Research, Engineering & Development Advisory Committee (REDAC)
Federal Aviation Administration
April 18, 2012
Meeting Minutes

On Wednesday, April 18, 2012, the Federal Aviation Administration (FAA) Research, Engineering and Development Advisory Committee (REDAC) held a meeting in the Round Room, at the FAA Building, 800 Independence Avenue, SW, Washington, DC. The purpose of the meeting was to provide recommendations on the FAA FY 2014 R&D portfolio. Attachment 1 provides the meeting agenda, attachments 2-6 provide the subcommittee reports and attachment 7 provides the REDAC letter to the Administrator.

Welcome and Introductory Remarks

Dr. Wilson Felder, REDAC Executive Director, read the public meeting announcement and thanked everyone for attending.

Dr. John Hansman, REDAC Chair, welcomed everyone and commented that the REDAC would accelerate the meeting due to FAA Awards Ceremony and the JRC meeting scheduled that afternoon.

Update – Organization

Ms. Vicki Cox, Associate Administrator for NextGen, thanked everybody for the work done on the committee. She commented that, all of the work seen in reauthorization and appropriations indicate that the work of this committee will become more important as they move ahead with NextGen. She spoke about the restructuring within the FAA under an effort called "Foundation for Success" that was established by the Administrator last year.

Ms. Cox mentioned the FAA Corporate Awards were taking place the same day and it noted that Dr. Wilson Felder was the recipient of the Golden Compass Award. This is the single most distinguished award that goes to an individual in the FAA.

Returning to the topic of the Foundation for Success, Ms. Cox stated that it consisted of an examination of several aspects of how the FAA did business and NextGen was one of those considered. The FAA used an outside consultant to help us and the findings and recommendations to be reviewed in the meeting were produced by the consultant. In addition, an internal group from across the FAA was selected to review those findings and recommendations, to determine how the FAA should proceed.

Ms. Cox noted a common recommendation for the Agency was to establish a Program Management Office (PMO) for NextGen so that all of the NextGen programs would be under the umbrella of one program office rather than scattered throughout the various lines of business. By establishing a PMO, the FAA will be able to implement best practices and identify synergies within the Agency to improve program management across the board. It was recommended that

the ATO lead the NextGen related initiatives since 90 percent of the agency's programs were in ATO.

Ms. Cox said as part of the Foundation for Success effort, the FAA initiated a cross-agency team that developed a new process, the Ideas to In-Service Process (I2I) that defines the collaboration, structure and coordination required of all FAA lines of business and staff offices to modernize the national airspace while maintaining the current system. The NextGen Office is in the process of training people on the process and remain optimistic of the integration of FAA's research efforts with the I2I process. Ms. Cox opened the floor for questions and comments.

Dr. John Hansman asked how I2I will influence or change research. Ms. Cox stated that as part of the reorganization, they restructured where their research is managed within the FAA. Since most of their actual research execution is done at the William J. Hughes Technical Center (Tech Center), management of research was moved to the Tech Center under Dr. Felder. Ms. Cox said there are opportunities presented with the I2I process to create synergies and to help define requirements for the research programs. Ms. Cox clarified that the I2I is not an organization; it is a process that pulls from across the organization. Dr. Hansman followed up by asking who's responsible for determining future requirements on the ATO side. Ms. Cox stated that the future requirements are developed through a cooperative effort, involving both the operational side of the FAA and the program management office. The entire process requires input from several operating arms of the FAA at various stages to minimize the requirements being overlooked. Dr. Hansman asked what the process was, by which an emerging need occurs, and how that cycles into the overall strategy. Mr. Paul Fontaine stated that measures have been put in place to gather strategic input.

Dr. Hansman commented that he would like to see the FAA be more proactive in developing innovative solutions to meet the Agency's needs. Ms. Cox added that the REDAC is an important component of the innovation process because it is the platform where new ideas are brought forth.

Ms. Cox stated that the I2I process makes it easier for the FAA to evaluate the need for improvements and maintaining existing capabilities. Mr. Steve Alterman, Chair of the Environment and Energy Subcommittee, mentioned that their subcommittee has an interest in finding someone to draft a report on the intersection of research and policy; how research impacts the development of policy. He went further to say that it appears to be a duplicative effort with the creation of the I2I process. In response, Ms. Cox reiterated the importance of having multiple organizations represented at meetings to ensure that technological needs are captured and to minimize the possibility of duplicative efforts.

REDAC Vision & Next Steps

Dr. Wilson Felder reiterated his explanation of the recent restructuring at the FAA. He shared his thoughts on his time as a REDAC member. A REDAC assessment working group within the Agency has been created to identify synergies within the various organizations that would increase the productivity of the REDAC. He also noted that Gloria Dunderman requested each

subcommittee Designated Federal Official (DFO) to look at the membership and recommend which members are due for retirement or renewal.

Dr. Felder indicated one issue with the management of the subcommittee membership is the limited budget on how much can be spent on the REDAC as a whole (1/10 of 1 percent of the RE&D budget).

Dr. Felder stated that they had a valuable pre-meeting with the NAS Ops Subcommittee to discuss how their meetings could be more useful, productive and rewarding for the members and beneficial for the FAA. One outcome was that the Subcommittee members would identify what they viewed as intellectual challenges for NextGen. Those intellectual challenges would then be used to direction the efforts of the Subcommittee.

Dr. Felder stated that a position has been announced for a Chief Scientific and Technical Advisor (CSTA) for Software to address the shortfall of technical expertise in this engineering area, an issue that had been raised by REDAC. The person, when selected, will directly report to Ms. Cox.

Dr. Hansman brought up the concern that it may be difficult to fill the CTSA position in a timely manner. He likened the position to another vacancy and asked if this new vacancy was a back-fill. Dr. Cathy Bigelow stated that the position was a newly created ANG position. There was further discussion on the new vacancy and how similar positions took years to get a qualified applicant.

Mr. Joseph Del Balzo asked for clarification on how the new open position relates to the existing staffing shortfall to support the Aircraft Safety R&D Program? Dr. Felder stated that there is a challenge with the aircraft safety digital assurance software and they will continue working that. The intent is to put some Agency-level jobs behind the general software engineering, which goes beyond aircraft safety ground systems and the NAS support. Dr. Hansman raised concern with hiring for the CTSA role because there is not an expertise within the FAA to support it. Dr. Amy Pritchett added that there is a concern that pointing to individual positions to address an agency-wide problem does not identify the magnitude of the problem. She added that there may be larger workforce issues; such as workforces with varying seniority, software proficiencies, or thoughts on training our current workforce so that they can better help address some of these issues. Dr. Felder said that was an excellent point; they're trying to provide confidence in credentialing with employees, on an agency-wide level, Dr. Hansman added that the real issue is finding competent individuals with expertise in the area of safety critical, so they are unable to find experts in the safety critical; so it is a real issue. There was further discussion on how to address the issue agency-wide.

Dr. Felder encouraged the Human Factor Subcommittee members to attend other subcommittee meetings. Dr. Pritchett added that the Human Factors Subcommittees is working with the NAS Ops Subcommittee to hold a joint meeting, and are looking at cross pollination with the Aircraft Safety Subcommittee. Dr. Felder stated the objective is to get the DFOs together and evaluate whether they were getting what they needed from the subcommittee structure and what recommendation they had back to the REDAC to realign the subcommittees. Dr. Hansman

emphasized the need to identify the purpose/goals of each subcommittee meeting so all working components can remain in sync with the mission. He added that many of the frustrations with the outcomes of the meetings stems from groups being briefed on items that have already been finalized.

Report – Subcommittee on Airports (Attachment 2)

Mr. Kevin Bleach presented for the Airports Subcommittee in the absence of the Subcommittee Chair, Mr. Ed Gervais. Mr. Bleach updated the members on the Foreign Object Debris (FOD) systems, arresting systems, light emitting diodes (LEDs), and the airport pavement test vehicle.

He highlighted that one of the Subcommittee recommendations was to develop AIP-supported FOD pilot program be initiated at a number of airports as a method for better understanding the operational issues associated with the technology. Mr. Jim White stated that they are planning to go live with the pilot program this upcoming summer to using AIP funding. He stated that one of the concerns is that the systems are expensive (close to $3million) and lack empirical data to evaluate true performance in real time. Mr. Bleach surmised that gathering the comparative information will assist with decision making on how many systems should be deployed at airports around the country.

Mr. Steve Bussolari asked if there was an issue with false alarm data. Mr. White stated that he did not think so, however, there is an issue of performance comparing it to the current process of visually assessing the runway (how much FOD, what the size is, etc.). He went further to stress the point of trying to gauge what type of data can be yielded, and weigh the benefits against the cost of the system. They have collected data during the research phase, but never fully instrumented the whole runway and collected comparative data.

Dr. Hansman asked about the existence of a developmental or experimental plan for the system; he wanted to know what the source was for the baseline data that will be used for comparison and the logic behind it. Mr. White confirmed that there is a developmental plan in place; they have been conducting research for a number of years and put out reports, which led to a performance spec. He said that implementation at airports will be the next phase. Mr. Bleach asked how Airports planned to use the recommendations as far as staffing; when and what parts of the runway are shut down. There was further discussion about FOD threshold requirements and how to get that information from a risk assessment on the FOD impact.

The Airports R&D program experienced a significant increase in funding in 2012 ($29.2 million) and the FY 2013 President's Request has $29.3 million for R&D. They anticipate a continuing resolution on the budget in light of the upcoming election year and don't foresee too many issues because the budgets for 2012 and 2013 are basically identical. The 2014 budget will be going into the Department of Transportation (DOT) in the next month: there is a slight increase associated with that. Mr. White explained that the large increase in 2012 was primarily due to the continuing resolution in 2011 that held them at 2010 levels. Mr. Bleach then went on to review the findings and recommendations given by the Subcommittee.

The first finding was that the Subcommittee was pleased with the progress to date on research underway in assessing extinguishing agents, methods and quantities for new composite aircraft materials and firefighting strategies for cargo aircrafts. The Tech Center staff has been conducting a lot of good research in this area. Dr. Hansman asked if they were conducting test on new composites. Mr. Bleach confirmed this. Mr. White stated that there has been some concern that the typical fire-fighting agents may react differently for composite fires, so there will be testing on that.

Another recommendation was on airport grounds surveillance technology; installations are in place at a few airports, including JFK, Atlanta, and Denver. The technology has enabled more efficient management of aircraft movements and reducing delay, taxi time, and associated fuel consumption (a study concluded that it could save about 5 million gallons of jet fuel each year and 14,800 hours in taxi time at JFK). He stated that technology has the potential to become a part of NextGen. One of the recommendations from the committees is that they look into what can be done integrating these technologies into NextGen. They have also developed for the signals to stay on once the aircrafts are off the runway so that the airports can use them for tracking in the non-movement area; hopefully helping reduce runway incursions and provide alerts to vehicles when they start going the wrong way. Dr. Hansman asked whether the suggestion for an additional project to be allocated to the budget request was related or added onto a project that was already in progress. Mr. White clarified that they wanted to look at what is available as it relates to the systems that are currently being installed.

