Drone Advisory Committee

eBook

DAC Member (Public) Information for the July 17, 2018 DAC Meeting • Santa Clara, CA

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Travel/Meeting Logistics

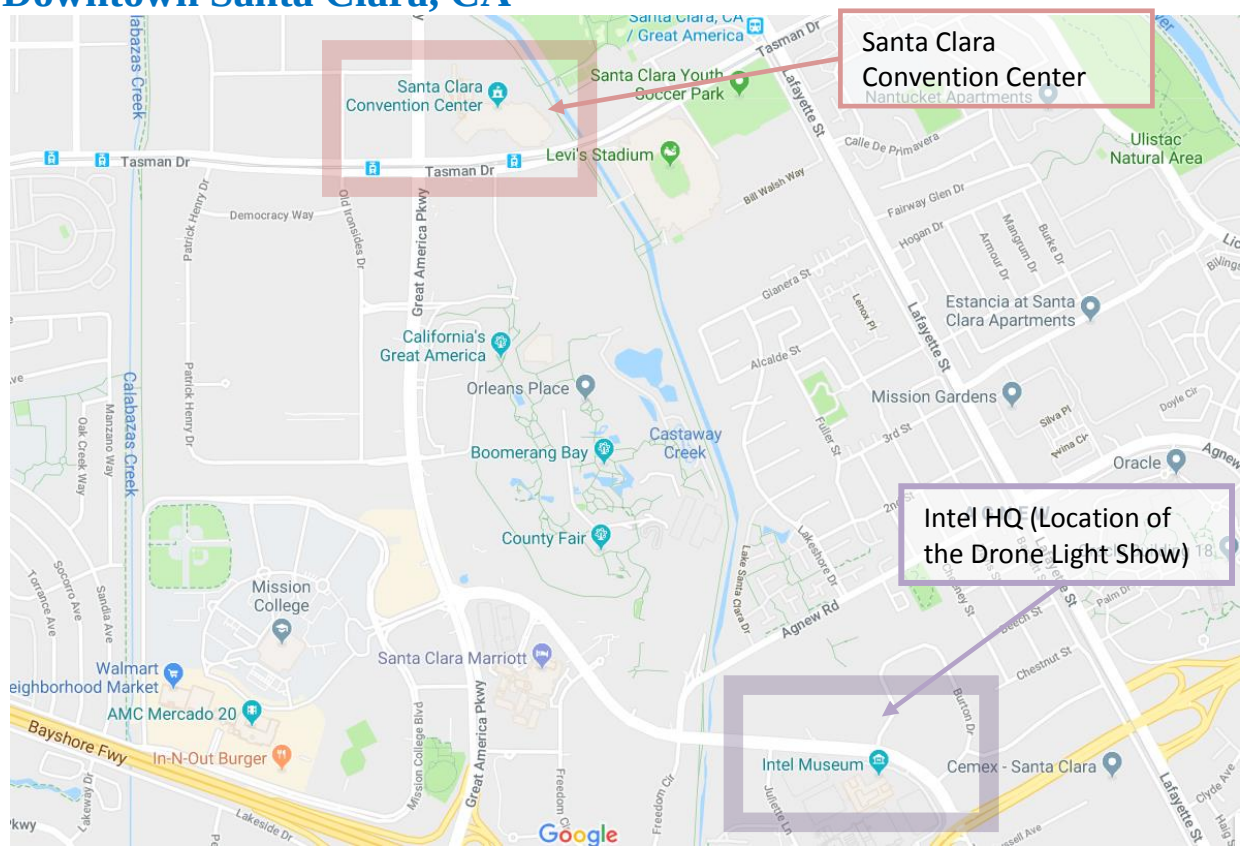
Schedule

Monday, July 16, 2018	
6:30 p.m. – 8:30 p.m.	**DAC Member (including select FAA) Reception and Dinner (invitation only)**
8:30 p.m. – 9:30 p.m.	**Intel Drone Light Show and Reception (open to all meeting attendees who register by COB 7/12)**
	Location (for both events): Intel Corporation, 2200 Mission College Blvd., Santa Clara, CA 95054 **Parking:** Free at Intel **Shuttles:** None

Tuesday, July 17, 2018 All events at the Santa Clara Convention Center, Grand Ballroom, Sections G and H 5001 Great American Parkway, Santa Clara, CA 95054	
8:00 a.m. – 9:00 a.m.	**Breakfast**
	DAC Member (including select FAA): Catered **Everyone else:** Continental
9:00 a.m. – 11:45 a.m.	**DAC Meeting**
	Parking: Free at the convention center **Shuttles:** None
11:45 a.m. – 1:15 p.m.	**Lunch**
	DAC Member (including select FAA): Catered **Everyone else:** Sandwich lunch provided
1:15 p.m. – 4:00 p.m.	**DAC Meeting Continued**
4:00 p.m.	**Meeting Adjourned**

Map Showing Santa Clara, CA and the Surrounding Area

Downtown Santa Clara, CA



Questions/Comments: Chris Harm (chris.harm@faa.gov or 202-267-5401), UAS Stakeholder and Committee Liaison

Confirmed FAA/DOT Attendees

Name	Title	Org.
1. Carl Burleson	Acting Deputy Administrator and Acting DAC Designated Federal Officer	FAA
2. Colleen Donovan	Senior Advisor to the Deputy Administrator	FAA
3. Ali Bahrami	Associate Administrator for Aviation Safety (AVS)	FAA
4. Tony Fathabadi	AVS Assistant	FAA
5. Earl Lawrence	Executive Director, UAS Integration Office (AUS)	FAA
6. Chris Harm	UAS Stakeholder and Committee Liaison, AUS	FAA
7. Teresa Denchfield	Logistics Coordinator, AUS	FAA
8. Tim Arel	Deputy Chief Operating Officer, Air Traffic Organization (ATO)	FAA
9. Jay Merkle	Deputy Vice President, Program Management Office, ATO	FAA
10. Claudio Manno	Associate Administrator for Security and Hazardous Materials Safety	FAA
11. Lorelei Peter	Assistant Chief Counsel for Regulations	FAA
12. Genevieve Sapir	Senior Attorney	DOT
13. Laura Remo	Chief, Air Carrier Fitness Division	DOT
14. Stefanie McCans	Project Manager, Aviation Safety Auditor	DOT
15. Robin Koch	Supervisory Auditor	DOT
16. Damon Walker	Transportation Industry Analyst	DOT
17. Rachel Mencias	Student Trainee (Auditor)	DOT

Drone Advisory Committee

7/17/2018 DAC Meeting • Santa Clara, CA

Public Meeting Agenda

Time: 9:00 a.m. to 4:00 p.m. Pacific Time
Location: Santa Clara Convention Center, Grand Ballroom, Sections G and H
5001 Great America Pkwy, Santa Clara, CA 95054

	Start	Stop	
1.	9:00 a.m.	9:01 a.m.	**Official Statement of the Designated Federal Officer**
2.	9:01 a.m.	9:02 a.m.	**Approval of the Agenda**
3.	9:02 a.m.	9:15 a.m.	**Opening Remarks**
4.	9:15 a.m.	10:15 a.m.	**FAA Update**
5.	10:15 a.m.	10:30 a.m.	**Break**
6.	10:30 a.m.	11:00 a.m.	**Unmanned Aircraft Safety Team Briefing on Safety Data**
7.	11:00 a.m.	11:45 a.m.	***Discussion of Safety Data***
8.	11:45 a.m.	1:15 p.m.	**Lunch and Networking**
9.	1:15 p.m.	1:45 p.m.	**FAA's Unmanned Aircraft Systems (UAS) Implementation Plan (IP) and FAA's UAS Integration Research Plan (IRP)**
10.	1:45 p.m.	2:15 p.m.	***Discussion of FAA's UAS IP and IRP***
11.	2:15 p.m.	2:30 p.m.	**Break**
12.	2:30 p.m.	2:45 p.m.	**Remote Identification**
13.	2:45 p.m.	3:30 p.m.	***Discussion of Remote Identification***
14.	3:30 p.m.	3:45 p.m.	**New Business/Agenda Topics**
15.	3:45 p.m.	4:00 p.m.	**Closing Remarks**
16.	4:00 p.m.	4:00 p.m.	**Adjourn**

RSVP Required: Email DACmeetingRSVP@faa.gov providing your full name and organization (if representing an organization).

Questions/Comments: Contact Chris Harm, UAS Stakeholder and Committee Liaison (chris.harm@faa.gov or 202-267-5401).

