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May 2, 2019

The Honorable Daniel Elwell  
Acting Administrator  
Federal Aviation Administration  
800 Independence Avenue, SW  
Washington, DC 20591

Dear Administrator Elwell: 

Attached below please find the findings and recommendations from the REDAC subcommittees from their spring meetings which were somewhat abbreviated following the government shutdown. The Safety subcommittee was most impacted and did not have any specific findings in the time available.

The REDAC was pleased to see progress and participate on the Research and Development Landscape in the identification of research drivers. We suggest that the drivers and landscape should be a flexible and continuously evolving document and look forward to being briefed on the update drivers at our next meetings.

One of the important drivers that the REDAC noted is the emergence of multiple new classes of vehicle and operations are likely to request airworthiness and operational approval as well as integration into the NAS. Vehicles include small and large UAS/RPAS, Supersonic Business Jets, Commercial Space, Optionally Piloted Vehicles (OPV), Electric, Hybrid and Solar Electric Vehicles, eVTOL, eSTOL. Operations include mixed manned an unmanned, low altitude urban, high latitude loiter supersonic and sub orbital operations.

Finally the REDAC noted the challenges which have occurred over the past 2 years due to changes in the grants approval process particularly for the Centers of Excellence. We note that there has been some recent improvement but the long delays in approval have disrupted the R&D process which is particularly difficult for students and academic institutions.

Thanks for the opportunity to contribute.

Sincerely,

R. John Hansman  
Chair, FAA Research, Engineering and Development Advisory Committee

Enclosure



**Research, Engineering and Development Advisory Committee (REDAC)  
Recommendations for Fiscal Year 2021 Research and Development Portfolio**

**Subcommittee on Human Factors**

**Finding:** **2021 Human Factors Research Portfolio** - The Human Factors Subcommittee reviewed the 2021 Human Factors (HF) Portfolio Research Requirements considering the emerging issues list that was created at the Winter/Spring 2018 meeting. These emerging issues represent the consensus of the Subcommittee of important issues that need to be addressed and require research. The Subcommittee was pleased to see that many of the emerging issues on our list were covered in the research requirements. While there were some gaps, these were not deemed to be significant (at this time) except for those involving Trajectory Based Operations and Cyber Security.

**Recommendation:** The FAA should use the Human Factors Subcommittee emerging issues list to inform both the Research and Development Landscape drivers as well as the requirements for the HF research portfolio. The FAA should ask the Subcommittee for additional guidance or specificity on the HF emerging issues where it would help them understand the Human Factors issues to be addressed.

**Consequences:** Addressing the emerging issues list will proactively reduce safety risks in the aviation system. Conversely, not addressing the emerging issues list will result in adding safety risks into the system, especially as new features and operations are added to the system.

**Finding:** **Trajectory Based Operations** - The HF Subcommittee was pleased with the description of proposed research for the FY2021 Enterprise ATC Human Factors development program, noting direct relevance to potential operational challenges for NextGen and TBO. The Subcommittee noted the scope of the proposed research was large and the proposed budget appeared insufficient to cover the proposed work, and there are not yet Agency commitments for execution of the portfolio. The Subcommittee believes the research proposal is on track to address the needs but the funding will need to be provided to ensure the needs are met.

**Recommendation:** The FAA should ensure the proposed FY2021 Enterprise ATC Human Factors research plan is in fact funded as planned and if there are gaps in the research, that are not covered under the current plan, they are identified and added to the proposed work for 2022.

**Consequences:** If the FAA does not fund the proposed research it will jeopardize the early identification of Human Factors opportunities and assessments needed to minimize program costs, enhance safety, and minimize operational risks.

**Subcommittee on Aircraft Safety**

**No Findings and Recommendations Report during the Winter-Spring 2019 reporting cycle due to truncated schedule.**

## **Subcommittee on Environment and Energy**

**General Observations:** The Environment and Energy (E&E) Subcommittee of the FAA Research, Engineering and Development Advisory Committee (REDAC) met in Washington, DC on March 19 – 20, 2019. The Subcommittee focused on reviewing the Research and Development (R&D) portfolio in Environment and Energy for 2019 – 2020. Both the House and the Senate should be commended for recognizing that the President’s proposed \$75M budget would not be enough to allow the Office of Environment and Energy (AEE) to address their mission. The approval of the FY19 budget which included \$191.1M for RE&D funds is an endorsement of the work that is being done by AEE. The importance of the FAA’s E&E R&D portfolio was reflected in the results of the recent International Civil Aviation Organization/Committee on Aviation Environmental Protection (ICAO/CAEP) meeting and the adoption of the Carbon Offsetting and Reduction System for International Aviation (CORSIA). Following is the report on the outcome of this meeting. The recommendations offered are all for inclusion in the REDAC report.