Mr. Paul Fontaine added that the surface surveillance is used for surface management and was an area where the FAA is applying the I2I process. They are currently looking into alternative work being conducted at Boston. He stated that there are a lot of different activities that have been occurring with the surface management program, including R&D activity. There was further discussion on the difference between operating strategies and R&D. Mr. Fontaine summarized the expectations of the R&D, stating that the initial work packages will make use of past R&D and future work packages will look at some of the more challenging tasks. Dr. Felder reiterated the importance of providing a briefing on how the I2I process works so the REDAC can better understand how it works in areas such as the surface management program. He stated that there may be a policy answer, procedural answer, or a certification answer that does not require the purchase of anything. Mr. Fontaine agreed and a briefing on the I2I process will be provided at a future meeting.

Dr. Hansman asked whether the Airports group had a specific type of project in mind, following the recommendation to add another project. Mr. Fontaine stated that the requirements for this type of capability have already been identified by the sponsoring organization as a tool that they want. There was discussion on the policy decision that will be forthcoming from the perspective of the air traffic management for ground surveillance.

Report – Subcommittee on Environment and Energy (Attachment 3)

Mr. Steve Alterman (Subcommittee Chair) began his presentation by noting that they had a productive meeting in March and they continue to support the work of the Office of Environment and Energy. In addition, they are working within the International Civil Aviation Organization

(ICAO) and their Committee on Aviation Environmental Protection (CAEP) in an attempt to put forth the U.S. position and work with the international community on environmental issues. He stated that the subcommittee continues to be concerned about looming uncertainty related to the funding crisis. In the past, the Environment and Energy (E&E) Subcommittee has talked about how to prioritize projects so the most important projects were executed and those of least importance either get delayed or deleted. Mr. Alterman stated that there were no new recommendations. He highlighted that the first thing he noticed when he first began working with the FAA was the lack of cooperation between NASA, FAA and EPA. The Subcommittee continues to be impressed with the continuing expansion of cooperation among the FAA, NASA and EPA. The subcommittee was equally impressed with the cooperation of work between the Office of Environment and Energy and the ATO office. Mr. Alterman stated that the terms of engagement and cooperation were encouraging to the subcommittee. He added that they are totally satisfied with the recommendations and agree with what the Agency put forth.

Mr. Alterman stated that although he recognized his group's obligation to follow through on the recommendations as a matter of bureaucracy, they lack the funding to tackle all of the problems. He added that improving water quality remains a priority even though the scope of research has yet to be determined. As a result of the meeting in March, there will be future collaboration efforts between E&E and Airports. A committee member has been designated to maintain the link between the Airport Subcommittee and the E&E Subcommittee to provide a contact for feedback. In response to Mr. Alterman's request for a scope of desired research and data, the Subcommittee asked for following three briefings.

- The impact of the FAA Reauthorization Act and reduced funding levels on the ability to move forward with environmental research projects. Based on varying assumptions, what programs will have to be delayed or abandoned?
- As the PARTNER program reaches its 10^{th} anniversary, a review of successes and failures and an overview of the PARTNER program in the next several years.
- The intersection of research and policy – how are research results used in the formulation of FAA policy? This information may be useful in helping the Subcommittee develop future environmental priorities.

Mr. Alterman moved on to discuss Section 911 of the FAA Reauthorization Act, which said the Administrator may designate a Center of Excellence (COE) for alternative jet fuel research in civil aircraft. However, the Subcommittee felt that was unnecessary; instead they the existing need could be addressed by the existing PARTNER COE, expanding by adding universities if needed.

Mr. Alterman stated that another recommendation was that a few more slots be added to the subcommittee for membership. It was also stated that the Subcommittee membership list needs to be revised because there are individuals who fail to show up to the meetings. This will be a continued recommendation from Environment and Energy.

He also stated that they should continue to fund tools for research and requirements development so that they can learn more about the interdependencies in the environmental area to assist with setting CO_2 standards. He mentioned that the subcommittee and Congress are in favor of the

CLEEN Program; they continue to support it and view the program as a high priority for funding. To keep this program robustly in operation, the Environment and Energy Office requested an above-target funding and the subcommittee supported that request.

Lastly, the PARTNER COE is coming to the end of a ten-year cycle; however, the program will continue to be an integral part of the Environmental research program. One of the recommendations was that a report be generated to identify successes, challenges, and lessons learned within the past ten years.

Report – Subcommittee on Human Factors (Attachment 4)

Dr. Amy Pritchett (Subcommittee Chair) presented the findings and recommendations for the Human Factors Subcommittee. She said that, overall, the Subcommittee thought the research proposed was good, in that it addressed critical areas and will help support certification and operational approval of current and future technologies. She stated that the subcommittee recognized that there were steps taken jointly by people working on the AVS research requirement prioritization by Human Factors specialists in AVS and others outside of AVS.

Dr. Pritchett noted that the prioritization as presented was tentative pending finalization of the FY 2014 budget. Therefore, the subcommittee asked what projects could be down-graded, deprioritized, or compressed in an effort to maintain momentum on the project, should funding be reduced. She pointed out that the Subcommittee had a recommendation to confirm and understand tentative research projects contingency research planning.

Dr. Hansman asked if the proposed recommendation was realistic. There was some discussion around the risk of having budget cuts and knowing whether a project is "on the bubble". It was confirmed that there are numerous opportunities for groups and members to identify areas of concern within the iterative AVS process of reviews; the process has a built-in mechanisms to deal with any kind of budget change.

There was a focus this year on identifying where Human Factors research projects were being used by both AVS and ATO. In their briefings, they saw clear mapping for research requirements for the NextGen Flight deck sponsored research for relevant operational improvements for NextGen. She stated that these improvements were not only informative to Human Factors but also viewed as a broader indication of cases where there was good tracking of how the research results were being placed into implementation and identifying challenges presented to some areas of research and application. Dr. Pritchett highlighted a recommendation to incorporate Human Factors in the development cycle; especially with ATC-related programs.

The Subcommittee found that Human Factors requirements and research insights were being entered into the system too late and appeared to only drive training requirements after design has been finalized. She stated that the subcommittee recognized that the recommendations should be an organizational mandate.

The second recommendation was to ensure that design requirements identify and analyze of both positive and negative transfer effects in design of new human interfaces such as new workstation

design support tools. Dr. Pritchett emphasized the need to create positive transfer effects in design of new human interfaces, which can only be acquired if tools are designed specifically to fit the requirements in the early stages of the design. She emphasized the importance of training Human Factors researchers and design practitioners early in the design process.

Dr. Hansman asked Mr. Fontaine where the new I2I process fits into the human factors arena. Dr. Felder interjected by stating that the I2I process is designed to support processes, through verification and validation. Mr. Fontaine stated that if staff operates effectively at the requirements stage, setting up the human factors requirements, then it will be easier to fix problems that arise. He stated the problem with verification and validation (V&V) is that it is very costly, so it may not be considered a priority.

Dr. Pritchett stated that another finding by the subcommittee was that some of the programs briefed did not have a focus on ATO or Flight Deck. They also noted that not all relevant research projects appeared to recognize where ground based flight operations needed to be considered. She stated that the recommendation put forth by the subcommittee was to ensure that all three areas of operation (ATC, flight deck, and Airline Operations Centers (AOCs)) were explicitly identified as components in all areas of NextGen research and implementation.

Another finding of the subcommittee was that the ATC/Technical Operations and NextGen ATC Controller Efficiency research programs tackled significant concerns that were both core and NextGen issues. Dr. Pritchett emphasized that the projected funding for these programs is anticipated to be significantly reduced, therefore, it would affect such activities as development of safety cases. Assuming that the reductions in funding are coming, the Subcommittee recommended that Human Factors articulate plans for developing safety cases for NextGen developments in the ATC/TO and NextGen ATC Controller Efficiency programs given the termination of human factors research activities. She stated that the plans may require pushing back projected deliverable dates for these programs, to later point out where required evaluations can be established. Dr. Pritchett added that there may be some planning needed to leverage what current work may be able to continue in an attempt to minimize the impact of the anticipated funding decrease.

Another finding from the subcommittee focused on the continued progress made on the development of the Human System Integration (HSI) Roadmap. The recommendation was to maintain the support for the maintenance and use of the HSI Roadmap. She stated, the subcommittee recommended actions to ensure activities for the HSI Roadmap continues.

Lastly, Dr. Pritchett discussed the subcommittee's findings on Next Gen Flight Deck Human Factors research. The research identified for 2013 is intended to address specific NextGen capabilities, Operational Improvements, and Segment Implementation Plan Increments. Budget enacted for FY 2012 and requested for FY 2013 were significantly reduced, specifically by 85 percent. The recommendation from the subcommittee was to balance the projected funding cuts to the Human Factors programs with the additional technical and programmatic risks they establish for NextGen.

Dr. Hansman asked for clarification as to whether the funding was AVS. Dr. Pritchett confirmed that the funding was NextGen. She noted a grave concern about the funding cuts and the recommendation is that they do an assessment to figure out just how much of an impact the funding cuts will have on the program efforts. There was still confusion as to what the actual recommendation was so further discussion occurred to narrow down the subcommittee's recommendation.

Mr. Del Balzo clarified that based on what was mentioned in a previous meeting, the actual recommendation was that FAA goes back and reassesses the budget cuts to the program. Dr. Hansman mentioned that the confusion with the HF recommendations lies at the center of identifying what type of research the budget cuts impact; AVS or NextGen. He went further to suggest the recommendation be that FAA takes a more strategic approach to the budget cuts to the Human Factors program because the funding comes from two different sources and a general budget cut leaves too much room for interpretation.

Dr. Cathy Bigelow commented that the human factors program being discussed (NextGen Flight deck) is not funded from two different sources; it is all NextGen funded. The discussion was confusing the core HF flight deck research and the NextGen flight deck research. She clarified what Dr. Pritchett was referring to was the NextGen flight deck human factors research which was NextGen funded. Dr. Hansman suggested that the Human Factors Subcommittee go back and provide a more specific recommendation because the one provided was too vague. He stated that one of the areas of focus should be the critical flight deck issues and major challenges.

Dr. Hansman stated that the subcommittee should focus less on the funding argument and provide more information and sustenance regarding the lack of products, services, and research as a result of the budget cuts.

Agam Sinha asked if a briefing on the I2I process would be forthcoming. It was confirmed that there were plans to provide a briefing at the next REDAC meeting.

ACTION: Briefing on the I2I process at the next REDAC meeting (September).

Report - NAS Operations Subcommittee (Attachment 5)

Steve Bussolari presented the NAS Operations Subcommittee report in the absence of the Subcommittee Chair, Dr. Victor Lebacqz. Mr. Bussolari mentioned that there were plans for progression with NAS Ops. He emphasized that they have had a long-standing request for getting visibility into the research taking place in the F&E projects for NextGen, specifically with an interest in air traffic operations. They received briefings on Trajectory Based Operations, Flight Data Object, Wake, ATC Technical Operations and other NextGen projects He added that this was also their first look at the I2I process; there appeared to be good coupling between Ops Concept development and the evolution of programs like ERAM.

