Drone Advisory Committee

Public eBook

Public Only Information
June 19, 2020
DAC Meeting • Virtual

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Virtual Meeting Logistics

- We ask that everyone remain muted during the presentations. After each briefing, there will be an opportunity for the DAC members to engage in discussion and ask questions

- Because of the large size of the group we ask that you first raise your hand using the Zoom command on your dashboard. An FAA moderator will be monitoring the dashboard and call on you to begin speaking

- This DAC meeting is being livestreamed and recorded. It will be made available for future viewing on the FAA's YouTube channel

- This is a public meeting and there may be members of the media viewing the livestream. They will be instructed that all discussions are for background only

- To access the livestream links, go to either of these websites: https://www.facebook.com/FAA or https://www.youtube.com/FAAnews

Confirmed FAA/DOT Attendees

Name	Title	Org.
1. Ali Bahrami	Associate Administrator for Aviation Safety	FAA
2. Dan Elwell	Deputy Administrator and DAC Designated Federal Officer	FAA
3. Jay Merkle	Executive Director, UAS Integration Office	FAA
4. Bill Crozier	Deputy Executive Director, UAS Integration Office	FAA
5. Arjun Garg	Chief Counsel, Office of General Counsel	FAA
6. Kirk Shaffer	Associate Administrator, Airports	FAA
7. Claudio Manno	Associate Administrator, Security and Hazardous Materials Safety	FAA
8. Timothy Arel	Deputy Chief Operating Officer, Air Traffic Organization	FAA
9. Brianna Manzelli	Assistant Administrator, Office of Communications	FAA
10. Teri Bristol	Chief Operating Officer, Air Traffic Organization	FAA
11. Angela Stubblefield	Chief of Staff	FAA
12. Alex Zektser	Attorney Advisor	DOT
13. Erik Amend	Manager, Executive Office, UAS Integration Office	FAA
14. Gary Kolb	UAS Stakeholder & Committee Liaison, UAS Integration Office	FAA

Confirmed FAA/DOT Observers

Name	Title	Org.
1. Adrienne Vanek	Director, International Division, UAS Integration Office	FAA
2. Michael McCrabb	Foreign Affairs Specialist, UAS Integration Office	FAA
3. Christopher Swider	International Specialist, UAS Integration Office	FAA
4. William Stanton	UAS Integration Lead for Air Traffic Organization	FAA
5. Tonya Coultas	Deputy Associate Administrator, Security and Hazardous Materials Safety	FAA
6. Rico Carty	Deputy Executive Director, Flight Standards	FAA
7. Genevieve Sapir	Senior Advisor, Security and Hazardous Materials Safety	FAA
8. Julie Marks	Deputy Director, Safety and Integration Division, UAS Integration Office	FAA
9. Robert Sweet	Senior Advisor, Air Traffic Organization	FAA
10. Elizabeth Forro	Special Assistant, UAS Integration Office	FAA
11. Alison LePage	Digital Communications Manager, Office of Communications	FAA
12. Alison Duquette	Digital Communications Team Lead, Office of Communications	FAA
13. Jessica Orquina	Lead Communications Specialist, UAS Integration Office	FAA
14. Khurram Abbas	Communications Specialist, UAS Integration Office	FAA
15. Gretchen Tressler	Technical Writer, UAS Integration Office	FAA
16. Jennifer Riding	Program Analyst, UAS Integration Office	FAA

Drone Advisory Committee

June 19, 2020 DAC Meeting • Virtual Meeting

Public Meeting Agenda
Time: 12:00 p.m. to 3:00 p.m. Eastern Time
Location: Virtual

	Start	Stop	
1.	12:00 p.m.	12:03 p.m.	**Greeting from FAA**
2.	12:03 p.m.	12:05 p.m.	**Official Statement of the Designated Federal Officer**
3.	12:05 p.m.	12:10 p.m.	**Review of Agenda and Approval of Previous Meeting Minutes**
4.	12:10 p.m.	12:25 p.m.	**Opening Remarks from Designated Federal Officer (DFO)**
5.	12:25 p.m.	12:40 p.m.	**Opening Remarks from DAC Chairman**
6.	12:40 p.m.	1:30 p.m.	**DAC Recommendation and Discussion: Tasking #7 – UTM**
7.	1:30 p.m.	1:45 p.m.	**Break**
8.	1:45 p.m.	2:35 p.m.	**DAC Interim Recommendation and Discussion: Tasking #8 – Safety Culture**
9.	2:35 p.m.	2:50 p.m.	**New Business/Agenda Topics**
10.	2:50 p.m.	3:00 p.m.	**Closing Remarks from DFO and DAC Chair**
11.	3:00 p.m.	3:00 p.m.	**Adjourn**

RSVP Required: Email DACmeetingRSVP@faa.gov providing your full name and organization (if representing an organization).
Questions/Comments: Contact Gary Kolb, UAS Stakeholder & Committee Liaison (gary.kolb@faa.gov or 202-267-4441).

DAC Membership – As of 05/20/2020

Stakeholder Group	Members
Designated Federal Officer	**Dan Elwell**, Deputy Administrator, Federal Aviation Administration
Chair	**Michael Chasen**, Chairman of the Advisory Board, PrecisionHawk USA, Inc.
Airports and Airport Communities	**Deborah Flint**, Chief Executive Director, Los Angeles World Airports **Marily Mora**, President and Chief Executive Officer, Reno-Tahoe Airport Authority
Labor (controllers, pilots)	**Trish Gilbert**, Executive Vice President, National Air Traffic Controllers Association **Joseph DePete,** President, Air Line Pilots Association (ALPA)
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 **Bob Brock,** Director of Aviation and UAS, Kansas Department of Transportation **Mark Colborn,** Senior Corporal, Dallas Police Department **Michael Leo,** Captain, New York City Fire Department **Steve Ucci,** Senior Deputy Majority Leader, Rhode Island State Assembly
Navigation, Communication, Surveillance, and Air Traffic Management Capability Providers	**George Kirov**, Vice President and General Manager, Commercial UAS Solutions, Harris Corporation **Christopher Penrose**, Senior Vice President of Emerging Devices, President of Internet of Things, AT&T **Mariah Scott,** President, Skyward (a Verizon company)
Research, Development, and Academia	**Robie Samanta Roy**, Vice President of Technology, Lockheed Martin Corporation
Traditional Manned Aviation Operators	**Mark Baker**, President and Chief Executive Officer, Aircraft Owners and Pilots Association **Houston Mills**, Vice President, Flight Operations and Safety, United Parcel Service (UPS) **Lorne Cass,** Vice President, Operations / Industry Affairs, American Airlines (AA) **Vacant**
UAS Hardware Component Manufacturers	**Phil Straub**, Executive Vice President and Managing Director, Aviation Division, Garmin, Ltd. **Christian Ramsey,** President, uAvionix Corporation
UAS Manufacturers	**James Burgess**, Chief Executive Officer, Wing (an Alphabet company) **Michael Chasen**, Chairman of the Advisory Board, PrecisionHawk USA Inc. **Gur Kimchi**, Co-Founder and Vice President, Amazon Prime Air **Brendan Schulman**, Vice President of Policy and Legal Affairs, DJI Technology **Michael Sinnett,** Vice President Product Development and Strategy, Boeing Commercial Airplanes
UAS Operators	**Greg Agvent**, Senior Director of National News Technology, CNN **Todd Graetz**, Director, Technology Services, UAS Program, BNSF Railway
UAS Software Application Manufacturers	**Jaz Banga**, Co-Founder and Chief Executive Officer, Airspace Systems, Inc. **Chris Anderson,** Chief Executive Officer, 3DR **Vacant**
Other	**Rich Hanson**, President, Academy of Model Aeronautics **Brian Wynne**, President and Chief Executive Officer, Association for Unmanned Vehicle Systems International

Stakeholder Group	Members
	Thomas Karol, General Counsel, National Association of Mutual Insurance Companies **David Silver,** Vice President for Civil Aviation, Aerospace Industries Association **Lee Moak,** Founder & Chief Executive Officer of The Moak Group

DAC Task Group #7
UTM Report

Report to the FAA Drone Advisory Committee
Work Product of Task Group #7—UTM Performance Capability Priorities
Task Group Lead—David Silver, VP for Civil Aviation Aerospace Industries Association

At the February 27, 2020 meeting of the Federal Aviation Administration's (FAA) Drone Advisory Committee (DAC), the Designated Federal Officer (DFO) asked Task Group #7 (TG7) to continue its work, led by David Silver from the Aerospace Industries Association (AIA), to provide industry comments for the FAA's UAS Traffic Management (UTM) CONOPs 2.0 document, released on March 6, 2020.

TG7 previously submitted a report to the FAA with performance capabilities definitions, as well as a road map of responsibility, FAA resource requirement, and industry priority levels for each defined capability.

INTRODUCTION

The FAA's DAC is made up of high-level industry participants from various companies, levels of governments, airports, and the manned aviation community. The volunteer members provide their expertise to the FAA on critical issues facing the future of the unmanned aircraft systems (UAS) industry at public meetings and in task group settings.

TG7 comprises 51 members representing 34 organizations[1] from the UAS ecosystem. The final work product from the group includes this high-level report, a synopsis of the group's comments to the CONOPs 2.0 document[2], and more detailed comments on specific areas where more discussion with the FAA is needed. Lastly, TG7 updated the deliverables that were previously presented to the DAC.

SCOPE OF TASK GROUP'S WORK

The DFO specifically tasked TG7 to "Provide industry comment on the UAS Traffic Management (UTM) concept of operations v2.0 and provide industry prioritization of UTM capabilities." Since the group had previously submitted the second tasking to the FAA, they focused this 90-day period primarily on the industry comments.

OVERVIEW OF WORK PRODUCT

Over the course of the 90-day tasking, TG7 met 7 times to build out this report as well as provide updates to the previous two deliverables. TG7 members were first asked to review and provide comments to the FAA's CONOPs document. Next, a survey was completed based on the themes of those comments and a series of break out calls were established to look at the topics that needed an in-depth review. Once the breakout calls occurred, the group came to consensus positions on the topics.

[1] Full list of participants included in appendix A

[2] Full list of comments included in appendix B

TG7 believes that these documents will provide the DAC, FAA, and other relevant stakeholders a comprehensive overview of the UTM CONOPs 2.0 document, as well as a holistic approach to the current state of UTM development. These comments do not speak for the entirety of industry, but for the participants of TG7.

UTM CONOPS 2.0 Industry Comments

INTRODUCTION

The FAA's UTM CONOPs 2.0 (CONOPs) is the FAA's 2nd iteration of a published UTM CONOPs, updated to reflect the advancement of the technology and industry, and allows for robust conversation about the current development of UTM. Overall, TG7 felt that the document is an accurate reflection of the state of UTM development and supports a large majority of the document as written. However, this CONOPs reflects version 2.0 of a document, and not the final version. Therefore, many of the group's more in-depth comments are reflected around the need for additional clarity from the FAA on a specific piece of the UTM ecosystem, more information on a new concept introduced in version 2.0, and lastly, areas where more discussion will be needed based on potential policy changes that would have to occur in the future.

Unless otherwise noted, all information contained in this report is directly from the UTM CONOPs 2.0 document.

AREAS OF WIDESPREAD SUPPORT

As mentioned above, TG7 supports many pieces of the document. Based on the common themes derived from the group's comments, TG7 unanimously supports:

1. The CONOPs description of the federated UTM system
2. The FAA recognition of the benefits of LAANC and the clear need for the UTM system
3. The FAA's understanding that some of the technologies referenced in the document are not fully developed yet, but will be necessary to maintain the safety of the National Airspace System
4. The specification of performance rules governing USSs and certain UTM services
5. The recognition of standards development organizations and their contributions to UTM and overall NAS safety
6. Notion of Government-qualified services and/or service providers

AREAS WHERE MORE DISCUSSION IS NEEDED

TG7 understands that this is version 2.0 of the CONOPs, and that there will be updates to the document in subsequent versions. The group feels that more discussion can lead to an updated version, which will likely provide answers to many of the open questions contained within version 2.0. However, the FAA and industry must work together prior to version 3.0 being published to ensure that clarity occurs.

TG7 feels that more discussion is needed on the following areas:

1. Role of Flight Information Management System (FIMS)
2. Participation of UAS within UTM
3. Role of UVR
4. Manned Aircraft Operators Participation
5. Benefits of the UTM system

6. Role of Performance Authorizations
7. Networked Remote ID
8. The ability for technology to take the place of certain UTM services
9. The accuracy of the scenarios contained within the document
10. Data protection
11. Volume-based vs. Trajectory-based Strategic deconfliction
12. Roles and Responsibilities of the operator and USS.

Role of Flight Information Management System/FIMS: TG7 supports the FAA's concept of FIMS as defined in section 2.3.2.4 of the document. FIMS will be a critical interface contained within the UTM ecosystem and help lead to the safe operation of aircraft. However, the CONOPs document should provide more clarity around the specific functions FIMS will serve, the separation of the roles of FIMS and the USS, as well as how the FIMS can provide information to the legacy Air Traffic Control system.

As shown in Figure 3, "Notional UTM architecture", details for the three arrows between FIMS and UAS Service Supplier need to be provided. This would include a description of the function for the three arrows, 1) Constraints, Requests for Information, 2) Responses and 3) Operations, Notification. The function being sent back and forth in these data transfers is critical and for a federated UTM to be possible, these three arrows need to be stable and published Application Programming Interfaces. For the data packets within the three arrows, the content, bit length, encryption is also necessary. This type of high level of requirement would provide high consistent guidance to UAS Service Suppliers which would speed the deployment of the UTM.

Participation of UAS within UTM: The group feels that more discussion is needed around participation within UTM. As stated in Section 2.4.1 "All UAS Operators not receiving ATC separation services are required to participate in UTM at some level using applicable services to meet the performance requirements of their operations." This is a substantial departure from the framework in UTM CONOPs 1.0 which expressly envisioned VLOS operations to not be required to participate in UTM. TG7 is seeking clarity around the terms "all UAS" and "at some level" as it is understood that this "level," and any corresponding requirements, will change based off the operation (e.g. VLOS or BVLOS), size of the aircraft, location, mission type, etc.

Role of UVR: UAS Volume Reservations (UVR) will be critical to ensuring the safety of the National Airspace System as UTM fully develops. As UTM is rolled out, there will be many different instances that could require airspace access to be limited for a period of time. For example, would UVRs be available only to public safety or would functionally similar tools be available to commercial entities? TG7 supports the UVR concept but believes that more clarity is needed on how UVRs will be utilized.

Manned Aircraft Operators Participation: As section 2.4.1.3 states, "Manned aircraft operators are not required to participate in UTM, but may, and are encouraged to voluntarily do so to obtain the safety benefits that are gained from shared awareness among airspace users." TG7 agrees with the text as written in the section that manned aircraft operators participation in

UTM should be voluntary. However, more discussion is needed on responsibilities, safety risks and other topics as this policy takes shape.

There are also other areas in the document that create confusion as to whether manned aircraft will need to obtain special/new equipage in order to be able to identify a UAS. TG7 agrees that a more robust discussion is needed on responsibilities of manned operators in UTM.

Benefits of UTM: Section 2.2 lists notional benefits that the UTM system will provide. TG7 agrees with all of these benefits, but believes the following benefits should be added to the list:

- A safe and stable environment for operators to operate and meet business needs through shared situational awareness and an operational framework consisting of standards, regulations, and common protocols that reduce risk and maintain stability.
- A flexible and extensible construct that can adapt and evolve as the trade space changes and matures.
- A construct that allows the FAA to maintain its authority over the airspace, while allowing industry to manage operations in areas authorized for low altitude UAS flight.
- UTM provides a framework wherein an integrated suite of services can be utilized to increase situational awareness of the operating environment and mitigate operational risk. These mitigations contribute to the overall risk profile of a given operation - thereby supporting operators' abilities in attaining performance authorizations for increasingly complex operations.
- UTM architecture will provide a secure framework for UAS, USS and SDSPs to operate their services efficiently, safely and capable of supporting increasing complexity with assured autonomy, utilizing artificial intelligence.

Role of Performance Authorizations: Performance Authorizations are critical to the safety of the National Airspace System as UTM becomes fully operational. The group agrees with the majority of the text in Section 2.4.2, but feels there are still some items that need greater clarity or discussion. TG7 believes that subsequent versions of the CONOPs will likely include some of these areas, but more information is needed about the specific type of performance linked to an authorization. For example, will the aircraft or the Communications, Navigation, Surveillance (CNS) capabilities determine an authorization? Likewise, could an authorization be linked to geographic location instead of airspace? TG7 believes that these are just some of the questions that will need to be answered by the FAA to further clarify the section.

Networked Remote ID: Section 2.6 of the document lays out the framework for Remote ID. TG 7 has limited our comments in this section to the CONOPs document, since the Remote ID rule is currently in the rulemaking process. One area where more clarification is needed by the FAA is how broadcast Remote ID could tie into the UTM system. For example, broadcast remote ID messages could be received by a network of sensors that relay the information to a Remote ID USS or the UTM system. TG7 unanimously supports the notion of Remote ID due to the safety benefits for all users of the National Airspace System, but believes the FAA should provide some more clarity on specifics tied to the UTM architecture.

The accuracy of the scenarios contained within the document: Section 3 of the document lays out five different scenarios for how UTM could be utilized in various situations. TG7 supports

the accuracy of all five of the scenarios, but recognizes that more complex scenarios to address future realities of the National Airspace System. Likewise, TG7 believes that a scenario featuring recreational flyers could help bolster the document. These scenarios have also led the group to ask for additional discussion and clarification from the FAA.

For example, in V2-4: Use of UTM to Remotely Identify UAS: Option 2 Figure 14 appears to oversimplify the complexities of the FAA setting up a new system to receive input from public service organization. TG7 is seeking additional information from the FAA regarding how this system would work, who would have access to it, and the benefits of it over the similar system in Figure 15.

Likewise, that same example would be strengthened by giving both local and federal officers the ability to access the system.

Another example is in V2-5: Federal Public Safety Request for UTM information the group is seeking more clarification on the architecture of Figures 15 and 16. Both figures raise similar questions as those raised in Figure 14.

Data protection: The CONOPs lays out principles for three types of UTM services that Operators might use in order to support their missions, including those services that are required by the FAA. For those services that are required due to FAA regulation, USSs should meet internationally accepted data protection standards in order to ensure that customer, government, and peer services are secured for the continued and safe operation of the UTM network.

Volume-based vs. Trajectory-based Strategic De-confliction: The CONOPs assumes that USS automation will use a series of intended four dimensional volumes (airspace volumes with time) to identify operations that may be in conflict. If two operations intend to use overlapping volumes, then the USS's associated with their operations will need to negotiate a de-conflicted solution or ensure that they are sufficiently aware of each other's operations to remain well clear. TG7 agrees that this approach will likely work for low levels of traffic but may not scale to high operational tempos or work when the majority of traffic is operating point-to-point. TG7 is seeking clarity from the FAA on whether a trajectory-based approach, which is more aligned to evolving ATM system for legacy traffic, would be effective as UAS operations evolve into the future.

Roles and Responsibilities of the Operator and USS: As the above themes have illustrated, the CONOPs laid out many new principles and concepts for managing UAS traffic. As these become clearer and continue to develop, the FAA must clearly define who is responsible for an individual piece of the UTM ecosystem. TG7 recommends that in subsequent versions of the CONOPs, the FAA clearly defines these roles and responsibilities for the operator and the USS platform.

STYLISTIC COMMENTS

Throughout the document, TG7 found a few cases of stylistic comments that should be addressed by the FAA. For example, in section 2.4.2.1 we believe that there is a typo in which the term "Victor Routes" is used. There are also a few locations where links contained within footnotes

appear to be broken. While we understand that these comments are not substantive in nature, TG7 believes that they should still be addressed.

CONCLUSION

TG7 thanks the FAA for the opportunity to provide feedback on the CONOPs. We look forward to continuing to work closely with all relevant stakeholders as UTM becomes more mature and enables the safe integration and operations of UAS in the National Airspace System.

****UPDATED 5.26.2020****

Report to the FAA Drone Advisory Committee

Work Product of Task Group #7—UTM Performance Capability Priorities

Task Group Lead—David Silver, VP for Civil Aviation Aerospace Industries Association

At the October 17, 2019 meeting of the Federal Aviation Administration's (FAA) Drone Advisory Committee (DAC), the Designated Federal Officer (DFO) established Task Group #7 (TG7), led by David Silver from the Aerospace Industries Association, to review "UTM CONOPs 2.0" and determine industry performance capability priorities for "UAS Traffic Management" (UTM).

While the tasking specifically referenced CONOPs 2.0, that version of the draft was not released during the 90-day duration of the task group. Therefore, the group worked off UTM CONOPs 1.0 and information obtained from early drafts of CONOPs 2.0. Because the group was unable to review CONOPs 2.0, the task group primarily focused on the prioritization of UTM capabilities.

INTRODUCTION

The FAA's DAC is made up of high-level industry participants from various companies, levels of governments, and airports, as well as the manned aviation community. The volunteer members provide their expertise to the FAA on critical issues facing the future of the unmanned aircraft systems (UAS) industry at public meetings and in task group settings.

TG7 comprises 47 members representing 33 organizations[3] from the UAS ecosystem who provided their expertise to compile a list of priorities for UTM capabilities. The final work product from the group includes this high-level report, a definitions document, and a "road map" that looks at industry and FAA resource requirements and priority levels for the identified specific performance capabilities.

SCOPE OF TASK GROUP'S WORK

TG7 recognized that certain items are critically important to the future of UTM and the UAS ecosystem, but fall outside the specific scope of this tasking. These include the roles and responsibilities of actors to carry out actions related to UAS and UAS Security. While this group did not specifically make recommendations on those items, TG7 believes that it will be important for relevant UAS Stakeholders and the FAA to continue to work together on the development of necessary policies, standards and other items that are needed for the development and implementation of a consistent UTM and the UAS ecosystem.

OVERVIEW OF WORK PRODUCT

Over the course of the 90-day tasking, TG7 met 5 times to build out two main deliverables:

[3] Full list of participants is included in appendix 3

1. A definition document describing the performance capabilities in the subsequent matrixed document (Note: these definitions are not meant to be set in stone, but merely used for context in describing a capability);
2. A matrixed document that breaks down each specific performance capability by responsibility (e.g. FAA or UAS Service Supplier [“USS”]), the type of resource required to make that performance occur (e.g. industry standard), the current status of that capability, and the industry’s priority level for that performance capability in the next 12-24 months.

The definitions of the performance capabilities used in the documents came from the FAA’s UTM CONOPs 1.0, early drafts of CONOPs 2.0, and industry driven priorities. TG7 believes this list encompasses a mature view of the UTM system and accounts for six critical pieces of the UTM puzzle, including:

- IT Services;
- Security Services;
- Operations Support Services;
- Conflict Management Services;
- Communications Services;
- Data Services.

These capabilities were then prioritized into low, medium, and high categories for resources in the near term (0-24 months).

TG7 believes that these documents will provide the DAC, FAA, and other relevant stakeholders a comprehensive overview of the current state of UTM performance capability development, as well as set up a road map for areas for the FAA to prioritize resources in the near term.

RECOMMENDATIONS

1. TG 7 recommends that the FAA and relevant UAS Stakeholders work to put a timeline together in advance of the next Drone Advisory Committee meeting that includes dates of when the FAA and industry believe that the task will be accomplished.
2. TG 7 asks the FAA to allocate resources based on the priority levels contained in this report.
3. TG 7 recommends that it remains in existence to address CONOPs 2.0 when available.

UTM Capability Definitions

General Terms

1. UAS Service Supplier (USS): USSs provide UTM services to support the UAS community, to connect Operators and other entities to enable information flow across the USS network, and to promote shared situational awareness among UTM participants.

IT Services:

1. FAA Messaging—A service which provides static, periodic, or event driven authoritative information from the FAA to USSs and UAS operators (e.g. airspace information, NOTAMs, TFRs)
2. Operator Messaging— A service which provides on demand, periodic, or event driven information on UAS operations (e.g. position reports, intent information, and status information) occurring within the subscribed airspace volume and time.
3. USS Network Discovery—A service which allows for service suppliers and UAS Operators to be aware of other service suppliers providing specific services of varying levels of capability in a specific geographical region.