**Finding: Noise Research** - The Subcommittee realizes that aviation noise is an ongoing issue and quite possibly the biggest threat to NextGen, the modernization of the NAS and constraint to the growth of the U.S. Aviation industry. Much research is still necessary to address the ongoing topic of aviation noise and the possible impact of new entrants into the market. The Subcommittee believes that there will be growth from Subsonic, UAM/UAS, Supersonics and Commercial Space vehicles and the FAA will need to be able to address the noise, emissions and health impacts of these new entrants. AEE is working with universities through the Aviation Sustainability Center (ASCENT) to better understand the underlying issues and develop innovative solutions. AEE is also working with industry to accelerate the development of technologies that reduce noise through the Continuous Lower Energy, Emissions and Noise (CLEEN) Program. Some of the work in ASCENT is being held up because of the current delay in processing grants.

**Recommendation:** The Subcommittee strongly supports the prioritization of the noise research that will support informed decision-making and enable NextGen Deployment. We believe that the focus should be on impacts of Subsonic, UAM/UAS, Supersonics and then Commercial Space vehicles, in that order. The FAA should aggressively move forward with its research efforts as research is the key to establishing sound policy.

**Finding: Global Leadership** - The adoption of CORSIA at the ICAO/CAEP meetings is a clear indication of the FAA’s ability to influence the establishment of international standards, which allows the U.S. aviation industry to maintain its competitiveness throughout the world. The Subcommittee believes that maintaining the U.S. global leadership position at ICAO/CAEP is essential to protecting U.S. aviation interests. This position is only possible because of the FAA’s ability to maintain its current research goals and its ability to evaluate the impacts of future entrants on the environment.



**Recommendation:** The Subcommittee recommends the prioritization of all research efforts/programs that will allow the FAA and the U.S. to maintain its current global leadership position at ICAO/CAEP and to expedite university research grants that support the U.S. work in ICAO/CAEP. It is the belief of the Subcommittee that if the FAA/U.S. does not maintain its leadership position at ICAO CAEP, it will not be able to influence policy/rulemaking and this could have a significant negative impact on the U.S. aviation industry.

**Finding: Alternative Jet Fuels** - It is the position of this Subcommittee that the work on Alternative Jet Fuels (AJF) is critical to the U.S. industry and should be supported at the highest levels. Having the FAA maintain a leadership role in the development of AJF will also ensure that the rules that are developed internationally will benefit the U.S. industry. A lot of progress has been made in the development of alternative fuels and any reduction of funding for the Alternative Jet Fuel (AJF) Program (including efforts in the Commercial Aviation Alternative Fuels Initiative (CAAFI), CLEEN and Aviation Sustainability Center (ASCENT)) will have a catastrophic effect on the maturation of this fledgling industry. It is our view that the new companies and the industry that have been created will not be able to continue the work on AJF without government funding and the policies and procedures that are currently in place. Alternative fuels are a critical component of the industry's emissions reduction strategy and must be developed if industry is to get to their carbon neutral growth goals after 2020 and their emissions reduction goals in 2050.

**Recommendation:** Since the maturation of the Alternative Jet Fuel program will be a major environmental benefit for the public, will create a new industry within the U.S. that benefits rural America, and will benefit the U.S. aviation industry, we strongly support funding for the continuation of research on AJF.

