RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Drone Advisory Committee

Meeting #6

March 9, 2018 – McLean, VA

RTCA
THE GOLD STANDARD FOR AVIATION SINCE 1935

Drone **A**dvisory **C**ommittee

Table of Contents

RTCA
THE GOLD STANDARD FOR AVIATION SINCE 1935

Drone Advisory Committee

1 DAC Membership

Greg Agvent	CNN	Member
Juan Alonso	Stanford University	Member
Mark Baker	Aircraft Owners and Pilots Association	Member
Jaz Banga	Airspace Systems Inc.	Member
Linden Blue	General Atomics Aeronautical Systems, Inc.	Member
Robert Boyd	Riley County, Kansas	Member
James Burgess	Google	Member
Tim Canoll	Air Line Pilots Association (ALPA)	Member
Michael Chasen	Precision Hawk USA Inc.	Member
Nancy Egan	3D Robotics	Member
Dan Elwell	Federal Aviation Administration (FAA)	Designated Federal Officer
Deborah Flint	Los Angeles World Airports	Member
Trish Gilbert	National Air Traffic Controllers Association (NATCA)	Member
Martin Gomez	Facebook	Member
Todd Graetz	BNSF Railway	Member
David Greene	Wisconsin Department of Transportation, Bureau of Aeronautics	Member
Rich Hanson	Academy of Model Aeronautics	Member
Robert Isom	American Airlines, Inc.	Member
Gur Kimchi	Amazon Prime Air	Member
George Kirov	Harris Corporation	Member
Brian Krzanich	Intel	Group Chair
Nancy Leveson	Massachusetts Institute of Technology	Member
Nan Mattai	Rockwell Collins, Inc.	Member
Houston Mills	United Parcel Service (UPS)	Member
Marily Mora	Reno-Tahoe Airport Authority	Member
Christopher Penrose	AT&T	Member
Steven Rush	Professional Helicopter Pilots Association	Member
Robie Samanta Roy	Lockheed Martin Corporation	Member
Brendan Schulman	DJI Technology	Member
Phil Straub	Garmin Ltd.	Member
Brian Wynne	Association for Unmanned Vehicle Systems International (AUVSI)	Member
Matthew Zuccaro	Helicopter Association International (HAI)	Member
Vacant	The MITRE Corporation	Member
Vacant	Insitu	Member
Vacant	City Government	Member

2 DAC Subcommittee Organization Membership

3D Robotics
A3 by Airbus Group
Academy of Model Aeronautics
Aerospace Industries Association (AIA)
AeroVironment (EUROCAE member)
Air Line Pilots Association (ALPA)
Air Traffic Control Association (ATCA)
Aircraft Owners and Pilots Association
Airlines for America
AirMap
Airports Council International (ACI North America)
Airspace Systems Inc.
Alabama Department of Transportation/NASAO
Amazon Prime Air
American Airlines, Inc.
American Association of Airport Executives
Apex Unmanned LLC
AT&T
ATAC
Aviation Management Associates, Inc.
BNSF Railway
City of Los Angeles
Consultant
Consumer Technology Association
Covell
Dart Aerospace
DJI Technology
DLA Piper LLP
Echodyne Corp
Facebook
Federal Aviation Administration (FAA)
Garmin Ltd.
GE Aviation
General Atomics Aeronautical Systems, Inc.
Google
GoPro, Inc.
Gryphon Sensors
Harris Corporation
Helicopter Association International (HAI)
HobbyTown
Honeywell International, Inc.
IBM
Insitu Inc.
Intel
JetBlue Airways
JHW Unmanned Solutions LLC
Kansas Department of Transportation
Leidos
Ligado Networks
Lockheed Martin Corporation
Los Angeles World Airports
MCR
NASA
National Agriculture Aviation Association
National Air Traffic Controllers Association (NATCA)
National Association of Counties
National Business Aviation Association
National Conference of State Legislators (NCSL)
National League of Cities
Noblis Inc.
Northrop Grumman Corporation
OPEIU
Port Authority of New York & New Jersey
Precision Hawk USA Inc.

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Drone **A**dvisory **C**ommittee

Property Drone Consortium
Qualcomm Technologies, Inc.
Regional Airline Association
Reno-Tahoe Airport Authority
Rockwell Collins, Inc.
RTCA, Inc.
SAIC
San Francisco International Airport
San Francisco, California
Security101
Skyward IO, Inc.
Small UAV Coalition
Stanford University
State of California
Thales Group
The MITRE Corporation
United Parcel Service (UPS)
University of Massachusetts, Amherst
University of Oklahoma
US Department of Transportation

3 MEETING AGENDA

RTCA, Inc.
1150 18th Street, NW, Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
www.rtca.org

Sixth Meeting of the Drone Advisory Committee (DAC)
Agenda

DATE: March 9, 2018

TIME: 9:00 AM – 3:30 PM EST

PLACE: MITRE-1 Building
7525 Colshire Drive
McLean, VA 22102-7539

Agenda

Start	Stop	Agenda Item
9:00 AM	9:01 AM	Call to Order; Official Statement of the Designated Federal Officer
9:01 AM	9:11 AM	Welcome and Introductions, Review of the Fifth DAC Meeting
9:11 AM	9:15 AM	Approval of Minutes from the Fifth DAC Meeting
9:15 AM	9:30 AM	Chairman's Report
9:30 AM	10:10 AM	FAA Update
10:10 AM	10:25 AM	Break
10:25 AM	10:35 AM	DAC Subcommittee (SC) Co-Chairs' Report
10:35 AM	11:15 AM	DACSC Task Group 3's (TG3) UAS Funding Report
11:15 AM	12:00 PM	Discussion of TG3's Report
12:00 PM	1:00 PM	Lunch
1:00 PM	1:45 PM	Discussion of FAA's Response to DAC Recommendations
1:45 PM	2:30 PM	Discussion of DAC Engagement in the Future
2:30 PM	3:15 PM	New Business/Agenda Topics
3:15 PM	3:30 PM	Closing Remarks
3:30 PM	3:30 PM	Adjourn

4 Presentation Slides

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Welcome to the Meeting of the Drone Advisory Committee

March 9, 2018

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Official Statement of the Designated Federal Officer

PUBLIC MEETING ANNOUNCEMENT
Read by: Designated Federal Officer Dan Elwell
Drone Advisory Committee
March 9, 2018

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:

February 17, 2018

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.

DAC Agenda Topics

- Welcome and Introductions, Review of the Fourth DAC Meeting
- Approval of Minutes from the Fifth DAC Meeting
- Report from the DAC Chairman/Update from the FAA
- Report from the DAC Subcommittee (SC) Co-Chairs
- Reports from the Co-Chairs of the DACSC Task Groups (TGs)
- Discussion of Reports from the Co-Chairs of the DACSC TGs
- Discussion of FAA Response to DAC Recommendations
- Discussion of DAC Engagement in the Future
- New Assignments/Agenda Topics/Other
- Closing Remarks
- Adjourn

RTCA
THE GOLD STANDARD FOR AVIATION SINCE 1935

Drone Advisory Committee

4.1 Welcome and Introduction

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Welcome and Introductions
Opening Remarks

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Review and Approval of:

Minutes – November 8, 2017

RTCA
THE GOLD STANDARD FOR AVIATION SINCE 1935

Drone Advisory Committee

4.2 FAA Update

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

DAC Chairman Report

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

FAA Update

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

DAC Subcommittee Co-Chair Report

Co-Chairs:
Sean Cassidy, *Amazon Prime*
John Allen, *jetBlue Airlines*

(intentionally left blank)

RTCA
THE GOLD STANDARD FOR AVIATION SINCE 1935

Drone **A**dvisory **C**ommittee

4.3 TASK GROUP 3 (UAS FUNDING)

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Final Report of DACSC TG3 (UAS Funding)

Co-Chairs:
Mark Aitken
Howard Kass

Setting the Stage for the Commercialization of Drones

- Development of the drone industry as a commercially viable industry providing returns for investors, innovation for companies and benefits for consumers is a priority of the Trump Administration
- Currently, federal agencies led by FAA are devoting increasing amounts of resources to getting drones integrated safely into the national airspace system.
  - As this requires the development of new protocols, procedures and processes, it is resource consuming for federal agencies with tight budget.
  - For the FAA, approximately 90% of the FAA budget is raised from taxes and fees paid by commercial airline passengers.
- Task Group 3 (TG3) was established to search for funding ideas so the FAA has the monetary resources to continue its vital mission in promoting the drone industry without shorting manned aviation interests that actually fund the FAA.
- TG3 short term report (July 2017) recommended increased Congressional appropriations to FAA so FAA has the resources it needs for drones and airlines

TG3 Approach

- We looked at different ways that the government pays for things:
  - Taxes
  - Fees
  - Auctions
  - PPPs
- We debated the different ideas but more importantly we grappled with a fairly unique set of facts.
  - Many in the industry are spending millions already to build UTM systems and other infrastructure necessary to support drone integration into air space, but also into the broader US economy.
  - Thus, while there is no objection that government needs more resources to maintain manned aviation and encourage drones, various entities are already ”paying.”

Process

- Based on the guidance received from the DAC, TG3 decided that it would be most beneficial to move forward with drafting it’s long-term report from the short-term report, given it’s key recommendation.
- Broke up into four subgroups to focus on the main categories of the FAA’s UAS integration efforts:
  1. Policies & Procedures, Rulemaking, and Standards
  2. Outreach, Communication, and Training
  3. Research & Development and Systems
  4. Potential Funding Mechanisms
- Re-evaluated the short-term report and updated the necessary sections that to reflect the long-term activity, including the recommendations made by TG2.
- What we don’t know is how much money FAA needs – we can cost out actions, but how many drones will be flying around in year 1 versus year 5?

Consent Recommendations

- Congress and the Administration need to lead and jumpstart the integration of drones into the US economy
  - DOT/FAA are doing their part – pilot programs, ARCs, Drone integration office
  - But, real limits to what the agencies can do without meaningful funding to hire, develop, regulate and introduce all of the safety-related requirements as well as the commercial “rules of the air.”
- Congress must provide a multi-year funding program so FAA/DOT and other agencies can get drones in the air and the drone revolution can begin
  - Corporations and State/Local governments are doing their part with investment, land, tax credits and incentives
  - Federal agencies are working as hard as they can with serious resource constraints
    - FAA cannot continue to charge the airlines for drone projects
- FAA needs to implement a sustainable cost accounting system

What That Means…

- Additional funding is necessary to safely integrate drones into the NAS.
- There will be a combination of government, industry, and shared funding across the integration efforts.
- Options for funding should not be constrained by the current traditional aviation funding structure and any recommended funding structure should not alter the current structure of funding for traditional, manned aviation
- The regulations, policies, and standards necessary in the next five years should be developed primarily by the FAA, with significant industry input.
- The research and development (R&D), and system development necessary in the next five years, should be a collaborative effort between government and industry, with the industry shouldering most of the basic R&D.
- The communication, outreach, and training necessary in the next five years should be shared between government and industry, depending on the activity.
- FAA should implement transparent cost accounting measures in order to track the resources being used for manned and unmanned aviation activities.
- The UAS industry may be expected to pay for the operation and maintenance of an automated Unmanned Traffic Management (UTM) system through a yet-to-be-created user fee funding model.

The Future – As Drones Take Off – Funding Ideas

- The drone community recognizes that as it takes off, the federal government cannot provide a sustained level of investment, absent Congressional buy-in
    - TG3 members explored other ways the federal government could pay for drone operations over a 3-5 year time period.
- The options explored include (note: some will require legislation):
    - User Fees – lots of government experience, can be tweaked to reflect policy preferences
    - Point of Sale Tax on drone-related hardware
    - Business Use/Transaction Tax
    - Public/Private Partnerships
    - Auction/Lease of Airspace
    - Access Charges
    - Other?

What are the Work Priorities?

- There is a lot of work being done by the drone community and at all levels of government. TG3 supports this (See July 2017 report). The drone industry recognizes that over time work that is being done by government today might be better handled by industry in the future.
- While research into safety, NAS integration and the development of a low-altitude UTM work continue apace, we believe there needs to be an acceleration in the following areas:
    - The regulations, policies, and standards necessary should be developed primarily by the FAA, with significant industry input.
    - The research and development (R&D), and system development necessary should be a collaborative effort between government and industry, with the industry shouldering most of the basic R&D.
    - The communication, outreach, and training necessary should be shared between government and industry, depending on the activity.

Additional Considerations

- Congress doesn't act.
- Agencies can't sustain work-levels on "borrowed" funds/resources
- Airlines complain about the diversion of funds/resources
- Investors and innovators conclude the regulatory process is too slow and divert resources elsewhere
- Corporations determine that they cannot receive a return on investment

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Discussion of TG3 Report

RTCA
THE GOLD STANDARD FOR AVIATION SINCE 1935

Drone **A**dvisory **C**ommittee

4.4 FAA Response to DAC Recommendations

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Discussion of FAA's Response to DAC Recommendations

(intentionally left blank)

RTCA
THE GOLD STANDARD FOR AVIATION SINCE 1935

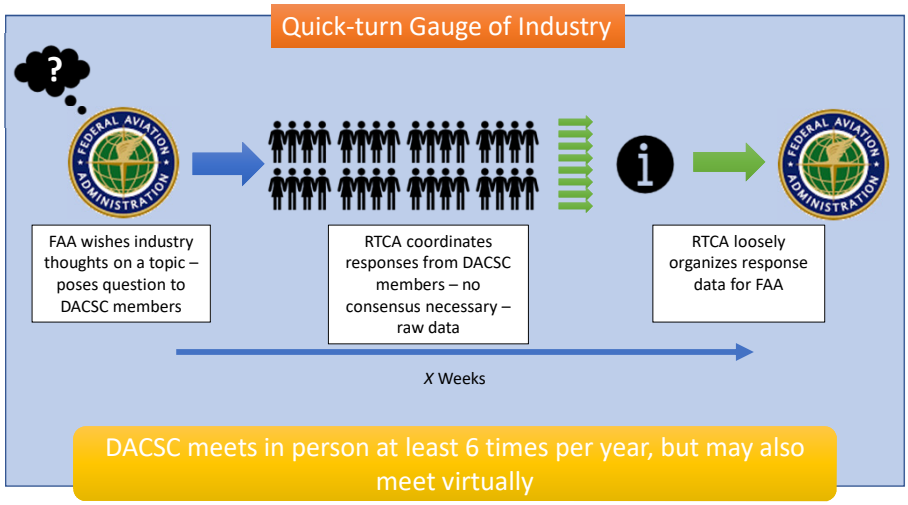
Drone **A**dvisory **C**ommittee

4.5 DAC Future Engagement

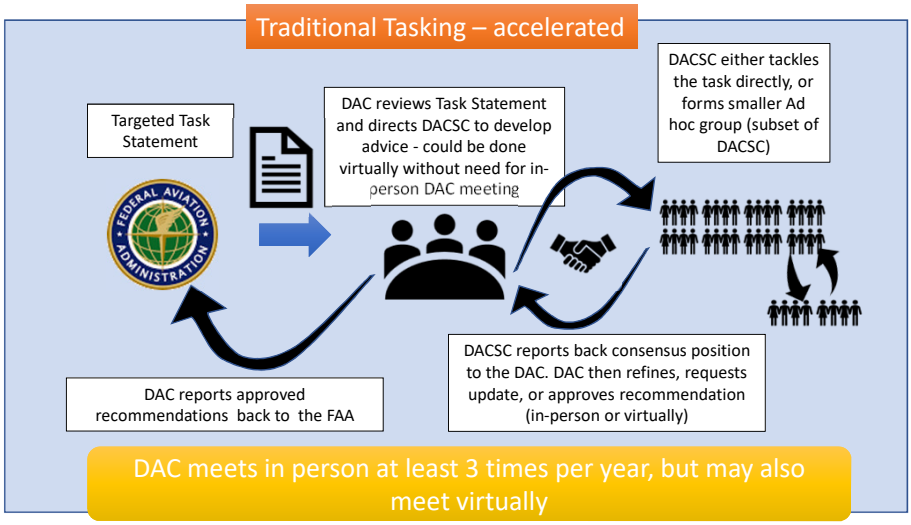
RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Discussion of DAC Engagement in the Future



Traditional Tasking – accelerated



(intentionally left blank)

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

New Business/Agenda Topics

(intentionally left blank)

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Meeting Summary/Action Item Review

DAC 2018 Meeting Schedule

- July 17, 2018, Location-TBA
- October 17, 2018, Location-TBA

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Closing Remarks

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Adjourn

RTCA
THE GOLD STANDARD FOR AVIATION SINCE 1935

Drone Advisory Committee

4.6 Draft Tenets

FAA Drone Advisory Committee Tenets[1]: Working Draft

Tenets provide a *shared vision* of a preferred future state that we work towards, and they help us validate, over time, that we are getting closer to that vision. Having an agreed-to set of tenets means that the decisions we make in isolation remain harmonized with that shared vision. Tenets "pre-resolve" conflicts (for example: what is more important, *safety* or *economics*? guided by our tenets, the answer will always be *safety*). Often when we observe *politics*, we could be disagreeing on our tenets. These tenets have been designed to work as a cohesive, integrated whole; by definition they should create a *tension* that drives for an energetic discussion and forces us to recognize & address the key issues facing our industry. We agree on the following tenets, unless you know better ones:

1) **Safe** – The safety of persons and property (inclusive of operators, users, bystanders and other impacted parties) is our highest priority. Our recommendations shall be grounded in safety and viewed in terms of *risks and mitigations*.

> **Unpacking:** Every recommendation we make (say: a "*virtual line in the sky*" at 200 feet) shall be evaluated against its safety impact: does it increase, decrease, or does not impact the safety of the NAS[2], or other transportation modalities (for example: by selecting *protocols that enable interoperability* between cars and UAVs, to collaboratively select a safe emergency landing site).

2) **Secure** – Based on their risk, capabilities and ConOps, vehicles, ground equipment and cloud services shall implement the appropriate physical and electronic security controls, using standards-based open protocols, best-practices & mechanisms.

> **Unpacking:** We have a unique opportunity to ensure that the future NAS is security-enabled from the beginning. The use of industry-standard interoperable security protocols & mechanisms that are already in the market has the potential to speed deployment, decrease cost and allow different transportation modalities to interoperate, to ensure safety. Finally, we posit that security-by-obscurity is not a valid approach when there are technical means that have been proven in other industries. Security Capabilities should include Authentication (*operator, owner, and/or user is who they claim to be*), Authorization (*…has permission to perform the mission they are performing*), Accounting (*a record of the mission is generated & stored*), Non-Repudiation (*the records produced are genuine, operator, user or owner cannot claim to have not performed recorded mission*), Anti-Spoofing (*no one can claim to be someone they are not*) and Integrity (*assurance that data & records have not been compromised in transit or at rest, and steps have been taken to ensure that data cannot be altered by an unauthorized person or program*).

3) **Balanced** – Our recommendations shall balance all stakeholder interests, including their corresponding technical, operational and financial ability to invest in any required performance or technical capabilities; we carefully balance the *Utility* each ConOps provides to users, vs. the Risk and/or *Complexities* it introduces.

> **Unpacking:** Stakeholders shall include both involved and impacted parties, inclusive of end users receiving services; as prototypical examples, consider the late-night *noise nuisance* due to search & rescue operations, vs. the utility of *locating* a lost person; Or, consider the perceived *privacy* issue of a package-delivery mission, vs. the *utility* offered to a disabled person who cannot go to the store; Or, consider the transference of risk from a human-pilot high-voltage wire inspection[3] mission, to a UAV performing the same mission.

4) **Innovation** – We shall enable rapid innovation to support UAS industry growth and broad societal benefits. It's our mission as representatives of the aerospace and transportation industries, inclusive of representatives of impacted parties, to enable innovators, small and large, to be successful and not suffer unnecessary delays.

> **Unpacking**: Our industry is made up of both traditional and new aerospace builders & operators, we will ensure that every player, large or small, traditional or new, has the ability (performance, technical and economics) to participate. There are many potential users waiting for innovative UAS capabilities, both from within the UAS industry and outside; as one successful example, consider how the ease and value of selling real-estate has improved due to the advent of UAS aerial photography.

