

HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON OVERSIGHT

"Operating Unmanned Aircraft Systems in the National Airspace System: Assessing
Research and Development Efforts to Ensure Safety"

Questions for the Record for Dr. Karlin Toner, Director, Joint Planning and Development
Office,
Federal Aviation Administration

Questions submitted by Dr. Paul Broun, Chairman

- 1) Please explain how agencies such as the Federal Aviation Administration (FAA), Department of Homeland Security (DHS), National Aeronautics and Space Administration (NASA), and the Department of Defense (DoD) coordinate to identify R&D gaps.
 - a. How do agencies decide who will fund projects to address these gaps?

The Joint Planning and Development Office (JPDO) is mandated by P.L. 112-95 to coordinate research goals and to create multi-agency roadmaps for the Next Generation Air Transportation System (NextGen). The JPDO began the prioritization of R&D topics with the NextGen UAS Research, Development and Demonstration (RD&D) Roadmap. Developed in 2011, the NextGen UAS RD&D Roadmap is a catalog of ongoing and planned R&D efforts being conducted by the NextGen partners supporting the integration of UAS operations into the NAS. Subject matter experts from the partner agencies – FAA, NASA, DoD, DHS, and the Department of Commerce – contributed to the NextGen UAS RD&D Roadmap, identifying planned and ongoing work and critical R&D challenges in their areas of expertise. The NextGen UAS RD&D Roadmap defined 23 challenges within the four technical tracks of Communications, Airspace Operations, Unmanned Aircraft, and Human Systems Integration.

Building on that effort, the JPDO continued coordination during FY12 to agree on a methodology to prioritize UAS research. The FY13 JPDO-led effort is reviewing the data collected in FY11, updating the UAS R&D needs and R&D inventory, conducting an initial gap analysis, and will collaborate on priority gaps. Continuing coordination among the JPDO and its partner agencies concerning UAS R&D, builds on the cooperative process established to formulate the UAS Comprehensive Plan, including the UAS National Goals, concluded earlier this fiscal year. The process included determination of agency needs based on published documents and resolution of issues through formal review, adjudication, and vetting. The same steps will be used to identify critical gaps in ongoing and planned R&D and categorize them with respect to criticality and goals being supported. This process is intended to be an on-going effort to ensure that priority research is identified. This structured coordination also allows for information sharing and greater efficiencies in demonstrations and analyses.

The coordination process will include a review of progress in filling the gaps, as well as identification of new and emerging needs and gaps. The results of these reviews, along with indications of actions that may be required, will be made available to the partner agencies for programming considerations. Interagency coordination on UAS research is also taking place through several efforts.

To cite a particular example, the FAA has partnered with DHS, Customs and Border Protection, in support of NextGen demonstration activities. The FAA also continues to partner with NASA in support of the multi-year "UAS in the NAS" project, and with DoD in support of their "Airspace Integration Joint Test." The agencies are committing resources and subject matter expertise to support research and analysis required to address known research challenges while identifying research gaps.

- 2) How often does the UAS Executive Committee meet to coordinate efforts?
 - a. How many times has it met in the last year?

The UAS ExCom meetings are normally scheduled quarterly. In 2012, the UAS ExCom only had three formal meetings due to schedule conflicts (19 January, 8 May and 28 August). However the ExCom principals also had several informal telecons to discuss issues and progress.

- 3) Are there any federal agencies or organizations that are not satisfactorily fulfilling their role in

addressing UAS safety concerns?

The FAA is not aware of any agencies that are not adequately addressing safety concerns related to UAS. The FAA's main partners who assist with UAS safety concerns are NASA and DoD. Both have been engaged with the FAA on addressing safety concerns. Intra-agency working relationships have been established at all levels with these two Agencies. There is a formal outlet for decision making and escalation through the UAS Executive Committee (ExCom).

4) Are there any organizations that should be involved that currently are not?

Those organizations with interest in current safety related issues are involved.

5) Please explain the relationship between the FAA and DHS as it pertains to safety and security.

- a. Understanding that you cannot speak for DHS, what is your understanding of what DHS is doing in this regard?

The FAA has an excellent working relationship with DHS and each agency has clear expectations and understanding of their respective roles and responsibilities. Both agencies understand the need to cooperatively develop solutions that meet individual requirements. DHS is proactively working to develop Unmanned Aircraft Systems capabilities and Operational Missions requirements while meeting FAA safety standards and documentation within coordination time frames.

- b. What is the FAA responsible for? What is the DHS responsible for? How does this differ?

