



## FAA ATO

### Low Altitude Authorization and Notification Capability (LAANC) Concept of Operations

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Version 1.1

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## Contents

1	Introduction.....	1
1.1	Background .....	1
1.2	Problem Statement .....	1
1.3	Purpose .....	2
1.4	Scope .....	2
2	Referenced Sources.....	3
3	Current Operations.....	4
3.1	Operational Shortfalls .....	4
3.2	Technology Gap .....	5
3.3	Implementation Alternative.....	5
4	Nature of Changes.....	6
4.1	Development and Deployment of LAANC.....	6
4.2	Essential Elements.....	7
4.3	Assumptions and Expectations.....	8
5	LAANC Key Concepts .....	10
5.1	UAS Service Supplier (USS) .....	10
5.2	ATC Displays for sUAS Operations .....	12
5.3	Distribution of LAANC Information to Relevant NAS Users .....	14
5.4	LAANC Roles .....	14
6	Operational Scenarios .....	18
6.1	Scenario 1: Voluntary Notification in Class G.....	18
6.2	Scenario 2: Part 101E Notification near Airport.....	20
6.3	Scenario 3: Part 107 Authorization Under Pre-Approved Altitude .....	23
6.4	Scenario 4: Authorization with FAA coordination .....	27
6.5	Scenario 5: Authorization of Flight Using Multiple Adjacent Polygons .....	31
6.6	Scenario 6: Contingency Operations.....	35
	Appendix A: U.S. Airspace Classification Descriptions .....	36
	Appendix B: Acronyms .....	39

## Index of Figures

Figure 1. LAANC Notional Architecture .....	11
Figure 2. Mockup of an ATC LAANC Data View .....	13
Figure 3: Operator Information Flows .....	15
Figure 4. USS Information Flows .....	16
Figure 5. FAA Information Flows .....	16
Figure 6: Scenario 1 – Part 107 Operation in G Class Airspace .....	19
Figure 7: Scenario 2 – Operation less than 5mi from Airport .....	20
Figure 8: Gridded Facility Map Data for PDX .....	21
Figure 9: PDX sUAS Pre-Authorization Altitude Restrictions in Feet AGL .....	22
Figure 10: Scenario 3 – Authorization for 107 Operation .....	24
Figure 11: sUAS Real Estate Photography .....	24
Figure 12: SFO gridded map system .....	25
Figure 13. SFO gridded altitude restrictions .....	26
Figure 14: Scenario 4 – Part 107 Altitude Not Pre-Approved .....	28
Figure 15: Gridded map system for JFK .....	29
Figure 16: Altitude restrictions JFK .....	29
Figure 17: Scenario 5 – Part 107 Large Area .....	31
Figure 18. Waypoints plotted on map .....	32
Figure 19. MSY Controlled Airspace .....	32
Figure 20. MSY Gridded UASFM Limits .....	33
Figure 21: Operation Bounded by Two Adjacent Polygons .....	34
Figure 22: Scenario 6 – Contingency Operations .....	35

# **1 Introduction**

The Federal Aviation Administration (FAA) is responsible for implementing authorization and notification processes specific to operation of small unmanned aircraft systems (sUAS) – see 14 CFR Part 101.41 and 14 CFR Part 107.41. From an Air Traffic Control (ATC) and Air Traffic Management (ATM) perspective, notification of unmanned aviation activity enables the provision of safe and efficient flight services to all aircraft in the NAS. From a regulatory and safety perspective, notification of unmanned aviation operations provides a means of traceability to (1) inform other NAS users, if needed, of unmanned aviation activity in the vicinity of the airspace in which they are operating; (2) ensure operators are complying and conforming to regulatory standards; and (3) identify and hold accountable those who are responsible during accident/incident investigations.

## **1.1 Background**

The FAA is in the process of determining its approach and business plan to integrate model aircraft, UAS, and sUAS into the NAS. As part of that approach, the FAA is dedicated to ensuring safety requirements are met for integration of unmanned aviation into the NAS, where unmanned aircraft are able to operate safely in the same airspace with manned aircraft. The FAA must ensure that integrated UAS operations meet appropriate performance standards and access requirements. The FAA seeks to reduce barriers to access and provide equitable access to airspace. The FAA's challenge is to foster equitable access for all users and providers while ensuring critical ATC technical and safety requirements are met for NAS operations. In addition, the FAA seeks to foster a free market environment for providers of UAS and related services.

As the FAA and industry move toward integration of all types of UAS into the NAS, the FAA promulgated 14 CFR Part 107. Part 107 contains a regulation that requires receipt of an authorization from the FAA prior to operating in Class B, C, D, or the surface areas of Class E airspace. In addition, Congress specified “model aircraft” may not endanger the safety of the NAS, but are otherwise exempt from aviation regulations as long as such aircraft are flown strictly for hobby or recreational use, are operated in accordance with a community-based set of safety guidelines, weigh no more than 55 pounds, are operated in a manner that does not interfere with and gives way to manned aircraft, and, when flown within 5 miles of an airport, the operator of the aircraft provides notification to the airport operator and the airport ATC tower with prior notice of the operation.

## **1.2 Problem Statement**

The FAA has developed a UAS implementation plan that outlines the long term planning for UAS integration. There is a limited strategy for identifying and inserting technological capabilities into existing FAA systems that would enable safe sUAS operations in accordance with established FAA rules as cited above. The current process for meeting authorization and notification requirements of existing rules is manually intensive, not scalable, and therefore costly. In addition, the time required for authorizations in this manual process is long enough to prevent some time-critical commercial and public sUAS operations.

More automation is needed to support the growing demands for safe and efficient sUAS operations in the NAS. The FAA has limited resources to respond to the need for automation development to support sUAS. At the same time, industry has shown an interest and capability to provide sUAS services as a critical element of future UAS Traffic Management (UTM), a concept which is being developed by NASA.

An aspect of such automation will be information sharing among the various entities responsible for sUAS operations. However, currently there are no conventions or standards for exchanging information between FAA and external entities about sUAS operations. Given the many FAA systems that comprise the NAS and associated support capabilities, conventions for the secure, safe, and orderly exchange of sUAS-related information are needed to enable sUAS operations to scale safely and quickly enough to meet the anticipated rapid growth in demand expected.

### **1.3 Purpose**

The development of a fully functioning and streamlined, user friendly authorization and notification capability is complex and subject to a variety of inputs and coordination points across the UAS community. This document will give stakeholders and leadership the necessary contextual information to understand and provide input on the FAA's Low Altitude Authorization and Notification Capability (LAANC) development, demonstrations, and fielding. A secondary outcome of the demonstration of LAANC will be to validate and inform data exchange for UTM.

### **1.4 Scope**

The scope of this document encompasses the concept of operations for LAANC development and planning, proof of concept, demonstration, and initial fielding ("Phase 1"). This document may reference features and plans for implementation and/or future functionality beyond Phase 1, but such information is subject to change as lessons are learned from Phase 1 activities.

LAANC Phase 1 is constrained in the following areas:

**Policy:** Phase 1 will leverage sending information to authorization and notification UAS Service Suppliers (USSs), allowing them to supply authorizations, and submit operational information back to the FAA. This poses a number of policy and legal issues that will need to be addressed along the way.

**Financial:** The FAA is utilizing internal resources to facilitate the outcome of LAANC as a public-private partnership. LAANC will not involve or result in a government acquisition of software programs or systems. Existing FAA resources available at this time will be adapted to meet requirements that apply to the FAA in the authorization and notification effort outlined herein.

## 2 Referenced Sources

- Federal Aviation Administration, Advisory Circular: 107-2, “*Small Unmanned Aircraft Systems (sUAS)*”, 21 June 2016
- Federal Aviation Administration, “*Integration of Unmanned Aircraft Systems into the National Airspace System, Concept of Operations v2.0*”, September, 2012
- U.S. Government Publishing Office, Code of Federal Regulations, Title 14, Parts 101, Subpart E (“Special Rule for Model Aircraft”) and 107 (“Small Unmanned Aircraft Systems”)
- FAA Modernization and Reform Act of 2012, Pub. L. 112-95 (Feb. 14, 2012)
- FAA Extension, Safety, and Security Act of 2016, Pub. L. 114-190 (July 15, 2016)
- Federal Aviation Administration, Airman’s Information Manual (AIM), December 10, 2015

### 3 Current Operations

Currently there are no means of automated authorization or notification between UAS operators and ATC.

One reason for this is that information needs with respect to UAS operations depend on a number of factors. For example, ATC may require more information about the proposed UAS activity as the risk of the operation increases.

Basic information needs should generally be consistent across operations. However, even for relatively straightforward operations, there are numerous regulatory factors that add to the complexity of automating authorizations and notifications. The following general criteria illustrates the process for identifying whether a given low altitude operation requires notification only or request for ATC authorization.

- a. To be considered a model aircraft operator, the operator must notify an Airport under 14 CFR Part 101E:
  - When the UAS is flown within **five miles of an airport**: the operator of the model aircraft provides the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport) with **prior notice** of the proposed operation.
  - Model aircraft operators flying from a **permanent location** within five miles of an airport: the operator can establish a mutually agreed upon **operating procedure** with the airport operator and the airport air traffic control tower (when an air traffic facility is located at the airport).
- b. For all sUAS operations under 14 CFR Part 107:
  - No person may operate a small unmanned aircraft in Class B, Class C, or Class D airspace or within the lateral boundaries of the surface area of Class E airspace designated for an airport unless that person has **prior authorization** from ATC.

*Note: There is no requirement for authorization in Class G airspace, however notification is required within five miles of an airport regardless of the airspace class in which the airport resides.*

#### 3.1 Operational Shortfalls

The new FAA UAS rules introduced in 2016 address the requirements for operators of sUAS. Recently, the FAA developed an initial set of requirements for both authorization and notification, based on the premise that authorization be automated to the greatest extent practicable. Those operational requirements were delivered under separate cover and provided as information to stakeholders. The current operational shortfalls are inefficient processes for obtaining authorization or notifying ATC of operations, the timeline required to obtain authorizations from FAA, and the growing backlog associated with current processes.

The FAA has established a process for commercial sUAS operators, operating under 14 CFR Part 107 to request a waiver of operation or authorization. A manual form has been



created that allows operators to enter data into the FAA's system. The data is forwarded to a review directorate in FAA. The FAA quotes, "The FAA will strive to complete review and adjudication of waivers and airspace authorizations within 90 days; however, the time required for the FAA to make a determination regarding waiver/airspace authorization requests will vary based on the complexity of the request." Because the FAA's current process depends on a manual review of every request, the time to complete the request is lengthy and costly. Because the review is manual, there is already a backlog in completing the review of requested waivers and authorizations.