Security Services:

1. Operator Registration—A service which provides the ability for vehicle owners to register data related to their UAS and a query function to allow appropriate stakeholder to request registration data.
2. USS Registration/Approval—A service which provides the ability for USS operators to register and be approved by the FAA and authenticate data related to their USS and their actions. Approval should be requirement-based and automated to the greatest degree possible.
3. Remote ID— A service that will allow for the UAS to be identified by authorized stakeholders and the public through broadcast and/or network means.
4. Communication Security—A service which provides keys and other security mechanisms necessary to authenticate the users and secure network transmissions.

Operations Support Services:

1. Airspace Authorization—A service which provides airspace authorization from the Airspace Authority/Air Navigation Service Provider to a UAS Operator.
2. Restriction Management—A service which manages and pushes operational restrictions from the Airspace Authority/ANSP to affected UAS operations.
3. UTM System Monitoring—A service which monitors USSs and other UTM components and provides status information to authorized parties.
4. Emergency— A USS service which provides a path for the safe passage or landing of an aircraft in emergency status by means of deconfliction or other conflict resolution.
5. ATM Interface—the way in which USSs will communicate with traditional Air Traffic Control

Conflict Management Services:

1. Pre-flight Planning—The ability of USSs to facilitate UAS operations taking into account airspace constraints, operator registration, information, restrictions, etc.

2. Strategic Deconfliction—A service which arranges, negotiates, and prioritizes intended operational volumes/trajectories of UAS operations with the intention of minimizing the likelihood of planned airborne conflicts between operations.
3. Conformance Monitoring--A service which provides real-time alerting of non-conformance to intended operational volume/trajectory to an Operator or another airspace user.
4. Conflict Advisory and Alert--A service which provides real-time monitoring and alerting through suggestive or directive information of UA proximity for other airspace users.
5. Dynamic Rerouting—A real-time service which provides modifications to intended operational volumes/trajectories to minimize the likelihood of airborne conflicts and maximize the likelihood of conforming to airspace restrictions and maintaining mission objectives. This service arranges, negotiates, and prioritizes inflight operational volumes/trajectories of UAS operations while the UAS is aloft.
6. Surveillance— A set of strategic and tactical services that support air risk assessment for safety case development, flight planning with airspace heat maps based on common traffic patterns, and flight operations by providing real-time tracking information of air traffic for a given geographic area. Surveillance services consist of three primary means of collecting information regarding airborne hazards: terrestrial surveillance, airborne surveillance, and satellite surveillance.
7. UAS Safety—The ability to incorporate multiple risk factors in assessing a UAS flight including ground risk data, population, hazards, weather, airspace density, etc. in the context of an SMS.
8. Manned Participation—Current aircraft equipage and communication links used when operating in airspace used for UTM operations.

Communications Services:

1. Communication/ C2--A service which provides infrastructure and quality of service assurance for radio frequency (RF) Command and Control (C2) capabilities to UAS Operators.
2. Alternative Navigation—Non-GPS Position, Navigation and Timing operations

Data Services:

1. Weather--A service which provides forecast and/or real-time weather information to support operational decisions of individual Operators and/or services.
2. Mapping--A service which provides terrain and/or obstacle data appropriate and necessary to meet the safety and mission needs of individual UAS operation or support the needs of separation or flight planning service.

UTM Capability	Responsibility?	FAA Resource Requirement	Current Status	Industry Priority Level in Near Term
IT Services:				
FAA Messaging	FAA	IT	TBD	High
Operator Messaging	USS	Standard	In progress	Medium
USS Network Discovery	USS	Standard	Developed	High
Security Services:				
Operator Registration	FAA	IT/Rulemaking	Complete	Complete
USS Registration	FAA	Advisory Circular	LAANC only	Medium/High
Remote ID	FAA	Rulemaking	TBD	High
Communications Security	USS	Standard	LAANC only	Medium
Operations Support Services:				
Airspace Authorization	FAA	IT/Notice of some kind	LAANC only; evolving	High
Restriction Management	FAA/USS	Standards/Advisory Circular	In progress	High
UTM System Monitoring	FAA/USS	IT	LAANC only; evolving	Low/Medium
Emergency	USS	Notice of some kind	TBD	Medium
ATM Interface	USS	Notice of some kind	TBD	Medium
Conflict Management Services:				
Pre-Flight Planning	USS	None	In development/ Deployed	Low
Strategic Deconfliction	USS	Standard	In development	High
Conformance Monitoring	FAA/USS	Standard	TBD	Medium/High

Conflict Advisory and Alert	USS	Standard	In development	High
Dynamic Rerouting	USS	None	TBD	Medium
Surveillance	USS	None	In development	High
UAS Safety	USS	Standard or Advisory Circular	TBD	High
Manned Participation	FAA	Policy	TBD	Low
Communications Services:				
Communication/ C2	Operator	Policy	In development	Medium
Alternative Navigation	USS/Operator	None	TBD	Low
Data Services:				
Weather	USS	None	TBD	Low
Mapping	FAA/USS	None	Limited obstacle info	Low

Appendix 1

Full list of participants include:

1	Justin Barkowski	AAAE
2	Max Fenkell	AIA
3	David Silver	AIA
4	Jacob Ruytenbeek	Airmap
5	Mark Reed	ALPA
6	Vas Patterson	ALPA
7	Sean Cassidy	Amazon
8	Robert Champagne	Amazon
9	Christopher Julius	American Airlines
10	Lorne Cass	American Airlines
11	Amit Ganjoo	Anra Technologies
12	Brent Klavon	Anra Technologies
13	David Murphy	Anra Technologies
14	Rune Duke	AOPA
15	Kenji Sugahara	Ariascend
16	Drew Colliatie	AUVSI
17	Rich King	AUVSI
18	Charlie Keegan	AVMGT
19	Wade Troxell	City of Fort Collins, Colorado
20	Lisa Ellman	Commercial Drone Alliance
21	Mark Colburn	Dallas PD
22	Brendan Schulman	DJI
23	Mark Aitken	DJI
24	Andrew Scharf	FDNY
25	Dave Messina	FPVFC
26	Dustin Kilgore	Garmin
27	Karen DiMeo	GE/AirXos
28	Ted Lester	GE/AirXos
29	Ken Stewart	GE/AirXos
30	Diana Cooper	Hyundai UAM
31	Jon Standley	L3Harris
32	Ryan Terry	Lockheed Martin Corporation
33	Tony Walsh	NATCA
34	Chris Keyes	NATCA
35	Steve Weidner	NATCA
36	Brittney Kohler	National League of Cities
37	Heidi Williams	NBAA
38	Bail Yap	NCDOT
39	Darshan Divakaran	NCDOT
40	Andy Thurling	NUAIR

41	John Deepu	NYPD
42	Chris Kucera	OneSky
43	Bob Hammett	OneSky
44	Kip Spurio	Raytheon Technologies
45	Matt Fanelli	Skyward
46	Greg Walden	Small UAV Coalition
47	Mildred Troegeler	The Boeing Company
48	Stella Weidner	The Boeing Company
49	Matt Satterley	Wing Avaition
50	Margaret Nagle	Wing Aviation
51	Mike Glasgow	Wing Aviation

Appendix 2:

Section Number	Comment	Recommended Change	Column1
1.1	Sentence 2 should reference all UAS not just sUAS as the combined volume is the bigger number. See also footnote 6 on page 6.	The predicted volume of UAS operations across both controlled and uncontrolled airspace, which could be on a scale comparable, if not greater, to that of present-day manned air traffic, compounds these challenges.	
1.1	Footnote 1- link does not work.	Fix the link	
1.1	Is the fleet number taken from registrations? If so, may not be accurate.	Base numbers off of sales if available.	
1.1	No acknowledgement of UAM and that UTM will evolve to support UAM.	Add visionary statement about UAM and how UTM will evolve to support UAM vehicles as well as UAS. Consider using "Universal Traffic Management" throughout document to encompass that UTM may support manned vehicles in the future.	
1.1	*"the existing Air Traffic Management (ATM) System infrastructure and associated resources cannot cost-effectively scale to deliver services for UAS. Further, the nature of most of these operations does no require direct interaction with the ATM system. To enable safe management of the expected rapid influx of UAS operations in the NAS, solutions that scale beyond the current ATM infrastructure and Air Traffic Control (ATC) personnel resources are necessary."*	*Support - recognition of the challenge with traditional ATM*	

1.2	Good to see FAA recognize that LAANC provides an initial UTM capability and that UTM will provide architecture for RID data exchanges.	None. Continue to support alignment of FAA UTM efforts.	
1.2	*"With the FAA's clarification that the airspace is managed by the FAA and that operations would be done cooperatively by Operators and their supporting services... enable a UTM ecosystem that provides management services to large-scale UAS operations in airspace where air traffic services are not provided."*	Support - decentralized, federated UTM model	
1.2	*"The FAA is supporting several organizations in the development of standards to permit, authorize, or allow the use of UTM services - including, but not limited to, ASTM International, the American National Standards Institue (ANSI), and the Joint Authorities for Rulemaking on Unmanned Systems (JARUS)... The FAA is also a member of the Global UTM Association (GUTMA). GUTMA serves as an industry voice and advocate for UTM technologies. GUTMA creates working groups to address UTM issues and drives a*	Support - recognition of standards development	

	common understanding across its membership."		
1.2	"UTM will provide the supporting architecture for information exchanges related to RID." This is the case only for RID solutions that relate to UTM services. A very large number of industry commentators, including DAC members, commented during the NPRM period in support of broadcast-only solutions that do not involve UTM supporting architecture in order to perform RID.	Add a line or explanation to the effect of, "UTM will provide the supporting architecture for information exchanges related to RID, other than for UAS that are exempt from RID or that accomplish Remote ID via a non-networked solution."	
1.3	Paragraph 2, sentence 3- should refer only to participating UAS as not all UAS must particpate in UTM.	In order to provide UAS with the same access as manned aircraft, UTM is designed to provide a similar means of cooperative traffic management for particpating UAS and other participating aircraft in uncontrolled airspace.	

1.3	2nd paragraph: "In order to provide UAS with the same access as manned aircraft, UTM is designed to provide a similar means of cooperative traffic management for UAS and other participating aircraft in uncontrolled airspace."	50% of all manned aircraft in the NAS have not voluntarily equipped with ADS-B Out and will not be required under ConOps 2 to do so. Nor are they required to have an ATC Transponder. Since these manned aircraft are not squalking or talking, and participation in UTM is voluntary, the only way to ensure effective traffic management is to install on-board DAA or collision avoidance systems on every BVLOS UAS operation, or support them with a ground based system.	2.4.1.3 states: "Manned aircraft operators are not required to participate in UTM, but may, and are encouraged to voluntarily do so." This policy was adopted in Version 1 and did not change with Version 2.
1.3	"In order to provide UAS with the same access as manned aircraft, UTM is designed to provide a similar means of cooperative traffic management for UAS and other participating aircraft in uncontrolled airspace." UAS already enjoy the same access as manned aircraft, with various statutory and regulatory frameworks currently providing freedom of operation in Class G under VLOS principles, which has produced several years of excellent safety records. Therefore FAA's drafting here misstates the function of UTM, which is not required to provide a means of access that already exists. UTM's purpose is to expand operations beyond VLOS frameworks.	This sentence should be revised to acknowledge that there are productive and even life-saving operations currently enabled that do not require UTM, pursuant to existing VLOS regulations and frameworks, and can go on to describe the nature and purpose of UTM.	

2.1	Paragraph 1, sentence 1- is UTM the only manner in which FAA will support operations? Disagree, it is only one method.	UTM is (one or the primary) manner in which the FAA will support operations for UAS operating in low altitude airspace.	
2.1	Paragraph 2, sentence 2. Not everyone is required to particpate in UTM. For example, UAS <250g.	Operators, voluntarily or when required, share their flight intent with each other and coordinate to de-conflict and safely separate trajectories.	
2.1	The third paragraph contains the sentence, "They are paramount to supporting the safe and secure conduct…" The pronoun reference "They" is unclear. The sentence can be interpreted to indicate that whatever "They" are, is paramount to the listed examples.	If my interpretation of the sentence's intent is correct, I would recommend changing the beginning of the sentence to read; "UTM services are essential to supporting the safe and secure conduct…" thus removing the unclear pronoun reference.	
2.1	*"USSs provide services to support the UAS community, to connect Operators and other entities to enable information flow across the USS Network, and to promote shared situational awareness among UTM participants. Some services provided by USSs require qualification by the government in order to support Operators in meeting applicable regulations and policies."*	Support - UAS Service Supplier network	

2.1	*Paragraph 3, sentence 4, states UAS Operators may choose to use third party USS or or they may choose to provision their own set of services. This contradicts the firm mandate described in the Remote ID NPRM. We would support this choice.*	*This contradicts the Remote ID NPRM and this conflict needs to be resolved. We are in favor of the Con Ops v2 wording.*	technical
2.1	Footnote 6 states that the "small" was dropped, but this appeared to be at the potential expense of acnowledging the low risk that relates to the Small category of UAS. Not all aircraft should be treated the same with respect to risk mitigation.		
2.1	In the bulleted list, it seems FAA is not working on measuring the nature and level of the risk that should be mitigated with respect to UTM operations. That's a primary function of the regulator, and will be needed in order to get the rules and frameworks "correct."	For example, shouldn't the “authorize and assess” philosophy say something about risk?	
2.1	Footnote 8	An indication of intended new FAA rules for the reader of what is coming e.g: RID; BVLOS; Flight over People; Weather brief etc. would be helpful.	
2.2	Benefits section is missing the primary benefit of UTM we have discussed for years: operations beyond the VLOS framework, including autonomy.	The DAC TG could develop a more refined set of benefits for FAA to list here.	

2.3	There is very little information as to how the FAA expects to manage other conventionally piloted aircraft (CPA) within “UTM airspace”. The implicit assumption is that they are visible to ATC and therefore visible to the UTM via the FIMS. But this not always the case, particularly at low altitudes and for those CPA without the necessary transponder equipage, or operating outside of a mandatory equipage airspace (e.g., the Mode C veil). Further information on how CPA will be managed within the UTM construct. Brief mention on page 25 but again much is left open or implied (they imply manned aircraft required to file intent, or equip)	Provide more information on how the FAA expects to manage other conventionally piloted aircraft (CPA)	Needs clarification
2.3	The notional architecture shows a separate link between the UAS Operator and Supplemental Data Service Provider. Careful consideration needs to be made to ensure this interface does not break “the common operating picture” model core to the UTM concept.	Carefulc consideration needs to be made to ensure this interface does not break "the common operating picture" model core to UTM concept.	Narrative
2.3	It is stated the ATC is not responsible for UTM but rather a group of	I contend the UTM must be under the authority of ATC. Without a single	technical

	unnamed FAA and other bodies (public and private?) are.	management structure within the FAA, UTM progress will be slowed.	
2.4	'performance authorization and requirements'	First use of this term in the text. A footnote to briefly expand/explain the term is needed, before paragraph 2.4.2	
2.4.1.3	*"Manned aircraft operators **should** have access to information regarding the conduct of UTM operations, and can voluntarily participate at different levels."*	I believe that there is a clarification 'verb' missing. Perhaps we ought to consider that manned aircrew ***should have*** access the appropriate UTM for their respective location/track of operation? This to ensure tactical awareness before flight, especially in busy controlled airspace.	
2.4.1.3	Active participation: "*Manned aircraft Operators **should** make their flight intent available to UAS operators/RPICs participation in UTM via the USS Network, **if their sphere of operation is within the UTM,** fostering situational awareness etc……..*	This will alert all UAS operators in the USS. They can appropriately avoid such planned traffic under Pt 107.37**.**	
2.6	Agree with FAA concept for Remote ID, Remote ID USSs, data sharing, and public safety USS functionality.	None.	
2.6	*"An Operator transmitting via network publish sends an RID Message to a USS that has been qualified by the FAA to provide RID services - termed an RID USS. The RID USS makes the RID message available to all other RID USSs, and vice versa, such that the complete set of messages held by these various*	Support - networked remote identification	

	USSs comprises a distributed database."		
2.6	RID is stated as providing protection to public safety vulnerabilities associate with low altitude UAS operations.	There is no proof of that UAS create a safety issue. Where is the Risk Assessment? This should be removed from the document.	technical
2.6	Two methods of RID message transmission are discussed.	We support the requirement of EITHER of these technologies and not both as described in the Remote ID NPRM.	technical
2.6	This section describes Remote ID and references the 2017 RID Aviation Rulemaking Committee (ARC) report which recommends two methods for UAS to transmit RID information; Direct Broadcast and Network Publishing. This contrasts with the RID NPRM, which basically dismissed these recommendations. The ConOps v2 document does not specify if both methods will be adopted.	It does, at least the way I read the plan, leaves open the possibility that a Network Broadcast method using a stand-alone device connected to the Internet (without Direct Broadcast from the UAS, or Limited Broadcast as defined in the RID NPRM) could be an option for recreational flyers without a RID equipped machine. On page 37, footnote 27 states: "VLOS UAS Operators are not required to strategically de-conflict with other UTM participants to conduct operations because they are able to visually separate from other aircraft." This would suggest that the UAS itself would not need to automatically connect to the Internet as proposed in the RID NPRM, but the operator would be required to log into a USS via a separate device to provide operational intent and receive an airspace authorization.	As I see it, unless the FAA approves this alternative Network Publishing method, all recreational flyers without Standard or Limited RID will be restricted to a FAA-recognized Identification Area (FRIA). FRIAs are essentially a 400' Visual Line-of-Sight (VLOS) bubble and being restricted to these areas will severely curtail the recreational market and STEM programs in schools and colleges. R/C flyers at existing sanctioned AMA fields are not pleased that they will have to reapply for FRIA status, but begrudgingly will comply so they can keep flying. However, if the FAA tries to force FPV flyers and multi-rotor drone operators into these FRIA

			areas where historically neither group has ever been welcomed, non-compliance will become commonplace, and enforcement by the FAA and federal LE will become laboriously impossible.
2.6	This section could discuss how Broadcast remote ID can provide UTM functionality by networking the receiver of the solution rather than networking the UAS.	Add discussion about Broadcast RID.	
2.6	"The RID USS makes the RID message available to all other RID USSs, and vice versa, such that the complete set of messages held by these various USSs comprises a distributed database." This statement raises privacy concerns by	FAA should acknowledge the privacy issues relating to UTM.	

	creating databases of operational information.		
2.6	Fifth paragraph. Second sentence. General public accessing public data.	I would hope that this will not include the GCS location and opertor information data, due to security concerns.	
2.7	No mention is made of data encryption or protection of PII.	This section needs to be enhanced to add a requirement for data protection and backup.	technical
3	The Operational Scenarios are well thought out, and rigourous discussion is applied to DAA and collision avoidance in several. This concept plan, however, is based on several fundamental FAA positions, several of which have changed since the release of Version 1. In ConOps v1.0, the FAA stated emphatically that it is the UAS operator's responsibility to maintain separation and avoid a collision with other UAS and especially manned aircraft (ConOps v1.0 Section 2.5.6, p. 14). Also, the FAA stated that UAS Visual Line-of-Sight (VLOS) operators are not required to participate in UTM (Section 2.5.1, p. 10). Those policies have changed.	The FAA in ConOps 2 has now adopted a shared approach to collision avoidance. The plan calls for all UTM users to share operational intent with all other UAS operators and manned aircraft before and during ALL flights, regardless of type of airspace. This is the most significant change in FAA policy from Version 1 and mirrors policy and regulation proposals in the RID NPRM.	The expectation is for all UAS to maintain DAA and collision avoidance with all manned aircraft at all times. But, in uncontrolled airspace, where many manned aircraft are not squalking or talking, is this expectation reasonable from a safety standpoint, a risk management perspective, and maybe less importantly, a liability perspective?

3.2	Operation Planning phase, paragraph 2, sentence 1. Not all flights will have a fixed flight path and may have an area of operations. (will include the element of time- e.g. 4th dimension)	Using gathered information, the Operator plans out a nominal 4D path or area of operations for the flight.	
3.3	"USS-PS authenticates the MedEvac Operator, confirming that it is a public safety entity permitted to request UVRs for the associated activity."	This seems relevant to the earlier points about who is authorized to request a UVR and whether FAA is contemplating any new authority to other governmental entities. The concept should be discussed earlier.	
3.4	Option 5 - "Rather, the UAS Operators have increased situational awareness of the manned aircraft and can plan/act accordingly, and the manned aircraft's intent can be used by a USS to provide notification to the PIC of relevant UAS activity near them." - Liability comes with awareness and this could be abused by "disruptive" manned pilots.		
3.5	NOTE should be changed. Operation Zenith in the UK showed that broadcast RID can be integrated into UTM through the use of ground based receivers. This is different from 3.6 where RID is received directly by cellphone held by law enforcement, and law enforcement intiates a	*NOTE: This scenario examines operational threads related to RID messages that are published to RID USSs. It is assumed that the UAS in the scenario are transmitting publicly-accessible RID messages via network publish through an RID USS or are broadcasting to ground based RID receivers that then re-transmit to a RID USS.*	

	query into the UTM system.		
3.5	Page 47, Option 2, paragraph 1. Change to agree with comment above.	After being authenticated by the FAA service, the officer initiates a query for any UAs transmitting RID messages within X radius of the property.	
3.5	Figure 14	Add column to show RID messages being sent by ground based receivers.	
3.5	Private Citizen Query of RID USSs for RID Messages	Under no circumstances should private citizens have access to the personal information of the UAS operator, or the position on the ground of the UAS operator...period.	
3.5	Note 37 I'm not sure this is accurate	Double check accuracy against ASTM standard and NPRM.	
3.6	Second paragraph in Overview: "The officer investigating the UA uses a device capable of receiving broadcasted RID message transmissions (in this scenario, assumed to be a smart phone), and obtains an RID message from the UA in question."	This can be done now to observe nearly 80% of all UAS in the air. It is called Aeroscope. And it is my understanding DJI is developing or has developed a mobile version.	
3.6	Option 1 - reference to USS-FS	You mean USS-PS?	
3.6	It seems unrealistic in this scenario to believe that the operator will answer a phone call while in the process of operating. That could be distracting. Most likely, pilot location information would lead	Modify the scenario	

	to the operator and the request to land.		
4	Paragraph 2, sentence 1. Should not be amount of property on the ground by the amount and type of property. Risk to property depends on type of property. For example, the risk to concerte structures is much different than say an automobile which is different from wood structures.	Stages of development are based upon three risk-oriented metrics: (1) the number of people and amount and class of property on the ground, (2) the number of manned aircraft in close proximity to the UAS operations, and (3) the density of UAS operations.	
1.1, 2.1, 2.4.1.2	*The phrases "recreation" and "Part 101" are only mentioned five times in this document. The reason perhaps is because recreational use of UAS without a Network connection to a USS is not part of the plan in any airspace, controlled or uncontrolled.*	*Shielded Operations (a concept of allowing UAS, and especially FPV flyers, to fly near the ground without airspace approval if they stay below the highest obstacle), is not mentioned in this plan either.*	Please see line # 7 below for a solution. Otherwise all current FPV, R/C, and multi-rotored UAS will be rendered obsolete and restricted to 400' designated FRIA bubbles.
2.1 and 2.2	No mention is made of recreational operators. Figure 1 on page 1 shows recreational UAS is the largest consumer of NAS yet no mention is made within the 2.1 Overview or 2.2 Benefits.	Recreational UAS operation should be part of the Overview and Benefits. There is a hint that recreational UAS use may be primarily limited to VLOS with minimal regulation. This should be explicitily stated as the focus of the Overview and Benefits are on UAS businesses and not the largest segment of UAS, recreational.	technical
2.3.1.1	*"With UTM, the FAA's primary role is to provide a regulatory and operational framework for operations and to provide FAA-originated*	Support - performance-based rulemaking	

	airspace constraint data to airspace users."		
2.3.1.2	Good that manned aircraft operators are listed as potential participants in UTM	None. Continue to explore manned aircraft utilization of UTM.	
2.3.1.2	*"The Operator is the person or entity responsible for the overall management of their operation. The Operator meets regulatory responsibilities, plans flight/operations, shares operation intent information, and safely conducts operations using all available information."*	Support - operator has ultimate responsbility	
2.3.1.3	The RPIC is responsible to avoid other aircraft.	The ConOps should require all manned aircraft to utilize ADS-B out so UAS may perform it's DAA responsibility	technical
2.3.1.4	Sentence 5." As needed basis" not technically correct. Access will be a legal construct, not a technical one.	Data can be accessed through dedicated portals or can be routed directly by service providers to public safety entities, local/tribal/state law enforcement agencies, and other relevant federal agencies (e.g., Department of Homeland Security (DHS)) when legally permissable.	
2.3.1.4	As stated, "The general public can access data that is determined or required to be publicly available."	The public should not have access to UAS operator location or UAS operator personal information.	technical
2.3.2	FAA may delegate some of the qualification activities to an independent industry 3rd party.	For #1 and #2 change to "qualified by the FAA or a FAA designee"	

2.3.2	*"At the most basic level, services can be characterized in one of the following ways: 1) Services that are required to be used by Operators due to FAA regulation and/or have a direct connection to FAA systems. These services must be qualified by the FAA against a specified set of performance rules.; 2) Services that may be used by an Operator to meet all or part of a FAA regulation. These services must meet an aceptbale means of compliance and may be individually qualified by the FAA.; 3) Services that provide value-added assistance to an Operator, but are not used for regulatory compliance. These services may meet an industry standard, but will not be qualified by the FAA."*	Support - approval processes	
2.3.2.1	Sentence 2, the archiving of data by USSs are subject to retention policies and privacy restrictions.	Should include a sentence that certain data can be subject to constitutional or statutory protections.	
2.3.2.1	What sort of "airspace reservations" will communities provide? Agree that they should be inputted through USSs.	Change "airspace reservations" to "local airspace advisory information or constraints".	

