

**Research, Engineering and Development Advisory Committee  
Federal Aviation Administration  
800 Independence Avenue, SW Washington, DC  
October 3, 2007**

**Meeting Minutes**

On Wednesday, October 3, 2007, the Federal Aviation Administration (FAA), Research, Engineering and Development Advisory Committee (REDAC), held a meeting in the Bessie Coleman Room, at 800 Independence Avenue, S.W., in Washington, DC. Attachments 1 and 2 provide the meeting agenda and attendance, respectively.

**Welcome and Introductory Remarks**

Mr. Barry Scott, REDAC Executive Director, read the public meeting announcement and turned the meeting over to the REDAC Chair, Dr. John Hansman.

Dr. John Hansman, REDAC Chair, welcomed the members and audience participants. He reminded everyone the full committee membership had decreased in size and that most of the work is done within the subcommittees.

**Operational Evolution Partnership – Vicki Cox**

Vicki Cox, Vice President, ATO Operations Planning, briefed on the Operational Evolution Partnership (OEP). She discussed defining the OEP domains and the seven “Solution Sets” targeted to address Capacity, Efficiency, Safety and Security.

Ms. Cox reviewed the format below for the REDAC input of the OEP review.

**Request Subcommittee Recommendations on Planned Domain/Solution Set R,E&D and Capital R&D Activities**

- Address all Solution Sets or Domains that are appropriate for the Subcommittee
- Recommend priorities
- Comment on linkages including those with other agencies
- Comment on proposed approach
- Recommend alternative approaches if appropriate

**Request Subcommittee Recommendations on Demonstrations**

- By appropriate Subcommittees
- Comment on proposed approach
- Recommend alternative approaches if appropriate

We will make specific requests of the subcommittees once we have our FY09 budget pass back and have made appropriate adjustments to our FY09 planning.

The REDAC recommendations will be discussed and approved at the March 5, 2008 meeting. Dr. John Hansman will present the Committee’s recommendations to the OEP Advisory Board.

## **Next Gen/JPDO Update – Robert Pearce**

Robert Pearce, Deputy Director of the NextGen JPDO, briefed the members on the JPDO and NextGen. He stated the goal is to achieve a Next Generation Air Transportation System that meets the nation's future air transportation safety, security, mobility, efficiency, and environmental needs. He stated a plan is in place for providing a mechanism for alignment and oversight in conjunction with various agencies. Implementation approaches include:

- Operation Evolution Partnership (OEP)
- NextGen Program Office
- Inter-agency Weather Study Team
- U.S. Department of Homeland Security
- NASA – Aeronautics Research Plan

Mr. Pearce commented on the focus and objectives for FY07 and FY08. FY07 was about completing the NextGen Plan. FY08 will be about achieving alignment and supporting implementation decision-making, while continuing to build depth and fidelity into the plan.

The Committee expressed concerns of needing a more solid, clearer plan. They asked: what is the feedback method for the gap analysis; what are the top 2 or 3 in the gap analysis; and what are the real shortfalls and status? Noted that without having key research drivers and key policies, implementation for 2008 cannot be made. Things that are really “hard” in the plan are unclear.

Members stated that if things have changed they are not aware of them. What are the priorities and what research needs to be done to support it? Reiterate in detail what the current plan is. Identify the top-level requirements, mid-level between the high-level and low-level and how to address them; key concepts development; the avionics road map; a time frame and traceability for the drivers.

The Committee discussed possible ways for the concerns to be addressed. Mr. Pearce took an IOU to brief the members again and address the concerns.

**ACTION:** JPDO will brief the Committee again in March. We will provide materials in advance for members to review prior to the meeting.

## **NASA/JPDO Update – Lisa Porter**

Dr. Lisa Porter, Associate Administrator for Aeronautics, presented an overview of what NASA and JPDO have been working on and future coordinated plans. While JPDO is transitioning to its new organizational structure, NASA continues to provide support to the various divisions. In addition, NASA has worked closely with counterparts in FAA to advance these areas in a coordinated manner. The agency will begin to address the challenge of integrating advanced aircraft configurations into the NextGen.

Dr. Porter reviewed the following:

- Airspace Systems Program
- Airborne Separation Assistance Concept & Safety Assessment

- Functional Allocation of Separation Assurance (SA)
- Aviation Safety Program
- ASIAS Status – NASA Activities
- Three Advanced Data-Mining Tools Applicable to ASIAS Developed in FY07
- FY08 R&D Activities Supporting Vulnerability Discovery
- Fundamental Aeronautics Program

John Hansman commented that trying to figure out the gaps is critical.

Dr. Porter invited members to visit the website for more information on NASA's Aeronautics Research ([www.aeronautics.nasa.gov](http://www.aeronautics.nasa.gov)).

### **Update on Aviation Safety Information Analysis & Sharing (ASIAS) – Jay Pardee and Thomas Tessitore**

Mr. Jay Pardee along with Mr. Thomas Tessitore updated the members on ASIAS. They discussed the many ASIAS objectives and how an increase in system capacity demands improved methodologies.

Mr. Pardee mentioned the various groups affiliated with ASIAS. He stated the transition of ASIAS to MITRE has been successfully completed. In addition, MITRE has completed initial high priority tasks that include an analysis of CAST Safety Metrics, and development of V1 ASIAS Operational Concept.

The ASIAS Executive Board (AEB) will: consist of two co-chairs (AVS & Industry); representative of key stakeholders; and consensus-based decision making. The board will provide guidance and oversight over the ASIAS program. They will coordinate analytical efforts among industry/government entities. The AEB will forward all analytical products to appropriate safety teams for in-depth analysis.

### **Weather Working Group (Report Approval) – Bill Leber and Ray LaFrey**

Mr. Bill Leber (Chair) and Mr. Ray LaFrey (Co-Chair) presented the final report of the Weather-ATM Integration Working Group. The objective of the twelve-month study was examining the potential benefits associated with a higher degree of integration between two dissimilar and fundamentally inexact sciences, namely weather and air traffic management. The study would also provide specific recommendations to the FAA that were considered most likely to lead to better, more efficient ATM solutions, in the face of weather constraints.

Mr. Leber stated that approximately 70% of NAS delays are attributed to weather. He reviewed the key findings and recommendations of the report. Mr. Leber summarized that there are opportunities that exist to reduce the weather related delay for both tactical 0-2 hours and strategic 2-10 hour planning horizons. An integrated, cross disciplinary research program is also needed for this to be successful.

The motion was presented and the report was approved. Members agreed to include a summary of recommendations at the beginning of the report.

## **Presentation of Subcommittee Guidance for Fiscal Year 2010**

The standing subcommittees review FAA's R&D investments in the areas of Air Traffic Services, Airport Technology, Aircraft Safety, Human Factors and Environment & Energy. Attachment 3 provides recommendations presented by the following chairs.

### **REDAC Subcommittee**

NAS Operations  
Airports  
Aircraft Safety  
Human Factors  
Environment & Energy

### **Subcommittee Chair**

Mr. Victor Lebacqz  
Mr. Edward Gervais  
Dr. Michael Romanowski  
Dr. John Hansman (for Dr. Kevin Corker)  
Mr. Steve Alterman

**Action:** Mr. Ed Gervais will summarize points of his June 25<sup>th</sup> memo and forward to Dr. Hansman for inclusion in the Committee's letter to the Administrator.

## **Committee Discussion – Guidance for FY 2010**

The members engaged in a discussion on the change in the FAA and NASA research efforts. Members commented that collaboration was improving in certain areas, but the research gaps are still unknown.