Since late 2015, the FAA has registered more than 700,000 hobbyist sUAS operators, with that number expected to grow significantly. The number of sUAS flights is expected to increase dramatically as the new rules expand to enable new types of operations and are further clarified regarding where and how sUAS flights can be conducted. Operators will be seeking ways to fly safely while complying with the governing rules. Processes and electronic systems supporting these rules and associated sUAS operations are needed now.

### **3.2 Technology Gap**

Technologically, UAS operators and the FAA need a streamlined, efficient, solution to enable notification and authorization. At this time, the primary ways in which UAS operators and ATC communicate for the purpose of notification and authorization is through submission of a web form on the FAA website, which then uses other forms of communication to process the data. The FAA is seeking to close the gap of manual versus automated data transfer and authorizations by defining and establishing a technological solution that will allow for data exchange between operators and ATC. A demonstration of an initial solution is envisioned as the first step in closing this technology gap.

### **3.3 Implementation Alternative**

A set of ATC operational requirements for authorization and notification was delivered by AJV-7 in 2Q FY16. The FAA investigated several alternatives to achieving the requirements and in 4Q FY16 issued a request for information (RFI) to gain the industry's understanding with regard to this capability. Based on the results of that RFI, the FAA is currently pursuing a public-private partnership alternative where the FAA establishes data exchange with USSs. In this alternative the FAA provides authenticated map data (see Section 4.2.3), and USSs provide authorization and notification data to the FAA via an automated interface. USSs are encouraged to develop competitive business models for providing services to UAS operators that include access to authorization and notification that is compatible with FAA systems. This partnership relieves the FAA of managing hundreds of thousands of operator accounts and helps create an efficient marketplace for UAS service providers. LAANC is intended for flexible integration with a wide range of USS business models in the evolving UAS services sector.

## **4 Nature of Changes**

### **4.1 Development and Deployment of LAANC**

Low Altitude Authorization and Notification Capability (LAANC) is the broad term for an enterprise capability to automate to the maximum extent possible the ability for FAA to grant authorization to Part 107 operators and to allow model aircraft (Part 101E) operators to notify ATC of planned operations within 5 miles of an airport. LAANC major elements include the FAAs provision of authenticated map data for use in determining authorization, the use of notification and authorization UAS Service Suppliers (USSs) to provide services to operators, and the ability for multiple USSs to provide services. Generally, LAANC should encourage participation of operators in creating an environment of inclusiveness and ease of use.

The development and implementation of LAANC will be done in a phased approach. As such, specific functionality depicted herein may not be incorporated into early phases of LAANC. Wherever possible, it is noted within this document when a feature is envisioned as part of early or late phase functionality.

#### **4.1.1 Summary: Phase 1**

In the first phase of LAANC, the FAA will provide USSs with map information (UAS Facility Maps – UASFMs) and operating rules, and USSs will provide the FAA with notifications and authorizations. The FAA will establish an initial capability to display UAS notifications and authorizations to ATC. Actual implementation in Phase 1 may involve a small subset of ATC facilities to be followed by national deployment. Additionally, Phase 1 will include multiple USSs providing and receiving data, all of which can be integrated for display at single ATC facilities. LAANC Phase 1 will handle automatic authorizations (using the UASFMs) and requests for further coordination with ATC in cases where authorization cannot be provided automatically.

#### **4.1.2 Summary: Phase 2 and Beyond**

Phase 2 is expected to include functionality addressing contingency operations for clearing airspace efficiently. It is also envisioned that Phase 2 will incorporate (among other things):

- associating waivers and sUAS registrations with operations,
- distributing LAANC information to other affected NAS users, and
- handling authorizations and notifications in Department of Defense (DOD) controlled airspace.

In Phase 2 or beyond, LAANC is expected to handle multiple associated vehicles (swarms), distribution of additional flight information (e.g. “FAA Extension, Safety, and Security Act of 2016” Section 2209), and other advanced features to support small UAS operations.

## **4.2 Essential Elements**

LAANC functions at the operational planning stage, identifying intended operations and managing the associated authorizations and notifications. Operators may submit intended operations well ahead of time (e.g. up to 90 days in advance). At a minimum, adequate time for ATC situational awareness is encouraged – for example, submitting operations at least a day or two before the operation commences. Most LAANC information exchanges occur in real time (notifications and automatic authorizations) and provide immediate feedback to operators.

### **4.2.1 Notifications**

*Notifications* are data sent from UAS operators to ATC to provide situational awareness about operation events planned in a particular airspace. Notifications are sent one way from UAS operator to ATC with a USS acting as an intermediary. Notifications may be required (as by Part 101E) or voluntary to improve safety and collaborative use of airspace.

### **4.2.2 Authorizations**

*Authorizations* are data sent to an operator in response to a request asking permission to operate in specific controlled airspace, operating under Part 107 rules. A request for authorization will contain data from a small UAS operator to a USS providing key parameters about an operation. The FAA may approve or deny such requests. LAANC includes a mechanism for automatic authorizations if the area of operation falls below the altitudes specified by ATC/ATM on a UAS Facility Map (UASFM). Otherwise, LAANC facilitates further coordination processes.

### **4.2.3 UASFMs**

*UAS Facility Maps* (UASFMs) are established by FAA facilities to establish the altitude thresholds at and below which sUAS may be granted automatic authorization under Part 107. UASFMs convey a critical element of pre-authorization information. As long as USSs use current and authoritative UASFMs and operate within agreed LAANC rules and processes, they can convey automatic authorizations to operators without case-by-case FAA interposition. Authorizations provided in association with UASFMs must still be transmitted to the FAA, and the FAA retains the prerogative to cancel any such specific authorizations.

UASFMs also serve as a warning threshold for Part 101E operations, as the airspace above automatic authorization limits indicates an area that an FAA facility has identified as potentially active with controlled, manned air traffic.

### **4.2.4 Further Coordination**

*Further coordination* is the term used for the authorization process facilitated by LAANC in cases where automatic authorization cannot be provided. That is, authorization can be requested via LAANC, but the process is not automatic. For example, if a Part 107 authorization request is sent from an operator to a USS, and the planned operation is in controlled airspace but not at or below an altitude limit set in a UASFM, the request cannot be approved automatically. FAA personnel must be involved in approving or

denying the request. The USS can submit the request for further coordination, LAANC will direct it to the appropriate authority, and when a response is available, LAANC will send it back to the USS/operator.

Further coordination requires longer periods of processing time (e.g. hours, days, etc.) than other LAANC processes, depending on the availability of ATC/ATM personnel to consider an authorization request. A response is not guaranteed; unresolved requests will expire if some time limit is reached (e.g. 30 days or 45 days) or if the proposed operational start time becomes imminent. Authorization requests that require further coordination should be submitted with this processing time in mind.

*Note: LAANC further coordination is not the same as a waiver as defined by Part 107 Subpart D. Waivers are not within the scope of LAANC Phase 1. Furthermore, Part 107 requires a waiver for operations above 400 feet. Therefore, LAANC Phase 1 can only provide Part 107 authorizations, whether automatically or by further coordination, for operations at or below 400 feet.*

### **4.3 Assumptions and Expectations**

Following are assumptions set forth to provide industry and FAA with common understanding of expected functionality associated with LAANC. The assumptions include key integration assumptions as well as those specifically applicable to the sUAS operations described in this document.

- 1) LAANC will service the well informed/well intended operator and will actively encourage participation in the FAA's goal of ensuring safe NAS operations for all aircraft types.
- 2) It is expected that the FAA will work with industry partners to establish the LAANC, and conduct a successful proposed solution demonstration, with an understanding that no decisions have been reached on the implementation of LAANC services.
- 3) It is expected that industry stakeholders will collaborate with each other as well as the FAA, through and within workshops, demonstration(s), data exchange partnerships, and in the overall development of the LAANC nationwide solution.
- 4) The use of UASFMs to perform automatic authorization is not a delegation of authority by the FAA to the USS. USSs assist operators to identify pre-approved authorizations as defined by regulations in collaboration with the FAA.
- 5) The pilot in command ("PIC"), i.e. the operator, is ultimately responsible for the operation and safety during flight.
- 6) FAA will supply maps UAS Facility Maps (UASFMs) for pre-determined authorizations via an FAA ArcGIS interface in GeoJSON format. Distribution of map data will be separate from the application programming interface (API) for LAANC data exchange concerning operations. Use of the UASFMs for issuing

authorizations must be in conjunction with a Memorandum of Agreement with the FAA and having completed an onboarding process.

- 7) FAA will supply airspace class designations and airport locations.
- 8) LAANC APIs will be limited to the smallest function practicable (e.g., via “micro web services”) to ensure scalability and flexibility. APIs will be versioned to accommodate additional phased capabilities as they are introduced.
- 9) For the purposes of communication between ATC and operators during flight events, a valid U.S. phone number point of contact that can be used to reach the operator at any time during flight operations will be required for all notifications and authorizations submitted to the FAA from any USS vendor in line with FAA’s Form 7711-2 process (Certificate of Waiver or Authorization Application).
- 10) Normal FAA communication with operator/users (for manual authorizations, contingencies, etc.) is anticipated to be conducted through LAANC via the USSs. By exception, the FAA may circumvent the USS when necessary to conduct direct communication via voice or text to the operator/user.
- 11) Any individual authorization or notification applies to one pilot in command flying one unmanned aircraft at a time during the operational window. Multiple pilots flying multiple UAS simultaneously require separate authorizations/notifications. (Future LAANC development may offer more complex authorization/notification representations, but until such time, the above scope definition is in effect.)
- 12) USSs are responsible for managing requests from operators in potentially large numbers. Accordingly, there is no maximum number of authorization or notification records the FAA will accept from a USS per day. The FAA will directly interact with operators to perform authorization/notification on an exception basis only.
- 13) If applicable, a USS may choose to utilize an operator’s registration number(s) when a flight request is entered. However, registration numbers will not be dynamically verified or pulled from FAA records or data sources. There will be no dynamic connection between USS systems and the FAA sUAS registration for Phase 1 of LAANC.
- 14) USS vendors will send the FAA a copy of all notification and authorizations provided from operators and provide operators confirmation of FAA receipt. USS vendors will share data with the FAA upon request for records of denials and operator requests that were above approved altitude boundaries.

