



U.S. Department
of Transportation

**Federal Aviation
Administration**

Office of the Administrator

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

July 9, 2014

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 Federal Aviation Administration's Research, Engineering and Development Advisory Committee for your April 24 letter providing recommendations on the Fiscal Year 2016 Research and Development (R&D) portfolio.

I have reviewed your recommendations and enclosed are the responses to the Subcommittee recommendations.

We will continue to incorporate the Committee's recommendations as we build an R&D portfolio that addresses safety, efficiency, and capacity of the air transportation system in an environmentally sound manner.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael P. Huerta", with a circled number "1" at the end.

Michael P. Huerta
Administrator

Enclosure

FAA Response to REDAC Recommendations on the FY 2016 R&D Portfolio

Subcommittee on Aircraft Safety

Finding: Information about the likelihood of predicted weather events has the potential to lead to better operational decisions by airline operations center personnel, pilots, air traffic controllers, and flow management specialist. To make use of such information in the design of weather displays and in decision support tools and in the training for their use requires an understanding of how these people deal with probabilistic weather information.

Recommendation (1): There is a significant body of knowledge about how people deal with probabilistic information for decision making in situations involving risk. It is recommended that the Weather program get sufficient understanding, using such information where appropriate, to help them design weather forecast displays, decisions support tools, and associated training that make use of probabilistic weather information.

FAA Response: The Federal Aviation Administration (FAA) agrees with the Subcommittee to leverage the significant body of knowledge that exists on probabilistic information for decision making in situations involving risk. The FAA plans to conduct a thorough literature review and looks forward to presenting progress in this area to the Subcommittee this fall.

Findings: The FAA provided the Human Factors and Aircraft Safety Subcommittees the opportunity to review the FAA's *Integration of Civil UAS in the NAS Roadmap* which they released in November 2013. While a major step in the right direction, the Subcommittees found that the roadmap was at a high-level and did not on its own contain sufficient detail with regard to specific milestones and dates for the Subcommittees to make informed recommendations to the FAA on research requirements, priorities, and gaps. The Subcommittee believes that access to the FAA's Unmanned Aircraft Systems (UAS) Airspace Integration Concept of Operations and the "integration plan" currently under development would be important.

In addition, the Subcommittees have the following observations:

- Given that the FAA has no formal role in influencing the selection and/or execution of research conducted at the FAA UAS Test Sites there is a potential for missed opportunity and concern that the FAA may not get useful research results from the effort.
- While there appears to be an urgent need for research to inform FAA decisions and planning efforts, much of the research will not produce results for several more years. As a consequence, much of the research may be late to need.
- Sensor fusion research seems focused on a solution that is associated with a design concept which may be the purview of a proponent. It would seem more appropriate for FAA research to be focused on results which would be the basis for establishment of standards and/or inform certification approaches.

- The following UAS integration research is either minimally addressed or apparently missing from the FAA's research portfolio: air traffic management procedures and capability enhancements; operational procedures development; ground station and communication requirements, the effectiveness of existing and planned procedural mitigations; and mechanisms for the safe response to failures and other contingencies.

Recommendation (2): The FAA should develop a holistic implementation plan to include a detailed R&D strategy which would address the research needs from both the regulator and airspace operator perspectives.

FAA Response: The UAS Integration Office and NextGen Research and Development Integration Division will leverage the work of the Interagency Planning Office (IPO) (formerly JPDO), the Science and Research Panel and our Government and industry research partners to build and update a UAS R&D research inventory to address key research needs. This R&D strategy will leverage the ongoing IPO research inventory and mapping effort that will be completed in Fiscal Year (FY) 2014. The strategy also leverages the ongoing commitment to develop joint research priorities with the Science and Research Panel on areas of mutual research interest. The UAS Integration Office and NextGen Research and Development Integration Division will continue our effective collaboration with the FAA Air Traffic Organization (ATO) Operational Concepts, Validation and Requirements, and Air Traffic Procedures directorates to incorporate their airspace operator perspective in the resulting research inventory and research execution plans. This perspective will help identify and incorporate Air Traffic Management (ATM)-related research for validation of the FAA UAS ConOps concept level requirements. Our continued coordination with the ATO Airspace Services Directorate will also help us plan for research related to future airspace and related air traffic operations requirements. The resulting research inventory will provide a continuing mechanism to collaborate by incorporating regulator and airspace operator research needs in specific research efforts, when practical, and identifying where closely-related research efforts can leverage related results when joint research objectives are not practical. This strategy may also provide a single common reference for research activities to be used in collaboration with our government and industry partners.