5) **Consistent, from Local to Global** – Just like our mobile phones work ("roam") everywhere, our laptops connect to the Internet anywhere in the world, or a certified airplane can be flown anywhere in the world, the recommendations we make should be consistent, deployable and scalable locally & globally, and can operate and interoperate consistently & seamlessly *within* and *across* local, regional and national borders.

---

[1] Revision 19, output from Feb 8th and Feb 27th 2018 *DAC tenets working group* interim meetings. Tenets working group members include Gur Kimchi (Editor), Houston Mills, Nan Mattai, Robert Boyd, Martin Gomez, Brendan Schulman, George Kirov, Todd A Graetz, and Christopher Penrose, and Albert Secen (representing RTCA).

[2] https://www.faa.gov/air_traffic/nas/

[3] https://gearjunkie.com/high-tension-wire-inspector-job-epic-occupation

Unpacking: Technical, Performance, and Operational *Consistency* is critical in enabling our industry; ensuring missions can be lawfully operated in any locale, and *across* locales, will improve safety & drive down costs, benefiting everyone; we are inspired by how *interstate-commerce laws* successfully enabled economic growth, or how consistent standards drove the Internet to the scale it has today. Consistency in how performance and technical standards are applied around the world will accelerate deployment and related benefits of this industry and will result in a more affordable and robust platform.

6) **Aviation and Technology Inspired**– We are *inspired* by 100+ years of aerospace engineering & operational rigor, and the resulting safety record that we enjoy every time we board a commercial flight; we combine this inspiration with state of the art robotics, communications and Internet/cloud technologies to support the creation of an industry that is scalable, reliable, secure, and redundant.

Unpacking: Commercial Aviation is the safest form of transportation in the world today, but much of the technology behind commercial aviation was developed in the 80s, is expensive to deploy, maintain, upgrade and scale, or lacks modern security capabilities. Our job is to foster the creation of a *modernized* NAS (inclusive of necessary upgrades to the existing Air-Traffic Management systems) that will scale for the *next* 100 years; we will reach outside traditional aerospace for the appropriate ideas, components and solutions. We prefer to be inspired by regulated, verified, robust and high-reliability technology (e.g. medical, communications, banking, cloud-services) vs. informal technology, (say, desktop computers or smartphones).

7) **Flexible, Scalable & Affordable** – The recommendations we make shall be invariant to the SWaP$[4], Concept-of-Operations, location(s), or meteorological conditions; the modernized NAD shall enable all users, in all scenarios.

Unpacking: UAS Operations come in all shapes and forms; from nano-scale "digital bees" for digital agriculture, to highly-automated high-altitude cargo planes or atmospheric satellites, and everything in between. Vehicles will be able to operate in VMC and/or IMC conditions, in highly complex environments (say, downtown areas or airports) or in remote locations (say, large scale agriculture, or the arctic), depending in their specific certification status, equipage & capabilities. The modernized NAS will *economically* and *fairly* support all operators across these scale, equipage & capability ranges.

8) **Iterative** – We agree that in the long-term *full integration* into the NAS is the ultimate and high-priority objective; at the same time, specific scenarios can be enabled sooner as long as their safely can be demonstrated.

Unpacking: We agree that full integration, in all flight levels, inclusive of all aircraft, across all classes of airspace and equipage/capabilites, is our long term objective. But we also acknowledge that as we learned from NextGen and SESAR, full integration requires creating new performance and technical interoperability standards, and updating mission-critical existing NAS services , and that it will take time and money. In the meantime, we will ensure that we support less-then-fully-integrated scenarios (for example, BVLOS "UTM"-controlled operations under 400 feet AGL within Mode-C veil's) as long as they are safe. We agree that every step we take along the way will be an investment that gets us closer to full-integration.

9) **Materials in the Room** – We prefer to leverage existing standards and technologies when they match performance and/or technical requirements, even if they come from outside aerospace. Possible examples may include (but are not limited to) Federated Systems-Architecture[5] (Internet/Cloud), Aviation TSOs[6], Internet and Cellular communications (e.g., Wifi, 4G/LTE/5G, Open Standard Security Protocols, et-al) and automotive safety systems (e.g., 802.11p[7], DSRC/V2V-V2X/BSM[8] etc.).

Unpacking: While the Aerospace domain has achieved unique and unprecedented levels of safety, other technology domains have been developing relevant technologies that have the potential to simplify, risk- and cost-reduce, and shorten the time it will take to operationalize the modernized NAS. We also posit that while Aerospace may leverage capabilities developed in other industries, other transportation domains that do not share the same high safety standards as aerospace can be similarly inspired. In the end, our objective is to improve the safety, scalability, affordability and capabilities of all transportation modalities.

10) **Open vs. Proprietary** - When we have the choice between *functionally equivalent* open and proprietary solutions, we shall choose the open solutions.

Unpacking: We are inspired by the positive effects of open solutions in other industries (say, Internet – TCP/IP and HTTP, or Communications – LTE/GSM), and the positive economic, market-opportunity, adoptability, affordability, and broad utility they offer us every day.

---

[4] SWaP$: Size, Weight, Power, or Cost.
[5] https://en.wikipedia.org/wiki/Federation_(information_technology)
[6] https://www.faa.gov/aircraft/air_cert/design_approvals/tso/
[7] https://en.wikipedia.org/wiki/IEEE_802.11p
[8] https://icsw.nhtsa.gov/safercar/v2v/

11) **Tested and Validated** – We expect designs to be validated, ensuring support of a broad-range of nominal, off-nominal and emergency scenarios; we encourage that this will be achieved via peer-reviewed analytical models, simulations, data sharing, and open multi-party technical interoperability events.

> **Unpacking**: We expect recommendations to be validated using formal and statistical performance, functionality and interoperability testing; we create mechanisms that allow newcomers to demonstrate correct and interoperable behavior before operationalization. We consider the new Part-23 Performance-based rules[9] and the TCAS Airworthiness Advisory Circular[10] as great examples of how to approach testing and verification.

12) **Transparent, Proactive and non-Punitive** – Our industry is healthier when we share safety-related operational data and integrate lessons-learned *rapidly*. Corrections (new or modified regulations, technology, CRM[11], operations, technical standards, etc.) shall be rolled out rapidly and, inspired by modern cloud services, new NAS services should be designed to be upgradable and/or modified without operational or safety impact.

> **Unpacking**: The airspace is a shared resource, *safety* in the air is everyone's responsibility, and our industry can only be as safe as the *least* safe element in it. Performance, algorithm and other technical or operational data that relates to safety (for example: airspace deconfliction) must be open, readily available, and actionable. While customer data must be private, operational & safety data must be shared.

13) **Enabling Remote-ID is critical** – Remote ID, in addition to enabling critical technical capabilities (say, flight over people, or BVLOS ops), will increase transparency which will increase trust; without Remote-ID we create opacity, which gives the false impression that lawful operators have something to hide.

> **Unpacking**: *Anonymous* operations (where there is no ability to trace back to the operator, user or owner) complicate the airspace, can reduce the trust in the overall industry, and is a common concern from law enforcement and defense parties. We *also need to support* use-cases where operator and/or mission *privacy* is required (such as law enforcement), or where anonymity is acceptable, for example, in private model-aircraft flying fields. For Remote-ID, we value a technical approach that is affordable, open and accessible to *existing* operators with a software (vs. hardware) upgrade; we posit that the necessary technology & standards to enable affordable and interoperable Remote-ID already exist in the DOT automotive domain and can be used essentially "as-is".

14) **Automation executes policies, People manage & audit these policies** – While automation enables scalable, safe & efficient nominal and off-nominal operations, people retain a key role: setting policies, deciding how to change these policies when managing exceptions, and auditing KPI[12]s.

> **Unpacking:** To operate highly-automated missions at scale we need highly-automated supporting services (say: UTM); at the same time, people can always monitor missions in real time, or later by analyzing logs & mission records.

15) **Trends –** We assume certain long-term trends to be true: (a) that *technology* will continue to get cheaper and more capable, and (b) that high levels of automation can and will exceed *human* performance and has the potential to enhance overall safety, especially in a highly-scaled time-critical environments.

> **Unpacking:** We posit that as the number of missions increase, and scenarios become more complex, the role of "humans-in-the-loop", due to their fixed error-rates and reduced situational awareness (being remote), will diminish, and the role of automation, given ever-improving technology, will increase.

16) **Role of Industry vs. Regulators –** *Industry* (e.g., operators, manufacturers, users) shall bear the responsibility for developing, operating and supporting the equipage and infrastructure (e.g., DAA capabilities, UTM, Cloud Services, etc.) required for UAS operations, ensuring compliance with standards, regulations and operating requirements. *Regulators* shall maintain authority over the safety, rule-making, standards-selection, ID/tracking, oversight, and compliance enforcement.

> **Unpacking:** In the future, operators (direct or as-a-service) shall deploy, operate and validate their *compliant* & *interoperable* operations *at their own cost* while regulators arbitrate & enforce rules & policies, ensuring local, inter-state, global and inter-country consistency. We accept that this is markedly different from the model in-use today (e.g. tax- & user-funded Central Air-Traffic Operations / ANSPs)

---

[9] https://www.faa.gov/news/updates/?newsId=88746
[10] https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC%2020-151A.pdf
[11] https://en.wikipedia.org/wiki/Crew_resource_management
[12] KPI: **K**ey **P**erformance **I**ndicators

5 Task Group 3 (UAS Funding) Final Report

RTCA

THE GOLD STANDARD FOR AVIATION SINCE 1935

Drone Integration Funding

Report of the Drone Advisory Committee

Final Report - March 2018

RTCA Paper No. 047-18/DAC-011

Funding the Integration of UAS into the National Airspace

1. Executive Summary and Background

The Drone Advisory Committee (DAC) established Task Group 3 (TG3) to make recommendations related to funding the integration of unmanned aircraft systems (UAS) or drones into the National Airspace System (NAS). TG3 submitted an interim report on short-term funding considerations in May 2017 that was approved by the DAC in July 2017. This report makes recommendations for the longer term. Specifically, this report makes recommendations about funding sources for the next three to five years, considers what activities should be prioritized, and finally, who should be responsible for funding UAS integration activities. See Appendix 1 for a complete list of activities and funding recommendations.

TG3 came to consensus on the following points:

- Additional funding is necessary to integrate drones safely into the NAS.
- Funding for integration efforts will be shared across government and industry.
- Options for funding should not be constrained by the current traditional aviation funding structure and any recommended funding structure should not alter the current structure of funding for traditional, manned aviation
- The regulations, policies, and standards necessary in the next five years should be developed primarily by the FAA, with significant industry input.
- The research and development (R&D) and system development necessary in the next five years, should be a collaborative effort between government and industry, with the industry shouldering most of the basic R&D.
- The communication, outreach, and training necessary in the next five years should be shared between government and industry, depending on the activity.
- No later than 2020, FAA should implement transparent cost accounting measures in order to track the resources being used for manned and unmanned aviation activities.
- The UAS industry may be expected to pay for the operation and maintenance of an automated Unmanned Traffic Management (UTM) system through a yet-to-be-created user fee funding model.

Over the past year, TG3 has hewed closely to the Tasking Statement that was provided by the FAA and approved by the DAC. While this report answers the questions presented in the tasking statement, below we highlight our approach to answering the specific questions. We note that at the last DAC meeting in November 2017, it became clear that there is legitimate concern that many of the ideas discussed in this report may be beyond the ability of the FAA to

implement under current law. Further, given the current nascent regulatory structure in this area, and the limitations on the commercial use of drones, forecasting how the industry will develop and what the right funding mechanism will be is premature. Thus, TG3 avoided selecting a particular funding mechanism in order to ameliorate any concerns (aside from direct Congressional appropriations). This permitted TG3 to take a broad approach and to consider numerous ideas, some of which are "outside the box", in order to provide a wide-variety of funding concepts for decision-makers to explore.

Accordingly, this report makes recommendations on which activities should be prioritized and discusses a variety of funding concepts. We believe this report is useful to decision-makers as it presents a set of funding options that could be further studied or tailored to meet the evolving market.

Tasking Statement Extract

1. *Who should be responsible for conducting the identified activities and services needed to support the safe integration of UAS operations into the NAS?*
    - *Are there activities and services that could be performed by industry in the near-term or longer-term, or through a public/private partnership?*

Response: Section 4 (Approach to Funding) discusses the activities and services that could be performed by industry and Appendix 1 is a list of activities and recommendations on whether the funding should be government, private sector, or shared. In allocating these activities, TG3 considered both short and intermediate term responsibility allocation. What is solely the FAA's responsibility today may, over time, become a stakeholder or shared responsibility as more and more drones enter service. At all times, we remained focused on safety first.

There are numerous activities both today and, in the future, where a partnership between government and industry might make sense. Indeed, today, the government and industry are collaborating on numerous FAA rulemaking committees and pilot programs. In other situations, industry and government experts regularly discuss and test ideas, technology, and processes to provide the foundation necessary for the safe integration of drones into the U.S. economy.

2. *For the activities the FAA should perform, what level of funding resources are needed to support the safe integration of UAS operations into the NAS?*
    - *If funding is insufficient, which activities or services have the highest priority?*

Response: TG3 determined early in the process that it was not in a position to estimate the amount of funds or other resources necessary to accelerate drone integration into the national air space system and the U.S. economy. TG3 focused its efforts on determining which activities and services should be prioritized. This approach was endorsed by both the DAC and DACSC.

The current level of FAA funding is neither suited nor adequate to permit the FAA and other agencies to accelerate the Administration's desire to make drones a vital part of the U.S.

economy as soon as possible. This funding and resource deficit creates tension between the manned and unmanned aviation communities as drones represent an important leap forward – Aviation 2.0 -- as described by some. But, manned aviation continues to represent an essential cornerstone of the U.S. economy and the current FAA funding formula of approximately 90 percent of the FAA budget funded through manned aviation taxes and fees, yet the FAA is increasing emphasis on drone integration projects. It is this dissonance that led to the creation of TG3, but also represents a drag on innovation and focus for both communities. Indeed, with sufficient funding and resources for both communities, the cooperation and sharing of knowledge between the two communities would reach new highs.

In summary, there is unanimous consensus within TG3 on what activities must be prioritized and that funding levels need to be raised at FAA and other federal government agencies where significant drone integration work is occurring.

3. *What funding mechanisms should be used to support these activities and services?*
    - *What activities and services should the Federal Government perform using traditional funding methods (such as taxes or fees)?*
    - *Should different Federal activities or services be paid for differently?*
    - *Should different types of UAS pay different amounts or via different mechanisms?*

Response: TG3 devoted a significant amount of time deliberating potential funding mechanisms. TG3 discussed numerous funding mechanisms in use today by FAA and other federal government agencies. At this point, the drone industry is in its infancy and very few private companies are generating returns. Moreover, the necessary building blocks to commercialize drone activity beyond the limited activities permitted under Part 107 and other applicable regulations are still being developed and tested. While many private companies are investing in the industry and deploying capital in support of these efforts, the industry is still nascent. Additional Congressional funding is necessary in the next five years. TG3 expects that over time, new users of the national airspace system or of unmanned traffic management systems may have to pay some portion of, at least, the operating costs.

The development of commercial drone activity is not far enough along to properly judge the impact of different types of UAS in the air space and whether there needs to be gradation, or a one-size fits all approach. We note, however, that aeronautical charges have been historically based on size, weight, or passengers/tonnage carried.

4. *How should the funding mechanisms be implemented for the near-term, and how might they change as the industry evolves?*
    - *Is there a recommended phased or incremental approach?*
    - *What are the implementation issues and costs?*
    - *What incentives or unintended consequences might result?*

Response: TG3's interim report (approved by the DAC in July 2017), recommended that near-term funding to support the commercialization of the drone industry should be provided by an

increase in appropriated funds. Going forward, this report discusses a variety of options for evolving the funding mechanisms as the industry grows revenues, profits and returns.

The federal government has a unique opportunity to support a nascent industry begin to take flight. If it directly funds the relevant government agencies to enable the expansion of UAS resources (money, people, technology) necessary, it will signal to companies and investors that the drone industry is a national priority and private capital, expertise, and technology will flow in support of industry development.

Should the federal government fail to create conditions to support a rapid, but safe, level of growth by the drone industry, companies and investors could reduce their commitments of capital, expertise, and technology as higher returns could be achieved elsewhere. Moreover, the U.S. could fall behind other countries in developing drone technology for commercial use.

At its core, TG3 was tasked with sorting out how to resolve the complaint of manned aviation that drone integration is coming at the expense of its customers and stakeholders. A strong resource-commitment by the federal government could energize the drone community but also allay the legitimate fears of the manned aviation community that its needs will not be subverted by increasing federal resources devoted to the unmanned community. The Administration's fiscal year 2019 budget calls for a significant increase in funding for drones, but left unanswered is whether it represents a fresh injection of funds or movement of current funds from other sources.

5. *What options were explored and rejected?*

Response: Because TG3 did not make a specific recommendation on a particular funding mechanism beyond direct appropriations, no ideas discussed by TG3 or the larger DAC/DACSC were excluded from this report. TG3 received input from a variety of outside experts as well as subject-matter experts on TG3, so ideas were thoroughly discussed during the weekly meetings that occurred.

TG3 has 51 participants, including 20 observers from the FAA. See Appendix 2 for a complete list of voting members and observers. Participants are from a cross-section of stakeholder groups from the unmanned and manned aircraft communities.

TG3 acknowledges and thanks the FAA for their help and assistance with our work. Numerous FAA staff attended our meetings, prepared presentations, and coordinated subject-matter experts to educate and help the group during its deliberations.

2. Scope

The FAA asked TG3 to provide near term recommendations by July 2017, and longer-term recommendations by March 2018. This report contains recommendations for funding and

priority activities over the next five years for UAS operations currently and under contemplation by the FAA and industry.

3. Methodology

The following summarizes the approach and methodology TG3 used to develop this final report. First, the group sought information from the FAA on its budget and funding mechanisms. In response, the FAA provided the group a series of briefings on the budget, public-private partnerships, the UAS Implementation Plan, aviation taxes, and the 2017 appropriations. The group also reviewed the history of the air traffic control system and the establishment and operation of the Airport and Airway Trust Fund. This look-back helped the group understand what it took to foster the vibrant and flourishing manned air commerce industry of today.

Following these briefings, the group discussed the process options with an aim towards collaboration, consensus, and transparency. The group then agreed to use the Analytical Hierarchy Process (AHP) developed by Decision Lens (DL) to prioritize the activities and recommendations. AHP is a decision-making process that abstracts criteria and weights and allows the user to focus on attributes that they recognize. The user compares and rates the importance of criteria and then evaluates options based on those criteria. The AHP is capable of bringing together numerous stakeholders who may have multiple and competing objectives to reach decisions and prioritize alternatives.

The group then reviewed how the FAA is organized to support the safe and efficient integration of drones into the NAS; these activities are spread across many offices and programs within the FAA. The FAA provided TG3 with the activities to be evaluated for funding. See Appendix 1. The group ranked each FAA activity against the following criteria:

- Safety among UAS operators, for people and property on the ground, and with current manned aviation, given a 60% weight.
- Enabling operations and technological readiness, given a 28% weight.
- Economic benefits to society and the government, given a 12% weight.

The result of this was a prioritized list of FAA activities, in rank order. The group then validated the results. The full results of the DL ranking are below and at Appendix 5.

Results: Prioritized List of Activities to Support UAS Operations

Graph Value Key
Safety – 60%
Enabling Operations – 28%
Economic & Societal Benefit – 12%

Following a validation of the list, TG3 divided these activities into three categories: 1) Regulations, Policies, and Standards; 2) Research, Development, and Systems; and 3) Outreach, Communications, and Training. The group divided into teams and provided written recommendations for priorities and funding for their assigned issues. The reports were circulated and discussed, and consensus was reached on the recommendations. The reports were then consolidated, and this final report was circulated for review and approval.

4. Approach to Funding: What Can Industry Do? What Should FAA Do? Who Should Pay?

In answer to the FAA's questions of who should be responsible for conducting the identified activities and services needed to support the safe integration of UAS operations into the NAS, the group provides the following analysis, for Regulations, Policies, and Standards; R&D and Systems; and Outreach and Training. Each is discussed below and summarized at Appendix 6.