## 5 LAANC Key Concepts

Automated transfer of information is essential to facilitate hobbyist and sUAS operator submission of all required flight information, retrieval of that information by ATC facilities and/or other FAA personnel, and provision of feedback from ATC to the UAS operator if necessary.

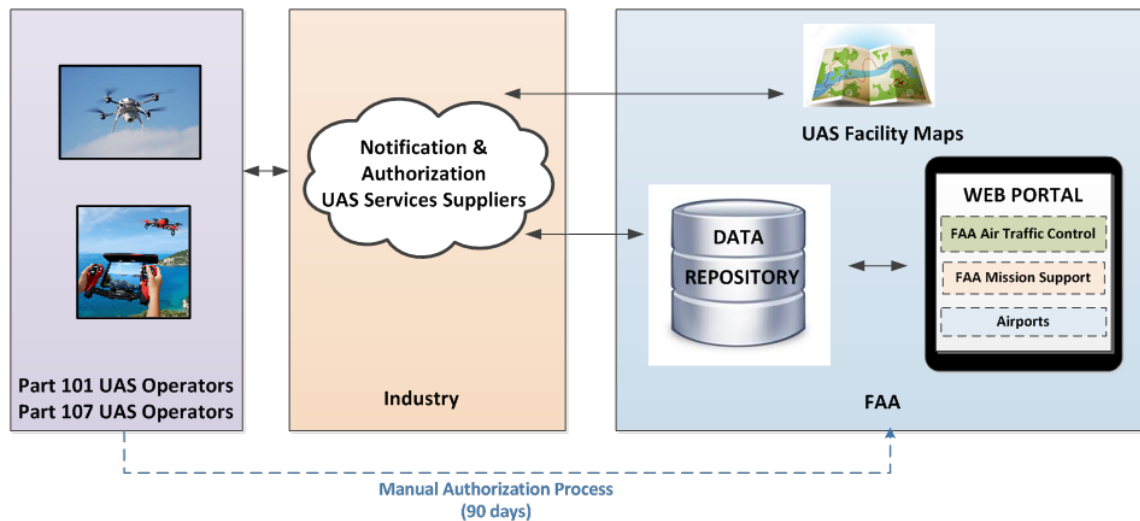
### 5.1 UAS Service Supplier (USS)

The FAA is pursuing the provision of LAANC services using private USSs to provide services specific to sUAS operations. Such services would be accomplished through an exchange of information between the FAA and the USS, whereby the USS would be the primary interface to the operator. The USS would use FAA UAS Facility Maps (UASFMs) and operating rules provided by the FAA to convey the automatic authorization of sUAS operations in a given area, at a particular time, under a set of conditions.

LAANC operational requirements call for an automated ATC authorization and notification system or service that would eliminate the need for operators to call ATC directly or make requests via the FAA's webpage, and would limit overall operator interaction with ATC. This requires the system/service to incorporate the following information:

- Available projected information on airspace status (e.g., Controlled Airspace, Special Activity Airspace)
- UAS Facility Maps (UASFM) that indicate pre-authorized altitude thresholds
  - Within each grid on the map, FAA would identify maximum altitudes at which flight is authorized without further coordination.
  - Airspace at or below the maximum altitudes would be “pre-approved fly zones” (automatically authorized) and airspace above the maximum altitudes would require further ATC coordination.
- Other “areas that require further ATC coordination” designated outside of airport-specific maps.

A notional architecture is shown below in Figure 1.



**Figure 1. LAANC Notional Architecture**

The operator may use the USS’s system to determine the feasibility of his/her proposed flight operation as a planning function. Based on the operator’s input for proposed operating area, altitude, date, start time, and duration, the USS would determine whether each proposed flight operation falls within pre-authorized airspace or requires further coordination. The USS may provide information to an operator for the following:

- (a) Five miles of an airport, or within Class B, C, D, or Class E surface area;
- (b) Any airport-specific “areas that require further ATC coordination”;
- (c) Special Use Airspace (SUA) where operations are prohibited; and
- (d) “No-fly zones” (outside of airport-specific maps, e.g. Temporary Flight Restrictions – TFRs).

### **5.1.1 Voluntary Notification**

If ATC authorization and/or notification is not required, the operator (or designee) may nonetheless voluntarily submit their proposed flight information through the LAANC. If no airspace restrictions exist, the system will provide confirmation to the operator that the flight information has been received and a record will be submitted to the FAA.

### **5.1.2 Required Notification**

If ATC notification is required (Part 101E), the operator (or designee) may submit their proposed flight information to a USS. The USS will check if a notification is required based on whether or not the operation falls within a 5 miles of an airport (per Part 101E). If notification is required, the USS will facilitate the submission of the notification via its LAANC API with the FAA.

*Note: Whether notification is required or not, Part 101E operations that are planned for airspace above a UASFM threshold may be subject to a warning commensurate with the*

*risk of operating in an area that is specifically associated with manned, controlled operations by an FAA facility.*

### **5.1.3 Required Authorization**

If ATC authorization is required (Part 107), the operator (or designee) may submit their proposed flight information to a USS. Using the available UASFM, the USS will determine if an operation can be automatically authorized. If so, automatic authorization is provided to the operator, submitted to the FAA, and the FAA internally makes that information available to ATC at the affected facilities.

If the operation is planned for an area and altitude that is not pre-authorized according to a UASFM, and outside of airspace where operations are prohibited or require a waiver, then authorization via LAANC is still possible but requires further coordination. The USS makes LAANC further coordination processes an option available to the operator, with the understanding that further coordination requires the consideration of ATC personnel and a response will not be immediate. Further coordination requests for authorization are submitted via LAANC and forwarded to the appropriate ATC authorities. Resources permitting, these authorities can provide authorization or denial electronically back through the USS to the operator.

If the operator (or designee) submits their proposed flight information, and the operation is within a volume in which operations are prohibited (e.g. due to a TFR), the USS will identify this and automatically deliver a message denying the operation.

If the operation has been authorized, either using authoritative maps (UASFMs) or by appropriate ATC authorities (further coordination), the UAS operator may proceed to operate within the authorized parameters.

*Note: The FAA anticipates continuing the current process of manual direct coordination between operators and the FAA in parallel with LAANC. That process is envisioned to remain in place as LAANC is introduced and after LAANC is fully operational. Future demand on the manual process is expected to decrease as a result of deploying LAANC.*

## **5.2 ATC Displays for sUAS Operations**

Designated ATC/ATM personnel will have access to an FAA-generated report of approved authorizations (part 107) and notified (part 101E) sUAS operations, with selectable timeframes and location. UAS authorizations and notifications will be displayed showing approved and pending operations.


Some fields will be filterable by facility or airport location, but all locations will be available to authorized personnel for viewing across regions or nationwide. The affected airport(s) for which the notification is intended for will be shown using the airport id referenced by FAA. LAANC interface to ATC will be tailored to applicable FAA procedures.



Each notification or authorization flight record is anticipated to include a specified point/radius or polygon of the flight operations. A link to a static map picture of the specific operation may be provided reference the center point of the affected airport. Finally, contact information ATC can use to contact the operation POC will be provided as part of the initial view designs for use by ATC. A concept of a proposed data view is shown in Figure 2.

3/14/2017

Low Altitude Authorization and Notification


**Federal Aviation  
Administration**

### Low Altitude Authorization and Notification

[DATA](#)
[MAP](#)

FILTER

TYPE	TIMEFRAME	DURATION	STATUS	FACILITY	ARP FRD	ALTITUDE	RADIUS	LINK	FLID	CONTACT
▲										
101	1500	10m	pending	SFO	SFO090003	005	3	<a href="#">map</a>	UAS002	355-555-1212
101	0930	12m	approved	SFO	SFO090005	210	3	<a href="#">map</a>	UAS003	355-555-1212
101	0840	19m	approved	DFW	DFW090003	300	3	<a href="#">map</a>	UAS004	355-555-1212
101	1900	15m	pending	JFK	JFK090003	390	3	<a href="#">map</a>	UAS009	355-555-1212
101	1100	17m	pending	LAS	LAS090003	140	3	<a href="#">map</a>	UAS010	355-555-1212
101	1700	10m	approved	SFO	SFO090003	260	3	<a href="#">map</a>	UAS011	355-555-1212
107	1600	53m	approved	PHL	PHL180002	220	5	<a href="#">map</a>	UAS001	555-555-1212
107	1030	23m	approved	DFW	DFW090004	200	3	<a href="#">map</a>	UAS005	355-555-1212
107	0700	11m	approved	LAX	LAX090003	030	3	<a href="#">map</a>	UAS006	355-555-1212
107	0500	21m	pending	LAX	LAX090003	120	3	<a href="#">map</a>	UAS007	355-555-1212

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**Figure 2. Mockup of an ATC LAANC Data View**

It is anticipated that the ATC interface will be presented as a Geographic Information System (GIS) formatted display. GIS information about authorized and/or notified flight operations may be displayed as a data overlay to existing UASFM map data. There are several options for display of this information, including potential use of the UASFM showing authorized quadrants, local facility VFR maps, and geographic maps. For example, it is anticipated that ATC personnel may be able to select an area of the map,

and by adjusting a radial distance from an airport, see all notifications and authorizations for operations in and around an affected airport. The display of sUAS data shown may show graphics representing the submitted airspace volume for each UAS in the vicinity with information including time of flight, unique identifier, and phone number associated with the record. Initial iterations of the map may show authorization and notification information by map quadrant.

### **5.3 *Distribution of LAANC Information to Relevant NAS Users***

In the interest of safe operations, as much UAS flight information as possible should be submitted via LAANC. Ideally, all NAS airspace users should have access to situational awareness information about UAS flights relevant to them. Disseminating UAS activity to other airspace users ensures safety of flight as UAS present additional safety concerns due to the ranges of UAS physical, flight performance, and operational characteristics that vary significantly from manned aircraft.

LAANC capabilities in this regard will be the subject of development extending beyond Phase 1. LAANC information could be disseminated via USSs, where those USSs share information with each other, could be done through FAA central distribution of collected information, or both. Such information could be sanitized to remove proprietary, personal, or secure information. Sanitized information would provide sufficient data to provide situational awareness to other sUAS or manned aircraft in the area.

The most immediate affected party within this area of LAANC information distribution capabilities is the airport operator. Part 101E requires that the airport operator (in addition to ATC) be notified of sUAS operations within 5 miles. As part of Phase 1, it is envisioned that the FAA will provide airport operators with some centralized access to the relevant notifications across all operators/USSs. The details of this mechanism have not been determined.