We do not see the need to publish a holistic implementation plan to document our R&D strategy as noted in this recommendation. We feel that the R&D strategy we are implementing will address research needs from both the regulator and airspace operator perspectives. We will brief the Subcommittee at the next meeting on progress we have made in implementing our R&D strategy.

Subcommittee on Human Factors

Finding: While the Department of Transportation and the FAA do not have a DOD-like Human-System Integration (HSI) process for acquisition, the Advanced Concepts and Technology Development Office (ANG-C) has been integrating human factors (HF) into the

acquisition process through an HF/AMS Integration Management Plan. Much of this effort has entailed creating relationships and showing the value of HF within the acquisition process. A quarterly Human Factors Acquisition Working Group meeting has also been implemented. The Subcommittee found these and other elements to be great strides in the correct direction of fulfilling the FAA policy to systematically integrate HF into the planning and execution of functions of all FAA elements and activities associated with system acquisitions and systems operations. However, while necessary, these steps alone are insufficient to ensure that HF will be appropriately integrated and addressed in all acquisitions. What is also needed is a means to formally instantiate HF integration into the lifecycle management process. One possible means would be to create specific HF checklist items within the lifecycle management process requirements.

Recommendation (1): To ensure HF is appropriately included in all FAA acquisitions, formally instantiate HF integration into the FAA lifecycle management process. An example is the inclusion of HF-specific checklist items as part of the overall acquisition process.

FAA Response: The FAA believes the Acquisition Management System (AMS) process as currently structured integrates human factors at many of the key points across the acquisition life cycle. As presented to the REDAC, the Human Factors Division coordinates with the ATO's Program Management Office through the Human Factors Acquisition Working Group to identify potential improvements to this integration. One such improvement involves development of additional guidance and standards, which may be sufficient to instantiate human factors in each phase of the AMS life cycle. Currently, the majority of these integration points into the AMS occur in the latter parts of the AMS lifecycle. As gaps are identified, such as in the early parts of the lifecycle, which require further changes to the AMS to either strengthen the human factors activities at key points or add additional human factors steps, these recommendations will be made to the FAA Acquisition Executive Board (AEB). Working on continually improving the role of HF in the AMS is an area of activity for the Human Factors Acquisition Working Group.

Finding: The research plan is judged to be sound and reasonable given the erratic and sparse funding. There were a few noted concerns however: (1) the Human-System Integration (HIS) roadmap seems to under-represent the impact of NextGen on potential NAS actors' work environment, tasks and training (including controllers and pilots); and (2) the impact of Operational Improvements (OIs) on different NAS actors doesn't appear to be well described.

Recommendation (2): The FAA responded to a previous recommendation (see response dated February 28, 2014) that, in the mid-term NextGen time frame, controller roles and responsibilities will not change. However, the tasks and task load of controllers, pilots, and other NAS actors are likely to change (e.g., different workload profiles, possible staff distribution across the facility, coordination between facilities, changes in communication load between controllers and between controllers and pilots, information requirements, training, etc.). Thus, ANG-C1 (HF Division) should perform an analysis of potential NAS actor task and work

environment changes related to mid-term NextGen implementation and reflect the implications on the HSI roadmap.

FAA Response: The Human Factors Division (ANG-C1) is in the process of updating the Human-System Integration (HSI) Roadmap to better represent the impact of OI's on each NAS actor. This change includes a new way of characterizing the potential effect of each OI on the NAS actors' work environment, tasks, and training. By displaying the changes in a greater level of detail, and focusing better on the nature of change, the impact of NextGen should be considerably easier to understand. ANG-C1 completed an analysis of the potential NextGen changes to the ATC NAS actor job in 2010 and will be updating that analysis this year. ANG-C1 will also be completing an analysis of the NextGen changes to technical operations job this year. The results of those analyses will be reflected in the HSI Roadmap and briefed to the Subcommittee at the next meeting.