Drone Advisory Committee

DAC Membership – As of 6/28/2018

Stakeholder Group	Members
Designated Federal Officer	**Dan Elwell**, Acting Deputy Administrator, Federal Aviation Administration
Chair	**Vacant**
UAS Manufacturers	**James Burgess**, Product and Systems Lead for Project Wing, Google X **Michael Chasen**, CEO, PrecisionHawk USA Inc. **Martin Gomez**, Director of Aeronautical Platforms, Facebook **Gur Kimchi**, Co-Founder and VP, Amazon Prime Air **Brendan Schulman**, VP of Policy and Legal Affairs, DJI Technology
UAS Operators	**Greg Agvent**, Senior Director of National News Technology, CNN **Todd Graetz**, Director, Technology Services, UAS Program, BNSF Railway
UAS Hardware Component Manufacturers	**Nan Mattai**, Senior VP, Engineering and Information Technology, Rockwell Collins, Inc. **Phil Straub**, Executive VP and Managing Director, Aviation Division, Garmin, Ltd.
UAS Software Application Manufacturers	**Jaz Banga**, Co-Founder and CEO, Airspace Systems, Inc.
Traditional Manned Aviation Operators	**Mark Baker**, President and CEO, Aircraft Owners and Pilots Association **Houston Mills**, Global Aviation Strategy and Public Policy Director, United Parcel Service **Steven Rush**, President, Professional Helicopter Pilots Association **Matthew Zuccaro**, President and CEO, Helicopter Association International
Airports and Airport Communities	**Deborah Flint**, Chief Executive Director, Los Angeles World Airports **Marily Mora**, President and CEO, Reno-Tahoe Airport Authority
Labor (controllers, pilots)	**Tim Canoll**, President, Air Line Pilots Association **Trish Gilbert**, Executive VP, National Air Traffic Controllers Association
Research, Development, and Academia	**Robie Samanta Roy**, VP of Technology Strategy and Innovation, Lockheed Martin Corporation
Local Government	**David Greene**, Bureau of Aeronautics Director, Wisconsin Department of Transportation **Wade Troxell**, Mayor of Fort Collins, Colorado, and the National League of Cities
Navigation, Communication, Surveillance, and Air Traffic Management Capability Providers	**George Kirov**, VP and General Manager, Commercial UAS Solutions, Harris Corporation **Christopher Penrose**, Senior VP of Emerging Devices, President of Internet of Things, AT&T
Other	**Rich Hanson**, President, Academy of Model Aeronautics **Brian Wynne**, President and CEO, Association for Unmanned Vehicle Systems International

Unmanned Aircraft Safety Team

Briefing Paper by Ben Marcus (Co-Chair)

The Unmanned Aircraft Safety Team (UAST) is an industry-government partnership committed to ensuring the safety of Unmanned Aircraft Systems (UAS) in the National Airspace System (NAS). The UAST supports the safe integration of UAS with data-driven safety enhancements and collaboration among members of the UAS industry. The UAST provides industry and government the mechanism to work together to increase safety in a non-regulatory fashion. Over 60 organizations are members of the UAST, including UAS manufacturers, operators, modelers, safety experts, and members of the manned community as well. Some examples of industry members include Academy of Model Aeronautics (AMA), Airline Pilots Association (ALPA), Aircraft Owners and Pilots Association (AOPA), Association for Unmanned Vehicle Systems International (AUVSI), Helicopter Association International (HAI), Amazon, Boeing, DJI, Kittyhawk, Measure, MOTA, Yuneec, and Zipline. The team is co-chaired by one FAA representative and one industry representative, currently Earl Lawrence from the FAA's UAS Integration Office and Ben Marcus from AirMap. A steering committee provides governance and direction.

Background

The UAST leadership has identified three keys to success for moving forward:

1. Adequate funding for data collection and analysis
2. Active participation from vested industry members
3. UAS community commitment to embrace and implement safety enhancements

As a data-driven group, collecting and analyzing flight data is a key component of the UAST's work. The UAST and MITRE, an independent third party data collection and analysis entity, have examined a small amount of flight data provided by UAST members. It has established core elements that should be included with each dataset and standard failure modes for UAS safety analysis. Using these lists, the UAST has begun outlining safety cases that include specific safety questions, related telemetry fields, potential data driven analysis outputs, and both in-flight and procedural mitigation strategies.

The UAST's goal is to develop an Aviation Safety Information Analysis and Sharing program similar to the one the Commercial Aviation Safety Team (CAST) uses. This system would use de-identified industry-sourced data and look for systemic safety issues. The UAST has recently developed a data governance document and cooperative agreement, setting the groundwork for the development of this system. However, significant resources are required to fully develop this system.

While implementing the operational flight data effort, the UAST is using accident/incident reports from a variety of sources including FAA, NTSB, and newsworthy reports to develop safety enhancements in a manner similar to CAST and the General Aviation Joint Steering Committee.

Discussion
Using analysis of these accidents and incidents, including the collision between a U.S. Army Blackhawk helicopter and a small quadcopter near New York City in September 2017, the UAST has adopted by consensus the first three safety enhancements.

Safety Enhancement 1 – Geofencing and Airspace Awareness. This SE aims to reduce the risk of collision through better airspace awareness for operators, geofencing capabilities, and preventing inadvertent beyond visual line of sight flight for untrained or ill-equipped operators. To reduce the risk of collision with other aircraft or structures, the industry should improve airspace awareness and geofencing capabilities. Two areas are being addressed:

i. Education, outreach (and possibly credentialing) on airspace awareness and authorization
ii. Enabling technology safety features to help prevent flight into unauthorized airspace

Safety Enhancement 2 – Flight Control Return-to-Launch (RTL) Function. This safety enhancement aims to reduce the risk of collision by proposing specific design objectives when incorporating RTL capability into UAS. It also proposes education and outreach to help ensure pilots understand the correct setup of RTL mode during mission planning/pre-flight.

Safety Enhancement 3 – Improve UAS Sightings Reports. This safety enhancement aims to clarify the risk associated with UAS by improving the quality of sighting reports from manned aircraft by both developing reporting requirements and educational material to better assess these incidents.

UAST Challenges
While the UAST made great progress in less than two years since its founding, challenges remain that the Drone Advisory Committee can help address.

1. Limited funding to support data collection and analysis: Significant financial resources are required to collect, de-identify, and analyze UAS data in a way that promotes safety in the NAS and provides additional benefit to those contributing the data.

2. Resources available to support UAST work: To be a truly effective safety team the UAST requires time and commitment from both industry and government members.

3. Reluctance to share flight data: Concerns over privacy and added value/benefit need to be addressed to fully reap the benefits of an industry-wide shared safety data analysis system.

FAA's UAS Implementation Plan and UAS Integration Research Plan

The mission of the Federal Aviation Administration (FAA) is to provide the safest, most efficient airspace system in the world. The National Airspace System (NAS) is a complex national asset providing essential capabilities for the United States along with a critical medium for aviation, the traveling public, commerce, and national security.

The emergence of Unmanned Aircraft Systems (UAS) technology triggered a broad range of applications in government, industry, academia, and recreational endeavors. The rapid growth of the UAS industry has created the need to ensure this new technology is safely integrated into the NAS. As with any rapidly advancing technology, successful integration of UAS into the NAS provides opportunities for innovation and growth, but also presents many challenges. To address these challenges, the FAA created the UAS Implementation Plan and UAS Integration Research Plan to guide the FAA on its path to full integration.

The UAS Implementation Plan

The integration of UAS into the NAS requires every office in the FAA to work toward this common goal. In order to coordinate such a venture, the FAA's UAS Integration Office led a collaborative effort across all FAA lines of business to develop a five-year plan. Subject matter experts from across the agency, under the guidance of the FAA's UAS Executive Working Group and UAS Management Board, created and then annually updated the UAS Implementation Plan.

This UAS Implementation Plan is an agency-wide document detailing how the FAA intends to accomplish its integration objectives over the next five years. It provides a common framework for discussing the vast landscape of UAS-related activities across the FAA. The plan provides a description of the actions, expected outcomes, and requisite timelines to achieve integration. Activities range from standards development to workforce training to outreach activities.

The UAS Integration Research Plan

UAS research is the foundation of UAS integration activities. Research enables the development of informed policies, procedures, and regulations. The UAS Integration Research Plan presents a framework for managing the variety of UAS-related research activities across the FAA, industry, academia, and other agencies.

The UAS Integration Research Plan, intended to be a rolling five-year plan and updated annually, is aligned to FAA Strategic Priorities, FAA Priority Initiatives, UAS Strategic Priorities, the Five-Year UAS Integration Approach, and the National Aviation Research Plan. It informs and reflects the priorities and initiatives of the FAA and research partners.

The FAA's Research, Engineering, and Development Advisory Committee (REDAC), another FAA Federal Advisory Committee, also reviews the UAS Integration Research Plan and provides input to the FAA that is incorporated into revisions of the annual plan.

Items for Discussion with the Drone Advisory Committee (DAC)

1. The FAA's research plan is focused on applied research, or in other words, focused on supporting rulemaking and policy setting. What other groups and or individuals should the FAA be reaching out to assure we are identifying all the core research needed to support rulemaking?

2. What entities would the DAC recommend the FAA engage to ensure that a variety of stakeholders are able to evaluate and comment on these plans?

3. With academia, industry and basic research entities like the National Aeronautics and Space Administration continually advancing technology what strategies do you recommend so that we fully incorporate UAS advancements into our research plan?

