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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 from the fall meetings of the standing REDAC Subcommittees (Aircraft Safety, NAS Operations, Environment and Energy, Airports, and Human Factors).

As a general observation, the REDAC has been encouraged by the efforts to develop a structured approach to integrate near term and longer term (NextGen) objectives as well as the beginning of a research requirements flow down process driven by NextGen. The REDAC is concerned, however, that the multiple shared objectives of NextGen (e.g. Capacity, Efficiency, Emissions, Noise, Safety, Security) are somewhat piecemeal and need to be more fully integrated in both near term and long term plans. It is also important that the NextGen planning processes remain dynamic and able to adapt to emergent factors such as fuel, emissions and financial concerns which may shift the relative importance of competing NextGen objectives.

We hope that these observations are useful to you and the agency. 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 (REDAC)
Guidance on FY 2011 R&D Portfolio**

Subcommittee on Environment and Energy

1. The Agency must continue to focus its environmental research on both activities to support NextGen and the traditional research necessary to ensure that United States leadership in the international process (ICAO) remains constant. It is therefore recommended that additional resources be made available, at least at the levels envisioned by the NARP.
2. With respect to NextGen, it is recommended that:
 - a. Concentration on applied solutions should continue, especially with respect to the ongoing research on potential alternative fuels. Indeed, to highlight the importance of alternative fuels, the Subcommittee recommends that funding for Alternative Fuels research be broken out as a separate line item in future FAA budgets.
 - b. Airspace redesigns have generated an entirely new class of aircraft noise complaints, with citizens miles from airports now voicing concerns. It is recommended that sufficient funds be made available for a thorough reassessment of the noise issue to ensure that the goals of NextGen are not derailed by environmental concerns based on noise.
 - c. Similarly, with NextGen considering a shift to underutilized or new airports to relieve future congestion, the environmental challenges inherent in such a paradigm shift, both in terms of noise and emissions, must be considered. Sufficient funding to conduct such research should be provided.
 - d. In order to foster continued communication and cooperation between the Office of Environment and Energy and the Air Traffic Organization (ATO), the subcommittee recommends that ATO establish one point of contact for work with the environmental community. Such communication is necessary to ensure that environmental metrics are included in the ATO NextGen decision-making process so that the environmental impacts on air traffic decisions are adequately considered.
 - e. With respect to longer term considerations, the subcommittee recommends that FAA environmental research also concentrate on the environmental benefits of new aircraft development and specifically that work in conjunction with NASA on such issues continue.
 - f. Finally, with global climate change an increasing environmental concern, the subcommittee recommends that the FAA work to bring together all relevant agencies to support the Aviation Climate Change Research Initiative (ACCRI).

3. With respect to the ICAO standard setting process:
 - a. The development of tools and metrics to support international standard setting should continue. In order to support these objectives, funding for the PARTNER program and the tool to assess the costs and benefits of various environmental initiatives (APMT) must continue.
 - b. With ICAO having established a new process to assess the issue of global climate change (GIACC), the subcommittee recommends that sufficient funding and personnel resources be made available to support this activity.

Subcommittee on Airports

The Airport Subcommittee submits the following recommendations:

1. The Subcommittee is pleased with the Airport Technology Research budget allocation for FY 10 / FY 11, and with the task statements and recommends a personnel increase of two persons that the budget supports.
2. The Subcommittee recommends closer coordination between the Airport Cooperative Research Program (ACRP) and the FAA's own Airport Technical Research Program based at the FAA Technical Center. This is especially important given the maturation of the ACRP after a several year start-up period. These two research programs should be, and largely are, complimentary and are both vital to supporting the airport progress needed in the years ahead. While they target different types of airport issues, only a continuous awareness by each program of the other's activities can assure that the goal of complimentary programs will be achieved.
3. There has been talk of moving the Airport Technology Research Branch (AJP) from ATO to AAS, which is the primary sponsor for the Airport Technology research. The subcommittee supports this realignment.
4. The subcommittee recognizes the good work that has come out of the large aircraft fire mock-up at Tyndall AFB in Panama City, FL and recommends the transition of this work to a draft training document as soon as possible to support fire crews across the nation at airports wherever the A380 might operate. An emphasis on composite fire fighting is also strongly supported.
5. The subcommittee supports the pavement area research and the construction of a laboratory to support this research area. There is one topic that the Airport Subcommittee recommends adding to the pavement area research and that would be an effort to investigate the use of warm-mix asphalt for air carrier airport pavements, which reportedly deliver environmental benefits to paving operations.