Finding: The FAA provided the HF and Aircraft Safety Subcommittees the opportunity to review the FAA's *Integration of Civil UAS in the NAS Roadmap* which they released in November 2013. The HF Subcommittee concurs with the general finding and recommendation provided by Subcommittee on Aircraft Safety. Particularly, the HF Subcommittee was concerned that the following UAS integration research is either minimally addressed or apparently missing from the FAA's research portfolio: air traffic management procedures and capability enhancements; pilot/operator operational procedures development; ground station and communication requirements, the effectiveness of existing and planned procedural mitigations; and mechanisms for the safe response to failures and other contingencies. Further, the HF Subcommittee has concerns, raised in earlier recommendations, that the research is not addressing UAS integration into the airspace from an air traffic perspective.

Recommendation (3): The FAA should develop a holistic implementation plan to include a detailed R&D strategy which would address the research needs from both the regulator and airspace operator perspectives.

FAA Response: The UAS Integration Office and NextGen Research and Development Integration Division will leverage the work of the IPO, the Science and Research Panel, and our Government and industry research partners to build and update a UAS R&D research inventory to address key research needs. This R&D strategy will leverage the ongoing IPO research inventory and mapping effort that will be completed in FY 2014. The strategy also leverages the ongoing commitment to develop joint research priorities with the Science and Research Panel on areas of mutual research interest. The UAS Integration Office and NextGen Research and Development Integration Division will continue our effective collaboration with the ATO Operational Concepts, Validation and Requirements, and Air Traffic Procedures directorates to incorporate their airspace operator perspective in the resulting research inventory and research execution plans. This perspective will help identify and incorporate ATM-related research for validation of the FAA UAS ConOps concept level requirements. Our continued coordination

with the ATO Airspace Services Directorate will also help us plan for research related to future airspace and related air traffic operations requirements. The resulting research inventory will provide a continuing mechanism to collaborate by incorporating regulator and airspace operator research needs in specific research efforts, when practical, and identifying where closely-related research efforts can leverage related results when joint research objectives are not practical. This strategy may also provide a single common reference for research activities to be used in collaboration with our government and industry partners.

We do not see the need to publish a holistic implementation plan to document our R&D strategy as noted in this recommendation. We feel that the R&D strategy we are implementing will address research needs from both the regulator and airspace operator perspectives. We will brief the Subcommittee at the next meeting on progress we have made in implementing our R&D strategy.

Finding: During the review of both the air and ground plans for HF research, the Subcommittee saw a lot of common themes across the domains, particularly in the NextGen research areas, and specific, focused topics where they are starting to integrate. These have a value also in identifying and mitigating risks earlier that may arise in the integration that can impact both air and ground developments. It is important the research sponsors be briefed on and fully understands the potential synergies and efficiencies that can be obtained and realized.

Recommendation (4): The FAA Air Traffic Organization (ATO) and Office of Aviation Safety (AVS) organization, in coordination with NextGen Office (ANG), should develop a consensus top five assessment of human performance issues with NextGen air/ground integration to drive appropriate research.

FAA Response: The FAA agrees that it is important that the sponsors across ATO, AVS, and ANG fully understand potential synergies and efficiencies that exist in their research requirements, particularly in the area of NextGen air/ground integration research.

In AVS, the top five NextGen related human factors priorities, as well as the full rank-ordered list of nearly 100 other AVS research requirements, are prioritized and vetted annually through the AVS RED prioritization process. These research requirements are reviewed and signed off by all levels of AVS management, from the requesting sponsor/end user up to AVS-1. ANG and the ATO Program Management Organization (PMO) have a jointly established and agreed upon list of their “Top Seven” programs.

ANG-C1 who manages the NextGen Air/Ground Integration Human Factors research will work with ATO and AVS Sponsors to address the air/ground integration areas of overlap and synergy on human performance issues. The results of the effort will be briefed to the Subcommittees on Aircraft Safety and Human Factors at the Fall 2014 Subcommittee meetings.

Finding: The Subcommittee observed that the Weather Technology in the Cockpit (WTIC) program is making progress in an area of research important to aviation safety, and which has

considerable HF implications. The WTIC Program has come up with a strategy for developing training that involves and leverages the Flight Standards (AFS) and Aircraft Owners and Pilots Association (AOPA) organizations experienced in training, and that inherently promotes dissemination. However, other aspects of the research are not as efficiently and effectively directed, particularly around experimental studies of pilot decision making. Based on the presentation they appear to believe that the problem to solve is in the information presentation, without an understanding that more (or higher quality) information will not entirely solve poor weather decision making. Results to date have been predictable.

