55	Final EA and FONSI/ROD for DroneUp, LLC Proposed Drone Package Delivery Operations in Dallas–Fort Worth, Texas	October 2024	Appendix J	FAA 2023

Operator	UA	MTOW (lbs)	Environmental Assessment or Relevant Source	Date	Noise Study Section	Measure-ment Protocol
Zipline	P2 Zip	63	Draft Environmental Assessment for Zipline International Inc. Proposed Drone Package Delivery Operations in Dallas–Fort Worth, Texas	June 2025	Appendix D	FAA 2023
Drone Express	TELEGRID DE-2020	23	Noise Assessment for DE-2020	December 2024	N/A	FAA 2023

Notes:
EA = Environmental Assessment; MTOW = Maximum Takeoff Weight; N/A = Not Applicable; ROD = Record of Decision
Source: (FAA 2025a)

3. Methodology for Data Analysis

The data sets presented in the documents listed in **Table 2-1** were used to develop a method to estimate the maximum potential community noise exposure that could result from package delivery operations by any of the listed UA. The operations would originate from a single delivery hub location within each proposed area of operations and could occur up to seven days per week, during both daytime and nighttime hours. Numbers of daily and equivalent annual delivery operations would vary for different operating areas. There are currently no standardized tools or processes in place to conduct a noise assessment for the proposed operational scenario and UA; therefore, HMMH, with detailed technical guidance from the FAA Office of Environment and Energy, developed a customized noise exposure prediction process based on the available data to conduct this analysis. The process was developed around FAA's understanding of typical use of UA by existing Part 135 package delivery operators. The following subsections describe the noise analysis methodology.

3.1 Application of Operations

The DNL metric applies a 10-decibel (dB) weighting for operations between 10 PM and 7 AM. The 10 dB weighting is mathematically equivalent to 10 times the number of operations. Therefore, the operations near point *i* can be weighted to develop a daytime equivalent number of operations ($N_{Equiv,i}$). The generalized form is expressed in Equation (1).[4]

$$N_{Equiv,i} = W_{Day} \times N_{Day,i} + W_{Eve} \times N_{Eve,i} + W_{Night} \times N_{Night,i} \quad (1)$$

Where:

- $N_{Day,i}$ is the number of user-specified operations between 7 AM and 7 PM local time
- $N_{Eve,i}$ is the number of user-specified operations between 7 PM and 10 PM local time
- $N_{Night,i}$ is the number of user-specified operations between 10 PM and 7 AM local time
- W_{Day} is the day-time weighting factor, which is 1 operation for DNL
- W_{Eve} is the evening weighting factor, which is 1 operation for DNL
- W_{Night} is the night-time weighting factor, which is 10 operations for DNL

For the DNL metric, the number of DNL daytime equivalent operations, $N_{DNL,i}$ simplifies to

$$N_{DNL,i} = N_{Day,i} + N_{Eve,i} + 10 \times N_{Night,i} \quad (2)$$

In practice, Equation (2) can be further simplified by defining the user-defined operations between 7 AM and 10 PM as a single value, rather than tracking $N_{Day,i}$ and $N_{Eve,i}$ separately.

[4] Equation (2) includes the three time periods of day, evening, night for consistency with other FAA documents that discuss the development of time averaging metrics such as DNL from individual SELs when operations during the evening are weighted differently, such as with the Community Noise Equivalent Level (CNEL) used in lieu of DNL in California. The CNEL metric is effectively the same as the DNL metric, with the only difference being use of an evening weighting factor, W_{Eve}, of 3 (approximately 5 dB) instead of 1.

3.2 Delivery Hub Infrastructure

UA package deliveries would emanate from a delivery hub location. A single delivery hub is anticipated to typically support multiple sets of launch and landing pads. For the purpose of the noise analysis, only one delivery hub is considered at a time. All the operations for the hub (all the launch and landing pads) are considered to be collocated at the centroid of the hub.

3.3 Application of Acoustic Data

The DNL at a location can be estimated with a summation of the SELs. For the purpose of calculating SEL, four specific activities are considered:

- The UA taking off from the hub and climbing to en route altitude,
- En route travel of the UA between the hub, the delivery point, and return,
- Delivery maneuvers of the UA at the delivery point, and
- Landing related activities of the UA at the hub.

3.3.1 Approach and General Assumptions

UA package delivery operations considered in the PEA could be from any combination of the previously evaluated UA or other UA with similar characteristics and operating procedures as those described in **Section 2**. Noise exposure resulting from UA package delivery operations is quantified in terms of SEL and subsequently DNL, which both account for the instantaneous sound level and the total duration of sound received at a location. Due to this fact, the UA producing the highest instantaneous levels is not necessarily the UA with the highest resulting SEL and DNL noise exposures. A UA, which is less noisy in terms of instantaneous sound level, can produce higher overall noise exposure levels if the duration over which it conducts its operational activities is longer (e.g., slower ascent/descent rates, longer hover periods, and/or slower en route speeds).

Because of this, noise exposure estimates are based on an aggregate representation of all package delivery UA that FAA has collected noise data for to date. This aggregate representation is developed by determining the maximum SEL generated by any of the UA during direct overflight of a receiver during approach to and departure from hubs and delivery locations, as well as along en route flight paths. Individual UA overflight SELs were compared at distances ranging from 0 feet to 4,500 feet from hub and delivery locations, and the maximum SEL generated by any of the 11 UA at each 1-foot distance interval was taken over the entire available data distance range.

The SEL for each individual UA at any distance point from a hub or delivery location is the sum of the energy from both the vertical climb/descent phases and outbound/inbound en route phases of flight. The noise contributions from each flight phase were summed at each receiver distance via decibel addition as follows in Equation (3).

$$Combined\ SEL = 10\log_{10}\left[\sum_{i}^{n} 10^{\left(\frac{SEL_i}{10}\right)}\right],\ dB \qquad (3)$$