Mr. Bussolari stated that several discussions and recommendations were generated. The subcommittee requested a of FAA surface programs R&D, which should include the

FAA/Industry Surface Team, the Surface Decision Support System (SDSS) prototyping, and TFDM concept development and prototyping.

Mr. Bussalori stated that the Subcommittee felt that the NextGen - Weather Technology in the Cockpit (WTIC) Program in various areas of research represented good scientific work however, the committee requested more insight into the process of establishing priorities for aviation weather research activities. A recommendation was made that the WTIC Program research priorities be synchronized with atmospheric diagnosis and forecasting requirements associated with NextGen ATM concepts, particularly as identified by the REDAC Weather/ATM Integration Working Group report.

The Subcommittee findings on Human Factors indicated that the training and selection analysis was focused on the midterm and concluded that there were no changes in the required aptitudes of FAA personnel hired in the near and midterm NextGen environment. It was noted that even though the hiring requirements for the midterm have not changed, they should be proactive in addressing staffing requirements in the future. The recommendation was that the FAA operational organizations take a longer-term approach to sponsoring research under the RE&D budget.

Report – Subcommittee on Aircraft Safety (Attachment 6)

Mr. Joe Del Balzo, Subcommittee Chair, presented the Aircraft Safety Subcommittee. He began by highlighting the general observations made at the last FAA REDAC Subcommittee meeting. He stated that all programs reviewed had expected outcomes that were directly linked to clearly defined research requirements. Mr. Del Balzo pointed out that the subcommittee noted FAA's ability to leverage research and expertise of industry, government agencies, and academic institutions as an effective method for conducting research with limited resources. One of the key observations was that the SAS continues to be concerned that there are several research programs that lack a critical level of technical expertise with limited resources. He clarified that the observation did not reference the level of expertise from the sponsoring organization, but rather the performing organization and its ability to execute programs.

Mr. Del Balzo stated that through his years of experience, he has noticed that there is more depth and breadth of technical expertise in the performing organizations than in the sponsoring organizations. However, the Subcommittee concluded that the roles have reversed. He noted that AVS has done an outstanding job at developing technical expertise in very difficult areas. As a result, there is an advanced technical capability and understanding on the sponsoring organization side, relative to the performing organization. He stated that the need to establish stronger internal FAA research capabilities in this area (now and in the future) remains open.

The subcommittee is anxious to see the successful implementation of the UAS airspace roadmap and the concept of operations. The subcommittee found that the research being conducted by the Aircraft Icing team was well considered and highly relevant to improving the FAA's understanding of icing conditions. He stated that it is a very critical area of research.

Mr. Del Balzo spoke briefly about the Civil Aerospace Medical Institute (CAMI) research, stating that the subcommittee continues to support the work being done there. The Flightdeck, Maintenance and System Integration Human Factors research was recognized by the subcommittee as providing useful support to certification and operational approvals. He stated that the subcommittee was concerned, however, by the lack of any planned funding for advanced vision system work in FY 2013. Mr. Del Balzo highlighted that the subcommittee was pleased with the amount of collaboration going on in the NextGen - Weather Technology in the Cockpit (WTIC) program. The subcommittee found that the strategic outlook from probabilistic forecast is most suitable for pre-flight planning and airline dispatch decision-making. With regard to the Advanced Materials/Structural Safety, the subcommittee indicated that one area of concern is that future research has yet to be defined in the area Structural Safety. He said that they are looking forward to a more detailed plan that ties that research to sponsor requirements with identification of milestones and how the outputs would be used.

Mr. Del Balzo went on to say that the subcommittee believes there is a lot of rotorcraft safety work being conducted. The subcommittee asked for a future briefing on the FAA's overall plan for R&D addressing rotorcraft safety program. Moving onto the next item, Mr. Del Balzo commented that the Propulsion and Fuel Systems Deep Dive was a good program that was well-focused and highly effective.

He stated that FAA gets criticized often on performance in the research area, however, with limited resources and money, FAA is to be given credit for what they are producing. He went further to say the significance and quality of those outputs in Aviation Safety demonstrates a maximum return on investment. He stated that the contribution that the committee could make is to ensure that FAA continues to get the visibility it deserves in the community.

Mr. Del Balzo mentioned that the GAO has been tasked to conduct a review of the FAA ASIAS Program by the IG. He added that this was an opportunity for FAA to capitalize off a strategically developed recommendation action plan.

Mr. John Hickey appreciated the compliments provided about AVS and felt that Mr. Del Balzo was spot on with the findings and recommendations.

Mr. Hickey asked if Mr. Del Balzo was referencing the researchers instead of the sponsors in the previous recommendation for FAA to establish an internal research capability. Mr. Del Balzo confirmed that he was, adding that software and digital systems is a hard area to attract the right people. There was further discussion about being able to attract talented people to government jobs. Dr. Felder stated that the FAA is developing a strategic plan to attract the unique talents needed in the research area; the plan is to make use of university relationships, bring in co-ops at the undergraduate level and transition them when they graduate, as well as bring in graduate level students who are working on research and transitioning them into the agency.

Mr. Hickey stated that Software and Digital Systems is an area where technology advancements are so rapid that the Agency struggles to stay ahead. Regarding UAS research, Mr. Hickey stated that the frustration with the program is the disbursement of UAS research occurring in different organization, within and outside the agency. They still get information passed down

about another research project occurring in the agency that UAS Program Office is unaware of. One of the current goals is to map out all of the UAS research and capture the collective outcomes. This will also help the agency gain understanding of what is being done in all areas.

With regard to the IG program assessment, Dr. Hansman asked if there was anything that the agency could do to assist with the effort. Mr. Hickey stated that they may suggest to the IG that the FAA researchers and technical experts be allowed to provide input to create a better understanding of the existing programs.

Committee Discussion

The members engaged in discussion on what recommendations should be included in the letter to the Administrator. Dr. Hansman reviewed some of the key concerns. (The Committee's letter to the Administrator is provided in Attachment 7)

Dr. Hansman opened the discussion to see if the committee would like to add a statement to the letter that would reflect the comments about creating visibility for the Agency's research performance and how it impacts other program areas. He added that there is a broader role for research and development in supporting policy. There was further discussion on looking at how great research impacts the development and continued formation of policy.

Dr. Pritchett asked whether they should allow ConOps to follow the technology or drive it. The focus is on the technical components and whether the agency is doing what's needed to get the procedures and applications in line.

Mr. Jack Blackhurst informed the committee of a White House press release on Quick Data and how seven organizations had placed bids on the research but FAA was not one of them. Dr. Hansman stated that there is a huge growing body of operational data that can be used to find efficiencies in systems and is seen as an opportunity space in the future. Dr. Pritchett added that it can be a strategy issue for NextGen to do monthly monitoring. Dr. Hansman asked what the takeaways were. He suggested tabling the idea for this cycle on whether to include a statement in the letter about FAA's performance in research.

There was discussion on big data and whether it should be mentioned in the letter. Dr. Felder suggested each subcommittee think about both issues; the non-technical acquisition-related research issue and the big data issue and what that might look like in their sphere. Dr. Pritchett added that the third aspect to the issue is about system complexity in NAS Ops, Aircraft Systems, and Human Factors. She said that is almost separable because it is not only reflected in the data, but in the systems as well. She asked where FAA's efforts have some common basis for increasing complexity in systems, operations, etc. Dr. Hansman indicated that the term "increasing complexity" is too broad of a topic to add as a task area, so further discussion is required. In regard to the term "big data," Mr. Tom Irvine stated that it is important for the subcommittees to understand what is meant by the term, big data and the scope of what the government is attempting to do. He went further to say that the agency needs to be mindful that some organizations may not own the data that they mine.

Dr. John Hansman thanked the members and the meeting was adjourned.

Attendance

Members:

John Hansman (Chair)	Steve Alterman	Jack Blackhurst
Steve Bussolari	Joe Del Balzo	Kevin Bleach
Tom Irvine	Amy Pritchett	Agam Sinha
Wilson Felder (REDAC Executive Director)		

Other Attendees:

James White, FAA	Lee Olson, FAA	Cathy Bigelow, FAA
Dale Hawkins, FAA	Paul Krois, FAA	Erik Amend, FAA
Michelle Yeh, FAA	John Mixon, FAA	Eric Neiderman, FAA
John Wiley, FAA	Mohan Gupta, FAA	Ken Knopp, FAA
Katherine Lemos, FAA	Robert Pappas, FAA	John Hickey, FAA
Carl Burleson, FAA	Vicki Cox, FAA	

Attachment 1

Research, Engineering and Development Advisory Committee
Federal Aviation Administration (FAA)
800 Independence Avenue, SW Washington, DC - 10th Floor Round Room
April 18, 2012

Agenda

8:00 am	Welcome	Wilson Felder John Hansman
8:15 am	Update – Organization	Vicki Cox
8:45 am	REDAC Vision & Next Steps	Wilson Felder
9:15 am	Subcommittee Report – Aircraft Safety	Joe Del Balzo
9:45 am	Break	
10:00 am	Subcommittee Report – Human Factors	Amy Pritchett
10:30 am	Subcommittee Report – NAS Operations	Steve Bussolari
11:00 am	Subcommittee Report - Environment and Energy	Steve Alterman
11: 30 pm	Subcommittee Report – Airports	Kevin Bleach
12:00 pm	Committee Discussion - Recommendations - Future Committee Activity	John Hansman Wilson Felder
1:00 pm	Adjourn	

Attachment 2

Airport Subcommittee Findings and Recommendations
April 2012

1. **Finding:** The subcommittee was pleased with the progress to date on research underway in assessing extinguishing agents, methods and quantities for new composite aircraft materials and firefighting strategies for cargo aircraft. Current research is focused on aircraft skin penetration testing, and developing of test protocols for evaluating agent application and forcible entry. Aircraft skin penetration testing is focusing on how to best approach events on the upper decks of the new large aircraft (A380 and B747-8). The height of the second deck requires longer booms and needs to have proven penetration capability from a variety of angles (which is proving to be a difficult task).

   Recommendation: The subcommittee is pleased with the progress made on this research and considers this as a high priority issue.

2. **Finding:** Research into Foreign Object Debris (FOD) detection systems is bearing fruit. The Subcommittee was impressed with a video from a FOD system used at Singapore Airport where the device immediately detected a blown tire on a departing aircraft, which left a large part of the tire on the runway. The pilot was not aware what happened, because of the FOD system the pilot was notified, and the large piece of the tire was quickly removed from the runway.

   Recommendation: Though existing technologies have proven adept at identifying FOD, U.S. airports have concerns with these technologies because of cost, liability and perceived additional manpower requirements. It is recommended that an AIP-supported FOD pilot program be initiated at a number of airports as a method for better understanding the operational issues associated with the technology.