Attachments

1. UAS Implementation Plan – Executive Summary
2. UAS Integration Research Plan – Executive Summary

UAS FY2019 IMPLEMENTATION PLAN: EXECUTIVE SUMMARY

The sky is changing. What was once the province of airplanes and helicopters is now the frontier for unmanned aircraft systems, or drones. UAS are dramatically changing the way we view aircraft and the role of the pilot. In short, technological advances and the automation of many processes and core piloting skills have revolutionized aviation, attracting a new community of remote operators taking to the sky.

Even more radically, UAS are changing the way we see the future of flight. And the future is promising. Industry estimates that full integration of drones could reach a national economic benefit of $82 billion and more than 100,000 jobs within the decade[1]. The applications UAS can perform have the potential to transform society – our neighborhoods, our communities, our everyday lives -- in ways that not only significantly bolster economic development, but also support human well-being and maintain public safety, including by:

- Delivering life-saving medical devices and other equipment.
- Facilitating response to hurricanes, wildfires, and other natural disasters.
- Forecasting dangerous weather patterns.
- Enabling inspection of critical infrastructure, such as pipelines and railways.
- Aiding precision agriculture.
- Serving consumers through new and innovative ways to deliver household and business products.
- Improving the safety and efficiency of the most dangerous, dirty, and dull jobs
- Helping control the world's deadliest creature – the mosquito.

While the rapid growth of the UAS industry has created tremendous opportunities for innovation and growth, the Federal Aviation Administration's core mission continues to be safety. In upholding this mission, the need to ensure this new technology is integrated *safely* presents us with a number of exciting and unusual regulatory and technical challenges. Safety of the National Airspace System (or NAS) -- a complex national asset that provides an essential medium for aviation, the traveling public, commerce, and national security – is paramount.

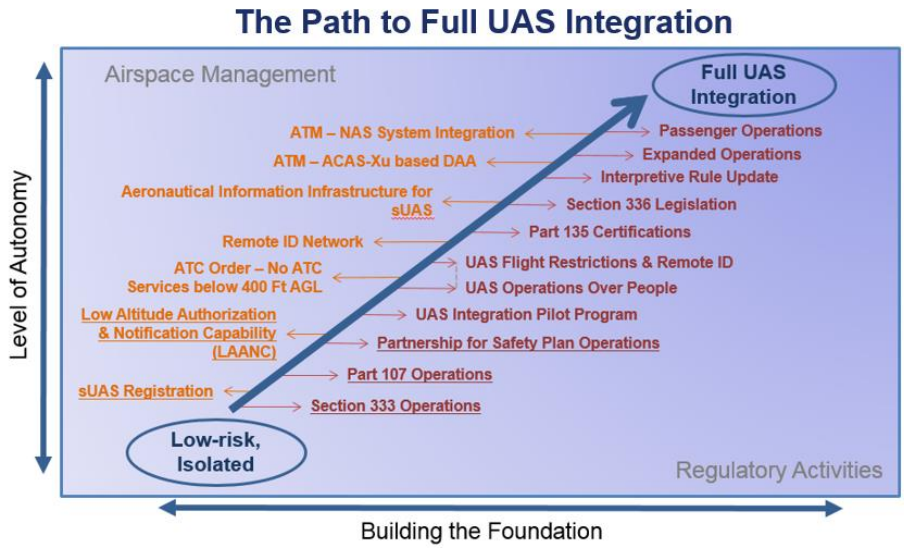
The *Implementation Plan for Integration of Unmanned Aircraft Systems into the National Airspace System: FY2019 Implementation Plan* is an agency-wide document detailing activities the FAA will carry out over the next five years. The purpose of the Plan is to organize and track agency-wide integration efforts and facilitate coordination of interdependent activities across the FAA by providing a common framework for discussion. The UAS Integration Office collaborated with a cross-agency team of subject matter experts to develop the Plan under the guidance of senior FAA leadership.

Vision

The FAA's vision for fully integrating UAS into the NAS entails unmanned aircraft operating harmoniously with manned aircraft, side-by-side in the same airspace. Additional air navigation services will be needed to facilitate unmanned traffic management at low altitudes. This vision goes beyond accommodation practices, which largely rely on segmenting operations to maintain systemic safety. As we work to realize this vision, UAS must be introduced to the NAS incrementally – progressing to increasingly complex operations -- to ensure the safety of people and property both in the air and on the ground.

[1] The Economic Impact of Unmanned Aircraft Systems in the United States, AUVSI, March 2013

This vision is anchored by FAA's mission to provide the safest, most efficient aerospace system in the world. To successfully achieve it requires a multi-dimensional balancing act between the potential of the technology, the speed of innovation, the volume of operations, and the shifting landscape of regulations and standards. As the fulcrum, a single safety risk management process will need to evolve, accounting for three interdependent factors: the aircraft, the airspace, and applicable safety mitigations.



UAS Forecast

Total Model (Hobbyist) Fleet (Million sUAS Units)			
Year	**Low**	**Base**	**High**
2017	1.10	1.10	1.10
2018	1.50	1.60	1.73
2019	1.76	2.00	2.35
2020	1.87	2.20	2.73
2021	1.92	2.30	2.94
2022	1.96	2.40	3.17

To support the agency's phased integration approach as outlined in the UAS Implementation Plan, the FAA has launched various market research activities to understand the possible magnitude of the UAS sector, implications on the spectrum of aircraft that may be used for model (hobbyist) flying, and the safety implications for the gradual integration of the UAS fleet into the NAS. Market estimates suggest that the small UAS, or sUAS, model fleet will likely more than double in size over the next 5 years, from the present 1.1 million units to over 2.4 million units[2].

The non-model sector, which is primarily commercial in nature, is exceptionally dynamic and is anticipated to accelerate in growth over the next few years.

Total Commercial Fleet (Number of Units)		
Year	**Base**	**High**
2017	110,604	110,604
2018	158,900	168,339
2019	229,400	268,937
2020	312,100	410,862
2021	407,400	604,550
2022	451,800	717,895

[2] FAA Aerospace Forecast: Fiscal Years 2018-2038, FAA, March 2018

What's Now

The FAA is making steady progress toward achieving full-scale integration. We introduced an online registration system for UAS weighing more than 0.55 pounds and less than 55 pounds. Since its introduction in December 2015 there have been over 1.1 million UAS registered for both commercial and recreational purposes. For perspective, there are currently just under 300,000 manned aircraft registered.

The Small UAS Rule, or part 107, established rules for routine, low-risk sUAS operations within line of sight. Continuing efforts to enable more complex operations are underway, including waivers for operations under part 107 and UAS type certification projects. Examples of more complex operations include those that go beyond visual line of sight, over people, and at night. For operations that cannot be performed under part 107, companies are looking at ways to meet the provisions of existing regulations to facilitate more complex operations, such as agricultural applications under part 137 to conduct aerial spraying and surveying for agricultural applications.

What's New

The FAA initially intended to integrate UAS by creating a series of performance-based rules that would enable higher risk operations. The agency was set to release a draft rule for operations over people in late 2015, when other federal agencies expressed concern about the rule's security implications. To address these concerns while continuing to advance UAS operations, we shifted our focus from a regulations-first framework to an operations-first framework. A number of projects based on existing safety requirements are underway to support this approach. The data generated and the lessons learned from project implementation are informing the next series of UAS regulations.

One of the most exciting new developments in our operations-first integration efforts is the recently announced UAS Integration Pilot Program. The IPP is a partnership with state, tribal, and local governments to jointly test and mature the concepts, processes, and data required to further integrate UAS into the NAS. The FAA will draw upon the results of the 10 IPP partnerships to inform rules, processes, and procedures to enable expanded UAS operations.

In order to ensure the safe operation of these new operations (and to ensure they are safely interacting with the existing ones), the FAA is working to update and automate its systems to address the increased volume. On any given day, there are 60,000 commercial aircraft flying through the NAS into the 30 biggest airports in the United States. If current trends persist, the same number of drone flights could originate from just one delivery fulfilment center in a major city. These orders of magnitude require a significant automation capabilities.

NASA and industry partners have been developing a suite of Unmanned Traffic Management capabilities, which they will transfer to the FAA to incorporate into a low altitude unmanned traffic management framework. This will facilitate countless more operations than can be managed manually. The FAA is already building its capabilities and components and deploying technologies that have evolved from previous UTM research. These include the UAS registration system and the Low Altitude Authorization and Notification Capability, a partnership between the FAA and industry. LAANC is designed to enable part 107 operators to obtain near real-time approval of airspace authorization requests and is launching at FAA air traffic facilities throughout 2018.

What's Next

The FAA has always relied on standards development bodies to develop safety standards for certification and operations, and the agency's approach to UAS is no different. Currently, there are a number of organizations developing standards on all things UAS, from control and communications links to UAS propellers. These performance standards provide a crucial basis for safety as UAS operations become more complex – helping to ensure the reliability, compatibility, and interaction of UAS regardless of manufacturer or model.

In addition to these standards, certifications will also be crucial for UAS package delivery and other operations. For example, design certification is one necessary component for large scale UAS package delivery, as is an Air Carrier and Operator Certification, also known as a part 135 certificate. A number of companies are already working through these processes. Although they will take time, the requirements will ensure public safety as package delivery via UAS becomes a routine option for the American public.