The members agreed to provide comments relative to the briefing received by the JPDO. Members will receive another briefing at the next meeting and wish to have materials in advance to prepare.

Dr. John Hansman thanked the members for the excellent work and adjourned the meeting. The Administrator's letter is provided in Attachment 4.

## Attachment 1

**Research, Engineering and Development Advisory Committee  
800 Independence Avenue, SW – Round Room (10<sup>th</sup> Floor)  
Washington, DC 20591  
October 3, 2007**

### **Agenda**

9:00 a.m.	Welcome	John Hansman Barry Scott, FAA
9:15 a.m.	Update – OEP - REDAC Task - Expectations	Vicki Cox, FAA
9:45 a.m.	Progress Update – Next Gen – JPDO - Progress to date – future outlook	Bob Pearce, FAA
10:15 a.m.	Progress Update - NextGen - JPDO - NASA (NASA's plans for NextGen) - FAA (What Research & Technology Development are doing to move toward NextGen)	Lisa Porter, NASA Barry Scott, FAA
11:00 a.m.	Break	
11:15 a.m.	Update – ASIAs - Roles of FAA, NASA & Mitre	Thomas Tessitore, FAA Jay Pardee, FAA
11:45 a.m.	Subcommittee on Aircraft Safety	Mike Romanowski
12:00 noon	Lunch	
1:00 p.m.	Report Approval - Weather Working Group	Bill Leber Ray LaFrey
<b><u>Presentation of Subcommittee Guidance for FY 2010</u></b>		
1:30 p.m.	Subcommittee on Airports	Ed Gervais
1:45 p.m.	Subcommittee on Human Factors	John Hansman
2:00 p.m.	Subcommittee on Environment & Energy	Steve Alterman
2:15 p.m.	NAS Operations Subcommittee	Victor Lebacqz
2:30 p.m.	Break	
2:45 p.m.	Committee Discussion – Guidance for FY 2010 - Future Activity	John Hansman
3:30 p.m.	Adjourn	

**REDAC Attendance – October 3, 2007**

**Members**

John Hansman, Chair  
Victor Lebacqz  
Agam Sinha

Steve Alterman  
Michael Romanowski  
Barry Scott, Executive  
Director

Lisa Porter  
Edward Gervis

**Other Attendees**

Denise, Davis, FAA  
Monique Morris, FAA

Gloria Dunderman, FAA  
Victoria Cox, FAA  
William Leber, NWA  
Elizabeth Soltys, FAA

Guy St.Sauvcur, DOD  
Gisele Mohler, FAA

Karlin Toner, NASA  
J.J. Furtck, FAA  
Lynn Pickard, FAA  
Nick Stoer, NSA  
Jay Pardee, FAA  
Charles Ruehle, FAA  
Mike Gallivan, FAA

Cathy Bigelow, FAA  
Sabrina Saunders-Hodge,  
FAA

Michelle Whetstine, FAA  
Susan Conry, FAA  
Raymond LaFrey  
Robert Pappas, FAA

Michael Schwartz, FAA  
John Wendelken, BAE .  
Frank Mangine, FAA  
John Cavolowski, NASA

Susan Mertes, AIA  
John White, NASA  
Art Shank, DOT/OIG  
Peggy Gilligan, FAA

Lee Olson, FAA  
Paul Krois, FAA

Nick Sabatini, FAA  
Kelli Willshire, FAA  
Bill Sears, Beacon  
Tim Athan, House Science  
Committee

Chris Seher, SRA Int'l.  
Dan Ellwell, FAA  
Tom Tessitore, FAA  
Mike Basehore, FAA  
Jean Watson, FAA  
Robert Pearce, JPDO  
Nelson Miller, FAA  
Kevin Johnson, NOAA  
Tom McCloy, FAA

**Subcommittee on Airports – Ed Gervais, Chair**

The Airport Subcommittee:

- ◆ Encourages continued cooperation between the FAA and the TRB ACRP.
  - u ACRP projects include the development of airport performance guidelines, trends and characteristics of rates and leasing policies, air quality impacts , the development of a multi-modal noise and emissions model, the development of an airspace analysis tool, methods for improved passenger throughput and prevention practices to avoid / minimize wildlife strikes.
  
- ◆ Appreciates the continued funding support and recommends an increase in staffing by one person in FY 09.
  
- ◆ Strongly supports testing with the new large aircraft fire fighting mock-up at Tyndall AFB, FL, as well as continued research on:
  - u FOD detection radar
  - u Light emitting diode technology for airport lighting
  - u Engineered Material Arresting Systems
  - u Airfield pavement behavior and longevity
  - u Design and construction of a materials laboratory at the Tech Center

The Airport Subcommittee suggests that the FAA:

- ◆ Consider taking on the most promising projects of the Innovative Pavement Research Foundation (IPRF) and the Airfield Asphalt Pavement Technology Program (AATP) in the event that either of those programs are not funded in the upcoming legislation.
  
- ◆ Initiate a study of the affects of runway de-icing fluids on surface friction.
  
- ◆ Consider starting a research project on the design of the location of exit taxiways, as a possible means to reduce runway occupancy times (this task relates to Next Gen initiatives).
  
- ◆ That the projects that are currently underway at the Tech Center are of high value and importance and should continue as planned.

**Summary of Recent Events**

The Airport Subcommittee continues to enjoy good industry participation and has welcomed new members from the San Diego Regional Airport Authority and the Airline Pilots Assn.

The National Pavement Test Facility continues to perform full scale pavement testing; currently evaluating concrete overlay performance under four wheel and six-wheel loading.

Internationally – The FAA opinion regarding the outcome of the initial (1998-2002) test results, as related to ACN / PCN appears to be on it's way to become the defining standard for the International Civil Aviation Organization ACN/PCN methodology.

**Subcommittee on Human Factors – Dr. John Hansman (for Dr. Kevin Corker)**

There were three areas of focus in research and development that were reviewed by the subcommittee for Human Factors in a subcommittee meeting held at NASA Ames Research Center (September 14-16, 2007).

1. The subcommittee was provided information on the new FAA organization with respect to the Human Factors Research and Engineering Group as a part of the Research and Technology Office in the Air Traffic Organization Operations Planning Services (ATO-P). We were briefed on the roles and responsibilities of the Human Factors Research and Engineering Group and its processes with particular emphasis on how that Group is managed and how that organization is responsive to the Joint Planning and Development Office (JPDO).
2. The subcommittee was also provided a view of the projected budget for Human Factors research and development (2008-2010).
3. Finally, the subcommittee was provided a view of current NASA research in Human Factors research in the Airspace Systems and Safety Programs. These briefings were intended to support the subcommittee in making an assessment of “gaps” in Human Factors research associated with the JPDO’s requirements and changes in NASA’s strategic direction and budget.

The following recommendations and comments of the committee are based on these perspectives.

***Summary Organizational Issues:***

The FAA has undergone significant organizational change in ATO-P supportive of JPDO and its research requirements.

*Finding 1:* The committee finds that Human Factors research and human-system integration is well aligned into the ATO-P processes and supportive of the JPDO research program, as well as the Operational Evolution Partnership

Recommendation: The subcommittee urges that the Human Factors Research and Engineering Group maintains its centrality in human-system integration research and attend to cross-cutting research issues in the ATO-P organization. Overall, the organizational structure, along with current and anticipated budgetary increases, bodes well for the appropriate level of concern for human-system integration.

