



U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of the Administrator

800 Independence Ave., S.W.
Washington, D.C. 20591

October 8, 2019

Dr. R. John Hansman, Ph.D. Chair,
Research, Engineering and
Development Advisory Committee
Massachusetts Institute of Technology
77 Massachusetts Avenue
Cambridge, MA 02139

Dear Dr. Hansman:

Thank you and the Research, Engineering and Development Advisory Committee (REDAC) members for your December 2, 2018, letter for former Acting Administrator Elwell and the wide-ranging observations and recommendations offered by the subcommittees. I appreciate your insights and valuable dialog they stimulate to address critical issues, emerging challenges and research needs across the aviation industry.

The Federal Aviation Administration (FAA) is appreciative of the committee's cross cutting observation about the challenges posed by the growing investment in highly automated and autonomous vehicles and emerging Urban Air Mobility concepts. In addition, we recognize the potential value of advanced data-mining techniques in identifying emerging risks in National Airspace System operations. In response to your concern, the FAA will review the grants approval process to ensure our commitment to support Science, Technology, Engineering, and Mathematics students and productive relations with U.S. academic institutions is realized.

I have reviewed the subcommittee's recommendations and enclosed are the Agency responses to these recommendations.

We will continue to incorporate the Committee's recommendations as we maintain a research portfolio that addresses safety, efficiency and capacity of the air transportation system in an environmentally sustainable manner.

We look forward to continuing our valuable dialog and collaboration.

Sincerely,

A handwritten signature in black ink that reads "Steve Dickson". The signature is written in a cursive style with a large, prominent "S" at the beginning.

Steve Dickson
Administrator

Enclosure

FAA Response to REDAC Guidance for the Fiscal Year (FY) 2021 Research and Development (R&D) Portfolio

Full Committee Report URL: <http://www.faa.gov/go/redac>

Subcommittee on Environment and Energy

Alternative Jet Fuels – Recommendation 1: Since the maturation of the AJF 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 recommend that either RE&D A13.a¹ or A13.b² budget line items have an allocation for the continuation of research on AJF.

FAA Response: The FAA concurs with the Committee’s finding and recommendation and is undertaking the following actions to address its recommendation(s).

The FAA continues to conduct research & development on the topic of alternative jet fuels. We recently convened the Commercial Aviation Alternative Fuels Initiatives (CAAFI) Biennial General Meeting, which brought together nearly 200 people from industry, government and academia to discuss progress in the deployment of alternative jet fuels. We are also happy to note that the Secretary of Transportation approved several research and development projects to conduct testing and analysis on alternative jet fuels within the Aviation Sustainability Center (ASCENT) Center of Excellence. We also recently convened an industry day in preparation for a solicitation for the third phase of Continuous Lower Energy Emissions and Noise (CLEEN) and had much industry interest in research on alternative jet fuels. We will consider this recommendation as we develop the Fiscal Year 2021 budget.

Public Private Partnerships – Recommendation 2: The Subcommittee continues to endorse funding Public Private Partnerships like CLEEN, CAAFI and ASCENT that leverage scarce resources. We also endorse the close collaboration between NASA and the FAA. In order to not interrupt the much needed work that is being accomplished, we request that the FAA expedite the approval of the pending grants associated with these partnerships.

FAA Response: The FAA concurs with the Committee’s finding and recommendation and is undertaking the following actions to address its recommendation.

The FAA supports the Administration’s vision to maximize the impact of taxpayer dollars by improving the efficiency of Federal programs through partnerships with industry and creating benefit for the American public. The vast majority of the Environment and Energy R&D

¹ Environment and Energy

² NextGen – Environment Research – Aircraft Technologies, Fuels, and Metrics

program has been leveraging resources from the private sector via public-private partnerships. CLEEN, CAAFI and ASCENT have all been successful because of their strong engagement with industry. We also appreciate the recognition of our close partnership with NASA and its value. The Fiscal Year 2021 budget for the Environment and Energy R&D Program will continue to leverage private sector innovation through partnerships with industry, academia, private sector, and other government agencies and coordinate initiative across federal agencies to maximize collaboration and avoid duplication of efforts.