2.3.2.1	*"USS services support operations planning, intent sharing, strategic and tactical de-confliction, conformance monitoring, RID, Airspace Authorization, airspace management functions, and management of off-nominal situations."*	Support - USS services (and interoperability)	
2.3.2.1	Needs Clarification. No mention of adherence to a given set of protocals to ensure communications between UTM actors	Add language that states participating actors will adhere to protocals as defined by standards to enable a federated system. Recommend adding the following sentence from 2.4.2.2: "It is expected that USSs will be qualified by the appropriate authority prior to providing a specified service, such that stakeholders have assurance of interoperability and reliability according to applicable standards."	
2.3.2.1	"(3) archives operations data in historical databases for analytics, regulatory, and Operator accountability purposes." This text should say something about privacy protection as well as due process rights and privileges.	"(3) archives operations data in historical databases for analytics, regulatory, and Operator accountability purposes, consistent with privacy protections and due process frameworks."	
2.3.2.1	"USSs work with local municipalities and communities, as needed, to gather, incorporate, and maintain airspace reservations into airspace data repositories that may be accessed by Operators."	Needs clarification, is this indicative of an intent to delegate airspace management functions to local government?	
2.3.2.3	All.	Support - UAS Supplemental Data Service providers	

2.3.2.4	The description of FIMS is very broad and it's described capability is a lofty goal. That same capability is intrinsically tied to functionality that ATC will require in order to maintain safety without compromise. In order for ATC to provide advisory information to controlled aircraft regarding a derelict UAV (for instance), the information needs to be real time. If a manned aircraft requires unplanned entry into airspace being used by UAV's, the traffic information for the manned aircraft and for the UAV also needs to be real time to be effective.	For the concerns of air traffic control to be satisfactorily addressed in this document, I feel that the description of FIMS should more specifically define an ability to process and share real time traffic data between the UTM and ATC environments. This two-way sharing of live traffic data will provide the tools that ATC and UAS Operators need to keep safety paramount.	
2.3.2.4	All.	Support - lightweight Flight Information Management System	
2.3.2.4	Add the following sentence: "The Flight Information Management System does not coordinate traffic or facilitate USS-USS interoperability.	Clarification - role of Flight Information Management System	
2.3.2.4	A mention of data security needs to be added.	Access or tampering with FIMS data could destroy UAS businesses or provide false information on a recreational UAS operator's flight. Data security and Write Once Read Many capabilities should be mentioned in this document as requirements.	technical
2.3.2.4	'airspace constraint data'	Add a footnote and give examples of the types of constraint data to the reader e.g: NOTAMS; TFR etc.	

2.4.1	"All UAS Operators not receiving ATC separation services are required to participate in UTM at some level using applicable services to meet the performance requirements of their operations (see Figure 4 for UTM in the context of ATM operations)." This is a dramatic departure from UTM ConOps 1.0 that expressly recognized that some UAS will not be part of UTM. It is also a sweeping statement that is not even true under the NPRM, given the exemptions contemplated therein.	We believe this perspective relates to the proposal for Remote ID which envisions all UAS using network remote ID. The many thousands of comments received by FAA expressed concern about the cost and burden of mandatory network solutions, especially as the ASTM industry standard was created to provide a performance-based solution via either network or broadcast Remote ID. In light of the pending rulemaking, the UTM ConOps ought to focus on the benefit and purpose of UTM. DAC TG should recommend language indicating that UAS that are exempt from RID (sub 0.55 pounds, amateur built aircraft, US government operators, etc.) are also not "required to participate" in UTM.	
2.4.1.	First sentence could be construed to require UTM services for all UAS though not really true. Not required forall ops VLOS in Class G. Is the FAA including registration as a UTM service as it is part of Dronezone? I'd advise against it. If anything it should deal with services communicate intent of an operator. e.g. LAANC, Authorizations	Some UAS Operators not receiving ATC separation services are required to participate in UTM at some level using applicable services to meet the performance requirements of their operations (see Figure 4 for UTM in the context of ATM operations).	

2.4.1.1	This section discusses BVLOS UAS operations. Since BVLOS operators are not able to visually separate from other UAS and manned aircraft, the FAA promotes their proposed UTM system by cryptically stating; “they are reliant on various technologies to safely operate in the NAS.” Among the various technologies mentioned are RID, data exchanges, monitoring of conformance to flight intent, notifications and alert of in-flight conflicts, in-flight routes, weather, surveillance and navigation. Also mentioned is the strategic de-confliction through the sharing of flight intent and negotiation.	This sounds like a great idea in theory, but rest assured no waiver-less BVLOS flight in the UTM environment will ever be approved without the installation of an independent DAA or collision avoidance system. These systems will have to be either on-board the UAS itself (i.e.: visual, acoustic, radars and LiDARS, sonar, etc.), or as ground-based systems that can cover the entire BVLOS route (i.e.: radar, acoustic, etc.). And most importantly, the system will have to ensure the UAS won’t run into any non-cooperative manned aircraft, which apparently will never be required by the FAA to equip with an identifying beacon or to participate by regulation in UTM. Eventually, the FAA will have to issue another NPRM for regulations that will allow non-waivered BVLOS operations. RID as proposed, was developed for ID only and won’t get us there.	
2.4.1.1	"As such, BVLOS Operators must utilize UTM services to enable their operations…" This is a sweeping statement that is not true when one considers special approvals, controlled airspace, potential "shielded BVLOS operations" (as the DAC recommended in its prior task reports to the FAA recently), emergencies, locations without connectivity, UAS with on-board avoidance	The FAA should add language here recognizing flexibility for operators who have alternative means of assuring against collisions and remove the word "must" from the section.	

	technologies, and so on. Words like "must" are rarely accurate in the aviation world, where exceptions and special operations always exist.		
2.4.1.2	See above	Language should be really cleaned up to indicate primary UTM services for VLOS operators is LAANC and/or authorizations and/or RID when network is required.	
2.4.1.2	Recreational UAS operators should not be required to use UTM.	This section is a set of refrences and isn't specific to UTM or RID requirements. It essentially says, recreational and commercial operators must follow regulations. It should be chnaged to state that VLOS for recreational and comercial operations should not be required in uncontrolled airspace and should only be required as LAANC is used today in controlled airspace.	technical

2.4.1.2	Currently, for VLOS ops in controlled airspace an operator using an Internet connected device, like a cell phone or tablet, must log into a LAANC USS provider and request a airspace authorization to fly. There is currently no requirement to do this in uncontrolled airspace.	Under this revised ConOps v2 plan, an operator, regardless of airspace (controlled or uncontrolled) will be required to Network transmit an Operations Plan and request an Airspace Authorization to the USS. Then, after being granted permission to fly, the UAS operator must be able to receive real-time updates about potential traffic conflicts, airspace changes, and other safety of flight information. If I am understanding this requirement correctly, for this to happen, the FAA wants all newly manufactured UAS, by a certain date after enactment, to connect to a USS automatically. The UAS and persumably the UAS's flight controller, via an Internet connected device, will be required to automatically connect to the Internet and relay its identifying information and position to the USS. The actual UAS, while in the air, will be required to Direct Broadcast the same identifying information not only back to the flight controller, but to anyone else who has the equipment to receive the transmission (i.e.: LE and public). The flight controller, via the connected device, will also relay the UAS's flight position and identifier to the USS.	And this Network Publishing method will be required in all types of airspace, controlled and uncontrolled. The only exeception is given to areas where cellular connectivity, or data connectivity, does not exist. Standard RID addresses this problem by requiring the UAS to Direct Broadcast its position in lew of a Network connection. If the machine can't do this, then it is not supposed to take off.

2.4.1.2	This seems to be a substantial change from ConOps 1.0, by indicating that even VLOS operations must make use of UTM. It seems accurate for FAA to acknowledge that "the ability to safely operate VLOS is not predicated upon data exchanges with other UTM participants" but then the rest of the section seems to presume that regulations will always require at least one UTM service. This is not true as explained above: there are other ways to obtain access in controlled airspace (manual FAA process) and to be exempt from, or perform, RID (below 0.55 pounds, amateur-built aircraft, broadcast remote ID, US government operations, etc). Also, in locations without connectivity, there are no UTM services possible.	Edit text to: "the primary UTM services they must use, if any, relate to meeting applicable regulatory and policy requirements." . . . . "They satisfy such requirements through use of FAA services, including those found in DroneZone or via a USS that has been qualified by the government to provide certain services (e.g., LAANC USS or RID USS), or by being exempt or engaging in alternate means of compliance."	
2.4.1.3	In order increase operational effectiveness of the airspace there may be areas where manned aircraft are required to participate in UTM. For example, in corridors established to route UAS to/from busy Class B/C airports.	Introduce the paragraph with "Except in limited circumstances, …". Add sentence, "In the future, manned aircraft may be required to participate in UTM in select, charted airspace such as UTM corridors to and from busy airports."	
2.4.1.3	Manned aircraft operators are not	If this is the case as a requirement, then ALL manned aircaft must be required to install ADS-B out so UAS	technical

	required to participate in UTM.	may de-conflict the NAS under 400 feet AGL.	
2.4.1.3	AOPA concurs with this section and the FAA's philosophy of making manned participation in UTM voluntary.		
2.4.1.3	Under Active participation for manned aircraft opeators, the last sentence is unclear: "They can also voluntarily equip with capabilities (e.g., ADS-B, RID) to provide additional data about their operations.	How will they voluntarily equip to provide additional data about their operations? Strickly with Network Publishing, or is there a Direct Broadcast method under consideration for manned aircraft?	
2.4.1.3	"Manned aircraft Operators are not required to participate in UTM, but may, and are encouraged to voluntarily do so to obtain the safety benefits that are gained from shared awareness among airspace users." Comment: We don't understand how UTM can be effective at preventing a collision if the primary risk factor (loss of lives on board manned aircraft) is not addresses because manned aircraft are non-participants in UTM.	Requires discussion of how manned aircraft will be part of UAS integration.	

2.4.1.3	Active participation: 'They can also voluntarily equip with capabilities (ADS-B; RID) to provide additional data about their operations.'	This needs more work/expanding. Is it inferring that all manned aircraft plus those in Class G (uncontrolled) should have ADS-B Out? And where mandated ADS-B IN to be able to glean UA situational awareness in flight? This assumes that RID data will be *parsed* and presented from a USS to the manned community via ADS-B? Or is this paragraph saying that manned aircraft ought to be able to transmit a RID equivalent to USS?	
2.4.2.1	CNS performance requirements may be enhanced as traffic demand requires in the future. This is described in section 2.7.1.1 third paragraph and in section 2.7.3 on Equity.	Add sentence after "general principles of efficient airspace use": "More stringent CNS performance requirements may be introduced in the future as traffic demands in a given region dictate the need for more efficient use of the airspace."	
2.4.2.1	typo	1st paragraph, the word, "Victor" is the intended word, "Visual" or maybe, "Vector"?	editorial
2.4.2.1	The FAA is not responsible for CNS.	How can the FAA not be responsible for Communication, Navigation and Surveillance?	technical
2.4.2.2	Performance authorizations should not be geographically limited. Instead they should be applicable anywhere where the limitations are it. For example, in/out of certain classes of airspace, above certain population densities, etc. Creating geographical limitations increases the FAAs workload as operations expand.	Remove geographical limitations associated with performance authorizations. Instead utilize airspace, air risk, and ground risk limitations associated with performance authorizations.	

2.4.2.2	The need for performance authorizations should decrease or be eliminated as UAS rulemaking activities occur allowing operations to operate in compliance with regulations without the need for individual FAA approvals. Most UAS operations have risk profiles closer to Part 91 operations than Part 135/121 operations and shouldn't need excessive FAA oversight.	Add sentence, "The need for performance authorizations will be reduced or eliminated as UAS rulemaking activities occur and UAS operators are able to operate in accordance with published regulations and guidance materials without individual FAA approvals."	
2.4.2.2	What criteria is the FAA going to use to approve performance authorizations? In section 2.4.2.1 it states that the regulator won't dictate CNS requirements yet in this section it says the FAA will evaluate operators' ability to meet CNS performance requirements.	Clarify what regulations/standards/policy/guidance material will be used for FAA approval of performance authorizations to avoid this becoming a "bring me a rock" game with arbitrary, undisclosed criteria being used by FAA as has been the case with many Part 107 waivers.	
2.4.2.2	A Performance Authorization does not prescribe the required performance, but is a validation of the declared performance.	Clarification - performance authorization	
2.4.2.2	First sentence: "UTM Operators are required to obtain a Performance Authorization prior to conducting a class or type of UTM operation…"	What is meant by the terms "class" and "type" in reference to this authorization?	

2.4.2.2	"UTM Operators are required to obtain a Performance Authorization prior to conducting a class or type of UTM operation, in which they substantiate their ability to meet flight performance capabilities in their intended area of operation." This is too sweeping given the prior statements that all UAS are participants even if all they are doing is RID or LAANC. What is meant by "UTM operation" if all operations involve using UTM services? FAA should clarify when a PA would be required. Many operations today do not require any authorizations.	Clarification required on FAA's intent. This discussion seems to require flight authorizations for each flight, which means that all airspace is turned into controlled airspace for UAS.	
2.4.3	UAS operators conducting UTM operations must obtain FAA authorization when operating within controlled airspace, Class B/C/D/E.	Does this imply that FAA authorization is not required in uncontrolled airspace?	technical
2.4.4	Deconfliction services may continue after the start of an operation, especially for changes that are further in the future.	Change last sentence to: "…to offer de-confliction support for changes in advance of tactical maneuvers."	

2.4.4	"The Operator identifies operational conflicts and strategically de-conflicts, potentially via USS-provided capabilities (e.g., Operator collaboration and de-confliction algorithms) designed to provide fair access to the airspace." Who is liable for an accident in the event of an Operation Plan?	It seems odd that FAA does not discuss responsibility and liability of an automated routing or traffic system.	
2.4.4	Second and third paragraph	Strategically this is the most important section in the CONOPS. And am concerned that in the Scenario section, there is not one that alludes to a 'high traffic density operation' and how the USS' interconnection will actually cope with the pressure to: deconflict, manage and agree on how the priority for allocation of the airspace by conflicting trajectory demands will be decided. And how much time, before launch, will it take to resolve all of the planning parameters for flight and then file, and receive permission to fly, as per 2.4.5. Perhaps artificial intelligence will resolve this.	
2.4.4.1	Strongly agree that all BVLOS UAS operators must participate in UTM.	UTM strategic deconfliction only works if all operators utilize it. Keep this key point in the ConOps.	

2.4.5	Paragraph 3 regarding UVRs. UVRs should be made available to commercial entities. For example, movie and advertising shoots happen over the course of a day. UAS work in specified airspace boundaries and their timing depends heavily on the pace of shooting. A UAS may need to be up in the air in a few minutes notice because of time schedule. This may be critical in instances where there is a shot where it is one take (car jump, explosions etc). Interruptions, delays, or an inability to take off could result in losses running into $10,000-$100,000 or more.	Would recommend adding certain commerical activities.	
2.4.5	Agree with FAA concept for UVRs being for activites that present a potential risk and that they are distributed by qualified USSs.	None.	
2.4.5	"UVRs are designed to support operational safety of transient flights (e.g., police activity, emergency response, public safety) by notifying UTM Operators to blocks of airspace in which these activities occur."	Question: Is this intended to create new authority for local officials that would "block" airspace in the absence of FAA involvement and approvals?	
2.4.6	Agree with FAA concept for separation and use of shared operational intent data and conformance	None.	

	monitoring. Also agree with 2.7.1.1 strategic management description.		
2.4.6	This section references the responsibility of an Operator to notify affected airspace users of vehicle non-conformance "as soon as practical". In the event that vehicle non-conformance results in UAV operation outside of the UTM environment, "as soon as practical" is insufficient.	Immediate notification through FIMS, supported by a more in depth description of FIMS capability in 2.3.2.4 would be more appropriate.	
2.4.6	"The Operator's Performance Authorization may require on-board communications, navigation, and detect and avoid (DAA) equipment to maintain separation tactically."	The FAA should discuss when such equipment might alone be sufficient for DAA in the absence of UTM services (or in locations where UTM is not available).	
2.6 2.7.1.2 2.7.1.4	2.6 Third paragraph; third sentence. 2.7.1.2 second & fourth paragraph 2.7.1.4 second paragraph	There is an assumption that this RID information will be presented to compliant manned aircraft, as per 2.4.1.3, in some way, shape or form. Is there a technical standard whereby such data can be presented on a Garmin PFD for example and integrated with ADS-B data? And should the UTM not suggest that USS and GCS have an ADS-B In capability to ensure that UAS operators can see ads-b compliant traffic that may be transiting at 500' agl and above? Do manned aircraft have a responsibility to avoid BVLOS iaw the rules of the air? Even under day VFR, research data has found that even a UA of 2-300lbs are very difficult to see; this is compounded as	

		UA will not have ADS-Out capability. Therefore, what is the conspicuity capability standard that is referred to in the final sentence of paragraph 2.7.1.2? 2.7.1.4 Data comms between UA and manned aircraft to support DAA? By what standard?	
2.7 (2.3.1.1 second paragraph & 2.3.2.4 refer to FIMS)	Near real-time notifications of airspace constraints.	Does this include NOTAMS and TFRs? Is this the responsibility and obligation of FAA to deliver this service to both USS & UAS operators alike, as part of their FIMS responsibility?	
2.7.1.1	Page 24, parapgraph 2, sentence 2. Not 100% accurate, some airspace authorizations require contacting of a tower to share intent.	Manned and unmanned Operators (e.g., Part 107/101(e) VLOS Operators) not required to share intent unless required by an airspace authorization, but operating near or below 400'AGL, are encouraged to, at minimum, utilize services to identify operations that could impact their route of flight as part of their pre-flight responsibilities.	
2.7.1.1	Description of strategic conflict management in 2.7.1.1, separation provision in 2.7.1.2, and contingency management in 2.7.1.3 are aligned with ASTM F38 UTM working group's expectations and	None. Keep alignment through frequent two-way communication with standards bodies such as ASTM F38.	

	protocols for UTM data exchange usage.		
2.7.1.1	Unclear why we wouldn't want USSs to pre-verify certain information such as performance authorizations, vehicle registration, or operator licenses with FAA authoritative databases prior to accepting an operational plan. This is an important step USSs can perform to protect the safety and security of the NAS.	Change sentence to read, "Operator data submitted during the planning stage may be pre-verified by the USS with agency authoritative databases for compliance at the time of submission (e.g. compliance…"	
2.7.1.1	*"UTM operations can be strategically managed through interactive planning and orchestration of intent information as well as relevant environmental considersations that enable strategic de-confliction for multiple UAS operations. Operation intent sharing, strategic de-confliction, airspace constraint evalutation, weather reporting and forecasting capabilities, and other key supporting features of UTM reduce the need for tactical separation management and reduce the liklihood of in-flight intent*	Support - interoperability strategic managemen options	

	changes due to weather or airspace restrictions."		
2.7.1.1	Needs Clarification. "Operator data submitted during the planning stage **does not need to be pre-verified with agency records for compliance at the time of submission** (e.g., compliance with Performance Authorization stipulations - AAOs, pilot certifications, use of specified equipment/technologies) but Operator accounts and records are subject to FAA auditing at the agency's discretion." Seems to contradict intent of footnote #12, "Performance Authorizations could be available in a standardized digital format **to provide assurance to the operating community that the Performance Authorization is valid.**	Recommend considering operating data does get verified for compliance upon submisison, or, explain rationale why this step is not necessary.	

	Digitization would also enable USSs to provide compliance monitoring services to a subscribing Operator."		
2.7.1.1	Needs Clarification. "USSs **work** with FAA, state, municipalities, and other entities as required to define airspace reservations (i.e. UVRs) in support of first responder activities." What does "works" mean in this context?	Recommend adding language that provides intent of what "work" is required by USS's regarding UVRs or similar.	
2.7.1.1	"Operators planning to fly BVLOS are required to share operation intent with other Operators/airspace users via the USS Network." This presumes all BVLOS operations require UTM. The DAC just sent advice to FAA concerning "shielded" operations where the BVLOS aspect is simply	The ConOps should acknowledge that, given the broad definition of BVLOS, not every BVLOS flight is one that requires a UTM solution.	

	an obstruction or flight below the obstacle plane.		
2.7.1.1	"proprietary information is shared only between an Operator and the Operator's respective USS." How is this to be squared with prior indications that flight information is shared with all other USSs?	Question	
2.7.1.1	"USSs work with FAA, state, municipalities, and other entities as required to define airspace reservations (i.e. UVRs) in support of first responder activities." Does this suggest a new grant of authority?	Should be clarified	
2.7.1.1	Third paragraph; third & fifth sentence and final paragraph last sentence.	How do we define 'traffic density'? Is there a standard either for longitudinal (by time), horizontal and vertical separation for UA traffic and how will we integrate UA of differing velocities? Ids this purely by 'block of airspace' moving with the UA and how are the parameters of a block determined?	
2.7.1.1	Tempo of traffic	Should the UTM comment on ground speed of UA and how some may be flying at 50/75/100/120mph and how they will be managed in terms of separation criteria?	

