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The Honorable Michael P. Huerta
Administrator
Federal Aviation Administration
800 Independence Avenue, SW
Washington, DC 20591

Dear Administrator Huerta:

Thanks for taking the time to meet with the REDAC during the full committee meeting on May 26. I have included the detailed findings and recommendations of the subcommittees as an attachment to this letter.

During the meeting we had a productive discussion of UAS issues with senior representatives from the UAS Integration Office and AVS following the "deep dive" into these issues the subcommittees took during their spring meetings.

One clear point which emerged during both the preparatory meetings and the discussion was one of communication. The external community, including the REDAC, does not have a clear vision of the FAA UAS Integration strategy at a level of granularity which allows the key implementation and research issues to be identified. The REDAC urges the FAA to be as open as possible in sharing decisions and working assumptions regarding UAS integration strategy, including elements such as Con-Ops, infrastructure and UAS Concept Maturation Plans. We understand that this is the intent moving forward and note that the integration of the various classes of UAS represent a significant increase in the mission of the agency.

As we discussed, the REDAC will continue to work with the agency to identify key UAS research issues. In addition REDAC subcommittees will consider opportunities to exploit "Big Data" within each of their domains of expertise.

The REDAC also identified the need for a high level research strategy and plan which coordinates research across the research areas of the agency. We strongly support the plan to develop such a strategy and offer any assistance which would be effective.

As a final point, the REDAC wanted to commend the global leadership which was exhibited by AEE research program to support the ICAO activity at developing a global CO2 emission standard.

The detailed findings and recommendations of the subcommittees are included below.

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
Recommendations for Fiscal Year 2018 Research and Development Portfolio

Subcommittee on Aircraft Safety

Findings: **UAS Leadership and Strategic Planning** - FAA still has not released to the SAS a high- level strategy and single, overarching, plan with clear objectives and milestones for dealing with UAS in an integrated manner. We believe that a roadmap is in development this information is not readily available for review. The lack of an articulated strategy makes it very difficult for the SAS, and others, to evaluate UAS R&D plan and identify potential gaps.

The UAS safety requirements come from the UAS office in AVS; the research is carried out by the NextGen office; and the UAS CONOPS development lies in the ATO organization. The integration and connection between these elements is not apparent. It is not clear who has the ultimate UAS authority and responsibility within the agency. To outside reviewers there is neither a method for developing comprehensive and integrated UAS research requirements, nor agreement on who has primary responsibility for this.

Recommendations: SAS recommends that the FAA -

- Distribute a coherent strategy for achieving safe and efficient UAS integration into the NAS. This should be the basis for a holistic approach to prioritized planning of UAS activities, responsibilities, and associated funding. A companion document should be developed to show how the objectives are being flowed out to ensure alignment of the research and to help identify gaps. These need to be shared with all UAS stakeholders.
- Implement a cohesive organizational structure for all of its UAS activities and place overall responsibility for the activities with a single person or organization.

Finding: **UAS CONOPS and Concept Maturation Plan** - The FAA should be commended for developing a CONOPS for integrating UAS operations into the NAS, associated "operational requirements", and a concept maturation plan for identifying research required to carry out the maturation plan. SAS found that the CONOPS was developed several years ago, based upon assumptions developed at that time, and has not been vetted with stakeholders outside FAA. Since the UAS situation is rapidly changing (e.g., increased emphasis on small UAS flying at low altitudes), and lacks broad community stakeholder input, the concept is likely incomplete.

Recommendation: SAS recommends that this CONOPS, the "operational requirements", the concept maturation plan, and the prioritized research requirements be vetted with all stakeholders and updated accordingly.

Finding: **UAS Data** - SAS supports the risk-based approach for UAS requirements, certification, concepts, and policy – but all of these require data. FAA panelists identified the need for more data, for a variety of purposes (environmental assessment, UAS forecasts, UAS policy decisions, FAA adoption of industry based standards, risk based UAS requirements, etc.). The lack of data and the lack of a serious FAA initiative to collect data is a shortcoming. Beyond certain incident and accident data from COA operations, there does not appear to be an attempt to get comprehensive data to understand the risk of UAS operation, and what potential safety issues might emerge. With over 400,000 registered small UAS, 3700 section 333 exemptions, several Pathfinder programs, and many other UAS operating in the airspace there is an opportunity to expand the operational and safety data routinely collected and analyzed. This existing data can be used to inform what data collection initiatives may be required in the future.