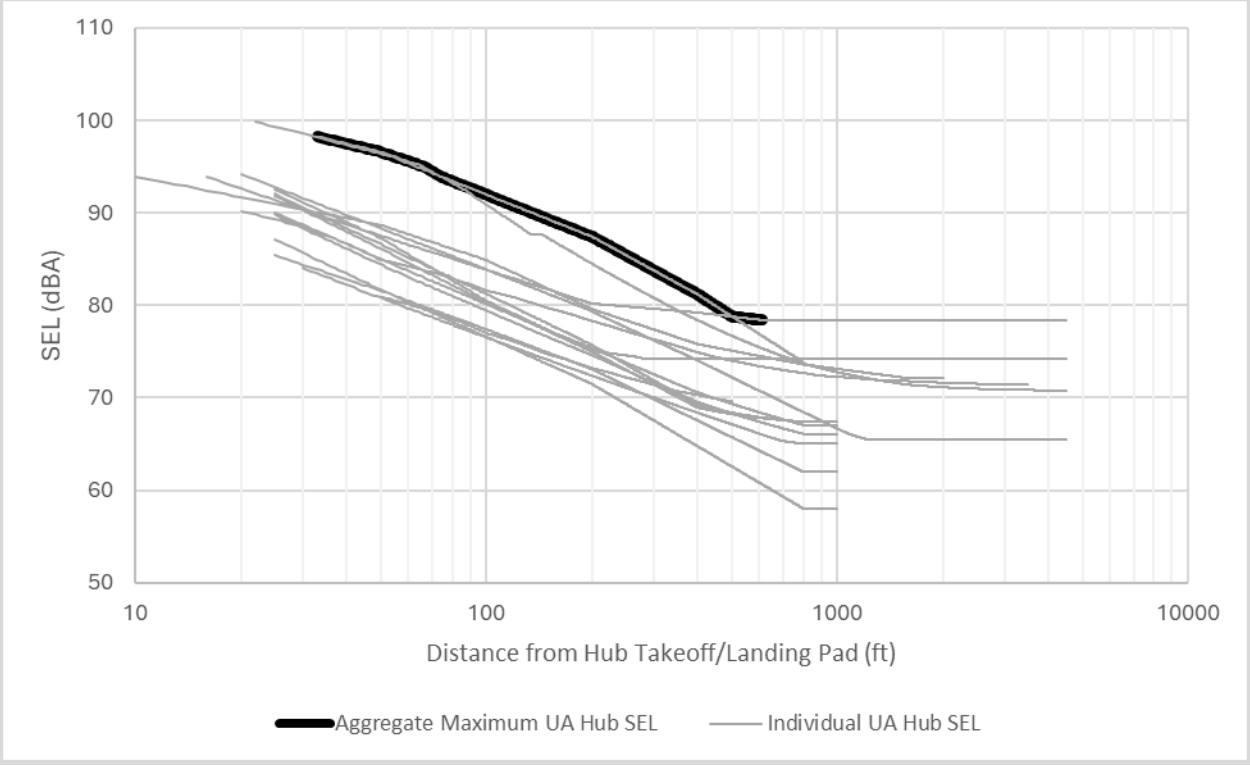
The resultant SEL relationships are used for all subsequent DNL analysis as a means of conservatively representing the potential noise exposure that could result from the operation of any of those UA or other UA with similar characteristics.

3.3.2 Delivery Hub

Figure 3-1 presents the estimated SELs for all delivery hub flight activity. This includes takeoff, landing, and transitions to and from en route flight. The SEL values assume that the UA passes directly over the receiver during all flight activity except vertical ascent and descent. SEL values are shown for each individual UA as well as the resultant aggregate maximum. Application of the SEL should be based on the position of the launch pad at a hub and can be applied radially as a circle with the pad in the center. If the exact location of the launch pad is not known, then using an outer boundary of the delivery hub would be slightly conservative.

The distance of 33 feet was the closest common distance for which measurement data was available for most UA. For the UA with the highest en route SEL, that noise level was reached at a distance of 611 feet from a hub (i.e., the distance at which hub takeoff and landing noise no longer contribute to the overall SEL). As such, noise exposure from hubs is evaluated from 33 feet to 611 feet from the takeoff and landing pad. For hubs it is assumed that takeoffs and landings use the same pad.

Figure 3-1. Delivery Hub UA Sound Exposure Levels Resulting from One Delivery Operation



3.3.3 En Route

This section describes the process used to estimate the SEL for the UA flying at different speeds and altitudes when needed and is maintained in this document for consistency with other similar noise assessments for UA package delivery operations. All en route SELs considered in this analysis are taken directly from the source documents (**Table 2-1**) which include the adjustments described in this section, if any such adjustments were made.

For some UA, the flight altitudes and/or speeds represented in the available measurement data differed somewhat from the expected typical en route conditions. In these circumstances adjustments were made to the measured data to estimate SELs for UA operation at the planned typical operating conditions. This section describes the process used to make those adjustments.

Sound exposure level for a given point i (SEL_i) with the aircraft flying directly overhead at altitude (Alt_i) in feet and a ground speed (V_i) in knots, was calculated based on the guidance in *14 CFR Part 36 Appendix J, Section J36.205 Detailed Data Correction Procedures* (FAA 1992). It should be noted that the equations presented in this Section are only applicable for an aircraft that is moving relative to a stationary receptor.

In particular, the sound exposure level adjustment for the altitude defined in 14 CFR Part 36 for a moving aircraft, is presented here as Equation (4).

$$\Delta J_1 = 12.5 \times \log_{10}\left(\frac{H_A}{H_T}\right), dB \quad (4)$$

where ΔJ_1 is the quantity in decibels that must be algebraically added to the measured SEL in order to estimate the SEL for a level flight path at an altitude differing from the altitude corresponding to the measured SEL; H_A is the reference height, in feet, corresponding to the measured SEL; H_T is the altitude at which an estimate of the SEL is being made; and the constant (12.5) accounts for the effects on spherical spreading and duration from the off-reference altitude. The value of ΔJ_1 is 0 if H_T is equal to H_A and can be negative if H_T is greater than (higher altitude) than H_A.

The sound exposure level adjustment for speed, as defined in 14 CFR Part 36, is presented here as Equation (5).

$$\Delta J_3 = 10 \times \log_{10}\left(\frac{V_{RA}}{V_R}\right), dB \quad (5)$$

Where ΔJ_3 is the quantity in decibels that must be algebraically added to the measured SEL noise level to correct for the influence of the adjustment of the reference speed on the duration of the measured flyover event as perceived at the noise measurement station, V_R is the speed at which the vehicle will be estimated at, and V_{RA} is the speed associated with the measured SEL.

To estimate the SEL of the UA flying en route at typical speed and altitude, the measured SEL made during overflight (SEL_M) was adjusted by combined application of equations (4) and (5). When the UA is flying at an altitude of Alt_i feet AGL and ground speed of V_i knots, Equation (6) was used to arrive at an $SEL_{adjusted}$ dB estimate for the respective phase of en route flight.

$$SEL_{adjusted} = SEL_M + 12.5 \times \log_{10}\left(\frac{Alt_A}{Alt_i}\right) + 10 \times \log_{10}\left(\frac{V_{RA}}{V_i}\right), dB \quad (6)$$

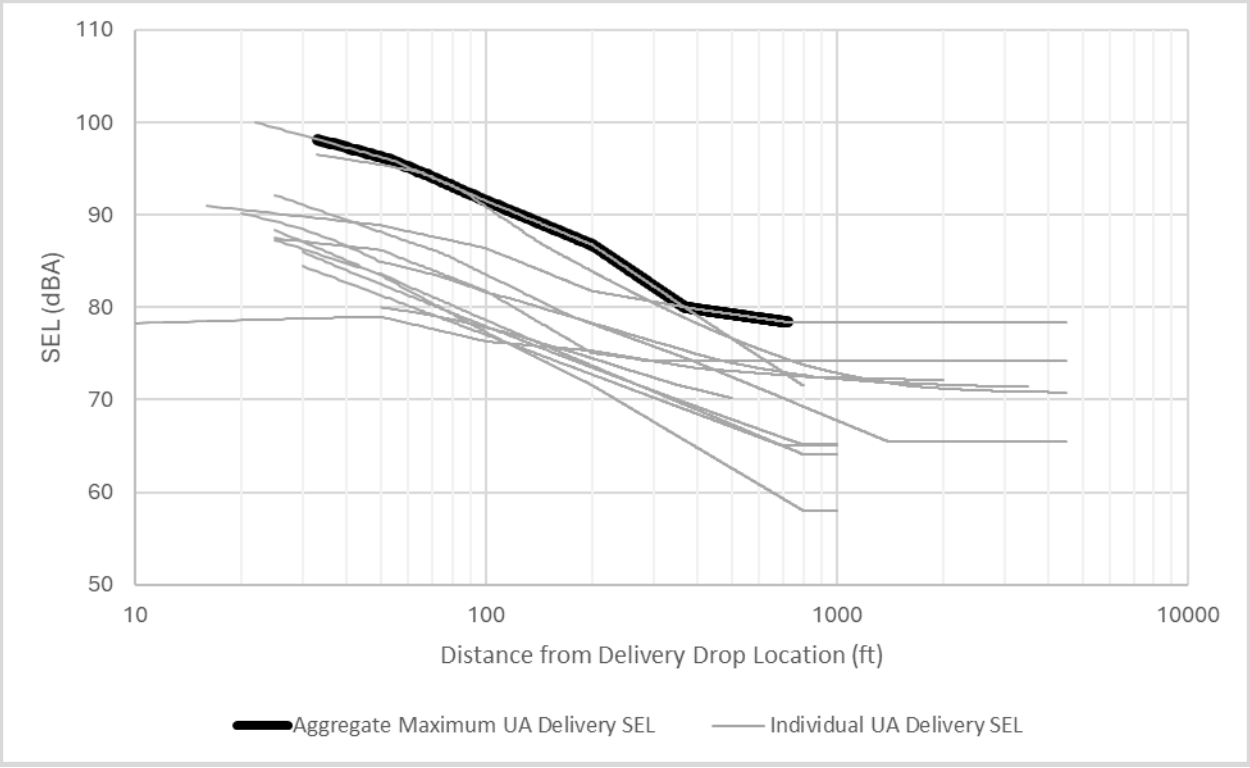
The resultant en route overflight SELs for the 11 UA considered in this analysis range from **58.5 dB** to **78.4 dB**.