Users of the NAS vary considerably. In this context, NAS users include commercial sUAS operators, model aircraft operators, general aviation (GA) airspace users, and commercial carriers. NAS users are required to review published notification information for relevant UAS activity along their intended routes of flight. For this information to be accurate and timely, UAS operators are responsible for adhering to regulations and following proper authorization and notification procedures. This includes ensuring that information accurately reflects their proposed operation, and that operations do not occur outside of the parameters of their authorization/notification.

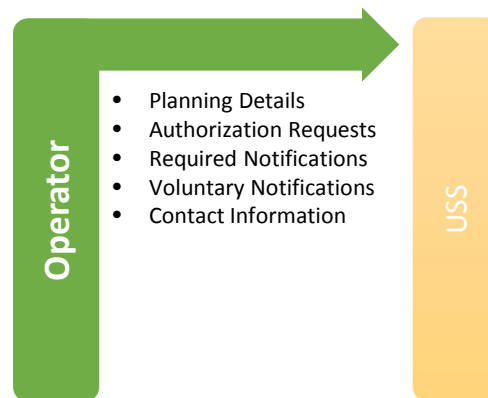
### **5.4 *LAANC Roles***

There are three primary roles defined for the LAANC concept: UAS Operator, USS, and FAA. Intermediary roles may develop over time, but for the purposes of the general concept, these are the primary roles.

### 5.4.1 UAS Operator

Operators are individuals who pilot a UAS, who must follow the rules outlined in 14 CFR part 107, 14 CFR Part 101E, or a certificate of authorization the FAA has issued to them. Operators submit required (and potentially voluntary) UAS operations information to a USS.

Operators provide information to a USS as shown in Figure 3 below.



**Figure 3: Operator Information Flows**

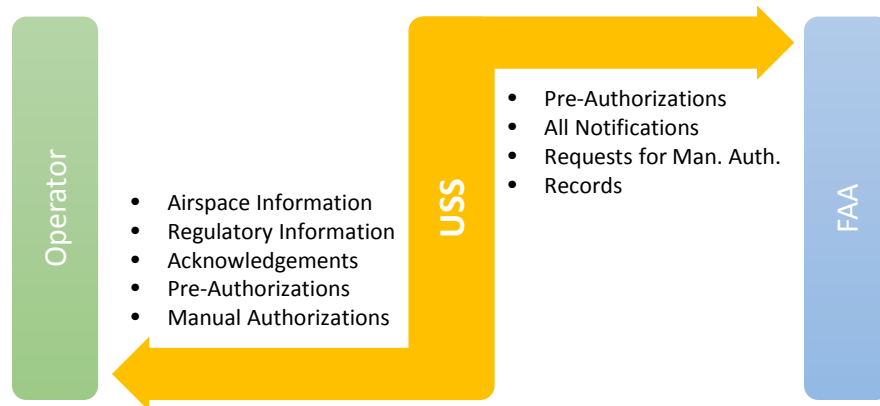
### 5.4.2 UAS Service Supplier

USSs will provide authorization and notification communication services between operators and the FAA. USSs are expected to be private entities, such as corporations. They provide the primary interface to the operator via system application software that is likely to include mobile applications. USSs will use FAA UASFM data to automatically provide, where feasible, confirmations of authorizations to UAS operators. Each USS will obtain UASFMs from a designated repository (currently [uas.faa.opendata.arcgis.com](https://uas.faa.opendata.arcgis.com)) managed by the FAA aeronautical information service organization (AJV-5). The USS will provide mechanism to ensure that the map in use is the most current map available from the FAA prior to authorization and will provide version information to the FAA with each authorization record provided to the FAA.

The USSs will manage and store all the records of authorization and notification requests in protected areas based on SORN (Systems of Records Notices) requirements. The USS will send authorization and notification records to the FAA. Finally, the USS will manage Part 107 operator requests for manual authorization after automatic denial has been provided.

The governance model for USSs is in development. All interfaces to the FAA where a USS is exchanging information with the FAA will be tested, proven, controlled and securely managed. The FAA will establish an onboarding process to allow new entrant USSs to connect to the API. In addition, a mechanism might be developed whereby the services provided by a USS will be monitored for performance and to collect metrics (e.g.

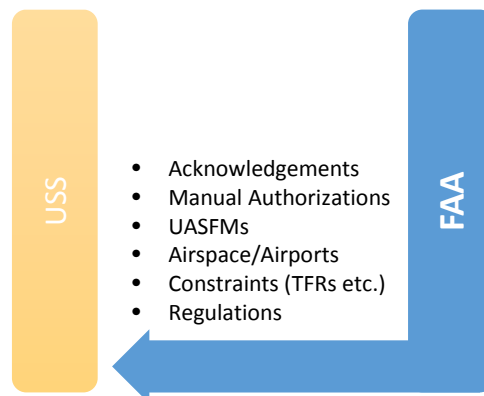
numbers and types of authorizations processed and associated error rates). Information exchanges between the USS and operators and the FAA are shown in Figure 4.



**Figure 4. USS Information Flows**

### 5.4.3 FAA

In the operating concept, the FAA will provide an API for processing to and from the USS. The FAA will also provide processing services to display information to meet the FAA users' needs (e.g. ATC). Internal to the FAA, the API serves as a routing function for display and storage. The basic exchange of information is shown in Figure 5.



**Figure 5. FAA Information Flows**

In the operating concept, air traffic control personnel at a facility will have an ability to see authorizations and notifications processed by a USS and sent to FAA. The method(s) of providing authorization and notification information to ATC personnel and the associated operational procedures are in development.

Beyond Phase 1, LAANC will incorporate enhancements related to waivers and contingency operations. USS will not be able to process waivers, but will have an ability to allow the operator to enter the waiver information for FAA review. ATC personnel at affected facilities will be provided with an ability to override requested operational actions. ATC personnel will have the ability to review all authorizations and notifications

affecting their respective airspace and will have the ability to reject, accept, acknowledge, or perform additional review.

## 6 Operational Scenarios

Scenarios in this section do not represent an exhaustive list of authorization and notification challenges that will be addressed by implementation of the LAANC system. The urgent need for an initial LAANC solution to enable time sensitive operations and expedite the authorization process has required prioritization of scenarios that will guide stakeholders in early development. The FAA will focus efforts to establish requirements for the LAANC system using the scenarios below. Through workshops and continued collaboration with industry and other government organizations, including NASA, the FAA will solicit feedback and refine scenarios to be prioritized as the LAANC demonstration and implementation effort progresses.

*Note that scenario descriptions are not comprehensive.* Details may be included in one scenario and not another for the purposes of brevity and minimal redundancy. Also these scenarios do not represent every permutation of operations that LAANC must handle, even in Phase 1. Scenarios may be added and/or modified as LAANC development continues.

*Note also that scenario descriptions are not equivalent to requirements.* In general, scenario descriptions provide nothing more than a detailed example that is compatible with the LAANC concept. Requirements associated with any part of LAANC (USS, FAA, operator, etc.) are or will be explicitly documented outside of this Concept of Operations.

### 6.1 Scenario 1: Voluntary Notification in Class G

#### 6.1.1 Operator & Airspace

Part 107, Class G, further than 5mi from any airport.

#### 6.1.2 Overview

An operator wants to conduct aerial photography for a real estate agency. This is a Part 107 operation in Class G airspace. The operator will be compliant with all provisions of Part 107, in that the operation will be during daylight, VLOS, not over people, below 400ft AGL. The operator under this scenario decides to provide “Voluntary Notification” because no authorization is required in Class G airspace and no notification is required outside of 5 miles from Airport Reference Point (ARP), the center of the airport. Figure 6 illustrates the operation.

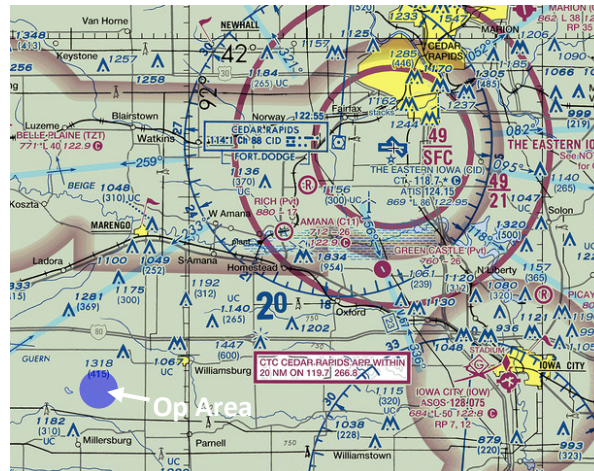


Figure 6: Scenario 1 – Part 107 Operation in G Class Airspace

### 6.1.3 Description of Activities

Prior to the operation, the FAA provides an authoritative map source identifying controlled airspace (including classifications) and airport locations. (This is separate from the UASFM, which indicates where a sUAS may be automatically authorized to fly. In this scenario, the planned operation is outside of controlled airspace, therefore no gridded UASFM threshold data is needed.)

The operator logs into the USS (that is, identity is authenticated) and the USS provides an interface that allows the operator to plan a flight. The USS is expected to provide the means for an operator to view areas of planned flight using a latitude/longitudinal reference mapping system. The mapping system is expected to depict the terrain and accompanying major natural and man-made features of the terrain. The operator enters the information for this proposed flight: Part 107, located at 41°37.90'N 92°10.46'W with a 2mi radius, ≤400', starting tomorrow at 9am with a 1hr duration.

In this scenario, the Part 107 operator receives a message from the USS that states *“No authorization is required in this airspace – you may voluntarily submit a notification of your intent to fly”* (or similar language).

The operator indicates the desire to submit a voluntary notification. The operator also provides a contact number that ATC can use if needed. (This number may be explicitly entered or pulled from the USS’s operator profile – a variety of designs could suffice.) The USS then provides the operator with an acknowledgement message that might state *“Thank you for submitting your notification of intent to fly.”*

The USS submits the notification to the FAA with all required operational details through the FAA-provided API using the appropriate published format. Note concerning the operator’s provided phone number: The FAA does not envision collecting personally identifiable information (PII) for its use, but does require a method to communicate with

the operator directly. Included in the submission is a unique identifier for tracking and communicating concerning the operation. (The scheme for this identifier is under development.)