Recommendation: SAS recommends that FAA begin a comprehensive effort to collect UAS operational and safety data. Data beyond just accidents and incidents is needed. Routine operational data will help establish baselines of operational use, norms, best practices, and serve as the dominator when considering mishaps rates. FAA should use this data to answer a series of questions: What sort of safety incidents are we aware of today? How many of them are occurring? Can these events be dealt with by existing policy or rules or will research be required to develop a solution?

Resulting from the rapid and often unpredictable UAS growth a research project should be initiated to determine what UAS safety data is needed 5-10 years from now and to lay the groundwork for its creation, collection, and analysis.

SAS further recommends that the Safety Oversight Management System (SOMS) project (A11H.SSM.11) be expanded to include UAS data.

Finding: UAS Pathfinder Projects - SAS commends FAA for the novel industry partnership in the three Pathfinder projects. This will lead to faster implementation of UAS procedures in the three areas of UAS application. With the exception of the participants, there is limited availability of the details of the pathfinder program initiatives outside of the FAA. The SAS remains concerned that the scope of the Pathfinder effort is limited when considered against the current UAS expected operational demands.

Recommendation: SAS recommends that the FAA consider accelerating the Pathfinder program to include more complex types of operation with more accelerated schedules. Additionally, a process should be developed for the results from the Pathfinder projects to be made widely available.

Findings: **UAS Center of Excellence (ASSURE)** - In most of the ASSURE presentations and the poster sessions at FAA-sponsored UAS seminar in February it was not clear what the

research question/issue being addressed was and how it related to FAA research priorities. SAS was unable to get a comprehensive picture of the research being performed by ASSURE or the gaps in research needs in the eyes of the FAA team. This finding is another reflection of the lack of a disseminated overarching UAS strategy. Without knowledge of the comprehensive picture it is hard to evaluate the ASSURE research and identify gaps.

ASSURE projects have received approximately $6m for this fiscal year but one of the six ASSURE project areas, "Air Traffic Integration", remains unfunded. The "Airworthiness" project was impressive – the team is building on years of work in developing a finite element model of a Boeing commercial aircraft and will have this ready to begin simulations of the impact of UAS collisions on different parts of the aircraft. It was not clear that the rest of the on-going projects were on a clear path to develop a flexible framework for risk-based UAS decision making and performance-based rulemaking. It seems unlikely that ASSURE will be able to answer key integration questions at the level of fidelity needed by FAA.

It is not clear that there can be widespread engagement between ASSURE and universities unaffiliated with the COE. This is a potential shortcoming of the FAA COE approach as there may be significant capability outside the ASSURE coalition that could likely benefit FAA.

Recommendations: SAS recommends that -

- Future ASSURE projects should be consistent with FAA research needs and priorities based on the overarching FAA plan for UAS integration into the NAS. The projects should include funding for UAS integration into the NAS.
- FAA develop and implement a process for engaging capable universities and other research organizations not affiliated with ASSURE in UAS research

Finding: **UAS Funding Impact on Other Safety Research Portfolio Items -** Contract funding for UAS is contained in Budget Line Item, A11.l, under AVS. SAS observed that funding for UAS has been significantly increased over the requested amount in the final congressional appropriation for the past two years. In 2015 the amount increased from a contract request of $7210k to $13210k. In 2016 the enacted amount increased from $8150k to $16022k. Overall this resulted in an average of 33% reductions in funding for other safety related BLIs. Contract requests for UAS in 2017 and 2018 are $8400k and $7400k, respectively. SAS is concerned that a similar congressionally directed re-allocation may occur in FY17 and FY18. We also note that this re-allocation of funds within the AVS scope impacts the FAA's ability to plan and conduct research in other areas considered critical to aircraft safety including human factors ($5.1M reduction in FY16), Aeromedical ($1.5M reduction in FY16) and Weather ($1.6M reduction in FY16).