Regulations, Policies, and Standards

There are critical rules necessary to enable UAS integration. There are also policies and procedures for FAA personnel and industry that must be developed to implement UAS rules, including those for air traffic control facilities, air traffic management, and airspace charting. Finally, there are standards needed to guide technical and operational aspects such as detect and avoid and pilot certifications. Each is discussed in detail below.

TG3 recommends that the following eight rulemakings be initiated in the next three to five years. This list is in order of priority. The rulemakings in italics are not included in the FAA's current rulemaking plan, but TG3 recommends that they be issued in this timeframe. There is

also the issue of fee structure and the implementing statute and/or regulation that will likely be necessary to establish it. Accordingly, we recommend that FAA begin work on the required statutory and regulatory changes in parallel with the list below so that the funding regime is in place concurrent with the operational expansion that will happen when these other eight rulemaking projects are completed.

- *Identification and Tracking*
- Security concerns
- Operations Over People (OOP)
- Expanded Operations (BVLOS, night, etc.)
- *Air Carrier Certification and Operations (i.e., package delivery)*
- *Unmanned Traffic Management System*
- Non-segregated Operations
- Small Cargo/Passenger Operations

These regulations will be developed primarily by the FAA, with significant industry input. It may not be possible for the FAA to complete all of these rulemaking projects in the next five years with existing personnel and resources. Thus, we recommend that the FAA request that Congress appropriate additional funding outside of the Airport and Airway Trust Fund. This will ensure adequate FAA staffing and resources to address this ambitious work schedule.

TG3 recommends that industry continue to participate in pre-rulemaking activities, comment on proposed rules, and participate in standards development. FAA should continue its traditional government role in rulemaking, guidance, enforcement, and informal adjudications.

Whether FAA can achieve these rulemaking milestones within the next few years depends on a number of factors. The first is the Administration's timely approval of FAA's rulemaking plan. Second is whether the impact Executive Order 13771, issued January 30, 2017, which requires agencies to identify two existing regulations to repeal for every new regulation issued applies to FAA UAS rulemakings, and whether it will slow the pace of FAA rulemaking projects. Third, it depends on effective collaboration between FAA and the national security and law enforcement agencies on security issues, including provisions of the 2016 FAA extension.[1] Fourth, resolution of the recommendations of the Identification and Tracking Aviation Rulemaking Committee (ARC) is critical. The fifth factor is what data may be obtained from the recently announced UAS Integration Pilot Program and when that data will be available. Sixth, further work from TG2 on a regulatory framework for commercial operations under the Mode C veil. Seventh, the recommendations from the "UAS in Controlled Airspace" ARC will influence the timeline. Finally, there is the question of whether there is or will be a sufficient number of FAA personnel to tackle all these rulemaking in the 3-5-year period (see discussion of fee structure *infra*). All these factors will impact the timely development of these and other rules.

[1] We recognize that law enforcement agencies requested hold on all FAA UAS rulemakings has already delayed for over a year the publication of the OOP proposed rule.

TG3 encourages the FAA to move forward with these UAS rulemaking projects as expeditiously as possible.

We begin the list with an **Identification and Tracking Rulemaking**. The ARC submitted recommendations to the FAA at the end of September 2017. If compliance with minimum performance standards is mandatory, a rulemaking will be required. So, too, if UAS operators not equipped to be remotely identified and tracked will be prohibited to fly in particular airspace, a rulemaking is necessary. We list this rulemaking separately from the security rulemaking because identification and tracking will address safety, privacy, and security concerns.

The FAA recently included in the Unified Agenda (the semiannual compilation of information about regulations under development required by Executive Orders 12866 and 13771) an Advanced Notice of Proposed Rulemaking (ANPRM) for Safe and Secure Operations of Small UAS, projected for May 2018. The purpose of the ANPRM is to seek comment on operational limitations, airspace restrictions, hardware requirements, and identification and tracking technologies, and consider the balance of needs between UAS operators and the law enforcement and national defense communities. While identification and tracking technologies are included in the scope of this ANPRM, the work of the remote ID and tracking ARC should result in the FAA moving directly to a proposed rule.

The scope of a **Rulemaking to Address Security Concerns,** identified in the FAA "Path to Full Integration," is uncertain, given this recent announcement of an ANPRM to address security concerns. This rulemaking could also address section 2209 of the Public Law 114-190, which requires FAA to establish a process to designate restrictions on UAS operations in the vicinity of certain fixed-site facilities, and FAA may elect to set up this process by rule. A security rulemaking may also address drone detection technology and use. Conceivably, a single performance-based rulemaking package could cover section 2209, detection technology and use, and remote identification and tracking.

Counter-drone technology and measures include detection, disabling, and destroying drones. FAA may be the appropriate agency to regulate drone detection, while law enforcement and national security agencies would regulate drone disabling and destroying. It is uncertain whether and when Title 18 of the United States Code might be revised to permit the disabling or destroying of a drone. The Department of Defense recently received some counter-drone authorities in the National Defense Authorization Acts of 2017 and 2018; and, the Department of Homeland Security recently asked for similar authorities during recent Congressional testimony by Secretary Nielsen. This issue is of critical importance to widespread UAS integration, and whether the FAA acts alone or in concert with other agencies, it is a project that should be addressed within the next few years.

The **OOP Rulemaking** would otherwise be listed first because the proposed rule is likely a finished product. Because it is on hold pending the resolution of law enforcement concerns, we

believe rulemakings addressing security issues should be the highest rulemaking priority in the near term.

The **Unmanned Aircraft Expanded Operations Rulemaking**, addressing operations beyond visual line of sight (BVLOS) and at night and other operations, may be delayed until the FAA has published proposed, if not final, rules addressing OOP, identification and tracking, and other security issues.

The **Air Carrier Certification and Operations Rulemaking**, establishing an UAS air carrier certification process and operational rules for package delivery, should be pursued in the near term and could be included as part of the expanded operations rulemaking.

The scope and timing of the **Non-Segregated Airspace Operations Rulemaking** is unknown. This is likely to result from the report and recommendations from the UAS in Controlled Airspace ARC, which was established only recently.

The timing of an **Unmanned Traffic Management (UTM) System Rulemaking** is uncertain. Some if not many of the standards and requirements for UTM concepts and UTM Service Suppliers could be established outside of a rulemaking, but a rulemaking may be necessary in terms of UAS operator equipage and operational requirements to be authorized to fly under the rubric of a UTM. The UTM System Pilot Program established by section 2208 of Public Law 114-190 is required to be completed by April 2019. Alternative methods, outside of the UTM, to accessing the NAS may also need to be considered. However, none of this is to say that absent UTM rulemaking, operators looking to utilize the current air traffic management system and protocols should be delayed access to the NAS.

A rulemaking to address **Small Cargo/Passenger Operations** is perhaps at the edge of the FAA's 3-5-year rulemaking horizon. How soon such a rulemaking will be necessary may depend in large part on the development of technology and the FAA's pace of certification of UAS capable of carrying one or more persons. As noted above, TG3 recommends that package delivery operations should be addressed sooner, perhaps as part of the Expanded Operations rulemaking.

Finally, as discussed above, in order to establish any additional collection of fees, the FAA will likely need to engage in a rulemaking to authorize those fees. Indeed, as discussed later in this report, a fee structure may require congressional authorization. In such a **Fee Structure Rulemaking**, the FAA would establish fees to be charged for certain work performed or overseen by the FAA. We have included this rulemaking as a placeholder as we believe a fee system should be considered for long-term sustainable funding for certain programs and activities. If a fee structure is authorized by law, any rulemaking required to impose and collect such fees should be a high priority.

After a rulemaking is completed, FAA may promulgate an Order (guidance to FAA personnel) and an Advisory Circular (guidance to the industry), and may need to establish waiver,

exemption, certification, or other approval processes. The responsibility will largely fall to FAA personnel to draft documents and to handle any approval process emanating from a rule. While the FAA has primary responsibility for these activities, it will be critical to have significant industry participation in the drafting and shaping of FAA guidance and approval processes.

We have identified four areas where **Policies and Procedures** should be prioritized in the next three to five years:

- Flights Standards
- Air Traffic Control
- Operator
- Airports

The FAA typically publishes additional guidance once a rule is published. This guidance should include policies and procedures for **Flight Standards**, **Air Traffic Control**, and **Airports**. The responsibility for these three policies should rest with the FAA. We recommend that the FAA set this as a high priority and request additional funding from Congress to increase staffing if necessary to address this ambitious work schedule if the FAA's current resources cannot meet the need.

FAA may require UAS **Operators** to develop policies and procedures for specifications, capabilities and limitations, operations, and maintenance. UAS operators, especially businesses utilizing multiple UAS, should develop manuals and procedures for operators, quality assurance, and remote pilots. Manuals and procedures may also be necessary for responsible persons for highly automated and eventually autonomous operations, unless this is addressed in hardware and software standards. The responsibility to develop operator policies and procedures lies entirely with industry. If the FAA requires UAS manufacturers or operators to submit these manuals to the FAA for review and approval, however, this could add a substantial workload burden to the FAA.

We have identified five **Standards** that should be prioritized in the next three to five years, and we recommend that these be a collaborative effort between the FAA and industry:

- Pilot Certification and Qualification
- Type, Production, and Airworthiness Certification
- Command and Control
- Detect and Avoid
- Geo-fencing

TG3 proposes that wherever possible the focus be on using existing technology and expertise to permit expanded operations as soon as possible.

A sixth standard for **remote identification and tracking** was the subject of the Remote Identification and Tracking ARC, which submitted its recommendations to the FAA at the end of September. The ARC's Final Report stated: "The FAA should promote fast-tracked development of industry standards while a final remote ID and tracking rule is developed, potentially offering incentives for early adoption and relying on educational initiatives to pave the way to the implementation of the rule."

Pilot Certification and Qualification Standards should be a collaborative effort between FAA and the manned and UAS pilot community. Pilot certification is required by statute, and the standards for issuance of a pilot certificate and ratings (other than a remote pilot certificate under Part 107) are set forth in Parts 61 and 65. Historically, Airman Certification Standards (ACS) have been developed in collaboration with the aviation industry. Part 107 requires remote pilots to pass an aeronautical knowledge test but does not impose any training or experience requirements with respect to operating an UAS. As the regulatory landscape matures to permit operations at night, BVLOS, over people, and ultimately highly-automated operations, the FAA may seek to impose new risk-based training and experience requirements (or risk-based equivalency standards for automated systems).

We are unaware of any standards organizations currently developing UAS **Type, Production, and Airworthiness Certification Standards**, but we understand that this subject is now under active consideration within the FAA as it has been working with a number of companies seeking type certification for a variety of UAS designs. The FAA is currently considering what adjustments to its current certification standards in Parts 21, 23, and 25 may be appropriate to address small and large unmanned aircraft and unmanned aircraft systems, including package delivery and passenger-carrying operations. Development of these standards would be a collaborative undertaking between the FAA and industry.

The subject of **Command and Control (C2) Standards** involves UAS equipage and spectrum issues. In 2016, RTCA SC-228 published a Minimum Operations Performance Standard (MOPS) for *terrestrial data link* C2. A Phase 2 white paper addressing *satellite-based* C2 issues was published in September 2017. One of Task Group 2's recommendations to the DAC—to evaluate the ability of existing cellular networks to meet low altitude UAS C2 requirements—states further that the "FAA should consider leveraging the 3rd Generation Partnership Project work study items (Study on Enhanced Support for Aerial)", and that the "FAA should establish an operational prototype that includes cellular connectivity, via the existing commercial cellular networks, as a C2 option…[2]" This may suggest that industry's work on C2 is complete, and the baton is passed to the FAA. However, SC-228 will continue to work on satellite solutions (SATCOM) in addition to cell network options in the near and intermediate term.

Regarding **Detect and Avoid (DAA) Standards**, RTCA SC-228 completed a Minimum Operations Performance Standard (MOPS) recommending DAA capability for UAS transitioning from the

[2] Report of the Drone Advocacy Committee, "Drone Access to Airspace", November 2017: https://www.rtca.org/sites/default/files/dac_tg2_final_reccomendations_11-17_update.pdf

surface to Class A airspace. Phase 2 will address DAA equipment necessary to support UAS operations in Class C, D, E, and upper E (above 60,000 ft. AGL) airspace and likely Class B and C as well. Detect-and-avoid technology remains one of the main challenges to expanded UAS operations. Many companies are developing sensor-based technology to address this issue. We recommend the development of DAA performance standards be made a high priority.

RTCA SC-147 is now conducting research into MOPs for an Aircraft Collision Avoidance System (ACAS) variant for UAS, called ACAS Xu, in collaboration with NASA, which will be interoperable with TCAS II and ACAS X (NextGen) systems. The projected date for publication is September 2020. TG3 supports the RTCA SC-228 AND -147 activities and notes that its work product and timetable are largely within the aviation industry's control.

Geo-fencing standards may be subsumed in Airworthiness Certification Standards noted above but could also be developed as a separate standard. Geo-fencing technology is already quite mature, but it behooves the FAA, working with industry, to develop standards with which all UAS operators operating over people, near structures and beyond visual line of sight, need to comply.

Research and Development and Systems

The FAA and industry each have a role to play in R&D and Systems development. The FAA should prioritize R&D and Systems funding based on the foundational-building blocks needed to create an automated system that can scale with the rapidly growing drone industry.

Near-Term (looking out 2 years)

We have identified several near-term priorities that should be supported and funded by government and industry within the next 24 months:

- **LAANC**
  - Related R&D Activity: Air Traffic Management, C2 & Spectrum, Separation
  - Related Systems Activity: Traffic Management System, Authorization Portal, ATC Systems/Capabilities, CNS Systems, Registration System, Spectrum Management

- **IT Gateway**
  - Related R&D Activity: Air Traffic Management, Separation
  - Related Systems: Traffic Management System, Authorization Portal, CNS Systems, Registration System

- **UTM Development and Initial Implementation**
  - Related R&D Activity: Air Traffic Management, C2 & Spectrum, Separation, Human Factors, Environmental
  - Related Systems: Traffic Management System, Authorization Portal, ATC Systems/Capabilities, CNS Systems, Registration System, Spectrum Management

- **UAS Integration Pilot Program**
    - Related R&D Activity: Expanded operations i.e. BVLOS, flight over people, package delivery, balancing local and national interests related to UAS integration, Human Factors, Environmental
    - Related Systems: UTM, Spectrum Management, C2, DAA, navigation

- **Counter UAS and Remote Identification and Tracking**
    - Related R&D Activity: Air Traffic Management, C2 & Spectrum, Separation, Human Factors
    - Related Systems: Traffic Management System, Authorization Portal, ATC Systems/Capabilities, Registration System, Spectrum Management

Low Altitude Authorization and Notification Capability (**LAANC**) will provide drone operators near real time processing of airspace notifications and automatic approval of requests that are below approved altitudes in controlled airspace. It is the first step toward implementing UTM, a "system of systems" for enabling safe, efficient low-altitude UAS operations.

The **IT Gateway** is a common web portal and associated software that will serve as a one-stop-shop for all UAS interactions with the FAA, allowing owners and operators to register their aircraft, apply for airspace authorization or waiver, file an accident report, and get the latest news.

UAS Traffic Management (**UTM**) concepts will enable safe and efficient operations by developing technologies such as airspace design, dynamic geofencing, congestion management, and terrain avoidance. The FAA already has a Research Transition Team in place with NASA to ensure there is coordination in the technology transfer that will come from NASA's UTM program. The FAA should continue to build upon the NASA and industry work to bring forward operational UTM solutions, through the UTM Pilot Program announced in February 2018, and other government-industry collaborations. This can be done in parallel with any ongoing work to utilize the legacy air traffic management for access to the NAS.

The recently-announced **UAS Integration Pilot Program (IPP)** is an opportunity for state, local, and tribal governments to partner with private sector entities, such as UAS operators or manufacturers, to accelerate safe UAS integration. R&D and Systems work within the IPP will hopefully inform future rulemaking.

Near term, **Counter Drone** and **Remote Identification and Tracking** R&D and Systems is needed to satisfy concerns of security agencies before rulemaking on expanded operations can proceed. Counter-drone technology and measures include detection, disabling and destroying drones. As noted, the FAA may be the appropriate agency to regulate drone detection, while law enforcement and national security agencies would regulate drone disabling and destroying.

Long-Term (looking out 3-5 years)

Assuming short-term priorities have been implemented, we recommend the FAA focus on:

- **UTM Implementation**, integrating all UAS types/sizes in all classes of airspace with all types of manned/unmanned equipped/unequipped aircraft
    - Related R&D Activity: Air Traffic Management, C2 & Spectrum, Separation, Human Factors, Environmental
    - Related Systems: Traffic Management System, Authorization Portal, ATC Systems/Capabilities, CNS Systems, Registration System, Spectrum Management

- **Legacy ATM/UTM Systems Interoperability**
    - Related R&D Activity: Air Traffic Management, Human Factors, Separation
    - Related Systems Activity: Traffic Management System, Authorization Portal, ATC Systems/Capabilities, CNS Systems, Registration System, Spectrum Management

- **Urban Air Mobility and Routine Operations at Airports**
    - Related R&D Activity: Human factors, Operators, ATC Systems, Air Traffic Control Training, Flight Standards, Air Traffic Management, Airports Training, Environmental
    - Related Systems: ATC Systems, Traffic Management Systems

To stay at the forefront of this emerging global industry, the federal government (FAA, NASA, FCC, and others) should continue to make R&D and systems investments to spur innovation and help create an automated IT infrastructure that will allow for interoperability and the industry to scale. To the extent that the FAA, the Administration, and Congress deem necessary, additional funds should be appropriated for these efforts.

Industry should also continue to invest in R&D and system development. Industry is currently working with the FAA on LAANC; and with the FAA and NASA on UTM development, standardization, and implementation.

Injury Severity R&D is primarily used to help inform FAA rulemaking. Moving forward we envision this being a collaborative effort, similar to what is being done at the UAS Center of Excellence. Data from the COE should be used by the FAA and industry to inform risk-based standards and rules.

The priorities set out above should also be aligned with the R&D activities needed to support the DACSC Task Group 2's initial recommendations and its follow-on work, as previously stated.

Outreach, Communications, and Training

Effective outreach, communications, and training will be critical for the successful integration of UAS into the NAS and growth of the industry. Outreach and communications include efforts to

address concerns raised by communities and interest groups and educating the public, industry stakeholders, public safety officials, and Congress.

The need for community outreach and communication is augmented by the recent introduction of the UAS Integration Pilot Program. There will need to be a focused effort to inform all key stakeholders how the pilot program and its lead agencies fit into the overall UAS regulatory framework. Data collected from this pilot program should be regularly promulgated to industry stakeholders, workgroups and the general public. Investment in communication now can reduce the rulemaking burden by making the process smoother, assuage stakeholder concerns about a variety of issues, and persuade people about critical issues such as safety. Without this communication, various stakeholders will continue to harbor concerns about the widespread introduction of drones in the broader U.S. economy.

Training in this context generally means training of the FAA workforce, including Air Traffic Control Training, Flight Standards Training, Airports Training, and AVS/AOV Oversight Training. Long-term funding for outreach, communication, and training should generally be shared by the FAA and industry.

Outreach and Communication efforts can continue using tools that are currently being implemented by community-based organizations, local governments, the FAA, and other UAS industry stakeholders. The most realistic approach is to share the necessary financial resourcing between publicly and privately funded organizations for those efforts.

Outreach and communication should be a shared responsibility between the FAA and the industry. The current situation shows the burden weighing more on industry than on the FAA, and this trend may continue in the future. The FAA may need to increase support for these programs through various methods, including public support and enforcement of violations.

An example of this outreach/communication is the *Know before You Fly* campaign. *Know before You Fly* is an educational campaign that provides prospective users with the information and guidance they need to fly safely and responsibly. It is conducted in partnership with industry and the FAA and has the official support of nearly 200 companies.

Other examples of outreach can be seen in UAS Public Service Announcements created and broadcasted by Sinclair Broadcasting Group, Best Buy employee training regarding UAS regulations, Walmart Know Before You Fly shelving displays, and Amazon's Fly Responsibly website links. These examples highlight how communications and outreach can and should be shared between industry and the government.