3. **Finding:** Research into trapezoidal runway grooving is promising and shows potential benefits as a method for more quickly removing water from runways and reducing the possibility of hydroplaning.

   Recommendation: Issues such as proprietary cutting technology and questions regarding hydroplaning tests have slowed finalization of this research and publication of FAA guidance. FAA needs to take positive steps to indicate how they plan to close out this research (additional hydroplaning analyses, evaluation of other cutting technologies, publication of technical notes, or further studies).

4. **Finding:** The Subcommittee is pleased that work has begun to progress on aircraft noise and sleep annoyance. The surveys and analyses that established FAA's noise significance levels are 34 years old and need updating. Even with all the advances made in reducing the noise levels of modern aircraft, noise is still a significant issue for the aviation industry, affecting airports abilities to expand and FAA's desires to redesign the airspace. This is expected to be

a multi-year study and the results will be a very important component of future efforts to expand the capacity of the NAS.

Recommendation: To assure full coordination and make use of available expertise it is recommended that a member of the Environment and Energy Subcommittee be appointed to liaison with FAA and Airport Subcommittee staff on this project.

5. **Finding:** Research on heated pavement as a means of melting precipitation during winter storm events is evaluating renewable energy sources as a means for pavement heating. Two demonstration projects are under consideration. 1. An electrically conductive heated pavement overlay powered by solar power and 2. A hydronic heated concrete apron utilizing geothermal energy.

   Recommendation: The committee is concerned whether this project will ever be a cost effective alternative to existing deicing technologies. The Subcommittee recommends that the FAA provide subcommittee members additional information on this project before the August meeting. The information should clearly spell out the definition of success, discuss the risk of a successful outcome, a cost/benefit analysis, and discuss the probability of eventual operational implementation.

6. **Finding:** The aircraft braking friction project is conducting testing of aircraft anti-skid brake systems on contaminated runway surfaces to enable more accurate prediction of aircraft landing performance. This research is partially in response to the Southwest Airlines overrun at Midway Airport in 2005 and the subsequent recommendations by NTSB to FAA for improving the capability of transport category aircraft to calculate, record and convey the braking ability required by an aircraft to stop a landing roll during winter time precipitation conditions. The project is a multi-year research effort that began in 2010.

   Recommendations: The investment and risk associated with this research is significant. The Subcommittee has requested that the FAA provide additional detail on this project that outlines the definition of project success, and breaks down the research schedule into go/no go milestones that can be assessed as the research effort proceeds.

7. **Finding:** The Runway Exit Design Interactive Model (REDIM), is used by airports for siting high-speed runway exits, and was developed by Virginia Tech with FAA and NASA support in the 1990s. This model has not been updated since it was originally produced and does not include realistic aircraft exit speeds as it excludes most of the aircraft in the current commercial fleet relies on performance data from older aircraft.

   Recommendation: The Subcommittee recommends that a new research project be initiated to update the REDIM model or create a new one for determining optimal exit taxiway locations to minimize runway occupancy time.

8. **Finding:** Airport Ground surveillance technologies have proven to provide significant benefit to airports in more efficiently managing aircraft movements and reducing delay, taxi

time, and associated fuel consumption. (Estimated annual savings at JFK were 14,800 hours of taxi time, 4.98 million gallons of fuel).

Recommendation: An additional project should be added to the FY 2014 budget request that evaluates the synergies that could be obtained by integrating airport ground surveillance technologies with Next Gen concepts.

Attachment 3

FAA REDAC Subcommittee on Environment and Energy
Meeting Report and Recommendations
April 2012

The Environment and Energy Subcommittee of the FAA Research, Engineering and Development Advisory Committee (REDAC) met in Seattle, Washington, on March 7-8, 2012. Following is the report on the outcome of this meeting.

Introduction – A review of the activities of the FAA Office of Environment and Energy (AEE) indicated that current priorities continue to remain intact, with an emphasis on NextGen and support of ICAO CAEP activities again dominating the Environment and Energy agenda. Consistent with reports made at recent REDAC meetings, the Subcommittee continues to be concerned with the continuing funding shortfalls that threaten important NextGen and environmental projects. Therefore, the prioritization recommendations made previously continue in effect. In addition, as noted in Recommendation (B)(3) below, we believe that out-year environmental funding should be increased in future Agency budgets.

The Subcommittee continues to be impressed with the continuing expansion of cooperation among the FAA, NASA and EPA and strongly urges that this cooperation continue to ensure that scarce resources are not wasted on duplicative efforts and that available funds can be leveraged to maximize a positive impact on aviation activities. In addition, as noted below in Recommendation (B)(1), the Subcommittee believes that increased cooperation with the Department of Defense is also a necessary component of ongoing environmental activity. Internally, the Subcommittee also is encouraged by the ongoing cooperation between the Office of Environment and Energy and ATO in the Agency's efforts to implement NextGen technologies.

The Subcommittee appreciates the responses of the Agency to prior suggestions on priorities and the need to leverage available funding through cooperation with other governmental agencies and other offices within the FAA. All previous recommendations can be closed out.

As noted at previous REDAC meetings, the Subcommittee continues to recognize that several areas of environmental research have been given a lower priority than others, even though it also recognizes that work in these areas continues to be necessary. Specifically, it is important to point out that, especially at the local level, aircraft noise is still a major issue. Therefore, consistent with available funding, continued work on the noise roadmap should continue. Similarly, water quality has been given a low priority, but, in an attempt to better understand the potential research issues surrounding the water quality issue, the Subcommittee received a briefing at the March 2012 meeting. As a result of this briefing, a Subcommittee member has been tasked with coordinating with the Airports Subcommittee to determine what, if any, future research activities are appropriate in this area.

Finally, in order to better understand future challenges, the Subcommittee requested that three specific briefings be given at the August 2012 meeting. These briefings are:

- The impact of the FAA Reauthorization Act and reduced funding levels on the ability to move forward with environmental research projects. Based on varying assumptions, what programs will have to be delayed or abandoned?
- As the PARTNER program reaches its 10th anniversary, a review of successes and failures and an overview of the PARTNER program in the next several years.
- The intersection of research and policy – how are research results used in the formulation of FAA policy? This information may be useful in helping the Subcommittee develop future environmental priorities.

Recommendations – The recommendations of the Subcommittee are broken down into two sections – the first recommendation is intended to be included in the REDAC submittal to the FAA Administrator, while the remainder of the recommendations is intended to address specific areas of Subcommittee discussion.

(A) Recommendation for Inclusion in the REDAC Submittal to the Administrator

Finding: Section 911 of the recently enacted FAA Reauthorization Act directs the Administrator to establish a research program for the development of alternate fuel sources. In addition, this Section provides that, "Not later than 180 days after enactment of FAA reauthorization, the Administrator **may** designate an institution as a Center of Excellence for Alternative Jet fuel Research in Civil Aircraft."

Recommendation: Since there is already a robust alternate fuels program within the existing PARTNER structure, the Subcommittee urges the Administrator to meet the goals of Section 911 by expanding the existing program rather than creating yet another Center of Excellence.

(B) Recommendations to be Included in the REDAC Report

Finding: Especially in view of fiscal restraints, cooperative research among various government departments continues to be a crucial element in all research programs. As noted above, the Subcommittee is encouraged by the cooperative efforts underway and urges that these efforts continue and expand in the future.

Recommendation: In order to bring other voices to the Advisory Committee process, the subcommittee recommends that the environmental research arm of the Department of Defense be invited to become a member of the Environment and Energy Subcommittee. In a similar vein, it is also recommended that another Non-Governmental Organization (NGO) be added to the Subcommittee.

Finding: Continued Operational and Tools Research is necessary to support the implementation of NextGen initiatives and the development of environmental standards through the ICAO process.

Recommendation: The Agency should continue to fund the development and refining of environmental tools that will enable the assessment of the environmental consequences of NextGen implementation as well as assist in the establishment of environmental standards at ICAO.

Finding: In the area of technology research, the ongoing CLEEN program, including its CAAFI alternative fuels component, continues to be one of the most promising projects in the environmental area.

Recommendation: The Subcommittee recognizes the continuing funding threat to the CLEEN program, but again strongly recommends that a high priority be given to this project. As technologies are developed and transitioned into the aircraft fleets, plans need to be in place for the next phase of the CLEEN program. In addition, the Subcommittee recommends that the Environment and Energy requests for "above-target" CLEEN funding for Fiscal Years 2014 through 2016 be adopted by the Agency.

Finding: United States leadership in the international community continues to be an important environmental priority, especially as the International Civil Aviation Organization (ICAO) debates the setting of a worldwide aircraft CO2 emissions standard.

Recommendation: The Subcommittee strongly recommends that funding necessary to support ICAO activities continue.

Finding: The PARTNER program continues to provide significant benefits in a number of environmental areas. This program enables the Agency to leverage resources and advance the state of existing knowledge.

Recommendation: The PARTNER program should continue to be an integral part of the FAA's environmental research program.

Attachment 4

Human Factors Subcommittee Findings and Recommendations
March 2012

Finding: The Human Factors Subcommittee was pleased to see the integration of HF research products being used by the FAA AVS and ATO lines of business. This "connecting the dots" was illustrated in several presentations highlighting the process from research requirements to products having operational use for each line of business. This promises to significantly reduce the risk of human factors and human interface issues leading to costly rework and schedule delays during implementation.

Finding: The Human Factors Subcommittee appreciated the briefings by key AVS sponsors of their proposed FY2014 research requirements. The briefings were also helpful for providing Subcommittee members with a better understanding as to how AVS coordinates with ANG-C1 and the research performers as part of a team effort to ensure the successful transition from "research to reality". The Subcommittee also appreciated seeing the mapping between the research requirements for NextGen flight deck sponsored research and relevant Operational Improvements (OIs) as described in the Enterprise Architecture. These indications not only informed the Subcommittee, but also were indicators of appropriate tracking of research results and of using this tracking to better inform further research.

Recommendation: Continue the tracking of research results as appropriate to their sponsor, such as application of the research results by AVS sponsors and implementation of research results, to establish an on-going process by which all human factors research is assessed. Many insights should be sought from this process, including identifying the attributes of successful research to build into research plans and highlighting the utility of human factors research. Use these insights to further inform research plans at all stages from year of execution to out-year identification of research requirements.

Finding: The Human Factors Subcommittee was briefed on the human factors research selected by AVS to sponsor in FY2014. These research elements represent significant concerns in current operations and in the ability of the FAA to certify and approve developments within the aviation community within the foreseeable future. The Subcommittee appreciates the steps that have been taken jointly by the AVS research requirements prioritization group and relevant human factors specialists in AVS and human factors researchers. However, the Subcommittee understands that this prioritization and selection is tentative pending final determination of the FY 2014 budget. The Subcommittee was not able to assess which of these research projects may be at risk of being not-funded with a reduction in the FY 2014 budget from the current plan; it is our understanding the relevant researchers are also not informed as to whether they should prepare contingency plans for de-selection or down-sizing of research areas versus conduct current research towards the selected FY 2014 activities. This lack of understanding results from the rankings of the tentatively selected projects not being made available to the AVS technical research sponsors, the researchers, or the Subcommittee.