*Finding 2:* The subcommittee feels that cross cutting areas of applied Human Factors research (specifically, in the areas of safety, human error and modeling) provide an opportunity for assuring that “human factors” concerns become an integral system engineering element in both the ATO and AVS research and development processes.

## ***Summary Budget Issues***

A significant increase in funding for fiscal year 2008 and a further increase in 2009-2010 are anticipated. The subcommittee concludes that the combination of significant increase in budget and major organizational changes offer significant opportunity for development and integration of human factors research in support of:

- decision-making in procurement issues,
- development of near and midterm flight deck and ATC workstations,
- development and convergence of ATC procedures and training, and
- support of flight deck and ATC JPDO research requirements

The subcommittee finds that the Human Factors office is responding to these and other specific areas of research development integration.

*Finding 3:* There is a convergence of conditions that the subcommittee feels provides the Human Factors Research and Engineering Group with an opportunity to redefine itself at a national level within the Human Factors research community. The new organizational structures in ATO, the significant proposed increase in budget and the likely increase in the breadth of demand for applied human factors research, given changes in NASA's roles and responsibilities in applied Human Factors research, remind the subcommittee of the opportunities and motivation provided for the National Plan for Aviation Human Factors.

*Recommendation:* The subcommittee recommends revisiting and updating a national Human Factors research plan, with the FAA taking the lead in applied aeronautical Human Factors research to address and define current gaps in support of JPDO research requirements.

## ***Summary Integration of Research with NASA***

It was a goal of this subcommittee meeting to have the Human Factors Subcommittee advise the FAA of the adequacy of its research portfolio given changes in NASA Aeronautical Human Factors research. It was, however, difficult to make an assessment of the NASA Human Factors research portfolio with respect to the FAA HF program. The subcommittee was provided presentation of specific research projects but did not receive information about the breadth or extent of NASA's investment in aeronautical Human Factors.

*Finding 4:* The committee did not feel it was in a position to make a comparison, or gap analysis, between NASA's response to JPDO Next Generation research requirements in Human Factors and that work being performed by the FAA.

*Recommendation:* The subcommittee recommends that an interagency programmatic exchange be undertaken with respect to applied aeronautical Human Factors and that the Human Factors Research and Engineering Group take the lead in this effort.

Subcommittee on Environment & Energy – Mr. Steve Alterman, Chair

The Environment and Energy Sub-Committee of the FAA Research, Engineering and Development (RE&D) Advisory Committee (REDAC) held a two-day meeting on August 21-22, 2007, in Arlington, Virginia. At that meeting, the sub-committee received status updates on various efforts and initiatives, including briefings from the Subcommittee's Continuous Low Energy, Emissions and Noise (CLEEN) Task Force and the Operational Evolution Partnership (OEP). The subcommittee members spent the majority of the meeting focusing on defining environment and energy drivers and strategic priorities.

The subcommittee identified the following specific issues as matters to bring to the attention of the Administrator.

**Issue 1:** The subcommittee feels that developing solutions (technology/fuels, operations) to limit or mitigate environmental impacts is critical to the future of the Next Generation Air Transportation System (NextGen). The maturing of technologies will have the greatest impact on future environmental advances and is therefore the most critical component.

**Recommendation 1:** For environmental solutions to become viable, sufficient additional resources will be required. The FY09 budget as proposed in the NARP is the minimum investment required from the agency.

**Issue 2:** The OEP briefing was critical since it ties research to implementation. Research in a vacuum does not solve problems; therefore, tying research to operational implementation is absolutely essential.

**Recommendation 2:** Developing a robust R&D plan for enabling the OEP transformation is critical. It is also important that environmental concerns be identified as a major priority along with capacity, efficiency, safety, security.

**Issue 3:** The subcommittee felt that the Office of Environment and Energy needs to reevaluate its strategic priorities.

Members view NextGen efforts as equal in importance, if not more so, than efforts focused on the International Civil Aviation Organization Committee on Aviation Environmental Protection (ICAO/CAEP). While members felt that both activities important and must be supported, emphasis should be driven by the change in importance of NextGen.

**Recommendation:** The subcommittee recommends that the Office of Environment and Energy consider the following priorities in its future efforts:

- **#1 Applied Solutions** such as technology development, alternative fuels, operational improvements and maturation of the CLEEN program should be the top priority.
- **#2 Modeling** should focus on NextGen as the #1 priority, although continued work on CAEP remains critical.
- **#3 Research on understanding** the various elements of aviation environmental challenges (climate, local air quality, noise and water quality) continues to be critical, with climate and water quality identified as the areas that need to be accelerated.
- **#4 Research to support regulatory work** must continue, but the subcommittee felt that the other priorities listed above are more important.

Continuing to mature Centers of Excellence (COEs) and the CLEEN consortium are business priorities, not program priorities, but clearly need to continue.

**Issue 4:** The National Airspace System (NAS) enabled by NextGen will have a number of new aircraft and systems. It is critical to determine the environmental impacts of these new aircraft and systems. Research to determine these impacts should be part of the NextGen R&D plan.

**Recommendation:** Ensure that determining the environmental impacts of new aircraft and systems (including developing appropriate analytical tools) is considered in building the FY10 FAA R&D budget.

**Issue 5:** The scope of the environment and energy program has grown to meet needs. Budget requests should include resources for additional personnel to address developing issues (while keeping to the principle of maintaining a lean organization).

**Recommendation:** Ensure that resources for additional personnel are part of future budget requests. FAA also needs a robust recruiting strategy to attract qualified personnel to execute the NextGen R&D efforts.

**Issue 6:** The committee was supportive of the CLEEN implementation briefing.

**Recommendation:** FAA and NASA should start working the details of CLEEN, even if establishing the program is reauthorization/appropriations dependent. The subcommittee should be briefed on progress/status at Feb 2008 meeting.

The subcommittee agreed to hold its next meeting 20-21 February 2008, in Savannah, Georgia. Gulfstream will host.

**NAS Operations Subcommittee – Dr. Victor Lebacqz, Chair**

Activity

1. NASOPS met for three days at the NASA Ames Research Center in August. One day was spent on a review of NASA's ATM-related research, and one to a joint meeting with the Human Factors Subcommittee of REDAC reviewing NASA's human factors research.
2. At the request of JPDO, NASOPS subcommittee made comments on the JPDO draft R&D plan.

Findings

1. NASA's foundational research in ATM automation technologies is addressing long-term issues in automation, but it is not clear that the FAA is tracking it or assessing its connection to their needs. NASA's human factors work should be addressing foundational issues in human-automation interaction or air-ground roles and responsibilities in the context of FAA NextGen design, and that connection was not clear from the briefings.
2. The final version of the JPDO R&D Plan needs to identify priorities in research, responsible parties for conducting the research, and estimated resources and timeframes (the committee saw only working drafts of the document which were lacking these important details).
3. Review of FAA's ATM and Next-Gen related research by the NASOPS subcommittee has continued to be confusing by virtue of incomplete or obscure financial and research information, and providing recommendations based on the level of detail that has been presented is difficult.