Voluntary notification data is retrievable by ATC at the nearest airport(s) and other facilities on demand. The retrieved information is provided to ATC as a listing, showing voluntary nature of the notification and all relevant flight information. The FAA envisions filtering mechanisms for ATC to enable/disable views for voluntary notifications, and to tailor the views of the data, such as filtering for voluntary notifications based on distance from the airport(s). FAA will be responsible for developing and maintaining its data display capabilities that would make use of the data received from the USSs.

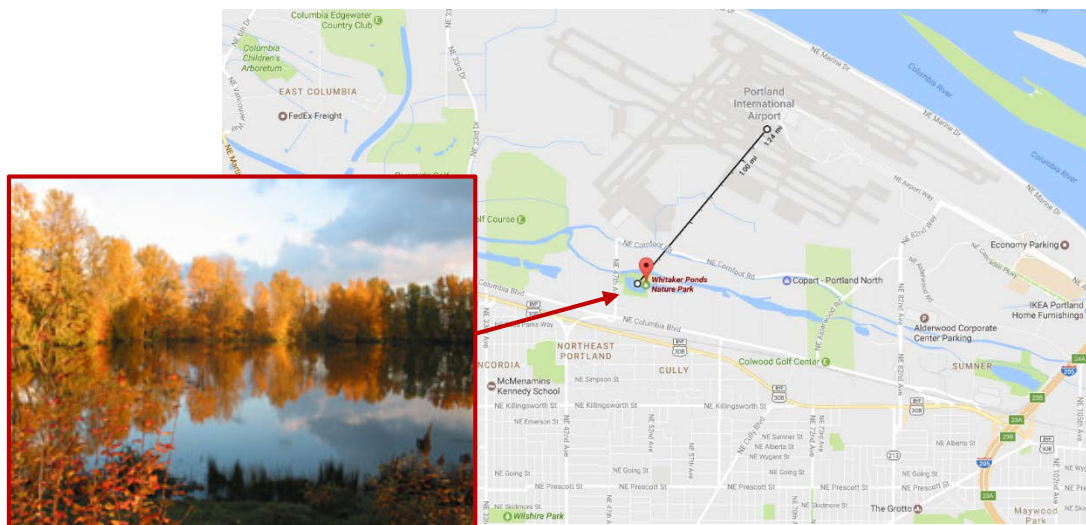
## **6.2 Scenario 2: Part 101E Notification near Airport**

### **6.2.1 Operator & Airspace**

Part 101E, Class C, less than 5mi from airport center point.

### **6.2.2 Overview**

A hobbyist operator wants to take photos of Whitaker Ponds Nature Park near Portland International Airport (PDX). This is a Part 101E operation about a mile from the PDX center point in Class C airspace. This operation fulfills the definition of “model aircraft” pursuant to 14 CFR Part 101.41. Operator must notify ATC and airport operator of pending operation. Figure 7 illustrates the scenario.



**Figure 7: Scenario 2 – Operation less than 5mi from Airport**

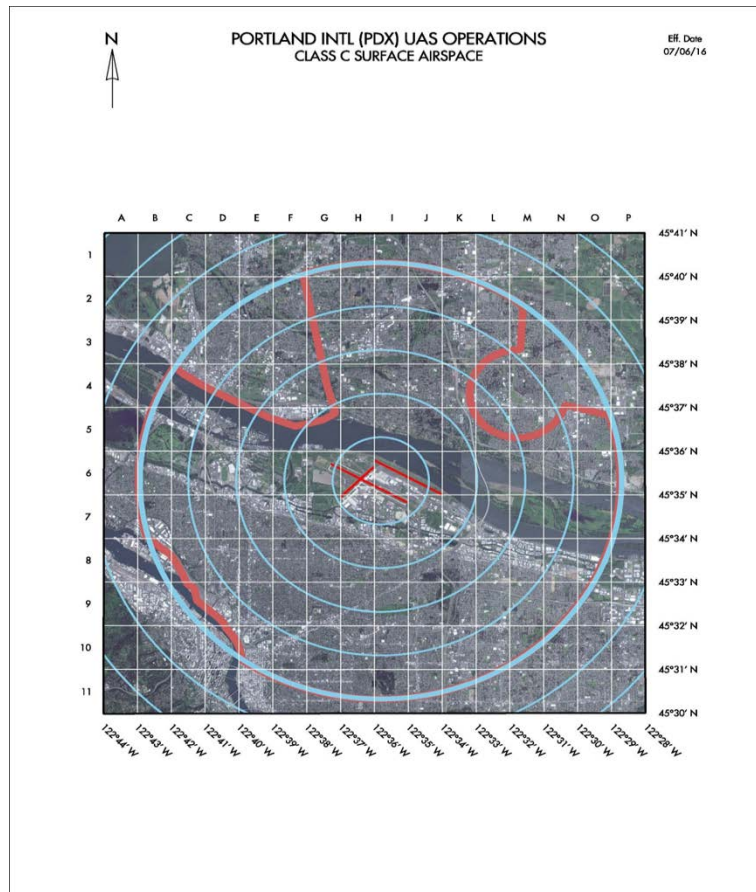
### **6.2.3 Background: PDX UASFM**

The FAA provides UASFM data via the ESRI ArcGIS API. That data includes a grid reference system for areas within controlled airspace. The gridded map system indicates



where a sUAS operation may be automatically authorized to fly (under Part 107), along with the automatically authorized altitudes within the grid elements. The FAA anticipates the gridded map data may also be applied to Part 101E operations – not for authorizations, but rather to generate intelligent warnings in areas that have been designated by ATC as requiring manual authorization (that is, ATC expects conventional traffic in the airspace). In this case, there is UASFM data associated with PDX.

The gridded map data for PDX, showing the 0AGL flight (i.e. “no fly”) and other areas on the grid where flights are allowed and their corresponding heights in “above ground level” are shown in Figure 8 and Figure 9. The coordinate gridding system used in both figures is the same.



**Figure 8: Gridded Facility Map Data for PDX**

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1							400	400	400	400	400					
2				100	100	100	400	400	400	400	400	400	400			
3			50	0	0	0	0	400	400	400	400	400	400			
4		0	0	0	0	0	0	0	0	0	0	200				
5		400	200	0	0	0	0	0	0	0	0	0	200	200	400	
6		400	400	200	0	0	0	0	0	0	0	0	0	0	0	0
7		400	400	400	200	0	0	0	0	0	0	0	0	0	0	0
8		400	400	400	200	0	0	0	0	0	0	0	0	0	0	0
9		400	400	0	400	400	400	400	400	0	0	200	200	200	0	
10				400	400	0	400	0	400	400	400	400	400	400		
11					400	400	400	400	400	400	0	400				

**Figure 9: PDX sUAS Pre-Authorization Altitude Restrictions in Feet AGL**

#### 6.2.4 Description of Activities

The operator logs into the USS system and the USS provides an interface to an operator that allows the operator to plan a flight. The operator enters the information for this proposed flight: Part 107, within 0.2mi of the center of Whitaker Ponds Nature Park,  $\leq 100'$ , starting at 4pm today with a 1hr duration. The USS may offer a variety of user interface features, but in this case, the interface might facilitate searching on “Whitaker Ponds Nature Park” and graphically defining a 0.2mi radius that does not extend onto PDX property.

The USS mapping system is expected to depict the terrain and accompanying major natural and man-made features of the terrain. The USS planning tool will also depict features relevant to UAS flight such as classes of airspace, distance from airport, any active temporary flight restriction (TFR), obstacles, or other restricted airspace (e.g., public utilities). In addition, any specific notes concerning the airport that may be helpful in the area of flight should be portrayed (e.g. PDX-specific requirements for contact or special notices of weather or other hazard.)

The USS checks against airport locations and finds that, not surprisingly, the operation is within 5mi of PDX. The sUAS operator is provided with a message that states ***“This operation is within 5 miles of an airport (PDX) and a notification of your intent to fly is required”*** (or something similar).

The USS also checks the PDX UASFM and finds a 0’ threshold for pre-authorizations. Although authorization does not apply to this situation (a Part 101E operator), it is an indicator that the airspace to be used is actively used by manned aircraft and therefore the risk to safety is higher. The UAS provides a message similar to: ***“Warning: Operating a UAS in this area constitutes a hazard to the National Airspace System. Operators who create a hazard to the NAS may be subject to civil penalties of up to \$32,666”*** The details of this warning mechanism are to be determined between the USS and FAA. It could be a single warning (e.g. at submission), a staged series (e.g. notification during planning, warning at submission), or some other approved method that meets the intended purpose.

Note: if the applicable UASFM threshold were higher than 0', the USS could go a step further in assisting the operator by identifying the maximum altitude that would avoid exceeding the pre-authorization limit (resulting in a safer operation).

The operator submits the notification. The USS provides an acknowledgement, such as *“Thank you for notification of your intent to fly in the PDX area.”*

The FAA will store the record of notification as a submittal with all provided data fields. FAA will be responsible for developing and maintaining its data display capabilities that would make use of the data received from the USSs.

After reception by the FAA, the notification data is retrievable by ATC and the airport operator at the nearest airport(s) to the planned flight (in this case, PDX). (The mechanism for airport operator access may not be defined in Phase 1.) The retrieved information shows the notification and any relevant flight information. The information is displayed on an internet-based application on the mission support network for situational awareness only. At some point (possibly Phase 1), the FAA envisions a graphical GIS based interface for ATC for UAS flights with relevant information. The FAA envisions that notifications within 5 miles of an airport will automatically display as a notification to ATC. The FAA also envisions that ATC can expand the variable distance from the airport to show additional information.

### **6.3 Scenario 3: Part 107 Authorization Under Pre-Approved Altitude**

#### **6.3.1 Operator & Airspace**

Part 107, Class B, below UASFM pre-approved altitude.

#### **6.3.2 Overview**

The operator wants to take pictures for real estate purposes. This is a Part 107 operation, some 2mi from the SFO ARP, in Class B airspace. The operation is compliant with all subparts of Part 107: daylight operations, VLOS, not over people, below 400ft AGL. The applicable ATC pre-approved altitude threshold is 100ft. Figure 10 and Figure 11 illustrate the scenario.