The FAA understands the new grant approval process has been challenging and we are working to improve the process. The FAA is working with Department of Transportation to streamline the grant approval process, while keeping all required organizations involved and informed.

Noise Research – Recommendation 3: 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, Urban Air Mobility (UAM)/UAS, supersonics and then commercial space vehicles, in that order. The FAA should therefore aggressively move forward with its research efforts.

FAA Response: The FAA concurs with the Committee’s finding and recommendation and is undertaking the following actions to address its recommendation.

Noise is indeed a challenge for the aviation industry. UAS, UAM, supersonic aircraft, and commercial space vehicles all present economic opportunities for the U.S. as well as potential concerns in terms of the environment, in particular noise. We have been working for many years to better understand the issues associated with noise from subsonic airplanes and helicopters and identify solutions that could help address noise concerns. More recently, the GAA has been doing work related to noise from supersonic aircraft and UAS. The FAA intends to continue these research efforts in the forthcoming budget submissions. Some of these efforts will address noise provisions in the 2018 FAA reauthorization. We are also working in close collaboration with NASA to address noise from subsonic aircraft, helicopters, UAS, UAM and supersonic aircraft. This includes domestic efforts as well as efforts in International Civil Aviation Organization (ICAO) Committee on Aviation Environmental Protection (CAEP). In coordination with the Institute for Noise Control Engineering (INCE), the FAA and NASA recently convened a workshop on noise emissions and noise control engineering technology for noise from UAS. This meeting brought together industry, academia and government to discuss the potential issues with UAS noise and identify opportunities for collaboration. Noise reduction from gas turbine powered fixed wing aircraft will also be an area of emphasis for the third phase of the CLEEN program, which will start in 2020.

Global Leadership – Recommendation 4: 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. It is the belief of the Subcommittee that if the FAA/U.S.

does not maintain its leadership position at the 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.

FAA Response: The FAA concurs with the Committee's recommendation and is undertaking the following actions to address it:

The FAA appreciates the support of the Subcommittee for our ICAO CAEP activities and the importance of continued U.S. leadership therein. We concur that it is critical for FAA to have robust participation in the ICAO CAEP process. FAA prioritized research efforts includes developing the modeling capabilities, and generating the data to support the decision-making process within ICAO CAEP. Efforts are also continuing in ICAO CAEP on supersonic aircraft. To be economically viable, these aircraft will need to be able to take off and land in other countries and this will require international agreements at ICAO CAEP. We have made considerable investments with industry to develop an engine Particulate Matter (PM) test database and modeling capabilities. As a result of these investments, we have a solid foundation for making decision in ICAO CAEP on an engine PM emissions standard at the CAEP/11 meeting.

Staffing – Recommendations 5: The Subcommittee recommends the FAA place a high priority on filling staff vacancies to manage the E&E R&D portfolio and support the expanding workload within AEE.

FAA Response: The FAA concurs with the Committee's recommendation and is undertaking the following actions to address it:

The FAA understands the Subcommittee's concern about staff availability within the Office of Environment and Energy (AEE). We are in the process of executing a hiring plan that was developed in accordance with administration guidance. To accommodate the evolving nature of the industry and the FAA's needs, we are seeking individuals who could cover a variety of needs to fill these openings. AE has had good success over the years in filling positions with highly qualified environmental professionals. This is due in part to the students and staff that have been trained as a part of Partnerships for Air Transportation Noise and Emissions Reduction (PARTNER) and ASCENT, the FAA Centers of Excellence for environment and alternative jet fuels.

Subcommittee on Aircraft Safety

Research and Development Program Strategy and Research Portfolio Assessment –

Recommendation 1: The FAA should consider not separating Human Factors and Aeromedical Factors in the new research focus areas.

FAA Response: The FAA concurs with the Committee’s finding and recommendation and is undertaking the following actions to address its recommendation:

These two research areas, while distinct disciplines, both focus on the impact and performance of the human operator in the safety of the aerospace system. There have been arguments made to both separate and to combine these human-centered research areas. The maturation and development of the landscapes has highlighted the synergies between these two research areas.