2.7.1.2	Paragraph 2, Sentence 3. From a policy perspective this does not make sense. Why are VLOS operators treated differently than BVLOS operators especially if they are both participating in UTM and providing intent?	Low altitude manned aircraft operating in both uncontrolled and controlled airspace have access to, and are encouraged to utilize UTM Operation Planning services to de-conflict their aerial work; low-altitude manned aircraft pilots share some responsibility with UAS Operators for maintaining separation from each other.23	
2.7.1.2	Page 26, parapgraph 2, sentence 1. Change all low altitude aicraft to Operators. Aircraft don't understand responsibilities, people do.	Operators share airspace with a clear understanding of responsibilities, rules, and procedures, regardless of whether they are participating in/receiving services from UTM or ATC.	
2.7.1.2	4th paragraph states the UAS operator is responsible for all separation, including with manned aircraft.	This requirement is only reasonable if ALL manned aircraft are required to use ADS-B out.	technical
2.7.1.2	paragraph 7 states the FAA's FIMS will receive no data from USS.	Where is data centrally held which will be used in investigations? Having everything distributed does not appear practible.	technical
2.7.1.2	2nd paragraph: "Low altitude manned aircraft operating in both uncontrolled and controlled airspace have access to, and are encouraged to utilize UTM Operation Planning services..."	Again, 50% of the manned fleet is still not equipped with ADS-B Out. That is a dismal voluntary compliance rate. Does the FAA really expect manned operators will do this? They can't even get most pilots to check NOTAMs or file a flight plan. I just don't see it happening.	
2.7.1.2	"Though low altitude operating manned aircraft ... are not required to share intent" Same question as earlier, how can UTM avoid highest-risk collisions if the manned traffic is not included?	Question	

2.7.1.2	Paragraph 8 (3) Land	How would an operator determine, under BVLOS operation, where a safe place from the public might be, to land, should a UVR be published that affects such an operation? And how would the UA be secured/protected assuming the UA is shutdown?	
2.7.1.2	Final paragraph	Endurance and fuel reserves. Are there standards for 'alternate/diversion energy reserves' to an alternate GCS destination [as per manned example: Pt 91.167]; should the UA need to comply?	
2.7.1.3	Page 26, parapgraph 2, sentence 2. Needs to be rewritten as it seems to imply that VLOS must yield to BVLOS operations. "that may affect their route of flight to increase the likelihood they identify UAS," makes that implication in that their flight path will be affected.	Though low altitude operating manned aircraft and VLOS unmanned aircraft (e.g., 14 CFR Part 107 and 101[e] operations) are not required to share intent, they are encouraged to, at minimum, utilize UTM services that enable them to identify UAS operations that may enter their flight area.	
2.7.1.3	"…the Operator is responsible for notifying affected airspase users."	How can a UAS operator be responsible for contacting all other UAS operators in an area of opeation? Why isn't this a requirement of the UTM operator?	technical

2.7.1.4	This seems like a good section for FAA to discuss scenarios in which on-board DAA and V2V technologies would be sufficient to operate BVLOS in the absence of UTM services. (FAA states: "In airspace where risk to life in the air and on the ground is low, a relatively higher risk of UAS-to-UAS collision may be accepted, and thus the FAA may not require DAA technologies. Conversely, operations in more heterogeneous environments (e.g., mix of manned and unmanned aircraft, controlled airspace) could impose increased risk to manned aircraft due to the higher criticality of collision, therefore, increased performance requirements may be imposed (e.g., onboard systems, real-time avoidance equipment, network-based solutions)").		
2.7.2	2.7.2, Page 30, paragraph 2, sentence 3. Is the purpose of the security requirements to make sure the data is available to support stakeholder needs or is it to guard against security threats?	UTM meets applicable security requirements through data collection, archival, and provision protocols within the IATF, ensuring operations data is secure.	

2.7.2.2	Sentence 2. Data access limitations must comply with both laws and the Constitution.	Legally appropriate data access limitations are set by the FAA for individual federal and public/public safety entities (e.g., public information, classified information, information that requires a warrant).	
2.7.2.3	"Operators must satisfy FAA-stipulated data archiving and sharing requirements to support safety and security."	This must be changed. Why would the operator be responsible to store and secure data? Where is there an analogous situaiton providing precedent?	technical
2.7.2.4	Needs Clarification. "USSs must be (1) discoverable to the requesting agency, (2) available and capable to comply with issue request, and (3) a **trusted source** as mitigation/enforcement actions may be taken as a result of the information provided." Further explaination is required for USS role in legal process involving mitigation and enforcement actions as a "trusted source?"	Recommend expanding on criteria that makes the USS a trusted source and what are the legal ramifications? This is especially important since USS are envisioned as Data Archivers as described in Appendix C.	
2.7.2.4	"These cybersecurity architecture, requirements, and structures are defined by IATF network policies."	Where may we find the details of these policies?	technical
2.7.3	FAA needs to outline in the conops the steps to manage demand if the demand for airspace becomes too great to maintain safety or support all ops.	FAA put in a paragraph about how deman would be managed.	

2.7.3	Needs Clarification. "In airspace with moderate demand, equitable access is achieved through Operator collaboration, efficient airspace design, and FAA rules. As demand for a volume of airspace increases, the performance requirements for the Performance Authorization may increase to ensure continued free access. If demand for a volume of airspace becomes too great to maintain safety of flight, or support all types of operations, the FAA may be r**equired to manage the demand for access.**" Please elaborate on what "...manage demand for access." means?	2.7.3.1 States, "**Business rules** ensure that individual Operators cannot optimize their own operations at the expense of sub-optimizing other Operators and the UTM ecosystem as a whole." Who decides the business rules and does this align with FAA managing demand for access? This is especially important since USS are envisioned as Demand/Capacity Balancers as described in Appendix C.	
2.7.3.2	"UVRs do not exclude UTM participants from the airspace"	This seems like it should be mentioned earlier in the document when the UVR concept is introduced and explained.	
3.4 - Option 4 and 5	AOPA concurs with this section and the FAA's philosophy of making manned participation in UTM voluntary.		
Appendix C	All.	Support - UAS Service Supplier network	
Appendix D	There are some overlaps in the services description, especially between Constraint Management and Mapping along with Operational Planning and Surveillance.	Clarify. May also need to add a sentence in the beginning along the lines of: "These services may not be individually separable and independently approved. Until specific standards or requirements are written for these services, there may be overlaps and grey areas as to what	

		specific functions fall under which service."	
Exec Summary	AiRXOS strongly endorses this ConOps and the architecture of community based, federated digital services it sets out. We applaud the FAA for making this document available to guide the community towards the future of air traffic management.	None	
Figure 3	*All*.	Support - notional UTM architecture	
Figure 4	There is no depiction of a recteatonal UAS.	As recreatonal UAS are the most abundant UAS, they should be inlcuded in this Figure. Hopefully with excemptions to UTM required use.	technical
General	Implications for Legacy Users: Throughout the document there is an assumption that legacy users would adopt new behaviors, use new information sources to plan flights, and our change how they operate their aircraft. This could race resistance for the general aviation and rotorcraft communities. While they talk about both passive and active participation, even the passive participation involves legacy users changing behaviors to utilize information from the USS network to gain	Change the assumption that legacy users would adopt new behaviors	Technical

	situational awareness for planning their activities.		
General	Volume-based vs. Trajectory-based Strategic Deconfliction: The assumption of a volume-based strategic deconfliction approach adds considerable operational complexity especially for flights that are transporting goods from point-to-point vs. operating over a contiguous geographic area (i.e., agricultural spraying, land surveying, area S&R). Basically, a trajectory has to be turned into a volume, the volume processed to determine potential conflicts and identify who needs to negotiate with who, and then trajectory deconfliction negotiated in a pair-wise fashion.	Change the assumption of a volume-based strategic deconfliction approach	Technical

General	Performance Authorization: The intention of performance-based authorization is unclear. Will the FAA basically endorse an operator, endorse specific aircraft, endorse specific PICs, endorse specific flights as having certain performance capabilities. Will or should performance include total flight error (akin to RNP), DAA capabilities, aircraft performance (e.g., climb rate, cruise speeds, turn rate)? Will it be all of these? How will this information be used to either enable or limit operational options? It says the FAA will evaluate? It is unclear how performance authorization decisions will be made, how this information will be managed on a flight day, and what it will mean operationally.	Clarify the intention of performance-based authorization	Needs clarification
General	Technology Dependency: Some technologies that are referred to in this document such as DAA have not been matured as of yet.	Acknowledge that some technology have not been matured enough	Narrative
General	Narrative. No comment about data ownership other than what is retained in FIMS.	Recommend adding comment about USS being permitted to retain operational data.	

General	First Scheduled, First Served Creates Risk to Fairness and Equity: The approach taken lacks controls to ensure that operators are not overly generous defining intended operational volumes effectively locking out other airspace users. This could include both temporal and spatial dimensions. This will not only risk the goals of fairness and equitable access but there may be significant wasted capacity (spoilage).	Change the proposed approach	Technical
High Level	Recreational UAS is shown in Figure 1 on Page 1, as the largest segment of UAS today and in the future. However, the document virtually ignores special provisions for recreational UAS.	Recreational UAS are important to the UAS industry, the US STEM programs and innovation in the US. This largest segment of UAS merits special focus and exeptions, especially when most recreational UAS is VLOS. Please consider adding recreational UAS as an important segment of UAS throughout the document in the specific sections I have noted in my detailed comments.	technical
List of Acronyms	101e can probably be deleted		
List of Acronyms	USS-FPS?	Not against one, but first time I've seen that acronym. And its not used in the document except here…	
Overall	Strategically this CONOPS is a very well thought through piece. It is a much more mature and detailed document than V1. It should be a sound basis to continue advancing and developing the more		

	complex concepts in UPP 2.		
Table 1, Footnote 1 & Section 2.7.1.2	Regarding: *"low-altitude manned aircraft pilots share some responsibility with BVLOS UAS Operators for maintaining separation from each other (though they do not share responsibility for separation from VLOS UAS Operators)."* This statement is a significant change from UTM ConOps v1.0, where UAS operators were exclusively responsible for maintaining separation from manned and unmanned aircraft. Additionally, it is in direct conflict with existing federal regulations (notably 14 CFR §107.37 and 49 U.S. Code §44809) and lacks justification for contemplating such a fundamental change to U.S. airspace and such a shift from existing federal regulations.	The ConOps should include further justification and analysis for why manned aircraft should be required to purchase and install additional equipment to share separation responsibilities with UAS operating BVLOS. Further, additional analysis and justification is required for why that additional equipment cannot be compatible with existing surveillance equipment already installed on manned aircraft (e.g., ADS-B over 1090 and UAT).	

1.3	Regarding: *"Class G airspace is the portion of airspace in the NAS that has not been designated as controlled airspace (i.e. Class A, B, C, D, or E). It is, therefore, designated uncontrolled airspace. ATC has no responsibility to provide separation services in Class G airspace; rather, manned aircraft cooperatively manage their operations predominantly through visual means based on specified principles and rules of operation. In order to provide UAS with the same access as manned aircraft, UTM is designed to provide a similar means of cooperative traffic management for UAS and other participating aircraft in uncontrolled airspace."* This paragraph is a paradox because it both designates Class G as "uncontrolled airspace" and introduces a framework for "cooperative traffic management" which, whether centrally- or self-managed, erodes the idea of uncontrolled airspace.	Since a concept of operations which requires all airspace to become "controlled" in order to accommodate UAS is not feasible, the ConOps should reflect the guidance of AC 90-66B Chg 1 (paragraph 9.2.1) and AC 107-2 (paragraph 5.8.1) which has been sufficient for safe mixed manned and unmanned operations in Class G airspace.	

2.4.1.3	Though UTM participation (either passive or active) is stated as voluntary in this section, other sections assume that manned aircraft will in some way equip for UTM services to facilitate UAS operations, particularly BVLOS. It is unreasonable to expect manned aircraft to install additional equipment to operate in shared airspace or detect UAS operating in shared airspace. Manned aircraft already have surveillance solutions consistent with today's Air Traffic Management (ATM) framework which allow for the safe and efficient integration of all types of aircraft in the National Airspace System (NAS). However, tens of thousands of U.S. General Aviation (GA) aircraft are exempt from the installation of surveillance equipment, such as aircraft with no electrical systems or not operating in 14 CFR 91.215/91.225 airspace.	The ConOps should clearly define the requirements for UTM participation and if/when manned aircraft equipage is required. It should also provide analysis and justification for why any additional equipment cannot be compatible with existing surveillance equipment already installed on manned aircraft (e.g., ADS-B over 1090 and UAT).	
2.4.1.3	Manned aircraft Operators have access to information regarding the conduct of UTM operations, and can voluntarily participate at different levels:	This infers that all manned aircraft have access, The Airline dispatch centers would have via what means? This implies addition additional service, who would provide such access and who would pay? This section should be clear that "manned	

		aircraft" reference are operating under VFR not IFR operations in controlled airspace	
2.4.1.3	Passive (manned) participation to gain situational awareness of nearby operations and plan their activities,	IFR plans for arrival and departs are based on ATC procedures and clearance, not UAS activities	
2.4.1.3	Active (manned) participation make their flight intent available to UAS Operators/RPICs participating in UTM via the USS Network	manned IFR flight plans and clearances for departures and arrivals are based on ATC needs, procedures and clearance, not UAS activities. Change to indicate type (VFR) of manned could / should participate	
2.4.1.3	Active (manned0 participation voluntarily equip with capabilities (e.g., ADS-B, RID) to provide additional data about their operations…	Most manned aircraft will be equipped with ADS-B (i.e. 91.225 & 91.227). Manned aircraft should not need to "voluntarily equip" at their cost to enhance or enable the safety case of UTM. UTM should be capable of providing a safe environment for all NAS users.	
2.4.6	Separation: UTM Operators are ultimately responsible for maintaining separation from other aircraft, airspace, weather, terrain, and hazards, and avoiding unsafe conditions throughout an operation.	How will the FAA who authorizes UTM operator monitor, and hold accountable the UTM Operators for loss of "separation"? Additional discussion is needed to explain the relationship of regulation oversight by the FAA and UTM Operators.	
2.4.6	For off-nominal situations that pose sufficient risk to manned aircraft operations, and where actionable, timely FAA/ATC intervention is achievable, the Operator (through the USS) notifies the FAA and sends data required	This should be one of the first capability of UTM in controlled airspace operations, i.e. LAANC.	

	to manage the event via FIMS.19		
2.7.1.4	Aircraft and Obstacle Avoidance: BVLOS and VLOS UAS Operators are responsible for separating from and remaining well clear of all other aircraft. This is in direct conflict with 2.4.5 "UTM Operators are ultimately responsible for maintaining separation from other aircraft,"	BVLOS under UTM can not require that both the UAS operator and the UTM operator to have the same responsibility. This conflict that need to be addressed and clear responsibility for separation from aircraft and obstacle avoidance defined.	
2.7.1.2	low-altitude manned aircraft pilots share some responsibility with BVLOS UAS Operators for maintaining separation from each other (though they do not share responsibility for separation from VLOS UAS Operators). This in conflict with 2.4.6. How can manned aircraft pilots share some responsibility with BVLOS UAS?	Manned aircraft can niether "see and avoid" (91.113) nor detect and avoid (DAA) BVLOS UAS. This is once a=agin not inline with 2.4.6. Correct to remove the manned aircraft from the "shared responsibility". UAS operating within VLOS or BVLOS under UTM must be solely responsible for seperation from manned aircraft.	
2.4.1	*This section states that "all UAS operators not receiving ATC sep services must participate at some level in UTM." This statement does not seem fully accurate- what about limited recreational use by modelers in the FRIA for instance?*	*As the final rule is not out on RID, this claim seems invalid. It is better to say “most” rather than "all."*	

2.4.1.3	*Section refers to active participation by manned aviation, but the notion of actively sharing flight only intent does not fit the model of UTM-- assuming that manned aviation is not de-conflciting with UAS, this means that manned avition will be given priority at all times. More information is better, but active participation requires that all participants have a minimum set of USS capabilities-- including safely separating from each other.*	*"Passive participation" on the part of manned aviation is fine, but "active participation" will require a fully featured USS.*	
2.4.2.2	A Performance Authorization is linked to an "Authorized Area of Operation" (AAO), and the paragraph states that "It is possible to have more than one AAO under a single Performance Authorization." For our CONOPs (deliveries from a warehouse), it is required that we potentially have a large number of AAOs-- many of which are likely to be in similar locations.	Although the process is not defined for obtaining an AAO, we recommend the definition of a geography-based (population, terrain, airspace classification, etc.) AAO type that has more stringent PA requirements-- but one that supports a larger range of geographic areas.	
2.4.2	"To obtain a Performance Authorization, an Operator submits a Performance Authorization request to the FAA for evaluation." We expect that this overall process might be	One method to streamline the process would be to give credit to UAS with a TC. In other words, design approval holders who want to operate their UAS can opt to receive a Performance Authorization in addition to a TC at the conclusion of the TC process.	

	slow due to the expected volume of applicants.		
2.4.4	"… the Operator's USS continues to offer de-confliction support up to the start of the operation." Agreed, but de-confliction should continue through the completion of the operation as well. The airspace should not be considered static.	Clarify requirements for continued safe separation in the airspace.	

DAC Task Group #8
Safety Culture
Interim Report

DAC TG#8 Safety Culture

Safety Culture Tenets

Tenets: A shared principle, belief, or doctrine generally held to be true…

Safety Ownership: empowering each individual across all groups with a share of the collective responsibility to learn, understand, advocate, and participate in best safety practices and behaviors for the intended activity.

Safety modeled by leadership: safety culture is driven throughout the aeronautical community from the operator to executive level management. Leaders should model safe practices (walk the talk) and reinforce the critical importance of safety as the top priority in the community.

Organizational Values: a safety culture reflects the values, principles, and normal behavior of an individual engaged in an activity that presents risk to the life, safety or property of others and must be scalable to the organization. Organizations can promote and enhance a culture of safety by modeling behavior, educating individuals, and emphasizing the importance of safety during activities that present heightened risks to people or property.

Learning Culture: a positive safety culture will always continue to learn and grow; individuals can adapt and change. Few operations in the National Air Space (NAS) are error-free but operators learn from failures going forward, utilize risk management tools (knowledge) to improve the safety and quality of operations or products with the power of data sharing both internally and within the communities to which they belong.

System wide approach: those who set and promote safety rules and parameters must share the responsibilities of system wide safety by the creation of risk-based rules that are reasonable and proportionate in light of the relative risk of the operation. It is also important to promote a voluntary nonpunitive environment where the sharing/reporting of unintentional unsafe experiences (events) is fostered and supported by an educational approach to continuously improving safety in the National Air Space.

Trust: A strong safety culture is enhanced by trust, a firm belief in the honesty, reliability and the ability of others. Trust is a two-way street and assumes all stakeholders (individual and organizations) are committed to doing the right thing to ensure safe and successful operations. Operators/stakeholders must trust that regulators and authorities will transparently act on and implement constructive input from operators/stakeholders and support best practices and constructive measures to address safety concerns, while regulators must trust that operators/stakeholders will adhere to prescribed safety standards and operational norms. Trust promotes confidence amongst operators, stakeholders, and regulators and leads to a cooperative environment for the sharing of safety related information, data and ideas.

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 19, 2020

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DRONE ADVISORY COMMITTEE

June 19, 2020

Housekeeping

- Meeting is being livestreamed on the FAA Youtube Channel and FAA Facebook page
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DRONE ADVISORY COMMITTEE

June 19, 2020

Official Statement

Dan Elwell

Designated Federal Officer,

FAA Drone Advisory Committee

Deputy Administrator, FAA

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 19, 2020

Official Statement of the DFO

PUBLIC MEETING ANNOUNCEMENT

Read by: Designated Federal Officer Dan Elwell

Drone Advisory Committee

June 19, 2020

In accordance with the Federal Advisory Committee Act, this Advisory Committee meeting is OPEN TO THE PUBLIC. Notice of the meeting was published in the Federal Register on:

May 4, 2020

Members of the public may address the committee with PRIOR APPROVAL of the Chairman. This should be arranged in advance.

Only appointed members of the Advisory Committee may vote on any matter brought to a vote by the Chairman.

The public may present written material to the Advisory Committee at any time.

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 19, 2020

Agenda Review

Dan Elwell
Designated Federal Officer,
FAA Drone Advisory Committee
Deputy Administrator, FAA

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 19, 2020

Agenda

Start	Stop	
12:00 p.m.	12:03 p.m.	**Greeting from FAA**
12:03 p.m.	12:05 p.m.	**Official Statement of the Designated Federal Officer (DFO)**
12:05 p.m.	12:10 p.m.	**Review of Agenda and Approval of Previous Meeting Minutes**
12:10 p.m.	12:25 p.m.	**Opening Remarks from Designated Federal Officer**
12:25 p.m.	12:40 p.m.	**Opening Remarks from DAC Chairman**
12:40 p.m.	1:30 p.m.	**DAC Recommendations and Discussion: Tasking #7 – UTM**
1:30 p.m.	1:45 p.m.	**Break**
1:45 p.m.	2:35 p.m.	**DAC Interim Recommendations and Discussion: Tasking #8 – Safety Culture**
2:35 p.m.	2:50 p.m.	**New Business/Agenda Topics**
2:50 p.m.	3:00 p.m.	**Closing Remarks from DFO and DAC Chair**
3:00 p.m.	3:00 p.m.	**Adjourn**

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 19, 2020

Approval of Previous Meeting Minutes

Dan Elwell
Designated Federal Officer,
FAA Drone Advisory Committee
Deputy Administrator, FAA

Federal Aviation Administration

DRONE ADVISORY COMMITTEE

June 19, 2020

Opening Remarks from the DFO

Dan Elwell

Designated Federal Officer,

FAA Drone Advisory Committee

Deputy Administrator, FAA

Federal Aviation Administration

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June 19, 2020

Opening Remarks from DAC Chairman

Michael Chasen

Chairman, FAA Drone Advisory Committee

Chairman, Advisory Board, PrecisionHawk USA, Inc.

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DRONE ADVISORY COMMITTEE

June 19, 2020

Task Group #7 UTM Performance Capability Priorities

David Silver

Vice President,

Civil Aviation

Aerospace Industries Association

Overview

- Task from the Designated Federal Officer: Continue work and provide industry comments on the FAA UAS Traffic Management (UTM) CONOPs 2.0 Document

- 51 members representing 34 organizations met seven times to complete TG7 work

- Deliverables to FAA include:
  - Industry comment document including:
    - Areas of unanimous support
    - Areas where more discussion is needed
    - Stylistic comments
  - Updated report from previous tasking
  - Appendix of group members and anonymized comments

Areas of Full Support

- Description of the federated UTM system
- Recognition of the benefits of LAANC and the clear need for the UTM system
- Understanding that some of the technologies referenced in the document are not fully developed yet, but will be necessary to maintain the safety of the National Airspace System
- Specification of performance rules governing USSs and certain UTM services
- Recognition of standards development organizations and their contributions to UTM and overall National Airspace System safety
- Notion of Government-qualified services and/or service providers

Areas Requiring More Discussion

- **Role of Flight Information Management System**
  - CONOPs document should provide more clarity around the specific functions FIMS will serve, the separation of the roles of FIMS and the USS, as well as how the FIMS can provide information to the legacy Air Traffic Control system.
- **Participation of UAS within UTM**
  - Seeking clarity around the terms “all UAS” and “at some level”
- **Role of UVR**
  - How will UVR be utilized?
- **Manned Aircraft Operators Participation**
  - More discussion is needed on responsibilities, safety risks and other topics as this policy takes shape

Areas Requiring More Discussion

- **Benefits of UTM**
  - Additional benefits to consider:
    - A safe and stable environment for operators to operate and meet business needs through shared situational awareness and an operational framework consisting of standards, regulations, and common protocols that reduce risk and maintain stability.
    - A flexible and extensible construct that can adapt and evolve as the trade space changes and matures.
    - A construct that allows the FAA to maintain its authority over the airspace, while allowing industry to manage operations in areas authorized for low altitude UAS flight.
    - UTM provides a framework wherein an integrated suite of services can be utilized to increase situational awareness of the operating environment and mitigate operational risk. These mitigations contribute to the overall risk profile of a given operation - thereby supporting operators' abilities in attaining performance authorizations for increasingly complex operations.
    - UTM architecture will provide a secure framework for UAS, USS and SDSPs to operate their services efficiently, safely and capable of supporting increasing complexity with assured autonomy, utilizing artificial intelligence.

Areas Requiring More Discussion

- **Role of Performance Authorizations**
  - More information is needed about the specific type of performance linked to an authorization
- **Networked Remote ID**
  - More clarity needed on specifics tied to Remote ID and UTM architecture.
- **The accuracy of the scenarios contained within the document**
  - More complex scenarios may be needed to address future realities of the National Airspace System.
- **Data protection**
  - USSs should meet internationally accepted data protection standards in order to ensure that customer, government, and peer services are secured for the continued and safe operation of the UTM network.

Areas Requiring More Discussion

- **Volume-based vs. Trajectory-based Strategic De-confliction**
  - Seeking clarity from the FAA on whether a trajectory-based approach, which is more aligned to evolving ATM system for legacy traffic, would be effective as UAS operations evolve into the future.
- **Roles and Responsibilities of the Operator and USS**
  - FAA must clearly define who is responsible for an individual piece of the UTM ecosystem.
  - FAA must also clearly define the roles and responsibilities for the operator and the USS platform.

Thank you!