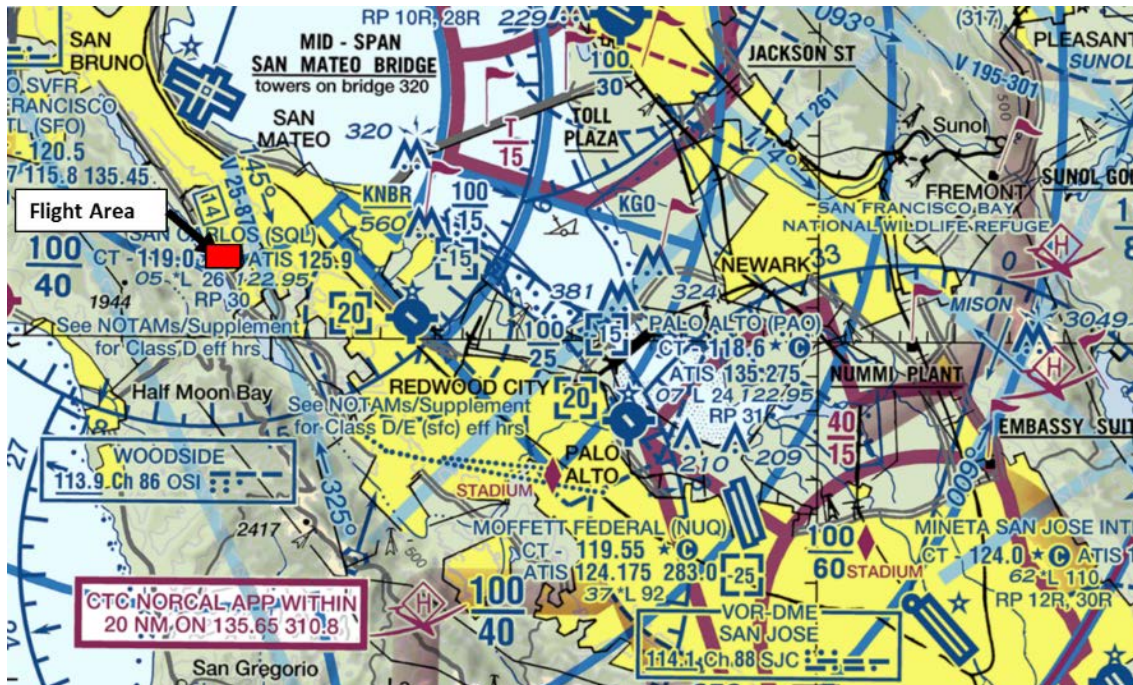


Figure 10: Scenario 3 – Authorization for 107 Operation



Figure 11: sUAS Real Estate Photography

### 6.3.3 Background: SFO UASFM

The FAA provides UASFM data for airports – in this case, SFO. Note that this operation is near other airports as well: San Carlos (SQL), Palo Alto (PAO), Moffett Federal (NUQ). However, we assume in this scenario that the FAA has designated SFO as the UASFM authority for the area in question. The gridded UASFM map indicates where a sUAS may be automatically authorized to fly, based on authorized altitudes within the grid elements.

The gridded map data for SFO showing the 0AGL flight (i.e. “no fly”) and other areas on the grid where flights are allowed and their corresponding heights in “above ground



level” are shown in Figure 12 and Figure 13. The coordinate gridding system used in both figures is the same. The area of this operation has a pre-authorization threshold of 100’.

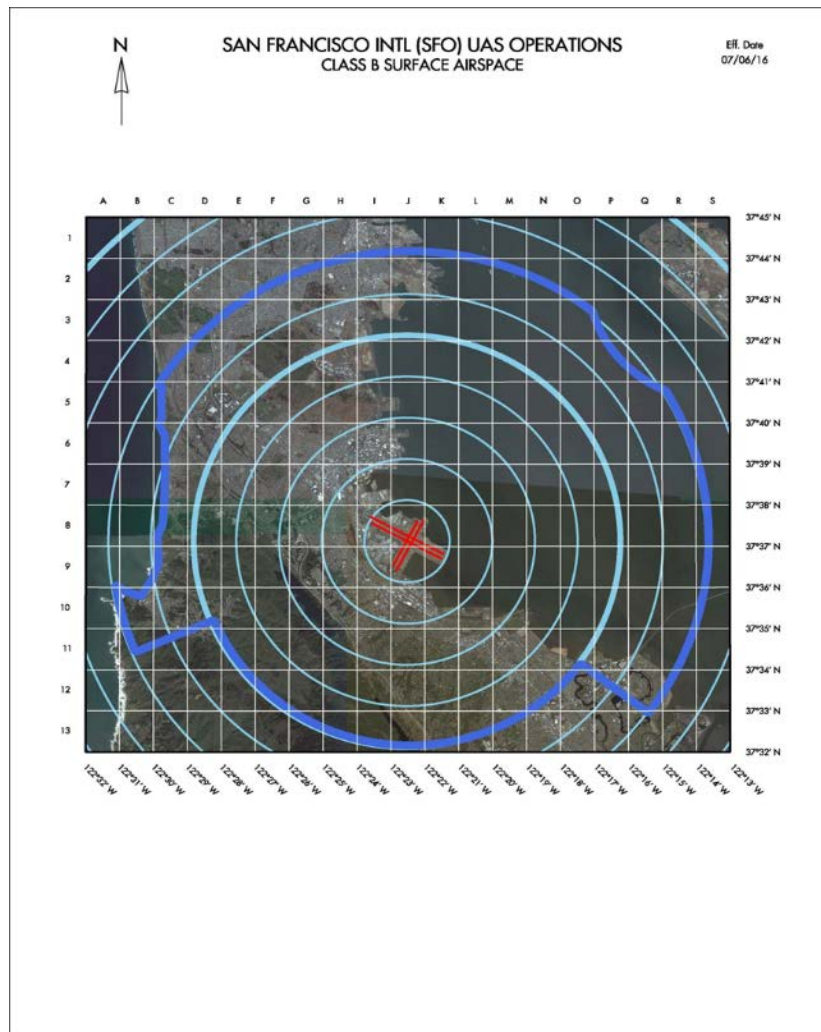


Figure 12: SFO gridded map system

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1								0	0	0	0	0							
2					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8			0	0	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	100	100	100	100	0	0	0	0	0	0	0	0	0	0	0
11		0	0	0	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0
12					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13							0	0	0	0	0	0	0	0	0		0		

Figure 13. SFO gridded altitude restrictions

#### 6.3.4 Description of Activities

The operator logs in and uses the USS planning interface, which could depict the terrain and accompanying major natural and man-made features of the terrain, classes of airspace, distance from airport, any active temporary flight restriction (TFR), obstacles, and other restricted airspace (e.g., public utilities).

The operator provides the operational details: Part 107,  $\leq 100'$ , starting at 11am for 2hrs the following day. This operator also uses a feature of the USS interface that specifies the operating area using a polygon (in this case, a rectangle). (Polygon definitions of operating regions are submitted to the FAA in GeoJSON format.)

The USS checks against airspace and airports. Noting the airspace classification, the operator provides a message to the USS such as ***“An FAA airspace authorization is required to fly in this controlled airspace.”*** Noting that the maximum altitude is at or below the applicable UASFM threshold, the USS further provides, ***“This operation as described is eligible for automatic Part 107 authorization.”***

Note: During the planning and entry of data, the operator may be provided additional guidance about the flight based on the location and any altitude restrictions which may lead to additional interaction with Air Traffic Control. For example, SFO might require operators to call before flying in their airspace (a site-specific form of notification) even if they have a pre-approved authorization.

The operator initiates submission of the authorization request, and the USS, based on the UASFM data, responds with acknowledgement of automatic authorization. The USS conveys relevant authorization information similar to that which is included in the manual authorization process in an authorization message to the operator and retain a

copy of the necessary information on record to be transmitted to the FAA. An example of an encapsulated authorization may read as follows:

*Operation Authorized – Unmanned Aircraft Systems operation on dd/mm/yy between the hours of 11:00 and 13:00 local time in accordance with Title 14, CFR Part 107, except “operations for small unmanned aircraft” Part 107.51 b(2) are limited to the altitude listed below: Class B, at or below 100 Ft. AGL within the identified airspace boundary, under the Jurisdiction of KSFO. During the operation, the operator will continuously be available at 650-821-9xxx. Additional Conditions specific to this flight: operator will contact SFO ATC at 650-821-xxxx within 30 minutes of flight. This authorization does not relieve the pilot in command from responsibility to check the airspace they are operating in and comply with all restrictions that may be present, such as 14 CFR 107.45 and 107.49 (a)(2) which requires adherence to prohibitions of entry into certain airspace.*

The USS provides a record of the authorization to the FAA via the USS-FAA LAANC API. The FAA stores the record of authorization approval.

The authorization data is retrievable by ATC and airport operators (beyond Phase1) at the nearest airport(s) to the planned flight. This includes SFO, of course, which is the designated facility for pre-approved authorizations in this area. It also includes SQL, PAO, and NUQ, which may need situational awareness of the flight to maintain safe manned operations. The USS does not need to make multiple submissions if there are multiple affected facilities in the area. One authorization or notification submission to LAANC is directed to as many operational stakeholders as warranted for safe operations.

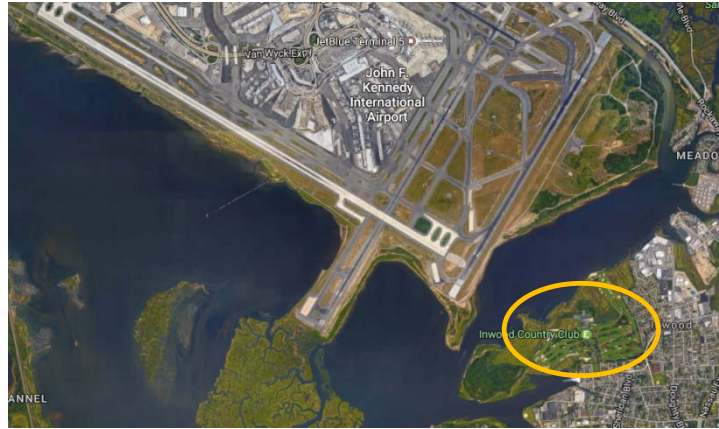
## **6.4 Scenario 4: Authorization with FAA coordination**

### **6.4.1 Operator & Airspace**

Part 107, Class B, and above UASFM pre-approved Part 107 altitude for operation at that location.

### **6.4.2 Overview**

Inwood Country Club is conducting analysis to determine the ecological impact caused by Jamaica Bay. An associated operator wants to conduct a Part 107 flight about 2,000' from JFK in Class B airspace. The operation is compliant with all provisions of Part 107: daylight operations, VLOS, not over people, at or below 400' AGL. However, it is not a pre-approved altitude for operation location. The operational scenario is illustrated in Figure 14.