And, as noted above, the full deployment of UTM services and capabilities will create an environment in which the entire spectrum of UAS operations can be safely realized, including transportation of people and property. The FAA is in the process of fielding these services, starting with registration and LAANC. Next up is developing and implementing requirements for remote identification of UAS and dynamic airspace management. By establishing a single set of airspace rules, the former is necessary from a safety perspective. It will also address security concerns posed by UAS. While there are many pieces to put together, UTM will allow for full integration of unmanned and manned aircraft at low altitudes.

While significant UAS integration progress continues to be made, the FAA recognizes that much remains to be done to maintain existing operational capacity, security, and safety, while protecting airspace users, people, and property on the ground from excessive risk. Our safety mission continues to be the driver for UAS integration. Working in collaboration with other federal agencies, industry partners, and research institutions, we are actively extending our culture of safety to the world of unmanned aircraft – first by normalizing low risk operations and, through systems enhancements and regulations, building the framework to support more advanced capabilities.

The FY2019 Implementation Plan identifies the UAS integration path forward in the form of critical near term, longer term, and cross-cutting activities and the timelines for realizing those efforts. We are committed to striking the appropriate regulatory and oversight balance to ensure that innovation is able to thrive without compromising the safest, most efficient aerospace system in the world.

The sky is changing, and it's open for business. The FAA will help you reach it safely.

DRAFT

UAS Integration Research Plan 2017–2022

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Executive Summary

Introduction

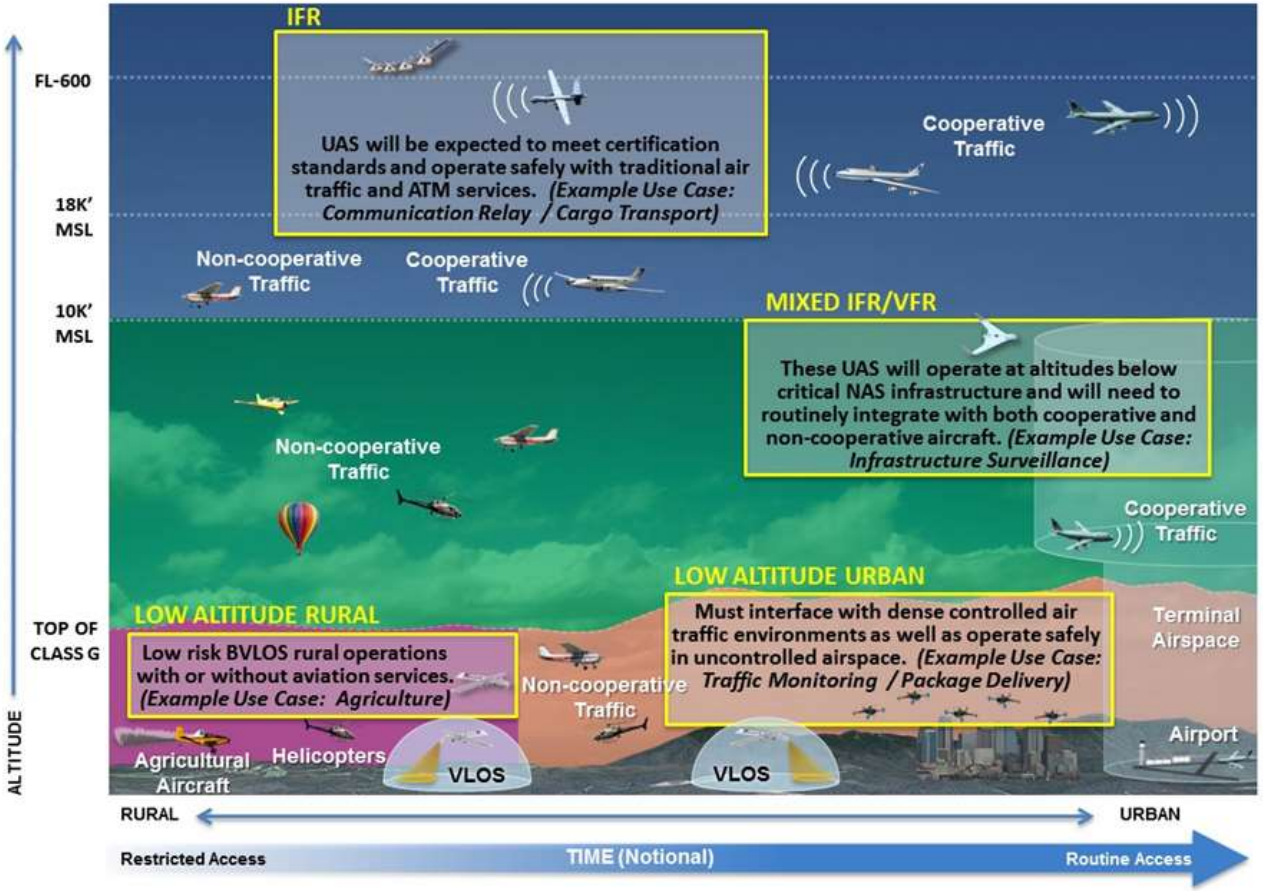
UNMANNED AIRCRAFT SYSTEMS (UAS) RESEARCH is the foundation of UAS integration activities. Research enables informed policies, procedures, and regulations. Section 2211 (Unmanned Aircraft Systems Research and UAS Research Activity Overview) of the FAA Extension, Safety, and Security Act of 2016 directs the FAA to work collaboratively with stakeholders to develop a roadmap of the estimates, schedules, and benchmarks for integrating UAS into the NAS. This shall include how to use research, assessments of abilities to integrate UAS, and updates on the advancement of various technologies. To meet this requirement, the FAA developed this *UAS Integration Research Plan*, which presents a framework for managing the variety of UAS-related research activities across the FAA, industry, academia, and other agencies.

The *UAS Integration Research Plan* is aligned to FAA Strategic Priorities, FAA Priority Initiatives, UAS Strategic Priorities, the five-year UAS Integration Approach, and the National Aviation Research Plan. While the *UAS Integration Research Plan* is a result of these strategic priorities and initiatives, it is also a vital component in an iterative process; this plan informs and reflects the priorities and initiatives of the FAA and research partners.

The FAA has established and maintains partnerships with entities including the National Aeronautics and Space Administration (NASA), numerous federal agencies, a dedicated UAS Center of Excellence (COE), UAS Test Sites, Federally Funded Research and Development Centers (FFRDCs), industry, academia, independent research organizations, and domestic and international standards groups.

Integrating UAS into the National Airspace System

AIRSPACE ACCESS for UAS in the National Airspace System (NAS) will expand incrementally as the FAA implements a phased approach over the next few years. Current, planned, and future UAS-related research activities and results will enable the FAA to revise regulations and keep pace with the growing demands of NAS users. UAS operations are in development that span the airspace environment, from High Altitude Long Endurance (HALE) aircraft flying for days or weeks, to aircraft flying only a few hundred feet or less above the ground.



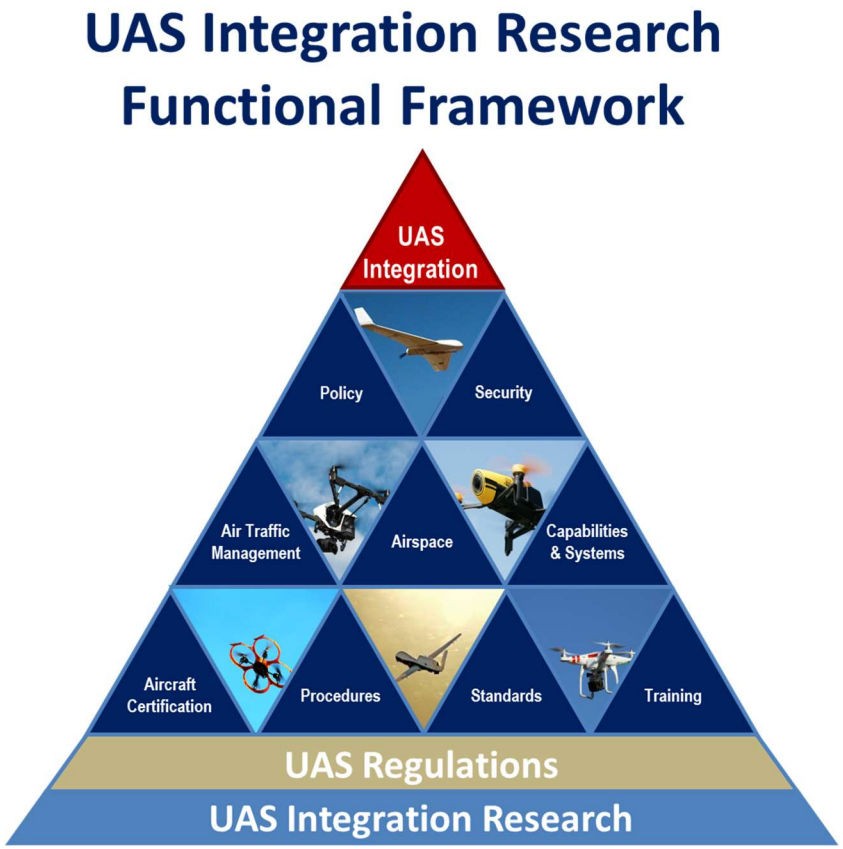
Source: Adapted from NASA, Aeronautics Research Mission Directorate

Current UAS Research Landscape

THE FAA PLANS to incrementally expand the operational envelope, allowing UAS operations with increasing levels of complexity, while fully maintaining critical safeguards for existing users of the NAS. This will ultimately allow UAS to safely conduct routine operations. The FAA is leveraging many UAS-related research activities across different research organizations, such as academia, NASA, UAS Test Sites, and standards bodies. It is leveraging technological advances from industry, lessons learned from approved operations, and expertise from around the world.