15 Minute Break

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June 19, 2020

Task Group - 8 Safety Culture

Task Group Lead: Captain Joe DePete

Co-Lead: Captain Steve Jangelis

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DRONE ADVISORY COMMITTEE

June 19, 2020

Tasking #8: Safety Culture for Drone Operators: FAA Tasking

- Tasking Question: What are ways we can help the drone community fully adopt the safety culture that is so engrained in manned aviation?
- Tasking Summary: Develop recommendations and ideas to assist the drone community in adopting an aviation safety culture. This includes ideas for motivation and suggestions for industry involvement
- Justification: The manned aviation community has a very strong safety culture. This culture is not just rules and regulations, aviators live and practice it every day. This culture has been one of the drivers of strong safety record we have today. The drone community is mostly new to aviation and having them learn and adopt this culture will greatly assist in the safe and efficient integration of drones into the National Airspace System (NAS)

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DRONE ADVISORY COMMITTEE

June 19, 2020

Tasking #8: Safety Culture for Drone Operators

- Membership

Brendan Schulman*	Brian Wynne*	Bryan Lesko	Catherine Self
Chad Budreau	Christopher Cooper	Christopher Julius	Dan Dalton
Dave Messina	Dewan Pifer	Diana Cooper	Houston Mills*
Jim Ackerson	Lorne W. Cass*	Mark Aitken*	Mark Bair
Mark Colborn*	Mark Reed	Max Fenkell	Nick Dryer
Randy Kenagy	Rich King	Richard Hanson*	Stella B Weidner
Steve Jangelis	Steven Hansen	Todd Graetz*	Tony Nannini
Tony Walsh	Vas Patterson	Wade Troxell	

*DAC Member

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June 19, 2020

Tasking #8: Safety Culture for Drone Operators

- Goal Number 1, Establish fundamental Truths/Tenets across aviation communities addressing the values of a Safety Culture
- Goal Number 2, Develop recommendations and ideas to assist the drone community in adopting an aviation safety culture. This includes ideas for motivation and suggestions for industry involvement
  - Timing: Third Quarter DAC meeting

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Tasking #8: Safety Culture for Drone Operators

- TG-8 Established four focused Sub-Groups to examine current and historical viewpoints of safety cultures
  - Traditional Manned (Lorne Case & Houston Mills)
  - Recreational unmanned (Rich Hanson)
  - National (large scale) commercial UAS operators (Todd Graetz)
  - Small (scale) commercial UAS operators (Dave Messina)

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Tasking #8: Safety Culture for Drone Operators

- Safety Tenets
  - **Tenets: A shared principle, belief, or doctrine generally held to be true…**
- Safety Ownership
- Safety modeled by leadership
- Organizational Values
- Learning Culture
- System wide approach
- Trust

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DRONE ADVISORY COMMITTEE

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Tasking #8: Safety Culture for Drone Operators

- **Safety Ownership**: empowering each individual across all groups with a share of the collective responsibility to learn, understand, advocate, and participate in best safety practices and behaviors for the intended activity

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DRONE ADVISORY COMMITTEE

June 19, 2020

Tasking #8: Safety Culture for Drone Operators

- **Safety modeled by leadership**: safety culture is driven throughout the aeronautical community from the operator to executive level management. Leaders should model safe practices (walk the talk) and reinforce the critical importance of safety as the top priority in the community

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DRONE ADVISORY COMMITTEE

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Tasking #8: Safety Culture for Drone Operators

- **Organizational Values:** a safety culture reflects the values, principles, and normal behavior of an individual engaged in an activity that presents risk to the life, safety or property of others and must be scalable to the organization
- Organizations can promote and enhance a culture of safety by modeling behavior, educating individuals, and emphasizing the importance of safety during activities that present heightened risks to people or property

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Tasking #8: Safety Culture for Drone Operators

- **Learning Culture**: a positive safety culture will always continue to learn and grow; individuals can adapt and change. Few operations in the National Air Space (NAS) are error-free but operators learn from failures going forward, utilize risk management tools (knowledge) to improve the safety and quality of operations or products with the power of data sharing both internally and within the communities to which they belong

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Tasking #8: Safety Culture for Drone Operators

- **System wide approach:** those who set and promote safety rules and parameters must share the responsibilities of system wide safety by the creation of risk-based rules that are reasonable and proportionate in light of the relative risk of the operation
- It is also important to promote a voluntary nonpunitive environment where the sharing/reporting of unintentional unsafe experiences (events) is fostered and supported by an educational approach to continuously improving safety in the National Air Space

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Tasking #8: Safety Culture for Drone Operators

- **Trust**: A strong safety culture is enhanced by trust, a firm belief in the honesty, reliability and the ability of others
  - Trust is a two-way street and assumes all stakeholders (individual and organizations) are committed to doing the right thing to ensure safe and successful operations
    - Operators/stakeholders must trust that regulators and authorities will transparently act on and implement constructive input from operators/stakeholders and support best practices and constructive measures to address safety concerns
    - Regulators must trust that operators/stakeholders will adhere to prescribed safety standards and operational norms
  - Trust promotes confidence amongst Operators, Stakeholders, and Regulators and leads to a cooperative environment for the sharing of safety related information, data and ideas

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Tasking #8: Safety Culture for Drone Operators

- Activities
  - Task Group leadership held 4 telecoms
  - Sub-Groups each held weekly telecoms

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Tasking #8: Safety Culture for Drone Operators

Questions

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DRONE ADVISORY COMMITTEE

June 19, 2020

New Business/ Agenda Topics

Dan Elwell

Designated Federal Officer, FAA Drone Advisory Committee

Deputy Administrator, FAA

Michael Chasen

Chair, FAA Drone Advisory Committee

Chairman, Advisory Board, PrecisionHawk USA, Inc.

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DRONE ADVISORY COMMITTEE

June 19, 2020

Closing Remarks

Dan Elwell

Designated Federal Officer, FAA Drone Advisory Committee

Deputy Administrator, FAA

Michael Chasen

Chair, FAA Drone Advisory Committee

Chairman, Advisory Board, PrecisionHawk USA, Inc.

Charter of the Drone Advisory Committee

1. **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 2. 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 Department of Transportation (DOT) and 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 and DOT 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 DOT and the FAA and or provide input to DOT and 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 U.S. 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. The UAS Integration Office is the primary entity within the FAA responsible for supporting the DAC.

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 $460,000, which includes 2.0 full-time equivalent salary and benefits at $413,000, plus $47,000 for meeting, travel, and miscellaneous expenses.

8. **Designated Federal Officer.** The FAA Administrator, on behalf of the Secretary of Transportation, will appoint a full-time or permanent part-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 DFO 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.**
    a. DAC estimates meeting three times a year to carry out its responsibilities. DAC meetings will be open to the public, except as provided under Section 10(d) of FACA, as implemented by 41 CFR part 102-3, and DOT Order 1120.3B.

10. **Duration.** Continuing, 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.** DAC shall comprise members appointed by the U.S. Secretary of Transportation upon recommendation by the FAA Administrator. All DAC members serve at the pleasure of the Secretary of Transportation.

    a. The DAC will have no more than 35 members. Members represent airports and airport communities; pilot and controller labor groups; local, state, and tribal governments; navigation, communication, surveillance, and air traffic management capability providers; research, development, and academia; traditional manned aviation operators; UAS hardware component manufacturers; UAS manufacturers; UAS operators; UAS software application manufacturers; and other interests.

    b. Members will serve without charge, and without government compensation. Members who represent a particular interest of employment, education, experience, or affiliation with a specific aviation related organization will serve as representatives. Members appointed solely for their expertise serve as Special Government Employees.

    c. Member representatives and SGEs are appointed for a 2-year term, but can continue to serve until their replacement is chosen or they are reappointed

13. **Subcommittees.** The FAA Administrator 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.** The records of the DAC are handled in accordance with the National Archives and Records Administration (NARA) General Records Schedule 6.2, or other approved agency records disposition schedules. 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 prepared for or by DAC will be available for public inspection at https://www.faa.gov/uas/programs_partnerships/drone_advisory_committee/.

15. **Filing Date.** This charter is effective June 12, 2020, which is the filing date of this Charter with Congress.

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 ¾ of all DAC public meetings during membership term.
- 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.

Daniel K. Elwell
Deputy Administrator

Daniel K. Elwell is the Deputy Administrator of the Federal Aviation Administration (FAA). Mr. Elwell was sworn in to office on June 26, 2017 following his appointment by President Trump. He also served as Acting FAA Administrator from January 2018 until August 2019.

Elwell previously served at the FAA as the Assistant Administrator for Policy, Planning, and Environment from 2006–2008. Most recently, he was Senior Advisor on Aviation to U.S. Secretary of Transportation Elaine L. Chao. Earlier in his career, he served as a legislative fellow for the late Senator Ted Stevens (R-Alaska).

From 2013–2015, as Senior Vice President for Safety, Security, and Operations at Airlines for America (A4A), Elwell was responsible for leading the advancement of commercial aviation safety and security excellence for major U.S. air carriers.

Prior to A4A, Elwell was Vice President of the Aerospace Industries Association (AIA) from 2008–2013. In this role, Elwell represented civil aerospace manufacturers and led policy development and advocacy for the civil aerospace manufacturing interests of more than 300 AIA member companies.

Elwell was a commercial pilot for 16 years with American Airlines, flying DC-10, MD-80, and B-757/767 aircraft. While maintaining his proficiency as an MD-80 Captain, he served as Managing Director for International and Government Affairs at American Airlines.

Dan earned his pilot wings at Williams Air Force Base in Arizona after graduating from the U.S. Air Force Academy with a Bachelor of Science degree in International Affairs. Lieutenant Colonel Elwell retired from military service as a Command Pilot with more than 6,000 hours combined civilian and military flight time in the U.S. Air Force and U.S. Air Force Reserve, including combat service during Operation Desert Storm.

Federal Aviation Administration

Jay Merkle

Executive Director, Unmanned Aircraft Systems Integration Office

Prior to being named the new Executive Director of the Unmanned Aircraft Systems Integration Office, Peter "Jay" Merkle was the Deputy Vice President (DVP) of the Program Management Organization (PMO) within the Air Traffic Organization (ATO). The PMO is responsible for all NextGen program activity; all National Airspace System (NAS) communications; navigation, weather, surveillance and automation modernization programs; and all service life extensions to legacy NAS sensors, communications and navigation aids. Given the tight coupling between successful automation program delivery and current system operation, the PMO also leads and manages all second-level automation engineering efforts. Lastly, the PMO works with FAA operations and aviation users to ensure globally interoperable solutions for NextGen.

Prior to that position, Merkle was the Director of Program Control and Integration, AJM-1, in the PMO for the ATO. In that capacity, he led the PMO in developing effective, timely, and innovative solutions to evolving business needs. The focus areas were program control, crosscutting analysis and integration, and special initiatives.

Since joining the FAA, Merkle has served as the Manager of Systems Integration for Portfolio Management and Technology Development within the NextGen organization. He also has held positions as the Lead Engineer for tower, terminal, and en route automation systems, as the Chief System Engineer for En Route and Terminal Domains, and as the Chief Architect for NextGen at the Joint Planning and Development Office.

Merkle has over 30 years of extensive experience in engineering and program management. He started his career as an engineer working in cockpit and crew station design on several aircraft, including the C-17 large transport aircraft. Merkle holds a Bachelor's degree in Psychology from the University of Central Florida and a Master's degree in Industrial Engineering and Operations Research from the Virginia Polytechnic Institute and State University.

Michael Chasen
Chairman of the Advisory Board, PrecisionHawk

Michael Chasen is the Chairman of the Advisory Board of PrecisionHawk, a leading software and service provider in the commercial drone space. PrecisionHawk uses advanced drone technology combined with artificial intelligence (A.I.) and machine learning to provide actionable business intelligence across Energy, Agriculture, Telecom and Infrastructure industries. PrecisionHawk is also one of the thought leaders in flying Beyond Visual Line of Sight (BVLOS).

Michael served as CEO of PrecisionHawk where he oversaw a series D funding round that culminated in $75 million and represented one of the largest financings to date in the commercial drone space.

In 2018, Chasen also lead PrecisionHawk to acquire five companies: Droners.io, AirVid, HAZON Solutions, InspectTools and Uplift Data Partners. These acquisitions helped solidify PrecisionHawk as the market leader for commercial drone services with a database of over 15,000 commercially-licensed drone pilots.

Prior to PrecisionHawk, Chasen was the co-founder and CEO of Blackboard (NASDAQ: BBBB), a leader in the global eLearning space. He grew Blackboard to serve over 30,000 institutions worldwide, had 3,000 employees and 20 offices around the world. Michael took Blackboard public in 2004 and ran it as a public company for 7 years before selling to Providence Equity Partners for $1.7B. Michael then started SocialRadar, a company specializing in improving location accuracy on SmartPhones, which he sold to Verizon in 2016.

Michael has an undergraduate degree in Computer Science and an MBA from Georgetown.

Drone Advisory Committee

02/27/2020 DAC Meeting • Washington, DC

Meeting Minutes

Time: 9:00 a.m. to 4:00 p.m. Eastern Time
Location: National Transportation Safety Board Boardroom and Conference Center, 420 10th St SW, Washington, DC 20594

For additional information, please view the Meeting eBook.

Meeting Summary

Prior to the official start of the meeting, the FAA shared that the meeting was being live streamed. The video will be posted online along with any meeting materials.

Drone Advisory Committee (DAC) Designated Federal Officer (DFO) Dan K. Elwell opened the meeting at 9 a.m. on February 27th. Mr. Elwell would need to leave during the lunch break due to prior commitments. Mr. Jay Merkle, the Executive Director of the FAA Unmanned Aircraft Systems (UAS) Integration Office took over the DFO duties from Mr. Elwell, in his absence.

DAC Chairman, Michael Chasen, PrecisionHawk USA, Inc. Chief Executive Officer (CEO), then gave his opening remarks. He highlighted the top priorities for the DAC going forward and shared that DOT will be putting out a solicitation for new DAC members in the near future.

Following the Chairman's remarks, Alexandra R. Randazzo, from the FAA Office of the Chief Counsel, gave a presentation on the Federal Advisory Committee Act (FACA) requirements for DAC members.

Mr. Elwell then invited FAA team members to present the FAA responses to the DAC recommendations presented at the October 2019 meeting.

Mr. Merkle, presented the FAA response to DAC Tasking #1: Remote Identification (Remote ID) Early Equipage. The DAC endorsed the ASTM remote ID standard as the equipage basis for a voluntary program and advised that the FAA should add a regulatory "overlay" and Minimal Operational Performance Standard (MOPS) on top of the ASTM standard as part of regulatory implementation. The FAA response acknowledges the DAC's consensus agreement to recommend the pending ASTM remote ID standard as the basis for any voluntary equipage incentives, and welcomed the DAC's layered approach to incentivizing as described in the recommendation.

Mrs. Elizabeth Soltys, Acting Division Manager, UAS Security, presented the FAA response to DAC Tasking #2: UAS Security Issues. The DAC recommended that:

- Original equipment manufacturers (OEM) should equip UAS with geofencing,
- The federal government should make available a database for critical infrastructure and Temporary Flight Restrictions (TFRs) issued,

- OEM should create alerts for UAS approaching sensitive areas,
- OEM should voluntarily equip Automatic Dependent Surveillance-Broadcast (ADS-B) receivers into UAS systems,
- OEM should voluntarily enable automated UAS flight limitations, and
- OEM should explore voluntary development and equipage of UAS-based detect and avoid technology

The FAA response agreed with the need for geofencing and working on this pursuit. Regarding the recommendation for a consolidated database, the FAA currently provides standardized sources capturing TFRs. For the third recommendation, creating alerts for UAS operators, the FAA response concurred on this recommendation and supports the expedited development of such means. For the ADS-B recommendation, the FAA and DOT published the proposed RID rule which addresses ADS-B. For the last two recommendations proposed by the DAC, the FAA response supports both recommendations and is looking into fielding both options.

Mr. Rico Carty, Deputy Executive Director of the FAA's Flight Standards Service, presented the FAA response to DAC Tasking #3: Part 107 Waivers. The DAC recommended to:

- Auto-renew expiring waivers
- Modify the FAA DroneZone
- Create a checklist of safety cases for complex waiver approvals
- Streamline automated approval
- Streamline process for groups of operators
- Increase transparency of part 107
- Establish a structured program for part 107 waiver inspectors

To the respective recommendations, the FAA responses were:

- Auto-renewal of expiring waivers:
  - The FAA highlighted plans on expediting part 107 waivers and renewal application process in FAA DroneZone.
- Modification of the FAA DroneZone:
  - The FAA has processes in place for changing information on an issued waiver.
- Creation of a checklist of safety cases for complex waivers:
  - The FAA published examples of approved safety cases for each regulation and is developing a risk took to assist applications.
- Streamlining of automated approval:
  - The FAA is required to review each waiver application submitted but will collaborate with industry on developing new guidelines for training.
- Streamlining of automated approval for operators:
  - The FAA is currently exploring and modifying DroneZone application formats to help streamline; this is anticipated to help with applications, receipt, and analysis of waiver applications.
- Increased transparency and accountability of part 107:

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  - The FAA has improved transparency by open communication between UAS Support Center and waiver analysts.
- Establishment of a structured program for part 107 waiver inspectors:
  - All FAA waiver analysts are certified and received additional part 107 specific waiver training.

Mr. Elwell presented the FAA response to DAC Tasking #4: FAA UAS Comprehensive Plan. The FAA thanked the DAC members for their comments and the FAA will incorporate the feedback into the final plan.

DAC Chairman Michael Chasen then invited DAC members to present on the DAC recommendations from the October 2019 taskings.

Dave Messina, President & CEO, The First Person View (FPV) Freedom Coalition (FPVFC), along Dean Schultz, Executive Vice President (EVP)/Chief Operating Officer (COO) of Reno-Tahoe Airport Authority, presented the DAC recommendations on Tasking #5: UAS Facility Maps. The task group recommended UAS Facility Maps grid refinement from one degree to half degree grid squares. Following the grid redesign, they also suggested putting into place a pilot program to identify best practices and creating a "Stakeholders of the UAS Maps" refinement team.

Task Group #6: Beyond Visual Line of Sight (BVLOS) Challenges, included four sub-group recommendations that were presented by four DAC members. Sub-group 1: Certification, presented by Sean Cassidy, Amazon Prime Air, recommends that the FAA allow an incremental UAS type certification under 14 CFR Part 21.17(b). Sub-group 2: Spectrum/C2, presented by Dave Messina, President & CEO, FPVFC, recommends that the FAA collaborate with stakeholders to create a comprehensive report to Congress and determine how spectrum resources are best utilized for UAS. Sub-group 3: Detect and Avoid (DAA), presented by Jennifer Player, Avineer, recommends the use of DAA technology for safety and future operations. Sub-group 4: Autonomy, presented by James Burgress, Wing Corporation, recommends that the FAA should partner with industry and create performance-based requirements to support autonomous functions.

Max Finkell, Director, Unmanned and Emerging Aviation Technologies, Aerospace Industries Association, presented on behalf of DAC member David Silver, for DAC Tasking #7: UAS Traffic Management (UTM) Performance. Task Group #7 recommends that the FAA and relevant stakeholders put together a timeline of when tasking will be accomplished, allocate resources based on priorities as identified by the group, and that Task Group #7 remain in active to address UTM CONOPs 2.0 when available.

DAC Chairman Michael Chasen then introduced the industry-led topics discussion.

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Chris Anderson, ASTM Durability & Reliability (D&R) Working Group Lead, presented on introducing simulation into a D&R certification process. He shared that if simulations were allowed to be used for D&R testing and certification, it would speed up the entire process. This would also allow for continuing rapid innovation, with potential cost savings, towards future certification methods of other aircraft.

The meeting concluded with Mr. Merkle reviewing the two new DAC taskings related to the topics raised by the DAC Chairman.

The meeting resulted in the following new DAC taskings:

Proposed DAC Tasking #7: UTM (continuation of Tasking #7)

Proposed Tasking:

- The UAS Traffic Management (UTM) concept of operations (ConOps) v2.0 was not released during the time period of task group #7's work. The FAA proposes the DAC continue work and provide comments on the release of v2.0

Summary:

- Comment on the UTM ConOps 2.0 concept and provide recommendations about what is most important regarding UTM capabilities. This will help inform FAA priorities and planning as we work toward building UTM capabilities and fully integrating UAS into the National Airspace System (NAS).

Tasking #8: Aviation Safety Culture for Drone Operators

Proposed Tasking:

- What are ways we can help the drone community fully adopt the safety culture that is so ingrained in manned aviation?

Summary:

- Develop recommendations and ideas to assist the drone community in adopting an aviation safety culture. This includes ideas for motivation and suggestions for industry involvement.

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Detailed Minutes

Official Statement of the Designated Federal Officer
Elwell read the official statement at 9 a.m.

DFO Opening Remarks
Mr. Elwell started his opening remarks by reiterating that DAC meetings start with the reading of the Official DFO Statement. The agenda for the meeting today was sent ahead of time for everyone's review. Before the presentations began, Mr. Elwell shared that he had some sad news to share. DAC member Matthew Zuccaro had passed away. Elwell spoke of Zuccaro as an icon in the aviation community. Zuccaro had quit college in 1968 to join the Army to become a helicopter pilot. After training at Fort Rucker, Alabama, he was sent to Vietnam. While in Vietnam, he flew helicopters in combat and received two Distinguished Flying Service medals. He served on the Helicopter Association International (HAI) board and was also a writer of note on helicopter safety. He led the safety initiative "Land and Live." The DAC thanked him posthumously for all his effort in this industry. Mr. Elwell then turned over the floor to the DAC Chairman Michael Chasen.

DAC Chair Opening Remarks
DAC Chairman Michael Chasen, offered his condolences to Matthew Zuccaro's family and asked everyone in attendance to join him for a moment of silence in memory of Matthew Zuccaro. Following the moment of silence, Mr. Chasen welcomed everyone who attended the meeting in person and watching online. He shared that when he took on the role of DAC Chairman, he had talked about two main areas affecting the industry's ability to move forward: technology and policy. He shared that we need to make sure that we have policies that don't hamper innovation and highlighted five policies to focus on going forward:

- Remote ID
- BVLOS
- Counter UAS
- The Waiver Process
- Public-Private Partnerships

Mr. Chasen shared that the day's meeting would address FAA responses to previously submitted DAC recommendations on Remote ID Early Equipage, UAS Security Issues, and Part 107 Waivers. Going forward, the next focus areas will be on the UTM Task Group being extended and creating a strong aviation safety culture in the UAS community. He also shared that the DOT will soon post a solicitation for new DAC member. The DOT and FAA want to fill vacancies for underrepresented groups and to ensure that they have a qualified pool of candidates for future vacancies.

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Federal Advisory Committee Act (FACA) Requirements Overview
Alexandra R. Randazzo, Office of the Chief Counsel, presented on the FACA requirements for DAC members. Ms. Randazzo is the managing attorney in the Litigation and General Law Division, and provides legal advice on FACA requirements. She provided the DAC with important aspects of the law as it relates to the DAC.

Ms. Randazzo shared that the role of the DAC is to advise the FAA. FACA sets forth procedures such as charters, memberships, etc. The DAC is a discretionary advisory committee. The appropriate federal registry notice, as required by law, was provided for this meeting. The goal is to provide public notice of the intent of the meeting. The law also requires that FACA meetings should be open to the public, unless a determination is made that it should be a closed meeting. As noted at the conclusion of this meeting, minutes of the meetings will be provided to the public. Records of the DAC are managed in accordance with General Records Schedule 6.2.

Turning to the individual DAC members' roles, Ms. Randazzo explained that as members of the DAC, they were each appointed by the Secretary of Transportation after appropriate ethics reviews. Member responsibilities include attending all attending meetings, preparing all committee reports, and offering recommendations.

Ms. Randazzo shared that DAC members can speak to Congress and the media only in their personal capacity, not on behalf of the DAC. Members should not discuss information which are covered under Freedom of Information Act (FOIA) exemptions 4 and 6. The DAC should not receive, compile, or discuss records that are trade secrets, commercial, or financial information. To the extent that the DAC determines, subcommittees should provide their work to the parent committee. The DAC will deliberate the work of the working groups and review their recommendations. Ms. Randazzo closed her presentation by sharing that if members have any questions, she is available to answer them. No members had questions.

Approval of the Agenda and Previous Meeting Minutes
DAC Chairman Mr. Chasen put forth a motion to accept the meeting minutes from the previous DAC meeting. The DAC unanimously approved meeting minutes from the last DAC meeting held on October 17, 2019.