3.3.4 Delivery Location

Figure 3-2 presents the estimated SELs for all delivery location flight activity. This includes approaching at en route altitude, descending for delivery, delivery, ascending back to en route altitude, and departing the area. The SEL values assume that the UA passes directly over the receiver during all flight activity except vertical ascent and descent. SEL values are shown for each individual UA as well as the resultant aggregate maximum. Application of the SEL should be based on the position of the package delivery location and can be applied radially as a circle with the delivery point in the center.

The distance of 33 feet was the closest common distance for which measurement data was available for most UA. For the UA with the highest en route SEL, that noise level was reached at a distance of 722 feet from a delivery location (i.e., the distance at which package delivery noise no longer contributes to the overall SEL). As such, noise exposure from package deliveries is evaluated from 33 feet to 722 feet from the delivery location.

Figure 3-2. Delivery Location UA Sound Exposure Levels



3.4 Proposed DNL Estimation Methodology

The number of operations overflying a particular receiver on the ground will vary based on the proposed operating area and demand. For a given receiver location *i*, and a single instance of sound source *A*, the SEL for that sound source SEL_{iA} is (energy) summed for the average annual daily number of DNL daytime equivalent operations ($N_{DNL,iA}$) to compute the DNL, or equivalently, by Equation (7).

$$DNL_{iA} = SEL_{iA} + 10 \times \log_{10}\left(N_{DNL,iA}\right) - 49.4, (dB) \quad (7)$$

The above equation applies to an SEL value representing all flight activity occurring for a single delivery at a delivery hub, delivery location, or directly under en route flight as presented in **Figure 3-1**, **Figure 3-2**, and **Section 3.3.3**. For each of the conditions presented below, results will be presented in tabular format with the estimated DNL.

3.4.1 DNL for Delivery Hubs

The takeoff and landing operations are anticipated to occur at the same location. Therefore, the results are calculated for a single set of receptors. Operations are assumed to be "head-to-head" in which case the takeoff and the landing flight paths are the same. Delivery hub operations are represented by the aggregate maximum SEL, as presented in **Figure 3-1**, which includes the estimated noise exposure for takeoff, landing, and transitions to and from en route flight.

3.4.2 DNL for En Route

En route includes the UA flying from a hub to a delivery location and back to a hub. A representative receiver will be positioned directly under the flight path, and the DNL will be calculated based on the altitude and speed-adjusted delivery SEL as described in **Section 3.3.3**. Operations assume that a receiver under the flight path will be overflown by the UA while it is traveling both outbound and inbound for a single delivery.

3.4.3 DNL for Delivery Locations

Operations are assumed to be "head-to-head" in which case the en route approach and en route departure flight paths are the same. Therefore, the results are calculated for a single set of receptors. Delivery operations are represented by the aggregate maximum SEL, as presented in **Figure 3-2**, which includes the estimated noise exposure for approaching at en route altitude, descending for delivery, delivery, ascending back to en route altitude, and departing the area.

4. Noise Exposure Estimate Results

This section presents the estimated noise exposure for proposed UA package delivery operations for a given set of average annual day (AAD) deliveries. The values presented are in tabular format and use of the table requires estimating the number of DNL Equivalent deliveries associated with a delivery hub. One delivery includes the outbound takeoff and inbound landing and is representative of two operations.

The DNL Equivalent deliveries, $N_{DNL,i}$ as described in **Section 3.1**, is presented below as Equation (8).

$$Deliveries_{DNL,\ i} = Deliveries_{Day} + 10 \times Deliveries_{Night} \quad (8)$$

$Deliveries_{Day}$ are between 7 AM and 10 PM and $Deliveries_{Night}$ are between 10 PM and 7 AM. If a portion of a delivery (either takeoff or landing) occurs in the nighttime hours, then it should be counted within $Deliveries_{Night}$.

A typical mission profile will include noise from multiple flight phases:

1. UA depart from and return to a hub, including transition to and from vertical to horizontal en route flight.
2. En route flight at a defined altitude to and from a hub to a delivery point.
3. Transition to and from horizontal en route flight to vertical flight at the delivery point, vertical descent to complete a delivery at the delivery point, and vertical ascent back to en route altitude for return to a hub.

4.1 Noise Exposure for Operations at Delivery Hub

For operations at a delivery hub, the UA-related noises include takeoff, landing, and transitions to and from en route flight. To provide a conservative view, all operations are assumed to be on the same en route flight path with outbound and inbound flights traversing it in opposite directions. For air traffic deconfliction, en route overflight of one operator's delivery hub by another operator is not anticipated. As such, the results presented here only include the originating air traffic associated with a delivery hub.

Table 4-1 presents data for the estimated extent of DNL under the flight path for 45 dB through 80 dB in 5 dB increments. In addition to the standard 5 dB increments typically reported, the DNL extent of 59.7 dB is also included in **Table 4-1**, as that is the DNL threshold below which significant noise impacts resulting from 1.5 dB or more increases to existing aviation noise cannot occur (see **Section 5**).