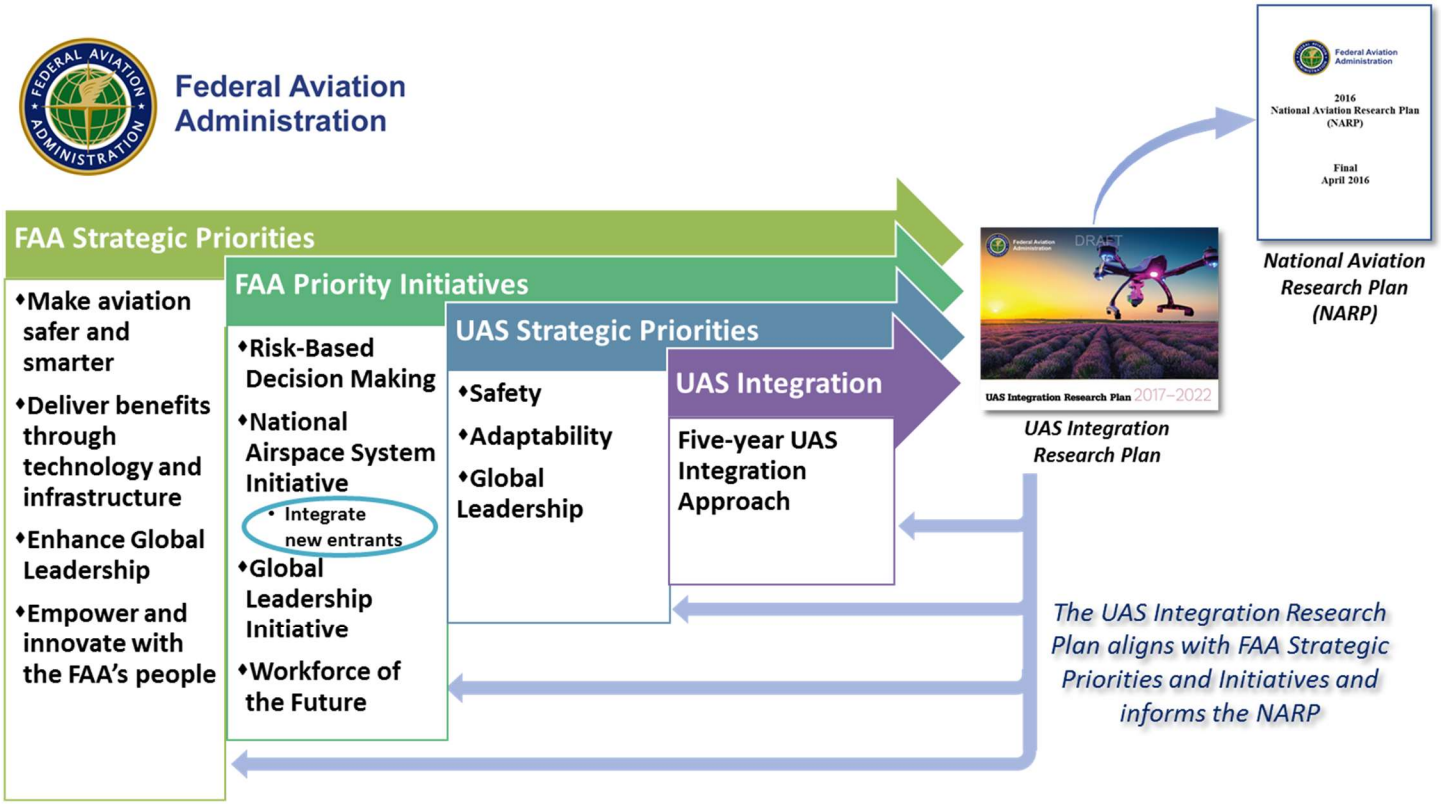
The FAA and partners have multiple efforts in progress to build upon recent changes to UAS-related regulations. For instance, the FAA is working with industry to approve UAS operations in Pathfinder programs, while NASA is exploring Low Altitude Traffic Management concepts. Multiple private and public research organizations are developing Detect and Avoid (DAA) technologies.

AS UAS operations become more fully integrated in the NAS, the FAA will mature its UAS operational requirements, develop repeatable approval processes, assess and invest in required infrastructure and systems, and continually analyze the costs and benefits for the FAA and UAS stakeholders. At the same time, the FAA will invest in additional research areas based on priorities identified within the FAA and by UAS stakeholder groups.



Alignment of Research to FAA's Strategic Priorities and Initiatives

THE *UAS Integration Research Plan* is aligned to FAA Strategic Priorities, FAA Priority Initiatives, UAS Strategic Priorities, and the five-year UAS Integration Approach, and informs the *National Aviation Research Plan*. This *UAS Integration Research Plan* is a result of these strategic priorities and initiatives and is a vital component in an iterative process. This plan informs and reflects the priorities and initiatives of the FAA's research partners, functional areas, and research activities that have been undertaken or identified by the participating UAS community.

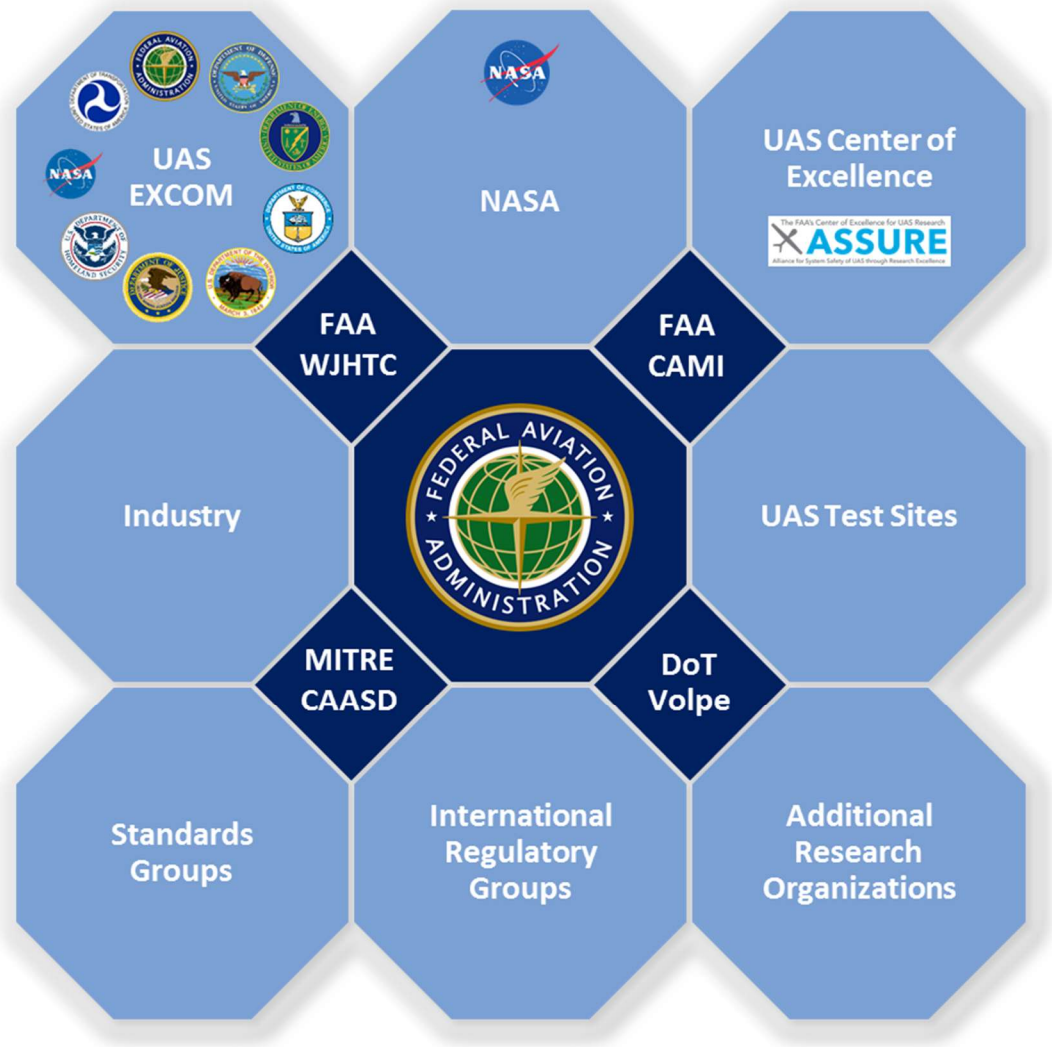


UAS Research Collaboration and Partnerships

INTEGRATION OF UAS operations is a multifaceted global challenge, requiring coordinated efforts within the FAA and across multiple agencies. To enable industry objectives while maintaining the security, safety, and civil rights of the public requires meeting multiple objectives in different domains.