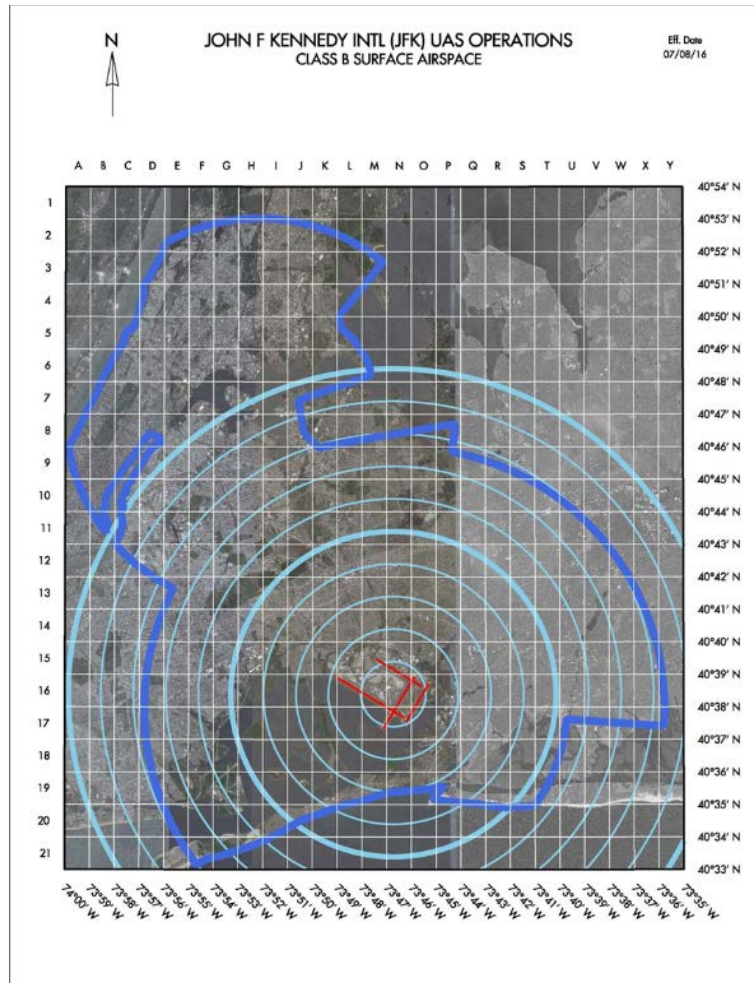


**Figure 14: Scenario 4 – Part 107 Altitude Not Pre-Approved**

### **6.4.3 Background: JFK UASFM**

The pre-authorization gridded map data for JFK showing the 0AGL flight (i.e. “no fly”) and other areas on the grid where flights are allowed and their corresponding heights in “above ground level” are shown in Figure 15 and Figure 16. The coordinate gridding system used in both figures is the same.





**Figure 15: Gridded map system for JFK**

	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
3																			
6																			
7																			
8																			
9	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
10	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
11	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
12	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
13	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400
14	400	400	400	400	400	400	100	0	0	0	0	0	100	250	400	400	400	400	400
15	400	400	400	400	300	100	0	0	0	0	0	0	100	400	400	400	400	400	400
16	400	400	400	400	300	100	0	0	0	0	0	0	50	400	400	400	400	400	400
17	400	400	400	400	300	100	100	0	0	0	0	0	100	400	400	400	400	400	400
18	400	400	400	400	300	300	400	400	0	0	0	0	400	400	400	400	400		
19	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400	400		
20	400	400	400	400	400	400													
21	400	400	400	400															

**Figure 16: Altitude restrictions JFK**

#### 6.4.4 Description of Activities

The operator logs into the USS and USS provides the means for an operator to view areas of planned flight using a latitude/longitudinal reference mapping system, including terrain, airspace classes, airports, TFRs, obstacles, etc. In addition, any specific notes concerning the airport that may be helpful in the area of flight should be portrayed (e.g. JFK specific requirements for contact or special notices of weather or other hazard.)

The operator enters the applicable information: Part 107, in a defined polygon area near at 40°37.220'N 73°45.64'W, ≤100', from 3pm-5pm, in 10 days time.

Based on the proposed operational information (and the JFK UASFM), the USS might provide the operator with a message that states ***“An authorization is required to fly in this controlled airspace. The operation exceeds the threshold for pre-approved authorizations from KFKJ. The published threshold is 0', therefore any Part 107 authorizations require manual approval from the FAA.”***

For proposed operations not below pre-approved authorization altitude thresholds in controlled airspace under Part 107, the FAA anticipates that the operator may use information from the USS to modify the operation to be below the UASFM pre-approved altitude. If so, the process continues with a normal pre-authorized LAANC submission. If not – as in this case where the threshold is 0' – the FAA envisions that the operator would indicate a desire to submit a request for manual consideration, acknowledging that the process will take substantially longer (days, weeks, etc.) than automatic authorizations. Furthermore, resource constraints may be such that the request cannot be handled prior to the proposed operation or a set expiration duration (e.g. 21 days or some other agreed-upon limit). The information asking for manual authorization would be forwarded to the proper authorities (at JFK or elsewhere as determined by the FAA).

Upon submission of the request for manual authorization, as with other authorizations and notifications, the USS assigns a unique identification number and operator contact information is included (telephone number). The FAA does not envision collecting personally identifiable information (PII) for its use, but does require a method to communicate with the operator directly. The USS would receive an acknowledgement of the authorization request from the FAA, and the operator would receive it from the USS.

In this scenario, we suppose that a response is provided after 5 days, and that the operation is denied based on the information provided. Denials are provided with rationale and possibly other comments from the applicable authority. A denial might state: ***“After consideration, this request authorization has been denied based on the location, time, and conditions of the flight. Due to the proximity of the operation to operational air traffic, no safe operation can be authorized.”*** A denial message might also include recommendations for future submissions (for example, altitudes or boundaries that might be more likely to be approved), but it is important to note that the

denial is final from a process standpoint. There is no explicit negotiation process; each request for authorization is stand-alone.

In the case of this scenario, the operator explores alternatives such as conducting the ecological survey from a UAS close to the ground (say  $\leq 10'$ , which should be more likely to be approved) or using boats and/or inspectors on foot.

## **6.5 Scenario 5: Authorization of Flight Using Multiple Adjacent Polygons**

*Note: This scenario (multiple polygons) is currently not included in LAANC Phase 1. This scenario is provided to stimulate planning and design for the definition of more complex operational areas in future LAANC development.*

### **6.5.1 Operator & Airspace**

Part 107, Class B, operation goes through multiple quadrants on facility map.

### **6.5.2 Overview**

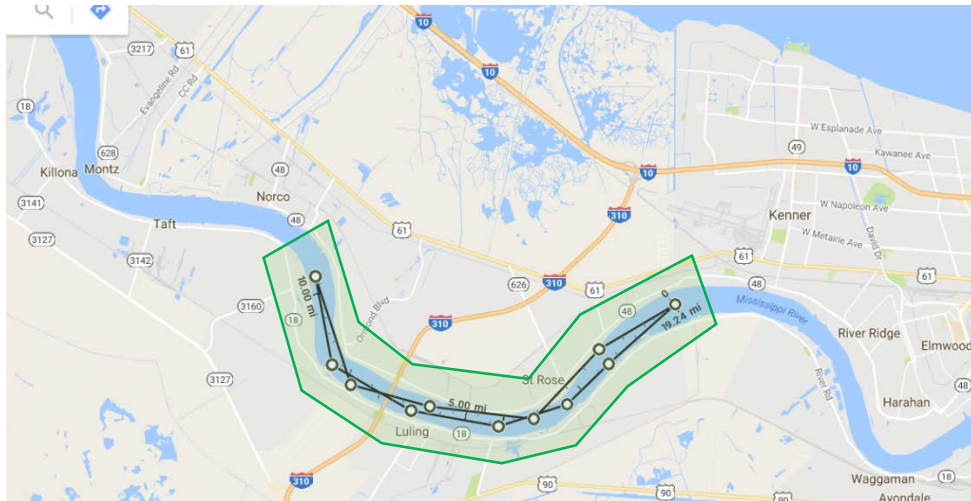
This scenario describes a Part 107 operation. A local company is filming a Boat Show on the Mississippi. The event will span 10 miles of the river, much of which is within the confines of New Orleans International Airport (MSY) controlled airspace. The operator intends to comply with Part 107.25: “No person may operate a small unmanned aircraft system – (a) From a moving aircraft; or (b) From a moving land or water-borne vehicle unless the small unmanned aircraft is flown over a sparsely populated area and is not transporting another person’s property for compensation or hire.” That is, the operator will fly UAS from a boat, within line of sight, as they move up and down the river. The path involves multiple quadrants of the MSY UASFM.



**Figure 17: Scenario 5 – Part 107 Large Area**

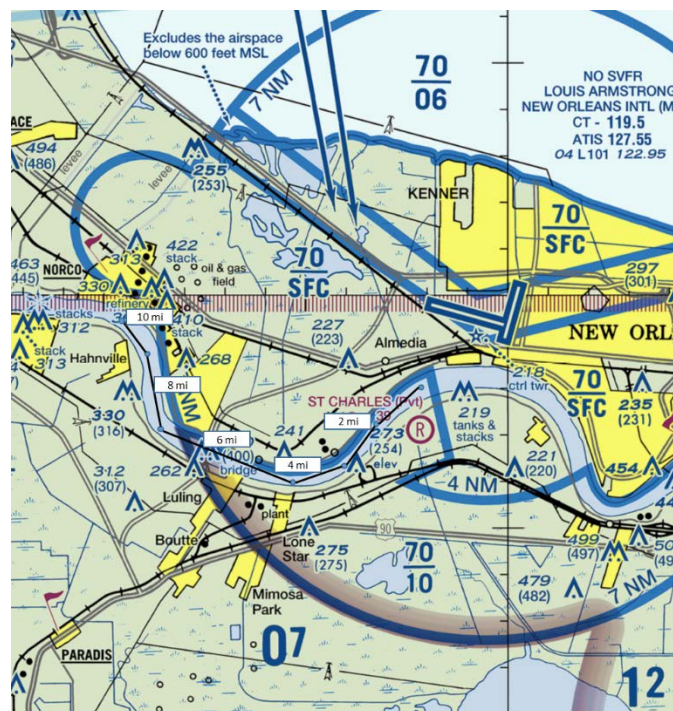
### **6.5.3 Description of Activities**

The operator logs into the USS and begins planning the proposed operation. The operator knows the desired path and uses a polygon to define the area as shown in Figure 18.