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FAA Response to DAC Tasking #1: Remote ID Early Equipage
Mr. Merkle presented the FAA response to DAC Tasking #1. He shared that this tasking was received at the last DAC meeting and the FAA committed to providing a response at this DAC meeting.
The FAA recognized three distinct time periods between this response and full implementation of the remote ID regulations and standards:

- **Period 1**: Starts when an industry consensus remote ID standard is published, and ends when the FAA's remote ID rule is final.Mr. Merkle shared that the FAA is currently in Period 1.
- **Period 2**: Starts when the FAA's remote ID rule is final and a UAS Service Supplier (USS) network is established for remote ID, prior to the FAA's formal acceptance of means of compliance for the remote ID standard. Mr. Merkle encouraged everyone to go comment on the proposed rule.
- **Period 3**: Starts when the FAA has accepted a standard to comply with remote ID, and ends on the required operational compliance date with the rule (currently proposed as three years after rule effectivity in the notice of proposed rulemaking or NPRM).

DAC Recommendation:
They recommended the ASTM remote ID standard to the DAC as the equipage basis for the voluntary program.

FAA Response:

- We acknowledge the DAC's consensus agreement to recommend the pending ASTM remote ID standard as the basis for any voluntary equipage incentives, and welcome the DAC's layered approach to incentivizing as described in their recommendation.

DAC Recommendation:
Incentives provided by the FAA: The DAC recommended incentives regarding waiver application processing and requirements, contract preference, equipage acknowledgement, airspace access, and rebates or monetary incentives.

FAA Response:

- **Waiver application processing and requirements:** The FAA commits to conducting a gap analysis of any remote ID industry consensus standard published during Period 1, and communicating to manufacturers and operators any additional information part 107 waiver applicants would need to provide for the FAA to give credit to for using remote ID as a risk mitigation in a waiver application.
- **Contract preference:** In order to be fair and equitable, it is highly unlikely that the FAA's procurement processes would enable preferential treatment for voluntary early adoption of equipment or compliance to regulations.
- **Equipage acknowledgement:** The FAA will maintain an online database of manufacturers who have declared compliance with an industry consensus standard

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recognized by the FAA as a means of compliance with the remote ID rule. We will begin this database with the first declaration of compliance.

- **Airspace Access:** The FAA commits to working with our federal security partners to determine whether an expedited process for remote ID compliant aircraft could be established in order to approve airspace access for certain UAS in certain circumstances. Additionally, we will add a field on the FAA System Operations Support Center (SOSC) Special Governmental Interest (SGI) form for indication of remote ID compliant aircraft, which could facilitate coordination with incident commanders and security partners in certain circumstances.
- **Rebates or monetary incentives:** The FAA commits to considering this option as an incentive for early remote ID compliance and equipage, for a fixed period of time and a specific number of UAS, but would need additional input from manufacturers in order to determine the best window to make this offer.

DAC Recommendation:
Incentives provided by others: The DAC recommended incentives regarding waiver application processing and requirements, contract preference, equipage acknowledgement, airspace access, and rebates or monetary incentives.

FAA Response:

- We strongly encourage states and municipalities to favorably consider remote ID equipped aircraft when establishing their restrictions and conditions, and we commit to undertaking an educational campaign for states/cities/municipalities specifically related to the benefits remote ID provides in terms of situational awareness for their law enforcement and public safety officials. The FAA recognizes that while this may not be a direct incentive for individual operators and recreational flyers, it should broadly incentivize the UAS manufacturer community to produce aircraft in compliance with published industry consensus standards (e.g., the serial number standard) as early and quickly as possible.
- The FAA's final commitment is to reconsider the DAC's recommendations, as well as any additional ideas to incentivize voluntary remote ID equipage, as we get closer to finalizing the rule.

Mr. Merkle ended his presentation by sharing that the rule should incentivize industry to create UAS based on published and industry consensus standards. The FAA commits to reconsider the DAC recommendation and any additional ideas for voluntary remote ID equipage as we are closer to finalizing the rule. Currently, there are over 30,000 comments in the docket of the NPRM.

Discussion:

- Captain Houston Mill (UPS): What is the FAA's time period on this?
  - Jay Merkle (FAA): The FAA is starting this process now.

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- Captain Joe DePete (Air Line Pilots Association [ALPA]): Can you elaborate on contract preference?
  - Dan Elwell (FAA): The FAA cannot require something that is not final yet. We are talking about voluntarily remote ID and if an applicant shows they have it, they are in a better standing than someone who does not, but this is only unofficial.

FAA Response to DAC Tasking #2: UAS Security Issues
Ms. Elizabeth Soltys, Acting Division Manager, UAS Security, Program and Data Management branch, presented the FAA response on DAC Tasking #2.

DAC Tasking #2:

- Identify what currently existing or near-term technical solutions at the aircraft or operational limitation/capability level could make it less likely that clueless and careless operators could operate UAS in ways that can be perceived as posing a safety or security threat
- Identify what is the universe of actions that IF relevant industry stakeholders agreed to do them, would substantially reduce the likelihood of unintentional threatening behavior

Ms. Soltys explained that the DAC analyzed the tasking and came up with five scenarios. In those scenarios, they looked at airspace, aircraft, and operators, across what they refer to as their three pillars. These three pillars are: airframe security, airspace/operational security, and airmen/operator security. They ran scenarios looking at TFRs, airspace in and around airports, mass gatherings, the vicinity of other aircraft (manned), and compliant UAS that were appropriately flying in that environment.

Recommendation #1: OEMs should equip their UAS with geofencing capabilities.

FAA Response:

- In her response, Ms. Soltys highlighted that the FAA and DOT had released its remote ID NPRM on December 31, 2019, with a comment period through March 2, 2020. Geofencing is reflected in the proposed rule and as part of the NPRM. The FAA envisions this requirement can be met through geofencing as one capability. The FAA also discussed command and control power limitations but the NPRM does not intend to propose imposing any range limitations on standard remote ID UAS. Ms. Soltys shared that the FAA looked at more sophisticated capabilities such as airspace prohibitions and TFRs, and she discussed that public safety drone missions that would be afforded access to airspace. The FAA would also consider part-time prohibitions. Ms. Soltys highlighted that current law prohibits enforcing FAA statutes by state and local authorities, otherwise known as pre-emption. Local law enforcement does have the necessary tools in its toolbox to deal with voyeurism. They also have ability to manage land, departure, and arrival locations.

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Recommendation #2: The federal government should make available a consolidated, standardized, and up-to-date database for critical infrastructure and TFRs issued, and ensure that it is machine processable.

FAA Response:

- On Recommendation #2, Ms. Soltys stated that the FAA does in fact already provide LAANC, the Low Altitude Authorization and Notification Capability, which came online as a beta test in April 2018. To date, there are approximately 600 airspaces, with 400 air traffic controllers managing them. If you go to the FAA website, the FAA promotes the LAANC capability and you will see that there are active LAANC service providers, approximately nine in total, that handle part 107 waiver requests in almost real-time. These providers also handle those requests that require a more detailed analysis. LAANC was upgraded in 2019 to handle recreational fliers, as well.
- In addition to these services, the FAA offers Notice to Airmen (NOTAMs) and is currently working on our aeronautical information service to enhance the NOTAM functionality with modernization capabilities. In the FAA Extension Safety and Security Act of 2016 Section 2209, the Secretary of Transportation was asked to manage a rule to prohibit or restrict access to a specific airspace. It was well defined what those fixed site facilities would be. Currently, Section 2209 is in the rulemaking process and has not been released yet, so as an interim solution the FAA is employing our current authorities under 14 CFR 99.7. This affords us special security instructions so that our federal security partners can use TFRs, in and around federal prisons, around military bases, and even in environments that are managed or requested by our security partners, such as the Super Bowl.

Recommendation #3: OEMs should create alerts for UAS operators when their UAS is approaching sensitive flight areas, such as controlled airspace, prohibited flight areas, TFRs, etc.

FAA Response:

- The DAC also requested that OEMs should create alerts for UAS operators when their UAS is approaching sensitive facilities such as: controlled airspace, prohibited flight areas, and temporary flight restrictions, etc. Ms. Soltys informed the attendees that the FAA supports this expedited development and fielding of this automation capability. The FAA supports this functionality in the future to also include 4D trajectory as the UTM system expands.

Recommendation #4: OEMs should voluntarily equip "ADS-B In" receivers on UAS systems (i.e., airframe and/or controller), combined with the notification system in recommendation #2 above. A follow-on to this would be voluntary equipage of an airborne conflict resolution/collision avoidance capability for the UAS operator.

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FAA Response:

- Ms. Soltys shared that for recommendation #4, the DAC recommends, that OEMs should voluntarily equip ADS-B In, receivers on UAS. This would be voluntary equipage for airborne conflict resolution collision avoidance capability for UAS operators. On December 31, 2019, the FAA and DOT issued a NPRM on remote ID. Public comments are being accepted through March 2, 2020. The FAA does in fact address ADS-B In the NPRM. It was evaluated and discussed in the NPRM that ADS-B is a capability that the FAA is not considering at this time. Instead, the FAA looked at spectrum analysis and air-traffic capabilities in that type of airspace. It was determined that there would be saturation and that we did not have the current infrastructure that would be able to manage this type of capability. The FAA in the NPRM proposes to address the identification issues associated with UAS requiring the use of new services as identified in the document.

Discussion:

- Christian Ramsey (uAvionix Corporation): I read the recommendation as advocating for ADS-B In, as "ADS-B receiver on the drone as a means to avoid a manned aircraft that is equipped with ADS-B Out." Your response is based on the assumption that the recommendation is based on an ADS-B Out on the drone and that therefore the manned aircraft could respond. Yes, the NPRM does address ADS-B Out as an inappropriate means of remote ID. It addresses the ADS-B Out function as inappropriate for part 107. It does not address any sort of recommendation at all on the use of ADS-B In as a means to avoid manned aircraft. I'm just reading through the text that there was a maybe a misunderstanding in the recommendation, but maybe someone who was on that task could clarify?
    - Elizabeth Soltys (FAA): ADS-B In is discussed in the NRPM and the comments affiliated with ADS-B are being received through March 2. Did you only wish to discuss ADS-B In?
- Christian Ramsey: The way I read this recommendation is that there is no spectrum utilization for ADS-B In, is that correct? So, I read the recommendation as recommending for ADS-B as a means for detect and avoid passively. The response seems to be the opposite.
    - Jay Merkle (FAA): In the elaboration of the response, the FAA focused a little bit more on the rule and ADS-B Out. He shared that Mr. Ramsey was correct that the recommendation was for ADS-B In and the FAA is actively working with multiple applicants on uses of ADS-B In.
- Christian Ramsey: I'm not seeing a statement. There is no recommendation here for an ADS-B In.
    - Jay Merkle: We will go back and relook at that. But we are actively working with applicants on the use of ADS-B In.
- James Burgess (Wing): I think it's helpful just to note for the DAC and for the FAA, that there are many active engagements and research efforts on detect and avoid, in particular using ADS-B In on the UAS. It does not create spectrum issues and I just think for

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awareness of the committee, there actually are many organizations I can see, including several around the table, that are working on this effort. It would be helpful to know from the FAA, if that momentum and effort, is well aligned and in the direction that the FAA sees as effective, either now or at a later stage.

- Jay Merkle: Without revealing who the applicants are, because that is private information, they are all consistent and they are all working towards moving to various ways to detect and avoid. We see a good consensus around all the approaches. It is our understanding that some of those companies are in fact talking with each other on making the approach more common. We strongly encourage that and we are seeing good progress in terms of defining what might be possible with the ADS-B In. We are supportive of the data collection efforts that people are suggesting and very much looking forward to the results. The results of these efforts could give us another very powerful tool in the layered risk mitigation toolbox, particularly in the Mode C Veil.

Recommendation #5: OEMs should explore the voluntarily enablement of automated UAS flight performance limitations — such as altitude limitations, return-to-home features, and a decrease in UAS speed or maneuverability — while in or near sensitive flight areas.

FAA Response:

- Ms. Soltys shared that the FAA does in fact support the development and integration by industry, in cooperation with the FAA, of automated UAS flight performance limitations linked to the proximity of airspace restrictions and other similar areas. The development of any such automation, which significantly alters UAS flight performance and behavior, must be closely coordinated with the FAA to address potential safety and security implications.

Recommendation #6: OEMs should explore the voluntary development and equipage of UAS with performance-based DAA technology, for collision/obstacle avoidance, on the airframe, using acoustic, optical, and/or other sensors, as well as robust DAA algorithms.

FAA Response:

- Ms. Soltys highlighted that the FAA supports this recommendation and would expect close coordination with the FAA, to ensure safety and security implications are worked through.

Discussion:

- Greg Agvent (CNN): As an operator who is flying every day in U.S. airspace, I want to give a little bit of a reality check to your slide number two. Slide two mentioned that the federal government should make available consolidated, standardized information. It's our experience that we see every day missing or disparate information from a number of different sources, whether it's interactive maps provided by the FAA, facility maps, vector maps, or LAANC information provided by the USS providers or even from

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manufacturers. While your response is that you offer this, I think there's a lot of work that still needs to be done on rectifying some of the disparate and missing information.

- Jay Merkle (FAA): Good comment and that is actually where that Automatic Identification System (AIS) effort is focused. AIS will do a better job of pulling all that data together. That is where the AIS links in with your comment.

FAA Response to DAC Tasking #3: Part 107 Waivers
Mr. Rico Carty, Deputy Director, Flight Standards, FAA, presented the FAA response to DAC Tasking #3.

Recommendation #1: Auto-renew expiring waivers

FAA Response:

- Mr. Carty emphasized that he was aware that the part 107 process can be considered a slow and onerous process. The FAA is working to streamline the waiver process. The FAA is currently planning an expedited part 107 waiver renewal application process in the FAA DroneZone. He explained that the FAA can't auto renew, but what they are trying to do is to make the process a little easier for applicants to get through without having to continuously do the entire application. The FAA will reduce the reapplication burden for waiver renewals or for applicants where the residual operational risk, regulatory structure, and policy has not changed since the original waiver issuance. The schedule will be announced at the FAA UAS Symposium in June 2020 with a likely 2020/2021 implementation date.

Recommendation #2: Modify the FAA DroneZone

FAA Response:

- Mr. Carty read the second recommendation of modifying the FAA DroneZone to allow the operator to update non-consequential waiver application information and forgo filing an amendment. The FAA and responsible persons are obligated to ensure all pertinent data and waiver applications, on an issued waiver, are accurate and up-to-date. The FAA must continuously keep this information updated and we have learned some of this from other applications.

Recommendation #3: Create a checklist of safety cases for complex waiver approvals

FAA Response:

- Mr. Carty shared that the FAA has published waiver safety justifications online as required by Section 352. The FAA is also developing a risk tool to assess applicants and assist in identifying and reducing UAS operational risks which would help with the application process. The intent is that disapproved waiver applicants may contact the UAS Support Center which may provide additional insight on deficiencies in disapproved

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waiver applications. That is a tool that is currently in use and the FAA will ensure that additional emphasis is placed on that resource. Applicants can call in and they can take a look at that resource and ask questions of our analysis. The FAA is also updating disapproval letters to provide more constructive feedback to the applicants. We will emphasize that applicants are able to contact us to ask what they can do better to get their application approved.

Recommendation #4: Streamline automated approval

FAA Response:

- Mr. Carty moved on to the next DAC recommendation. The FAA is required to review each waiver application submitted and currently that is what we do. The FAA recognizes the potential safety benefits of specialized experience, advanced training programs, and industry audits. Currently, sponsored research projects can identify and quantify the appropriate amount of mitigation credit for specialized experience and advanced training. We are working to incorporate some of that and we are continuing to do so as we move forward. We are taking advantage of some of those mitigations. The FAA will collaborate with industry to leverage the research outcomes and to develop publicly available guidelines for training programs and specialized experience.

Recommendation #5: Streamline process for groups of operators

FAA Response:

- Mr. Carty stated that the FAA is working to streamline some of the process. The FAA is currently exploring and modifying the FAA DroneZone application to streamline the application, receipt, and analysis of waiver applications, and make it a quicker, better, more efficient operation. Part 107 waiver changes will begin to be implemented in calendar year 2020 and into 2021. As mentioned previously, the FAA is continuously evaluating strategy and methods to facilitate improvement in our process.

Recommendation #6: Increase transparency and accountability of part 107

FAA Response:

- Mr. Carty then provided the FAA response to recommendation #6. Mr. Carty emphasized that a waiver analyst cannot act as a risk acceptor. All risk acceptance occurs at the AFS-800 branch level. Those individuals work for Mr. Carty, and the FAA wants to make sure risk acceptance happens at a division manager level or above for part 107. The FAA has improved the transparency of processes by creating an open line of communication between the UAS Support Center and waiver analysts. The UAS Support Center serves as the primary point of contact and information gateway for applicants who seek explanation or guidance regarding waivers. Mr. Carty shared that the FAA will work to increase awareness of the UAS Support Center's role as a benefit for applicants.

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Recommendation #7: Establish a structured program for part 107 waiver inspectors

FAA Response:

- Mr. Carty shared that all waiver analysts are certified and accredited aviation safety inspectors. They are trained in the waiver process. Additionally, inspectors assigned to the waiver team receive additional part 107 specific waiver training on part 107 waiver analysis, part 107 risk recommendation standardization, part 107 waiver quality control processes, ongoing part 107 waiver agencies subject matter experts, engagement, and education based on complexity of waiver application being analyzed. The FAA holds yearly refresher training for inspectors, at which time anything new that has been learned is incorporated into the process.

Discussion:

- Bob Brock (Kansas Department of Transportation): Our participation in the UAS Integration Pilot Program (IPP) has brought a great deal of lessons learned in engaging with AFS, Flight Standards Service, and the waiver and authorization process, and how to get to a meaningful solution. One thing I would like to offer to the DAC, as a perspective, is that a tremendous number of stakeholders at this table engage in this precise process so routinely to get waiver authorizations accomplished. The communication we enjoyed with this UAS program gives us insight and access to communication channels, directly to the people who will say "yes." Ultimately, the issue we have to overcome is that it is not enough to know there is a gap in your data analysis. What would be helpful is if a Flight Standards person can tell me, "Here are some solutions others have engaged that got them to success." I think there is some very clear and present value in lessons learned that other applicants or stakeholders have done to complete applications successfully. This is both a compliment to UAS IPP and to Jay's leadership, but it is also a "lessons learned" observation for the community. Just getting to "no" isn't improving and elevating the entire program. I think we really can find those paths to lessons learned or the people who do it well, and that will be extremely helpful to the others.
    - Dan Elwell (FAA): That is a great point. One of the goals of the IPP is exactly what you shared. It is to get the best practices, but more importantly, in the aviation ecosystem we keep no secrets when it comes to safety best practices. This is going to be central to the success of this industry, that both regulators and the industry share all of these best practices and all of these technologies that allow safety to continue to be a number one priority. This is especially the case as we get closer and closer to true integration.
    - Jay Merkle (FAA): Going back to Mr. Carty's point, the UAS Support Center today is broadly using the lessons learned that we have. As we codify the lessons learned from IPP, we are adding that to their notes and material. To Dan's point, I want to highlight that the industry-based Unmanned Aircraft Safety Team (UAST) is also another place that promotes best practices, particularly safety management. UAST provided a safety management system that operators — everyone from a single operator up to bordering part 135 type operations — can

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use to help guide them. Using those tools and best practices, we see companies and individuals tend to be more successful in the application process. Those who take advantage of the material on the website and UAS Support Center, tend to have more success. The other thing I want to acknowledge is that we realize that there are some complex operations people want to do and currently are trying to under part 107. This makes it somewhat difficult to get those operations approved under part 107. We know some of those complex operations have been approved under part 135 and that seems to be an easier path. But that might be too much of burden for others. Under the IPP, we are looking at a middle ground and looking to see if we can codify that, so applicants can understand that prior to the availability of a rule. How can we approach a waiver or exception that would be beyond part 107 but not all the way to a part 135?

- Brian Wynne (Association for Unmanned Vehicle Systems International [AUVSI]): One of the approaches that the task group took was to look at gaps from the FAA side and the industry side. One specific gap that was identified in the waiver process was the inability to use an outside standard to establish qualifications of pilots because this is going to be really important as we move forward. I was generally very pleased with the response, but we are going to be evolving the pilot qualifications. As we look at part 135, not just what the qualifications of the pilots are, but also what the certification process is going to be. Is it operation-specific, is it going to be platform-specific, as well as pilot-specific? In regards to part 107 gaps, the industry already saw that and stepped into that, leveraging existing aviation principles and training that was being done by traditional aviators. I would just suggest that given that was a gap that was identified by the people in the waiver process, we ask ourselves: how can we test the veracity of the pilot, who says I really know how to do this? The answer is, prove that you can to us, by things that are well known in aviation. What kind of training you have done, how many hours have you done this kind of operation? You see that throughout the recommendations we made. We don't have to completely start from scratch. Industry is willing to shoulder that burden and provide that training.
    - Rico Carty (FAA): I don't disagree with that at all. I think from a Flight Standards perspective, we need to think outside of the box. We are at the Orville and Wilbur stage for this type of thinking. We are doing stuff we have never done before from that standpoint. I completely agree that we need to be thinking in different terms on how we train UAS pilots; and when we get into the UAM business, we will need to think differently.
    - Jay Merkle: I think in Rico's slides you see evidence of some of that deep thinking. The fact that they are doing research and looking at how we can really do a good job of taking credit for all of those things and make sure that they are doing it in a standardized, unified way, rather than a one-off kind of haphazard way. I think you have really stimulated thinking in Flight Standards and they are responding to that.
- Captain Joe DePete (ALPA): If I could just add from ALPA's perspective. ALPA applauds the effort that went into this, when you look at the slide that talks about auto-

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renewal based on compliance unless there are compliance issues. How do you make that determination? Is it after the fact or is forensic or is it pre-emptive — when the waiver analyst looks at the entire package in making a determination? Some of that is going to be out in the field. I am curious to look at the how inspectors and how the framework of that inspection process will take place. Will it be mission-dependent on the type of operation or is it going to need a lot of flexibility? I think the task group did a great job on this.

FAA Response to DAC Tasking #4: FAA UAS Comprehensive Plan
Mr. Dan Elwell, Deputy Administrator, FAA, presented the FAA response to DAC Tasking #4.

FAA Response:

- Mr. Elwell shared that the FAA has received the input on the UAS comprehensive plan and is currently going through all the comments. The FAA thanks the members for their comments, which are very thought provoking. We hope to get our response back to members quickly.

Completion of FAA Responses to DAC Tasking:
At the end of the FAA responses to the DAC recommendations, Jay Merkle shared he would like to make a correction on something he said earlier. He confused the two drone related items on the federal docket. The remote ID NPRM comment period closes on March 2, 2020. There is second docket on airworthiness and use of special categories in that policy and that closes March 4, 2020. He encouraged everyone to submit their comments for the remote ID NPRM.

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Before the start of the DAC tasking presentations, Mr. Elwell left the meeting due to another commitment. He delegated the DFO duties to Mr. Merkle for the remainder of the meeting.

Recommendation & Discussion for DAC Tasking #5: UAS Facility Maps

Presenters:
Marily Mora, Task Lead, Dave Messina, President and CEO, FPV Freedom Coalition, and Dean Schultz, EVP/COO, Reno-Tahoe Airport Authority

Ms. Mora introduced DAC Tasking #5. She shared that the Reno-Tahoe Airport Authority was particularly interested in the facility maps tasking, because they were one of the early adopters of the LAANC program. The Reno-Tahoe International Airport accounted for a fourth of the LAANC approvals for operations. She turned over the presentation to Dave Messina and Dean Schultz. Dave Messina is President and CEO of the FPV Freedom Coalition which represents recreational drone users in the United States. Dean Schultz is the COO of the Reno-Tahoe Airport Authority. Effie Needham provided the visuals and video graphics, which helped illustrate the task group's ideas.

Mr. Messina shared that the remit for the UAS facility maps testing group was to recommend to the FAA improvements to the UAS facility maps with collaboration from the FAA and a range of stakeholders. These recommendations would benefit both unmanned as well as manned aircraft operations. First and foremost, any changes that the group supports or makes must have safety as the top priority. The tasking group decided the best way to improve the UAS facility maps was to come up with a problem statement. The team agreed that the UAS facility map should be updated, as it has been three years since the UAS facility maps were created. They have experience from the operators as well as insight into the process. The task group agreed the need to maintain high standards of safety for manned aircraft flights. The group noted that there are areas around airports where zero above ground level (AGL) makes a lot of sense, as supported by people with local experience. The group came up with following recommendations:

- **First Recommendation**: Refine the grid map. This area is where the group spent most of their presentation.
- **Second Recommendation**: Have a pilot program. The idea of a pilot program is to study the process, looking at the data and then have it roll out across the country. These are proposals only and the group is proposing this to the DAC to be voted on.
- **Third Recommendation**: Focus on the "who." In particular, who would do this work? This is vitally important to the group.