Recommendations

1. The FAA and NASA signed a new MOU (Feb 2006) that stipulated the formation of an Executive Research Steering Committee to coordinate research and development activities between the two agencies, but this has not been implemented. It is recommended that the FAA and NASA do so.
2. The FAA and NASA, through their roles in JPDO, should assure that the JPDO R&D plan, as coordinated through the OMB, will serve as an actionable de-facto guide to their respective research initiatives for NextGen. If the FAA wishes REDAC to weigh in on the JPDO research requirements, a formal means of review with adequate time for review and JPDO feedback should be instantiated.
3. FAA should continue to find ways to report on research related to NextGen in ways that are consistent with understanding both the research and the budget associated with it. Recent efforts to relate the work to the OEP solution sets appears to be step in the right direction. Adopting a common format for reporting on research projects (similar to what had been used by the REDAC in previous years) would aid in project evaluation.

Subcommittee on Aircraft Safety – Dr. Michael Romanowski, Chair

**FAA REDAC Safety Subcommittee Observations and Recommendations  
October 3, 2007**

**Subcommittee Focus:**

The Safety Subcommittee has undertaken a strategic approach to reviewing the FAA's safety research portfolio. The subcommittee has defined the following priorities to guide its reviews, observations, and recommendations:

- Research linked to the development and implementation of the Next Generation Air Transportation System (NextGen).
- Research addressing currently identified safety issues that are substantiated by data characterizing the level of risk associated with the particular issue. The subcommittee is especially concerned with those research needs identified by the Commercial Aviation Safety Team (CAST), General Aviation Joint Safety Committee (JSC), and the International Helicopter Safety Team (IHST).
- Research aimed at improving the identification and assessment of emerging safety issues.
- Research aimed at enabling the insertion of new technologies into certified civil aviation products and their operations.

**Strategic Guidance:**

The Safety Subcommittee applauds the FAA's Associate Administrator for Aviation Safety (AVS-1) for developing and issuing strategic guidance for the development of the aviation safety R&D portfolio. We believe this type of guidance is instrumental for achieving the proper alignment and prioritization of the R&D, especially in light of limited resources. The subcommittee reviewed the July 24, 2007 guidance memo for FY 2010, as well as the process that will be used to develop the FY 2010 safety R&D portfolio, and offers the following observations and recommendations:

- The contents of strategic guidance memo are generally aligned with the Safety Subcommittee's focus and priorities that are outlined above. However, it takes some analysis of the memo's contents to reach this conclusion and the subcommittee is concerned that critical direction may be lost as technical teams work to develop an integrated portfolio. For example, by its structure, the memo outlines detailed programmatic guidance in advance of the strategic thrust supporting NextGen. Although no priority may be intended, this approach could be interpreted to list NextGen-related R&D as the lowest priority item in a listing of twelve items. The subcommittee believes this would be an unfortunate result. The subcommittee believes the strategic thrusts for AVS R&D priorities should be clearly articulated in advance of the detailed programmatic guidance. As a result, we are concerned that the synergy that could be possible and the alignment that is necessary for the tailored, integrated R&D portfolio may not occur. *Recommendation:* The Safety Subcommittee recommends that the Strategic Guidance Memo be clarified to highlight the critical strategic thrusts for FAA's safety R&D portfolio (along the lines articulated above for the Safety Subcommittee's focus and priorities), and that this guidance also be supplemented with the detailed programmatic instructions outlined in the July 24 memo.

- The Safety Subcommittee received a briefing of the FAA's OEP planning process and the timeline to receive REDAC/subcommittee review of the FY 2010 NextGen/OEP plan. The subcommittee also received a briefing of the AVS safety R&D planning process and timeline. The subcommittee is concerned that the OEP activity and AVS activities may not be linked or phased appropriately to achieve effective results. The subcommittee is also concerned that there is continued lack of integration and communication of the NextGen/OEP R&D needs for use in driving the contents of the safety R&D portfolio. The exception appears to be the ASIAs program. However, in all other cases, in response to subcommittee queries, research program managers stated they did not have adequate visibility to the NextGen/OEP needs for use in program planning and conduct. Furthermore, during a review of the anticipated FY 2010 safety portfolio development process, the subcommittee observed that the mechanisms for providing this input appeared to be lacking. For example, the roles and interface points for identified NextGen/OEP points of contact could not be clearly articulated, and there is no clear process-defined linkage or visibility of the Technical Committee Representative Groups (TCRGs) to the JPDO's Working Groups or its Concepts of Operations (ConOps), Integrated Work Program (IWP), or other NextGen/OEP-related planning or activities. The subcommittee recognizes that many of the detailed R&D requirements still must be identified. However, it is clear that there are several areas beyond safety information sharing, such as complex software digital systems, systems integration, human factors, and automation where key research issues will need to be resolved and it is not premature to conduct R&D in these areas – in fact it is critical for timely NextGen/OEP development and implementation.

*Recommendations:*

- The Safety Subcommittee recommends that the FAA ensure that the OEP planning timelines are consistent with the AVS planning timelines.
- The Safety Subcommittee recommends that the FAA modify its safety R&D portfolio development process to clearly identify the linkage between NextGen/OEP planning activities, planning documents and any identified R&D needs, and their incorporation into the detailed AVS planning activities and the resulting R&D portfolio. The roles and engagement of AVS focal points supporting NextGen/OEP planning should be clearly articulated.
- The Safety Subcommittee recommends that the FAA begin to realign the thrust of its activities in critical research areas that will be necessary for NextGen/OEP implementation and certification of advanced technologies as soon as practicable, including FY 2008 and FY2009 activities. In advance of detailed NextGen/OEP R&D requirements, preparatory research should be conducted as expeditiously as possible in areas such as advanced software digital systems, complex systems integration, human factors/automation, enabling enhanced crew situational awareness and assessing potential air crew or air traffic controller responsibility changes, etc.

### **Facilities & Equipment Concerns**

- The Safety Subcommittee noted that many of the FAA's facilities and/or personnel are truly world-class and deliver outstanding results. However, there is concern for the future: the FAA needs to make sure that its research capability is not diminished by loss of key personnel or degradation of its facilities. The impressive research facilities need continued F&E support to maintain serviceable or replace obsolete equipment and instead seems to rely on RE&D funds. Unfortunately, there was no evidence that the research community either has access to the F&E funding streams, or that it understands how to access any available F&E funding streams to make adequate use of these processes.

*Recommendations:*

- The FAA should make every effort to assure that F&E funding is available to sustain critical R&D capabilities, that the R&D community knows how to access F&E funding, and that needed equipment upgrades are obtained in a timely manner.
- The FAA should ensure that critical R&D facilities, such as its fire test facilities, are identified as national assets and that they are included in the National Aeronautics R&D facilities plan to protect their long-term vitality.

**Specific Programmatic Observations and Recommendations**

The Safety Subcommittee noted a wide range of approach and effectiveness across the safety research portfolio. Many of the programs, such as weather, icing, and fire protection, were forward looking and providing positive results for both government and industry. However, the subcommittee was quite concerned that other components of the program that appeared to be unfocused, retroactively focused, or conducting work that did not appear to be appropriate or meaningful for a research effort. The subcommittee believes that programs of this variety must immediately begin to redirect their activities to align with the strategic focus for safety R&D, rather than continuing to perform lower-value R&D with scarce, limited funds. Virtually all of the program areas will benefit from increased alignment with NextGen/OEP objectives and from increased program integration and communications across the safety R&D portfolio. Also, with some notable exceptions, few of the research program managers presented, or were able to discuss, compelling accident/incident data to support the need for the safety research they were performing. As noted above, the safety subcommittee will continue to emphasize the need to link the research program contents and priorities to safety data. Specific observations and recommendations for some components of the safety R&D portfolio are outlined below:

- **Aging Aircraft/Continued Airworthiness**

- Flight Controls & Mechanical Systems

The Safety Subcommittee is concerned that the Flight Controls & Mechanical Systems R&D program does not appear adequately focused or impactful, and appears to be examining old technologies, instead of conducting the R&D that will be necessary to enable certification new concepts and technologies. This is illustrated by the current plan to embark on R&D into fly-by-wire concepts, despite the fact that fly-by-wire systems are now common place, having been certified in aircraft for approximately 20 years. Meanwhile, there was no planned activity on technologies like fly-by-light, which is likely to be introduced into products in the foreseeable future.