Recommendation: SAS recommends that the FAA conduct a review that assesses the collateral impact of congressional re-allocations of budget on existing and proposed RE&D and Aviation Safety research portfolio to understand the funding changes required, and the

impacts of those changes, on other aviation safety RE&D priorities. Specifically, those BLIs or RE&D tasks that are provided funding in a one year, then halted in interim year(s), and restarted may make it difficult to efficiently utilize resources and effectively complete RE&D activities. The Subcommittee recommends re-reviewing prioritization within and between BLIs for consideration of balancing funds and ensuring the most significant aviation safety priorities are addressed, particularly in light of the RE&D restrictions during Continued Resolution operations.

The FAA should also consider developing an alternate approach to incrementally funding UAS that does not result in significant reductions in research budgets for other BLIs.

Finding: Additive Manufacturing. SAS has been previously expressed concern that the FAA may be falling behind in evaluating technologies and certification criteria related to Additive Manufacturing and its expected increasing presence in industry. This has been a finding in the past two SAS meeting reports and was identified as one of the emerging issues. The FAA has responded to our concerns by noting that Certification Policy Memos and an Additive Manufacturing Research Roadmap are in development. There is also a tactical project plan, which is working the issue. The Committee applauds these efforts and encourages their continuation on an expedited pace although we remain concerned that the pace of change is too slow to support industry. Additionally, it is noted that Additive Manufacturing research continues to fall below the funding cutoff levels in the 2017 and 2018 research plans.

Recommendation: Expedite **efforts** to provide the Additive Manufacturing Research Roadmap and Certification Policy Memos and reconsider required funding in future year plans to accomplish the required tasks in the tactical plan and Roadmap.

Findings: Advanced Materials Research – Supportive of SAS Emerging Issue - SAS published its Emerging Issues and Future Opportunities Tasking Report in the fall of 2014. The report included a description of an emerging issue related to the Certification of Advanced Materials and Structural Technologies. Specifically, "as aircraft and engine designs drive towards advanced performance, new material systems and structural concepts will continue to be introduced that are significantly different from the current ways of designing, building, and maintaining airframes and engines. The FAA needs to stay abreast of these changes to make certification decisions and build its knowledge to support regulations, standards, guidance materials, and training that maintain safety."

Four specific areas are recommended for additional propulsion system research in alignment with this emerging issue, Hot Corrosion in Nickel Alloys, Advanced Inspection Technology, Cold Dwell Fatigue in Titanium and Advanced Computational Materials Methods for Microstructure Changes.

- The effect of hot corrosion on engine rotor life is an important element that needs to be matured, especially the influence of operations in severe environments. Initial results of a program to predict the formation and growth of corrosion pits during service is

being incorporated into the FAA rotor life prediction design code known as DARWIN (Design Assessment of Reliability With Inspection) to quantify the degrading effects of hot corrosion on rotor life. This work should be continued.

- The engine industry continues to rely on the Fluorescent Penetrant Inspection (FPI) process whose reliability is highly dependent on human performance. With innovative NDE methods, it is becoming increasingly possible to more reliably detect cracks and to also characterize microstructure for anomalies prior to crack formation and as a means to measure material properties to determine remaining life. In addition, methods to nondestructively determine grain size and bond joint integrity can be used as tools to both validate manufacturing processes and to provide finished part quality assurance. Lastly, advanced NDE used during on-line process monitoring of manufacturing processes has the ability to virtually eliminate manufacturing induced anomalies. The Subcommittee notes with concern the lack of FAA resources currently allocated for the NDE of Critical Engine Components requirement. This requirement is currently programmed for zero funding in FY16, FY17, and FY18.

- The Subcommittee notes that the FAA has also made significant progress in studying Dwell-Fatigue in Titanium (Ti6242). This work established some of the fundamental, physics-based reasons for the occurrence of the cold dwell phenomenon, which can lead to fatigue failures and uncontained rotor failures. The research identified titanium features that are required for the activation of the cold dwell phenomenon. Quantitative characterization of these microstructural features was initiated during this project in both metallographic and ultrasonic methods, but specific, standardized characterization tools and methods were not established or proposed. There are follow-on efforts that would be useful in establishing an industry-wide adoption of tool/methods to mitigate the incidence of cracks and fractures due to cold dwell fatigue.