When the landscape for Human Factors and Aeromedical Factors is presented at the Spring 2019 REDAC meeting, this approach can be evaluated with input from the industry representatives.

FAA Research and Development Landscape – Recommendation 2: In order for the SAS to provide the FAA more meaningful feedback on the proposed research portfolio, we recommend that the FAA convey, for each research activity:

- a. The alignment or linkage to the current or emerging hazards with a high likelihood or potential to result in significant safety risks as identified by the FAA’s research priorities, and
- b. The benefits (e.g., safety improvement) of each research activity drawing on all available data and reasonable hazard assessment (i.e., going beyond limited-source data such as the Commercial Aviation Safety Team (CAST), General Aviation Joint Steering Committee (GAJSC), or Helicopter Safety Team data).

FAA Response: The FAA concurs with the Committee’s recommendations and with the noted exceptions and clarification intends to undertake the following actions to address its recommendation(s).

The Program Area Report presented to the subcommittee in the spring 2019 meeting will include information on the safety risk/implied benefit the research in the proposed portfolio is addressing.

As a point of clarification, the Pareto charts included in the FY 2021 Aviation Safety Strategic Guidance are there as examples of some of the aviation safety hazard and risk data that is used by the major safety teams, reflecting the areas with the greatest fatalities. The Strategic Guidance recognizes in its introductory paragraph that the included data is only a subset of the data the FAA has available for use in decision-making. The Strategic Guidance provides this subset of

existing, potential future, and emerging aviation safety risks for the sponsoring offices to consider, that are all based on the available data. The FAA continues to collect data and develop new data sources to use in making decisions.

Future Research Needs – Recommendation 3: Data that is more up to date should be used when identifying hazards, risks and safety issues analyzing risk in the NAS and identifying strategic research needs.

Recommendation 4: Advanced in data mining and machine learning should be applied to the large set of operational data to identify casual influences and trends in emerging risk areas.

FAA Response [to Recommendations 3 and 4]: The FAA concurs with the Committee’s recommendation(s) with the noted exceptions and clarifications intends to undertake the following actions to address its recommendation(s).

The FAA will continue to collect data and develop new data sources to use in making decisions. The Pareto charts included in the FY 2021 Strategic Guidance show the events with the highest fatality risk in part 121, General Aviation (GA), and helicopter operations. While the data used to create the charts as shown on their time stamp is older data, the top events remain the top events and are the ones addressed by the Commercial Aviation Safety Team (CAST), General Aviation Joint Steering Committee (GASJSC), and the United States Helicopter Safety Team (USHST). These groups are using the latest available data and tools, including advanced data mining and machine learning capabilities, to identify, analyze, and develop mitigations for the underlying safety hazards, and only a small number of these cases result in the need for research funded through the Aviation Safety Research and Development program.

As an example, CAST monitors risk in commercial aviation by review and analysis of accident data, incident data, and unexpected or unusual findings uncovered during review of operational data. CAST uses these various data sources to identify broad even categories to prioritize resources. These categories reflect internationally adopted taxonomies that allow for mutual understanding and communication of safety agendas throughout the world. U.S. commercial aviation has undergone a sea change in safety in recent years, with only one passenger fatality in nearly a decade’s worth of Part 121 air travel. Nonetheless, CAST continues to seek safety improvements by using Aviation Safety Information and Sharing (ASIAS) system to sift through the vast amounts of operational data and voluntary safety reports to identify emerging hazards, as well as to evaluate the effectiveness of deployed mitigations for known risks. As an evidence of this, note that the 21 most recent safety enhancements enacted by CAST have been based on non-accident data. The identified risks represent contributing factors to established accident categories. For example, the recent analytical study of Airplane State Awareness (ASA) represents a subset of loss of control (LOC) accident risk. ASIAS detected the presence of underlying contributing factors that could lead to loss of control events based on loss of situational airplane state awareness by the flight crew. Review of the incident data, as well as the

operational flight profiles of similar precipitating factors, opened new avenues for potential mitigations. Some of these mitigation strategies involve research; the ASA study team proposed research on enhanced flight display systems to provide better recovery cues for flight crews. These research areas are prioritized within the research processes.