**Finding: Public Private Partnerships** - The Office of Environment and Energy (AEE) have proven over decades to be very good stewards of taxpayer money. They have used their budgeted amounts to conduct and coordinate the research necessary to produce informed policies, facilitate technological advances in the aviation industry, and produced models and data that have positioned the U.S. as both a State leader at ICAO/CAEP and on the global aviation stage. This has been accomplished by working collaboratively with private industry, major universities through the Partner and ASCENT Centers of Excellence, other federal departments and foreign governments. Three quarters of Environment and Energy research funds generate 100% plus cost matching from non-federal partners (CLEEN, CAAFI, and ASCENT). Recent challenges in the grant approval process have led AEE to solicit new project ideas from a wide range of researchers in the ASCENT and CLEEN program. These ideas will lead to new research efforts for ASCENT that should result in real-world innovation. In order for the work that is being conducted with private industry and by the universities in the Center of Excellence to not be adversely impacted, the government must approve these new grants and expedite the approval of grants that are currently in the pipeline. Delays in the approval of these grants has a negative effect on our working relationship with our partners.

**Recommendation:** The Subcommittee continues to endorse the robust funding of Public Private Partnerships like the CLEEN, CAAFI and ASCENT that leverage scarce resources. The Subcommittee is also pleased with the close collaboration between NASA and the FAA. AEE

presented an overall plan on how to get much needed new research ideas and to expedite the grant approval process. The Subcommittee endorses this plan. In order to not interrupt the much needed work that is being accomplished, we request that the FAA adopt this plan and expedite the approval of university grants.

**Finding: Emissions** - AEE has identified challenges associated with the use of the Aviation Environmental Design Tool (AEDT) to evaluate compliance with air quality standards. AEE has also identified challenges in getting air quality and noise data to support modeling efforts. AEDT is an important tool in the arsenal of tools that the FAA relies on to enhance usability and improve airspace and airport design. The Subcommittee is supportive of the work that has been done to develop this tool, but believes that a plan needs to be developed to address air quality modeling challenges and to compare AEDT results with field measurements.

**Recommendation:** The Subcommittee recommends the FAA continue the simultaneous balanced development of usability improvements, enhanced features, and increased accuracy of AEDT in the near term. The FAA should make a point of emphasis to improve the dispersion modeling that is used by AEDT to evaluate air quality impacts. We also recommend that the FAA reach out to airports that use air quality and noise monitors and partner with them in order to get their emissions and noise data that would support their modeling efforts.

### **Subcommittee on Airports**

**Finding: 10 Year Airport Pavement Plan Update** - During the meeting, FAA Airport Pavement Research Program staff discussed their plans to update its 10-year airport pavement research plan, reflecting research that would be conducted between 2020 and 2030. The Subcommittee supports this effort.

**Recommendation:** The Subcommittee recommends that the FAA proceed with updating its 10-year airport pavement research plan in coordination with both the Subcommittee and the more specialized airfield pavement Technical Advisory Group. We also request a progress report concerning the 10-year plan at our Summer 2019 meeting.

**Finding: Smart Airports** - The Subcommittee also received a briefing from Eric Neiderman regarding the concept of “smart airports”, a term Mr. Neiderman used to refer to the increasing use of connected and interactive technologies at airports to manage operations, facility maintenance, improve customer service, and enhance efficiency. The Subcommittee noted that considerable efforts are already underway within the airport industry both in the U.S. and internationally to define the term “smart airport” and its constituent components. Subcommittee members also noted that there are many existing industry forums dedicated to the development and refinement of “smart airport” concepts and enabling technologies, including the Internet of Things (IoT), building information modeling and asset management systems, and total airport management (TAM) concepts.



Consistent with these discussions, the Subcommittee found that FAA research and development activities related to smart airports should be informed by and build off well-established work that is already in progress within the airport industry.

**Recommendation:** The Subcommittee recommends that the FAA work with the Subcommittee members and other subject matter experts both within the airport industry and, more broadly, in the fields of technology, urban planning, and transportation planning to better understand the evolving field of “smart airports” and narrow its research focus to areas that are (1) associated with FAA’s statutory remit and (2) not otherwise being researched or developed by industry.

**Finding: PFAS** - As noted in our findings and recommendations from our Fall 2018 meeting, potential environmental contamination by per- and polyfluoroalkyl substances (PFAS) is a growing public policy issue. PFAS are a class of fluorinated hydrocarbon molecules that have been linked to adverse health outcomes in humans.<sup>1</sup>

In the airport context, PFAS are used in aqueous film-forming foam (AFFF) suppress and extinguish aircraft fuel fires. Under current FAA regulations, certificated airports are required to use AFFF because of the high level of performance it provides (e.g., ease of dispensing via current ARFF equipment, fire knockdown times, fire burn-through times).<sup>2</sup> This said, over the last decade there have been numerous alternative foams that have come onto the market and are being used at airports around the world.