One area where FAA should increase its outreach is with other stakeholders including airlines. As drone activity increases, particularly around airports, FAA outreach to make sure operations officials at airlines, airports and the local communities understand the tempo of operations and any impact to current airline or airport operations as well as other environmental impacts such as noise.

With respect to **Training**, in the long-term, funding should continue to enjoy support from the FAA, through the federal appropriations process, but the overall financial burden should begin to weigh heavier on industry through a user fee structure as the industry moves closer to the 5-year mark. Formal training for FAA workforce, which includes Air Traffic Control, Flight Standards, Airports, and other oversight, can also be augmented with industry training options.

5. Approach to Longer-Term Funding and Potential Funding Mechanisms

The Airport and Airway Trust Fund, also known as the Aviation Trust Fund, is a collection of revenues from manned aviation-related fees and excise taxes on passengers, cargo, and fuel. The Trust Fund is dedicated to financing investments in aviation and must be authorized and appropriated by Congress. It funds construction and safety improvements at airports; maintenance and technology upgrades to the air traffic control system, including navigational aids, research, education and development programs; and a large portion of the FAA operations account. For the airlines, these fees and charges are passed through to passengers through the price of a ticket. Other aircraft operators pay a fuel tax. In both cases, the collection mechanism is simple and efficient. There is currently no comparable mechanism to fund the drone industry-related activities.

The FAA is experiencing increased workloads surrounding the regulation of UASs without a corresponding increase in FAA personnel and other funding. And current Part 107 waiver and airspace authorization processes do not include a "pay for what you use" framework. Given it's our tasking statement, TG3 has grappled with the question of what the best funding mechanism is to safely integrate drones into the NAS. With a diverse set of stakeholders including, airlines, drone operators, manufacturers, labor, airports and other interested parties, TG3 engaged in lively and far-reaching discussion and debate in search of proposals for the DAC.

Our stakeholders bring diverse perspectives to the table. For example, airlines are concerned that an increasing percentage of FAA, DOT, and other government resources are being devoted to promoting drone introduction and integration and thus not devoted to issues primarily of interest to manned aviation stakeholders. Yet, approximately 90 percent of the FAA's budget is raised from aviation industry taxes and fees. The drone community, while recognizing the current funding issues, contends that the industry is contributing to the integration of UAS into the airspace by investing millions in new technology, including developing air traffic management systems in partnership with the government.

The activities for which funding mechanisms should be considered includes all the rulemaking, policies, procedures, and standards; research and development and systems; and outreach, communications, and training, all of which are discussed above. Most funding mechanisms are

intended to cover FAA costs, but some also address joint-FAA industry initiatives such as LAANC and UTM system development and implementation.

As an initial matter, all TG3 participants agreed that the Administration and Congress should develop an appropriations package outside of the Aviation Trust Fund to give the FAA and other relevant agencies enough funding to nurture and support the development of this nascent, yet futuristic industry, over the next three to five years. All TG3 stakeholders acknowledge the transformational impact that drones can have on improving the American economy, technological leadership, and productivity among other exogenous benefits.

A multi-year appropriations package to supplement the Aviation Trust Fund would permit the FAA to support the Administration's aims to widely-introduce drones into the American economy as soon as safely possible. It would also allow legislators and regulators to watch how the industry evolves before determining whether to adopt a specific revenue-raising mechanism in the out years. The logic of this approach is all the more compelling given the nascent and dynamic state of the drone industry.

Beyond unanimity on a multi-year funding appropriation, TG3 evaluated a number of different funding mechanisms that are in place around the government today. There is no magic bullet funding solution among those reviewed, especially given early stages of where the UAS marketplace is today. Different stakeholders favor different mechanisms consistent with their business and economic interests. The intent of this discussion is to provide ideas and aggregate information that stakeholders can use as a reference. What follows is a summary of the funding options discussed. (Note: these are not listed in any priority order.)

User Fees

As FAA programs are currently funded by fees and taxes paid for by the manned aviation industry,[3] funds generated by one or more user fees could be added to the FAA accounts to cover the incremental increases in resources necessary to manage and oversee the UAS industry—from regulation and certification to Air Traffic Management. While such user fees would be consistent with the current funding structure of the FAA, the UAS industry is a separate enterprise from that which has historically been managed by the FAA, TG3 recommends that cost accounting measures be implemented to ensure that fees amounts are collected and allocated appropriately.

Federal law declares that each service or thing of value provided by an Executive Branch department or agency to a person should be "self-sustaining to the extent possible." *See,* 31

[3] These taxes and charges are: a 7.5% domestic passenger ticket tax; a $4.00 per domestic flight segment fee; an international arrival and departure tax ($17.80); a frequent flyer awards tax (7.5% of the value of miles awarded); a charge of $8.90 for flights between the continental U.S. and Alaska or Hawaii; the commercial fuel tax ($0.043 per gallon); the non-commercial fuel tax ($0.193 per gallon avgas and $0.218 per gallon jet fuel); and a domestic cargo/mail tax of 6.25% of the price of transport.

U.S.C. 9701 (formerly 31 U.S.C. 483a). This law authorizes each department or agency to promulgate rules establishing a charge for the service or thing of value, which charges must be fair and based on (1) the costs to the government; (2) the value to the recipient; (3) public policy or interest served; and (4) other relevant facts.

Under this authority, the Office of the Secretary of Transportation promulgated a rule imposing processing fees for the filing of certain documents. *See*, 14 CFR 389.25. The highest fee, to file an application for merger or acquisition of control or an application for approval of a code share agreement, is $1,080. The cost of filing an exemption request varies from $53 to $371.

Apart from the government-wide authority in section 9701, several agencies, including the FAA, have separate statutory authority to collect fees. An example outside of the FAA that is analogous to the drone industry is the Federal Drug Administration (FDA), which is primarily funded through fees paid by the pharmaceutical companies that it regulates. The FDA collects application fees from drug manufacturers to cover the costs of a new drug application process, but in order to continue collecting such fees, the FDA must meet certain performance benchmarks, primarily related to the speed of certain activities within the review process.

A second example is the Federal Communications Commission (FCC). The FCC is required by statute to "assess and collect" fees to recover the costs of enforcement activities, policy and rulemaking activities, user information services, and international activities. The FCC is also authorized by statute to collect fees to cover the costs associated with the application process for licensing communication service providers. This includes activities such as issuing permits, testing applicants, certifying licenses, authorizing transfers, assigning or transferring call signs, and adjudicating disagreements.

Currently, the FAA may charge fees in an amount not to exceed $12 for an airman certificate, $25 for registration of an aircraft after transfer of ownership, $15 for renewing aircraft registration, and $7.50 for processing a form for a major repair or alteration of a fuel tank or fuel system of an aircraft. *See,* 49 U.S.C. 45302. This authority applies only to aircraft not used for commercial air transportation. The FAA has not implemented this authority. Section 45301 of title 49 authorizes and requires the collection of overflight fees for Air Traffic Control services provided to foreign carriers that traverse U.S. airspace but do not takeoff or land in the United States.

Section 45305 of title 49 *requires* the FAA to impose a fee for several enumerated services and activities, in an amount not to exceed the cost of such service or activity. These activities and services include registering an aircraft ($5); reregistering ($5), replacing ($2), or renewing ($5)_ aircraft registration certificate; issuing an original ($10) or additional ($2) dealer's aircraft registration certificate; issuing a special registration number or a renewal thereof ($10); issuing

an airman medical certificate; and providing a legal opinion pertaining to aircraft registration or recordation.[4]

Under section 45305, the FAA could, by rule, establish a fee or fees applicable to the drone industry for any of the enumerated services in this section. The FAA has already established a fee of $5 for on-line registration (and renewal) of unmanned aircraft (each unmanned aircraft operated under part 107 must be registered individually, but an owner of multiple model aircraft operated under the special rule for model aircraft must register only once).[5] *See,* 14 CFR 48.30.

There is currently no fee to apply for an exemption under Section 333 or a waiver under Part 107, or to seek ATC authorization to operate in controlled airspace.[6] Under the executive branch-wide authority in found in 31 U.S.C. 9701, the FAA could promulgate a rule to charge a fee to cover document processing costs or to reflect the time spent by FAA personnel to process such requests. The FAA could also seek to impose a drone-related fee to cover the services and activities enumerated in section 45305, but *only if* an appropriations act provides for the expenditure of the fee to pay the costs of such service or activity. *See*, 49 U.S.C. 45305(b).

Finally, the FAA could seek additional statutory authority to impose fees not already authorized for manned aviation, or, under the executive branch-wide authority in section 9701, the FAA could impose fees by rule and could seek to recoup the costs of other drone services and activities for which fees are not currently authorized in the Federal Aviation Act.

Point of Sale Tax

Another option for commercial drone use of airspace would be to impose a tax on drones at the point of sale. This tax would be included in the retail and/or wholesale price of the drone. The proceeds from such a tax could be dedicated or credited to an FAA account. Sales taxes are generally imposed by State and local governments. Federal legislation would be required to impose a Federal sales tax as well as to ensure that the proceeds are used to defray the costs of drone-related activities. As the FAA noted in the Tasking Statement, taxes are often assessed as a percentage of the cost of the product, and not necessarily proportional to the services or benefits being provided by the government. A taxing regime would raise difficult questions regarding whether the tax would apply to all drone sales and what amount of tax would be

[4] The dollar figures referenced were determined by FAA rule. The FAA expects to publish a notice of proposed rulemaking to determine fees for services for which there is no fee at this time (RIN 2120-AK37).
[5] An owner of a drone that will be operated under Part 107 must register and pay the $5 fee for each drone the person owns. A model aircraft owner is required to register only once (and pay only $5) for as many drones the person owns.
[6] Indeed, there is no fee for air carriers or manned aircraft operator to apply for or obtain an exemption or waiver under the Federal Aviation Act or FAA regulations; or to apply for or obtain type, production, or airworthiness certification for an aircraft; or to apply for or obtain an air carrier operator certificate or air agency certificate.

sufficient, and whether retailers would be compensated for any administrative burden such a Federal tax would impose of them.

Business Use or Transaction Tax

Alternatively, a business use or transaction tax could be imposed on the purchase of a drone service. Each commercial business that uses drones on behalf of a customer or as a part of their customer service could be responsible for a "pay as you go" model for use of the navigable airspace. This tax would be added to the invoice. The drone operator would be responsible for collecting this tax (similar to the current sales tax model) and reporting and remitting those funds to the FAA- designated organization. This tax would need to be authorized by Congress and would also present difficult questions regarding which drone operations would bear this burden and the amount of tax.

Public Private Partnership

A Public Private Partnership (PPP) is a partnership between public and private entities to achieve a solution, such as delivery of an infrastructure service over the long term. It combines the strength of the public sector's mandate to deliver services and its role as regulator and coordinator of public functions with the private sector's focus on profitability and therefore commercial efficiency. PPPs leverage private sector expertise and technical innovation; decrease procurement costs; increase revenue share; provide access to otherwise inaccessible financing; and allow the public sector to postpone payments or leverage future revenues for purposes of fulfilling present day demands.

Current FAA Other Transaction Authority (OTA) may authorize the establishment of new Public Private Partnerships for drone activities. Such partnerships present a unique opportunity to move the drone industry forward more rapidly, while reducing government costs and risk. The FAA would be responsible for protecting the public's interest, setting policy goals and objectives, administering the procurement process, and overseeing the agreement, while the private-sector party or parties would be responsible for operating the system or program.

The FAA could set up one Public Private Partnership or develop projects on a project-by-project basis. Projects that could be developed under a PPP include UTM command and control centers; technology development and testing; UAS Integration Pilot Program; and UTM testing sites. In a PPP, the FAA's role would shift from facility operator and overseer to a performance-based contract manager.

Auction or Lease of Airspace

An auction may be considered as a way for the government to recoup costs or receive revenue for use of a public resource (*i.e.*, the navigable airspace, the public highway established by the Federal Aviation Act). In 1993, Congress gave the FCC authority to auction portions of the communications spectrum. Under this authority, the FCC has conducted several auctions,

pursuant to which it has granted licenses to companies to operate within a definable and divisible spectrum, which license would not necessarily be exclusive. Auctions serve to provide certainty to industry, while avoiding overcrowding of spectrum as well as interference with adjacent spectrum, and result in significant revenues for the government. The closest aviation analogy is the idea of auctioning of airport slots: the authority for an aircraft to takeoff or land within a thirty-minute window. Slot auctions have been proposed to address the problem of overcapacity at certain airports, where the airfield capacity is limited for efficiency and safety reasons to a certain number of flights per hour, but a slot auction has never been employed.[7] No auction process exists or has been proposed for manned aircraft use of the navigable airspace.

In a UTM scenario, Congress could authorize the FAA to conduct an auction to grant a license to UTM Service Suppliers, which would be authorized to recoup from drone operators the costs of UTM services the Service Supplier provides. Thus, the government would receive revenue for leasing the use of the navigable airspace, and the Service Supplier would be able to provide services as either a not-for-profit or profit-making entity. At this point, there is nothing close to a capacity issue with respect to the operation of drones in any airspace supporting an auction based on scarcity or capacity.

Airspace Access Charges

Congress could enact a law to require drone operators to pay the government directly for the use of the navigable airspace. A drone operator filing online a flight plan or other request to operate within the rubric of a UTM system could be required to provide a credit or debit card to pay for the services that a UTM would provide. The LAANC system, where requests to operate in controlled airspace are processed online, might be more adaptable to provide for the payment of a fee online, at the time of a request. (Currently, a person registering a drone online must pay the $5 fee with a credit or debit card.) An airspace access charge could be justified as a cost recovery fee under the general section 9701 authority, in which case the FAA would impose the charge by rule, but such a charge would rest of firmer footing if established by Congress.

6. Estimated Resources that will be Required for Activities and Initiatives

It is difficult to determine the exact financial resources the FAA will need to conduct all of the activities discussed herein. Congress has appropriated dedicated funds for UAS activities at the FAA. Ideally, these funds would be appropriately segregated from funds that support manned aviation.

[7] When the FAA proposed to establish a slot auction, the proposal was challenged for want of legislative authority. The auction proposal was withdrawn before the legal question was resolved.

For the necessary **Rulemakings, Policies, and Standards** discussed herein, we do not know whether the FAA has calculated the number of staff used for the interim final rule on electronic registration, Part 107, or the not-yet-published OOP proposed rule. Such a calculation could be used to estimate the number of FTEs necessary to complete current and future rulemakings.

For **R&D and Systems**, TG3 does not have enough information on current FAA UAS funding to estimate future resource requirements. The FY17 enacted budget for Research, Engineering, and Development (RE&D) is $20 million, but drops to $7 million in the FY18 budget request. This decrease may not support the projected increase in the continued development of UTM.

For **Training**, the working group researched course fees for similar training programs to find that costs range from $650-$1,200 per course per student. Assuming an average of six operations personnel per Part 139 airport are trained for an average of $1,000 each, we conclude that these training initiatives can be achieved in the near-term for approximately $3 million. If one employee from each of the 1,000 general aviation airports also receive training, for a cost of $1 million, we estimate a total short-term funding requirement of $4 million.

7. Conclusion and Next Steps

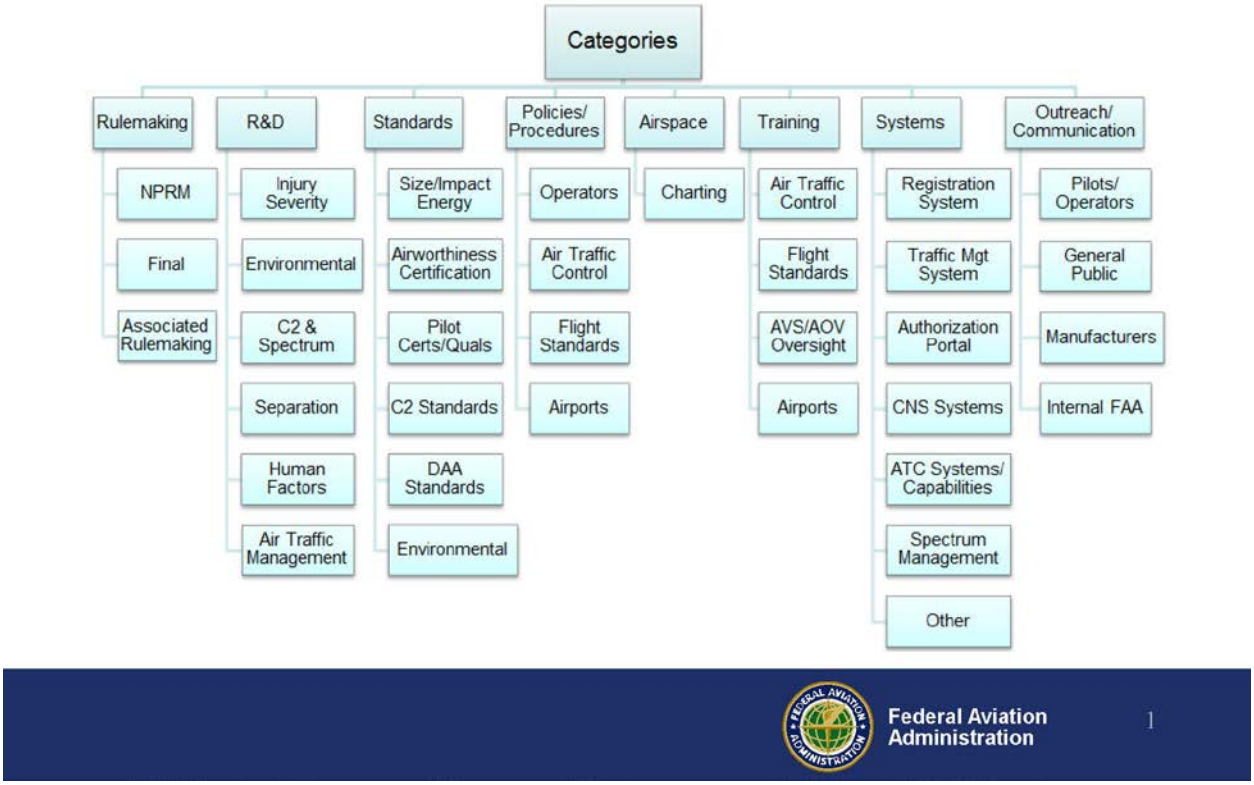
Industry, the FAA, and Congress should work together to identify one or more funding structures for the drone industry that is separate and segregated from the Aviation Trust Fund. The funding mechanism should be flexible enough to support potential far-reaching structural changes to FAA funding and activities. TG3 further recommends that FAA continue to work with industry and the DAC to develop the funding mechanism ideas, some of which are presented in this report, and forge consensus on one or a combination of these mechanisms to fund the integration of drones into the airspace.

8. Appendices

- *Appendix 1 – FAA UAS Integration Activities*
- *Appendix 2 – List of TG3 voting members*
- *Appendix 3 – FAA Tasking Statement*
- *Appendix 4 – Genesis of Aviation Taxes*
- *Appendix 5 – Decision Lens Results*
- *Appendix 6 – Funding Recommendations for each FAA Activity*

Appendix 1

Integration Breadth and Depth



Appendix 2

Mark	Aitken	Akin Gump Strauss Hauer & Feld LLP	Group Chair
Howard	Kass	American Airlines	Group Chair
Meghan	Ludtke	American Airlines	Observer
Justin	Barkowski	Aircraft Owners and Pilots Association	Member
Peter	Challan	Harris Corporation	Member
Joe	DePete	Air Line Pilots Association (ALPA)	Member
Tyler	Dobbs	Academy of Model Aeronautics	Member
John	Eagerton	Alabama Department of Transportation/NASAO	Member
Nancy	Ford	Security101	Member
Ben	Gielow	Amazon Prime Air	Member
Matthew	Grosack	DLA Piper LLP	Member
Doug	Johnson	Consumer Technology Association	Member
Charlie	Keegan	Aviation Management Associates, Inc.	Member
Lance	King	Northrop Grumman Corporation	Member
Gregory	McNeal	AirMap	Member
Albert	Muldoon	US Department of Transportation	Member
Margaret	Nagle	Google	Member
Jon	Resnick	DJI Technology	Member
Megan	Rosia	Rockwell Collins, Inc.	Member
Justin	Towles	American Association of Airport Executives	Member
Gregory	Walden	Small UAV Coalition	Member
Jennifer	Warren	Lockheed Martin Corporation	Member
Steve	Weidner	National Air Traffic Controllers Association (NATCA)	Member
Greg	White	Apex Unmanned LLC	Member
Sterling	Wiggins	Federal Aviation Administration (FAA)	Member

Appendix 3

This Page Intentionally Left Blank

U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of the Deputy Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

Drone Advisory Committee (DAC) – Task Group 3
Tasking on Unmanned Aircraft Systems (UAS) Funding
March 7, 2017

ACTION: Tasking on UAS funding.