Automation and Artificial Intelligence – Recommendation 5: FAA should develop a research plan to develop certification approaches and to support certification criteria and human factors evaluation of advanced automation systems.

FAA Response: The FAA appreciates the Committee’s finding and recommendation on developing a research plan to support airworthiness criteria for advanced automation systems. However, we are not able to pursue this recommendation at this time for the following reasons.

The FAA recognizes automation systems that use machine learning are not supported well by traditional software development and verification standards. Hence, FAA is investigating use of different ways of satisfying the safety goals. European Aviation Safety Agency (EASA) Executive Director and FAA’s Associate Administrator for Aviation Safety are already discussing innovative means of software and airborne electronic hardware approval criteria. This initiative would look at development assurance standards, extracting high-level objectives to cover, and openly and innovatively look at how to use alternative standards in the aviation domain, when they better match industry technological developments. Consequently, ongoing policy initiatives have a bearing in this area and must be developed first; should those initiatives lead to a need for research in the subject area, then we will consider development of a plan that would allow us to meet our research needs in the most effective manner

Runway Friction Research – Recommendation 6: The FAA should develop a plan to explore data reduction methods and provide the REDAC with an update research approach including the overall roadmap and strategic plan.

FAA Response: The FAA concurs with the Committee’s finding and recommendation and is undertaking the following actions to address its recommendation.

The FAA will reconvene its runway friction research working group, which includes representatives from industry, and will update its runway friction research plan based on SAS recommendation and will submit the updated plan to the SAS subcommittee in the third quarter of FY 2019.

Recommendation 7: The FAA should continue down the path of developing and maturing research focus areas and landscapes and provide a draft to the subcommittee for review and feedback prior to the next subcommittee meeting March 2019. The draft should include a compilation of the ongoing research that supports the research focus areas, regardless of BLI.

FAA Response: The FAA concurs with the Committee's recommendations and with the noted exceptions and clarifications intends to undertake the following actions to address its recommendation.

The FAA plans to complete the initial draft landscapes by the end of February 2019. For presentation to REDAC at the next subcommittee meeting. The draft landscape will not yet include a complete compilation of ongoing research. The FAA looks forward to REDAC's feedback after their review of the draft version.

Subcommittee on NAS Operations

Human Factors – Recommendation 1: The FAA should develop a clear top-down strategy for identifying and prioritizing human factors research that spans existing acquisition programs as well as future NextGen initiatives. This strategy should extend beyond tactical air traffic control to include complex collaborative air traffic management considerations in the future Trajectory Based Operations (TBO) environment. A more effective process for cataloguing and disseminating human factors research products should also be defined and implemented.

FAA Response: The FAA concurs with the Committee's finding and recommendation and is undertaking the following action to address its recommendation.

The NextGen Human Factors Division will brief the Subcommittee at its next meeting to amplify on the strategy and approach for identifying and prioritizing research for both the Core and NextGen Air Traffic Control (ATC) programs. The Core program addresses near-term research requirements including human factors integration in acquisition programs. The Air Traffic Organization (ATO) uses its research requirements process called the Roundtable to determine its research priorities each year. In addition, Core program staff directly support the Air Traffic Control System, Command Center and its development of collaborative air traffic management programs. The NextGen program uses an Enterprise strategy to identify with ATO and the Office of NextGen (ANG) sponsors the human factors research requirements that are cross-cutting between NextGen capabilities. This includes inter-dependencies in human factors across capabilities and programs involved in future trajectory based operations. Human factors research products are disseminated to ATO and ANG programs and human factors practitioners, as well as presented to the human factors community through Human Factors Reviews held twice

annually. Reports are published on public websites maintained by the Technical Center and Civil Aerospace Medical Institute (CAMI).

Commercial Space Transportation – Recommendation 2: The FAA should accelerate its investment in near-term solutions (not requiring new tools) to minimize operational impact of commercial space launches on all NAS users. Investment in research for longer term solutions, such as TBO and integration R&D relate to surveillance, aircraft separation, and airspace management during space operations needs to be accelerated. Technology, data, and processes should be developed for objectively mediating the relative costs and priorities between space and air operations requesting access to the same airspace.