Table 4-1. Estimated Maximum DNL Noise Exposure for Delivery Hub Locations

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	45 DNL Extent Feet	50 DNL Extent Feet	55 DNL Extent Feet	59.7 DNL Extent Feet	60 DNL Extent Feet	65 DNL Extent Feet	70 DNL Extent Feet	75 DNL Extent Feet	80 DNL Extent Feet
≤1	≤365	71	<33	<33	<33	<33	<33	<33	<33	<33
≤5	≤1,825	202	95	42	<33	<33	<33	<33	<33	<33
≤10	≤3,650	282	149	71	<33	<33	<33	<33	<33	<33
≤20	≤7,300	394	226	110	56	53	<33	<33	<33	<33
≤30	≤10,950	466	275	144	72	70	<33	<33	<33	<33
≤40	≤14,600	>611	316	174	86	82	<33	<33	<33	<33
≤50	≤18,250	>611	352	202	99	95	42	<33	<33	<33
≤100	≤36,500	>611	476	282	156	149	71	<33	<33	<33
≤200	≤73,000	>611	>611	394	234	226	110	53	<33	<33
≤300	≤109,500	>611	>611	466	284	275	144	70	<33	<33
≤400	≤146,000	>611	>611	>611	326	316	174	82	<33	<33
≤500	≤182,500	>611	>611	>611	363	352	202	95	42	<33
≤600	≤219,000	>611	>611	>611	397	384	221	107	51	<33
≤700	≤255,500	>611	>611	>611	423	411	238	118	57	<33
≤800	≤292,000	>611	>611	>611	447	435	253	129	63	<33
≤900	≤328,500	>611	>611	>611	469	456	268	139	68	<33
≤1,000	≤365,000	>611	>611	>611	490	476	282	149	71	<33
≤1,100	≤401,500	>611	>611	>611	536	495	295	159	75	<33
≤1,150	≤419,750	>611	>611	>611	593	507	302	164	77	<33

Notes:
DNL Equivalent Deliveries = AAD Daytime Deliveries + (10 x AAD Nighttime Deliveries)
">611": Refer to en route noise DNL table for distances greater than 611 feet in Appendix D.
"<33": Limit of available data, see Appendix D.

4.2 Noise Exposure under En Route Paths

For noise estimation under en route conditions, the UA are conservatively assumed to fly the same outbound flight path between the hub and the delivery point and inbound flight path back to the hub. Therefore, each location under the en route path would be overflown twice for each delivery served by the respective overhead en route path. Among different operators, the actual en route flight path procedures could vary, and the same locations may not be overflown multiple times. En route flight for UA must be below 400 feet AGL,[5] and, based on the UA evaluated to date, would typically range from approximately 150 feet to 377 feet AGL.

For the proposed action, the exact location of all potential delivery hubs and their applicable delivery ranges is not known. **Table 4-2** presents the maximum potential noise exposure resulting from a range of 1 to 1,150 AAD deliveries overflying a single location based on an en route SEL of 78.4 dB, which is the highest noise level of the evaluated Part 135 package delivery UA. The maximum number of AAD delivery overflights that could occur over any single noise sensitive receiver location without potential for significant noise impacts resulting from 1.5 dB or more increases to existing aviation noise is 1,150. Due to the generally expected limitations of UA

[5] Condition & Limitation No. 27 in Exemption No. 18163E issued by FAA states that UAS must not exceed 400 feet AGL.

delivery area ranges and required collision avoidance plans,[6] it is highly unlikely that 1,150 AAD deliveries (2,300 overflights) would occur over any single noise sensitive receiver location.

Table 4-2. Estimated Maximum DNL Noise Exposure for Under En Route Flight Paths

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	Estimated Maximum DNL Under Flight Path
≤1	≤365	29.0
≤5	≤1,825	36.0
≤10	≤3,650	39.0
≤20	≤7,300	42.0
≤30	≤10,950	43.8
≤40	≤14,600	45.1
≤50	≤18,250	46.0
≤100	≤36,500	49.0
≤200	≤73,000	52.0
≤300	≤109,500	53.8
≤400	≤146,000	55.1
≤500	≤182,500	56.0
≤600	≤219,000	56.8
≤700	≤255,500	57.5
≤800	≤292,000	58.1
≤900	≤328,500	58.6
≤1,000	≤365,000	59.0
≤1,100	≤401,500	59.4
≤1,150	≤419,750	59.6

Note: DNL Equivalent Deliveries = AAD Daytime Deliveries + (10 x AAD Nighttime Deliveries)

4.3 Noise Exposure for Operations at Delivery Point

The noise exposure for delivery location operations includes the noise exposure for all flight activity occurring at and around the delivery point. The flight activity includes the UA approaching at en route altitude, descending for delivery, delivering the package, ascending back to en route altitude, and departing the area. The estimated noise exposure values assume the UA passes directly over the receiver during all flight activity except vertical ascent and descent.

Table 4-3 presents the estimated DNL values for a range of potential daily average DNL Equivalent delivery counts at a delivery point. Values were calculated at distances of 33 feet, 50 feet, 75 feet, 100 feet, and 125 feet from the delivery point and are representative of distances from which nearby properties may experience noise from a delivery.[7] The maximum potential number of daily deliveries to individual delivery locations is unknown, but most deliveries would be of goods and products to residential locations and other businesses. As

[6] Condition & Limitation No. 33 in Exemption No. 18163E issued by FAA requires operators to prepare a collision avoidance plan that specifics how the operator will manage conflicts with other UA. Condition & Limitation No. 41 requires the operator to maintain a conflict management capability to ensure the UA remains clear of any manned aircraft and other UA.

[7] The U.S. Census Bureau national average lot size for single-family homes sold from 2020-2024 was approximately 15,000 square feet. This is representative of a property with dimensions of a 122.5-by-122.5-foot square. The 125 feet represents a 125-foot lateral width of the parcel rounded up to the nearest 25 feet (U.S. Census Bureau 2025).

a result, the FAA expects that more than one or two deliveries to the same location per day over the course of a year would be atypical.

Table 4-3. Estimated DNL Noise Exposure for Delivery Locations

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	Estimated Delivery DNL at 33 Feet	Estimated Delivery DNL at 50 Feet	Estimated Delivery DNL at 75 Feet	Estimated Delivery DNL at 100 Feet	Estimated Delivery DNL at 125 Feet
≤1	≤365	48.8	46.9	44.3	42.2	40.6
≤5	≤1,825	55.8	53.9	51.2	49.2	47.6
≤10	≤3,650	58.8	56.9	54.3	52.2	50.6
≤20	≤7,300	61.8	59.9	57.3	55.2	53.6
≤30	≤10,950	63.6	61.7	59.0	56.9	55.4
≤40	≤14,600	64.8	62.9	60.3	58.2	56.7
≤50	≤18,250	65.8	63.9	61.2	59.2	57.6
≤100	≤36,500	68.8	66.9	64.3	62.2	60.6
≤200	≤73,000	71.8	69.9	67.3	65.2	63.6
≤300	≤109,500	73.6	71.7	69.0	66.9	65.4
≤400	≤146,000	74.8	72.9	70.3	68.2	66.7
≤500	≤182,500	75.8	73.9	71.2	69.2	67.6
≤600	≤219,000	76.6	74.7	72.0	69.9	68.4
≤700	≤255,500	77.3	75.4	72.7	70.6	69.1
≤800	≤292,000	77.8	75.9	73.3	71.2	69.7
≤900	≤328,500	78.4	76.5	73.8	71.7	70.2
≤1,000	≤365,000	78.8	76.9	74.3	72.2	70.6
≤1,100	≤401,500	79.2	77.3	74.7	72.6	71.0
≤1,150	≤419,750	79.4	77.5	74.9	72.8	71.2

Note: DNL Equivalent Deliveries = AAD Daytime Deliveries + (10 x AAD Nighttime Deliveries)