Recommendation (5): The research plan needs to articulate the pilot decisions that they are aiming to support, and then analytically define how WTIC-provided information and portrayal of that information is expected to improve pilot decision making. Then, predict how information portrayal may support or degrade these specific decisions based on the literature and use Human-In-The-Loop (HITL) to validate the analysis and predictions. Likewise, examine other ways of improving pilot decision making about weather, independent of the quality of the information, such as training for pilots about decision making about weather accounting for likely behaviors such as decision biases.

FAA Response: The FAA concurs with the Human Factors Subcommittee recommendation to investigate pilot decision making in various adverse weather scenarios to identify the minimum meteorological (MET) information and rendering techniques in the cockpit that are needed to enhance pilot decision making relative to adverse weather. We also concur that HITLs and literature reviews should be used to evaluate the impacts of various rendering and portrayal methods on pilot use of the MET information. The FAA also agrees that training aspects relative to pilot decision making need to be researched. The WTIC program will include details about ongoing and planned research that supports these recommendations in updates to the REDAC the fall of 2014.

Finding: The Subcommittee noted that that the Air Traffic Control (ATC)/Tech Ops HF Core program has developed a promising strategic direction that involves tighter partnering with the ATO. Their strategy appears to be driven by what they can get initial traction on with ATO sponsors, and what they can do with limited resources. However, it is recognized that getting initial traction has a potential long-term benefit for highlighting the benefit of HF to a wide range of sponsors in ATO, and that the strategic direction can also be extended to more direct contribution to service analysis and strategic planning functions in the Acquisition Management System (AMS).

Recommendation (6): The strategic direction for ATC/Tech Ops HF Core program should also articulate how the FAA should use Core HF research in service analysis and strategic planning functions in the AMS.

FAA Response: Service organizations (sponsors) in the FAA use Human Factors (HF) ATC/TO Core research products to mature operational concepts, reduce risk, or define requirements. The

HF program does not currently describe these products in terms of AMS outputs and products. At the next HF Subcommittee REDAC, the ATC/Tech Ops HF core program will report back on how outputs and products of applicable proposed FY16 research project briefed at the April 2014 HF Subcommittee maps to Service Analysis and Strategic Planning and explain how they should be used at that stage. For example, the output of the “Safety Alerts” project may be used to advance the maturity of programs undergoing Concept Maturity and Technology Development in the Service Analysis phase. As an additional example, the “Scenarios and Human Performance Metrics” project may be used in the Preliminary Shortfall Analysis Report product to quantify the human-system performance shortfalls and capabilities to be attained, human-in-the-loop system performance measures or targets, and quantification of operational benefits. Such outputs and products help programs to proceed further in the life cycle management process. At future HF REDAC Subcommittee meetings, mappings of relevant proposed research to Service Analysis and Strategic Planning phases in the AMS will be included as a matter of course.

Finding: In earlier findings and recommendations, the HF Subcommittee noted that the key role of development of a Fatigue Risk Management System (FRMS) database plays in (1) supporting the implementation of FRMS at air carriers, (2) guiding a standard implementation of FRMS at air carriers, and (3) allowing the FAA to monitor for continuing flight crew fatigue issues. Earlier recommendations noted that the proposed FY 2016 activities to develop this database are too late to be fully effective, and the proposed work should be moved earlier. Aggravating the need for this research since the earlier recommendations, the FAA has further implemented Code of Federal Regulation (CFR) 117, which implements new pilot scheduling requirements intended to further mitigate pilot fatigue risk. However, while the proposed research’s value appears to be recognized by tentative selection within the AVS process, its tentative funding date remains at FY 2016.

Recommendation (7): To ensure that the pilot scheduling rules called for under CFR 117 are meeting their intended fatigue reduction goals, and for the reasons also cited in previous recommendations, the proposed research developing a FRMS database should be moved earlier, i.e., viewed as a pop-up within FY 2014 and/or scheduled to start in FY 2015.

FAA Response: The FAA is currently working on database development for input from certificate holder’s Fatigue Risk Management Plans (FRMP). Database development for certificate holder’s proposed FRMS is under internal FAA discussion. Part of this work in FY 2014 includes consideration for an unbudgeted research proposal in FY 2015 to begin earlier tasking of the FY 2016 requirement. Status of the FRMP database will be provided at the next Subcommittee meeting in September 2014.