SUMMARY: The Federal Aviation Administration (FAA) asks the DAC to provide recommendations for options on how to fund the activities and services required both by government and industry to safely integrate UAS operations into the National Airspace System (NAS) over the near and longer terms. The FAA would welcome consideration of a broad array of options, including industry assuming a lead role for certain aspects, or public-private partnerships between government and industry. This would include an evaluation of which activities and services are more efficiently done by the government, which could be performed effectively by industry, and considerations of short-term practicality and eventual scalability.

Most of the FAA's funding comes from aviation users, through a series of excise taxes on airline passengers and shippers, fuel taxes, and user fees for registration, aeronautical charting, and overflights of U.S. airspace. As the UAS sector is growing, so are its demands on FAA staffing and other resources. What will be required to safely integrate UAS will be an ongoing conversation between government and industry, but it is important to note that this work will be added on to FAA's already constrained budget. The FAA is committed to full integration of UAS into the NAS, which requires additional resources to support the required new and ongoing activities. The FAA has a draft plan describing the activities needed over the next two to five years to facilitate the integration of UAS into the NAS. Progress on integration is essential to maintain U.S. competitiveness in this field while also sustaining the exemplary aviation safety record.

TASK: The FAA tasks the DAC to evaluate and analyze potential mechanisms for UAS users to fund the activities and services required to safely integrate UAS operations into the NAS over the near term. The DAC is to make recommendations to the FAA reflecting a consensus view that could be used to inform near-term government action. In the event of failure to reach consensus, majority and minority reports may be submitted. FAA subject matter experts will be available to assist as needed.

Develop Recommendations

The Task Group should develop recommendations as to the UAS community's preferred method(s) for funding Federal activities and services required to support UAS operations for the next two years, and beyond. Multiple options may be explored and analyzed. The report should address:

1. Who should be responsible for conducting the identified activities and services needed to support the safe integration of UAS operations into the NAS?
   - Are there activities and services that could be performed by industry in the near-term or longer-term, or through a public/private partnership?
2. For the activities the FAA should perform, what level of funding resources are needed to support the safe integration of UAS operations into the NAS?
   - If funding is insufficient, which activities or services have the highest priority?
3. What funding mechanisms should be used to support these activities and services?
   - What activities and services should the Federal Government perform using traditional funding methods (such as taxes or fees)?
   - Should different Federal activities or services be paid for differently?
   - Should different types of UAS pay different amounts or via different mechanisms?
4. How could the funding mechanisms be implemented for the near-term, and how might they change as the industry evolves?
   - Is there a recommended phased or incremental approach?
   - What are the implementation issues and costs?
   - What incentives or unintended consequences might result?
5. What options were explored and rejected? Why were they rejected?

SCHEDULE: The Task Group's interim recommendation report should be submitted to the Drone Advisory Committee no later than June 30, 2017 to enable DAC consideration via teleconference in July. The Task Group should then consider feedback from the DAC, as well as the longer term evolution of funding, in a report by March 2018.

FOR FURTHER INFORMATION CONTACT: Victoria Wassmer, Acting Deputy Administrator and Chief NextGen Officer (ADA-1), and DAC Designated Federal Official (DFO) at (202) 267-8111; or Earl Lawrence, Director, Unmanned Aircraft Systems Integration Office (AUS-1) and DAC Sub Committee Federal Lead at (202) 267-0168.

Issued in Washington, DC, on March 7, 2017.

Victoria B. Wassmer
Deputy Administrator (A), Chief NextGen Officer
and DAC Designated Federal Official

BACKGROUND:

The FAA faces challenges of budget instability, budget inadequacies, and lack of management flexibility. In order to facilitate the introduction, integration and on-going operations of UAS throughout the United States, the FAA requires new resources to be devoted to this task. The UAS Implementation Plan lays out the myriad UAS activities of the Agency over the next few years and many of them require additional funds.

Up to this point, the FAA's UAS efforts have been funded primarily by reallocating personnel and shifting internal funds to support these activities, which include standing up the UAS Integration Office, developing the Agency's framework for UAS integration into the NAS, and conducting the initial implementation of the Small UAS Rule (14 CFR part 107). Absorbing these costs is impacting the FAA's ability to meet its other responsibilities. While the FAA received funding for some UAS work in prior years, the requirements to meet UAS needs is outpacing the Agency's resources. Without additional funds, the FAA will not be able to keep pace with the dramatic growth in public, industry, and business demands for UAS operations.

For example, after one month of implementing the Small UAS Rule, the demand for UAS operations had already overwhelmed our traditional systems and manual processes. The current processing and backlog of Waivers to Airspace Authorizations are similar to the issues with the exemption process for Section 333 of the FAA Modernization and Reform Act of 2012 (FMRA), which grants the Secretary of Transportation the authority to determine whether an airworthiness certificate is required for a UAS to operate safely in the NAS. However the backlog of waivers is worse due to an even higher public and industry demand. The FAA does not have the funding necessary to build automation systems that would allow the agency to meet public demand. Requirements from the recent reauthorization legislation (FAA Extension, Safety, and Security Act of 2016, P.L. 114-190) may also be impacted. For example, while the FAA will be able to conduct the pilot program on airspace hazard mitigation using unmanned aircraft detection systems required under Section 2206 of the reauthorization legislation (Public Law 114-190 (July15, 2016)), the development and implementation may need third party investment, perhaps through a public-private partnership. This situation will grow more urgent as the FAA continues through the next phase of its rulemaking activities, such as enabling operations over people or beyond line of sight. And while significant UAS traffic management efforts may be borne by the private sector, integrating operations into the FAA's air traffic control automation systems will require significant capital investment. Further, any services required to respond to the growth of UAS activities, whether counter-UAS, airspace management, or other types of service will most likely require additional investment and operational funding.

Looking beyond currently planned activities, if additional funding cannot be found, progress will be greatly impacted. All related activities required for FAA to fully integrate UAS operations into the NAS over the long-term – rulemaking, developing safety standards, conducting safety oversight, developing automation and other IT systems, and conducting research – will be impacted by limitations of FAA's current funding. For example, in order to incorporate UAS into the NAS, current systems such as En Route Automation Modernization (ERAM) and Terminal Automation Modernization and Replacement (TAMR) might require significant modifications and this will require more funding.

Industry Funded Models

In terms of industry funded activities, the ARINC model provides a good example. ARINC, established in 1929 as Aeronautical Radio, Inc., is a major provider of transport communications and systems engineering solutions to commercial airlines and airports. It provides fee-based services to the aviation industry. It was chartered by the Federal Radio

Commission (which later became the Federal Communications Commission (FCC)) in order to serve as the airline industry's single licensee and coordinator of radio communication outside of the government. Through most of its history, ARINC was owned by airlines and other aviation-related companies such as Boeing, until the sale to The Carlyle Group in October 2007, and then to Rockwell Collins in 2013.

ARINC took on the responsibility for all ground-based, aeronautical radio stations and for ensuring station compliance with FCC rules and regulations. ARINC expanded to support transport communications, as well as the commercial aviation industry and U.S. military. ARINC also helps develop consensus-based, voluntary technical standards for the aviation industry.

Other examples of industry-led activities include the FAA's Designee program, where the FAA designates qualified technical people who are not FAA employees to perform certain exams, tests, and inspections necessary to comply with applicable standards. Industry conducts these activities using its own resources under FAA oversight.

The FAA does not charge U.S. manufacturers for aircraft certification; however, there are international models where authorities such as the European Aviation Safety Agency, (EASA) impose fees on applicants seeking EASA certificates of airworthiness.

FAA Funding Today

The FAA today is largely funded through a series of excise taxes imposed on aviation users. These revenues are collected in the Airport and Airway Trust Fund (Aviation Trust Fund). Congress appropriates funds for the FAA's four budget accounts from two principal sources: the Aviation Trust Fund revenues, and contributions from the General Fund of the U.S. Treasury. Though the funds in the Aviation Trust Fund are generated by users of the airspace, they cannot be used by the FAA unless first authorized and appropriated by Congress.

The FAA has experienced a continuing resolution (CR) at the beginning of each fiscal year for the last 20 years, three instances of furloughs or shut downs in the last five years, and a series of authorization extensions (23 extensions of the last reauthorization, and currently on our third extension). Without certainty about funding levels each year, long term planning becomes extremely difficult. When operating under a CR, agencies must be careful not to overspend, so programs might not move forward as quickly as desired or expected. There is also a prohibition on "new starts" during a CR, limiting FAA's ability to be quickly responsive to emerging issues.

Airport and Airway Trust Fund (Aviation Trust Fund)

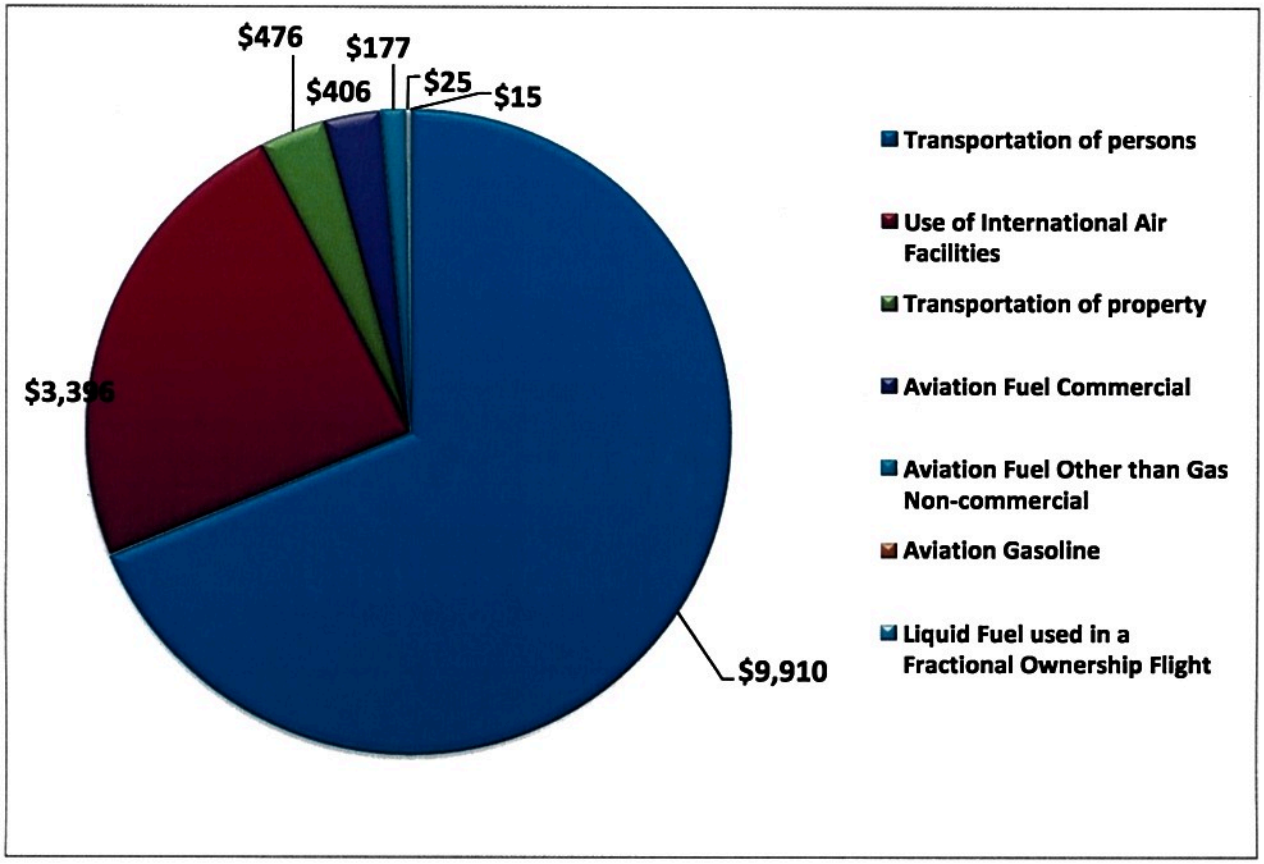
Created in 1970, the Aviation Trust Fund constitutes the primary funding source for FAA programs. Each year since Fiscal Year (FY) 2012 the Aviation Trust Fund has provided no less than 71 percent of the FAA's annual funding. In FY 2016, the Aviation Trust Fund constituted 87.8 percent of the FAA's funding.

The Trust Fund receives revenues from a variety of excise taxes paid by users of the NAS. Aviation excise taxes are imposed on domestic passenger tickets, domestic flight segments, international passenger arrivals and departures, and on purchases of air travel miles for frequent flyer and similar programs. In addition, taxes are imposed on domestic air cargo waybills and aviation fuel purchases. These taxes fall into four broad categories: (1) domestic transportation of persons; (2) use of international air facilities; (3) domestic transportation of property (air cargo); and (4) domestic aviation fuel taxes.

Aviation Trust Fund Excise Tax Structure

Trust Fund Excise Tax Revenue Sources	**Rates effective as of January 1, 2017**
Domestic passenger ticket tax	7.5 percent
Domestic flight segment tax (excluding flights to or from rural airports)	$4.10 per passenger per segment; indexed to the Consumer Price Index
Tax on flights between the continental United States and Alaska or Hawaii (or between Alaska and Hawaii)	$9.00 per passenger; indexed to the Consumer Price Index
International arrival and departure tax	$18.00 per passenger; indexed to the Consumer Price Index
Tax on mileage awards (frequent flyer awards tax)	7.5 percent of value of miles
Domestic commercial fuel tax	4.3 cents per gallon
Domestic general aviation gasoline tax	19.3 cents per gallon
Domestic general aviation jet fuel tax	21.8 cents per gallon Note: Effective after March 31, 2012 a 14.1 cents per gallon surcharge for fuel used in fractional ownership flights
Tax on domestic cargo or mail	6.25 percent on the price paid for transportation of domestic cargo or mail

Total FY 16 excise tax revenues $14,406 M



General Fund

The General Fund of the U.S. Treasury also provides resources for the Agency's Operations account. In FY 2016, it accounted for $1.9 billion of the $9.9 billion appropriated to that account. Over the past ten years, the General Fund appropriation has ranged from a low of $1.1 billion in FY 2015 to a high of $5.4 billion in FY 2010.

A funding option would be to consider the UAS industry an "infant industry" in need of special protections. The infant industry argument for tax (or regulatory) relief is typically invoked in cases where a nation sees the existence of potentially large external benefits from the growth of an industry, or the potential for other important non-economic benefits. With this consideration, Congress would need to be asked for additional General Fund support explicitly for the FAA's UAS-related resource requirements in the absence of any kind of tax or fee revenues from UAS.

Charging Mechanisms

The Congressional Budget Office defines a user fee as "money that the Federal Government charges for services or for the sale or use of federal goods or resources that generally provide benefits to the recipients beyond those that may accrue to the general public." User fees assign

part, or all of the costs, of programs and activities to readily identifiable users of those programs and activities.

One purpose for having user fees as a funding mechanism is equity, as they help ensure that government services are paid for--at least partly--by those who use them. A principal advantage of user fees over many other funding mechanisms is that they may foster production efficiency by increasing awareness of the costs of publicly provided services and therefore increase incentives to reduce costs where possible. One challenge of user fee funding is that this method may have difficulty achieving revenue adequacy if the basis of cost recovery relies on historic costs and the costs of providing services increase over time.

The FAA currently collects a variety of fees: overflight fees, registration fees, and aeronautical information services (aeronautical charting products) fees. The FAA also collects fees for the services of Flight Standards Service (AFS) Aviation Safety Inspectors (ASI) outside the United States; these fees recover the costs of certification services and approvals. Overflight fees are charges for costs of providing air navigation services for aircraft flights that transit U.S.-controlled airspace, but neither land in nor depart from the United States. The FAA charges separate fees for en route and oceanic airspace services; the fees charged reflect FAA cost accounting and air traffic activity data. Overflight fees fund the Department of Transportation's Essential Air Services program and do not support any FAA activities or operations.

The FAA also charges fees for aircraft registration and airmen (replacement) certification. The current fees were established in the 1950s and 1960s and have never been updated. Under the 2012 FAA Reauthorization, the FAA was directed by Congress to update fees and to begin charging fees for three additional activities (airmen certificates, airmen medical certificates, and legal opinions related to aircraft registration). At the present time, the FAA is in rulemaking to establish new and updated fees.

Since 1926, the Federal Aeronautical Charting Program has been a fee-based service. Congress transferred the program from the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA) to the FAA in October 2000. Public Law 106-181, dated April 5, 2000, provided for the FAA to charge user fees to recover the full costs of the compilation, production and distribution of both electronic and paper charts. Recently, with the rise of digital formats for our navigation and charting products and the corresponding reduction in paper sales, the Agency has faced challenges in fully recovering these costs.

In comparison with fees, a tax has the primary purpose of raising revenue. Taxes are unrequited in the sense that benefits provided by the government to taxpayers are not normally in proportion to their payment. Tax represents revenue that a government collects; such revenue typically comes from an individual or business when they perform a particular action or complete a specific transaction. Such a tax is often assessed as a percentage of an amount of money involved in the transaction e.g., a tax is often placed on the sale of goods or services, such as the aviation excise taxes explained above.

Sometimes the line between user fees and taxes is blurred, as in the case of federal gasoline excise taxes being used to fund the Interstate Highway System. This tax system is based on the

"user pays" principle in which the costs of the construction and maintenance of roadways are paid by the individuals and firms that use and benefit from the service through taxes. Like user fees, Congress can – and sometimes does – choose not to make the full amount of taxes available to a Federal agency for expenditure and the balances in a dedicated trust fund (like the Aviation Trust Fund) may accumulate and go unspent.

UAS users and operations could be taxed for FAA services in varied ways. For example, a UAS purchaser could incur a sales excise tax with the rationale that there is a likely to be a tie-in between the expected future operations of the UAS and the use of government (FAA) services. Alternatively, an excise tax could be levied on the price paid for commercial services rendered by UAS operations. This tax could be analogous to the excise tax on the price paid for the transportation of domestic air cargo. Either of these taxes (a tax on the good purchased or a tax on the service provided) would require new, and potentially, substantial federal tax administration.

Implementation Considerations

Legislative authority is required in order to provide federal revenue through user fees, taxes or the General Fund. Taxes generally fall under the jurisdiction of the tax committees, while user fees can be handled through authorizations and/or appropriations. For many years, the FAA has had an annual appropriations law prohibition on instituting new user fees, which would need to be addressed. In addition, obtaining new funding from Congress involves navigating its inherent political nature and political challenges.

Congress could set fees in statute but rulemaking may be necessary if Congress is not prescriptive enough or establishes cost-recovering user fees. For example, the FAA is currently promulgating rules updating overflight fees and for establishing new and updated aircraft and airman registry fees. If user fees are established, the FAA would most likely be the billing and collection agency for the fees. Federal excise sales taxes are administrated by the Internal Revenue Service (IRS).

Fees and taxes can also change behaviors by creating disincentives or friction. For example, a transaction-based fee charged as a condition of receiving a specific service may cause people to avoid the service. This is undesirable for fees that have potential safety implications. In contrast, a point-of-sale retail tax appears to the user as essentially bundled into the retail price, and so appears simple. Its impact on the purchase decision will be influenced by its size relative to the purchase price and the overall price sensitivity of the purchaser.