*Recommendation:* The Safety Subcommittee recommends an immediate redirection of the Flight Controls & Mechanical Systems program to align with the four areas of focus outlined above, or a redirection of the program's funding to other higher priority activities.

- Electrical Systems

The Safety Subcommittee is concerned that the Electrical Systems R&D program is unfocused and lacks a sound means to prioritize its resources, as is illustrated by the fact that in FY 2007 it is conducting 25 distinct projects with its \$2.4 million funding.

*Recommendation:* The Safety Subcommittee recommends an immediate redirection of the Electrical Systems program to align with the four areas of focus outlined above, or a redirection of the program's funding to other higher priority activities.

- Other Aging Aircraft/Continued Airworthiness Program Elements

The Safety Subcommittee endorses continued efforts aimed at advanced inspection techniques and their applicability to a broad range of products. This is a proactive activity consistent with identifying emerging safety issues. However, the subcommittee is concerned about the amount of continued activity across the program aimed at fatigue and damage tolerance of well characterized materials such as aluminum, and does not believe additional investment is warranted in this area. This view is strengthened by a lack of activity on more advanced materials such composites, metal matrix materials, or advanced polymers. The subcommittee feels it is important that the FAA remain forward looking and obtain a more thorough understanding of the behaviors and issues involving these materials to promote safe insertion of these technologies into certified products. The subcommittee noted research program managers' statements that the FAA may have insufficient technical expertise in many of these advanced materials to conduct appropriate research, and believes this is a situation that must be rectified. Improved integration between the Continued Airworthiness R&D program and the Advanced Materials Structures R&D program is a potential solution.

*Recommendations:*

- The Safety Subcommittee recommends that the FAA take advantage of all the previously conducted fatigue and damage tolerance work done with classic metallic materials, such as aluminum, and that their funding for FY 2008 and beyond redirected to higher priority areas.
- The Safety Subcommittee recommends that the FAA increase the technical capability available to the Continued Airworthiness R&D program to include composites and other advanced material expertise. The FAA should explore improved integration between the Continued Airworthiness R&D program and the Advanced Materials Structures R&D program as a potential solution.
- The Safety Subcommittee endorses the FAA's non-destructive inspection (NDI) R&D and recommends that the FAA safety R&D managers take steps to ensure that there is full integration and communications of plans and results between all elements of the portfolio conducting NDI technology development to maximize synergy and effectiveness.

### **Advanced Materials & Structural Safety**

- The Safety Subcommittee believes the Advanced Materials program is producing timely and relevant composites guidance data. As noted above, under Continued Airworthiness, the FAA should explore increasing the linkage between this program and the Continued Airworthiness R&D program. The subcommittee also recognizes the transition of the Crashworthiness program towards analytical modeling and endorses this redirection.

### **Aircraft Catastrophic Failure Prevention**

- The Safety Subcommittee believes that the Catastrophic Failure Prevention program is substantiated by data and is progressing well. However, the subcommittee believes that the program should clearly articulate a goal of supporting the development of means to enable analytical certification of containment.

*Recommendation:* The Safety Subcommittee recommends that the R&D on containment support a goal of developing technology to enable the analytical certification of containment capability.

## **Aviation Weather**

- The Safety Subcommittee believes that the Aviation Weather research program is an excellent example of research coordinated with and in collaboration with industry. The subcommittee believes that the program is making a contribution to safety with its products that are made available to the dispatchers and meteorologists via the web. However, the subcommittee needs to better understand the full range of users and customers of the Aviation Weather research program's products. Also, the subcommittee needs to better understand the Aviation Weather research program's linkage with ATM and other elements of the federal community conducting weather-related R&D or defining R&D requirements, particularly those agencies that will participate in forthcoming Joint Weather Office and with the JPDO. The subcommittee strongly believes that the Aviation Weather research program will benefit from improved clarity of R&D needs from the JPDO. Aviation Weather research is an area where the subcommittee believes 100% alignment between this program and NextGen needs; however, the program indicated it is receiving little guidance from JPDO or OEP. This is especially apparent with the Weather in the Cockpit Research Program. Also, the Weather in the Cockpit program will benefit from pursuing the type of collaborative partnership with NASA that is evidenced in the ASIAS program, where a clear roadmap for development and transition of technologies to FAA and the private sector was defined and implemented.

### *Recommendations:*

- The Safety Subcommittee recommends that the FAA ensure full alignment of all its aviation weather-related research with NextGen R&D needs. FY 2008 and FY 2009 program adjustments should be made as necessary.
- The Safety Subcommittee recommends that the FAA work with NASA to develop an agreed-to roadmap for weather in the cockpit-related R&D along the ASIAS model.

## **Airliner Cabin Environment**

- The Safety Subcommittee believes the Airliner Cabin Environment program is appropriately structured and that it will provide useful results that will help the FAA and industry understand and appropriately resolve the controversial and emotional issues surrounding the airliner cabin environment.

## **Civil Aerospace Medical Institute**

- The Safety Subcommittee believes the Civil Aerospace Medical Institute program is appropriately structured and that it is providing useful results.

## **Flight Deck/Aviation Maintenance/System Integration Human Factors**

- The Safety Subcommittee is concerned over the lack of focus and clarity for the human factors R&D program. The program does not appear to be well integrated into other portions of the safety R&D portfolio or into NextGen/OEP needs. Furthermore, the program appears to lack a data-driven focus. As human factors considerations are going to be key for both NextGen development and enabling the insertion of new technologies, it is too important not to focus the program contents on critical issues.

*Recommendation:* The Safety Subcommittee recommends an immediate redirection of the Human Factors R&D program to align with the four areas of focus outlined above. Enhanced priority should be assigned to those areas directly supporting NextGen development and implementation and those areas that directly support CAST, JSC, and the IHST initiatives.

## **Unmanned Aircraft Systems**

- The Safety Subcommittee is very concerned over the lack of focus of the Unmanned Aerial Systems R&D program. The program is hampered by a lack of any clear goals and objectives that will result in few meaningful products coming from the program if it is allowed to continue as it is constructed. It also is apparent that the research-value of much of the program's contents is questionable, and is better and more efficiently performed by other elements of the FAA. Furthermore, there is a glaring lack of integration with other related elements of the safety R&D portfolio. This is clearly illustrated by the fact that the UAS program is not conducting R&D into UAS maintenance issues at this time (the subcommittee believes this is appropriate). However, the Human Factors program is conducting R&D in UAS maintenance issues, with little clear benefit that could be seen by the subcommittee. It is clear to the subcommittee that an effective UAS R&D program must be constructed and executed in the near future to ensure safe introduction of unmanned system into the NAS. Critical questions must be answered. To develop an effective program, the UAS R&D program, and other UAS-related R&D, must be integrally linked to the UAS roadmap that is under development and NextGen/OEP planning. Unfortunately, to date the UAS R&D program has had no visibility to the draft UAS roadmap; the subcommittee believes this must be rectified as soon as possible.