The FAA is taking advantage of independent, non-sponsored UAS research efforts. It is leveraging a wide spectrum of UAS research and analyses being conducted by government agencies, industry, academia, international organizations, standards bodies, etc. to inform rulemaking and operational changes that will enable full UAS integration into the NAS.

UAS Research Partners

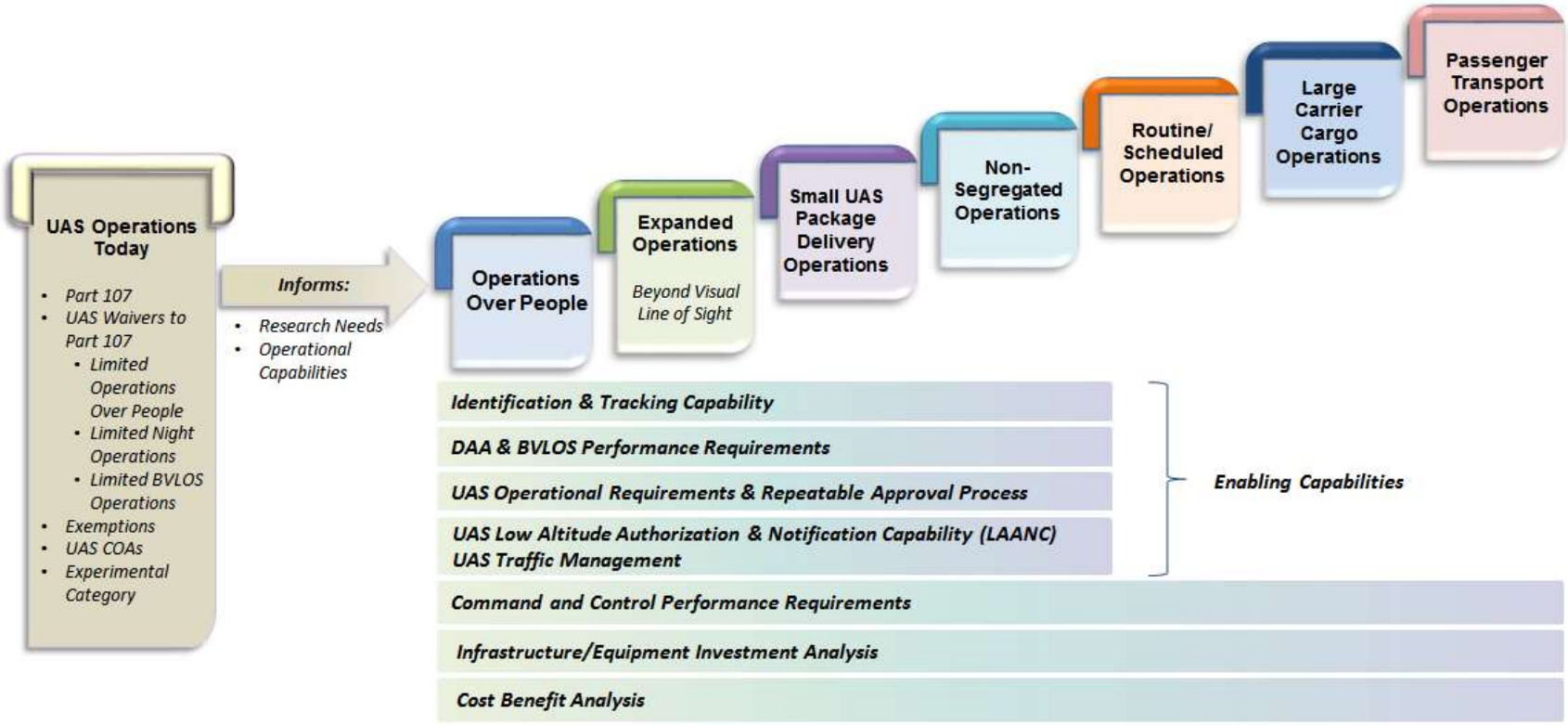


UAS Research Partners

- **AFRL**: Air Force Research Lab
- **ANSI**: American National Standards Institute
- **APAC**: ICAO Asia and Pacific Office
- **ASEB**: NAS Aeronautics and Space Engineering Board
- **ASSURE**: Alliance for System Safety of UAS through Research Excellence
- **CANSO**: Civil Air Navigation Services Organization
- **CTA**: Consumer Technology Association
- **EASA**: European Aviation Safety Agency
- **EuroCAE**: European Organisation for Civil Aviation Equipment
- **EXCOM SSG SARP**: Executive Committee – Senior Steering Group – Science And Research Panel
- **FAA CAMI**: Civil Aerospace Medical Institute
- **FAA WJHTC**: William J. Hughes Technical Center
- **ICAO**: International Civil Aviation Organization
- **IEEE**: Institute of Electrical and Electronics Engineers
- **ITU**: International Telecommunications Union
- **JARUS**: Joint Authorities for Rulemaking on Unmanned Systems
- **MIT/LL:** Massachusetts Institute of Technology Lincoln Laboratory
- **MITRE CAASD**: Center for Advanced Aviation System Development
- **NAS**: National Academy of Sciences
- **NATO**: North Atlantic Treaty Organization
- **NSF**: National Science Foundation
- **NIST:** National Institute of Standards and Technology
- **SAE**: Society of Automotive Engineers
- **TRB**: NAS Transportation Research Board

Operational Capabilities Towards Full UAS Integration

THE FAA'S APPROACH TO UAS RESEARCH is phased by operational capabilities providing a pathway to UAS integration, which will enable incremental expansion of airspace access for UAS over the next few years. As depicted in the graphic, these operational capabilities use a "building block approach" where successive capabilities are informed by previous research. It is important to note that the research path differs from the path used by rulemaking, as research informs rulemaking and policy .



Operations Over People: Includes expansion of the Code of Federal Regulations (CFR) 14 part 107 rule to enable small UAS (sUAS) to operate over persons not directly participating in the operation. Research activities include evaluation of ground collision severity and counter UAS technologies. Additional research is needed to determine risk-based thresholds and to develop centralized data collection.

Expanded Operations: Builds upon part 107 sUAS operations over people while expanding to beyond visual line-of-sight (BVLOS) operations, swarms, and on-airport operations. Research activities include the development of low altitude UAS traffic management, detect and avoid (DAA) requirements, and requirements for multi-UAS operations. Additional research is needed to evaluate UAS safety containment capabilities and develop cybersecurity requirements.

Small UAS Package Delivery Operations: Enables sUAS fleet operators to conduct operations that involve multiple launches and landings for delivering or retrieving packages or material. Research activities include development of automation strategies and human factors standards. Additional research is needed to develop standards for certification and pilot proficiency.