- Recent and anticipated progress in computational materials science has shown that fundamental theoretical research and modeling can be used to develop an understanding of the critical physical phenomena that occur during metal processing. With this understanding microstructural changes can be anticipated and accounted for in the process. Computer experiments can be used to aid in rotor alloy designs and manufacturing process development.

Recommendations:

1. The FAA should continue to prioritize funds within the Improve Aviation Safety R&D portfolio to allow further development and validation of hot corrosion models and their incorporation into the DARWIN code.
2. The FAA should reinstate previous funding levels to continue the study of innovative NDE research for engine materials characterization and to assist with the transition of the most promising methods to OEM production and field overhaul facilities. Efforts should also be focused on advanced NDE to replace and improve

upon Fluorescent Penetrant Inspection

3. The FAA should continue to work collaboratively with industry and AFRL through the RISC and JETQC initiatives to fully understand texturing in Titanium and identify billet and forging practices needed to prevent cold dwell failures including standard definitions for characterization and certification of titanium material.
4. The FAA should continue to work collaboratively with the USAF and other agencies to develop and incorporate similar computational methods into the DARWIN code to better enhance its life prediction accuracy.

Finding: Research to Mitigate the effects of Ice Crystal Icing – engine test and analysis capabilities - In the spring 2016 SAS meeting, the Subcommittee was presented a comprehensive review of the icing-related RE&D portfolios (A11.D (Icing), A11.K (Weather)), with a focus on proposed funding and research in FY18. Significantly differing allocations between the BLIs (in this case A11.D and K) were noted.

Recommendation: The near-term need for ice-crystal-icing (ICI) test and analysis tools for engines has been noted in the engine harmonization working group (EHWG) and acknowledged by the Technical Community Representative Group (TCRG). While further weather research may be advantageous to assist in operations to avoid ICI conditions, it would not be practical to expect all operations to be able to avoid ICI. Therefore a means for engines must to be designed, analyzed, and-or lab tested to predict and reduce susceptibility is crucial. The need for near-term solutions for predicting effects of ICI on specific engine design, and to allow for methods of compliance other than extensive and complex flight testing is recommended. The Subcommittee recommends that RE&D funding for A11.D be prioritized at a higher level for FY18 and forward.

Subcommittee on Human Factors

Finding: The HF Subcommittee was asked to focus on UAS technology needs and research for this session. We applaud CAMI and the HF staff for identifying the top 5 HF UAS research needs and their intent to produce an HF UAS tech roadmap. We also were impressed with the NASA and AFRL Detect and Avoid Display research which should be reviewed by the FAA. The addition of the UAS Tech Center efforts will complement this research. However, we believe the proposed FAA FY18 UAS HF Research Plan, as presented, is not properly prioritized, aligned and funded to meet pressing UAS users' and customers' needs in the next five years.

Recommendation: In view of this situation, the HF Subcommittee recommends the FAA conduct several workshops this summer with the Nation's top human factors experts and other appropriate areas of expertise to develop UAS baseline guidelines for HF issues such as displays, control stations, etc., based on current and past research for UAS and manned systems. These guidelines should be provided to the FAA and published as appropriate. This would be a huge step forward for the FAA and serve as an initial baseline with incremental upgrades as the UAS

HF research matures. Failure to do this will result in commercial systems being built without the benefit of the existing documented HF research and expertise.

Recommendation: Human Factors Subcommittee recommends the FAA prioritize, align, and appropriately fund the HF UAS research using results from the summit addressed in the finding. Alignment consists of integrating the HF research with the overall UAS Research Plan which, in turn, needs to be integrated with the UAS Implementation Plan.

Finding: The Committee was extremely pleased by the efforts of the Human Performance group within the ATO to create a new process for gathering Human Factors and Human Performance requirements from various program acquisition groups. Using a "Roundtable" forum that brings together various stakeholders and organizations responsible for these requirements is a significant step in prioritizing human factors research needs within the ATO. While it is anticipated that this process will result in a more robust and effective research portfolio, there was some concern about the timing of the roundtable meetings and how the output will impact out-year research submittals. In addition there was also a concern that the results of the roundtable process could lead to an emphasis on more reactive research proposals rather than a more strategic view of what needs to be accomplished to fulfill longer term needs and gaps.