*Recommendation:* The Safety Subcommittee recommends the FAA immediately realign the UAS R&D program, and other UAS-related R&D, to the UAS roadmap that is under development and with NextGen/OEP planning. FY2008 and FY2009 R&D plans should be adjusted as necessary.

## **Aviation Safety Risk Analysis/ASIAS**

- The Safety Subcommittee believes significant progress has been made over the past year in defining the Aviation Safety Information Analysis and Sharing Initiative (ASIAS) program and its execution. The subcommittee especially notes and credits the personal leadership of Nick Sabatini and Jay Pardee of the FAA and Lisa Porter of NASA for driving a well integrated plan that will form the basis for proactive risk identification and assessment in the future. The subcommittee supports ASIAS and believes ASIAS will be an important link in the overall industry safety system. It provides perhaps the most potential for safety improvements, if pursued correctly and vigorously, with active support from all stakeholders.

## **Propulsion**

- The Safety Subcommittee is generally aligned with the FY 2008 and FY 2009 turbine research program, noting that its work on cold dwell fatigue is slated to end by FY 2010.
- The subcommittee noted that there was no apparent safety community linkage to the alternative fuels initiative that is underway in the environmental community.

*Recommendation:* The Safety Subcommittee recommends that the FAA develop clear program linkage between its safety-related fuels program and its environmental alternative fuels initiative.

- The Safety Subcommittee notes the valiant efforts of the Unleaded Fuels program aimed at finding a suitable, lead-free alternative to 100LL aviation gas. The program has reached a key decision point. The program has achieved an important result by assessing over 70 alternate formulations tested and finding them unsuitable for use as a 100LL replacement: it is safe to conclude there is no readily available solution to remove lead from the fuel. Given this, it is an appropriate time to redirect the FAA's Unleaded Fuels R&D program away from further pursuit of alternates under FAA sponsorship. These

results of the Unleaded Fuels program should be collated and clearly communicated to the aviation and petroleum industry. Furthermore, the subcommittee is concerned over FAA's plans to "begin research into the modification of general aviation piston engines to run properly on lower octane fuel." The subcommittee believes that this work crosses into detailed design and development work that is well beyond the FAA's responsibility, and is instead, the responsibility of industry. However, the subcommittee also believes that the general aviation piston engine-fuels test facility should remain available as a resource for the private sector as it continues work on either new fuel mixtures or potential modifications to engines to accommodate lower octane fuels.

*Recommendations:*

- The Safety Subcommittee recommends that the FAA collate the results of its Unleaded Fuels program and that the FAA transfer these results to the aviation and petroleum industry for the private sector's use in any additional efforts aimed at developing alternatives to 100LL aviation gas and modifications to piston engines to accept lower octane fuels.
- The Safety Subcommittee recommends that the FAA realign the resources targeted to the FY 2008 and FY 2009 Unleaded Fuels program to higher priority areas, while ensuring that the general aviation piston engine - fuels test facility remain available as a resource for the private sector as it continues work on either new fuel mixtures or potential modifications to engines to accommodate lower octane fuels.

## **Fire**

- The Safety Subcommittee believes that fire facility and personnel at the William J. Hughes Technical Center are truly world-class, and that they continue to provide meaningful benefits to the FAA, industry, and traveling public. The Safety Subcommittee believes that the FAA needs to ensure that this research capability is retained in the future and that its facilities are identified and maintained as critical national resources. The Ultra-fire Resistant Polymer program appears to be producing amazing results for very little resource expenditure. This is an excellent example of a proactive research approach and capability development.
- *Recommendation:* The Safety Subcommittee recommends that the FAA ensure that its fire test facilities be identified as national assets and that they are included in the National Aeronautics R&D facilities plan to protect their long-term vitality.

## **Software & Digital Systems Safety**

- The Safety Subcommittee was unable to gain a clear view of the Software & Digital Systems Safety R&D program contents, goals, and objectives. However, the subcommittee believes that a well-constructed and well-executed program is *critical* for the development and implementation of NextGen, and for the insertion of new, enabling technologies into civil aviation products in general. It is not clear that the current program has any visibility to NextGen needs. However, the subcommittee strongly believes that the Software & Digital Systems Safety program is one of the areas where 100% alignment is required between the program and NextGen needs.

*Recommendations:*

- The Safety Subcommittee recommends that the FAA ensure full alignment of its Software & Digital Systems Safety R&D with NextGen R&D needs.
- The Safety Subcommittee recommends that in advance of commencing any FY 2008 or FY 2009 activities in this area, the FAA immediately conduct a thorough review of the goals, objectives, and content of the FY 2008 and FY 2009 Software & Digital Systems Safety R&D program, with budget, program and other adjustments being made as necessary. The subcommittee requests that the results of this review be shared with the subcommittee before the subcommittee's February meeting.

## Icing

- The Safety Subcommittee believes that the Icing Research program is well-constructed, based on data and known technical knowledge gaps, and that it is producing relevant results for the FAA and industry. Due to the positive impact of applied icing-related research on safety, operational efficiency, and NextGen, the subcommittee believes the program should be supported as a priority. The FAA Icing R&D program has benefited tremendously by cooperative research between the FAA and NASA. However, the subcommittee is concerned that this linkage does not exist any longer, and that the FAA is relying on experimental test capabilities that have been provided by NASA, but are no longer in NASA's plans. To insure there is no disruption in this critical research, the Safety Subcommittee strongly believes that the nation will benefit substantially from the development and implementation of an ASIAs-like roadmap for icing research.
- *Recommendation:* The Safety Subcommittee recommends that the FAA work with NASA to develop an agreed-to roadmap for icing-related R&D along the ASIAs model.

## Request to FAA - Content of Future Subcommittee Meetings

The Safety Subcommittee appreciates the openness and candor provided during the safety program briefings and believes this constructive engagement provides a solid basis for moving forward. The subcommittee is currently planning to hold its next meeting in the February 2008 timeframe, at the FAA William J. Hughes Technical Center in Atlantic City. To foster increasingly effective reviews and feedback, the subcommittee requests the following support from the FAA and its personnel at future meetings:

- Participation from both R&D program managers and their FAA-management sponsors. The subcommittee believes this is especially important to understand both the program content and the associated drivers and priorities.
- The FAA R&D management sponsors and R&D program managers provide the subcommittee a summary matrix of
  - Proposed research requirements and associated program plans against the elements contained within the AVS strategic guidance and the Safety Subcommittee focus points defined at the beginning of this document.
  - The priority ranking of the R&D research requirements and the associated program elements that are proposed for inclusion in the safety R&D plan, as well as those that are not proposed for inclusion in the plan.
- During briefings associated with each research requirement/program element, please identify:
  - Which of the subcommittee's "focus point(s)" the research requirement/program element aligns with, and details supporting that alignment. That is,
    - For NextGen/OEP, please state which elements of the plan(s) the R&D supports;
    - For identified safety issues/risks, please cite relevant data, and/or linkage to any CAST, JSC, ISHT R&D recommendations;
    - Identification of emerging risks;
    - Enabling insertion of new technologies.
  - If a research requirement/program element is driven by a Congressional mandate or is intended to enable the FAA's formal response to NTSB recommendations, please identify the relevant mandate/recommendation.
  - The expected R&D deliverables or products from each research requirement/program element.
- Please provide copies of all summary information, background materials and planned briefings to the subcommittee at least two weeks in advance of the meeting.