FAA Response: The FAA concurs with the committee's finding and with noted clarification is undertaking the following actions to address its recommendation. First, we should note that there are two programs underway – the Space Data Integrator (SDI) and Acceptable Level of Risk (ALR) which address the committee's recommendation.

The SDI program is an investment in near-term solutions that minimizes operational impact of commercial space launches on all NAS users. SDI automates the FAA's currently manual, time consuming and resource-intensive procedures to support commercial launch and reentry operations. The objectives of the SDI are to allow for extending the operations' planning to include filing a flight plan, to provide situational awareness to the Joint Space Operations Group at the FAA Air Traffic Control System Command Center on the launch and reentry vehicle position and mission parameters during the full operations, and to support the detection and response to abnormal events. The program is currently in the investment analysis phase with a final investment decision expected in 2019 at which point a baseline implementation schedule will be established.

Based on safety principles from both the commercial space and aviation industries, the Acceptable Level of Risk (ALR) is another approach designed to mitigate NAS efficiency and capacity impacts resulting from airspace segregation. To support this impact mitigation, three key elements of the ALR approach are application of an intermediate adjustment in individual risk, operational restrictions, and a new collective risk limit.

The FAA will offer status updates on these program initiatives as they progress at future committee meetings.

Subcommittee on Human Factors

Flight Crew Information Management – Recommendation 1: The FAA should fund research on Flight Crew Information Management to address the identified gaps in the HF R&D portfolio. The research should document current practices, identify actual/potential threats, and identify mitigation strategies. The research should also include but should not be limited to the following:

- Managing information across systems such as: Controller-pilot data link communications (CPDLC), Aircraft communications addressing and reporting system (ACARS), Radar, EFB, aircraft systems, external (non-aircraft) applications, etc.
- Identify strategies for mitigating information overload and distraction,
- Methods for understanding the accuracy, integrity, (i.e., trustworthiness), and timeliness of information,
- Effective information management for operational,-tactical, and strategic decision-making.

FAA Response: The FAA concurs with the Committee's finding and recommendation and is undertaking the following actions to address its recommendation.

Research related to Flight Deck Information Management is a high priority to FAA and Industry: The FAA plans to engage relevant stakeholders to develop a coordination strategy for addressing information management needs within and across flight deck systems, including those that may arise during the initial Trajectory Based Operations (iTBO), full TBO, and dynamic TBO transition. The FAA will consider the four topic areas defined in Research, Engineering and Development Advisory Committee (REDAC) Recommendation 2 to support research requirements that contribute to the evolution of FAA policy and guidance, as appropriate. Based on the current state of the research program, NextGen priorities, and the needs of technical sponsors, the NextGen Human Factors Division (ANG-CI) will work to accelerate the start of this important effort and will provide a briefing at the next REDAC subcommittee meeting, to include work currently underway and programmed in FY 2020 and beyond.

Research and Development Landscape - Recommendations 2-5: Content

- Continue to mature the Landscape framework.
- Identify partnerships for cross cutting Human Factors areas and identify what research is being done, where, and any gaps.
- Identify lead, leverage, and watch areas for HF research areas and provide links to partnerships.
- Illustrate the budget for the entire portfolio and identify high priority areas and how they link to funded programs.

FAA Response: The FAA concurs with the recommendations related to the content of Landscape framework and will share the first draft with the REDAC subcommittees during the 2019 spring meetings. (See Aviation Industry Landscape aggregate response at the end of this document.)

Recommendations 6-7: Process

- Create a means by which the Landscape can inform the R&D portfolio, including prioritization of projects.
- Describe how the Landscape will address cross cutting issues like Human Factors and Safety that impact multiple areas/domains identified in the Landscape.

FAA Response: The FAA concurs with this recommendation on Landscape Process. (See Aviation Industry Landscape aggregate response at the end of this document.)

Recommendation 8-9: Communication

- Provide the HF subcommittee evidence the Landscape is influencing the HF portfolio and prioritization of projects.
- Provide examples of how the Landscape is being used to influence the overall R&D portfolio, especially as related to partnering and leveraging R&D from other stakeholders.