NAS Operations Subcommittee

Background: At its August 2013 meeting, the NAS Operations Subcommittee recommended that the FAA expedite its work with MITRE to develop an initial set of weather research requirements in early CY 2014 and that this work encompass both Aviation Weather Research (AWRP) and Weather Technology in the Cockpit (WTIC). The Subcommittee further recommended that the FAA rapidly identify those portions of the WTIC program that can provide quantitative NextGen and GA safety benefits and brief the Subcommittee on those benefits. In March 2014, the FAA briefed the Subcommittee on their progress with the MITRE Operational Weather Needs Analysis (OWNA), a formal, operationally-based analysis tool. The FAA also provided a briefing on the GA safety benefits of WTIC.

Finding: The Subcommittee found that the FAA has made significant progress with the MITRE OWNA tool in providing a stronger foundation for the requirements for the NextGen weather programs that will help the FAA prioritize its research initiatives across AWRP and WTIC. While OWNA provides an initial qualitative assessment, a significant amount of quantitative analysis may be required for prioritization of research initiatives. The Subcommittee was pleased that, for the example presented (Collaborative Airspace Constraint Resolution), the methodology was also used to analyze specific research needs for WTIC to provide NextGen benefits. The Subcommittee found that the portion of WTIC that is focused on GA safety is properly aimed at providing advisory material and standards for the content and presentation of weather information to GA pilots and was appreciative of FAA's response to their recommendations.

Recommendation (1): The FAA should continue its use of the OWNA methodology with the goal of providing a comprehensive set of weather research needs across the AWRP and WTIC portfolios. The Subcommittee looks forward to reviewing these needs during their August 2014 meeting.

FAA Response: The FAA will be pleased to update the REDAC on the progress of the users' needs analyses using the OWNA methodology. By August we will have completed the analysis of operational needs for virtually all of the remaining elements of NSIP 5.0. We will be prepared to present those results to the Committee in the fall.

Finding: The implementation of RECAT Phase I at Memphis (MEM) and Louisville has delivered substantial NextGen operational benefits to date and implementation will continue in FY 2014 (at Cincinnati, Miami, Philadelphia, Northern California, Southern California, and Atlanta). Preliminary FY 2015 budget numbers presented to the Subcommittee indicated that zero funding would be available to continue with Phase I implementation (at New York, Boston, Chicago, Anchorage, and Indianapolis). While the baseline Facilities and Equipment (F&E) budget of \$1.4 million for RECAT is projected to be restored in FY 2016, the Subcommittee is concerned that the FY 2015 budget reduction will result in a substantial opportunity cost due to

the delay of the RECAT Phase I benefits at the affected airports. Even if the budget is fully restored in FY 2016, this delay is likely to extend beyond a year, due to the recovery time for the Phase I implementation team – a highly competent research team, assembled across Government and industry that has matured over a period of many years.

Recommendation (2): The Subcommittee recommends that FAA estimate the annual benefits of RECAT Phase I at the airports scheduled for implementation in FY 2015 and use this estimate in its decision making on how to allocate budget cuts among the NextGen F&E budget line items. To this point, FedEx estimates an 18% improvement in throughput at MEM. While this benefit will scale according to unique attributes of traffic at other airports, this gain has significant potential value through expanded implementation. The Subcommittee encourages FAA to identify whether there are alternative means to continue translating the outcome of its wake turbulence research into achieved benefits, balancing these efforts with other priorities for procedures and airspace improvements.

FAA Response: The FAA appreciates the Subcommittee acknowledgement of the excellent work and the importance of the benefits achieved at MEM, Louisville International Airport (SDF), Cincinnati/Northern Kentucky International Airports (CVG) and now Hartsfield-Jackson Atlanta International Airport (ATL) (implemented June 1, 2014). In response to the recommendations from the NextGen Advisory Committee (NAC), the FAA is reviewing the waterfall of airports for RECAT implementation. The waterfall will consider:

- 1) The ability of each facility to accomplish the change associated with RECAT by the end of FY 2015 given all of the other changes these sites are accomplishing (e.g., runway widening, implementation and training of Terminal Automation Modernization and Replacement (TAMR), the required annual facility refresher training, etc.).
- 2) Whether the sites have the Electronic Flight Strip Transfer System which currently supports RECAT capabilities, or whether the facility uses Flight Data Input Output system for flight strip generation and will need to wait until a software change to that system is available in early FY 2015.
- 3) Benefit analyses. It should be recognized that there are limitations to the current state of the art of benefit analysis and the ability of those tools to account for operational constraints that do not manifest until wake separation constraints are relaxed. This was an observation from MEM where departure benefits were realized immediately but arrival benefits came in terms of reduced flight time in terminal airspace. Once additional arrival gates were developed some 9 month later and Enroute was able to deliver more aircraft per hour to MEM TRACON airspace, the arrival capacity rose from 77 to 99 per hour. Relative benefit rankings are considered in the waterfall development.