Recommendation: AVS should continue its efforts to coordinate and communicate with its technical research sponsors and research teams as to the rankings of requirements, especially with regards to providing the information the technical sponsors and research teams require for longer-range planning. This includes an understanding of the potential for the research not being funded (e.g., providing rankings or identifying which projects would be funded under different budget scenarios) early enough to inform their on-going research and longer-range planning. A suitable time for releasing such information would be before the Spring meetings of the relevant REDAC Subcommittee.

Finding: For ATC related programs, many human factors requirements and research insights appear to be entering the system too late and hence appear to be only capable of driving training requirements after design has been more or less finalized, rather than impacting the actual design. Earlier inclusion of human factors requirements in ATC related programs would serve to reduce training requirements as well as enhance operator efficiency. While consideration of training needs for the system is important, industry best practices for Human System Integration call for the earliest inclusion of human factors requirements so that (1) design can be impacted early in the RE&D process, and so that (2) positive transfer effects building on established human expertise and capabilities can be built into the system. Without such early consideration, programs risk delaying the human-system integration work to a later point where it can only focus on identifying and mitigating unintended negative transfer effects.

Recommendations:
a) For ATC related programs, ensure that industry best practices for early and comprehensive inclusion of human factors requirements is accomplished in the RE&D and F&E requirements processes regardless of organizational or process constraints. Among other things, such best practices might include a policy requirement by all programs, projects, or portfolios to conduct a human factors assessment and create (and monitor) a human-system integration plan initiated during the initial investment analysis.

b) Ensure that design requirements call out for the consideration and analysis of both positive and negative transfer effects in the design of new human interfaces such as new workstation design support tools. This will facilitate the transition of new capabilities into the system.

Finding: Next Gen airspace contains three significant nodes of collaboration; ATC, flight deck and Airline Operations Centers. While these three nodes are identified in some areas, not all relevant research projects appear to recognize where ground based flight operations centers need to be considered in human factors research and implementation of Next Gen concepts of operation relying heavily upon collaboration and decision making by aircraft operators.

Recommendation: Ensure that all three nodes of collaboration, including AOCs, as appropriate, are explicitly identified as components in all areas of Next Gen research and implementation where the three way collaboration either exists today or will exist in Next Gen. Ensure research projects consistently evaluate which nodes of collaboration will be significant contributors to the aspects of NextGen that they are examining, and incorporate their concerns.

Finding: The Subcommittee was briefed on the core Air Traffic Control/Technical Operations and NextGen ATC Controller Efficiency programs. These research areas tackle significant concerns with both core and NextGen issues and they have been identified in close-collaboration with other organizations within the FAA to best integrate their activities and outcomes into broader FAA developments. This includes the Technical Operations research on maintenance of air traffic systems that serves a vital role, particularly as significant changes are made, including the implementation of automation. Projected funding, however, for the NextGen Controller Efficiency program is anticipated to be significantly reduced and would affect such activities as development of safety cases.

Recommendation: Articulate plans for developing safety cases for NextGen developments in the ATC/TO and NextGen ATC Controller Efficiency programs given termination of human factors research activities; these plans may require pushing back projected deliverable-dates for these programs to later points where required evaluations can be reestablished. Where research areas are being reestablished, these plans should examine mechanisms for leveraging off personnel and facilities in related research projects.

Finding: The Human Factors Subcommittee was pleased to see that significant progress has been made on the development of the Human System Integration (HSI) Roadmap. In addition, there have already been some important gaps identified in the implementation of NextGen through the use of the HSI roadmap. This is an important activity that needs to be continued and we were advised the senior staff member responsible for the Roadmap will be retiring soon.

Recommendation: Ensure staffing and resources are in place for the maintenance and use of the HSI roadmap, specifically addressing staffing risks in this area due to planned retirement of key personnel in ANG-C1.

Finding: The Human Factors Subcommittee was given a briefing on NextGen Flight Deck Human Factors research. Five research requirements have been identified and will be undertaken in FY 2014. The research is intended to address specific NextGen capabilities, Operational Improvements, and Segment Implementation Plan Increments. The budget enacted for FY 2012 was reduced by approximately 50 percent. The budget request for 2013 is further reduced to approximately 85 percent of the FY 2012 request. A similar reduction to the FY 2013 budget would be devastating and the implications would carry over into FY 2014 and beyond. The subcommittee finds that the research originally planned to sustained FY 2012 levels serves a vital role in reducing the risks associated with human performance while ensuring system safety and supporting NextGen efficiency and capacity goals.

Recommendation: To the extent possible within a volatile budget planning process, the projected funding cuts to these programs should be balanced with the additional technical and programmatic risks they establish for NextGen. The negative impacts of significant swings in year-to-year funding should be recognized and mitigated to avoid situations such as starting up projects that are then terminated before being able to provide some return on their research investment.

Attachment 5

NAS Operations Subcommittee Meeting
March 2012

Meeting Summary

The NASOPS subcommittee met at the WJ Hughes Technical Center in Atlantic City, New Jersey, March 27 and 28, 2012. The Chair of NASOPS, Dr. J. Victor Lebacqz, along with Dr. R. John Hansman (Chair of the REDAC) and Dr. Steven R. Bussolari (REDAC member), had met on March 26 with Dr. Wilson Felder (REDAC DFO), Dr. Eric Niederman (NASOPS DFO), and Ms. Gloria Dunderman of the FAA to review and discuss the parameters of NASOPS reviews. As a result of this meeting, the NASOPS meeting was initiated by Dr. Felder providing an overall view of the NextGen NAS philosophy as he sees it, to provide a point of departure for the remaining briefings. The subcommittee agreed to reply to Dr. Felder, prior to its next meeting, with a list of the top 3-5 intellectual challenges facing the FAA in implementing NextGen.

The subcommittee received briefings on the following topics:

Budget Status
Trajectory-Based Operations and Flight Data Object
FY 14 NextGen Wake and Wake Re-Categorization
Air Traffic Control Technical Operations (ATC/TO) Human Factors
NextGen - Staffed NextGen Towers
NextGen - Weather Technology in the Cockpit
NextGen - Operations Concept Development Validation

Findings and recommendations based on these briefings are summarized below.

Overall Finding

The presentations of the Oceanic Tactical Trajectory Management, Flight Data Object, and the Operations Concept Validation and Infrastructure Evolution work at the March NASOPS meeting represent the FAA's response to a long-standing request by NASOPS to gain visibility into the considerable research and development work that the FAA performs as part of its NextGen F&E portfolio. The subcommittee is grateful to Paul Fontaine, Thien Ngo, and Michele Merkle for these high-quality briefings. NASOPS views this work as timely and sound, and we look forward to having similar briefings for other aspects of NextGen research and development in future meetings.

Findings: TBO and Flight Data Object Demonstrations

Thien Ngo, with support from Paul Fontaine, gave a very valuable briefing covering the FAA NextGen demonstrations on the ATM side of the CNS /ATM equation:

AIRE – Atlantic Interoperability Initiative to Reduce Emissions
OTTM – Oceanic Tactical Trajectory Management - OCAS and CDP
FDO – Flight Data Object
AFES – Airborne Execution of Flow Strategies

1. This briefing broadly satisfied the subcommittee desire for tangible evidence of research progress toward greater TBO NextGen capability and addressed several of the subcommittee's past calls for greater depth in NextGen CATM strategies and progress. Paul Fontaine augmented Thien's briefing regarding the lasting effects of the demonstrations toward the sustained NextGen operational capabilities. The Subcommittee appreciated the insights into the balanced research approach taken among multiple and competing concepts which will allows the FAA to discover the best overall approach by exploring a range of alternatives. The research description illustrated the highly leveraged value to NextGen of taking a cross cutting path to the benefits of integrated ATM.
2. The Oceanic theater for the current trials can serve as a powerful precursor to continental United States (CONUS) applications. Challenges to consider in translating Oceanic to CONUS applications include the effects of operational intensity in CONUS on the interaction/negotiation cycle times required for flight path clearances. Research in this regard, on the negotiation cycle time effects on traffic density limits, would be valuable.

Findings: NextGen - Operations Concept Validation and Infrastructure Evolution

1. NASOPS is pleased that the Operations Concept Validation work appears to be well-coupled with the ERAM and Data Comm implementation plans. This will provide the user community with a roadmap that clearly connects NextGen operational benefits with the specific NAS infrastructure and procedural changes required to achieve them. The description of the High Performance Route (HPR) concept refinement and functional analysis was illustrative of the new Idea to Inservice Management (I2I) process that the FAA has developed to allocate new functions to NAS infrastructure (e.g., ERAM). NASOPS looks forward to learning how this approach is being used in the terminal and airport surface domains.
2. Michele Merkle gave her usual clear and well-informed briefing on these activities. The subcommittee has consistently supported this work, which we consider to be high priority, and we look forward to working with John Marksteiner as he takes over this area. We wish to congratulate Michele on her new job within the FAA. We will miss her briefings.

Finding: NextGen - Weather Technology in the Cockpit (WTIC)

1. Gary Pokodner gave a good briefing on the status of the WTIC project. The subcommittee was very glad to hear of the good programmatic progress on this project, and was gratified that our previous recommendations had been useful in reformulating the project.

Finding: NextGen - Staffed NextGen Towers

1. The subcommittee appreciates the update on Staffed NextGen Towers (SNT) and was pleased that the FAA is now looking seriously at surveillance requirements, concepts of operation, and safety analysis for SNT at small and medium sized airports where this concept is perhaps most viable in the near- to mid-term. The FAA noted that SNT's budget and research goals have been de-scoped due to schedule slips associated with external airport-surface related research and development programs, specifically the Tower Flight Data Manager (TFDM) program.

Recommendation:

Given the importance of airport surface research to NextGen, articulated for example by RTCA Task Force 5, we recommend that the subcommittee receive a more comprehensive review of FAA surface programs R&D at a future NASOPS meeting to help put the SNT work in context. We recommend that this review include a summary of NextGen funded activities including the FAA/Industry Surface Team, the ANG Surface Decision Support System (SDSS) prototyping, and TFDM concept development and prototyping.

Finding: Weather Program

1. The subcommittee felt that the Weather Program research in the areas of convection, turbulence, in-flight icing, ceiling and visibility, and other areas represents excellent scientific work by qualified researchers, and is clearly germane to enhanced aviation efficiency and safety. However, the committee would appreciate more insight into the process by which priorities are established for aviation weather research activities. In particular, the current portfolio appears to focus heavily on weather conditions germane to general aviation and, as a result, may not fully address capability needed to support NextGen concepts for collaborative ATM, trajectory based operations and/or high-density airport operations.

Recommendation:

We recommend that the Weather Program research priorities be synchronized with atmospheric diagnosis and forecasting requirements associated with NextGen ATM concepts, particularly as identified by the NASOPS Weather/ATM Integration Working Group report, and request a briefing on how you plan to address that at an upcoming meeting.