Recommendations:

- Expand the use of the roundtable forum to discuss and prioritize Human Factors research requirements within the ATO.

- Consider categorizing and prioritizing Human Factors research needs along at least two time horizons: short-term and long-term needs. This will facilitate a more strategic view of what needs to be accomplished in the longer term.

- Execute on the six month plan: identification of an executive sponsor and advocate for Human Performance within the ATO, education of ATO personnel on Human Performance areas of significance, and documentation of the scope, roles, and responsibilities of the Roundtable.

Finding: The Committee was pleased with the flight deck/maintenance core and NextGen research presented. There was concern expressed that current training methodologies and assessment of training effectiveness to measure pilot performance may not keep up with modern learning methods and technologies. For example, there is evidence that new NAS procedures are not trained consistently by all operators. In some cases distance learning and bulletins are being used to deliver required training without determining the effectiveness of the training or adequately measuring if the pilots actually obtained the required knowledge and skills to safely fly the new procedures in the NAS. The assumption is usually made that simply by watching the distance learning or reading the bulletin that the training was effective.

Recommendation: The Committee recommends that the FAA identify required pilot knowledge and skills for current and new flight deck systems operated in NextGen. The FAA needs research on available training methodologies and procedures to train current and future systems for

NextGen that emphasizes performance-based measurements of training effectiveness. This should include what data should be collected to measure effectiveness.
The FAA should identify a process for defining the required knowledge and skills, training devices, and the training methodology for training instructors and aviation personnel for current and new NextGen systems, including how to measure effectiveness and what data should be collected to measure training effectiveness.

Finding: During this review, it has been difficult for the Human Factors Subcommittee to assess the HF priorities and total FAA Human Factors research and application investment to include leveraged work done by external agencies supporting FAA. This is probably true of the other REDAC Subcommittees in their research areas.

Recommendation: This Committee recommends the FAA provide a summary of overall FAA prioritized research needs across lines of business at a high level and how the proposed investments (both internal and external) are aligned and leveraged to satisfy these needs and identify the gaps. The Director of Research should brief all of the REDAC Subcommittees at an upcoming set of Subcommittee meetings.

Subcommittee on Environment and Energy

The Environment and Energy (E&E) Subcommittee of the FAA Research, Engineering and Development Advisory Committee (REDAC) met in Washington, DC on April 4 - 5, 2016. Following is the report on the outcome of this meeting. The recommendations offered are all for inclusion in the REDAC report.

Finding: The International Civil Aviation Organization (ICAO) recently adopted CO2 emission standards for in-production and new type certificate airplanes per plan. The environmental assessment tools developed as part of the FAA E&E RE&D program were critical in the evaluation of stringency options for the CO2 standard development. The readiness and capabilities of the tool suite enabled FAA to achieve global leadership in ICAO discussions.

Recommendation: The ICAO CAEP/11 work program includes the development of an nvPM standard. The Subcommittee recognizes that this requires the development of a database based on engine test measurements. While some progress has been made significant work remains. The Subcommittee recommends that the FAA commit the necessary resources to generate this database and associated analyses tools. This is needed to develop the standard on time and maintain FAA's global leadership in ICAO discussions.

Finding: During the Subcommittee meeting, the FAA presented progress on several tasks that clearly indicated that this RE&D program is achieving more robust results by collaborating with other FAA departments (like ATO, ANG, ARP) and other government agencies (like NASA, DOA, DOE). This collaborative approach has matured during the past several years.

Recommendation: The Subcommittee recommends that the FAA continue to explore additional opportunities and, where feasible, develop a joint work plan to achieve even greater benefits from the collaboration.

Finding: FAA shared the results of the CLEEN program tasks which indicated successful technology maturation of several technologies with opportunities for insertion into products starting 2016 to beyond 2020 with significant environmental benefits. The FAA also shared the program plan for CLEEN-II. This portfolio is well balanced among noise and emissions reduction technologies and alternative jet fuel development.

Recommendation: The Subcommittee is highly pleased with the progress here and recommends that the FAA continue their commitment to this program which produces high value especially with the greater than 1:1 cost share by industry.

