

Statement of

R. John Hansman, Jr.

**T. Wilson Professor of Aeronautics & Astronautics and Engineering Systems
Director, MIT International Center for Air Transportation
Massachusetts Institute of Technology**

before the

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

June 11, 2015

Chairman Smith and Members of the Committee:

Thank you for the opportunity to comment on research and development issues which support “Transforming America’s Air Travel.” I am a Professor of Aeronautics and Astronautics at the Massachusetts Institute of Technology and the Co-Chair of the FAA Research and Development Advisory Committee (REDAC). The REDAC is a Congressionally mandated committee which advises the FAA Administrator on research and development. I should note that while my testimony is informed by my participation on the REDAC, due to time constraints my comments have not been coordinated with my REDAC colleagues so I am speaking as an individual today.

Research, Engineering and Development (RE&D) are vital to maintaining and improving the safety, efficiency, environmental performance and security of the aviation system in the United States and worldwide. The FAA has specific and unique RE&D requirements which come from it’s oversight and operation of the National Airspace System (NAS) as well as it’s role in regulating civil aviation in the United States. Research is required to improve the performance of the NAS, to be prepared to regulate and certify new vehicles and technologies as well as to respond to emerging challenges. The resulting research portfolio is very broad ranging from topics related to safety, airports, NAS operations, environmental impact, civil space and more.

As part of a recent strategic planning exercise the REDAC identified a number of emerging issues where it felt that research will be critical for the FAA. These include:

- Integration of UAS in the National Airspace System (NAS)
- Validation and Verification of Increasingly Complex NAS Systems
- Human Factors of Increasingly Automated Systems
- Data Integrity and Cyber-Security
- Challenges and Opportunities of Big Data in the NAS

- General Aviation Safety

In addition, some of the recent strategic observations that the REDAC has made and transmitted as advice to the administrator include.

Enabling the Potential of “Big Data” in the FAA - The growth of operational data and advances in data analysis open up exciting new approaches to better understand and improve the safety and efficiency of the NAS. The FAA has taken initial steps in this direction with data driven programs such as ASIAs and ADSI but there is significantly more potential. Realizing the full potential of “Big Data” will require development of data access policies which will allow the most open possible access to researchers and other users while protecting data confidentiality restrictions. The REDAC recommends that the FAA consider creative approaches to access policies such as multiple access levels to partitioned data structures. At the most open level the data could be fully open to the public enabling crowdsourcing and open competitions for students to creatively analyze and visualize

Emerging Human-Automation Issues - The increasing reliance on automation in aircraft and ATC systems have created emerging vulnerabilities in the aviation system highlighted by recent events. This was an important area of research during the initial introduction of highly automated aircraft such as the A-320 and B-767/757 in the 1970s but the character of emerging issues is changing. The REDAC recommends increased priority for human-automation interaction research and that the FAA work with related activities at NASA and the DOD.

Validating NEXTGEN Con-Ops - The key to successful delivery of NEXTGEN benefits will be to validate the Con-Ops currently under Concept Maturity and Systems Development at a sufficiently detailed level that operational feasibility can be assured and risks can be identified and managed. This includes definition of candidate operational procedures, addressing human factors issues (often in Human in the Loop Simulations) and considering operational issues such as mixed equipment and off-nominal conditions.

Mixed UAS and Manned Aircraft Operations - The committee appreciates the recent progress in UAS operational approval for small UAS but notes that the approaches for low altitude segregated operations do not address the larger UAS integration challenge. Many future UAS operations will require Con-Ops and procedures for mixed UAS and manned aircraft. This will be very challenging and the committee is concerned that the fundamental work to support this has been deferred or neglected.

Evaluating Community Noise Impact of Advanced Terminal Area Procedures - Community noise concerns with advanced PBN procedures at levels below the 65DNL threshold appear to be raising. This is a dual concern as it creates a barrier to implementation of NextGen procedures and creates pressure to revisit

noise metrics and evaluation processes. Research is required to improve the noise evaluation process, support a strong scientific basis for any metric adjustments and to enhance community involvement.

Opportunities for Cross Cutting Approaches - The REDAC notes that many emerging technical opportunities (e.g. Big Data Analysis, Cyber-Security, Human-Automation System Integration) impact multiple lines of business throughout the agency. There appear to be opportunities to take cross-cutting approaches in these areas.

Finally, I would note that it has been a challenge for the REDAC to maintain a comprehensive strategic view of the FAA research portfolio as research, engineering and development activities occur under different budget accounts and offices including: RE&D, Facilities & Equipment, Operations (NextGen), and the Airport Trust Fund).

Thank you for the opportunity to comment on the importance of research to the FAA and I am happy to answer any questions you might have.