The FAA's role is to ensure the safe operation of aircraft within the National Airspace System. DHS has the National Security Mission responsibility for protecting U.S. borders in a safe manner so as to avoid unnecessary damage or harm/injury to individual citizens and property.

How are decisions like this made?

Together, the FAA and DHS cooperate to ensure DHS' priority missions are given timely NAS access while meeting the FAA's safety requirements and minimizing the impact to operations.

- c. How involved has the Transportation Security Administration (TSA) been in the process?

The FAA interacts with TSA and other DHS agencies as appropriate in carrying out our mission to ensure safe operations.

6) A late 2012 GAO report suggests that the FAA has failed to act on a 2008 GAO recommendation to utilize the operational data it has collected on UAS as part of its Certificate of Waiver or Authorization (COA) to develop safety, reliability, and performance standards. Why has FAA failed to act?

The FAA has been challenged with turning the limited safety data provided via the Certificate of Waiver or Authorization (COA) process into tangible performance standards, aircraft certificate standards, or operational integration standards. In response, the FAA has charted a plan to acquire the needed data through Research and Development (R&D) Projects, both joint with interagency partners, and independently. The goal of these research projects is to ensure that developed standards meet rigid safety standards and fall within the parameters of our NextGen Modernization Program.

- a. If this assessment is inaccurate, please describe how the FAA has utilized data it received from COA recipients such as NASA, DHS, and public universities.

The FAA has used the limited data available to help define the requirements for future R&D strategy development which will serve as an input for our safety standards development.

- b. Has the FAA utilized data from UAS manufacturers that received special airworthiness certificates?

Yes, the FAA has used the data collected from the COA holders as well as experimental certificate holders to identify adverse trends and assess operational risks imposed by the accommodation of UAS in the NAS.

7) RTCA's Special Committee 203 has been working on Minimum Aviation System Performance Standards (MASPS) and Minimum Operational Performance Standards (MOPS) for unmanned aircraft. How critical are these processes in advising us what research and development work is needed?

These processes are very important in advising the FAA on what R&D work is needed.

a. When are these standards likely to be finalized?

RTCA provides the FAA with recommendations on technical standards for all types of avionics. RTCA is working on developing standards for Detect and Avoid (DAA) equipment and Command and Control (C2) radio equipment. The DAA system is designed to replace the functionality of the pilot on manned aircraft to "see and avoid" other aircraft in the airspace. This capability is a key enabler for integration of Unmanned Aircraft Systems (UAS) into the National Airspace System (NAS). C2 radios are also key to approval of UAS by the FAA. This standard will allow aircraft equipment manufacturers to build radios for controlling UAS that meet FAA safety requirements.

NASA and the FAA are conducting supporting research for both DAA and C2 standards. In addition, the USAF Research Lab is leading the effort to create DAA systems and is playing a key role in the development of RTCA standards. In an effort to ensure that RTCA SC-203's efforts are aligned with the strategic needs of the FAA, the Governing Board that oversees all FAA standards writing special committees will revise the tasking for SC-203. After the tasking has been revised, RTCA in collaboration with the FAA will publish new timelines for completion of these standards.

8) Many who follow this issue argue that a "one-size-fits-all" approach to regulation will not be effective given the wide range of systems.

a. What is your recommendation for categorizing the systems? By size (i.e. weight)? Payload? Capabilities? Mission? Complexity?

The UAS Aviation Rulemaking Committee (ARC) addressed this question through the Terminology and Classification Action Team (TCAT), and anticipates the delivery of their final recommendations to the FAA in Spring 2013. At this time, it is expected that the TCAT will recommend that large UAS follow the existing categorization used for manned aircraft. A category for small UAS is being addressed as part of the small UAS rulemaking activity.

b. How does this impact R&D investments? Do you see a greater need for R&D on smaller or larger systems?

FAA UAS research is currently studying various sizes of UAS. In addition to physical size and weight differences, small and large UAS operations may differ in other ways, such as in flight profiles, operational missions, performance characteristics, and crew composition. These differences all have the potential to significantly impact National Airspace System (NAS) operations. UAS integration will require that UAS impacts on the safety of the NAS be well understood, such that appropriate mitigations (in the form of standards, regulation, policies, procedures, etc.) can be identified and put into place. Therefore, research should encompass as many of these operations—and UAS sizes--as possible.

c. What is the status of a final rule regarding the certification and operation of small (i.e., ultralight, low-speed, short-life) UAS?

The small UAS Notice of Proposed Rulemaking (NPRM) is in coordination with FAA and DOT. The FAA is targeting release of the NPRM for 2013.

d. What sort of training or certification will be required of civilian UAS operators?
1. Would certification be universal or system-specific?