Finding; The environmental impacts of Unmanned Aerial Systems (UAS) are going to be a growing issue. Given the recent surge in the number of UAS operation approvals, there is a need to get proactive on this issue.

Recommendation: The Subcommittee recommends that the FAA start plans to assess and understand the noise impact of UAS. This would include the development of environmental impact assessment tools starting with evaluating the applicability of AEDT2b. We are also encouraging the FAA to explore opportunities to make noise measurement that will provide both an indication of the future challenge and a better understanding to make assessment models more relevant and practical.

Subcommittee on NAS Operations

Findings: UAS Integration in the NAS - The Subcommittee appreciated the opportunity to learn about the FAA's UAS plans at the recent session of the UAS Research Expo. It is clear that the FAA recognizes the need for a high level, cross-agency approach to the integration of UAS in the NAS and the Subcommittee strongly concurs and finds that integration of UAS in the NAS will require a strong system engineering approach with centralized leadership that is capable of making the significant technical and procedural decisions necessary to make progress. his system engineering approach must include all aspects of integration of UAS in the NAS, including UAS certification and safety, operational procedures, and supporting technologies.

Finding: The Subcommittee finds that FAA has performed significant work to develop a UAS concept of operations and a set of mid-term UAS operational scenarios. The FAA has decomposed these into a set of FAA requirements and operational shortfalls and an evolution strategy for air traffic operations. The FAA has developed a UAS Concept Maturation Plan that focuses on those activities that address existing FAA shortfalls associated with the provision of air traffic services to UAS airspace users in the mid- term and beyond. However, the FAA has not shared this work to any significant degree with the external stakeholder

community. The result is that the external community cannot appreciate the specific problems that the FAA is addressing and is unaware of any substantial plan to move toward a solution. In addition, the FAA cannot benefit from the ability of the external stakeholder community to recommend innovative solutions to some of the problems (e.g., through UAS equipage or procedures). As the Subcommittee has already reported to the FAA: "Finding a common approach to addressing routine UAS access to the NAS requires that UAS community develop patience and understanding of the challenges of operating in the airspace and that the FAA develop a greater sense of urgency to allow safe and effective UAS business."

Finding: As previously noted by the Subcommittee, the level of effort, as reflected by the allocation of RE&D and F&E funding that the FAA has been given in FY'16 for UAS research and development, appears to be substantially focused on airframe safety and certification and not on the development of operational concepts and procedures that are necessary to close the operational and technical shortfalls identified in the UAS Concept Maturation Plan. This apparent mismatch will likely further delay the integration of UAS in the NAS.

Finding: The Subcommittee finds that the UAS technology space and user demand continues to grow at an extremely rapid pace and continues to significantly outstrip the FAA's ability to plan for and conduct the research and development necessary to address the operational and technology shortfalls.

Recommendation: The Subcommittee recommends that FAA immediately engage the broadest set of external stakeholders of the UAS community and share with them the FAA's UAS operational scenarios, requirements breakdown and UAS Concept Maturation Plan. The FAA should use this engagement to inform the user community of the technical and operational challenges it faces and revise that plan with input from the community.

Recommendation: The Subcommittee recommends that FAA establish and maintain high level system engineering leadership, as described above, focused on UAS integration in the NAS. This leadership should be charged with prioritizing research and development across all the FAA organizations to ensure that UAS integration progresses as rapidly as possible. This leadership must be able to make the significant operational and technical decisions necessary to make this happen. The Subcommittee recommends that this leadership develop an integrated research and development plan for UAS in the NAS and present a progress report on this plan at its August 2016 meeting.

Subcommittee on Airports

The Subcommittee met on March 15-16 at the at the FAA William J. Hughes Technical Center's (the Tech Center) Airport Technologies Research Facility in Atlantic City. Tech Center leadership (Ms. Shelly Yak and Mr. Eric Neiderman), representatives from the Airport Technologies Research Branch and FAA Office of Airports also attended the meeting. During the meeting the Subcommittee reviewed the ongoing progress Branch staff have made on the

varied airport safety, planning, design, environmental and pavement projects within the Branch's research portfolio and reviewed the Branch's proposed FY2018 budget.