6. The subcommittee recommends an increase for FY 2011 of \$1,375,000 for visual aids, which increases this item to a total of \$3,200,000. The increase is required to start work on the development of a visual aids test. For visual guidance FAA will start a multiyear initiative to develop a state-of-the-art visual guidance technology test bed that will enable visual guidance engineers an opportunity to design, install, test, monitor, and report on what it will take to create a visual guidance infrastructure that will take full advantage of state of the art technologies in Signs, Lighting and Markings to provide a more efficient infrastructure and the best visual cues to the airport user. Major advances in visual guidance technology have brought forth new, brighter, more efficient and more conspicuous lighting devices, enhanced paint material that lasts longer than traditional paint, and airport signage that is easier to read from greater distances. This new technology, when compared with the current state of visual guidance systems, warrants that the FAA undertake a major research effort to enhance these essential systems, making improvements that will best serve the future of our nations aviation system. The FAA's conceptual "NextGen" Program talks about levels of air traffic increasing to three times what it is today, bringing thousands and thousands of aircraft to smaller airports that have historically seen very little traffic. The demand for the visual guidance infrastructure at these airports will increase significantly, bringing with it higher levels of usage, higher performance requirements, and higher costs to maintain. Energy use and energy costs are becoming an important consideration for all airports in their efforts to become more sustainable and "green". Today's General Aviation community is already indicating that there is a need to enhance their visual aids, citing examples of aging power cables, antiquated fixtures, and high energy costs as major problems that they are experiencing now.

7. The Subcommittee recommends that at some point in the future to carry out a study that would validate (or refute) the findings on taxiway deviation at JFK, now that NLA operations have begun. While not necessarily the only study that could be considered for validation, it would be timely to do this, once the numbers of daily operations increase to a suitable level.

8. The Airport Subcommittee sees an overarching need for the NextGen program to more thoroughly consider airport issues in its plans. The NextGen Program should decide what a future airport might possess in order to make it fully NextGen ready, and then articulate the attributes that airports will need to build to, in order to achieve consistency with that vision.

Subcommittee on Human Factors

Observations

1. The committee noted the strong cooperation/collaboration between ATO-P and AVS human factors (HF) personnel. The committee believes that a continued level of close cooperation will be critical to achieving success in development and fielding of NextGen concepts.
2. The Personnel Roadmap is an extremely valuable tool to ensure recognition and visibility for human-related issues in NextGen. The committee strongly supports this effort and feels it will be a valuable component of the NextGen development process.
3. It is important that NextGen planning and implementation continue to leverage common resources across industry, government and academia.

Findings and Recommendations

Finding 1 - Focus on Equipment at Expense of Human Issues. Current FAA NextGen planning in the solution set framework focuses primarily on equipment acquisition and insufficiently addresses human-related issues and needs. Greater emphasis on human systems integration in NextGen is required.

Recommendation 1a: Edit and revise NextGen planning documents, enterprise architecture, etc. to address human systems integration issues related to NextGen implementation. Continued development and integration of the Personnel Roadmap should facilitate this process.

Recommendation 1b: Change term “Human Factors” in FAA job titles and organizational names to “Human Systems Integration.” This may facilitate a broader role and understanding of the human component in the systems engineering approach.

Finding 2 - Human Factors Resource Limitations. Human factors resources in ATO-P and AVS are insufficient to carry out the range of activities required to adequately support NextGen development and implementation.

Recommendation 2: Increase AVS and ATO-P HF staffing and ATO-P HF research funding to support NextGen. In case of an extended Continuing Resolution for FY09 that will maintain Human Factors funding at the FY08 level, the FAA should augment human factors research funding so that critical NextGen human factors activities can be initiated. The human factors subcommittee notes that for FY08 the NextGen human factors budget line items were among the few that did not receive funding to perform substantive work. An additional delay in funding will jeopardize human system integration for NextGen.

Finding 3 - Lessons Learned Not Well Integrated. The Post Implementation Review (PIR) process for the Advanced Technologies and Oceanic Procedures program resulted

in a number of significant human factors findings, but there is not a clear process to ensure these findings are fed forward to benefit other NextGen programs.

Recommendation 3: Develop a process to formalize a human factors component to Post Implementation Reviews and establish processes to ensure lessons learned are available to other NextGen programs.

Finding 4 - Crosscutting NextGen HF Issues Are Not Adequately Addressed. Due to the management structure of NextGen (individual program managers, solution set managers, etc.), it is not clear how crosscutting human factors issues will be recognized and addressed.