- 4) The complete set of NAC priority recommendations, including other separation Standards changes for Closely Spaced Parallel Operations, DataComm, Surface Operations, and Performance-Based Navigation.

The RECAT waterfall for FY 2014 and FY 2015 will be available by the middle of July 2014.

Finding: The NAS Operations Subcommittee also observed that ConOps validation activities are spread across multiple organizations, including those in the FAA's NextGen line of business (ANG) and the Air Traffic Organization (AJV). HF analysis appears to be performed in multiple ways, including use of FAA resources for some projects and external organizations for others. While the Subcommittee was informed that there is regular coordination between the two organizations, a clear strategy for management and allocation of work was not presented.

Recommendation (3): The Subcommittee recommends that the FAA manage its ConOps validation activities in the aggregate (including the full range of efforts from initial exercises to HITLs) to ensure that risk reduction efforts are appropriately resourced for NextGen implementation priorities. The Subcommittee recommends that the FAA report on its efforts in this regard at the next Subcommittee meeting.

FAA Response: During the spring 2014 meeting, the NAS Operations Subcommittee noted the importance of managing concept validation activities in the aggregate to limit risk and encourage appropriate resourcing for NextGen priorities. To this end there are a number of efforts underway at the Agency. The NAS Concept Steering Group (CSG) serves as the coordinating body to facilitate the organizing, vetting, and prioritizing of enterprise-wide concept development efforts. CSG efforts require close collaboration across all FAA lines of business and ensure that concept development efforts are consistent with NextGen initiatives. The NAS Enterprise Architecture service roadmaps and operational improvements represent strategic planning activities that help move the agency toward the NextGen vision. A NAS Operational Requirements Document (ORD) is being developed to provide a coordinated set of operational requirements for the future NAS from the perspective of the users of the system. The NAS ORD will describe the requirements that enable the realization of the FAA's vision of the NAS of the future. Within the NextGen organization, the multi-year research plan that is currently being updated by the Advanced Operational Concepts Division provides a multi-year approach to research and addresses operational shortfalls and potential benefits. The plan is being coordinated across the Agency to ensure priorities are met and research resources effectively coordinate across lines of business.

Subcommittee on Airports

Finding: The Branch staff's request for a modest budget increase in FY 2016 for the Airport Technologies Research Program appears justified in light of the Branch's ongoing and planned future research projects.

Recommendation (1): We recommend that the FAA fund the Airport Technologies Research Program in accordance with FAA Branch staff requests.

FAA Response: Although the Fiscal Year (FY) 2016 Airport Technology Research budget request is still a draft until the FAA budget for FY 2016 is formally submitted to Congress next year, the FAA is pleased for the support received from the Subcommittee.

Finding: Regarding the aircraft braking friction studies, the Subcommittee remains very interested in the Phase 1 goal of the project, which is to establish real relationships between surface conditions and tire dynamics. Branch staff continued to make progress on its data collection efforts for this important project over the past six months, despite a variety of technical challenges that have emerged during the testing program. Due to mechanical issues related to the test aircraft, only limited data was collected from snow-contaminated pavements during this past winter season. The Subcommittee is very interested in seeing if these data provide promising bases for evaluating pavement-tire interactions for snow-contaminated pavements. It appears that additional data collection efforts for snow-contaminated pavements will likely be needed next winter season.

Recommendation (2): We recommend that Branch staff provide an updated project schedule and “go/no go” decision points based on the need for additional data collection efforts during next year’s winter season. We also recommend that staff assess ways in which the management of technical and schedule risks during the data collection process can be improved next season.