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November 7, 2007

The Honorable Robert Sturgell  
Administrator  
Federal Aviation Administration  
800 Independence Avenue, SW  
Washington, DC 20591

Dear Administrator Sturgell:

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

The REDAC has been working with the ATO to develop a process to provide input earlier in the research requirement generation process through the Operational Evolution Partnership. We will prototype this process in the coming year and believe that it will be a mechanism for more effective advisory input.

As you know, the REDAC has also been addressing specific topics of identified importance to the agency. Recent studies include: "Weather-ATM Integration", "Separation Standards", "Financing the Next Generation Air Transportation System" and "Controller Training". We would look forward to discussing with you other topics where the REDAC could provide advice or input which would benefit the mission of the agency.

One of the congressionally mandated tasks of the REDAC is to advise on the relationship between the FAA research activities and those of other government agencies. In this regard, the REDAC has responded to several requests from the JPDO and received several briefings on JPDO and NASA research activities and plans.

With the refocusing of the NASA Aeronautics efforts to be more fundamental and thus less directly implementable, there has been a change in the relationship of FAA and NASA research efforts. This has, and will, require the FAA to adjust and expand some of its efforts. However the REDAC was pleased to observe that there does appear to be growing collaboration between the FAA and NASA in areas such as safety data analysis (ASIAS) where there is collaboration at the senior level and a clearly defined fundamental technology need which NASA can address.

In order to frame the FAA and NASA research efforts in the context of NextGen, the REDAC had requested briefings on the NextGen plan and was also asked to provide input into the NextGen R&D planning document. The REDAC was disappointed and concerned with the lack of substance in the briefings and lack of specifics in the planning documents. The JPDO has agreed to provide a more substantive briefing at a future meeting and the REDAC hopes that this will be at a level sufficient to justify the enormous trust the FAA must put in this planning process.

The challenges of implementing and receiving operational approval for the unprecedented scope of proposed changes in technology and procedures is a critical area which has emerged in the NextGen discussions. The initial NextGen implementation steps (eg ADS-B and SWIM) illustrate the challenges of transition. We must find innovative approaches to accelerate the modernization process while maintaining the safety and capability of the system. This may be a topic for a more focused REDAC study.

The REDAC and the communities which the members represent are committed to maintaining the health and viability of our air transportation system as we face the technical, operational and financial challenges ahead. We stand ready to help in this regard. I, and the other members of the REDAC, are available if you would like to discuss these, or other, issues in more detail.

Sincerely,

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

Enclosure

## **R&D Guidance for FY 2010**

### **Subcommittee on Airports**

With regard to specific topics the Airport Subcommittee recommends:

1. Continued close cooperation between the FAA Technical Center and the Airports Cooperative Research Program.
2. That the highest of priorities be placed on testing with the new large aircraft fire mock-up at Tyndall AFB in Panama City, FL so as to gain a clearer understanding of the quantity of fire fighting agent that will be needed to successfully deal with such events should they occur. Note should be taken that commercial operations by the Airbus A380 in the United States will commence within months.
3. Among the many projects that the Technical Center is carrying out, the Subcommittee especially supported the proposed research tasking on:
  - a) Foreign Object Damage (FOD) detection radar,
  - b) The development of light emitting diode technology for airport lighting (cooperative effort with Rensselaer Polytechnic Institute),
  - c) The study of Engineered Material Arresting System material behavior due to prolonged exposure to freeze / thaw cycles,
  - d) Continued development of the capabilities of the pavement test facility to mimic complex wheel arrangements, and
  - e) Expedited design and construction of a laboratory to support the pavement research.
4. Among the topics that the Airport Subcommittee would like to see added to the research that is already in progress are:
  - a) A consideration for the Airport Technology Branch to possibly take on the most promising of the pending projects of the Innovative Pavement Research Foundation (IPRF) and the Airfield Asphalt Pavement Technology Program (AAPT) should there be no funding approved in upcoming legislation for these programs,
  - b) The FAA should initiate a study of the affects of runway de-icing fluids on surface friction, and
  - c) The FAA should consider starting a research project on the design of the location of exit taxiways, as a possible means to reduce runway occupancy times.

### **Subcommittee on Environment and Energy**

The subcommittee identified the following specific issues as matters to bring to the attention of the Administrator.

**Issue 1:** The subcommittee feels that developing solutions (technology/fuels, operations) to limit or mitigate environmental impacts is critical to the future of the Next Generation Air Transportation System (NextGen). The maturing of technologies will have the greatest impact on future environmental advances and is therefore the most critical component.

**Recommendation 1:** For environmental solutions to become viable, sufficient additional resources will be required. The FY09 budget as proposed in the NARP is the minimum investment required from the agency.

**Issue 2:** The OEP briefing was critical since it ties research to implementation. Research in a vacuum does not solve problems; therefore, tying research to operational implementation is absolutely essential.

**Recommendation 2:** Developing a robust R&D plan for enabling the OEP transformation is critical. It is also important that environmental concerns be identified as a major priority along with capacity, efficiency, safety, security.

**Issue 3:** The subcommittee felt that the Office of Environment and Energy needs to reevaluate its strategic priorities.

Members view NextGen efforts as equal in importance, if not more so, than efforts focused on the International Civil Aviation Organization Committee on Aviation Environmental Protection (ICAO/CAEP). While members felt that both activities important and must be supported, emphasis should be driven by the change in importance of NextGen.

**Recommendation:** The subcommittee recommends that the Office of Environment and Energy consider the following priorities in its future efforts:

- **#1 Applied Solutions** such as technology development, alternative fuels, operational improvements and maturation of the CLEEN program should be the top priority.
- **#2 Modeling** should focus on NextGen as the #1 priority, although continued work on CAEP remains critical.
- **#3 Research on understanding** the various elements of aviation environmental challenges (climate, local air quality, noise and water quality) continues to be critical, with climate and water quality identified as the areas that need to be accelerated.
- **#4 Research to support regulatory work** must continue, but the subcommittee felt that the other priorities listed above are more important.

Continuing to mature Centers of Excellence (COEs) and the CLEEN consortium are business priorities, not program priorities, but clearly need to continue.

**Issue 4:** The National Airspace System (NAS) enabled by NextGen will have a number of new aircraft and systems. It is critical to determine the environmental impacts of these new aircraft and systems. Research to determine these impacts should be part of the NextGen R&D plan.

**Recommendation:** Ensure that determining the environmental impacts of new aircraft and systems (including developing appropriate analytical tools) is considered in building the FY10 FAA R&D budget.

**Issue 5:** The scope of the environment and energy program has grown to meet needs. Budget requests should include resources for additional personnel to address developing issues (while keeping to the principle of maintaining a lean organization).

**Recommendation:** Ensure that resources for additional personnel are part of future budget requests. FAA also needs a robust recruiting strategy to attract qualified personnel to execute the NextGen R&D efforts.

**Issue 6:** The committee was supportive of the CLEEN implementation briefing.

**Recommendation:** FAA and NASA should start working the details of CLEEN, even if establishing the program is reauthorization/appropriations dependent. The subcommittee should be briefed on progress/status at Feb 2008 meeting.

## **NAS Operations Subcommittee**

### **Findings:**

NASA's foundational research in ATM automation technologies is addressing long-term issues in automation, but it is not clear that the FAA is tracking it or assessing its connection to their needs. NASA's human factors work should be addressing foundational issues in human-automation interaction or air-ground roles and responsibilities in the context of FAA NextGen design, and that connection was not clear from the briefings.

The final version of the JPDO R&D Plan needs to identify priorities in research, responsible parties for conducting the research, and estimated resources and timeframes (the committee saw only working drafts of the document which were lacking these important details).