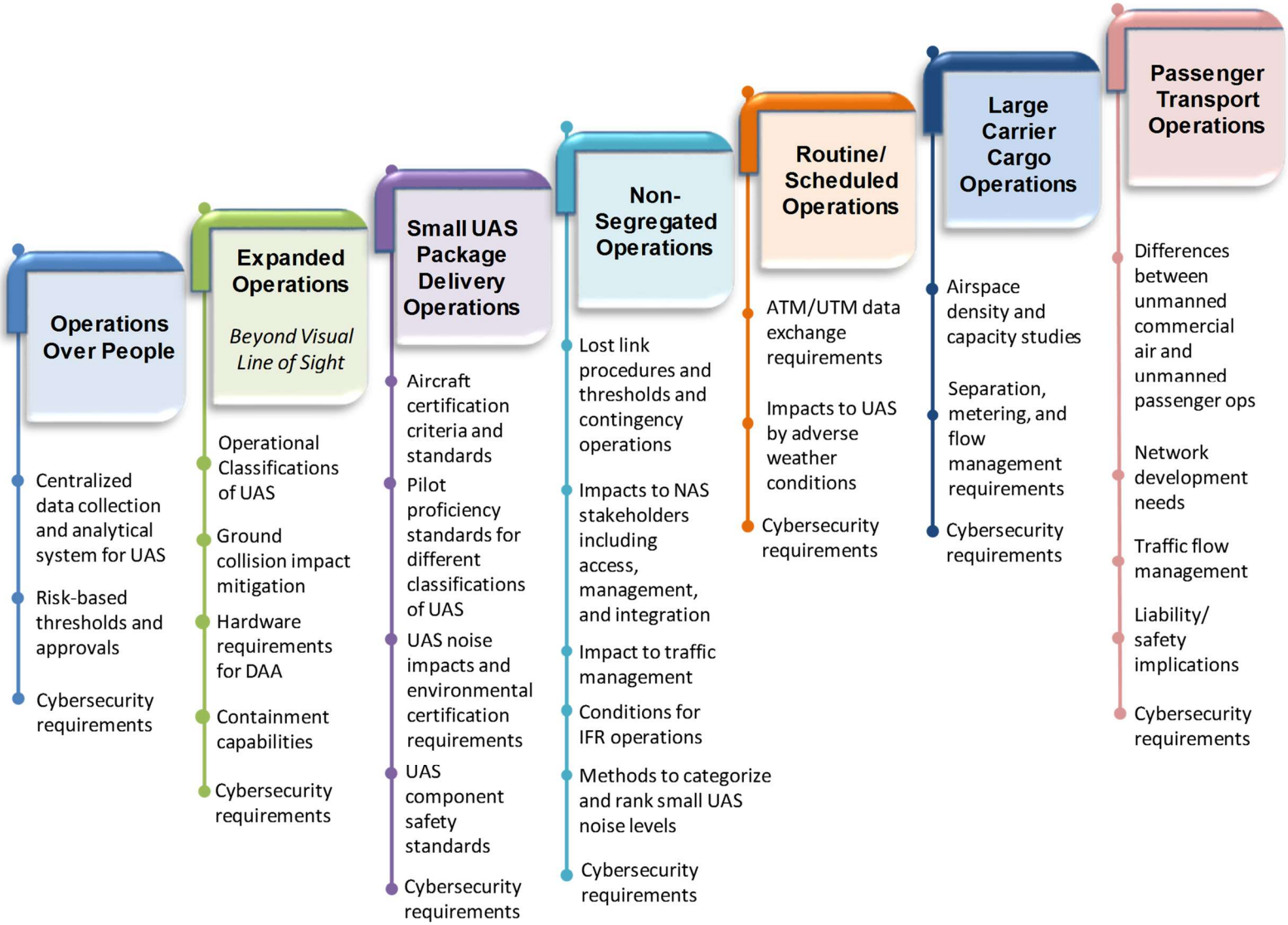
Non-Segregated Operations: Enables UAS operations to co-exist, with restrictions, in controlled airspace with manned aircraft. Includes operations with large, properly equipped UAS at varying altitudes and under instrument flight rules (IFR). Includes interstate delivery and small cargo operations. Research activities include procedures for lost link and thresholds for contingency operations. Additional research is needed to assess the severity of airborne collisions, determine communications thresholds, and to develop UAS performance standards

Routine/Scheduled Operations: Enables regularly scheduled UAS arrivals and departures at Class B, C, and D airports and permits optionally piloted aircraft for large cargo operations. Research activities include evaluating collaborative decision making capabilities and leveraging flight data to develop enhanced safety analyses. Additional research is needed to determine cybersecurity requirements, develop data exchange interfaces, and to explore impacts of adverse weather on UAS.

Large Carrier Cargo Operations: Enables the transport of cargo to be conducted by remote pilots in U.S. domestic airspace. Research activities include determining command and control (C2) standards and evaluating failure risks. Additional research is needed to identify separation, metering, and flow management requirements, and to perform studies related to airspace density and capacity.

Passenger Transport Operations: Enables air taxi services to be conducted by remote pilots, based on vehicle performance and type certification of the aircraft, its equipment, and the automation technology that replaces pilot functions on board. Research activities include investigating standards and emerging technologies for human transport by UAS. Additional research is needed to study differences between unmanned commercial air operations and unmanned passenger operations, and to identify network development needs.

Summary of Identified Needs for Operational Capabilities



Advancing FAA's UAS Research Program

AS UAS TECHNOLOGIES and business cases evolve, so will the demand for increased UAS operations. The FAA must keep up with the UAS community as operations expand, in order to ensure the safety of the NAS and to people on the ground. Therefore, research needs that were previously unanticipated may arise due to the rapid pace of UAS progression, increased operations, and the associated safeguards and mitigations.

The FAA will continuously re-evaluate its UAS research program to determine the required level of effort and to account for unanticipated changes. Because UAS integration challenges span multiple FAA Lines of Business, any of which may sponsor UAS research, estimated levels of effort will account for cross-agency research resources and leverage collaboration with partners to the extent possible.

The FAA will continue to work with research partners to determine a path forward for addressing gaps, and will continue to revise research plans to reflect the dynamic nature of the UAS landscape.

Remote Identification

The Federal Aviation Administration's (FAA) small Unmanned Aircraft Systems (UAS) rule (part 107) is just the beginning of an incremental approach to a regulatory framework for expanded UAS operations. As Transportation Secretary Elaine Chao recently announced, the FAA will soon be issuing a notice of proposed rulemaking for operations over people and an advanced notice of proposed rulemaking for security concerns.

In order to move forward, the FAA is prioritizing remote identification (ID), which enables threat discrimination and is a crucial component of a UAS Traffic Management (UTM) system, along with the FAA's Low Altitude Authorization and Notification Capability (LAANC) and dynamic airspace management. The FAA is committed to establishing these requirements as quickly as possible.

There are numerous components to effectively implement remote ID, including ensuring that the technology is scalable and appropriate to meet safety and security requirements.

Background

To address safety and security concerns, the FAA established an Aviation Rulemaking Committee (ARC) to provide recommendations on how to implement an ID and tracking system for UAS, and our security partners were involved in the process. In October 2017, the agency received the report from this ARC, which is available here:
https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/UAS%20ID%20ARC%20Final%20Report%20with%20Appendices.pdf

Since October 2017, industry and the government have been working concurrently to accelerate the development of a remote ID rule and related standards. In early 2018, FAA began sharing a conceptual remote ID framework with industry and security partners and the public. In the spring of 2018, the FAA assembled a cross-functional rulemaking team and published a Rulemaking Identification Number (RIN) to the Unified Spring Agenda of Regulatory and Deregulatory Actions, which can be found here:
https://www.reginfo.gov/public/do/eAgendaMain?operation=OPERATION_GET_AGENCY_RULE_LIST&currentPubId=201804&showStage=longterm&agencyCd=2100

At the same time, at least three standards bodies have formed groups or committees to address standards for remote ID:

- ASTM International:
  - Group F38 (WK27055) - New Practice for UAS Remote ID and Tracking
  - Initiated: First workgroup meeting in June 2018, currently finalizing the title and scope for the standard

- SAE International:
  - AIR6388 – Remote Identification and Interrogation of Unmanned Aerial Systems
  - Initiated: March 2017

- Consumer Technology Association:
  - ANSI/CTA-2067 Small Unmanned Aerial Systems – Remote Identification
  - Initiated: February 2017, 25% complete

Possible Items for Discussion with the DAC

1. The remote ID framework is being developed, in part, to facilitate UTM and Beyond Visual Line of Sight (BVLOS) operations throughout the National Airspace System (NAS). The FAA believes the participation of all UAS operating in the NAS, including model aircraft operators, is required. Absent congressional action with respect to the Special Rule for Model Aircraft (Pub. L. 112-95, Section 336), the FAA would not be able to apply remote ID requirements to model aircraft.

   Can the remote ID rule be effective without applicability to model aircraft operators? Are there ways for the remote ID requirements to be effective without applicability to model aircraft operators?

2. As the FAA has initiated rulemaking for remote ID requirements, our ability to participate in the committee work by the above referenced standards groups for remote ID is limited. However, industry consensus for remote ID, which can inform a final rule, is critical for a successful remote ID system without unnecessary delay. Specifically, as the remote ID system is being developed with the UTM conceptual operations in mind, the effectiveness of the remote ID rule may be contingent upon the availability of new systems to support network capabilities. The FAA has existing relationships and agreements with UAS service suppliers who facilitate airspace authorizations under part 107 through LAANC. Similar or new network-based systems need to be developed by the FAA and/or private industry in order to enable remote ID implementation.

   How can industry work towards consensus by all parties on remote ID standards?

3. The FAA is considering a network-based remote ID system that builds on the LAANC data exchange model.

   What is the most effective way to develop and implement a network-based system? How do you conceive the network-based system would be structured? What are the pros and cons of setting up a UAS Service Supplier network (like that used for LAANC) as compared with another network-based concept? How long would it take manufacturers to update software to accomplish remote ID? How long does it take to update software to use remote ID data? Is there anything required from the FAA to assist software development?

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

ORDER 1110.157

Effective Date:
06/15/18

SUBJ: Charter of the Drone Advisory Committee

1. Enter overview of the Order here. This will help provide a uniform look for all FAA directives. **Committee's Official Designation.** The Committee's official designation is the Drone Advisory Committee (DAC).

2. Authority. The Committee is established under the authority of the U.S. Department of Transportation (DOT), in accordance with the provisions of the Federal Advisory Committee Act (FACA), as amended, Pub. L. 92-463, 5 U.S.C. App. The Secretary of Transportation has determined that the establishment of the Committee is in the public interest.