5. Threshold of Significance and Mitigation

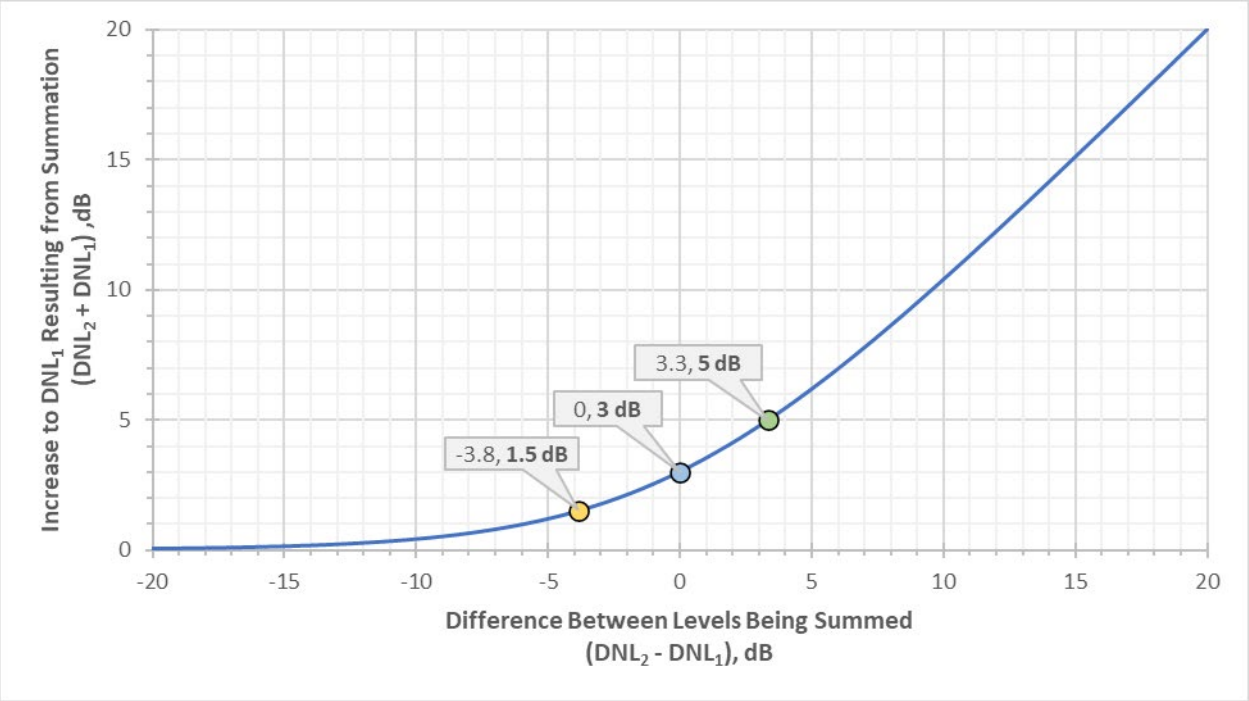
FAA Order 1050.1G, Appendix A, states noise impacts would be significant if the action would increase noise by DNL 1.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe (FAA 2025b). For example, an increase from DNL 65.5 dB to 67 dB is considered a significant impact, as is an increase from DNL 63.5 dB to 65 dB.

Additionally, *FAA Order 1050.1G, Appendix C, Section C-1.4 Environmental Consequences* requires additional reporting for air traffic airspace and procedure actions where the study area is larger than the immediate vicinity of an airport (FAA 2025b). In such cases, noise exposure assessments should identify where noise will change by the following specified amounts:

1. For DNL 65 dB and higher: +1.5 dB
2. For DNL 60 dB to <65 dB: +3 dB
3. For DNL 45 dB to <60 dB: +5 dB

The FAA refers to noise changes meeting criteria 1 as "significant" and those meeting criteria 2 and 3 as "reportable." **Figure 5-1** presents the relationship between the dB difference in two noise sources and the increase resulting from the summation of those noise sources. The FAA's change criteria of plus 1.5, 3, and 5 dB are also plotted on the curve for reference.

Figure 5-1. dB Increase Resulting from DNL Summation



Source: HMMH

For instances where the proposed UA package delivery operations would occur in areas subject to other aviation noise sources, it is necessary to evaluate the cumulative noise exposure that would result from the other aviation noise sources present. Examples of such scenarios are UA package delivery operations occurring in the vicinity of an airport and where package delivery area ranges from multiple delivery hubs may overlap with one another.

Potential increases to DNL resulting from cumulative aviation noise effects can be evaluated with **Figure 5-1** by considering the proposed action noise exposure as DNL_2 and the sum of all other aviation noise sources at the same location as DNL_1. If the difference between DNL_2 and DNL_1 is:

- Less than -3.8 dB, the increase in DNL would be less than 1.5 dB.
- From -3.8 dB up to but not including 0 dB, the increase in DNL would range from 1.5 dB up to but not including 3 dB.
- From 0 dB up to but not including 3.3 dB, the increase in DNL would range from 3 dB up to but not including 5 dB.
- 3.3 dB or greater, the increase in DNL would be 5 dB or greater.

Beyond differences of +/- 15 dB, the curve becomes asymptotic to a slope of 1 and 0, illustrating that the addition of noise levels with differences greater than that results in effectively no increase from the higher of the two noise source levels being summed.

For an increase of 1.5 dB or more to occur from an existing DNL of 63.5 dB, the added noise on its own must be at least DNL 59.7 dB (i.e., 59.7 dB + 63.5 dB = 65 dB). As such, 59.7 dB is the DNL threshold below which significant noise impacts resulting from 1.5 dB or more increases to existing aviation noise cannot occur. The decibel level of additional noise that is required to result in an increase of 1.5 dB to any existing noise level can be determined by subtracting 3.8 from the value of the existing noise level (e.g., 63.5 - 3.8 = 59.7).

The FAA would request that operators locate their hubs at sufficient setback distances from noise-sensitive land use to prevent increases of DNL 1.5 dB or more from occurring within existing DNL 65 dB or resulting in new DNL 65 dB. Based on the noise data presented in **Sections 3.3.2 – 3.3.4 and 4.1 – 4.3**, the number of deliveries within a specified geographic area that would pose no potential for significant impacts i.e., the unit capacity threshold (**Section 2.2**), is 1,150 AAD deliveries. Hubs conducting up to 1,150 AAD deliveries would be sited a minimum of 600 feet from any noise sensitive land use, ensuring that such land use would be beyond the maximum potential extent of DNL 59.7 dB from the hub. Similarly, en route operations over any noise sensitive land use would not exceed 1,150 AAD deliveries (i.e., 2,300 overflights), ensuring that noise exposure from en route overflights would be less than DNL 59.7 dB.