FAA Response: The FAA Concur with the communication recommendations. (See Aviation Industry Landscape aggregate response at the end of this document.)

Subcommittee on Airports

Commercial Airspace Aviation Rulemaking - Recommendation 1: The Subcommittee recommends that the FAA's Office of Airports together with the Airport Technology Research Branch directly coordinates with the Spaceport Categorization ARC and, to the extent it is pertinent, the Airspace Access Priorities ARC to ensure that their research informs (and is informed by) the ARCs.

FAA Response: The FAA concurs with the Committee's recommendation(s) and with the noted exceptions and clarifications intends to undertake the following actions to address its recommendation(s).

The Airport Technology Research Branch will continue to work with the Office of Airports (ARP) in finalizing the findings from the ongoing Gap Analysis study of ARP regulations and standards as they pertain to Commercial Space applications, with a focus on vehicle profiles and

their effects on airport infrastructure and equipment. Due to the sensitive nature of the information gathered for this research effort, the Office of Commercial Space Transportation (AST) will review the findings and determine what information can be shared with the ARCs. It is expected that the findings will be shared with the ARCs in FY 2019, 4th Quarter.

Cybersecurity R&D Plan - Recommendation 2: The Subcommittee recommends that the FAA work with the Subcommittee members and other subject matter experts at airports to ensure that the FAA Cybersecurity R&D Plan appropriately reflects airport operators' roles, responsibilities, and involvement in aviation cybersecurity in the United States.

FAA Response: The FAA concurs with the Committee's finding and recommendation and is undertaking the following actions to address its recommendation.

The Airport Technology Research Branch will engage the FAA Cybersecurity R&D team, located at the Technical Center to coordinate discussions with the Office of Airports and pertinent Subcommittee members, to ensure that the FAA Cybersecurity R&D Plan appropriately reflects airport operators' roles, responsibilities, and involvement in aviation cybersecurity in the United States. The completion date is FY 2019, 4th Quarter.

PFAS - Recommendation 3: The Subcommittee strongly recommends that the FAA expedite completion of ongoing research efforts relating to foam proportioning systems. The Subcommittee also strongly encourages the FAA to revisit firefighting foam research and ensure that there are scientifically based mechanisms/testing protocols for evaluating fluorine-free foams in the civil aviation sector, ideally using the newly commissioned and state-of-the-art fire testing facility at the FAA Technical Center.

FAA Response: The FAA concurs with the Committee's finding and recommendation and is undertaking the following actions to address its recommendation.

- 1) The Air Traffic Requirements (ATR) Aircraft Rescue and Fire Fighting (ARFF) Research Program and the Office of Airports completed an evaluation and report on three technologies of foam proportioning system testing devices. The report was published in June 2019 and can be found at <http://www.airporttech.tc.faa.gov/Products/Airport-Safety-Papers-Publications/Airport-Safety-Detail/ArtMID/3682/ArticleID/1484/Evaluation-of-Input-Based-Foam-Proportioner-Testing-Systems>
- 2) The other aspect of the recommendation refers to the search for a fluorine-free replacement for current Aqueous Film Forming Foam (AFFF) chemistries. The ATR ARFF Research Program is beginning the process of investigating currently available fluorine-free products for viable candidates for future fire extinguishing performance testing. The process will also include potential modification to existing chemistries to improve fire-fighting performance. Selection of potential candidate products for fire

testing will begin in the third quarter of calendar year 2019.

- 3) Fire extinguishing performance testing using the new fire research facility currently under construction will begin by the end of calendar year 2019. This research will be a top priority and the anticipated schedule is to have a report on viable candidate replacement chemistries by the fourth quarter of 2021.

Recommendation 4: We also recommend 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 FAA Research Programs.

FAA Response: The FAA concurs with the Committee's finding and recommendation and is undertaking the following actions to address its recommendation. The ATR ARFF Research Program will perform a gap analysis of research regarding the health and environmental hazards associated with fluorinated AFFF use at airports. The gap analysis will be performed concurrently with the literature review search for fluorine-free alternatives starting in the first quarter of calendar year 2019. The gap analysis is scheduled for completion at the end of the second quarter of calendar year 2019. The Subcommittee was updated during their July 31 meeting on the status of this work. The research has been completed and is under review.