Any funding mechanism will have impacts on those charged as well as practical considerations for implementation. The administrative burdens vary both for entities paying and charging. There are costs and time processes associated with establishing and collecting fees, as well as with enforcing compliance. As UAS are further integrated into the NAS, industry environment will continue to change along with the regulatory landscape. The funding solution needs to be flexible and scalable to accommodate these changes.

Lastly, options for a funding structure for UAS should not be constrained by the current traditional aviation funding structure. At the same time, as funding structure for UAS should not be expected to alter the current structure of funding for traditional aviation.

Appendix 4

This Page Intentionally Left Blank

Taxation of aviation related activities prior to 1970

- Transportation including aviation have been subject to special taxes (fuel, tires, oils, etc.) for decades. Originally those taxes were not dedicated to transportation purposes.
- The Revenue Act of 1932 which imposed the first federal gas tax and reimposed taxes on oil lubricants, tires, and inner tubes specifically included aeronautical uses among other transportation uses subject to the taxes.
- Excise taxes on the transportation of persons and property were imposed during the early 1940s as war revenue measures. These taxes were taxes on general transportation including aviation transportation. In subsequent years, tax legislation began setting precedents for separate taxes and separate rates for aviation related activities.
- The revenues obtained from these taxes were not applied directly to airways expenditures. They were either earmarked for other purposes or went into the general fund of the Treasury.

FAA

Preparing for the future of air transportation

The ability to transport people and products by air-safely, surely, and efficiently is a national asset of great value and an international imperative for trade and travel. That ability is being challenged today by insufficiencies in our nation's airports and airways. The demand for aviation services is threatening to exceed the capacity of our civil aviation system.

The proposed airport program consists of both an expanded planning effort and the provision of additional Federal aid for the construction and improvement of airports.

To provide for the expansion and improvement of the airway system, and for a high standard of safety, this Administration proposes that the program for construction of airways facilities and equipment is responsive to the substantial expansion in the operation and maintenance of the air traffic system in the next decade. Technology is moving rapidly and its adaptation to provide future solutions must keep pace. Consequently, this program includes a provision for a doubling of development funds.

However, the added burden of financing future air transportation facilities should not be thrust upon the general taxpayer. The various users of the system, who will benefit from the developments, should assume the responsibility for the costs of the program. By apportioning the costs of airways and airports improvements among all the users, the progress of civil aviation should be supported on an equitable, pay-as-we-grow basis.

The revenue and expenditure programs being proposed are mutually dependent and must be viewed together. We must act to increase revenues concurrently with any action to authorize expenditures; prudent fiscal management will not permit otherwise.

RICHARD NIXON
White House
June 19, 1970

FAA

Financing government outlays for air transportation

Revenue passenger miles on U.S. domestic scheduled air carriers more than tripled from 1960 to 1970 and are projected to almost triple again from 1970 to 1980. From 1970 to 1980, total aircraft operations are expected to rise by 179 percent and total IFR aircraft handled at FAA air route traffic control centers are projected to increase by 86 percent. These growth indicators depict an urgent need to provide facilities to meet the demand for the use of the system.

To provide additional revenue for the financing of the increased Federal Government outlays for the expansion and the development of the airport and airway system, new and increased user taxes are necessary to pay for an increasing portion of the total Federal Government expenditures for the air transportation system. Without these user taxes the general taxpayer would be required to finance most of the cost of the system through general appropriations, if the need is to be met.

The Trust Fund is created in order to insure that the aviation user taxes are expended only for the expansion, improvement, and maintenance of the air transportation system.

•Report submitted by the Senate Committee on Finance--February 1, 1970

FAA

Establishing the Airport and Airway Trust Fund

- In 1970, Congress passed the Airport and Airway Development Act and the Airport and Airway Revenue Act. Congress initiated these two acts to deal with the inadequacy of the Nation's airport and airway systems in meeting current and future projected growth in aviation. The Airport and Airway Trust Fund, also known as the Aviation Trust Fund, was enacted by the latter act and was effective on July 1, 1970

- The Airport and Airway Revenue Act of 1970 authorized the aviation trust fund and aviation-related excise taxes to finance aviation. Taxes for the trust fund included the existing taxes on aviation gasoline and passenger tickets on domestic flights, and three new taxes, which were on international passenger tickets, air-freight waybills (transportation of property by air, i.e. cargo), and annual aircraft registration.

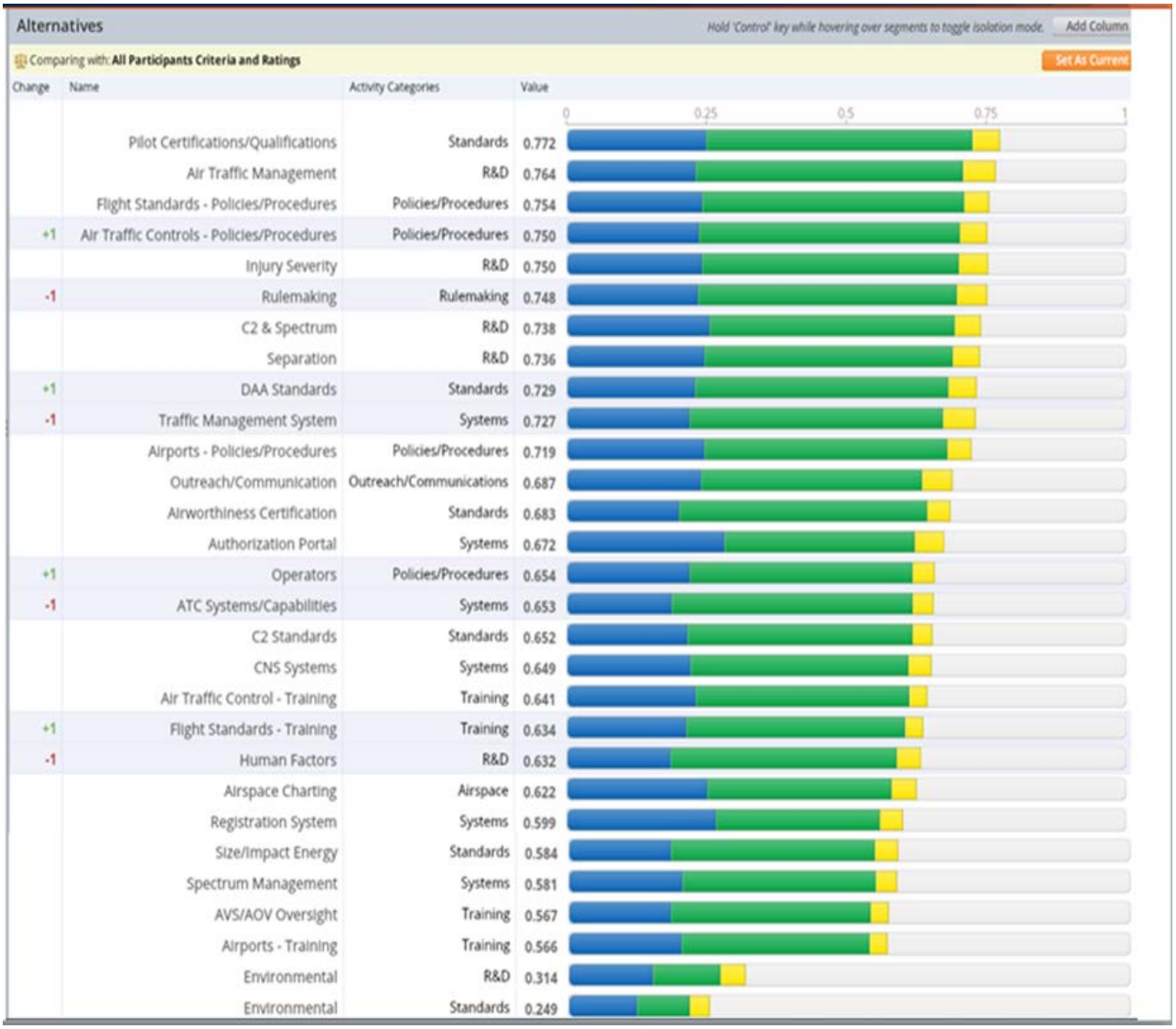
The Airport and Airway Trust Fund Evolves

- Debate over the proper use of the trust fund and what proportion could be spent on the operation and maintenance of the air traffic control system began almost immediately. Proposals by the Nixon Administration in 1971 to restrict capital spending from the trust fund, while fully funding FAA operations from it, led the Congress to restrict trust fund spending to only the capital costs of the aviation system, some administrative expenses, and research and development activities related to air navigation safety; use of trust funds for maintenance and operation of air navigation facilities was no longer permitted. Beginning in 1977, the trust fund was authorized to fund again a portion of FAA operations spending in addition to aviation capital requirements.

- The tax and fee structure and the rates charged have been modified on several occasions, most notably by the Taxpayers Relief Act of 1997. Among other changes, this Act added a flight segment (i.e., a single takeoff and landing) tax, a tax on the purchases of the right to award frequent flyer miles, and a reduction in the tax rate on passenger tickets on domestic flights (from 10% to 7.5%). Certain taxes are indexed to inflation.

FAA

Appendix 5


Alternatives
Hold 'Control' key while hovering over segments to toggle isolation mode.
Add Column
Comparing with: All Participants Criteria and Ratings
Set As Current
Change
Name
Activity Categories
Value
0
0.25
0.5
0.75
1
Pilot Certifications/Qualifications Standards 0.772
Air Traffic Management R&D 0.764
Flight Standards - Policies/Procedures Policies/Procedures 0.754
+1 Air Traffic Controls - Policies/Procedures Policies/Procedures 0.750
Injury Severity R&D 0.750
-1 Rulemaking Rulemaking 0.748
C2 & Spectrum R&D 0.738
Separation R&D 0.736
+1 DAA Standards Standards 0.729
-1 Traffic Management System Systems 0.727
Airports - Policies/Procedures Policies/Procedures 0.719
Outreach/Communication Outreach/Communications 0.687
Airworthiness Certification Standards 0.683
Authorization Portal Systems 0.672
+1 Operators Policies/Procedures 0.654
-1 ATC Systems/Capabilities Systems 0.653
C2 Standards Standards 0.652
CNS Systems Systems 0.649
Air Traffic Control - Training Training 0.641
+1 Flight Standards - Training Training 0.634
-1 Human Factors R&D 0.632
Airspace Charting Airspace 0.622
Registration System Systems 0.599
Size/Impact Energy Standards 0.584
Spectrum Management Systems 0.581
AVS/AOV Oversight Training 0.567
Airports - Training Training 0.566
Environmental R&D 0.314
Environmental Standards 0.249

Appendix 6

Priority	**Activity**	**Lead Funding (Short-Term)**	**Lead Funding (Long-Term)**
1	Pilot Certifications/Qualifications - Standards	Gov't. & Ind.	Gov't. & Ind.
2	Air Traffic Management – R&D	Gov't. & Ind.	Gov't. & Ind.
3	Flight Standards Policies/Procedures	Government	Government
4	Air Traffic Controls - Policies/Procedures	Government	Government
5	Injury Severity – R&D	Gov't. & Ind.	Gov't. & Ind.
6	Rulemaking	Government	Government
7	C2 & Spectrum – R&D	Gov't. & Ind.	Gov't. & Ind.
8	Separation – R&D	Gov't. & Ind.	Gov't. & Ind.
9	DAA Standards	Gov't. & Ind.	Gov't. & Ind.
10	Traffic Management System	Gov't. & Ind.	Gov't. & Ind.
11	Airports - Policies/Procedures	Government	Government
12	Outreach/Communication	Gov't. & Ind.	Gov't. & Ind.
13	Airworthiness Certification	Gov't. & Ind.	Gov't. & Ind.
14	Authorization Portal	Gov't. & Ind.	Gov't. & Ind.
15	Operators	Industry	Industry
16	ATC Systems/Capabilities	Gov't. & Ind.	Gov't. & Ind.
17	C2 Standards - Standards	Gov't. & Ind.	Gov't. & Ind.
18	CNS Systems	Gov't. & Ind.	Gov't. & Ind.
19	Air Traffic Control - Training	Gov't. & Ind.	Gov't. & Ind.
20	Flight Standards - Training	Gov't. & Ind.	Gov't. & Ind.
21	Human Factors – R&D	Gov't. & Ind.	Gov't. & Ind.
22	Airspace Charting	Government	Government?
23	Registration System	Government	Government

24	Size/Impact Energy	Government	Government
25	Spectrum Management	Government	Gov't. & Ind.
26	AVS/AOV Oversight	Government	Government
27	Airports - Training	Government	Gov't. & Ind.
28	Environmental – R&D	Gov't. & Ind.	Gov't. & Ind.
29	Environmental - Standards	Government	Government

6 Drone Advisory Committee Meeting 5 Minutes

RTCA, Inc.
1150 18th St. NW
Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
November 15, 2017

RTCA Paper Number: 306-17/DAC-010

Drone Advisory Committee (DAC)
November 8, 2017 Meeting Minutes

List of Attachments

- Attachment 1: Attendees
- Attachment 2: Agenda
- Attachment 3: Presentations *Please visit www.rtca.org to view presentation slides*

Summary

The November 8, 2017 DAC meeting was hosted by Amazon at the Amazon Meeting Center in Seattle, WA. The DAC heard presentations from The MITRE Corporation and three Task Groups (TGs): TG1 - Roles and Responsibilities, TG2 - Access to Airspace, and TG3 - Unmanned Aircraft Systems (UAS) Funding. Michael Guterres of The MITRE Corporation presented the results of a local government outreach effort conducted by MITRE and Juan Alonzo, DAC member and Stanford University Professor. The outreach efforts gathered feedback from local government officials on the desired role of local governments in regulating low-altitude drone operations. MITRE conducted focus-group sessions on this topic at the annual conferences of the U.S. Conference of Mayors, and the National Association of Counties.

The Co-Chairs of TG1 presented a summary report of nine common principles developed by the TG. Of the nine principles presented, five had gained full Task Group consensus and four represented the TG majority opinion. The language of the four remaining principles was disputed and as a result, two versions of the four non-consensus principles were presented. TG2 presented five final recommendations intended to guide future activities necessary to provide access to airspace for drones. With several small editorial changes suggested by the DAC, the Committee unanimously approved the recommendations for submission to the FAA. TG3 provided a summary of their work completed since their July 2017 interim report. They plan to present final recommendations to the DAC at its first meeting in 2018. The meeting discussions are summarized below. All times noted below are Pacific Standard Time (PST).

RTCA, Inc.
1150 18th St. NW
Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
November 15, 2017

RTCA Paper Number: 306-17/DAC-010

Official Statement of the Designated Federal Officer
Dan Elwell, Deputy Administrator and Chief NextGen Officer, FAA

The Designated Federal Officer (DFO) statement was read by FAA Deputy Administrator Dan Elwell at 9:02 AM.

DAC Chairman's Report
Peter Cleveland, Vice President, Government and Policy, Intel Corporation

DAC Chairman Brian Krzanich was unable to attend the meeting. Mr. Peter Cleveland, Vice President, Government and Policy Group for Intel, led the meeting in his place. Mr. Cleveland welcomed everyone to the meeting and thanked Amazon (specifically Gur Kimchi, Sean Cassidy, Ben Gielow, and Naomi Duprey) for hosting the previous evening's event. He complimented Amazon on the meeting space and thanked them for hosting the committee. He noted that much has happened since July in the drone space. The wildfires and hurricanes over the past months demonstrated the usefulness of drones. Mr. Cleveland acknowledged the FAA for moving quickly to allow drone technology to be used, stating that the constructive approach of advising and partnering with the FAA leads to the best results. He commented that Dan (Elwell) is gaining experience in his new position and that he is appreciated. Mr. Cleveland noted that Ethan Klein of the White House Office of Science and Technology Policy (OSTP) would be making a presentation on the newly created UAS Integration Pilot Program, in addition to the MITRE and TG reports. Next, Mr. Cleveland recognized the efforts of TG1 (Co-Chairs Brendan Schulman and John Eagerton) and commended RTCA's rebalancing efforts in support of the group. He noted that TG1 has developed a list of Common Principles and will present a status update on that work. He then recognized TG2's (Co-Chairs Sean Cassidy and Rob Hughes) efforts in developing their final recommendations for DAC consideration. Next, he acknowledged TG3 (Co-Chairs Mark Aitken and Howard Kass) and highlighted that they would provide a status update as the final presentation for the day. TG3 is mid-task and is working on identifying alternative funding mechanisms as options for funding efforts to integrate drones in the airspace.

Mr. Cleveland recognized the excellent leadership of outgoing DAC Subcommittee co-chair, Bryan Quigley, and welcomed his replacement, John Allen, of jetBlue Airline. He emphasized John's experience and credibility as a leader. Following this, Mr. Cleveland emphasized that the DAC conducts a transparent process and its meetings are open to the public. He verified with DAC secretary Al Secen that no public comments had been requested to be made during the meeting.

Approval of Minutes from Previous Meeting

The minutes of the previous meeting were unanimously approved as distributed.

RTCA, Inc.
1150 18th St. NW
Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
November 15, 2017

RTCA Paper Number: 306-17/DAC-010

FAA Remarks

Dan Elwell, Deputy Administrator, and Chief NextGen Officer, FAA
Ethan Klein, Policy Advisor, White House Office of Science and Technology Policy
Earl Lawrence, Executive Director, FAA UAS Integration Office
Teri Bristol, Chief Operating Officer, FAA Air Traffic Organization

Please see attachment 4 for the FAA Deputy Administrator and Chief NextGen Officer's remarks.

Mr. Ethan Klein presented a slide that introduced the new UAS Integration Pilot Program. The Administration sees this pilot program as a priority. Mr. Earl Lawrence also presented additional information on the pilot program and informed the DAC that an announcement of the program was officially released in the Federal Register, thus opening the application window for the program. Mr. Lawrence outlined the sequence of events for applying and being awarded a role in the pilot program. He reviewed the application process and indicated there had been substantial interest already shown. He further noted that additional information is available online on various websites.

Ms. Teri Bristol spoke about the success of LAANC (Low Altitude Authorization and Notification Capability) in reducing the time of approving authorizations for drone operators from days to minutes. The LAANC program is a partnership between the industry and FAA. It provides an automated process that reduces the approval time from 60-80 days, to 15 seconds.

Question: What role will the DAC play in the pilot program process?

Response: That was alluded to in opening remarks of the Deputy Administrator. There is an expectation of a re-tasking of TG1 to assist with the pilot program. That full tasking is expected soon. The websites set up by the FAA have FAQs and information about the pilot program. There is a helpdesk and social media presence. But before a new tasking for TG1 can be released it must be reviewed to ensure there will not be an organizational conflict of interest (OCI) for companies that wish to serve on the DAC and participate in the pilot program.

Question: How is the pilot program addressing liabilities?

Response: There have been no proposals received yet. The FAA wants to be surprised and hear things that are important. Liabilities have been discussed in reference to local communities with respect to drone operations. The FAA is looking for these projects to help determine answers to these questions. The White House is making sure that the FAA is working with local authorities to address these issues. Additionally, the FAA is looking to dive down into those tough questions to identify responsibilities. Other federal agencies are involved in the pilot program and will provide their expertise.

RTCA, Inc.
1150 18th St. NW
Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
November 15, 2017

Question: Can the FAA elaborate on whether airport authorities can apply as a lead for a proposal?

Response: Yes, they can apply. Several already have.

Question: Will there be any public review period to allow comment on the proposals?

Response: No, because this is a contracting opportunity and there is a Screening Information Request (SIR) that lays out exactly how the proposals will be evaluated. There is no expectation of the public reviewing the material. Additionally, the FAA has direction from the Presidential Memo to coordinate with DoD, DHS, and NASA to get input on applicants. The decision to award lies with the Secretary of Transportation.

Question: Does this mean that only government will review for safety and security?

Response: Yes, But the FAA is soliciting community involvement as well. Applicants should coordinate with the public to determine their interest. If the public citizens of the locality applying for the program are not interested in having the program go forward, it will score lower in evaluations. There are a maximum number of applications (1,000) and it is expected that some of them will address drone operation time/use/manner questions, or zoning regulations affecting take-off and landing. Involving communities in the development of the proposal will serve as the community vetting process.

Question: Is there any federal funding for the pilot program?