3. Objectives and Scope of Activities. The objective of the DAC is to provide independent advice and recommendations to the Federal Aviation Administration (FAA) and to respond to specific taskings received directly from the FAA. The advice, recommendations, and taskings relate to improving the efficiency and safety of integrating Unmanned Aircraft Systems (UAS) into the National Airspace System. In response to FAA requests, the DAC may provide the FAA with information that may be used for tactical and strategic planning purposes.

4. Description of Duties. The DAC will act solely in an advisory capacity and will not exercise program management responsibilities. Decisions directly affecting implementation of transportation policy will remain with the FAA Administrator and the Secretary of Transportation. The DAC will:

a. Undertake only tasks assigned by the FAA.

b. Deliberate on and approve recommendations for assigned tasks in meetings that are open to the public.

c. Respond to ad-hoc informational requests from the FAA and or provide input to the FAA on the overall DAC structure (including the structure of subcommittees and or task groups).

5. Agency or Official to Whom the Committee Reports. The DAC reports to the Secretary of the Department of Transportation (DOT) through the FAA Administrator.

6. Support. The FAA will provide support as consistent with the act, including funding for the Committee. For the period of this charter, the FAA plans to utilize contractual support to provide for logistics and administrative support.

7. Estimated Annual Operating Costs and Staff Years. The FAA's annual operating costs to support the DAC for the period and scope specified by the charter is approximately $704,000, which includes 1.0 full-time equivalent salary and benefits at $204,000, plus $500,000 in contractor costs.

8. Designated Federal Officer. The FAA Administrator, on behalf of the Secretary of Transportation will appoint a full-time Federal employee to serve as the DAC Designated Federal Officer (DFO). The DAC DFO will ensure that administrative support is provided for all activities. The Designated Federal Officer will:

a. Ensure compliance with FACA and any other applicable laws and regulations.

b. Call and attend all the committee and subcommittee meetings.

c. Formulate and approve, in consultation with the Chair, all committee and subcommittee agendas.

d. Notify all Committee members of the time, place, and agenda for any meeting.

e. Maintain membership records.

f. Ensure efficient operations, including maintaining itemized contractor invoices.

g. Maintain all DAC records and files.

h. Adjourn any meeting when doing so would be in the public interest.

i. Chair meetings when directed to do so by the FAA Administrator.

9. Estimated Number and Frequency of Meetings. Committees will meet as follows:

a. It is estimated that the DAC will meet three times a year to carry out its responsibilities.

b. Meetings of the DAC will be announced in the *Federal Register* at least 15 days before each meeting, unless exceptional circumstances require shorter notice. Such circumstances will be explained in the notice. DAC meetings will be open to the public, except as provided by section 10(d) of the FACA and applicable regulations. The DAC will publish an annual report summarizing activities held in closed or partially closed meetings, consistent with the policies of the Freedom of Information Act.

c. Anyone interested may attend committee meetings and appear before the DAC within reasonable limits of space and time. Additionally, anyone interested may file written statements with the committee.

10. Duration. Subject to renewal every 2 years.

11. Termination. The charter will terminate 2 years after its effective date, unless renewed in accordance with FACA and other applicable regulations. If the DAC is terminated, the FAA will give as much advance notice as possible of such action to all participants.

12. Membership and Designation. The FAA will submit recommendations for membership to the Secretary of Transportation, who will appoint members to the DAC. All DAC members serve at the pleasure of the Secretary of Transportation.

a. The DAC will have no more than 35 members.

b. Members will serve without charge, and without government compensation. The employing organization bears all costs related to its participation. Members must represent a particular interest of employment, education, experience, or affiliation with a specific aviation-related organization.

13. Subcommittees. The DAC DFO has the authority to create and dissolve subcommittees as needed. Subcommittees must not work independently of the DAC. They must provide recommendations and advice to the DAC, not the FAA, for deliberation, discussion, and approval.

14. Recordkeeping.

a. The records of the committee and subcommittee will be handled in accordance with the General Records Schedule 6.2, or other approved agency records disposition schedules.

b. Meeting minutes must be kept in accordance with GSA standards as published in 41 CFR Part 102-3 Subpart D - § 102–3.165.

c. These records will be available for public inspection and copying, subject to the Freedom of Information Act, 5 U.S.C. 552. The records, reports, transcripts, minutes, and other documents that are made available to or provided for or by the DAC are available for public inspection at www.faa.gov/regulations_policies.

15. Filing Date. This charter is effective June 15, 2018, the date on which it was filed with Congress. This Committee will remain in existence for 2 years after this date unless sooner terminated or renewed.

Daniel K. Elwell
Acting Administrator

Advisory Committee Member Roles and Responsibilities

Advisory committees have played an important role in shaping programs and policies of the federal government from the earliest days of the United States of America. Since President George Washington sought the advice of such a committee during the Whiskey Rebellion of 1794, the contributions made by these groups have been impressive and diverse.

Through enactment of the Federal Advisory Committee Act (FACA) of 1972 (Public Law 92-463), the U.S. Congress formally recognized the merits of seeking the advice and assistance of our nation's citizens to the executive branch of government. At the same time, the Congress also sought to assure that advisory committees:

- Provide advice that is relevant, objective, and open to the public;
- Act promptly to complete their work;
- Comply with reasonable cost controls and recordkeeping requirements; and
- Had government oversight through creation of the Committee Management Secretariat.

Participation in a FACA such as the Drone Advisory Committee (DAC) provides the Federal Government with essential advice from subject matter experts and a variety of stakeholders. The FACA requires that committee memberships be "fairly balanced in terms of the points of view represented and the functions to be performed." Selection of committee members is made based on the particular committee's requirements and the potential member's background and qualifications. DAC members assume the following responsibilities:

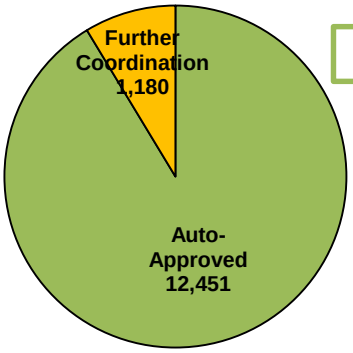
- Attend the DAC public meetings.
- Provide oversight, deliberation, comments and approval of the DAC activities.
- Contribute respective knowledge and expertise.
- Participate as a member on a working group, if desired.
- Coordinate with the constituents in his or her Unmanned Aircraft System and aviation sector.
- Review work plans, if requested.
- Review the DAC and any subcommittee or working group recommendation reports.
- Inform the DAC Chair and the DFO when he or she can no longer represent his or her organization/association on the DAC.
    - Members may continue to serve until a replacement has been appointed or removed. Alternate representatives may be appointed when necessary by the Secretary of Transportation.

As of July 6, 2018

UAS Metrics Update

LAANC Airspace Requests

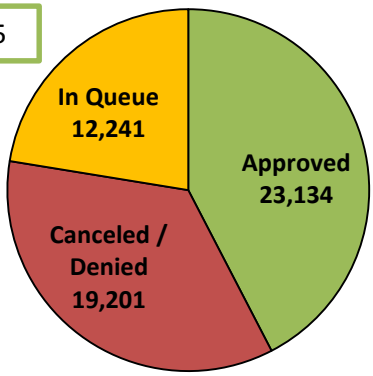
Incoming Requests* (total)



Total: 13,631

Manually Processed Airspace Waiver/Authorizations

Total: 11,165



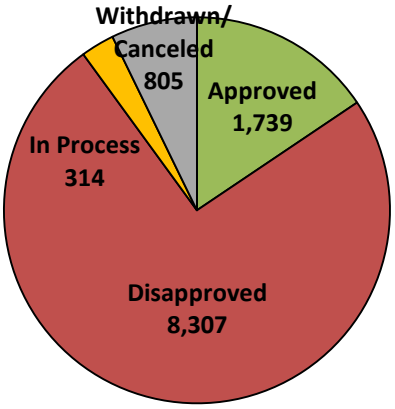
Part 107 Provision (Top 5 Requested)	# Waivers Issued
Night Operations	1,635
Operations over People	13
BVLOS Operations	18
Operational Limitation: Altitude	21
Operations from a Moving Vehicle	6

10 UAS Integration Pilot Program (IPP) Lead Participants

Remote Pilot Certificates Issued: 98,118
Knowledge Exam Success Rate: 92%

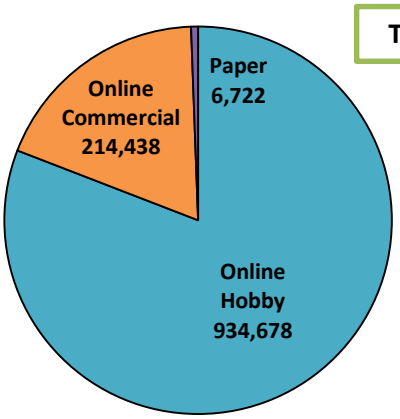
Non-Airspace Waivers

Total: 55,608



UAS Registrations

Total: 1,155,838



12 UAS Type Certification Projects Ongoing

4 Active Partnership for Safety Plans (PSP) Underway