FAA Response: The FAA Project Team successfully completed nose gear brake testing on manufactured snow on April 9 and 10, 2014. Data was collected and recorded during 17 aircraft test runs with the nose gear tires running through manufactured snow test beds and application of braking. Analysis of the data, which was completed on June 30, 2014 has shown that Project Team engineers were successful in collecting good, valid data during the tests runs. In addition, analysis has shown that the data correlates to the data that was collected during earlier test runs on both wet and dry pavement. An interim report highlighting the results of the testing on the manufactured snow test beds is being drafted and will be briefed to the Subcommittee during the fall meeting. An initial go/no go decision point was the evaluation of the effectiveness of data collection from testing on manufactured snow in being able to capture the full Mu-Slip Curve of the nose gear tires. This go/no go decision will be discussed at the next fall meeting. The next go/no go decision point will come at the end of the next winter season, in April 2015. This go/no go decision point will be based on the level of success of the FAA Project Team in conducting data collection during aircraft braking friction testing on natural winter contaminants (i.e., snow, slush, and ice) on the ACY Runway with the main gear braking system.

The FAA Project Team will conduct an assessment to determine the most effective ways to manage both technical and schedule risks associated with the data collection process. Managing technical risks will include identifying aircraft items considered to be most vulnerable to failure during future testing and to maintain replacements for these items. Managing schedule risks will include ensuring that the aircraft is maintained in the proper operating condition to conduct testing during any predicted winter weather event. Managing schedule risk will also include conducting additional braking friction testing on manufactured snow with the aircraft main gear to supplement testing completed under natural snow conditions.

Finding: The Subcommittee notes that FAA Office of Airports has still not yet taken action on the Subcommittee's recommendation that FAA Office of Airports make necessary modifications to its advisory guidance—particularly Advisory Circular 150/5320-12C, *Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces*—so that airport operators can use trapezoidal grooves to improve runway drainage and friction under wet conditions should they desire.

Recommendation (3): The Subcommittee reiterates its recommendation that FAA Office of Airports make necessary modifications to its advisory guidance—particularly Advisory Circular 150/5320-12C, *Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces*—so that airport operators can use trapezoidal grooves to improve runway drainage and friction under wet conditions should they desire. If additional research is needed to address outstanding design, reliability, or durability issues, we recommend that the FAA expedite the development of research project requests for these additional activities and move ahead with this research quickly.

FAA Response: The FAA Office of Airport Safety and Standards is currently reviewing the need for further research for evaluate the performance of trapezoidal shaped runway grooving in comparison with the rectangular shaped runway grooving in Advisory Circular 150/5320-12C. They intend to complete this review and provide an update at the fall REDAC Subcommittee meeting.

Finding: The Airport Technology Program is currently engaged in the development of an airport safety database as part of Research Planning Description (RPD)141. This database fuses information from the FAA's wildlife strike database as well as accident and incident reports from FAA and NASA databases. Subcommittee members would like to ensure mechanisms exist for airport operators to view and assess the data for their facilities.

Recommendation (4): The Subcommittee recommends that mechanisms be established for airport operators to access the data in the airport safety database for their airports.

FAA Response: The FAA concurs and will establish a process to provide any airport in the airport safety database, upon their request, an individual report summarizing all data collected for that airport.

Subcommittee on Environment and Energy

Finding: Aircraft noise continues to be a major issue, with citizen complaints accelerating as the nation's airspace is redesigned to take advantage of NextGen capabilities. The FAA Noise Research Roadmap has been designed to expand the Agency's knowledge of the current state of aviation noise impacts on the general public and to provide the data necessary for future Agency activity in this area.

Recommendation (1): The Subcommittee recognizes the importance of the Noise Roadmap effort and recommends that sufficient funding continue to be allocated to ensure that this program is not unreasonably delayed. Findings made in the course of this research should be objective, fact based and data driven and should be used to update and implement Agency policy in the noise area.

FAA Response: The FAA appreciates the Subcommittee's continued support of our Noise Research Roadmap as it will inform future noise policy considerations. We are working to increase the funding that is available for this effort to ensure it is successful. The national community noise survey, being done in collaboration with our Airports Office, is a central component of this effort. In addition, we continue to advance our understanding on the impacts of noise on health and welfare.

Finding: As noted above, much progress has been made in all areas of Office of Environment and Energy (AEE) activity. The Subcommittee recognizes these successes but feels that they need to be better communicated both to government decision makers and the public at large.

Recommendation (2): The Subcommittee recommends that the FAA develop better methods of communication to ensure that the results of research efforts are distributed to those with the need to know or simply with interest in AEE activities. Specifically, the Subcommittee urges the FAA to improve its websites to make navigation easier and to highlight the activities that have resulted in significant environmental progress.