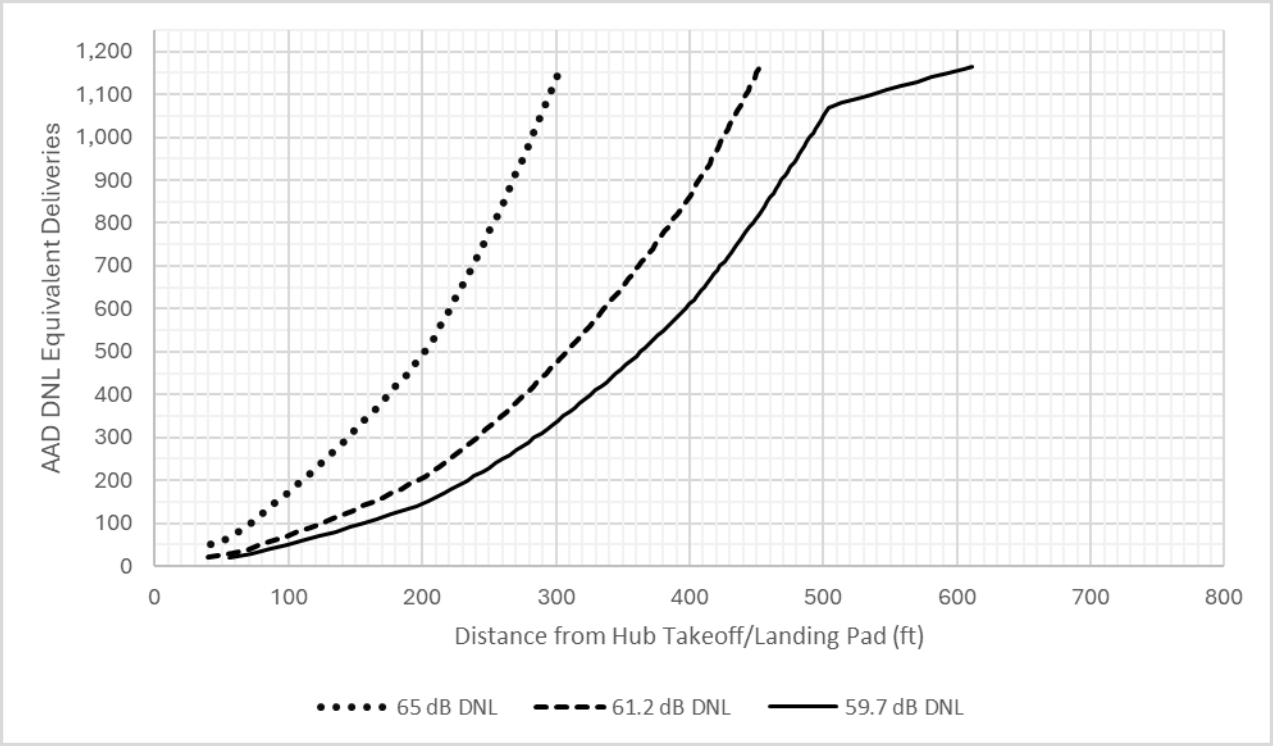
These criteria account for any potential cumulative effects of aviation noise from nearby airports as drone package delivery noise less than DNL 59.7 dB cannot result in increases of 1.5 dB or more in combination with any existing aviation noise equal to or greater than DNL 63.5 dB. For individual UA generating lower SELs than the aggregate maximum and/or for UA operating at sufficiently far distances from airports, higher numbers of deliveries and/or lesser hub setback distances may be possible without any potential for significant noise impacts. However, the exact location of the DNL 63.5 dB contour from an airport will generally not be identifiable without conducting an airport noise study. For hubs with fewer than 1,150 daily deliveries, lesser setback distances would be required and are presented in **Table 4-1.** For circumstances in which an operator may wish to conduct more than 1,150 AAD deliveries and/or place a hub within the distances indicated in **Table**

4-1 for the relevant number of AAD deliveries, a more detailed analysis specific to the proposed activity would be required to evaluate the potential for noise impacts.

As a supplement to the DNL extent results presented in **Sections 4.1** and **4.3, Figure 5-2** and **Figure 5-3** present the maximum potential extents of the DNL 59.7 dB, 61.2 dB, and 65 dB as a function of AAD equivalent DNL operations for both hub and delivery locations, based on the aggregate maximum SELs for those locations. A DNL of 61.2 dB is the minimum noise level that can result in an increase of at least 1.5 dB to an existing DNL of 65 dB (i.e., an increase from DNL 65 dB to DNL 66.5 dB). Significant noise impacts at noise sensitive locations could not result from drone package delivery operations for any AAD delivery and distance combinations to the right of the curves presented in **Figure 5-2** and **Figure 5-3** under the following scenarios:

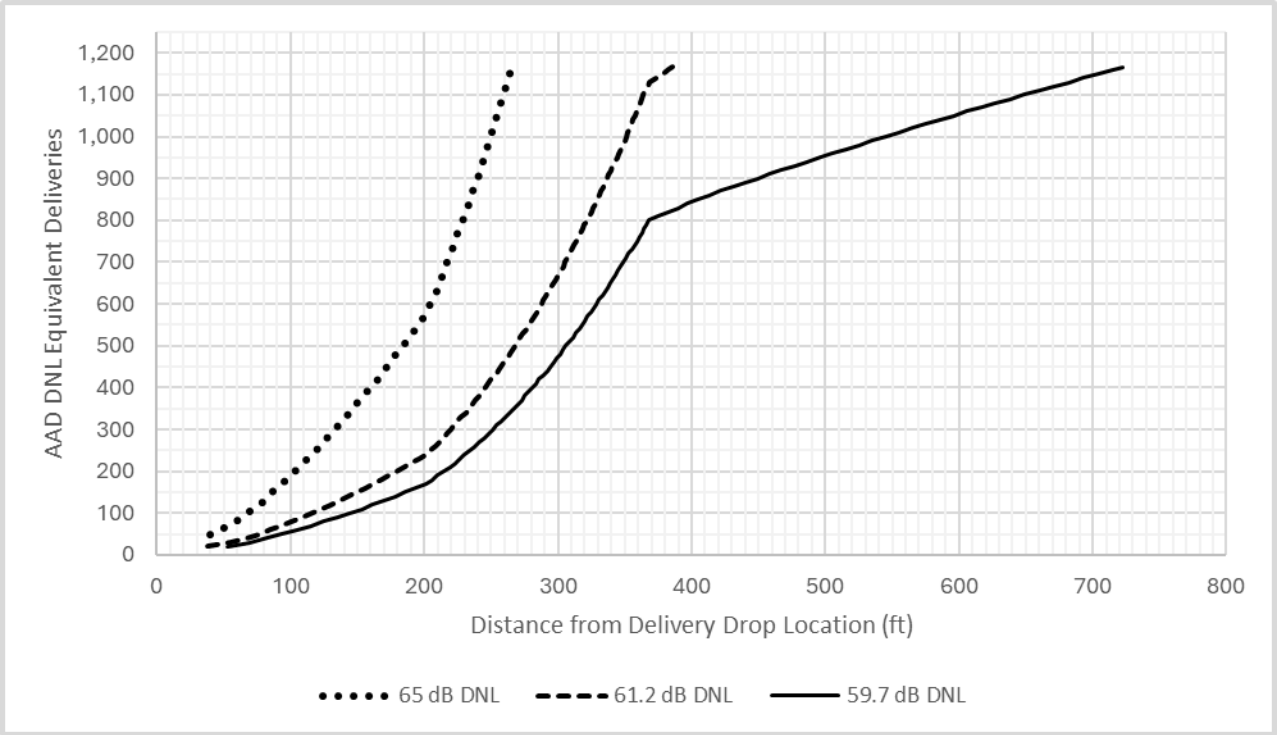
- DNL 65 dB: At locations where no other aviation noise sources are present
- DNL 61.2 dB: At locations within the DNL 65 dB noise contours of airports or other aviation noise sources
- DNL 59.7 dB: At all locations, regardless of the noise levels from other aviation noise sources

Figure 5-2. DNL Extents from a Hub Takeoff/Landing Pad Based on AAD Deliveries



Source: HMMH

Figure 5-3. DNL Extents from a Delivery Point Based on AAD Deliveries



Source: HMMH

Drone operators may also establish hubs close enough to each other that their respective delivery ranges overlap, allowing for certain areas to be accessible from multiple hub locations. The degree to which different operators would operate within areas of shared airspace is entirely dependent on the operators, their specific business use cases, and their ability to deconflict with one another in the overlapping delivery areas with shared customers.