Since the Subcommittee last met, the U.S. Environmental Protection Agency issued its *Per- and Polyfluoroalkyl Substances (PFAS) Action Plan*, which describes the research, regulatory, and governmental and community outreach activities the EPA is currently leading or plans to lead to “understand and effectively manage from PFAS”. The Action Plan encompasses initiatives that will be undertaken in the immediate to near future—2019 through 2022. In addition, since the Fall of 2019, key governmental organization and legislatures within several states—notably California, Massachusetts, Michigan, Oregon, and Washington—have raised significant concerns about potential PFAS contamination on and near airports.

We note that in accordance with the Subcommittee’s Fall 2018 recommendations, the FAA has expedited publication of a Cert Alert enabling the use of foam proportioning testing systems that enable certain FAA certification requirements to be met without requiring AFFF to be discharged into the environment. That said, the Subcommittee finds that the aforementioned actions of the U.S. EPA and state and local governments increase the urgent need for credible research regarding (1) containment practices that reduce the potential for PFAS contamination into the environment, (2) mitigation practices for PFAS that is already present in the environment, and (3) alternative fire suppression agents that do not contain PFAS.

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<sup>1</sup> <https://www.epa.gov/pfas/basic-information-pfas#health>

<sup>2</sup> The FAA Reauthorization Act of 2018, enacted on October 5, 2018, includes a provision that requires the FAA to allow use of non-fluorinated foams within three years of enactment provided they meet appropriate performance standards.

**Recommendation:** The Subcommittee reiterates its recommendation that the FAA proceed with all due speed with defensible research into the performance and use of alternatives to AFFF in the civil aviation sector including completing and commissioning its new fire research facility at the Technical Center.

We also reiterate our recommendation that the Airport Technology Research Programs perform a gap analysis of research regarding the health and environmental hazards associated with fluorinated AFFF use at airports and work with the Subcommittee to determine how these gaps can be addressed either within or externally to the these FAA Research Programs.

### **Subcommittee on NAS Ops**

**General Observation:** During the Spring 2019 NAS Operations REDAC meeting, the Subcommittee was briefed by the Enterprise Concept Development office on the FY2021 proposed portfolio for Budget Line 1A11A. The Enterprise Concept Development program assesses the feasibility of proposed NextGen capabilities during the early phases of the AMS lifecycle.

**Finding:** One Enterprise Concept Development project is the re-architecture of the U.S. NOTAM (Notice to Airmen) System. This was identified as a project of significance to the NAS from both safety of flight and an operations efficiencies perspectives. Human Factors considerations must be taken into account during the development of the concept for this re-engineered NOTAM system to guide configuration, adaptation, and integration of NOTAMS for pilots, ATC, and airport operators critical to the safety of the NAS.

**Recommendation:** The Subcommittee recommends that the Enterprise Concept Development project for NOTAM modernization engage Human Factors experts to help develop and validate effective concepts that adequately address human performance issues.

**General Observation:** During the Spring 2019 NAS Operations REDAC meeting, the Subcommittee committee was briefed by the Weather Technology in the Cockpit (WTIC) Office on the FY2021 proposed portfolio for Budget Line A12.c. The WTIC program research enhances safety, efficiency and capacity impacts related to weather.

**Finding: Weather Technology in the Cockpit Program (WTIC)** - WTIC plans to address weather information requirements and service criteria affecting existing UAS operations. UAS criteria are likely to differ significantly from those associated with GA owing to differences in aircraft dynamics, the airspace in which they operate and possible sensing and control latencies. WTIC does not appear to have extended this research to other important new entrants, in particular small, (in the future) pilotless passenger aircraft. The Subcommittee could not ascertain WTIC research plans addressing pertinent aspects of Simplified Vehicle Operations to support this class of aircraft.

**Recommendation:** WTIC should include research activities in their FY2021 portfolio that address weather information requirements and minimum service criteria for pilotless passenger

aircraft, particularly when these operate in urban airspace over people, structures or ground vehicles. Unique meteorological aspects of the urban environment, for example blockage and/or channeling of winds which could affect safety of ascent or descent should be considered.