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Drone Integration Funding

Report of the Drone Advisory Committee

Final Report - March 2018

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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?*
   o *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?*
   o *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?*
    o *What activities and services should the Federal Government perform using traditional funding methods (such as taxes or fees)?*
    o *Should different Federal activities or services be paid for differently?*
    o *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?*
    o *Is there a recommended phased or incremental approach?*
    o *What are the implementation issues and costs?*
    o *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.
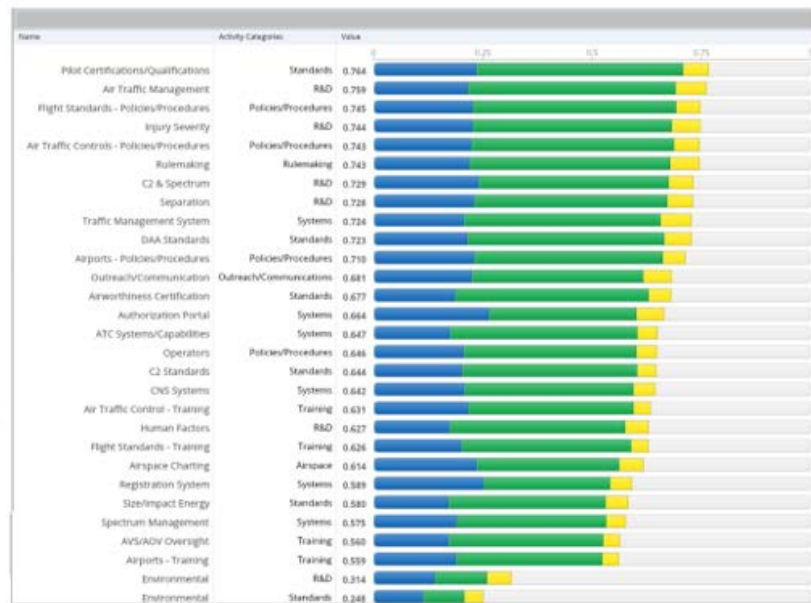
The group then reviewed how the FAA is organized to support the safe and efficient integration of drones into the NAS; these activities are spread across many offices and programs within the FAA. The FAA provided TG3 with the activities to be evaluated for funding. See Appendix 1. The group ranked each 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%

Name	Activity Categories	Value
Pilot Certifications/Qualifications	Standards	0.764
Air Traffic Management	R&D	0.759
Flight Standards - Policies/Procedures	Policies/Procedures	0.745
Injury Severity	R&D	0.744
Air Traffic Controls - Policies/Procedures	Policies/Procedures	0.743
Rulemaking	Rulemaking	0.743
C2 & Spectrum	R&D	0.729
Separation	R&D	0.728
Traffic Management System	Systems	0.724
DAA Standards	Standards	0.723
Airports - Policies/Procedures	Policies/Procedures	0.710
Outreach/Communication	Outreach/Communication	0.681
Airworthiness Certification	Standards	0.677
Authorization Portal	Systems	0.664
ATC Systems/Capabilities	Systems	0.647
Operators	Policies/Procedures	0.646
C2 Standards	Standards	0.644
CNS Systems	Systems	0.642
Air Traffic Control - Training	Training	0.631
Human Factors	R&D	0.627
Flight Standards - Training	Training	0.626
Airspace Charting	Airspace	0.614
Registration System	Systems	0.589
Size/Impact Energy	Standards	0.580
Spectrum Management	Systems	0.575
AVS/AOV Oversight	Training	0.560
Airports - Training	Training	0.559
Environmental	R&D	0.354
Environmental	Standards	0.248

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.

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[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

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

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

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

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

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[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

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[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.

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[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*

Integration Breadth and Depth
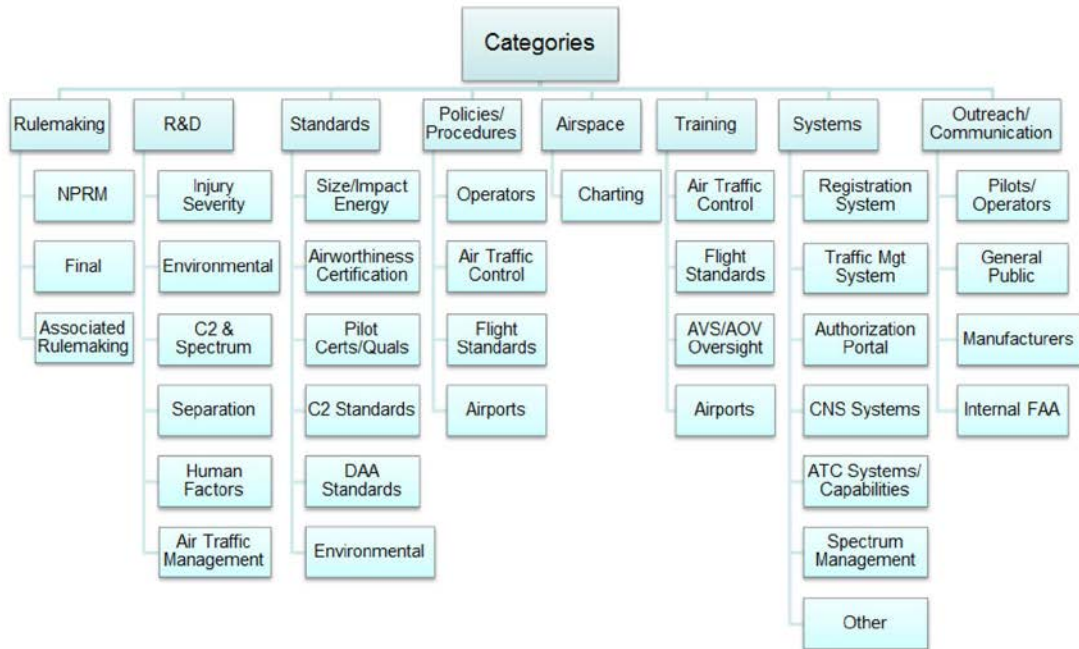
Mark	Aitken	Akin Gump Strauss Hauer & Feld LLP	Group Chair
Howard	Kass	American Airlines	Group Chair
Meghan	Ludtke	American Airlines	Observer
Justin	Barkowski	Aircraft Owners and Pilots Association	Member
Peter	Challan	Harris Corporation	Member
Joe	DePete	Air Line Pilots Association (ALPA)	Member
Tyler	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

