

**Statement of**  
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before the

**Committee on Science, Space and Technology**  
**U.S. House of Representatives**

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Chairman Babin and Members of the Committee:

Thank you for the opportunity to comment on the FAA Research and Development Programs and Future Plans.

I am a Professor of Aeronautics and Astronautics at the Massachusetts Institute of Technology and an active pilot. I Chair of the FAA Research and Development Advisory Committee (REDAC) and am also Co-Director of the FAA Center of Excellence for Alternate Jet Fuels and the Environment (ASCENT). I should note that while my testimony is informed by my participation in the REDAC, due to time constraints my comments have not been coordinated with my colleagues so I am speaking as an individual today.

The FAA has unique Research and Development needs to support its mission of providing the safest and most efficient aerospace system in the world. It requires research to support oversight and certification of aircraft, operators, airports and systems as well as to support the safe operation and modernization the National Airspace System including Air Traffic Control and related communication, navigation and surveillance systems.

Because of the breadth of the FAA R&D portfolio the REDAC reviews and provides advice to the agency through subcommittees focused on: Safety, Airports, Environment and Energy, Human Factors, and NAS Operations. The topical findings and recommendations by these subcommittees which are reviewed and submitted by the full REDAC committee along with cross cutting observations.

I will mention a few observations and R&D challenges which the REDAC has noted or discussed in recent meetings.

### *Moving Forward While Increasing Safety*

Safety is the primary mission objective of the FAA and the extraordinarily high level of safety of air transportation in the US and worldwide is unmatched by any other mode of transportation. There are several challenges to maintaining an improving the high level of safety of the system as we move forward. The first is that we need to avoid complacency and develop new approaches to identify emerging risk areas. Historically aviation safety has improved by investigating and mitigating factors which have caused accidents. Fortunately accidents are now rare and we need research to develop methods to identify and mitigate risk precursors before accidents occur.

A second, and less obvious challenge resulting from the high level of safety is that it becomes difficult to change the National Aviation System (NAS) to modernize, add new capabilities or incorporate new types of vehicles or operations. While it is relatively straightforward to have confidence and approve new technologies to be do the same thing that older technologies have done it is very difficult to evaluate the impact of new ways to operate or new types of operations. As a consequence the NAS is very slow to modernize and it is difficult to approve new types of vehicles or operations. The FAA has moved to a risk based process for certification and operational approval but enabling research on approaches to evaluate risk in emerging vehicles, technologies and operations will be enabling.

### *Improving Aviation Sustainability*

The importance of improving the environmental sustainability of aviation has emerged as a key focus of the global air transportation system and is an important competitiveness factor for the US. Understanding and mitigating Green House Gas (GHG) emissions, particulates and noise is a focus of the FAA R&D efforts. The FAA has had a strong leadership role nationally and internationally as reflected in the impact on ICAO sustainability efforts and the high quality of the US Aviation Climate Action Plan. Its success in this area is built on a strong collaborative research program with industry, academia, NASA and other government agencies as well as international collaborators.

### *Integrating and Approving New Vehicles, Technologies and Operations*

We are in an exciting period of innovation and development of new vehicles and operations based on advancing technologies such as electrification, automation, Artificial Intelligence and cloud computing. New eVTOL and eSTOL aircraft are in development and are in the process of developing plans for airworthiness certification. Small UAVs are now commonly being operated although segregated from normal operations but there are proposals and interest in fully integrating larger UAVs in the system. There is also interest in applying advances in AI and Machine Learning which have software architectures which are not compatible with existing software certification processes.

There is a need for FAA R&D to understand safety critical and operational aspects of these emerging vehicles, technologies and operations to make informed decisions on approving and integrating these capabilities into the NAS. The FAA should also continue to collaborate with NASA in this area and NASA could provide underlying and enabling research to support FAA decision making. Strategic R&D will also help the FAA develop the workforce in emerging areas such as digital technologies, software, AI, electrification and cyber technology.

### *Responding to Emerging Issues*

The FAA has often been challenged by the sudden emergence of issues which were not fully anticipated. Historical examples include pressure to allow sUAS particularly acute in R&D where the budget process requires that the research plans be defined 3 years in advance. Given that it takes time to conduct research, the FAA is often presented with situations where there are no research results to guide decisions. The REDAC has worked with the FAA to provide some advice on emerging trends but there will continue to be unanticipated issues which require rapid response from the FAA R&D organization. One approach to addressing this concern is to include a reserve in the R&D budgeting process which can be allocated to emerging issues through some approval process.

Thank you for the opportunity to comment on FAA Research and Development and how it can enable the safety, efficiency and sustainability of air transportation.