DOT/FAA Strategic Research - Recommendation 5: The Subcommittee recommends including discussions of the alignment of the Airport Technologies Research program with broader DOT and FAA strategic research goals in each of our face-to-face meetings.

FAA Response: The FAA concurs with the Committee's finding and recommendation and is undertaking the following actions to address its recommendation.

The Airport Technology Research Branch will review, present and include discussions of the alignment of the Airport Technologies Research program with broader DOT and FAA strategic research at future Subcommittee meetings. It should be noted that the Airport Technology Research Branch together with the Office of Airports are actively engaged in the ongoing development of various FAA strategic research documents. Date of completion is 4th Quarter, FY 2019.

Strategic Program Focus - Recommendation 6: Although we do currently plan to meet for two days at our March 2019 meeting, the Subcommittee recommends continuing the precedent set at the summer of 2018. This includes organizing the agenda for this meeting to focus on strategic reviews of Airport Technologies Research Program, its connections with other FAA research programs-notably the Environment & Energy Research Program, and alignment with DOT research priorities.

We understand that this would come at the expense of more comprehensive and detailed reviews of individual research projects. To ensure that reviews of projects of particular interest are not missed, the Subcommittee proposes to identify 4-5 projects for deeper technical discussion in collaboration with the FAA Research Program leadership a month or so prior to each face-to-face meeting.

FAA Response: The FAA concurs with the Committee's finding and recommendation and is undertaking the following actions to address its recommendation.

The Airport Technology Research Branch will coordinate with the Subcommittee chair to develop subcommittee meeting agendas that, along with selected project reviews, provide strategic reviews of Airport Technologies Research Program and its connections with other FAA research programs, as well as alignment with DOT research priorities. Date of completion: Feb 15, 2019.

Recommendation 7: The Subcommittee also recommends that the FAA continues to provide web/teleconference access for Subcommittee members that are unable to attend the meeting in person either due to financial or time constraints.

FAA Response: The FAA concurs with the Committee's finding and recommendation and is undertaking the following actions to address its recommendation.

The Airport Technology Research Branch will provide web/teleconference access for Subcommittee members that are unable to physically attend the meeting. Expected date of completion: on-going service.

Aviation Industry Landscape Recommendations

Safety Subcommittee: The FAA should continue down the path of developing and maturing research focus areas and landscapes and provide a draft to the subcommittee for review and feedback prior to the next subcommittee meeting in March 2019. The draft should include a compilation of the ongoing research that supports the research focus areas, regardless of BLI.

Human Factors Subcommittee:

Content

- Continue to mature the Landscape framework.
- Identify partnerships for cross cutting Human Factors areas and identify what research is being done, where, and any gaps.
- Identify lead, leverage, and watch areas for HF research areas and provide links to partnerships.

- Illustrate the budget for the entire portfolio and identify high priority areas and how they link to funded programs.

Process

- Create a means by which the Landscape can inform the R&D portfolio, including prioritization of projects.
- Describe how the Landscape will address cross cutting issues like Human Factors and Safety that impact multiple areas/domains identified in the Landscape.

Communication

- Provide the HF subcommittee evidence the Landscape is influencing the HF portfolio and prioritization of projects.
- Provide examples of how the Landscape is being used to influence the overall R&D portfolio, especially as related to partnering and leveraging R&D from other stakeholders.

FAA Response: The FAA concurs with the recommendations related to the Aviation Industry Landscape framework and intends to undertake the following actions to address its recommendations.

At the 2019 spring subcommittee meetings, the FAA will present the first draft of the landscape framework. This framework will identify drivers that FAA understands may affect industry objectives, emerging technologies, and/or envisioned operations. At the spring meetings, the RED AC subcommittees will validate the draft drivers and provide additional known industry research drivers. FAA anticipates REDAC providing input and feedback on a regular basis and updating the landscape framework accordingly. As the landscape framework matures, the FAA will assess its role in its research prioritization process and in identifying cross cutting issues/ areas.