Information shared by various operators indicates that some would try to minimize overlap in their own hubs' delivery ranges while others plan to allow for inter-hub flights and therefore may plan for overlap within their own operations. In cases where a single operator's hubs would have overlapping delivery ranges, most operators have stated they do not expect such circumstances to have additive effects that would result in increased package deliveries to those areas. The primary reason given for this is that the services provided by different hubs would generally be redundant, or at least similar, and, as such, customer demand for those services would be unaffected by the number of hubs within delivery range of the same area. In cases where different operators' hubs would have overlapping delivery ranges, some additive effect could occur within those areas depending on customer demand for the various types of package delivery services being provided by each operator. From a business perspective, it is anticipated that operators would make every effort to minimize overlapping operations with other operators to the extent practicable and/or would implement necessary deconfliction measures that would mitigate the potential for flight path concentration over any single location.

Existing authorized UA activity in an area would be evaluated as part of the review process for approving new applicants to operate in the same area. Should a potential for the combined operations from separate hubs

exceed 1,150 AAD deliveries (2,300 overflights) within any shared airspace be identified, a more detailed analysis specific to the proposed activity would be required to evaluate the potential for noise impacts.

Based on the noise analysis and implementation of the above-listed mitigation measures, the proposed action would not have a significant noise impact.

This page intentionally left blank.

6. References

FAA (Federal Aviation Administration). 2025a. "Public Involvement and Environmental Review for Drone Operations." U.S. Department of Transportation. https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

FAA. 2025b. Order 1050.1G *FAA National Environmental Policy Act Implementing Procedures.* Environmental Policy & Operations Division. June 30. https://www.faa.gov/regulations_policies/orders_notices/index.cfm/go/document.current/documentnumber/1050.1

FAA. 2023. AEE-100, *Measuring Drone Noise for Environmental Review Process*, Draft Measurement Protocol for Applications for EA Noise Analysis V05, PowerPoint Presentation. October.

FAA. 1992. 14 CFR Part 36, Appendix J, Section J36.205, *Detailed Data Correction Procedures*. U.S. Department of Transportation. September 16. https://www.ecfr.gov/current/title-14/chapter-I/subchapter-C/part-36/appendix-Appendix%20J%20to%20Part%2036

U.S. Census Bureau. 2025. "Characteristics of New Housing." File "Soldlotsize_cust.xls." Accessed August 8, 2025. https://www.census.gov/construction/chars.

This page intentionally left blank.

APPENDIX D

SECTION 106 CONSULTATION

This page intentionally left blank.

GOVERNMENT-TO-GOVERNMENT TRIBAL CONSULTATION

This page intentionally left blank.

U.S. Department of Transportation
Federal Aviation Administration

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Chairman Darryl Brady
Yomba Shoshone Tribe of the Yomba Reservation, Nevada
HC61, Box 6275
Austin, Nevada 89310

Transmitted via email and mail ystchairman24@gmail.com

RE: Invitation for Government-to-Government Tribal Consultation for Proposed Rulemaking regarding Unmanned Aircraft Systems to Operate Beyond Visual Line of Sight

and

Drone Package Delivery Operations

Dear Chairman Brady:

As directed by Congress in the Federal Aviation Administration (FAA) Reauthorization Act of 2024, the FAA is working on establishing a performance-based regulatory pathway for unmanned aircraft systems (UAS) to operate beyond visual line of sight (BVLOS). The FAA recently published a Notice of Proposed Rulemaking (NPRM) in the Federal Register regarding UAS BVLOS operations.

Normalizing Unmanned Aircraft Systems Beyond Visual Line of Sight Operations, 90 Fed. Reg. 38212 (Aug. 7, 2025), available at https://www.federalregister.gov/documents/2025/08/07/2025-14992/normalizing-unmanned-aircraft-systems-beyond-visual-line-of-sight-operations

The proposed rule includes several types of UAS operations as described further below.

With this letter, we are initiating government-to-government consultation regarding the proposed rule as well as the proposed authorization of commercial UAS operators to deliver goods to customers (referred to as package delivery) using UAS (also referred to as drones). The primary purpose of government-to-government consultation is to ensure that Federally Recognized Tribes (Tribes) are given the opportunity to provide meaningful and timely input regarding proposed FAA actions that uniquely or significantly affect the Tribes. This policy is provided in Federal Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*; Presidential Memorandum, *Uniform Standards for Tribal Consultation*; Department of Transportation Order 5301.1A, *Department of Transportation Tribal Consultation Policy and Procedures*; and FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures*.

This rulemaking proposes new, more expansive operating requirements to allow UAS to operate for commercial and recreational purposes beyond the visual line of sight (BVLOS) of operators and at low

altitudes in the National Airspace System (NAS). To date, the FAA has enabled some such operations through exemptions and waivers to existing regulations and is using that experience to develop a repeatable, scalable framework to allow for wide-scale adoption of UAS technologies.

The proposed rule would normalize certain low altitude UAS operations while ensuring the safety and efficiency of the United States airspace. This action proposes performance-based regulations for the design and operation of UAS at low altitudes BVLOS and for associated third-party service suppliers, including UAS Traffic Management, that support these operations as directed by the FAA Reauthorization Act of 2024. The proposed rule represents the next step in integrating UAS into the national airspace system and is intended to provide safety and economic benefits by providing a predictable and clear pathway for operators to safely conduct routine and scalable operations, including package delivery, agriculture, aerial surveying, civic interest, flight training, demonstration, recreation, and flight testing.

In addition, the FAA is preparing a nationwide programmatic environmental assessment (PEA) to assess the potential environmental impacts of commercial drone package deliveries from takeoff and landing areas (referred to as 'hubs'). This analysis ultimately could support the BVLOS rule. The package delivery operations may be conducted for the purpose of delivering goods to customers from an operator-controlled location to one that is outside the operators' visual line of sight with an operating permit.

Locations of drone package deliveries are currently unknown. As operators identify specific areas where they would like to operate, the FAA would evaluate specific requests for authorization. In the future, if a proposed package delivery operating area involves flying over Tribal lands, additional opportunities to consult under Section 106 of the National Historic Preservation Act will occur. Please see the attached General Description of Commercial Package Delivery Operations (Attachment A). The FAA is available to discuss the details of the PEA with you. We encourage you to read the NPRM and send us any feedback or concerns you have, specifically about the PEA and operation of commercial drone package deliveries. If you would like to consult with the FAA on a government-to-government basis, please contact the FAA at 9-FAA-UAS-BVLOS-Rule@faa.gov to initiate consultation. If you would like to submit feedback on the proposed rulemaking, please refer to the **ADDRESSES** section of the NPRM.

Early identification of Tribal concerns will allow the FAA to consider ways to avoid or minimize potential impacts to Tribal resources for both the rulemaking and commercial package delivery operations. The FAA stands ready to consult with Tribes on any issue that may uniquely or significantly affect them. Please see the attached Additional Information and Resources Regarding UAS (Attachment B).

We look forward to hearing from you. In addition to the contact information above, you may contact us with any questions or concerns you have about UAS and drone package deliveries. You can call 844-FLY-MY-UA (844-359-6982) or email UAShelp@faa.gov. The FAA stands ready to consult with Tribes.