The group understands that in many cases, the first time the UAS facility maps were created by members at the air traffic management relying on Air Traffic Policy Order JO 7200 23a. The tasking group felt that expanding the responsibilities across a stakeholder team would not only

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spread the workload but would also increase the buy-in from unmanned and manned operators. The group felt it was appropriate that there probably could be changes made to the UAS facility maps across the country. The group agreed to increase the amount of airspace for UAS and that could be done by making the grid squares or rectangles smaller. This would allow them to hold AGL at zero on the airport grounds. Then a half mile away they could raise the altitude to something that would provide sufficient and safe operations. The current UAS facility maps have a one-degree grid square or rectangle. These rectangles are about one mile square and the group agreed to split that in half in both directions. Where there is one square, there could then be up to four. The group agreed on this approach and split the grids in half. The proposed grids would be smaller and able to create more of a step as they go from on airport to outside the airport and may be able to create a little more altitude.

The group recommends the work to change the AGL limits should be led by air traffic management, which would be responsible for assigning new AGL limits for each of the new grid squares. During the pilot program the stakeholder team would evaluate the data that the group suggested to determine its utility and to set new AGL limits on the local UAS facility maps. They would also determine if some data sets should be ignored. All data that is discussed in the tasking group is existing data. The group is not recommending the creation of any new data. The group feels the data is current and it will help provide the stakeholder team with sufficient information to provide updates, which will be useful in the refinement and grid process.

The tasking group recommends that this refinement process be applied to controlled airspaces in classes B, C, D, and E. Airports in Class E airspace have been viewed with an overly protective stance, because of a lack of air traffic management (ATM) in sight and also because of a good abundance of caution. Air Traffic Policy Order JO 7200. 23a mentioned a 200-foot per nautical mile criteria which provides good vertical distance but it did not provide a consistent lateral guidance. The group described an oval that was a 10- by 14-mile oval. There is a good lateral area where the FAA could add to the UAS altitude and UAS could be able to fly in those areas off to the sides of the runway. The group put this forward for future consideration because UAS approval is gained through LAANC. There could be dynamic situations that would allow for changes such as in weather; there could be changes that happen maybe longer term for things like construction. This is a flexible system; this is data that also exists so no new data sets are created. It also gives us the ability to do something dynamically and on the fly.

The group had one additional proposal for the DAC, and that is called shielded operations. This concept is accepted in New Zealand as a regulation and it is well received by unmanned and manned operators. The idea is that there would be a nominal lateral distance from the obstruction where no manned aircraft would fly. Local insight to things like law enforcement and medical facilities would overrule the possibility of a shielded operation. An example is the Reno-Tahoe airport, where you can see green shaded area (on the animation) where we know no manned aircraft would fly. This information is from track data, obstruction obstacle databases, as well as local knowledge. This area would be considered for shielded operations. Next, we take a look at the Reno-Tahoe Airport by the downtown area. The hotel owner's would really like some nice

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drone videos and photographs to publicize their properties. The idea is that a man-made structure would create a shielded operation that would safely allow UAS to fly, and would be in no way creating any safety issues for manned aircraft.

Mr. Messina ended the presentation by recapping the recommendations and thanked all those who partook in the task group.

Discussion:

- Bob Brock (Kansas DOT): I have one question about the shielded operations as you look at what the FAA calls masked operations. Do you anticipate assigning an equipage requirement for conducting shielded operations, which addresses some of the risk management issues required to handle if you are masked from the satellite and things like that, for the actual aircraft themselves? Sometimes the mask operations can actually induce lost links. This is readily mitigated but not every drone operator may be as technically proficient as we would like them to be. What if we potentially consider a shielded operation, including that you must have risk mitigated against EMI and some of those lost link procedures? Do you anticipate doing things like that?
    - Dave Messina (FPV Freedom Coalition): Yes, we did and initially one of the capabilities was to utilize LAANC. It is in controlled airspace so that we would be putting forward a request for the flight. In addition, it is consistent with the ASTM standard. We would request a polygon of geometry that would be demonstrating exactly where I'm going to fly.
- Captain Houston Mills (UPS): It still feels a little creepy when drones get that close, from the aviator perspective. Is geofencing connected to that, because that whole concept seems very fascinating. I just wonder as you talked through that, since there are different types of command and control, was the geofencing perspective incorporated in this particular piece?
    - Dave Messina: It was not, although what was really interesting to me is we had air traffic management from Alaska, Memphis, Dallas, Reno-Tahoe, and LAX. They were all very supportive of this. We did have some lively discussion about flying on airport grounds. We did talk about geofencing but it was not incorporated in the write-up.
- Captain Houston Mills: From a manned aviation perspective that is just a matter of safety, particularly for those type of operations. The closer you get, you think loss link is not going to happen, but it is going to happen. So that safety link is something I would recommend that we think about.
- Dave Messina: Yes, thank you. We agree.
- Brendan Schulman (DJI): On the geofencing point, we agree. In at least for our geofencing system, we have used ICAO and FAA principles concerning the approach path in and out of the runways. I would expect those to generally correspond to the safe LAANC related areas and altitudes, in which to fly. As well as the shielded operations which reflect again the obstacle plain principles under ICAO Annex 14 and FAA Part 77. I also just want to say to the group, terrific job and this is quite impressive. I've said it

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before at the DAC meeting that we would like to see more representation of small business operators, especially for drone service providers who are not represented at the high-level DAC. In terms of the FAA consideration of adding members, that would be terrific. I do see reflected in the work of the group the diverse interests that were represented. I can see that you had the interests of the daily operators in mind and that's certainly important to us. Those are the people who are most directly impacted, including financially in terms of the constraints, on where and when they can fly. Great job in trying to promote innovation and efficiency in the industry.

- Dean Schultz (Reno-Tahoe Airport Authority) Good morning, everyone. I don't want to close out the Q&A but I did want to make a comment that as an airport operator, safety is our number one priority. We are very much concerned with that and as you know that the recommendations here are still a good balance. But given the experience that we've had in our community in the use of drones, a lot of the drone activity is a very localized activity. Whether it is for real estate or photography or construction, there are a lot of times when a very large grid restricts access to airspace that is not necessarily problematic for the operation of the airport. As you saw in Reno-Tahoe, we have north-south runways, primarily. The east-west runway is primarily a general aviation airport. Most of our operations are going north, which leaves a lot of airspace east and west that is not actually utilized substantially. In the first animation there was a grid that went from 50 to 200 smaller grids. It would allow for a more tiered increase into that airspace. Every airport is unique and as I said, we have parallel runways but their activities are not symmetrical. In our city the heavier density population is on the west side of the airfield. Most all of our aircraft activities are on the east side of the airfield, so the UAS facility maps probably should be looked at in that light and not necessarily symmetrical from that perspective as well. Then we did have lengthy conversations on part 77 and Terminal Instrument Procedures (TERPs). It can get very complicated but we didn't want to necessarily get into that level of detail because there are some very important surface approach and departure services particularly that protect approaches and aircraft operations up to and through an altitude of 500 feet. Beyond that they should not be interfering with their own activity. We encourage the FAA to use those resources but not necessarily have to implement every aspect of it. We wanted to have some lateral guidance and consistency but be cautious in not trying to apply every aspect of that. I did also want to emphasize that it was discussed extensively in our conversations the importance of having stakeholders involved in this go-round. Based on the conversations we had, we've heard many stories where stakeholders were in some cases allowed to participate and in other cases they were just informed of what it was going to look like. I think manned as well as unmanned operators, the airport, air traffic controllers, and the FAA management, all have useful information that can be used to form these revised UAS facility maps. I strongly encourage that when this process gets underway that stakeholders are allowed the opportunity to have an input into that process.
- Captain Joe DePete (ALPA): As you know, we participated in this and we strongly support the recommendations with the one caveat. We are presupposing that this is predicated upon the drones acting as expected. So there are still the flyaway risks that

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concern us a little bit here but hopefully we can work together to try to determine how we could manage that.

- Captain Mills: I also want to add that I think the process you followed was excellent. It was really a collaborative decision-making sort of approach. We get everybody around the table and everybody's not going to agree but hearing from each is really important. I think that this is a good model for any task group to follow. I'm curious if you set out guidelines after your first meeting to say this is how we're going to do this or did you just let it happen naturally?
    - Dave Messina: We didn't just let it happen. It's four decades of herding cats inside an organization that's ten times as large as the FAA. It was a great group and it is just the experience of facilitating a group, listening, and guiding to an end point.
- Lorne Cass (American Airlines): I agree also with Houston and Joe. Our concern as a large aircraft operator is on establishing this airspace and it looks like you've got the right approach. Our concern, of course, is making sure that everything stays where it is supposed to stay just as we are expected to stay where we are supposed to be as well.
- Captain Joe DePete: How will the flyaway possibility be addressed? We have talked about geofencing but in just different manned airspace where we have different equipment requirements. I'm kind of thinking that if you were that enclosed that there'd be some prerequisite for a geofence or some types of alerting systems or whatever, to be able to tell flight crews that there's a chance of something happening. Have we not gone that far yet to determine how we might handle a remote event?
    - Jay Merkle (FAA): Under the IPP we are looking at aircraft operations on the airfield and the Air Traffic Organization recently led a safety panel in that area. They are looking at all those kinds of questions and factors. That panel has completed its work and the results of the panel are in FAA internal review, from safety oversight. As soon as that is complete we'll be able to release those results. I think that will give a good indication of the kind of hazards, risks, and potential mitigations that might be useful in and around the airport area.
    - Dave Messina: From a recreational perspective this is a great deal, great plug for STEM. From recreational users, flyaways are never good, you are losing your expensive device, but it is also not safe. We've got a number of either failsafe devices or failsafe coupled with devices that would be compliant with the minimum kinetic energy requirements.
- Bob Brock: I want to add that the UAS IPP just did flight operations at the Eisenhower International Airport. Thank you for the risk you assumed as taking on this kind of leadership position. It is not an easy task. I think part of your answer maybe comes from Task Group 3 findings and how we talk about part 77 surfaces and identify areas that you could legally be on. There are places you shouldn't be without a certain level of training and certification. State of Kansas operators are fostering an ecosystem; they really want every operator to be able to have full access, as a part of the IPP focused very heavily on formalized training procedures to say you are authorized to operate in this kind of airspace. If you are going to operate within a Class B, where there are heavies and other

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significant aircraft, you need to have that specialized training to deal with emergency procedures. This is just like it is with manned aircraft that is going to have emergency procedures. A lost link situation has a very prescribed model on how to do that safely. I wouldn't put an 18-year-old that has the Costco drone out there and trust that he's going to do his emergency well. So, we do require that in Kansas for how we do operations in these advanced UAS operations to say that not all places are appropriate. That's why it's important to have sufficient and proper training that's validated and to have someone's checked them out. I'll tell you it's a little intimidating to stand on runway 9 left with a drone, when they're clearing aircraft for land on runway 9 right. So every rated pilot turns around to final approach and looked every single time we heard that clearance on the radio to make sure that manned pilot was on the right runway. Those training and certifications are a thing and they can be a thing in UAS just as anywhere else.

- Captain Houston Mills: I am going to add to your thought. This really comes back to the whole access to airspace. I think there is some interconnectivity between this really good effort and as that continues to evolve. You made me think about certification qualification and how the closer you get, the higher the risk. So that great initiative really needs to be interlinked with that access as well.
- Dean Schultz: As a rule, everyone that participated on this panel was very respectful of the fact that you know safe integration is paramount and top of mind. There wasn't a huge push from anyone in particular to have access to every square inch of airspace; they were very respectful of everyone. We are not actually suggesting or recommending that the airspace in closest proximity to an airport should now suddenly be opened up. In fact, we did have many hours of conversation about zeros on airports and as a standard and starting point. I think it was pretty much agreed that it was necessary to have all airport property zeros. But then airport operators like myself may want to actually use a drone in certain situations as well as for various activities. That is going to be an item or an issue that still needs to be worked out. There was no advocating for opening up the airspace over top or underneath the approach and departure paths of runways.
- Todd Graetz (BNSF): I just have one quick question, what surprised you in all the conversations other than what you previously mentioned?
    - Dave Messina: I was blown away that people who do this for a living are really open to opening up their airspace. It sounds cute but I really was surprised. I'm coming in from a recreational drone perspective. There was a view that we should do this and that really surprised me. There was agreement across the group and it happened early on and that allowed us to have a good discussion from there forward.

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Recommendation & Discussion for DAC Tasking #6: Beyond Visual Line-of-Sight (BVLOS) Challenges

BVLOS: Certification Sub-Group

Sean Cassidy, Director of Safety and Regulatory Affairs for Amazon Prime Air, presented on the certification sub-group. He highlighted that the recommendations are a continuum of items that will allow an applicant to start out with a fairly constrained process. This is a sequential approach that will go from a very constrained ad hoc approach, to initial operating authority for the vehicle. Then over time it can evolve into a normalized approach to meet the requirements as defined by the statutes, to have airworthiness through minimum safety requirements, and also validation through air operating certificates.

Mr. Cassidy explained that we are in the middle of a comment period for a policy change to Rule 2117B for Special Class Aircraft. This rule was never envisioned to be applied to unmanned systems. It was written for aircraft that are lighter than air and gliders. It is a very positive step forward, that 2117B can be a means of compliance for a special class aircraft for an unmanned system. However, it is just the beginning. Under this kind of risk-based method there is a new kind of approach called durability and reliability (D&R). D&R is an output-based approach to certification, in which an applicant that comes in with a system and go through a Test & Evaluation campaign, against air awareness requirements. If they meet all the conditions, they are issued a type certificate. This was initially oriented toward the IPP crowd, small UAS operating under 55 pounds, using a risk-based approach. A true performance and risk-based approach should be agnostic to the weight of the vehicle. This is reflected in the type certification approaches recommended in the Rule 2117B policy change comment.
Mr. Cassidy then presented the first recommendation from the certification sub-group. There should be a purposeful approach that looks at test cases in which there is an obligation for flight hours. It should incorporate reliability data, fault tree analysis, and failure mode analysis, to allow for a more refined allocation of those hours which would lead to a type certification. This would be a true performance- and risk-based approach.

The second part of the recommendation is a bridge plan. The 44807[1] statute allows for certain categories of aircraft to enter and be put in a commercial service, minus the requirements under 44704[2]. For those applicants whose operators who have a bona fide type certificate and have gone through all these hoops, they can be ensured that they will have continuity of the service from the point they're operating under 44807, up to the point that they get to the actual type certificate.

[1] 49 U.S.C. §44807, Special Authority for Certain Unmanned Aircraft Systems
[2] 49 U.S.C. §44704, Type certificates, production certificates, airworthiness certificates, and design and production organization certificates

The sub-group's third recommendation is to normalize the means by which everyone can actually realize beyond visual line-of-sight. Industry is seeking a path that provides more clarity around the role of Air Certification, the role of Flight Standards, and the role of the Air Traffic Organization. From the industry standpoint, by clearing up these swim lanes, we are heading toward that process of normalizing beyond visual line-of-sight operations.

The final recommendation is a look forward. The group advocates beginning work on this right away.

Discussion

- Houston Mills (UPS): Currently, 44807 expires in September 2023 by law. I think there's a current policy that basically shuts it off in October 2020. My question is, does the FAA have a pathway forward to ensure that the exemption shall have a pathway forward in accordance with the law, in case the certification process doesn't pan out? I'm just wondering is there an alternative pathway in case that doesn't happen?
    - Jay Merkle (FAA): 44807 does not expire in October. The IPP expires in October and the operations under the IPP, as a result of the IPP expiring, would lose that exemption. The FAA is looking at what the post-IPP world would look like. That does not mean that as of November 1, anyone in the IPP cannot fly. The FAA is looking at a number of bridging activities between 44807. The FAA realizes there are number of things policy-wise and regulatory-wise that are needed to be put into place before that 44807 exemption expires. The good news is we are seeing significant positive responses to the message that people need to get their aircraft certified. We are also seeing participants doing a lot of work in this area that is leading-edge work. At times it is difficult and painful for the participants but we are forging that path for these new drones. Early in the summer 2019, the FAA had approximately 12 programs that were moving towards certification. We are now up to approximately 40. One of the keys to operating beyond part 107, is a type certification or an airworthiness determination. I feel very positive that Aircraft Certification and Flight Standards are helping the FAA get there. I see industry wanting to get there as well. The answer is yes, we do know there is a need for a bridge and we are forming that bridge and the good news is everyone's responding.
- Captain Joe DePete (ALPA): ALPA sees this 2117b and these approaches as a good step towards a more industry-based set of certification standards. We're supportive of it as long as we try to move quickly towards that goal. I realize that is a catch-22, because you have to understand the mission and the operations. But the end state is to have a set of acceptable industry certification standards.
    - Sean Cassidy: I think the end state is something that does not recognize UAS as a special class aircraft. When we get to normalized operations, UAS should not be looked upon as a kind of unicorn. They should be looked upon as normalized systems that are fully integrated into the airspace.

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- Jay Merkle: I can assure you, no one in this industry wants to move slowly, but they all do want to move safely.

BVLOS: Spectrum/C2 sub-group

Dave Messina, President and CEO, FPV Freedom Coalition, presented on behalf of the spectrum/C2 sub-group. The sub-group recommendations were approved and vetted by the entire team. The sub-group realized that it would be critical of the FAA in this work and they took that very seriously and with caution.

Looking at Section 374 of the 2018 FAA Reauthorization Act, referencing C band and L band, Congress mandates that the FAA work with the Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA). Before starting, the group learned the spectrum office within the FAA had, on October 19, 2019, submitted a request for stakeholders to send comments to them by November 19, 2019. The group requested copies of the comments received as they were regarding spectrum arena, in particular Class C and L bands. The sub-group was declined access to the comments, until late in the process. As such, the group went out and gathered much of the feedback and put together a summary of the statements. That distillation became the four problem statements:

- The FAA, FCC, and NTIA do not appear to be coordinating on a single report addressing the allocated L-band and C-band for UAS operations,
- The FAA, in its request for stakeholder feedback, failed to mention or acknowledge standards and analysis already completed that will advance the creation of regulations regarding the safety of UAS operations and inform spectrum usage,
- Industry leaders provided stakeholder feedback to the FAA, proposing that the L-band and C-band not be opened for sharing,
- The Lack of spectrum regulations that enable BVLOS missions and ensure the safety of operations is hampering commercial growth of UAS in the United States.

The sub-group recommends that the FAA should work collaboratively with the FCC, NTIA, and other organizations. UAS operators, along with issues related to spectrum, will be diverse and all spectrum requirements must consider safety. The sub-group found in the write-up that safety was not necessarily the first tenant. Sharing spectrum with terrestrial users and the expectation that terrestrial users would give up bandwidth in times of high use didn't seem practical or prudent to the group. In addition, the World Radio Conference of 2007-2012 allocated spectrum to be made available to the UAS, in particular the C band and the L band. The sub-group recommends the FAA should assert its oversight and take lead to ensure that spectrum is maintained for the use of the UAS. Any consideration of sharing or auction must maintain safety primacy for UAS. The sub-group recommends that the FAA, FCC, and NTIA should work closely together and the group further suggests that a single or individual champion might be beneficial while working on cross-agency situations. The FAA should assess the existing work already completed, as well as

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the standards already created and in progress. Lastly, members of the sub-group are eager to help further should the FAA need it.

Discussion

- Greg Agvent (CNN): Can you expand on the last line in the last slide? The line "this work should include recognizing commercial cellular," how significantly was that discussed?
    - Dave Messina: It was relatively significantly discussed. This was brought to the table by the two large cellular providers. There was a discussion about can it work explicitly or can it not, and do we have to aim terrestrial antennas skyward? This was discussed significantly and even to the point of considering whether maybe it's outside of the remit of the section 374. We felt it was not, as a group.
- Greg Agvent: Follow-up question: I know that the focus was on enabling BLVOS. But was there any discussion at all about the potential to use segregated spectrum for security — say, if a hobbyist was in an unlicensed spectrum and commercial operations were segregated into another spectrum? Did it come up at all, that there was a positive security aspect to separating or segregating spectrum for our control?
    - Dave Messina: We tried to separate the discussion by mission. It did not come up with respect to security as an input. There was a lot of discussion about what is a better way to split this up because the documents that were put forward by the spectrum office in October had a one-size-fits-all approach. This was met with a lot of rebuttal by many of the respondents. They felt this really needs to be broken down by what you are doing, is it beyond visual line-of-sight, at what altitude, what is your cargo, etc.
- Robie Samanta Roy (Lockheed Martin Corporation): A note on working with the NTIA: I think that is important because they are representing all the other government departments and agencies. For everyone's awareness, there are national security considerations going on now in the 5G world. The Defense Department at the undersecretary level has a task force and is looking at spectrum issues. As we evolve this and as many other things are happening in this very complex, congested electromagnetic spectrum, we will need to be aware of a lot of other moving parts and coordination at the NTIA level. That is going to be really important as many other governmental considerations come into play.

BVLOS: Detect and Avoid Sub-group

Jennifer Player, Founder, Avineer, presented on behalf of the Detect and Avoid (DAA) Sub-group. DAA is a key piece of the puzzle for enabling BVLOS operations. The DAA group came up with four recommendations. They found that a framework is needed for the near-term operational approval waivers. There are several standards development organizations that are currently engaged in the development of performance standards and test methodologies for DAA systems.

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The DAA sub-group's first recommendation is that the FAA ultimately accept these standards once they are published as means of compliance for these systems. Second, the FAA should define operating environments for which a DAA is not required. Third, until those performance standards and test methodologies standards have been published, there is a bit of a gap. To fill that gap the FAA should take the lessons learned, from programs like IPP and Pathfinder, and provide information to industry on how to safely and slowly expand BVLOS operations. Lastly, looking forward and thinking about operations in an integrated airspace, the sub-group recommends that the FAA work with industry to create, endorse, and promote technology, suitable for collaborative DAA between manned and unmanned aircraft.

Discussion

- Robie Samanta Roy (Lockheed Martin Corporation): I want to ensure that the FAA is continuing close cooperation across the agencies. I'm specifically pointing to NASA and the the Department of Defense, where the Air Force Research Lab has been working on DAA technologies. One example is collaboration between NASA, the Air Force, and Lockheed Martin, where they developed a ground collision avoidance system. For example, if an F-16 pilot goes into High-G maneuver and blacks out, the airplane completely goes into automated mode and essentially prevents the aircraft from flying into terrain. There are technologies out there to ensure manned and unmanned teams of aircraft are not bumping into each other, which is essentially the kind of problem we are talking about here. We want to make sure industry and other aviation stakeholders are aware that there is a broad, rich set of activities going on that are completely unclassified. We need to be able to make sure that this community taps into a lot of that activity.
    - Jennifer Player: Certainly, and we should be mindful of the range of UAS and the swap considerations and what a larger UAS can do versus the smaller ones.
- Houston Mills (UPS): From a manned aviation perspective we talked about "see and avoid", and that is really the threshold. Are we going to create something equal to that, mathematically something like ten to the minus ninth? I just think there has to be a solution to that. If it is a mathematical probability in terms of risk mitigation, we want to find something that was equivalent or acceptable from a DAA perspective. Whatever math it is, it seems that this should be one of the cornerstone pieces. I'm sure NASA and others have had similar discussions, for example on the carriage of lithium batteries. There was a lot of concerns about safe carriage of batteries. We talked about that and NASA was here and they were able to educate the group and shared the probability of spontaneous activity is ten to the minus ninth. So these batteries are very safe and they are even on the International Space Station. When we talk about what this will look like and how do we get there, I think we need to bring that level of detail into this conversation.
    - Jennifer Player: We should be mindful that there is a difference between operational safety and system safety. We must bring both together in the appropriate way.
- Christian Ramsey (uAvionix Corporation): I would like to second your last bullet. As a manufacturer of DAA types of equipment, we have some DAA already on the market and

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others that are in development. We keep an eye on what is happening in the industry across all types of technologies. There is a real concern out there that what is on the market now is not going to get us where we need to be, from a performance perspective or cost perspective or spectrum perspective. We really need the FAA to sort of help guide industry on where they see promise, so that we may direct our activities in certain areas.