FAA Response: The FAA agrees that outreach is critical to our continued success and that the Web should be a central component of this effort. As a part of our NextGen Environmental Management System effort, we are developing a Web site that could ease navigation to the various environment-related efforts within the FAA as well as efforts from others outside the FAA. We will present progress on this effort at our next REDAC Subcommittee meeting.

Finding: An area of AEE activity that demands continued prioritization is the ongoing Continuous Lower Emissions, Energy, and Noise (CLEEN)/Alternative Fuels program. As noted, efforts in these areas have already led to successes in accelerating the transition of research into products that can be incorporated into aircraft and engine design and in developing fuels that can be used as a substitute for traditional petroleum-based jet fuels. Continued funding is necessary as the Agency transitions from CLEEN I to CLEEN II and the effort to develop

commercially viable alternative fuels progresses. In the past, Congress has recognized the importance of these projects by continually providing funds in excess of those requested in the President's Budget.

Recommendation (3): The Subcommittee strongly recommends that funding necessary to support the CLEEN/Alternative Fuels programs continue. Indeed, the Subcommittee continues to endorse the AEE above-target funding request for the continuation of these programs at the highest possible level.

FAA Response: The FAA appreciates the Subcommittee's support of our efforts to mature aircraft technology and advance alternative fuels through the CLEEN program. We are also advancing alternative jet fuels through the Commercial Aviation Alternative Fuels Initiative and the Aviation Sustainability Center (ASCENT), our new Center of Excellence for Alternative Jet Fuel and Environment. The CLEEN program is indeed one of our top priorities as is our work to advance alternative jet fuels. We are pursuing the above target request for FY 2016 through the budgetary process. We continue to prepare for a second round of CLEEN (CLEEN II) and anticipate that the solicitation will be published during the summer of 2014.

Finding: The International Civil Aviation Organization (ICAO) effort to establish worldwide environmental standards is ongoing and United States leadership in the ICAO Committee on Aviation Environmental Protection (CAEP) process continues to be an important priority.

Recommendation (4): Sufficient funding should be available to AEE to permit continued U.S. leadership in the ICAO arena. The current ICAO initiative to develop a worldwide CO₂ standard is moving forward, with specific deadlines that must be met. In addition, efforts have begun on some of the technical elements of a proposal for global market based measure (GMBM) for international aviation to be considered by the ICAO Assembly in 2016. It is important that the United States remain in a leadership position. AEE-developed tools are central to the work of ICAO/CAEP and sufficient funding should be available to maintain and update the existing tool suite. While the work on the technical elements of a GMBM proposal is extremely important and AEE should be a leader in this effort, it is critical to maintain focus and priority on the important CAEP work of establishing the CO₂ standard for aircraft and developing the basis for a Particulate Matter (PM) standard.

FAA Response: The FAA appreciates the support of the Subcommittee for our ICAO CAEP activities and the importance of continued U.S. leadership therein. Robust funding is critical to not only ensuring that we have robust participation in the ICAO CAEP process but also to the development of our modeling capabilities and the generation of data to support the decision-making process within ICAO CAEP. Continued progress on a CO₂ emissions standard is the direct result of many years of investment and the development of a global market based measure is also benefiting from these investments. We agree with the importance of developing

the basis for a Particulate Matter standard and will continue to support the required testing and analysis.

Finding: The FAA's cooperation with other federal agencies in the development of alternative jet fuels has enabled scarce government resources to be leveraged resulting in the most effective means of moving forward in the alternative fuels area.

Recommendation (5): The Subcommittee strongly recommends that this inter-governmental agency cooperation continue and specifically urges that the Alternative Jet Fuel Inter-Agency Coordination Group (ICG) framework continue to be supported in future efforts to align and leverage alternative jet fuel research.

FAA Response: The FAA agrees that it is critical to leverage resources across the Federal Government to achieve shared objectives such as advancing alternative jet fuels. To that end, we are fostering cooperation among domestic agencies with the National Alternative Jet Fuel Strategy. We are also working across the Federal Government to revive the U.S. Air Force effort to streamline the alternative jet fuels certification process. This effort will be a central element of the research portfolio for ASCENT. We are also working with other governments to align our efforts to advance alternative jet fuels. We will continue to seek additional means to leverage our resources more effectively and we will give updates on these efforts at future REDAC Subcommittee meetings.