Finding: Human Factors

1. The subcommittee appreciated the more focused approach that appears to be underway for the ATC/TO Human Factors part of the portfolio. However, as briefed, the training and selection analysis was focused on the midterm and concluded that there are no changes in the required aptitudes of FAA personnel in the near and midterm NextGen

environment. The subcommittee noted that personnel hired in the near and midterm NextGen environment will likely be still operating as NextGen moves to the far term. In the "core" part of the briefing, when the lack of pursuing far term selection criteria was again questioned by the subcommittee, the answer was that the sponsoring organization (FAA HR) did not request or require anything beyond what is needed in the midterm. There is little doubt that, to varying degrees, the functions of the human in the NextGen far term environment will be different than in the current NAS environment, and the lack of research on the criteria for selection of individuals best suited to perform them is a serious gap. While the subcommittee agrees in principle with the FAA's requirement that an operating organization "sponsor" all the RE&D budget work, the "sponsors" must understand that the principal objective of research and development is to look forward to address knowledge gaps. It seems reasonable to the subcommittee that some modest fraction (e.g., 10-15%) of the work should be allowed to address far term issues.

Recommendation

NASOPS recommends that the FAA operational organizations take a longer view when "sponsoring" research work done under the RE&D budget. In this specific case, we recommend that the Human Factors Core work on personnel selection include exploration of far term selection criteria for the FAA personnel who will operate NextGen.

Attachment 6

FAA REDAC AIRCRAFT SAFETY SUBCOMMITTEE
MEETING REPORT
MARCH 2012

GENERAL OBSERVATIONS

- The SAS finds the 2014 portfolio to be substantially correct.
- All programs reviewed had expected outcomes directly linked to clearly stated research requirements.
- No programs or research activities are recommended for elimination.
- The SAS continues to be concerned that several research programs lack a critical level of technical expertise and bench strength.
- The ability of FAA to take advantage of the research and expertise of industry, other government agencies and academia continues to be an effective way to conduct research with limited resources.
- Specific Findings and Recommendations on individual areas of research reviewed and discussed by the subcommittee follow.

Software and Digital Systems

Finding: The SAS notes the progress made in defining a comprehensive Software and Digital Systems research program closely coupled to well thought through research requirements with clearly defined outputs and expected outcomes. The SAS looks forward to a deep dive during the Fall 2012 meeting to review the research plans and project approach for individual activities along with a plan to ensure that an adequate core capability is available to support the required research in both the near and long term.

The previous recommendation regarding the importance of establishing a stronger FAA internal research capability to deal with digital systems now and in the future remains open.

Unmanned Aircraft Systems (UAS) Research

Findings:

- In March 2011, the Subcommittee was told that the FAA was about to finalize their UAS Airspace Integration Roadmap and it would soon be available to the subcommittee and others in the aviation community. The subcommittee feels that such a roadmap should be a critical driver for the identification of R&D requirements and establishment of a realistic Research Management Plan. In August 2011, we were told that the roadmap was not quite ready. At our meeting in March 2012, we were once again told that the Airspace Integration Roadmap is still not ready and is under review by the UAS ARC that may recommend changes, which the FAA will then need to incorporate.
- While a number of operational and technical issues exist as barriers to UAS integration, there are likely to be several significant policy decisions required to be made by the FAA. These policy decisions are likely to be significant drivers to the R&D requirements.

- The R&D schedule appears to be out of synch with Congressional and UAS proponent expectations regarding integration of UAS. Given the expectations in the community, it would appear that the FAA is behind schedule.
- The consolidation of UAS airspace integration R&D activities into a single coordinated effort is a positive step.
- In the absence of a coordinated UAS Airspace Integration Roadmap and a Concept of Operations, the research that we heard identified appears to be right activities consistent with anticipated needs.
- The FAA and the aviation community still appear to be getting a handle on the complexity of the operational, technical, and policy challenges associated with UAS airspace integration. There may be insufficient resources devoted to the topic given the complexity and multiple dimensionality of the challenges.
- Establishing a single FAA executive who is focused full-time on UAS airspace integration across FAA lines of business is a very positive development.

Actions: At our deep dive on UAS R&D planned for August 2012, the subcommittee would like a detailed briefing on the FAA's UAS Airspace Integration Roadmap and Concept of Operations and how this material is being used to inform R&D planning.

Recommendations:
The FAA needs to identify the key policy decisions that are required and the operational/technical data required to inform decision-making to guide research planning.

While Congressional and UAS proponent timelines may appear unrealistic, the FAA needs to define realistic airspace integration timelines to guide research planning efforts, manage community expectations, and identify the appropriate resources required.

The FAA needs to continue to avoid the temptation to compromise safety in an effort to satisfy aggressive integration timeline objectives from the UAS community.

Terminal Area Safety
Finding: The Subcommittee supports these efforts, especially recognizing FAA's constructive response to the Subcommittee's recommendations.

Aircraft Icing Research
Finding: The Subcommittee finds the research being conducted by the Aircraft Icing team to be well considered and highly relevant to improving our understanding of icing conditions. The work plans presented are a good blend of basic research (ice crystals), near term operational improvements (ground icing operations) and advanced analysis (3d ice accretion shape prediction). The ice crystal research approach is an excellent example of a multi-national, multi-company, multi-agency collaborative effort aimed at addressing a challenging technical issue affecting aviation safety. **The Subcommittee reiterates a prior observation that the FAA in-house technical staffing level in this area remains too low to adequately meet current & future research needs.**

CAMI – Aeromedical Research

Finding: The Subcommittee continues to support the valuable work of CAMI.
As the Subcommittee has noted before, CAMI represents a unique facility in the world, and, like FAA's fire facility, represents an area of pride to the FAA and enhancement of its world-wide reputation. Continued, consistent funding of CAMI remains essential, especially in times of economic difficulty. The Subcommittee strongly supports the modernization and refurbishment of CAMI's aging facilities in the aeromedical equipment needs requirement program, and urges steady and continuing funding for this essential effort.

Flight Deck/Maintenance/Systems Integration/Human Factors

Finding: The Subcommittee recognizes and supports the effort to connect the human factors effort to real-life practical problems. It also noted that this work provides useful support to certification and operational approvals which is essential and is needed now to support current approval requests by industry.

The Subcommittee is concerned by the lack of any planned funding for advanced vision system work in FY13; even though it understands that carry-over funds may be available.
A related issue, on which work is needed, is the relation between pilots and aircraft state and the responsible maintenance technicians at the beginning of a flight. There is little or no communication between them and often a lack of commonly used language. Work to improve this essential connection represents an important human factors issue.

Weather Technology in the Cockpit (WTIC)

The subcommittee was pleased to hear that collaboration with other NextGen programs is expanding and encourages effort to expand collaboration with other organizations outside of FAA as well.
Findings: (1) An element of the research on Presentation of MET Information on Legacy Display Devices is intended to address cost constraint considerations of low end GA aircraft operators. Given the technology options (i.e. I-pads, etc…) available to the GA community, the intent of this specific activity may have already been addressed.

Action: The SAS request a briefing on the relevancy and need for research to support Presentation of MET Information on Legacy Display Devices, given the other technology options that are currently available to provide the GA community with suitable weather information in the cockpit at a relatively low cost.

Findings: (2) The strategic outlook from probabilistic forecast is most suitable for pre-flight planning and airline dispatch decision making. Research to Simulate Cockpit use of Probabilistic Forecasts is a relevant activity but must be done in an integrated approach that considers the role of the cockpit relative to the ground component, particularly where operational value of the WTIC capability could be impacted by ground-based weather capability.
Action: The SAS requests a briefing to understand the proposed role of the cockpit in the use of probabilistic weather forecast and to assess the adequacy of the air/ground integration considerations for the use of this information.

Weather Program
Finding: Weather program was well presented. The two sponsors (AVS &ATO) appear to have coordinated requirements in a workable manner that meets both their needs.
Actions: (1) With regard to the Mountain Pass Weather in the Contiguous United States the FAA will review and brief the SAS on the relevant lessons learned from the CAPSTONE program done in Alaska.

Continued Airworthiness Program - Engine Non-Destructive Evaluation (NDE)
Finding: The Subcommittee finds the research in the Engine NDE area relevant and appropriate. Good collaboration with industry and University programs is present. The research might benefit from closer interaction with the Human Factors experts where inspection results require human cognitive skill based interpretation. The Subcommittee is happy to note that the research results are being implemented via updated Advisory Circulars and rule making as appropriate.

Aircraft Catastrophic Failure Prevention
Finding: The subcommittee finds the research being performed by the Aircraft Catastrophic Failure Prevention team to be relevant to new tools and materials for advanced analysis and risk assessment methods in un-contained failure. It is evident that the FAA team has formed a strong partnership with industry and academia in development of these capabilities.

Recommendation: The subcommittee recommends that, FAA, based on final outcome of this research project, create guidelines for analysis tools and material properties to facilitate future compliance and certification procedures.

Discussion on the Relevance of Proposed FAA Long Range Research and Development Initiative
Finding: The SAS supports FAA work to identify the longer term evolution of systems and technologies. However it is important to learn from past attempts and ensure that longer term research be connected to current and near term research work in FAA, DOD and NASA and best assumptions of future technologies.

Continued Airworthiness: Flight Control Mechanical Systems
The SAS agrees that the stall departure, recognition and recovery task to address Loss of Control (LOC) is a high priority and should be pursued.

Continued Airworthiness: Structural Integrity Metallic
The SAS again notes that this research activity is relevant with outcomes coupled to clearly stated requirements and is a good example of self funding through industry cost sharing and engineering support.

Advanced Materials/Structural Safety
Finding: The Aircraft Safety Subcommittee recognizes that the industry's use of composites is growing rapidly and will continue to do so for the foreseeable future. The comprehensive deep dive presentation in Advanced Materials/Structural Safety shows that the research being conducted is well structured and relevant. The development of education for use by all

stakeholders, collaborative approach used by FAA, responsiveness to the needs of industry and demonstrated use of results are particularly noteworthy. One area of concern was the research being conducted on Structural Crashworthiness, particularly the desired areas of future research that have not been funded. The subcommittee feels that the suggested areas of research might not be specific enough and lack an in depth discussion on future needs. Additionally, the plan needs to lay out a roadmap with more detail and substance for the management of future R&D needs.

Recommendation: The subcommittee recommends that the proposed areas of future research be more clearly defined to include more details on specific requirements, relevant milestones, levels of performance, and a discussion of how the results will be used to support policy and certification.

Continued Airworthiness – Maintenance and Inspection

Finding: In a previous review, the Subcommittee commented that staying ahead of the composite aircraft fleet is very important to assure future continued operational safety. Further, in the recent report "Status of FAA's Actions to Oversee the Safety of Composite Airplanes," the GAO identified key safety-related concerns with the repair and maintenance of composites in commercial airplanes. The Subcommittee finds that the FAA has kept these concerns in mind in the Maintenance & Inspection research area of Continued Airworthiness of Composite Structures. The research plan is results-oriented, and focused on making progress toward important outcomes. While composite applications are not new, their use is growing, and at the same time the Subcommittee notes the general trend of loss of skills in the industry's maintenance workforce. Thus the FAA is urged to stay focused on maintenance and inspection processes and training to deal with composites in the fleet.