- Jay Merkle (FAA): Under the IPP and in working with our colleagues on the standards committees, the FAA is seeing a need to create a larger DAA framework. DAA is one term, but we realize it applies in many ways, in many levels of performance. We are preparing to engage industry in a conversation of what does that framework look like and how we can best use it. The FAA is committed to a performance-based standard approach. Any of the technologies that we would want to give people credit for in terms of risk mitigation, we would like to see move towards industry-based consensus standards. We do have some of those standards but they are mostly focused on large aircraft that can carry large systems, and generate a tremendous amount of electricity energy. We are seeing more promise in the solutions in DAA, both in electro-optical and ADS-B In. We are working with industry to establish what the right performance requirements for the mission are, and foreshadowing the autonomy recommendations.

BVLOS: Autonomy Sub-group

James Burgress, Chief Executive Officer, Wing, standing in for Toni Nannini. Mr. Burgess shared the Autonomy sub-group arrived upon three recommendations for the FAA. The Autonomy sub-group highlighted that they looked at across the board performance-based requirements standards. These standards will help everyone take advantage of what this technology can bring and really look at things on a broader scale. The second recommendation is to look at the net benefit of rulemaking activities and what do they do for safety, how that actually improves safety. Lastly, the sub-group recommends looking at operational risk level, to include the consideration of those risks and safety benefits.

Discussion

- Jay Merkle (FAA): Clarifying question, you called the subgroup "Autonomy". In the response, the FAA will most likely address the bullets that you provided rather than the term. Autonomy is a very difficult thing to respond to.

Recommendation & Discussion for DAC Tasking #7: UTM Performance

Max Fenkell, Director, Unmanned and Emerging Aviation Technologies, Aerospace Industries Association (AIA) presented on UTM Performance. The UTM group's tasking scope was

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specific to review of UTM CONOPs 2.0 and the industry prioritization of UTM performance capabilities. The UTM group created a roadmap compiling the capability, responsibility, resource requirement, current status, and industry priority level in the near term, which is defined as 0-24 months. Each capability was then quantified as: high priority capabilities, medium/high priority capabilities, medium priority capabilities, low/medium priority capabilities, low priority capabilities, or completed capabilities.

Following the list of capabilities and priority level, the UTM group shared their first recommendation. The group recommends that the FAA and relevant stakeholders put a timeline together in advance of the DAC meeting that includes when the FAA and industry believe the task will be accomplished. The second recommendation from the UTM group is that the FAA should allocate resources based on the priority levels provided in UTM group report. Lastly, the UTM group recommended to the FAA that the group should remain in place to address ConOps 2.0, when it is available.

Discussion:

- Jay Merkle (FAA): When you say "ability to monitor UAS in airspace," the airspace surveillance is usually associated with the delivery of instrument flight rules (IFR) or in some cases visual flight rules (VFR) service, so do you really mean surveillance in the same way that we use it in air traffic management?[3]
    - Max Fenkell: I think what we are looking at here is really, the U.S. security technologies that are out there to provide UAS volume reservations (UVRs) and other services. I think this is the route the group took it. We might need to clarify that a little further to your point, if there's a manned vehicle definition for it.
    - Jay Merkle: It is very specific in support of air traffic control (ATC) operations, at least in this environment. I know if I was a policeman in another environment, surveillance would have a different meaning. But for the FAA that is very much the meaning.
    - Lorne Cass (American Airlines): I think in the dialogue, my sense is we were talking about the surveillance that you describe. As the type police would have out there where they are watching. We did have discussion, because when I think of ATM, I think of it like you do: this is surveillance radar, this is ADS-B. Due to the different context, maybe we can define it better.
    - Jay Merkle: I think as we continue to work on this, we are finding that clarifying it would be good. Because in this emerging community, where we have both traditional and non-traditional, and all these security partners, we have a tendency to talk past each other. So words have meaning and it would be good to better define things.
    - Max Fenkell: I think as we have this transition from traditional aviation, this is something we need to continue to work on. We will commit to going back and looking at that and any other term that we feel maybe necessary.

[3] Surveillance is listed as a High Priority Capability by the UTM Group.

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- Christian Ramsey (uAvionix Corporation): A question on the communication C2 service, and no FAA resource requirement: it feels like there is a requirement there from a spectrum allocation recommendation or standard perspective. Did the group talk at all about the need of guidance from FAA?
    - Max Fenkell: Spectrum is a topic we touched on a little bit earlier today. It is one topic that is near and dear to everyone at this table. It is the lifeblood of everything we do as an industry and obviously this is assuming we need new allocations, depending on the specific type of spectrum you can operate on. We think there will be some guidance that comes out of the FAA. But that is a conversation that must happen between the FCC, NTIA, and FAA. There is a definite need though to understand what the spectrum capabilities for UAS are and where we might need new allocations, and where we can leverage existing technologies. This is one topic of conversation that needs to continue.
    - Christian Ramsey: But your conclusion is that there's no FAA resource requirement for that service?
    - Max Fenkell: That might be one that we need to go back and look at in light of this conversation. One of the nice things about this is we are going to continue to update the document. We will go back to review the proper resource requirement from the FAA.

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Industry-Led Technical Topics/Open Discussion
Michael Chasen, DAC Chair

Mr. Chasen then turned to the industry-led topics and open discussion. He asked the group if anyone had a question, comment, or topic of discussion for the DAC members.

Industry-Led Technical Topics: Introducing Simulation into a D&R Certification Process, Chris Anderson, 3DR, ASTM D&R Working Group Lead

Chris Anderson presented on Introducing Simulation into a Durability & Reliability (D&R) Certification Process. Why use a D&R process? The D&R process provides certification faster, easier, allows for continuing rapid innovation, and can be a "Pathfinder" towards future certification methods for other aircraft. There are limitations, including that you are only certified for the tests you conduct. It can also be unduly burdensome. Simulation into a D&R process as an acceptable means of compliance. Simulators are getting better and better, they can provide a variety of conditions. We are unsure of how to submit this simulator data currently. Simulators have some issues, such as they cannot fully create some scenarios. How can we establish the fidelity of a simulation? There are two ways, deterministic and probabilistic simulations. Both of those type of simulations are conducted today. The option might be, in a failure injection matrix, to have a combination of simulations, both real world and some simulated. We would like guidance from the FAA if this would be acceptable. For the more probabilistic testing, there are some ranges you cannot test. The question is, can you just submit simulated data for some scenarios where it is not possible to test in the real world. The time is right for the FAA to consider simulated data and provide industry guidance on how to proceed.

Discussion: Introducing Simulation into a D&R Certification Process

- James Burgess (Wing): We use simulation quite intensively and when we talk about some of the very low likelihood of failure scenarios, there is no other way to test those but through simulation. Just to give some orders of magnitude, we run a million or more simulations a day. Those help us get to the levels we are trying to get to. If there is a way through ASTM standards or industry consensus or work with the FAA, to bring that learning and data into the D&R process, we would be happy to support that and look at how we can contribute.
- Christian Ramsey (uAvionix Corporation): Even in the world of traditional avionics component certification, there are certain requirements that you can't test in an actual real world environment or even at a test lab. There are allowances for analysis and a lot of times that analysis does include an element of simulation. It is not unprecedented what you are now suggesting.

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Open Discussion:

- Houston Mills (UPS): One thing we talked at the beginning of the IPP program was that as the FAA gathered data and the program comes to an end, the FAA would perhaps use the DAC as a vetting source or sounding board. I am just curious if the FAA is still thinking about maybe bringing something that the DAC can chew on or perhaps help think about.
    - Jay Merkle (FAA): We need to produce a report 90 days after the end of the IPP. We have already started on the outline of that report and we have also started on our messaging plan. As we get closer to that point and we get the report to the public, there will be some opportunities to bring items to the DAC. There can also be offshoots and you see some of the things we are discussing today, responses to the recommendations, that will be informed by the data and experience gained under the IPP. There are other things we will not wait for the final report to tell the DAC about, pertinent things that the DAC can review. We do consider the emerging data when we think about DAC tasking. As we get closer to the end of the IPP, we are looking at those remaining things to do coming out of the IPP. In order to get truly scalable, economically viable beyond visual line-of-sight, etc., which will become a rich environment for industry-FAA collaboration and DAC tasking.
    - Marily Mora (Reno-Tahoe Airport Authority): In reference to the IPP projects, I thought that there was to be some learnings on roles and responsibilities. Do you still see that coming out of the IPP and would that come back to the DAC — in particular, regarding community involvement?
    - Jay Merkle: We will make everything that comes out of the IPP available to the DAC. The presidential directive does instruct us to do community involvement, community integration, societal integration, etc. We have been very open, that initially we thought we would see a lot of that through flying and our IPP participants who are engaging communities. But it doesn't get to all of the aspects of what state, local, and tribal municipal communities are concerned with. As such, we have adopted some innovative approaches and we think we have a methodology in working with state and local governments, to define needs and requirements, and define how we can work together as an air navigation service provider and as a regulator. There is still more to come and we need to figure a few more things out before we can go wide with that.
    - Bob Brock (Kansas DOT): If the committee has interest we can certainly, as a UAS IPP member, give a short brief on our experience in IPP lessons learned and community outreach results. We have surveys of a thousand people on their opinion of their engagement with drones, of UAS, and of sensor activity. If it would be beneficial to the DAC, we could bring a briefing next time we meet.
    - Jay Merkle: We would be willing to put that on an agenda for next time or the meeting after.

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- Brendan Schulman (DJI): I just wanted to acknowledge and appreciate the feedback that we have seen from the FAA. We are seeing the full circle of getting some work done, putting out a work product in a short period. Most importantly, seeing what the FAA has to say about it, which really validates all the time and effort that we spend here and offline in the task groups. Ultimately, we're trying to implement something that collaboratively reflects the industry's approach, the stakeholders' approach, as well as the FAA's thoughts on what is useful. When we think about remote ID, it's something that we have been committed to for years. This is very helpful in knowing, how can we and others, move forward with safety and security goals, well before the regulations come along. We appreciate the advice as well as our opportunity to collaborate in the cycle of input and feedback.
    - Jay Merkle: It has been a good learning experience for us as well. I can see how much work you need to put in during the 90 days. We have many lessons learned in our first review and response to DAC recommendations. I hope that it will be a little smoother internally next time. It was a very worthwhile process and I'm looking forward to moving on the recommendations and the responses.

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New Business/Agenda Topics/Review Taskings

Jay Merkle, Acting DFO, Executive Director, FAA UAS Integration Office, and Michael Chasen, DAC Chair

Jay Merkle opened the last agenda item, as the acting DFO. Mr. Merkle summarized the DAC taskings #7 and #8. Mr. Chasen, appointed the following members to lead the new taskings: David Silver as the chair for Tasking #7, UTM (Continuation of Tasking #7) and Joe DePete as the chair of Tasking #8, Aviation Safety Culture for Drone Operators. The two task groups will have 90 days to deliver their work to the DAC.

- **Tasking #7: UTM (Continuation of Tasking #7)**
  Mr. Merkle pointed out that the FAA did not provide the UTM ConOps 2.0 to the DAC for review upon first assigning tasking #7. As such, DAC tasking #7 is an extension of the previous tasking, and provides the DAC with the required document. The FAA was in the final stages of review and it was due to be released that day or by the end of the week. The FAA will start looking at DAC comments but will not provide any formal response until the DAC has had a chance to look at UTM 2.0 concept.

- **Tasking #8: Aviation Safety Culture for Drone Operators**
  Mr. Merkle shared this task had bubbled up through the DAC to the FAA. The task is to look at what are the ways the FAA can help the drone community fully adopt the safety culture that is ingrained in manned aviation. The FAA would like the DAC to develop a set of recommendations and ideas to assist the drone community in adopting aviation safety culture, including ideas for motivation and suggestions for industry involvement, in the process of building up this safety culture.

  - Joe DePete (ALPA): Thank you for the consideration on assigning this task. I appreciate the cooperation of the entire group. As Dan said earlier, we do not compete on safety, we collaborate on safety. This is a great way for us to share some of the experiences that we have learned.

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Closing Remarks

Mr. Merkle thanked the DAC members for their Task Group recommendations. He stated that the FAA would carefully look at those recommendations and provide feedback at the next DAC meeting. Mr. Merkle shared that the FAA would work closely with the DAC chair to build the agenda for the next meeting and include a briefing on community involvement. He offered his condolences to Matt Zuccarro's family for their loss. Mr. Merkle also thanked Mr. Chasen for his leadership and thanked the DAC members for their time and effort.

Mr. Merkle then handed over the meeting to Mr. Chasen. Mr. Chasen thanked the DAC members and everyone that was involved. He shared he was impressed by the progress made by the DAC. He highlighted that by the third meeting, the FAA has reviewed the DAC recommendations and provided feedback on where they are going. He felt the DAC is heading in the right direction in its mission and reminded members that DOT will be posting solicitation for new DAC members soon.

Adjourn

The meeting ended at 2:20 p.m. Eastern Time.

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Appendix A: Meeting Attendees

First Name	Last Name	Organization	Attendee Type
Michael	Chasen	Chief Executive Officer, PrecisionHawk USA, Inc.	DAC Chair
Greg	Agvent	Senior Director of National News Technology, CNN	DAC Member
Chris	Anderson	Chief Executive Officer, 3DR	DAC Member
Bob	Brock	Director of Aviation and UAS, Kansas Department of Transportation	DAC Member
James	Burgess	Chief Executive Officer, Wing (an Alphabet company)	DAC Member
Lorne	Cass	Vice President, Operations / Industry Affairs, American Airlines (AA)	DAC Member
Mark	Colborn	Senior Corporal, Dallas Police Department	DAC Member
Joseph	DePete	President, Air Line Pilots Association	DAC Member
Trish	Gilbert	Executive Vice President, National Air Traffic Controllers Association	DAC Member
Todd	Graetz	Director, Technology Services, UAS Program, BNSF Railway	DAC Member
David	Greene	Bureau of Aeronautics Director, Wisconsin Department of Transportation	DAC Member
Rich	Hanson	President, Academy of Model Aeronautics	DAC Member
Thomas	Karol	General Counsel, National Association of Mutual Insurance Companies	DAC Member
Gur	Kimchi	Co-Founder and Vice President, Amazon Prime Air	DAC Member
George	Kirov	Vice President and General Manager, Commercial UAS Solutions, L3Harris Technologies	DAC Member
Michael	Leo	Captain, New York City Fire Department	DAC Member
Houston	Mills	Vice President, Flight Operations and Safety, United Parcel Service (UPS)	DAC Member
Marily	Mora	President and CEO, Reno-Tahoe Airport Authority	DAC Member

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First Name	Last Name	Organization	Attendee Type
Christian	Ramsey	President, uAvionix Corporation	DAC Member
Robie	Samanta Roy	Vice President of Technology, Lockheed Martin Corporation	DAC Member
Mariah	Scott	President, Skyward (A Verizon Company)	DAC Member
Brendan	Schulman	Vice President of Policy and Legal Affairs, DJI Technology	DAC Member
Wade	Troxell	Mayor of Fort Collins, Colorado and the National League of Cities	DAC Member
Brian	Wynne	President and CEO, Association for Unmanned Vehicle Systems International	DAC Member
Dan	Elwell	DAC Designated Federal Officer, FAA Deputy Administrator	Government
Jay	Merkle	Executive Director, FAA UAS Integration Office	Government
Khurram	Abbas	FAA	Government
Kristen	Alsop	FAA	Government
Erik	Amend	FAA	Government
Teresa	Anderson	FAA	Government
Tim	Arel	FAA	Government
Chris	Brown	FAA	Government
Robert (Rico)	Carty	FAA	Government
Karen	Chiodini	FAA	Government
Thuy	Cooper	FAA	Government
Bill	Crozier	FAA	Government
Maria	DiPasquantonio	FAA	Government
Alison	Duquette	FAA	Government
Bill	English	NTSB	Government
Asena	Fern	FAA	Government
Nia	Fields	FAA	Government
Elizabeth	Forro	FAA	Government
Reed	Garfield	DOT	Government
Arjun	Garg	FAA	Government
Scott	Gore	FAA	Government
Nicole	Hartman	FAA	Government

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First Name	Last Name	Organization	Attendee Type
Tammy	Jones	FAA	Government
Chad	Kirk	FAA	Government
Gary	Kolb	FAA	Government
Winsome	Lenfert	FAA	Government
Allison	LePage	FAA	Government
Keri	Lyons	FAA	Government
Claudio	Manno	FAA	Government
Julie	Marks	FAA	Government
Mike	McCrabb	FAA	Government
Joe	Morra	FAA	Government
Arun	Murthi	FAA	Government
Chris	Nassif	FAA	Government
Michael	O'Donnell	FAA	Government
Jessica	Orquina	FAA	Government
Brad	Palmer	FAA	Government
Leesa	Papier	FAA	Government
Rob	Pappas	FAA	Government
Lorelei	Peter	FAA	Government
Alexandra	Randazzo	FAA	Government
Genevieve	Sapir	DOT	Government
Elizabeth	Soltys	FAA	Government
Bill	Stanton	FAA	Government
Rob	Sweet	FAA	Government
Gretchen	Tressler	FAA	Government
Adrienne	Vanek	FAA	Government
Tony	Walsh	FAA	Government
Jim	Ackerson	UPS Flight Forward Inc.	Observer
Mark A.	Aitken	DJI	Observer
Chad	Barbir	HERE Technologies	Observer
Justin	Barkowski	American Association of Airport Executives	Observer
Patrick	Bauer	Aero Organization	Observer
Ben	Berlin	Amazon Prime Air	Observer
Sam	Brothers	General Public	Observer
Chad	Budreau	General Public	Observer
Mike	Burnside	American Fuel & Petrochemical Manufacturers	Observer
Sean	Cassidy	Amazon Prime Air	Observer

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First Name	Last Name	Organization	Attendee Type
Andy	Cebula	Airlines for America	Observer
John "JC"	Coffey	Cherokee Nation Technology Portfolio, NOAA	Observer
Drew	Colliate	AUVSI	Observer
Christopher	Cooper	Aircraft Owners & Pilots Association	Observer
Diana	Cooper	Hyundai	Observer
Jason	Cunha	Concept Solutions, LLC	Observer
Dan	Dalton	Wing Airspace Systems	Observer
Jon	Damush	Boeing	Observer
Mel	Davis	Cavan Solutions	Observer
Jeff	Dvgert	ATT	Observer
Robert J.	Ehrich	Slipstream Strategies	Observer
Max	Fenkell	Aerospace Industries Association	Observer
Nicholas T.	Flom	Northern Plains UAS Test Site	Observer
Susan	Friedberg	Dedrone	Observer
Guido	Fuentes	PRISM/ARGUS International	Observer
Paul	Gentile	3DXhobbies	Observer
Ben	Gielow	Amazon	Observer
Tom	Gramaglia	Battle Road Advisors	Observer
Dean	Griffith	Jones Day	Observer
Brendan	Groves	Skydio, Inc.	Observer
Michael	Guterres	MITRE	Observer
Jon	Hegranes	Kittyhawk	Observer
Paul	Hoffman	General Public	Observer
Colton	Hotary	FLIR Systems, Inc.	Observer
Rob	Hughes	Northrup Grumman	Observer
Catherine	Jackson	Airline Dispatchers	Observer
Douglas	Johnson	Consumer Technology Association	Observer
Randy	Kenagy	Air Line Pilots Association International	Observer
Phil	Kenul	General Public	Observer
Rich	King	AUVSI	Observer
Brittany	Kohler	National League of Cities	Observer
Sylvia	Ladunga	ANRA Technologies	Observer
Christopher	Martino	Helicopter Association International	Observer
Dave	Matsuda	Drone Safe Communities	Observer
Maureen	McLaughlin	Iridium	Observer
Terry	McVenes	RTCA, Inc.	Observer

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First Name	Last Name	Organization	Attendee Type
Dave	Messina	FPV Freedom Coalition	Observer
Thomas	Mickler	European Union Aviation Safety Agency	Observer
Nora Ann	Mishler	Unmanned Systems Training	Observer
Margaret	Nagle	Wing	Observer
Effie	Nidam	CNN	Observer
Christopher	Oswald	Airports Council International – North America	Observer
Jennifer	Player	BNSF	Observer
Jonathan	Pruett	General Public	Observer
Mark	Reed	Air Line Pilots Association Int.	Observer
Michael	Robbins	The Moak Group	Observer
Iain	Ronis	Honeywell	Observer
Jim	Rosenblum	Amazon	Observer
Dean	Schultz	Reno Airport	Observer
Al	Secen	RTCA, Inc.	Observer
Catherine	Self	BNSF	Observer
John	Shea	HAI	Observer
Shelly	Simi	General Public	Observer
Victor	Suarez Jr	General Public	Observer
Anne	Swanson	Wilkinson Barker Knauer, LLP	Observer
Clifford	Sweatte	Akin Gump Strauss Hauer & Feld LLP	Observer
Ryan	Terry	Lockheed Martin Corporation	Observer
Andy	Thurling	NUAIR	Observer
Justin	Towles	Akin Gump Strauss Hauer & Feld LLP	Observer
Gregory S.	Walden	McGuireWoods Consulting LLC	Observer
Stella	Weidner	The Boeing Company	Observer
Chief Charles	Werner	DRONERESPONDERS	Observer
Curt	Westergard	Digital Design & Imaging Service, Inc	Observer
Heidi	Williams	National Business Aviation Association	Observer
Ray	Young, Ph.D.	New York UAS Test Site	Observer

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Written Public Comments Submitted Since Last DAC Meeting

This email was sent through the Federal Aviation Administration's public website. You have been contacted via an email link on the following page:
www.faa.gov/uas/programs_partnerships/drone_advisory_committee/

To whom it may concern:
The DAC is well behind the power curve on providing advice to the FAA.

It should address the needs of optionally piloted aircraft and large drones. If it has a plan to do so, this information is not being shared well with the public.

Sincerely,
Mark Jones Jr.
mark@flighttestfact.com

This email was sent through the Federal Aviation Administration's public website. You have been contacted via an email link on the following page:
www.faa.gov/uas/programs_partnerships/drone_advisory_committee/

Attention:
Drone Advisory Committee and FAA

Subject:
FAA UAS Facility Maps

Dear DAC/FAA and Stakeholders:

I am writing to you to comment on Tasking #5 (Facility Maps), as discussed at the 2/27/2020 meeting of the Drone Advisory Committee with the FAA. I agree with the direction the committee is going with smaller 'sizing' of the grids depicted on the FAA UAS Facility maps. However, there are discrepancies in the boundaries of controlled airspace as shown on FAA Sectional Charts, and the way that same airspace is shown on FAA UAS Facility maps. The discrepancies lie in the methodology used to show the grids, themselves. On the UAS Facility maps, rectangle shapes are used exclusively to represent areas within controlled airspace. However, use of rectangles results in grid areas that actually exceed the boundaries of controlled airspace as shown on FAA Sectional Charts. An example is shown, below, for Class E airspace surrounding the Glens Falls, NY (KGFL) airport.

Figure 1-Sectional Chart
In the above screenshot of the FAA Sectional Chart for KGFL, note the 'shape' of Class E airspace, as shown by a dotted magenta line outlining that airspace. The northern portion of Class E stops just before Lake George near the southern portion of the lake.

Figure 2-AirMap LAANC app
In this next screenshot from the AirMap application, above, (part of LAANC), note that KGFL's Class E airspace accurately follows the same contours as shown on the FAA Sectional Chart.

Figure 3-FAA UAS Facility Map
The FAA UAS facility map, however, utilizes rectangular grid squares that actually exceed the boundaries of KGFL's Class E airspace. This results in a confusing depiction of 'where' UAS may actually fly, and fly legally. I would humbly suggest that the FAA update their facility maps using shape-files that accurately follow the contours of controlled airspace, resulting in a consistent message to both full scale and UAS pilots. That way we'll all be on the same page in the air, whether we're referencing an FAA Sectional, a LAANC application, or FAA UAS facility maps.

Thank you for taking the time to review my comments. I appreciate being part of the process.

Peter W. Galligan
Email: pwgalligan@gmail.com