It is anticipated that certification will generally be universal. The FAA currently has a legacy system in place which may be used. This system consists of an aeronautical knowledge exam and a practical examination whereby a person demonstrates competency on flying the aircraft. Through using this process, a UAS pilot would have a certificate for the operation of an unmanned aircraft and its associated system(s).

2. What training opportunities currently exist for want-to-be civilian UAS operators?

Currently, several universities and UAS manufacturers offer training in unmanned aircraft systems.

3. Will proof of training be required to purchase a UAS? Would there be penalties (e.g., fines, revocation of license) for operating a UAS without proper credentials?

There is no required training to be able to purchase a UAS. However, training is required to operate a UAS in the NAS. Penalties currently exist for operations without proper certification of the Airman.

4. Will current air traffic controllers require any new or supplemental training to familiarize themselves with UAS operations?

As with all emerging technologies (e.g. ADS-B, and other NextGen systems) the Air Traffic workforce will require updated training on system capabilities, new procedures or work processes, as well as new standards or performance characteristics as they relate to UAS operations.

- 9) GAO's Dr. Dillingham testified that "[e]nsuring uninterrupted command and control for both small and large UAS remains a key obstacle for safe and routine integration into the national airspace." Dr. Dillingham's testimony also states that "UAS currently use unprotected radio spectrum and, like any other wireless technology, remain vulnerable to unintentional or intentional interference. This remains a key security and safety vulnerability..."
 - a. Who is responsible for ensuring that command and control and navigational links are secure, reliable, and robust?

Information system security will be approved as a part of the aircraft certification process, which will include certification of a safe and secure command and control link. The FAA's Aircraft Certification Service will certify civil UAS using industry standards developed by RTCA. These standards are currently in development, and are not expected to be complete before 2016. These standards will be implemented using Technical Standard Orders.

- 10) Dr. Toner, in your statement you mentioned "perception and acceptance." There are a lot of misconceptions and associated fears with regard to unmanned systems. What can be done to change that?

Given the amount of recent publicity on UAS, there appears to be an opportunity for public outreach and education to specifically address public and media concerns head on and to act as the Administration's focal point for high-level UAS messaging. Partnership opportunities exist with Public (Governmental) UAS users, UAS Industry Groups, UAS Modeling Associations and Privacy Advocates; Who would be responsible for leading the development and execution of such a public outreach campaign is to be determined. The six UAS test sites, as required by the *FAA Modernization and Reform Act of 2012*, will provide the FAA with information that may be used in the future to support educational opportunities.

- 11) Please identify any projects jointly funded by FAA and NASA with any other agency, as well as the FY13 funding level for those projects.

The FAA and NASA are collaborating on the NASA-funded "UAS in the NAS" project. The FAA is providing subject matter expertise, but no funding, in support of various sub-projects: 1) Separation Assurance and Sense and Avoid Interoperability; 2) Human-System Integration; 3) Communications; 4) Certification; and 5) Integrated Test and Evaluation. The FAA is providing NASA with technical and operational expertise to provide input into research objectives, methodologies, test plans, and reports, and is also sharing with NASA results from FAA-led research.

12) Is current funding sufficient to meet the Congressional mandate for full integration of UAS by 2015? Is this timetable reasonable?

UAS Integration is expected to be incremental and will take a number of years, starting in 2015, with the integration of small UAS in the National Airspace System. The aggressive timeline in the *FAA Modernization and Reform Act of 2012*, which called for the safe integration of civil unmanned aircraft systems into the national airspace system as soon as practicable, but not later than September 30, 2015, did not provide for additional resources. The loss of staff hours and contract support due to sequestration further complicates the Agency's timetables. .

13) FAA's report titled "NextGen UAS Research, Development and Demonstration Roadmap" indicated that it would be updated regularly. How is this document used to make investments at FAA? How often do you plan on updating this report? Do you believe this document is sufficient to coordinate R&D investments?

The NextGen UAS Research, Development and Demonstration Roadmap is a catalog of ongoing research projects from partner agencies – FAA, NASA, DoD, DHS, and DOC. This baseline document can be used to compare against the UAS research needs to enable gaps to be identified. The RD&D Roadmap is being used, in addition to updated information received from each of the partner agencies, to form a complete view of ongoing research for UAS as of FY13, which will then be used by the partners to determine where their research efforts (ongoing and new) fit into the UAS priorities. The updated catalog of research, the agreed-upon research priorities, and the enhanced relationships among the various research groups will improve the coordination of R&D investments.