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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.
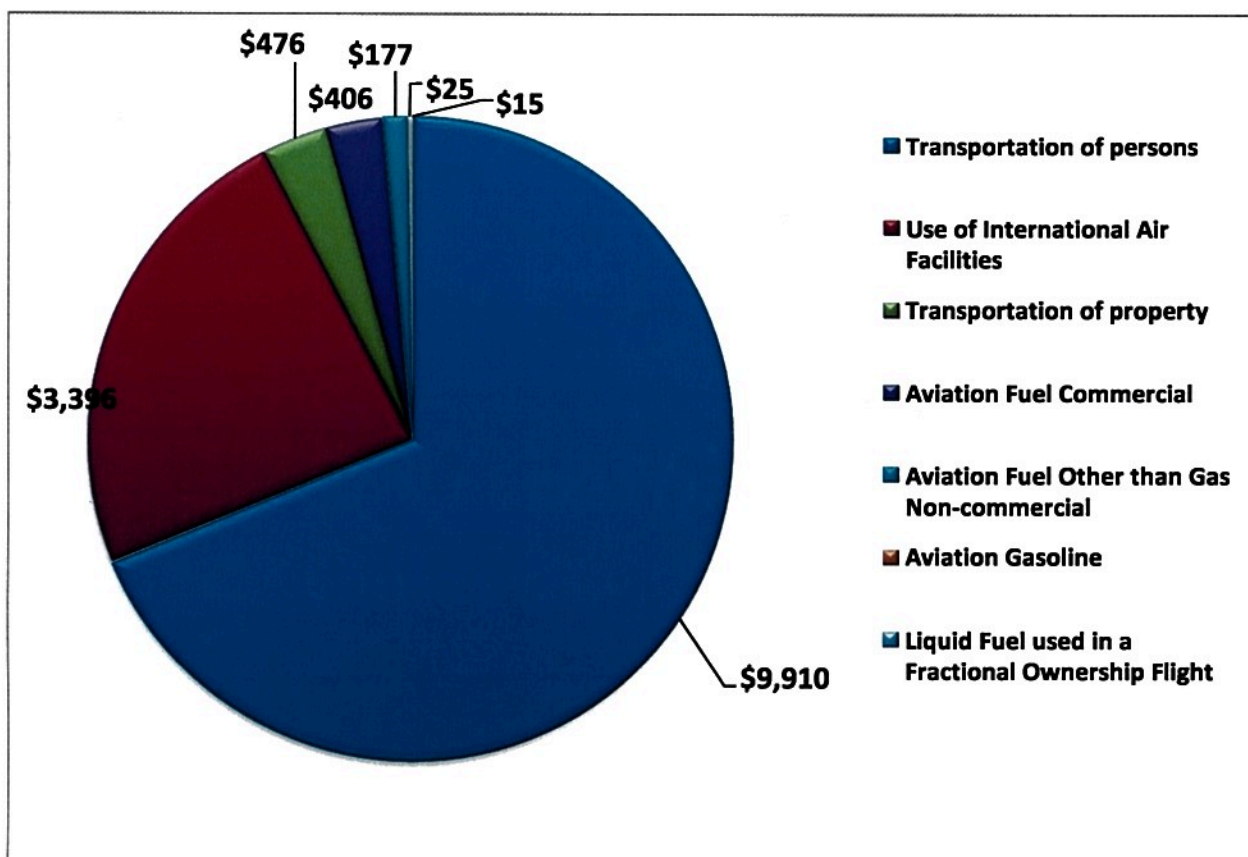
The Trust Fund receives revenues from a variety of excise taxes paid by users of the NAS. Aviation excise taxes are imposed on domestic passenger tickets, domestic flight segments, international passenger arrivals and departures, and on purchases of air travel miles for frequent flyer and similar programs. 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

$476 $177

$406 $25 $15

$3,396

$9,910

- Transportation of persons
- Use of International Air Facilities
- Transportation of property
- Aviation Fuel Commercial
- Aviation Fuel Other than Gas Non-commercial
- Aviation Gasoline
- Liquid Fuel used in a Fractional Ownership Flight

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 administered 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

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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.

FAA

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

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
	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