Continued Airworthiness – Rotorcraft Systems

Finding: The Subcommittee recognizes that safety of rotorcraft has received on-again and off-again emphasis within the community during the past several years, and that many of the accident causes are related to operational and cultural conditions not directly addressable by FAA research. The Subcommittee further recognizes that in addition to the HUMS-related research being performed in the Continued Airworthiness of Rotorcraft Systems area, there are several other FAA activities with direct emphasis on rotorcraft, including involvement in the International Helicopter Safety Team (IHST) and the desire to pull FOQA-like info into ASIAS. However, these other activities were judged to likely produce operational solutions that do not requiring R&D. The Subcommittee found that it is not apparent whether there is an overall plan for rotorcraft R&D.

(Potential) Action: At a future meeting, the Subcommittee requests a briefing on the FAA's overall plan for R&D addressing rotorcraft safety.

Propulsion & Fuel Systems Deep Dive

Finding: The Subcommittee found the efforts aimed at understanding and correcting the causes of major rotating engine part fatigue crack formation and growth to be well focused and highly effective. The FAA has successfully garnered both technical and financial support from the engine manufacturers to deliver a useful analysis tool (DARWIN) for assessing fatigue crack

growth behavior in rotating components under realistic operating conditions. The Subcommittee applauds the FAA's work in this key area to assure continued operational safety of the fleet.

Attachment 7

May 2, 2012

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

Dear Administrator Huerta:

On behalf of the Research, Engineering and Development Advisory Committee (REDAC), I am enclosing the summary findings and recommendations from the spring 2012 meetings of the standing REDAC Subcommittees (Aircraft Safety, NAS Operations, Environment and Energy, Airports, and Human Factors).

The consensus of the full Committee is that the research, engineering and development portfolio is generally well aligned with agency priorities and is well managed given the limited resources available.

The Committee was also pleased to note that prior REDAC recommendations have been acted on with positive effect.

As always, the REDAC stands ready to assist if there is any way we can help in our common objectives of improving the safety, efficiency and capability of the air transportation system.

Sincerely,

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

Enclosure

Research, Engineering and Development Advisory Committee
Recommendations on the FY 2014 R&D Portfolio

Subcommittee on Airports

Finding: The subcommittee was pleased with the progress to date on research underway in assessing extinguishing agents, methods and quantities for new composite aircraft materials and firefighting strategies for cargo aircraft. Current research is focused on aircraft skin penetration testing, and developing of test protocols for evaluating agent application and forcible entry. Aircraft skin penetration testing is focusing on how to best approach events on the upper decks of the new large aircraft (A380 and B747-8). The height of the second deck requires longer booms and needs to have proven penetration capability from a variety of angles (which is proving to be a difficult task).

Recommendation: The subcommittee is pleased with the progress made on this research and considers this as a high priority issue.

Finding: Research into Foreign Object Debris (FOD) detection systems is bearing fruit. The Subcommittee was impressed with a video from a FOD system used at Singapore Airport where the device immediately detected a blown tire on a departing aircraft, which left a large part of the tire on the runway. The pilot was not aware what happened, because of the FOD system the pilot was notified, and the large piece of the tire was quickly removed from the Runway.

Recommendation: Though existing technologies have proven adept at identifying FOD, U.S. airports have concerns with these technologies because of cost, liability, and perceived additional manpower requirements. It is recommended that an AIP-supported FOD pilot program be initiated at a number of airports as a method for better understanding the operational issues associated with the technology.

Finding: Research into trapezoidal runway grooving is promising and shows potential benefits as a method for more quickly removing water from runways and reducing the possibility of hydroplaning.

Recommendation: Issues such as proprietary cutting technology and questions regarding hydroplaning tests have slowed finalization of this research and publication of FAA guidance. FAA needs to take positive steps to indicate how they plan to close out this research (additional hydroplaning analyses, evaluation of other cutting technologies, publication of technical notes, or further studies).

Finding: The Subcommittee is pleased that work has begun to progress on aircraft noise and sleep annoyance. The surveys and analyses that established FAA's noise significance levels are 34 years old and need updating. Even with all the advances made in reducing the noise levels of modern aircraft, noise is still a significant issue for the aviation industry, affecting airports abilities to expand and FAA's desires to redesign the airspace. This is expected to be a multi-

year study and the results will be a very important component of future efforts to expand the capacity of the NAS.

Recommendation: To assure full coordination and make use of available expertise it is recommended that a member of the Environment and Energy Subcommittee be appointed to liaison with FAA and Airport Subcommittee staff on this project.

Finding: Research on heated pavement as a means of melting precipitation during winter storm events is evaluating renewable energy sources as a means for pavement heating. Two demonstration projects are under consideration. 1. An electrically conductive heated pavement overlay powered by solar power and 2. A hydronic heated concrete apron utilizing geothermal energy.

Recommendation: The committee is concerned whether this project will ever be a cost effective alternative to existing deicing technologies. The Subcommittee recommends that the FAA provide subcommittee members additional information on this project before the August meeting. The information should clearly spell out the definition of success, discuss the risk of a successful outcome, a cost/benefit analysis, and discuss the probability of eventual operational implementation.

Finding: The aircraft braking friction project is conducting testing of aircraft anti-skid brake systems on contaminated runway surfaces to enable more accurate prediction of aircraft landing performance. This research is partially in response to the Southwest Airlines overrun at Midway Airport in 2005 and the subsequent recommendations by NTSB to FAA for improving the capability of transport category aircraft to calculate, record and convey the braking ability required by an aircraft to stop a landing roll during winter time precipitation conditions. The project is a multi-year research effort that began in 2010.

Recommendation: The investment and risk associated with this research is significant. The Subcommittee has requested that the FAA provide additional detail on this project that outlines the definition of project success and break down the research schedule into go/no go milestones that can be assessed as the research effort proceeds.

Finding: The Runway Exit Design Interactive Model (REDIM) is used by airports for sitting high-speed runway exits and was developed by Virginia Institute of Technology with FAA and NASA support in the 1990s. This model has not been updated since it was originally produced and does not include realistic aircraft exit speeds as it excludes most of the aircraft in the current commercial fleet relies on performance data from older aircraft.

Recommendation: The Subcommittee recommends that a new research project be initiated to update the REDIM model or create a new one for determining optimal exit taxiway locations to minimize runway occupancy time.

Subcommittee on Environment and Energy

Finding: Section 911 of the recently enacted FAA Reauthorization Act directs the Administrator to establish a research program for the development of alternate fuel sources. In addition, this Section provides that, "Not later than 180 days after enactment of FAA reauthorization, the Administrator may designate an institution as a Center of Excellence for Alternative Jet fuel Research in Civil Aircraft."

Recommendation: Since there is already a robust alternate fuels program within the existing PARTNER structure, the Subcommittee urges the Administrator to meet the goals of Section 911 by expanding the existing program rather than creating yet another Center of Excellence.

Finding: Continued Operational and Tools Research is necessary to support the implementation of NextGen initiatives and the development of environmental standards through the International Civil Aviation Organization (ICAO) process.

Recommendation: The Agency should continue to fund the development and refining of environmental tools that will enable the assessment of the environmental consequences of NextGen implementation as well as assist in the establishment of environmental standards at ICAO.

Finding: In the area of technology research, the ongoing Continuous Lower Emission, Energy, and Noise (CLEEN) program, including its Commercial Aviation Alternative Fuels Initiative (CAAFI) alternative fuels component, continues to be one of the most promising projects in the environmental area.

Recommendation: The Subcommittee recognizes the continuing funding threat to the CLEEN program, but again strongly recommends that a high priority be given to this project. As technologies are developed and transitioned into the aircraft fleets, plans need to be in place for the next phase of the CLEEN program. In addition, the Subcommittee recommends that the Environment and Energy requests for "above-target" CLEEN funding for Fiscal Years 2014 through 2016 be adopted by the Agency.

Finding: United States leadership in the international community continues to be an important environmental priority, especially as the ICAO debates the setting of a worldwide aircraft CO2 emissions standard.

Recommendation: The Subcommittee strongly recommends that funding necessary to support ICAO activities continue.

Finding: The Partnership for AiR Transportation Noise and Emissions Reduction (PARTNER) program continues to provide significant benefits in a number of environmental areas. This program enables the Agency to leverage resources and advance the state of existing knowledge

Recommendation: The PARTNER program should continue to be an integral part of the FAA's environmental research program.

Subcommittee on Human Factors

Finding: The Human Factors Subcommittee appreciated the briefings by key AVS sponsors of their proposed FY2014 research requirements. The briefings were also helpful for providing Subcommittee members with a better understanding as to how AVS coordinates with ANG-C1 and the research performers as part of a team effort to ensure the successful transition from "research to reality." The Subcommittee also appreciated seeing the mapping between the research requirements for NextGen flight deck sponsored research and relevant Operational Improvements (OIs) as described in the Enterprise Architecture. These indications not only informed the Subcommittee, but also were indicators of appropriate tracking of research results and of using this tracking to better inform further research.

Recommendation: Continue the tracking of research results as appropriate to their sponsor, such as application of the research results by AVS sponsors and implementation of research results, to establish an on-going process by which all human factors research is assessed. Many insights should be sought from this process, including identifying the attributes of successful research to build into research plans and highlighting the utility of human factors research. Use these insights to further inform research plans at all stages from year of execution to out-year identification of research requirements.

Finding: The Human Factors Subcommittee was briefed on the human factors research selected by AVS to sponsor in FY2014. These research elements represent significant concerns in current operations and in the ability of the FAA to certify and approve developments within the aviation community within the foreseeable future. The Subcommittee appreciates the steps that have been taken jointly by the AVS research requirements prioritization group and relevant human factors specialists in AVS and human factors researchers. However, the Subcommittee understands that this prioritization and selection is tentative pending final determination of the FY2014 budget. The Subcommittee was not able to assess which of these research projects may be at risk of being not-funded with a reduction in the FY2014 budget from the current plan; it is our understanding the relevant researchers are also not informed as to whether they should prepare contingency plans for de-selection or down-sizing of research areas versus conduct current research towards the selected FY2014 activities. This lack of understanding results from the rankings of the tentatively selected projects not being made available to the AVS technical research sponsors, the researchers, or the Subcommittee.

Recommendation: AVS should continue its efforts to coordinate and communicate with its technical research sponsors and research teams as to the rankings of requirements, especially with regards to providing the information the technical sponsors and research teams require for longer-range planning. This includes an understanding of the potential for the research not being funded (e.g., providing rankings or identifying which projects would be funded under different budget scenarios) early enough to inform their on-going research and longer-range planning. A suitable time for releasing such information would be before the Spring meetings of the relevant REDAC Subcommittees.