**Figure 18. Waypoints plotted on map**

The operation is in controlled airspace as shown in Figure 19.



**Figure 19. MSY Controlled Airspace**



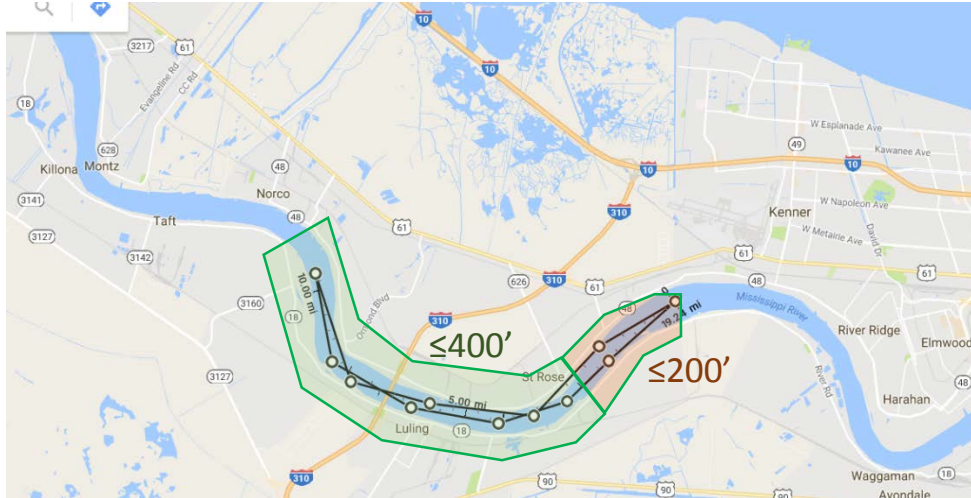
The FAA-provided UASFM for MSY indicates the pre-approved altitude limits for Part 107 authorizations as shown in Figure 20. The rightmost portion of the operation falls within a 200' grid, an area next to that within a 300' grid, and the remainder in 400' grids.



**Figure 20. MSY Gridded UASFM Limits**

The USS informs the Part 107 operator a message such as, “*An FAA airspace authorization is required to fly in this controlled airspace.*” Furthermore, “*The operation exceeds the threshold for pre-approved authorizations from KMSY.*”

In this case, the USS then offers features that help the operator visualize the pre-authorization constraints. (Note that this scenario describes a feasible example, not USS requirements.) Using these features, the operator notes that the operation could be fit into MSY pre-authorized limits if the rightmost section of the operation is trimmed and conforms to a lower altitude limit. The result is two polygons (one with an altitude limit of  $\leq 200'$ , the other with an altitude limit of  $\leq 400'$ ) as shown in Figure 20.



**Figure 21: Operation Bounded by Two Adjacent Polygons**

The revised operation fits within pre-authorization limits, and the operator makes the submission via the USS interface. The USS submits the authorization information to the FAA. In its feedback to the operator, the USS includes the relevant authorization information and retains a copy of the necessary information on record. An encapsulated authorization may read as follows:

*Operation Authorized – Unmanned Aircraft Systems operation on dd/mm/yy between the hours of hh:mm and hh:mm in accordance with Title 14, CFR Part 107, except “operations for small unmanned aircraft” Part 107.51 b(2) are limited to the altitude listed below: Class B, at or below limits provided AGL over unpopulated waterway, under the Jurisdiction of KMSY. During the operation, the operator will continuously be available at xxx-xxx-xxxx. This authorization does not relieve the pilot in command from responsibility to check the airspace they are operating in and comply with all restrictions that may be present, such as 14 CFR 107.45 and 107.49 (a)(2) which requires adherence to prohibitions of entry into certain airspace.*

The authorization data is retrievable by ATC at the affected airport(s) to the planned flight (e.g. KMSY), as well as the airport operator and other local stakeholders to assure safe operations.

## 6.6 Scenario 6: Contingency Operations

*Note: This scenario (contingency operations) is currently not included in LAANC Phase 1. This scenario is provided to stimulate planning and design for contingency operation features in future LAANC development.*

### 6.6.1 Description

This scenario addresses a need to ensure that all UAS in a specified area are grounded for a specified duration of time (e.g. 1 hour or 1 day) with a single action controlled by the ATC facility.

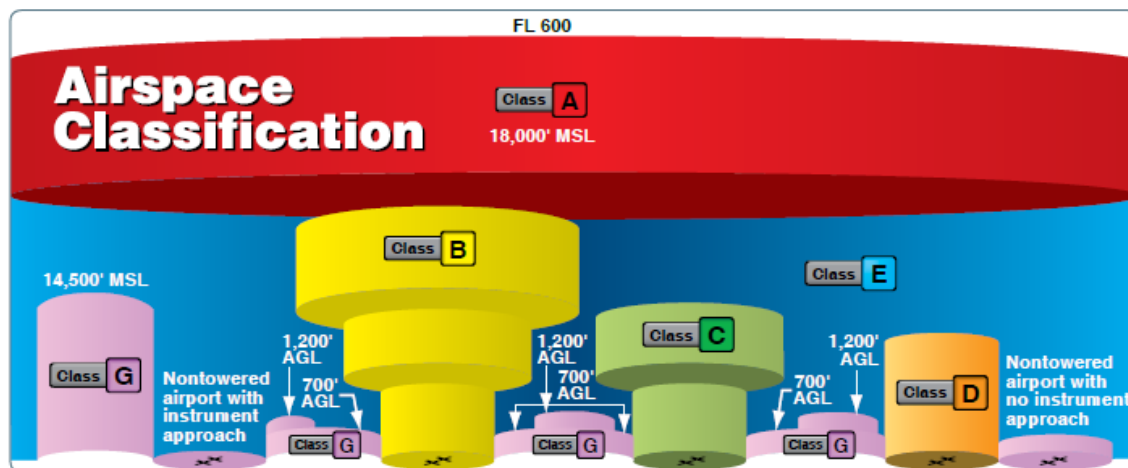


**Figure 22: Scenario 6 – Contingency Operations**

### 6.6.2 Overview

The FAA envisions that any ATC facility may require a contingency operation where ATC may require all UAS to land immediately. This operation is envisioned to be active in a specific UASFM grids (geographic basis) for a specific time. The time selected may be variable. The FAA anticipates the ATC facility will have the capability to select the geographic grid or grids to command “all down”. It is expected that the “all down” command will apply to all USSs with planned operations in the selected grids and the command would go to all operations in the grids. The USS will relay the command to all operators in the selected geographic area. The USS will also prevent authorizations and notifications in the selected grids for the selected time period. The “all down” condition will end at the end of the time selected by ATC.

## Appendix A: U.S. Airspace Classification Descriptions



### U.S. Airspace Classifications

Note: See Federal Aviation Administration, *Pilot Handbook*, Chapter 15 – Airspace, Pg. 15-2 and 15-3.

### Controlled Airspace

Controlled airspace is a generic term that covers the different classifications of airspace and defined dimensions within which air traffic control (ATC) service is provided in accordance with the airspace classification. Controlled airspace that is of concern to the sUAS remote pilot is:

- Class B
- Class C
- Class D
- Class E

### **Class A**

(While not applicable for sUAS UTM operations described in this document, included for clarity.)

Airspace Class A airspace is generally the airspace from 18,000 feet mean sea level (MSL) up to and including flight level (FL) 600, including the airspace overlying the waters within 12 nautical miles (NM) of the coast of the 48 contiguous states and Alaska. Unless otherwise authorized, all operation in Class A airspace is conducted under instrument flight rules (IFR).

### **Class B Airspace**

Class B airspace is generally airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of airport operations or passenger enplanements.



The configuration of each Class B airspace area is individually tailored, consists of a surface area and two or more layers (some Class B airspace areas resemble upside-down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace.

### **Class C Airspace**

Class C airspace is generally airspace from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a surface area with a five NM radius, an outer circle with a ten NM radius that extends from 1,200 feet to 4,000 feet above the airport elevation, and an outer area. Each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace.

### **Class D Airspace**

Class D airspace is generally airspace from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace is normally designed to contain the procedures. Arrival extensions for instrument approach procedures (IAPs) may be Class D or Class E airspace. Unless otherwise authorized, each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace.

### **Class E Airspace**

If the airspace is not Class A, B, C, or D, and is controlled airspace, then it is Class E airspace. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace is configured to contain all instrument procedures. Also in this class are federal airways, airspace beginning at either 700 or 1,200 feet above ground level (AGL) used to transition to and from the terminal or en-route environment, and en-route domestic and offshore airspace areas designated below 18,000 feet MSL. Unless designated at a lower altitude, Class E airspace begins at 14,500 MSL over the United States, including that airspace overlying the waters within 12 NM of the coast of the 48 contiguous states and Alaska, up to but not including 18,000 feet MSL, and the airspace above FL 600.

### **Uncontrolled Airspace**

#### **Class G Airspace**

Uncontrolled airspace or Class G airspace is the portion of the airspace that has not been designated as Class A, B, C, D, or E. It is therefore designated uncontrolled airspace. Class G airspace extends from the surface to the base of the overlying Class E airspace. Although ATC has no authority or responsibility to control air traffic, operators should

remember there are visual flight rules (VFR) minimums which apply to Class G airspace. A remote pilot will not need ATC authorization to operate in Class G airspace.

## Appendix B: Acronyms

Acronym or Term	Description
AGL	Above Ground Level
API	Application Programming Interface
ARP	Airport Reference Point
ATC	Air Traffic Control
ATM	Air Traffic Management
ATO	Air Traffic Organization (FAA)
CFR	Code of Federal Regulations
DOD	Department of Defense
FAA	Federal Aviation Administration
GA	General Aviation
GeoJSON	Geographic JavaScript Object Notation
GIS	Geographic Information System
LAANC	Low Altitude Authorization and Notification Capability
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
PIC	Pilot in Command
PII	Personally Identifiable Information
RFI	Request for Information
SORN	Systems of Records Notices
SUA	Special Use Airspace
sUAS	Small UAS
TFR	Temporary Flight Restriction
UASFM	UAS Facility Map
USS	UAS Service Supplier
UTM	UAS Traffic Management
UAS	Unmanned Aircraft System
VFR	Visual Flight Rules
VLOS	Visual Line of Sight