Response: There will be no federal funding.

Question: Data will be very important in this endeavor. Is there a plan for what data will be collected, how data will be collected, and to whom and how the data will be disseminated?

Response: The FAA has been preparing for this program for a while. The planning office in the FAA is proceeding in a methodical way to define data required and data-gathering steps. The FAA is building on the existing Mission Logging System for test centers but will not set forth data requirements ahead of time. Those requirements will be articulated in the MOA agreements approved regarding what data will be collected (technical, information, community established criteria, etc.)

Question: Will there be any commitment to make the data collected available to everyone?

Response: Yes – all collected data will be available in the presidential report. A decision on releasing in any other form has not yet been made.

Question: Authorizations and pilot authorizations have been victims of our success. Automation is key. Help us understand the data collection process and how the data is going to be used--how state and

local officials can participate? How is this going to be automated, and how this will come together over time?

Response: FAA will be focusing on automating the system. Applicants need criteria and the local communities will teach them what they need. A sheriff can call [FAA] ATC and request a flight restriction. Many forget that. What criteria do they use to request airspace restriction? If we can automate that, it would be very helpful and will also help with the UTM concept. How we put it all together will be key in moving forward.

Question: (Follow up question) In manned aviation we have had great success in collaborating on safety cases. We have done so working as a team (labor, private, operators). This seems to be different. I am encouraged by the [pilot program] initiative but am concerned the process could exclude insights from some stakeholders.

Response: Are you referring to the Commercial Aviation Safety Team program? (Questioner: Yes, In part).

Response: I misunderstood the previous question as asking if all stakeholders would be involved in the selection (award) process. What you are describing is exactly what we want for the conops of the future. They would not be involved in the selection, but we would expect the proposal to address safety.

Question: Do you see the lead applicants being grouped by mission, or use cases, or by institutional affiliation? Will priority be given to certain use cases?

Response: The memo outlines the objectives. Geographic diversity (and others) will be a selection criterion. The criteria are also outlined in the memo (technological advancements, balancing of local and federal authority, what is the interaction among them). UTM, BLOS, etc. will be prioritized. We are looking for diversity among the projects selected. Proposals should assume using existing authorities and resources. Also, this is a rolling program, in which we will initially tee up at least 5 projects for the Secretary to endorse. The final number will be driven by resources (i.e., the larger the projects, the fewer there will be (and vice versa) due to resource limitations).

Question: Regarding liability and safety, how does the safety responsibility get delegated to local authorities?

Response: Everything is predicated on existing laws and regulations. Any project that requires BVLOS requires the appropriate exemption and waivers from FAA. BVLOS site projects will get priority because we are trying to advance those particular activities. However, the proposed operation still must be safe. The idea is to not bypass safety requirements.

Question: What altitudes are involved in pilot program?

Response: The presidential memorandum opens up to 200 feet and allows up to 400 feet for operations.

Question: How would you view any overlapping or layering of local governments applying for the pilot program?

Response: We would welcome multi-jurisdictional applications that are being cooperative among multiple jurisdictions.

Question: Who will ensure coordination among levels?

Response: We are learning more and more about overlapping authorities. The FAA has learned that some local authorities can't apply to the pilot program because their state pre-empts them. The FAA is learning how this works and is not quite sure how this will be covered. We will take applications at face value, judging applications on information received. We expect that coordination among local jurisdiction will be done prior to application with FAA. We are moving forward with the underlying assumption that if a city is applying for something they have the legal authority to do so.

Comment: This presentation has been very helpful to the DAC and TG1 also. We expect data gathered will feed back into our future tasking.

MITRE Presentation on Local Outreach

Michael Guterres, Principal, Navigation & Unmanned Aircraft Systems, The MITRE Corporation

Mr. Guterres presented findings from their focus sessions with city and county representatives at the US Conference of Mayors Conference and the National Association of Counties Conference (refer to the slide material for the details of the presentation). The main topics discussed included input from participants on opportunities, challenges and issues facing local authorities, and communities with respect to the drones in the airspace. Mr. Guterres presented information in the following areas: background information; county and city representatives; state map outline; major findings; jurisdiction and enforcement; outreach; education and training; major concerns; benefits and positive feedback; differences between mayors' and county officials' feedback; and recommendations and next steps.

Comment: A member noted the tactical perspective of the counties and the strategic perspective of the mayors. The existence of a consistent data model of perspectives is encouraging.

Question: Is education and training a topic that the DAC will take on this afternoon or is it being tabled until TG1 is re-tasked?

Response: There were thoughts of asking the DAC to incorporate education and training into their recommendations going forward. The focus sessions conducted by MITRE alerted local officials to an existing monthly FAA telcon with law enforcement. We need to get that word out more.

Question: Did the study reveal any interest in local authorities regulating manned aircraft?

Response: No. The concern was brought up (i.e., a patchwork of rules). Some stated it could perhaps be managed like 911 (the emergency phone number). There was general recognition of the challenge, but not many solutions. Many are looking at drones as extended ground assets.

Comment: (Non-DAC member) Tom Odell, representing the NLC, stated the NLC has already been getting letters about drones. He commended MITRE for their presentations and encouraged them to include NLC in their research.

Response: RTCA noted that Brittney Kohler is a working with them to ensure they have the right representatives on the DAC TGs, and she, in fact, recommended that Mr. Odell attend this meeting.

DAC Subcommittee Co-Chairs

Nancy Egan, Consultant, 3DRobotics, and John Allen, Vice President of Safety, jetBlue Airways

Mr. Cleveland introduced Nancy Egan and John Allen as the Co-Chairs of the DAC Subcommittee. Ms. Egan thanked the FAA and member organizations of the DAC who helped with the California wildfires this summer. She further thanked the FAA, Dan Elwell and Earl Lawrence for providing encouragement to the DACSC to bring the best thinking forward, including alternate views so the FAA gets the benefit of the best substantive thinking. Ms. Egan thanked the leaders and members of TG1, TG2 and TG3, who have put in many hours and produced incredible work. She also welcomed new Co-Chair, John Allen.

John thanked Ms. Egan and Bryan Quigley (outgoing DACSC Co-Chair) for their work. He stated that a regulator should be an enabler for new technology and to make new technologies work. This means we should not be risk averse and we should build trust. They then introduced TG1 Co-Chairs, Brendan Schulman and John Eagerton.

RTCA, Inc.
1150 18th St. NW
Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
November 15, 2017

RTCA Paper Number: 306-17/DAC-010

TG1 – Roles and Responsibilities Report Out

Brendan Schulman, Vice President of Policy and Legal Affairs, DJI Technology and Dr. John Eagerton, Chief, Aeronautics Bureau, Alabama Department of Transportation/National Association of State Aviation Officials (NASAO)

The Co-Chairs presented the work completed since May. The TG has refocused on the Roles and Responsibilities aspect of the tasking, moving away from initial focus on enforcement. They provided a description of the meetings and exercises conducted by TG1, which included a field exercise looking at UAS altitude and the ability for ground observers to determine a UAS altitude accurately. The outcome of the field trip experiment served as input to the common principles. The field exercise was conducted to provide operational data to understand the technology and its impact on ground observers.

Following this, as well as the extensive TG meetings and discussions on these topics for several months, a "line in the sky" thought experiment was conducted to determine the efficacy of the existence of a specific line in the sky [an altitude below which local jurisdiction could have some authority to manage drone operations]. Two subgroups were formed to explore outcomes in a world with the opposite view they personally held for the "line in the sky" argument. This required members to adopt and understand views they would normally not accept and to candidly discuss their concerns and desires for that scenario. The experiment produced excellent discussion and was a flexion point in the discussions to date. These experiments and discussions resulted in the formation of 9 common ground principles.

Teams self-formed to flesh out the principles into papers. By late September, it was obvious consensus on the papers was not possible in the time remaining, so the team refocused on just getting consensus on the principles themselves. A smaller team was formed to reach this consensus.

In bringing the 9 common ground principles (5 of which reached full consensus and 4 of which were majority opinions) to the DAC, the members should recognize that the principles, although presented singularly, should be considered in total. Some members of the TG indicated that their support of one principle depended on the existence of one or more other principles.

Please see the slide material of TG1 for the presentation details of the 9 principles.

The 9 Principles as presented are:

(1) Public Process to support reasonable outcomes for Local UAS Ordinances/Laws (Full Consensus)
(2) UAS Operations Impact on Private Property and Interests (Majority Opinion)
(3) Common Ground Not Applicable to Manned Aviation (Full Consensus)

(4) Takeoff and Landing (Majority Opinion)
(5) Initial UAS State and Local Model Policy or Guidance (Full Consensus)
(6) Altitude Estimation Challenges (Majority Opinion)
(7) FAA's Role in Aircraft Certification (Majority Opinion)
(8) Unjust or Unreasonable Discrimination (Full Consensus)
(9) Generally applicable state criminal law and state tort law (Full Consensus)

Alternate opinions submitted by some of the TG participants were also presented by the Co-Chairs.

The Co-Chairs concluded by welcoming new tasking from FAA and thanking those who attended the meetings and assisted in developing the work to date.

Comment: Mr. Cleveland thanked the TG1 leadership for their hard work.

Comment: A letter from the Mayor of San Francisco (DAC Member, not in attendance) was summarized by the Mayor's aide. The representative thanked the Co-Chairs for the presentation and clarified that where there is an alternative opinion, it is a unified response from all city/state/local representatives on TG1.

The representative then summarized the letter from Mayor Lee. The letter is attached.

First member response: A member responded that he respectfully could not disagree more with the letter and its characterization of the intent behind the TG, the way TG1 worked. Numerous invitations were extended to the state, local, and county representatives. A list of the names of the members from local, state, county representatives including several from the San Francisco Mayor's office that attended the kickoff meeting for the creation of the common principles was presented. In fact, San Francisco was better represented at the meeting than any other stakeholder and attended both sessions of the thought experiment despite the request from the exercise organizers to take part in only one. Invitations to join and participate in the TG had been made many times. The member then read from an email from the San Francisco representative in early July in which San Francisco was offered membership and San Francisco replied that they should NOT be listed as a member, but would be willing to act as an observer. The work of the members was in good faith, and the number of in-person meetings shows that this was not an attempt to drive through a single view or option. The member took personal and professional exception to the accusations from the Mayor's representative and others not familiar with the group's work as to what the team was trying to do and the good work done to get to this point.

Second member response: Several members of TG1 recognized early the need to re-balance the group, adding more local voices, and the member commended the work that RTCA conducted reaching out to and attempting to bring in additional groups, particularly from local governments. The challenge for the

Co-Chairs regarding newly added participants is to bring them up to speed on the past work accomplished before they arrived; to keep the process moving without interruption, yet bring new members aboard. The leaders tried very hard to accommodate that reality via information distribution and communication mechanisms. They attempted to find dates for meetings that met most people's schedules through polling. They did their best to pick time/place/venues to have all participate. Meeting notes and data are all posted to Workspace for members to review. All members have other jobs and are working hard - there are challenges and the TG has done as good a job as they could with the challenges they faced.

Third member (DFO) response: Appreciate both answers from the Co-Chairs. The FAA seeks recommendations and consensus, but the FAA found the options to be edifying and the discussion of how they were reached very interesting. He thanked the Co-Chairs for characterizing the alternative opinion as options and noted that he did not hear the output characterized as consensus and "minority rebuttal", saying it was gracious of the Committee to do that. He acknowledged that he has been working with RTCA on the reconstituted TG makeup that he hopes will be more balanced. He recognized the many requests for additional community involvement and will keep working to maintain that balance.

Question: Hypothetically, if the TG balance had been closer to 50/50 in makeup [local government to industry], would the makeup of the principles have been substantively different?

Response: The experience of the Co-Chairs has been that the ratio of representatives is not as important as the attempt to make a thoughtful, good idea to gain support. One person can offer an excellent idea. The exercise to develop the principles was to "put yourself in the other world", which means we had two, roughly, equal numbers of people in each group.

Comment: From manned aviation perspective, having a variety of opinions is normal. The public must buy-in to any change in accepting drones. We should all keep that in the forefront of the process. Every opinion is important, and we should not undermine public confidence.

Comment: The process is moving along. The previous comment regarding active involvement is right on. Our organization (National Association of Counties) supports the process and will be an active and thoughtful participant going forward.

Comment: In the case of law enforcement, that role is a unique public role and we need to have the right numbers to address these unique concerns. They have been present as subject matter experts, but should be brought on as members for the entirety.

Question: What are the mayor's thoughts on what consensus is?

Response from Mayor's Representative: If the goal is to have consensus, you have to come to agreement on something. That may be impossible and that is recognized. But this process was not consensus as the principles were not presented as balanced. When options were presented, Option 1 was shown as the work of the TG and Option 2 was shown as a subset of the whole group. We don't support that view.

Comment (DFO): As a DAC Member, I did not interpret what I heard that way. The leadership did a very nice job of presenting the material as option 1 and option 2, and it's very clear that option 2 is also not consensus. Option 2 is the view of a narrower group than what option 1 represents. We have to be careful to say that when this is presented, the leaders are not biasing this one way or another. What's coming out is something very different than that.

Comment: It is important to note these are not recommendations. Option 1 was the result of the thought experiment and discussion by the group as a whole. Option 2 was a submitted alternative that was not subject to discussion by the group. So, the two options are actually different, but neither one is being reflected as consensus or a recommendation.

Question: Is there a new direction for TG1?

Response (DFO): The new tasking is being refined. It will be closely aligned with the pilot project and the DAC can help inform the pilot project. TG2 may also be better aligned to support the pilot project.

Question: Can the Co-Chairs comment more on the experiment on the line in the sky and can it help the DAC establish airspace going forward?

Response: Principle 2 deals with the Line in the Sky experiment. It was thought by most members that, if there is a line, (below which is owned and managed by local authorities rather than the FAA) it matters where you put it. Putting the line too low is a concern for privacy and can be handled by privacy laws or other constructs. Putting the line too high begins to intrude on useful airspace operations that save lives and transmit the news and other operations recognized as beneficial. It will matter where that line goes, and the higher the more flexible the regulation has to be (exceptions, presumptions, etc.). Perhaps the pilot program can help here (this was discussed during the TG1 field trip).

Question: Most language in the principles is about privacy and trespass, but what about safety - where does that come into play in the discussion?

Response: The TG had guiding principles developed a year ago and safety was paramount. After the prioritization exercise early on, the group focused on enforcement. The tasking statement asked what the interests of the government in UAS integration were.

Safety, if not explicit, is implicit in everything we discuss. Flying over people and flying low raises safety concerns.

Comment: Every time we look at recommendations, we should look at them with safety lens. How does each principle increase or decrease safety, and that increase or decrease can be changed based on the different perspectives?

Comment: The pilot program and the structure of the data to be collected needs to be looked at closely. Policy issues need to be thought of in terms of data that can be collected.

Outcome: TG1's presentation of Common Principles was accepted by the DAC. TG1 will be reconstituted for follow-on taskings.

TG2 – Access to Airspace Report Out

Sean Cassidy Director, Safety & Regulatory Affairs, Amazon Prime Air, and Rob Hughes, Senior Policy Advisor, Northrop Grumman Corporation

Mr. Cleveland introduced TG 2 Co-Chairs and noted that their work has been reviewed by the DAC previously (at the May meeting). The TG was given instructions to update their material and that has been done and brought back to the DAC for approval. The recommendations delivered to the DAC today will be voted on for transmission to the FAA. This has gone through an iterative process over the past few months.

Mr. Cassidy began by extending regrets for Mr. Hughes, who could not attend the meeting. He then reviewed the process the TG used to create the deliverables. The group began with a deep dive of the tasking statement from the FAA, establishing the boundaries of the activities to make sure the deliverables would be timely. It also set the boundaries for the group in terms of scope, namely, what they were not going to do as well as what they were going to do.

The process should define deliverables that can be implemented within 24 months. The TG examined the current state of affairs and the current framework for the airspace. The group also developed assumptions and guiding principles. As an example, the group did not focus on anything that would be covered by Part 107 exemptions. Then, they examined market demand to narrow the focus to low-altitude operations, beyond line-of-sight, primarily below 400 ft. Looking at detailed desired use cases allowed the group to identify how current operating rules affect those use cases. Smaller groups were then formed within the TG and papers written that became the deliverables to the DAC. That foundation facilitated full consensus on all the issue papers. The industry players involved represented a diverse group bringing forward many opinions and concerns.

The results of TG2 were the highest priorities for what operations should be given access to the airspace next. The group proposes to continue their work, developing recommended mechanisms for implementing the recommendations.

The group felt a peak market demand would be in Class B airspace surrounding the 37 largest airports in the United States and the 30 mile "mode-C veil" airspace that surrounds the Class B areas. Agreeing that that airspace should be the subject of the recommendations, the group focused on how operations could be enabled safely. Most aircraft operating in the given airspace have requirements for communications equipment/capabilities. The group would like to address how that fact can be accounted for in the recommendations.

The final report and presentation are attached.
The recommendations are summarized as follows:

1. **Prioritize sUAS BVLOS operations within the Mode C Veil below 400 ft AGL**: operations below the altitude where most vehicles operate, but are equipped to allow their location to be positively conveyed through standard communications interfaces (and when needed, with ATC) and understand where everyone else in the volume of airspace is. (This recommendation lead to cascading ideas that are all related.) These operations would allow close flight near airports if the flights do not cross the arrival/departure corridors for the runways.
2. **Develop technology-neutral navigation performance requirements**: This volume of airspace will require a framework that allows performance-based beyond visual line-of-sight operations that is agnostic to technology (equipage) and focuses on the performance requirements for operating in that airspace and allows industry to innovate to meet those requirements.
3. **Evaluate the minimum requirements needed to meet low altitude UAS command and control (C2) operations**. Thinking in terms of performance based requirements, we should be thinking about ways of managing command and control that are not necessarily the same as traditional aviation (aviation protected spectrum). How can we leverage cell phones and the networks that support them, if that can be done safely? How can Wi-Fi be used similarly to how dedicated short-range communications in the automotive industry are used for anti-collision devices?
4. **Establish a FAR Part 135 regulatory "pathfinder" program for commercial UAS low-altitude (<400') BVLOS Operations: because Part 107 explicitly excludes air carrier operations (commercial operations) and specifically prohibits beyond line-of-sight operations and common carriage**. How can these operations be enabled? Meetings were held with FAA representatives on the regulatory requirements that revealed many rules that relate only to manned operations (PIC time, supplementary oxygen). We should be looking at existing rules and developing similar rules specific to UAS operations in the low-altitude regime. This can be

done by identifying existing rules that must be complied with, and those that shouldn't hinder UAS operations, but might have an alternate means of compliance.

5. **Develop Beyond 24-month Timeframe Recommendations:** Even though the initial tasking order was to develop recommendations that could be implemented within 24 months, the end goal must look at beyond 24 months as a result of the recommendations being made. The recommendations made here will need to be examined for the mechanisms that should be put in place to implement these recommendations.

The final report incorporates changes requested by the DAC during the May 2017 meeting.

Question: Thank you for the recommendations. The wording of recommendation 1 may be unclear – does it refer to flight within the Mode C veil below 400 ft.?

Response: Yes. It refers only to flights below 400 ft.

Comment: Recommendations 3 and 4 are forward looking and complimentary with the integration pilot program and the pilot project can help inform answers.

Question: On the conventional aviation side, there are many good aspects of the recommendations. For example, Required Navigation Performance (RNP) and Required Communication Performance (RCP) should not be prescriptive. There seems to be a natural tension between technology and interoperability. How do we manage that tension?

Response: We need to pursue standards and guidelines that define performance. This can be done through interoperability standards and performance-based standards and by using performance-based standards that allow moving away from specific technology [i.e. are not too proscriptive].

Question: Is that similar to ADS-B, having two frequencies to operate? In other words, the technology (frequency) is not prescribed, but the performance of the ADS radio is?

Response: Yes.

Comment: Returning to the previous question about the Mode C Veil, the language "which includes Class B airspace" seems to be ambiguous and may lead to confusion. Recommend striking the clause from recommendation 1 for clarity before forwarding final report to the FAA.