The following section summarizes the Subcommittee's Findings, and Recommendations.

Finding: The Spring 2016 meeting was the first meeting at which Branch projects and associated budgets/spending were grouped by research project area (RPA). As noted in the Subcommittee's Fall 2015 report, the Branch had proposed presenting project budgets by RPA to more clearly indicate how Branch funding is and will be allocated and prioritized and provide a more logical grouping of individual research projects. The revised budget presentations based on RPAs did provide these benefits, but there was concern among Committee members that budget reporting at the individual project level was lacking in the new reports. There was also continuing concern that current budget reports do not effectively convey individual project progress (e.g., project spending to date vs. anticipated budget to complete).

Recommendation: The Subcommittee recommends that Branch staff provide more detailed budget reports that include detail at the individual projects (e.g., RPD) level that can then be rolled up to RPA subtotals. The Subcommittee also recommends that Branch staff provide clearer summary-level assessments of spending to date and anticipated budget to complete projects at the RPD level.

Finding : The Branch's proposed FY2017 and FY2018 budgets as presented to the Subcommittee included capital investments for new facilities—specifically an on-site photometric laboratory, an asphalt concrete pavement testing facility, and additional storage space. The budgets for these facilities were presented as "above the line" expenditures, defined by Branch staff to mean capital projects that would require expenditure above expected FY2017 and FY2018 funding levels. Subcommittee members raised concerns about the long term sustainability of such above the line expenditures and suggested that barring extraordinary circumstances/justification, such expenditures should be included within the existing program budgets.

Recommendation: The Subcommittee recommends that Branch staff include capital expenditures within expected program budgets, rather than as supplemental/additional program expenditures. Such requests should be accompanied by a description of the project's justification (e.g., critical testing functions that cannot be obtained on a timely or cost effective basis elsewhere; essential facility rehabilitation). The Subcommittee also recommends that the Branch consider dedicating a portion of its budget to capital improvements, including major facility maintenance/renovation, the costs of which are expected to increase as several of the Branch's facilities age.

Finding: Other than the aforementioned requested enhancements to budget reporting and treatment of capital projects described in Findings 1 and 2, the Subcommittee was satisfied that the Branch's proposed FY2018 budget is reasonable and reflective of industry priorities for airport-related research.

Recommendation: The Subcommittee recommends accepting the Branch's proposed FY2018 budget, but suggests that the FAA investigate options for incorporating capital expenditures within future budgets.

Finding: The Subcommittee appreciates the Branch's increased focus on airport planning and environmental issues and is interested in helping the Branch assess research projects in these areas.

Recommendation: The Subcommittee recommends that the FAA Office of Airports and Branch staff engage Subcommittee members (or their designees) to discuss future airport planning and environmental research projects. We also recommend engaging members of the Subcommittee on the Environment and Energy in these discussions.

Finding: The Subcommittee supports the Branch's involvement in Unmanned Aircraft System (UAS) research that facilitates integration of UAS into the National Airspace System in a manner that does not undermine the safety and security of the NAS, particularly in the vicinity of airports.

Recommendation: The Subcommittee recommends that the Branch continue its support of UAS research activities that enhance airport safety, security, and efficiency.

Finding: Branch staff has continued to refine their airport safety database, which fuses information from the FAA's wildlife strike database as well as accident and incident reports from FAA and NASA databases. This database has been a key tool in the development of the FAA's Runway Incursion Mitigation (RIM) program, which began in the fall of 2015 and is expected to continue indefinitely. In the RIM program, the FAA is identifying specific airfield locations at specific airports that are high priorities for physical or operational mitigations to reduce the risk of runway incursions. Subcommittee members believe that airport operators should have some level of access to the airport safety database to better understand what data are being used to drive RIM activities at their airport and so that these operators can undertake mitigation activities more proactively. The Subcommittee understands that providing such access may require de-identification of some of the incident and accident reports incorporated into the database (e.g., ASIAS, ATSAP).

Recommendation: The Subcommittee reiterates its recommendation from spring 2015 and requests the FAA evaluate how it can make data from the Airport Safety Database available to airport operators so that this information can be used proactively by airport operators to enhance margins of safety at their facilities.