Finding: For ATC related programs, many human factors requirements and research insights appear to be entering the system too late and hence appear to be only capable of driving training requirements after design has been more or less finalized, rather than impacting the actual design. Earlier inclusion of human factors requirements in ATC related programs would serve to reduce training requirements as well as enhance operator efficiency. While consideration of training needs for the system is important, industry best practices for Human System Integration call for the earliest inclusion of human factors requirements so that (1) design can be impacted early in the RE&D process, and so that (2) positive transfer effects building on established human expertise and capabilities can be built into the system. Without such early consideration, programs risk delaying the human-system integration work to a later point where it can only focus on identifying and mitigating unintended negative transfer effects.

Recommendations:
a) For ATC related programs, ensure that industry best practices for early and comprehensive inclusion of human factors requirements is accomplished in the RE&D and F&E requirements processes regardless of organizational or process constraints. Among other things, such best practices might include a policy requirement by all programs, projects, or portfolios to conduct a human factors assessment and create (and monitor) a human-system integration plan initiated during the initial investment analysis.

b) Ensure that design requirements call out for the consideration and analysis of both positive and negative transfer effects in the design of new human interfaces such as new workstation design support tools. This will facilitate the transition of new capabilities into the system.

Finding: Next Gen airspace contains three significant nodes of collaboration; Air Traffic Control (ATC), flight deck and Airline Operations Centers (AOCs). While these three nodes are identified in some areas, not all relevant research projects appear to recognize where ground based flight operations centers need to be considered in human factors research and implementation of Next Gen concepts of operation relying heavily upon collaboration and decision making by aircraft operators.

Recommendation: Ensure that all three nodes of collaboration, including AOCs, as appropriate, are explicitly identified as components in all areas of NextGen research and implementation where the three way collaboration either exists today or will exist in NextGen. Ensure research projects consistently evaluate which nodes of collaboration will be significant contributors to the aspects of NextGen that they are examining, and incorporate their concerns.

Finding: The Subcommittee was briefed on the core Air Traffic Control/Technical Operations (TO) and NextGen ATC Controller Efficiency programs. These research areas tackle significant concerns with both core and NextGen issues and they have been identified in close-collaboration with other organizations within the FAA to best integrate their activities and outcomes into broader FAA developments. This includes the Technical Operations research on maintenance of air traffic systems that serves a vital role, particularly as significant changes are made, including the implementation of automation. Projected funding, however, for the NextGen Controller Efficiency program is anticipated to be significantly reduced and would affect such activities as development of safety cases.

Recommendation: Articulate plans for developing safety cases for NextGen developments in the ATC/TO and NextGen ATC Controller Efficiency programs given termination of human factors research activities; these plans may require pushing back projected deliverable-dates for these programs to later points where required evaluations can be reestablished. Where research areas are being reestablished, these plans should examine mechanisms for leveraging off personnel and facilities in related research projects.

Finding: The Human Factors Subcommittee was pleased to see that significant progress has been made on the development of the Human System Integration (HSI) Roadmap. In addition, there have already been some important gaps identified in the implementation of NextGen through the use of the HSI roadmap. This is an important activity that needs to be continued and we were advised the senior staff member responsible for the Roadmap will be retiring soon.

Recommendation: Ensure staffing and resources are in place for the maintenance and use of the HSI roadmap, specifically addressing staffing risks in this area due to planned retirement of key personnel in ANG-C1.

Finding: The Human Factors Subcommittee was given a briefing on NextGen Flight Deck Human Factors research. Five research requirements have been identified and will be undertaken in FY 2014. The research is intended to address specific NextGen capabilities, Operational Improvements, and Segment Implementation Plan Increments. The budget enacted for FY 2012 was reduced by approximately 50 percent. The budget request for 2013 is further reduced to approximately 85 percent of the FY 2012 request. A similar reduction to the FY 2013 budget would be devastating and the implications would carry over into FY 2014 and beyond. The subcommittee finds that the research originally planned to sustained FY 2012 levels serves a vital role in reducing the risks associated with human performance while ensuring system safety and supporting NextGen efficiency and capacity goals.

Recommendation: To the extent possible within a volatile budget planning process, the projected funding cuts to these programs should be balanced with the additional technical and programmatic risks they establish for NextGen. The negative impacts of significant swings in year-to-year funding should be recognized and mitigated to avoid situations such as starting up projects that are then terminated before being able to provide some return on their research investment.

NAS Operations Subcommittee

Finding: The subcommittee appreciates the update on Staffed NextGen Towers (SNT) and was pleased that the FAA is now looking seriously at surveillance requirements, concepts of operation, and safety analysis for SNT at small and medium sized airports where this concept is perhaps most viable in the near- to mid-term. The FAA noted that SNT's budget and research goals have been de-scoped due to schedule slips associated with external airport-surface related research and development programs, specifically the Tower Flight Data Manager (TFDM) program.

Recommendation: Given the importance of airport surface research to NextGen, articulated for example by RTCA Task Force 5, we recommend that the subcommittee receive a more comprehensive review of FAA surface programs R&D at a future NAS Operations Subcommittee (NASOPS) meeting to help put the SNT work in context. We recommend that this review include a summary of NextGen funded activities including the FAA/Industry Surface Team, the ANG Surface Decision Support System (SDSS) prototyping, and TFDM concept development and prototyping.

Finding: The subcommittee felt that the Weather Program research in the areas of convection, turbulence, in-flight icing, ceiling and visibility, and other areas represents excellent scientific work by qualified researchers, and is clearly germane to enhanced aviation efficiency and safety. However, the committee would appreciate more insight into the process by which priorities are established for aviation weather research activities. In particular, the current portfolio appears to focus heavily on weather conditions germane to general aviation and, as a result, may not fully address capability needed to support NextGen concepts for collaborative air traffic management (ATM), trajectory based operations and/or high-density airport operations.

Recommendation: We recommend that the Weather Program research priorities be synchronized with atmospheric diagnosis and forecasting requirements associated with NextGen ATM concepts, particularly as identified by the NASOPS Weather/ATM Integration Working Group report, and request a briefing on how you plan to address that at an upcoming meeting.

Finding: The subcommittee appreciated the more focused approach that appears to be underway for the ATC/TO Human Factors part of the portfolio. However, as briefed, the training and selection analysis was focused on the midterm and concluded that there are no changes in the required aptitudes of FAA personnel in the near and midterm NextGen environment. The subcommittee noted that personnel hired in the near and midterm NextGen environment will likely be still operating as NextGen moves to the far term. In the "core" part of the briefing, when the lack of pursuing far term selection criteria was again questioned by the subcommittee, the answer was that the sponsoring organization (FAA HR) did not request or require anything beyond what is needed in the midterm. There is little doubt that, to varying degrees, the functions of the human in the NextGen far term environment will be different than in the current NAS environment, and the lack of research on the criteria for selection of individuals best suited to perform them is a serious gap. While the subcommittee agrees in principle with the FAA's requirement that an operating organization "sponsor" all the RE&D budget work, the "sponsors" must understand that the principal objective of research and development is to look forward to address knowledge gaps. It seems reasonable to the subcommittee that some modest fraction (e.g., 10-15%) of the work should be allowed to address far term issues.

Recommendation: Subcommittee recommends that the FAA operational organizations take a longer view when "sponsoring" research work done under the RE&D budget. In this specific case, we recommend that the Human Factors Core work on personnel selection include exploration of far term selection criteria for the FAA personnel who will operate NextGen.

Subcommittee on Aircraft Safety

Findings:

- In March 2011, the Subcommittee was told that the FAA was about to finalize their UAS Airspace Integration Roadmap and it would soon be available to the subcommittee and others in the aviation community. The subcommittee feels that such a roadmap should be a critical driver for the identification of R&D requirements and establishment of a realistic Research Management Plan. In August 2011, we were told that the roadmap was not quite ready. At our meeting in March 2012, we were once again told that the Airspace Integration Roadmap is still not ready and is under review by the Unmanned Aircraft systems Aviation Rulemaking Committee (UAS ARC) that may recommend changes, which the FAA will then need to incorporate.
- While a number of operational and technical issues exist as barriers to UAS integration, there are likely to be several significant policy decisions required to be made by the FAA. These policy decisions are likely to be significant drivers to the R&D requirements.
- The R&D schedule appears to be out of synch with Congressional and UAS proponent expectations regarding integration of UAS. Given the expectations in the community, it would appear that the FAA is behind schedule.
- The consolidation of UAS airspace integration R&D activities into a single coordinated effort is a positive step.
- In the absence of a coordinated UAS Airspace Integration Roadmap and a Concept of Operations, the research that we heard identified appears to be right activities consistent with anticipated needs.
- The FAA and the aviation community still appear to be getting a handle on the complexity of the operational, technical, and policy challenges associated with UAS airspace integration. There may be insufficient resources devoted to the topic given the complexity and multiple dimensionality of the challenges.
- Establishing a single FAA executive who is focused full-time on UAS airspace integration across FAA lines of business is a very positive development.

Actions: At our deep dive on UAS R&D planned for August 2012, the subcommittee would like a detailed briefing on the FAA's UAS Airspace Integration Roadmap and Concept of Operations and how this material is being used to inform R&D planning.

Recommendations:
The FAA needs to identify the key policy decisions that are required and the operational/technical data required to inform decision-making to guide research planning.

While Congressional and UAS proponent timelines may appear unrealistic, the FAA needs to define realistic airspace integration timelines to guide research planning efforts, manage community expectations, and identify the appropriate resources required.

The FAA needs to continue to avoid the temptation to compromise safety in an effort to satisfy aggressive integration timeline objectives from the UAS community.

Finding: The subcommittee finds the research being performed by the Aircraft Catastrophic Failure Prevention team to be relevant to new tools and materials for advanced analysis and risk assessment methods in un-contained failure. It is evident that the FAA team has formed a strong partnership with industry and academia in development of these capabilities.

Recommendation: The subcommittee recommends that, FAA, based on final outcome of this research project, create guidelines for analysis tools and material properties to facilitate future compliance and certification procedures.

Finding: The Aircraft Safety Subcommittee recognizes that the industry's use of composites is growing rapidly and will continue to do so for the foreseeable future. The comprehensive deep dive presentation in Advanced Materials/Structural Safety shows that the research being conducted is well structured and relevant. The development of education for use by all stakeholders, collaborative approach used by FAA, responsiveness to the needs of industry and demonstrated use of results are particularly noteworthy. One area of concern was the research being conducted on Structural Crashworthiness, particularly the desired areas of future research that have not been funded. The subcommittee feels that the suggested areas of research might not be specific enough and lack an in depth discussion on future needs. Additionally, the plan needs to lay out a roadmap with more detail and substance for the management of future R&D needs.

Recommendation: The subcommittee recommends that the proposed areas of future research be more clearly defined to include more details on specific requirements, relevant milestones, levels of performance, and a discussion of how the results will be used to support policy and certification.