Response: This goes back to the assumptions and guiding principles of the TG. Where is the market demand that needs to be met? Think of this in terms of stepping stones and make safety a priority. This needs to be scoped down to actionable recommendations.

Question: If we are making a recommendation from the DAC, public perceptions are important. In terms of priorities, is it more important to reach for rural access first? Would that make this initiative more successful? We should be mindful of where the lesser risk is.

Response: The TG considered where the point of entry for the recommendations is. These started with the FAA. If you are outside of the Mode C Veil, it does not speak to the market demand. These operations are already occurring under Part 107 waivers (for rural operations), and the TG wanted to examine beyond the current rules.

Question: When you say BVLOS, are you including all operations over people and nighttime operations, or focusing on a subset of those flight profiles?

Response: The TG was focusing on those use cases that are not part of Part 107 and this does include nighttime operations and flights over people. TG2 identified the BVLOS and nighttime operations as the framework of future use cases.

Question: Was there any discussion in the Subcommittee of moving the bar too quickly? Should we only allow one change at a time (e.g., BVLOS; nighttime operations; flights over people), or all three at once?

Response: The TG felt that would be a question for the next tasking. The Pilot Program will answer some of those questions also.

Question: Thinking about the future and what is appearing in draft legislation, what might be useful to the FAA going forward (in Part 135 or other places)? How can the DAC be useful going forward?

Response: ***Recommend the next step is to have the DAC stand up a tiger team of SMEs to define within the category of aircraft what is applicable to UAS*** [in Part 135]. What needs to be done to establish an alternate means of compliance and what are things that are clearly out of bounds (like oxygen requirements)? Having guidance for applicants would greatly benefit the industry.

Question: Does TG2 have a reasonable timeframe in mind for implementing these recommendations?

Response: We considered 24 months (as detailed in the tasking letter), and this is why the group stayed away from some items (e.g., rewriting Part 107; redo airspace rules). The TG looked at using technologies that were available and operations that were within the current airspace rules.

Comment: For the record, in looking back when the DAC first received this tasking, the idea was to enable services for the operators within a reasonable amount of time with the reasonable regulation.

Response: Taking things in small pieces and resolving them, codifying it and moving on is the way to go.

Question: When it says, "Recommend FAA prioritize BVLOS UAS Operations", do we mean prioritize the rules to allow it or prioritize it over manned operations?

Response: No, the recommendation is to make the development of rules or operating guidelines a priority for unmanned systems; not to prioritize one set of operations (unmanned) over another (manned).

Question: Are you recommending focusing on BVLOS before and at the exclusion of flight over people or at night?

Response: These recommendations are not that granular. The TG does not envision BVLOS that precludes flight over people and nighttime operations. So, no, it does not preclude those other operations.

Comment: At the time the DAC was tasked [with this work], the team consciously skipped ahead because they thought they were on the verge of having rules in place that would cover some of these situations [because there was a Flight Over People ARC in place]

Final Comment: With clarifying amendment, call for motion to approve the recommendations

Outcome: Mr. Cleveland called for motion to approve the recommendation. It was so moved and seconded. The document was approved.

TG3 – UAS Funding Report Out

Mark Aitken, Director of Government Relations, AUVSI, and Howard Kass, Vice President of Regulatory Affairs, American Airlines

Mr. Cleveland introduced TG3 Co-Chairs, Mark Aitken and Howard Kass.

Howard Kass commented that the timing of the DAC couldn't be better. The group has made great progress through listening sessions and in-person meetings. As industry makes investment decisions, the question of the right mechanism for paying for things is in the forefront.

Before proceeding, the TG leadership thanked the DAC members for allowing their staff to participate on TG3 and recognized Nan Shellaberger (FAA) and her staff on the excellent support they have provided to TG3.

One caveat on the presentation material was stated, namely that it had to be prepared and proved 4-6 weeks prior to this meeting and so some material might be out-of-date.

The success of the industry depends on a strong private sector and government collaboration. The FAA is funded primarily from money from airline ticket taxes and fuel taxes and money appropriated by Congress (the latter being a small part of the budget). All the interest it has generated by the pilot program, proves that the FAA needs to have its required resources funded to keep up with the pace of progress of the drone industry. TG3 submitted short-term recommendations in July 2017, and long-term recommendations are due in March 2018. The listening sessions held by TG3 were open to the entire DAC (not just the TG) and focused on: 1) how should these activities be funded, and 2) a little bit on how should the FAA organize. The FAA is currently organized to support one very broad client base: manned aviation (notwithstanding commercial space). As mentioned earlier, a new chapter in the history of aviation is being written. While this is happening, the book is not being closed on previous chapters. The listening sessions have provided great input and generated great conversation on both of these activities.

The principles upon which the TG bases its finding are equity and scalability (to allow for growth). TG3 members are concerned that dollars spent are dollars being taken away from manned aviation. Funding mechanisms include taxes and fee-for-service. Taxes can be based on size/weight/operation of the user. These items do not represent final recommendations but have been discussed in the listening sessions.

The TG has been grappling with what is “equitable” in funding. The TG has expressed numerous questions it intends to answer. The current administration has indicated the safe and expeditious introduction of drones into the airspace is a priority for them and Congress has acted to put forth resources to accomplish that. TG3 believes there should not be a negative ramification for manned aviation as this effort moves forward.

There are many activities that need to be prioritized within the FAA. Who is shouldering the cost for the activities (industry/government/shared)? The group is struggling with the concept of sharing the costs (between government and industry) and what activities lend themselves to cost-sharing. What is the ratio of costs for industry and government and can this cost ratio change in relation to activity?

The TG is trying to think creatively. The TG will now break into smaller groups to fill in the details. What might fit in the next 3-5 years? The most “out of the box” thought is for classes of airspace as defined in the UTM concept (similar to the framework the FCC uses for spectrum allocation). We are unsure if the

UTM concept is analogous with FCC spectrum options. The task is to explore options and that is what the group is doing.

Lately, the group has been focusing on the current landscape (LAANC and UTM). The next few meetings will be to provide finer details for the DAC to consider.

One of the challenges the TG faces is the lack of good data on what future costs are. The FAA should consider establishing a cost accounting system.

The industry is spending and building out infrastructure and the FAA must regulate that build-out. How should that be paid for? Since no one is flying today, industry is being asked to pay for something they can't use.

Question: Are organizational structure options within the bounds of the scope?

Response: Not explicitly, but the money flow of the FAA touches on that. It won't have equal weighting with funding issues, but suggestions may be driven out by the funding responses.

Question: In manned aviation today, support activities are certification, oversight, and then operations. Are you using existing cost buckets for what it should look like? Follow-on question: Based on that, can you use current resources to predict the future costs?

Response: Yes, we are looking at current cost accounting categories (operations, research and development, and facilities and equipment). For the second question, applying manned rules to drones can be complicated (e.g., number of pilots for airline aircraft versus for drones; the growth of the drone numbers is unknown.) The past three FAA budget cycle numbers were examined and have been flat. Manned aviation cost is measured in the billions and unmanned aircraft costs are measured in the 10's of millions per year. There could be a significant ramp-up in the near future. TG3 has been looking to the work of TG2 to see what those costs might be (based on their recommendations). This group has to make many assumptions and they are looking to the DAC for boundaries and input.

Question: Have you looked at models for access-based fees versus a usage-based model?

Response: We have had that discussion (but haven't looked at the numbers). There has been discussion of a tax paid at the point of purchase. It has not been seen as favorable by many in the drone industry. There is no data to look at per se, but approaches such as an annual registration fee have been discussed.

Question: Drones are analogous to Wi-Fi devices (device came first, then networks followed, as opposed to the network being built first and then the devices being produced).

Response: The TG has spent a lot of time on the network model (the cell phone analogy is raised often).

Comment: Drone operators should offer data to the FAA. We assume industry will carry the bulk of expense for operations.

Outcome: Final report is due in March 2018. Set up today has been very good. Looking forward to the final report.

New Business

The Acting Chair called on the DAC members to identify new business for the DAC. No new business was identified.

Action Item Review

Action	Responsible Party	Schedule	Status
Action	Responsible Party	Schedule	Status
ACTIONS OPEN FROM PREVIOUS MEETING			
RTCA to summarize the comments received for each TG and submit for their review and consideration.	RTCA	ASAP	CLOSED
TG1 to re-look at priority 4 (State and Local Interest In and Response to UAS) with more attention.	TG1	July	CLOSED
RTCA to help identify DAC members who wish to assist in addressing county and city conventions, and to assist in defining what output can be produced that will benefit the two conventions; and work with DAC member Mayor Lee's office and Robert Boyd to get on their agendas.	RTCA	OBE	CLOSED

Action	Responsible Party	Schedule	Status
RTCA to coordinate a webinar for SC-228 that can be reviewed by all DAC members.	RTCA & SC-228	ASAP	CLOSED
ACTIONS OPEN FROM CURRENT MEETING			
Strike "which includes Class B airspace" from TG2's recommendation 1 for clarity before forwarding final report to the FAA. Modify the Mode C Veil language.	RTCA/TG2	Nov 2017	OPEN
DAC to establish a TG2 Tiger Team of SME's to define what is applicable to UAS in the existing rules.	DAC/DACSC	TBD	TBD
Re-task and reconstitute TG1.	FAA/RTCA	Spring 2018	OPEN
Future DAC Agenda item for DAC procedures and meeting tenets.	DAC/RTCA	Spring 2018	OPEN
Coordinate DAC 2018 Meeting Schedule.	RTCA	Dec 2017	OPEN

Closing Chairman Remarks

Mr. Cleveland thanked the DAC members for attending and participating in the DAC meeting. He also thanked Administrator Huerta for his leadership and accessibility to the aviation industry. He commented that Administrator Huerta has been an incredibly effective link between government and industry.

FAA DFO Closing Remarks

The Deputy Administrator thanked Amazon for being great hosts. He said he was encouraged by the attendance at the meeting. He reiterated the Unmanned Aircraft Systems (UAS) Integration Pilot Program numbers mentioned earlier in the day and referenced the White House presidential memo on the Pilot Program. He stated that the FAA welcomes any ideas going forward within the confines of the OTA structure and are open to more discussion and training on how this is going to progress. The Pilot Program will inform this nascent industry, so they want to get it right.

He continued that he couldn't emphasize enough his thanks to TG1 for the group's efforts, and it is not a failure or a flaw that there are alternate options; it was edifying and educational, and with more time

they could have reached consensus. He thanked TG2 for their recommendations. He found them to be superb and he believes many of those recommendations will complement the Pilot Program. In referring to the TG3 work, he expressed his concern that the recommendations of funding and budget is outside of the control of the FAA. The FAA is not as interested in those recommendations as they have little say in how to implement recommendations.

He observed that this is possibly the first advisory committee he has sat through where the FAA reauthorization was not discussed, and he reminded the group that the FAA is on an extension until the end of March. Since this is a high-profile part of FAA, there are things that may happen in the legislative process until March. There is a controversial proponent of the house bill to move ATO out of the FAA. If that were to become a reality, that would change the complexion of these discussions quite a bit. There is much going on outside this room that will affect the work being done by this group and subgroups.

He said that the next time the DAC is together, he hopes for progress on those fronts. He closed by thanking everyone for taking time to attend and provide input.

Adjournment

The meeting was adjourned at 4:30 PM.

RTCA, Inc.
1150 18th St. NW
Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
November 15, 2017

Attachments

RTCA, Inc.
1150 18th St. NW
Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
November 15, 2017

Attachments

RTCA, Inc.
1150 18th Street, NW, Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
www.rtca.org

November 8, 2017 DAC Attendance

Name	Organization
Adams, Tim	Federal Aviation Administration (FAA)
Agvent, Greg	CNN
Aitken, Mark	Association for Unmanned Vehicle Systems International (AUVSI)
Allen, John	JetBlue Airways
Allison, Darren	RTCA, Inc.
Alonso, Juan	Stanford University
Ambrose, Jennifer	Federal Aviation Administration
Anderson, Blair	Amazon
Baker, Mark	Aircraft Owners and Pilots Association
Banga, Jaz	Airspace Systems Inc.
Barkowski, Justin	Aircraft Owners and Pilots Association
Bechdolt, Anne	FedEx Express
Belhumeur, Marc	NATCA
Berlinberg, Eric	Amazon
Bosch, Dan	SICdrone
Bova, Ubaldo	Amazon
Boyd, Robert	Riley County, Kansas
Bristol, Teri	Federal Aviation Administration
Broadbent, Alana	Amazon
Brock, Bob	State of Kansas
Brown, Chris	Federal Aviation Administration
Burgess, James	Google
Canoll, Tim	Air Line Pilots Association (ALPA)
Carleton, Jordan	Amazon
Cassidy, Sean	Amazon
Chrisman, Geoffrey	Flirty
Cirillo, Michael	Airlines for America
Cleveland, Peter	Intel
Cochran, Walt	Leidos
Cooper, Diana	Precision Hawk USA Inc.
Crawford, Korin	Avenue 360 Infrastructure & Real Estate
Dalton, Daniel	Airspace Systems, Inc.
Deux, Antoine	Amazon

RTCA, Inc.
1150 18th Street, NW, Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
www.rtca.org

Name	Organization
DeWinter, Marque	International Alliance of Theatrical Stage Employees - International Cinematogra
Dixon, Scott	Amazon
Donovan, Colleen	Federal Aviation Administration (FAA)
Dreiling, Lindsey	State of Kansas
Duprey, Naomi	Amazon
Durand, Jean-Guillaume	Amazon
Eagerton, John	ALDOT/NASAO
Egan, Nancy	3D Robotics
Elwell, Dan	Federal Aviation Administration (FAA)
Endicott, Catherine	
Falkin, Melissa	Amazon Prime Air
Fanelli, Matt	Skyward IO, A Verizon company
Felser, Larry	Amazon
Flint, Deborah	Los Angeles World Airports
Fontaine, Paul	Federal Aviation Administration (FAA)
Garver, Lori	Air Line Pilots Association (ALPA)
Gielow, Ben	Amazon
Gilbert, Trish	National Air Traffic Controllers Association (NATCA)
Gomez, Martin	Facebook
Graetz, Todd	BNSF Railway
Gramaglia, Tom	American Tower Corporation
Greene, David	Wisconsin Department of Transportation, Bureau of Aeronautics
Grimsley, James	University of Oklahoma
Guckian, Paul	QUALCOMM TECHNOLOGIES INC.
Guterres, Michael	The MITRE Corporation
Hall, Brandon	Textron Unmanned Systems
Hanson, Rich	Academy of Model Aeronautics
Harm, Chris	Federal Aviation Administration (FAA)
Hartman, Ryan	Insitu Inc.
Hernandez, Matt	Amazon
Horsager, Taylor	American Family Insurance
Irvine, Peter	US Department of Transportation
Jenny, Margaret	RTCA, Inc.
Kass, Howard	American Airlines, Inc.
Kenitzer, Allen	Federal Aviation Administration
Khattar, Puneet	Zipline International Inc
Kim, Gene	Southwest Airlines
Kimchi, Gur	Amazon Prime Air
Kirov, George	Harris Corporation

RTCA, Inc.
1150 18th Street, NW, Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
www.rtca.org

Name	Organization
Klein, Ethan	White House
Larson, Shelly	Federal Aviation Administration
Lawrence, Earl	Federal Aviation Administration (FAA)
Lenfert, Winsome	Federal Aviation Administration (FAA)
Leveson, Nancy	MIT Lincoln Laboratory
Lindgren, Adrienne	City of Los Angeles
MacArthur, John	Washington State Dept of Transportation
Mahoney, John	USGS/FGDC
Malloy, Lisa	Intel
Martin, Greg	Federal Aviation Administration
Martino, Christopher	Helicopter Assoc International
Mattai, Nan	Rockwell Collins, Inc.
McCardle, Matt	Amazon
McDuffee, Paul	Insitu
McKelligan, Mark	NATCA
Mefford, Cory	SICdrone
Mills, Houston	United Parcel Service (UPS)
Monaco, John	Property Drone Consortium
Mora, Marily	Reno-Tahoe Airport Authority
Murdock, Joel	FedEx Express
Murphey, Sean	T-Mobile
Niles, Frederick	The MITRE Corporation
Odell, Thomas	National League of Cities
Paczan, Nathan	Apple
Papadopoulus, Didier	Garmin
Pasztor, Andrew	Wall Street Journal
Penrose, Christopher	AT&T
Peter, Lorelei	Federal Aviation Administration (FAA)
Phelps, Adam	Spokane International Airport
Pollner, Leslie	City of San Francisco
Power, Andres	San Francisco, California
Reed, Mark	Air Line Pilots Association (ALPA)
Remo, Laura	Department of Transportation
Resmini, Paolo	Matternet
Richards, Jeffrey	NATCA
Richter, Jennifer	Akin Gump / CTIA
Robinson, Phil	Protonex Technology Corp.
Roth, Robert	Amazon
Samanta Roy, Robie	Lockheed Martin Corporation

RTCA, Inc.
1150 18th Street, NW, Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
www.rtca.org

Name	Organization
Sapir, Genevieve	Department of Transportation
Schulman, Brendan	DJI Technology
Schultz, Dean	Reno-Tahoe Airport Authority
Secen, Al	RTCA, Inc.
Shellabarger, Nan	Federal Aviation Administration (FAA)
Spengler, George	Amazon
Stone, Kevan	National Association of Counties
Straub, Phil	Garmin Ltd.
Suarez, Brandon	General Atomics Aeronautical Systems, Inc.
Suomi, David	Federal Aviation Administration
Swafford-Brooks, Lisa	Department of Transportation
Swanson, Mo	Echodyne Corp
Teel, Brandi	RTCA, Inc.
Terkeurst, Brandi	Delta Air Lines
Terry, Ryan	Lockheed Martin
VanOverschelde, Riley	Amazon
Velky, Jacob	Duke Energy
Voronka, Nestor	M42 Technologies
Wang, Daniel	Amazon
Weidner, Steve	NATCA
Williams, Dan	Federal Aviation Administration
Williams, Heidi	NBAA
Williams, Pete	Amazon
Willis, Randy	Federal Aviation Administration
Wright, Marchall	Security101
Wynne, Brian	Association for Unmanned Vehicle Systems International (AUVSI)
Yap, Basil	North Carolina Department of Transportation
Young, Alden	Amazon
Zuccaro, Matthew	Helicopter Association International (HAI)

RTCA, Inc.
1150 18th Street, NW, Suite 910
Washington, DC 20036
Phone: (202) 833-9339
Fax: (202) 833-9434
www.rtca.org

Fifth Meeting of the Drone Advisory Committee (DAC)
Agenda

DATE: November 8, 2017

TIME: 9:00 AM – 4:30 PM PST

PLACE: Amazon Meeting Center
2031 7th Avenue
Seattle, WA 98121

Wednesday, November 8, 2017

Start	Stop	
9:00 AM	9:02 AM	Official Statement of the Designated Federal Officer (DFO)
9:02 AM	9:12 AM	Welcome and Introductions, Review of Previous DAC Meeting
9:12 AM	9:15 AM	Approval of Minutes from Previous DAC
9:15 AM	9:25 AM	DAC Chairman's Report
9:25 AM	9:50 AM	FAA Remarks
9:50 AM	10:05 AM	Presidential Memo on UAS Integration Pilot Program
10:05 AM	10:25 AM	MITRE Report
10:25 AM	10:35 AM	Break
10:35 AM	10:40 AM	DAC Sub-Committee (DACSC) Co-Chair Report
10:40 AM	11:10 AM	Report of DACSC Task Group (TG) 1 (Roles and Responsibilities)
11:10 AM	12:00 PM	Discussion of Task Group 1 Material
12:00 PM	1:15 PM	Lunch
1:15 PM	1:55 PM	Report of DACSC TG2 (Access to Airspace)
1:55 PM	2:40 PM	Discussion of TG2 Material
2:40 PM	2:55 PM	Break
2:55 PM	3:35 PM	Report of DACSC TG3 (Funding UAS)
3:35 PM	4:10 PM	Discussion of TG3 Material
4:10 PM	4:20 PM	New Assignments/Agenda Topics/Next Meeting Details/Meeting Summary
4:20 PM	4:25 PM	FAA DFO Closing Remarks
4:25 PM	4:25 PM	Adjourn