Review of FAA's ATM and Next-Gen related research by the NASOPS subcommittee has continued to be confusing by virtue of incomplete or obscure financial and research information, and providing recommendations based on the level of detail that has been presented is difficult.

### **Recommendations:**

The FAA and NASA signed a new MOU (Feb 2006) that stipulated the formation of an Executive Research Steering Committee to coordinate research and development activities between the two agencies, but this has not been implemented. It is recommended that the FAA and NASA do so.

The FAA and NASA, through their roles in JPDO, should assure that the JPDO R&D plan, as coordinated through the OMB, will serve as an actionable de-facto guide to their respective research initiatives for NextGen. If the FAA wishes REDAC to weigh in on the JPDO research requirements, a formal means of review with adequate time for review and JPDO feedback should be instantiated.

FAA should continue to find ways to report on research related to NextGen in ways that are consistent with understanding both the research and the budget associated with it. Recent efforts to relate the work to the OEP solution sets appears to be step in the right direction. Adopting a common format for reporting on research projects (similar to what had been used by the REDAC in previous years) would aid in project evaluation.

## **Subcommittee on Human Factors**

### **Summary Organizational Issues:**

The FAA has undergone significant organizational change in ATO-P supportive of JPDO and its research requirements.

*Finding 1:* The committee finds that Human Factors research and human-system integration is well aligned into the ATO-P processes and supportive of the JPDO research program, as well as the Operational Evolution Partnership

Recommendation: The subcommittee urges that the Human Factors Research and Engineering Group maintains its centrality in human-system integration research and attend to cross-cutting research issues in the ATO-P organization. Overall, the organizational structure, along with

current and anticipated budgetary increases, bodes well for the appropriate level of concern for human-system integration.

*Finding 2:* The subcommittee feels that cross cutting areas of applied Human Factors research (specifically, in the areas of safety, human error and modeling) provide an opportunity for assuring that “human factors” concerns become an integral system engineering element in both the ATO and AVS research and development processes.

### **Summary Budget Issues:**

A significant increase in funding for fiscal year 2008 and a further increase in 2009-2010 are anticipated. The subcommittee concludes that the combination of significant increase in budget and major organizational changes offer significant opportunity for development and integration of human factors research in support of: decision-making in procurement issues, development of near and midterm flight deck and ATC workstations, development and convergence of ATC procedures and training, and support of flight deck and ATC JPDO research requirements.

The subcommittee finds that the Human Factors office is responding to these and other specific areas of research development integration.

*Finding 3:* There is a convergence of conditions that the subcommittee feels provides the Human Factors Research and Engineering Group with an opportunity to redefine itself at a national level within the Human Factors research community. The new organizational structures in ATO, the significant proposed increase in budget and the likely increase in the breadth of demand for applied human factors research, given changes in NASA’s roles and responsibilities in applied Human Factors research, remind the subcommittee of the opportunities and motivation provided for the National Plan for Aviation Human Factors.

*Recommendation:* The subcommittee recommends revisiting and updating a national Human Factors research plan, with the FAA taking the lead in applied aeronautical Human Factors research to address and define current gaps in support of JPDO research requirements.

### Summary Integration of Research with NASA

It was a goal of this subcommittee meeting to have the Human Factors Subcommittee advise the FAA of the adequacy of its research portfolio given changes in NASA Aeronautical Human Factors research. It was, however, difficult to make an assessment of the NASA Human Factors research portfolio with respect to the FAA HF program. The subcommittee was provided presentation of specific research projects but did not receive information about the breadth or extent of NASA’s investment in aeronautical Human Factors.

*Finding 4:* The committee did not feel it was in a position to make a comparison, or gap analysis, between NASA’s response to JPDO Next Generation research requirements in Human Factors and that work being performed by the FAA.

*Recommendation:* The subcommittee recommends that an interagency programmatic exchange be undertaken with respect to applied aeronautical Human Factors and that the Human Factors Research and Engineering Group take the lead in this effort.

## Subcommittee on Aircraft Safety

The Safety Subcommittee recommends that the FAA take the necessary actions to ensure its safety R&D portfolio, including the FY 2008 and FY 2009 program elements, are fully aligned to the following priorities:

- Research linked to the development and implementation of the Next Generation Air Transportation System (NextGen).
- Research addressing currently identified safety issues that are substantiated by data characterizing the level of risk associated with the particular issue. The subcommittee is especially concerned with those research needs identified by the Commercial Aviation Safety Team (CAST), General Aviation Joint Safety Committee (JSC), and the International Helicopter Safety Team (IHST).
- Research aimed at improving the identification and assessment of emerging safety issues.
- Research aimed at enabling the insertion of new technologies into certified civil aviation products and their operations.

The Safety Subcommittee has provided AVS management with detailed observations and recommendations related to each of its specific program elements.

- The Safety Subcommittee recommends that the FAA ensure that the OEP R&D planning timelines and the AVS R&D planning timelines are consistent.
- The Safety Subcommittee recommends that the FAA modify its safety R&D portfolio development process to clearly identify the linkage between NextGen/OEP planning activities, planning documents and any identified R&D needs, and their incorporation into the detailed AVS planning activities and the resulting R&D portfolio. The roles and engagement of AVS focal points supporting NextGen/OEP planning should be clearly articulated.
- The Safety Subcommittee recommends that the FAA begin to realign the thrust of its activities in critical research areas that will be necessary for NextGen/OEP implementation and certification of advanced technologies as soon as practicable, including FY 2008 and FY2009 activities. In advance of detailed NextGen/OEP R&D requirements, preparatory research should be conducted as expeditiously as possible in areas such as advanced software digital systems, complex systems integration, human factors/automation, enabling enhanced crew situational awareness and assessing potential air crew or air traffic controller responsibility changes, etc.
- The Safety Subcommittee recommends that the FAA make every effort to assure that F&E funding is available to sustain critical R&D capabilities, that the R&D community knows how to access F&E funding, and that needed equipment upgrades are obtained in a timely manner.
- The Safety Subcommittee recommends that the FAA ensure that critical R&D facilities, such as its fire test facilities, are identified as national assets and that they are included in the National Aeronautics R&D facilities plan to protect their long-term vitality.
- The Safety Subcommittee recommends that the FAA develop clear program linkage between its environmental alternative fuels initiative and its safety-related fuels program to ensure any potential safety-related implications are identified and addressed.

- The Safety Subcommittee notes the positive impact of close FAA –NASA collaboration on ASIAs, where a joint FAA-NASA roadmap was developed and implemented for research development and transition from NASA to FAA and then the private sector. The subcommittee believes other program areas will benefit from the development of similar FAA-NASA collaborative roadmaps. Therefore, the subcommittee recommends that, at a minimum, the FAA and NASA pursue joint roadmaps related to weather in the cockpit and icing R&D.

### **Observation on the ASIAs Program**

The Safety Subcommittee believes significant progress has been made over the past year in defining the Aviation Safety Information Analysis and Sharing Initiative (ASIAs) program and its execution. The subcommittee especially notes and credits the personal leadership of Nick Sabatini and Jay Pardee of the FAA and Lisa Porter of NASA for driving a well integrated plan that will form the basis for proactive risk identification and assessment in the future. The subcommittee supports ASIAs and believes ASIAs will be an important link in the overall industry safety system. It provides perhaps the most potential for safety improvements, if pursued correctly and vigorously, with active support from all stakeholders.