Sincerely,

Wendy L. O'Connor

Wendy O'Connor
Executive Director (A), FAA UAS Integration Office

Enclosures:
Attachment A – General Description of Commercial Package Delivery Operations

Attachment B – Additional Information and Resources Regarding UAS

Attachment A

General Description of Commercial Package Delivery Operations

In general, based on previous proposals for drone package delivery operations, package delivery operators partner with established businesses and identify the location for a hub at the business's parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard. This allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities.

While UA come in varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: 1) takeoff and climb, 2) en route outbound, 3) delivery, 4) en route inbound, and 5) descent and landing. Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the hub. The UA then climbs and performs aerial deliveries. After delivery, the UA returns to its hub via a pre-determined flight path. The five phases of operation for a typical multi-copter or hybrid UA are further described below. **Figure 1** shows a typical flight profile; however, certain operators may have unique operations that are not captured in the figure or this general description. For example, some operators load packages onto the UA while the aircraft hovers above the ground as opposed to loading the packages while the UA is on the ground.

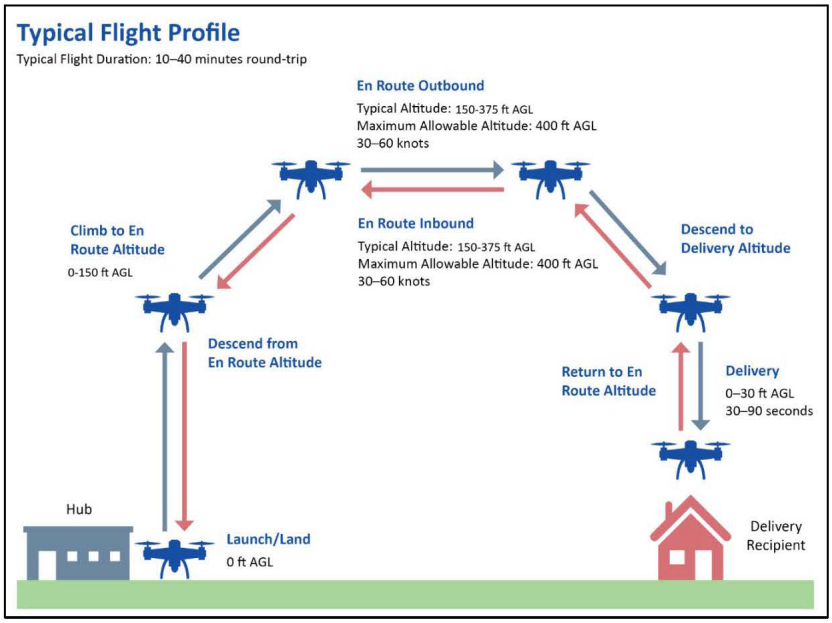


Figure 1. Typical Flight Profile

Drone package deliveries would occur 7 days per week. The FAA expects most deliveries would occur between the hours of 7:00 a.m. and 10:00 p.m. However, the FAA anticipates that a small percentage of

deliveries may occur outside those hours; therefore, this PEA accounts for some drone package deliveries to occur 24 hours per day. For example, a UAS operator could deliver a medical device, such as an automated external defibrillator, to a person in need or conduct other medical-related deliveries.

Launch and Climb

The launch and climb phase is described as the portion of the flight in which a fully loaded UA takes off from the hub and climbs vertically. The UA may then hover briefly as it conducts various systems checks to ensure it is functioning properly. With a multi-copter design, the UA can take off and descend vertically, as well as hover. Typical flights begin with the UA departing from a hub and ascending vertically to no more than 400 feet AGL.

En Route Outbound

The en route outbound phase is defined as the part of the flight in which the fully loaded UA flies a pre-programmed route from its hub to a delivery point. During this flight phase, typical normal cruising speeds range from 30–60 knots (35–70 miles per hour), and typical cruising altitudes range from 150–375 feet AGL.

Delivery

The delivery phase is defined by descent from the en route outbound phase to a delivery point to deliver a package. Upon arrival at the delivery point, the UA descends vertically to deliver the package. The UA may hover at an altitude that varies in height. Most current UA use a tether to lower the package from the UA to the ground while the drone hovers. Others drop the package from a low height AGL. Once the UA releases the package, it climbs vertically to the cruise altitude and begins the en route inbound phase. The delivery process typically takes 30–90 seconds, depending on the operator.

En Route Inbound

Upon completion of a delivery, the UA flies from the delivery point back to a hub. In general, the UA would use the same or similar route back to the hub that it used to reach its delivery location.

Descend and Land

Upon reaching the hub, the UA vertically descends, lands, and turns off.

Attachment A-2

Attachment B

Additional Information and Resources Regarding UAS

UAS—also known as drones—are a rapidly evolving technology. Tribal governments have played a key role in pioneering the use of drones to benefit their communities. For example, the Choctaw Nation of Oklahoma was one of nine participants in the FAA's Integration Pilot Program and continues to participate in the BEYOND program.[1] Other Tribes have explored the use of drones to carry out activities, such as forest management, wildlife monitoring, and surveying for cultural resources.

The FAA has made great strides in developing the technical and regulatory standards, policy guidance, and operational procedures on which successful UAS integration depends. Many of FAA's UAS-related activities and accomplishments are captured in numerous online resources. As we move forward with continuing to safely integrate UAS into the National Airspace System, we want to ensure you have the resources you may need to understand the regulatory framework for drones and take advantage of their potential, such as commercial drone package deliveries.

You may recall our letter[2] sent to you in December 2020 providing links to FAA's UAS integration efforts, including the FAA's integration roadmap[3] and codes and regulations pertaining to drone operations. For example:

- Public Safety and Government users: https://www.faa.gov/uas/public_safety_gov
- Recreational flyers under 49 United States Code Section 44809: https://www.faa.gov/uas/recreational_flyers
- Certificated Remote Pilots, including Commercial Operators flying under 14 Code of Federal Regulations (CFR) Part 107: https://www.faa.gov/uas/commercial_operators
- Educational users: https://www.faa.gov/uas/educational_users
- More complex and advanced operations, such as agricultural aircraft operations under 14 CFR Part 137 or package delivery operations under 14 CFR Part 135: https://www.faa.gov/uas/advanced_operations

If drone operators need relief from regulatory requirements, they may be able to apply for relief from those requirements. For example:

- FAA can grant waivers for certain small UAS operations outside of the 14 CFR Part 107 regulations: https://www.faa.gov/uas/commercial_operators/part_107_waivers
- FAA can also grant exemptions to regulatory requirements on a case-by-case basis: https://www.faa.gov/uas/advanced_operations/certification/section_44807

All drone pilots who are required to register or have registered their drone must operate in accordance with the Remote Identification (ID) rule (14 CFR Part 89).

---

[1] See: https://www.faa.gov/uas/programs_partnerships/beyond

[2] Jay Merkle, Executive Director, Office of UAS Integration, December 9, 2020.

[3] See: https://www.faa.gov/sites/faa.gov/files/uas/resources/policy_library/2019_UAS_Civil_Integration_Roadmap_third_edition.pdf

- Remote ID is the ability of a drone in flight to provide identification and location information that can be received by other parties through a broadcast signal. https://www.faa.gov/uas/getting_started/remote_id

The FAA is continuing to work to advance drone research and development activities. Information on this work and critical partnerships can be found at: https://www.faa.gov/uas/research_development.

FAA's website (https://www.faa.gov/uas) has the latest on drones, and you can follow the FAA on social media as well (https://www.faa.gov/newsroom/stay_connected).

Attachment B-2