Recommendation 4: Develop management structure to address cross cutting human systems integration issues. Consider sharing REDAC subcommittee members or joint REDAC subcommittee meetings.

Subcommittee on Aircraft Safety

Key program observations and recommendations are listed below:

Observation 1: The Subcommittee on Aircraft Safety is encouraged by the FY2011 AVS Strategic Guidance provided by the Associate Administrator to the research planning community. The guidance created two new TCRGs, one focused on Weather in the Cockpit and the other on Self Separation & Air-Ground Integration. Additionally, emphasis was placed on the importance of program metrics, milestones & project phases in planning research projects. All positive additions intended to guide the right project management planning & execution.

Recommendation: Item tracking database put in place. Assures subcommittee input is addressed.

Observation 2: The Subcommittee on Aircraft Safety reiterates it's past recommendation that R, E & D requirements definition for NextGen must be expedited. Failure to define the research needs supportive of the envisioned cutting edge technologies that NextGen is counting on will result in less capable, in hand, solutions having to be implemented with NextGen performance suffering as a result. Given that the NextGen mid-term implementation target dates are 2012-2018 or just 3 to 9 years from now, R&D should already be well underway on any new capabilities envisioned for these time frames. Without roadmaps in place, some capabilities currently being envisioned for NextGen may already be overtaken by time.

Currently only about 10% of the R,E&D efforts are aligned explicitly with NextGen needs based on a SAS requested Solution Set, Domain & Roadmap alignment assessment. While waiting for top down requirements;

Recommendation: The Subcommittee recommends AVS R,E&D management extend the assessment approach, on a proactive basis, to uncover potential research requirements by reviewing Roadmaps, Integrated Work Plans, ConOps and Operational Improvements (as well as any other lower level plans that might exist) and discuss the findings with the Solution Set coordinators for validation.

Observation 3: As was discussed at the July 2008 REDAC workshop on NextGen, there is currently no overarching System Safety Analysis model for NextGen. This model could be used to assess the impact of the large number of proposed NextGen system & subsystem elements and enable proper trades & capability requirements to be defined.

Recommendation: The Subcommittee recommends a System Safety Model be developed to permit an integrated, quantitative assessment of NextGen.

Observation 4: Aviation Weather research is a very complex topic with the dual goals of improving both safety and capacity. The Subcommittee appreciated the review provided by Ken Leonard and the team. A strategic plan is needed to show how the products developed under the research program will be transitioned to meet the needs of the flying community.

Recommendation: Recommend the FAA engage the user community for both safety and capacity improvements validation.

Observation 5: ASIAs has indeed come a long way. However, there is still much work to do in R,E&D to accomplish ASIAs objectives as envisioned. Tools are still needed to effectively process, integrate, and mind the large amounts of disparate data that will be entered into ASIAs as more data sources come on line. Thus need to have clear roadmaps with roles and responsibilities of what new capabilities are needed and how they will be inserted into ASIAs. Also, it was noted that a Continuing Resolution (CR) in FY09 will impact new starts planned for ASIAs. SAS did not hear a mitigation strategy if CR should go past March, which is indeed possible in an election year.

Recommendation: Subcommittee strongly recommends FAA create mitigation plans, in the event the CR goes for an extended period. (note: this concern is not unique to ASIAs)

Observation 6: FAA should continue to contribute to instrumentation development for the NASA High Ice Water Content Atmospheric Characterization effort. There is a need for fundamental physics research on accretion of ice crystals inside an engine – partial funding of this work is being contemplated by the FAA. This basic research is needed for future engine development and certification as well as resolving in-service issues of engine power loss. This research has applications beyond the engine, to any inlet with a heated surface, as well as probes which can be corrupted by ice crystals.

Recommendation: Subcommittee recommends finding a way to enable the Weather program to provide “pop-up” support of the upcoming flight test effort to maximize the efficiency of the test program.

Observation 7: The influx of new Unmanned Air Systems (UAS) requirements from the user community is not waiting for or being driven by NextGen. The FAA needs to address current requirements that are ready for operational implementation, and also have a strategic plan to ensure NextGen can accommodate emerging and future UAS requirements.

Recommendation: Subcommittee recommends the FAA take a proactive education approach aimed at the “newcomers” to this rapidly expanding aviation sector as well as accelerating rulemaking supporting research.

Observation 8: Research is planned to: “Develop minimum standards for augmented manual control Fly By Wire (FBW) designs”. The Subcommittee is surprised that the current certification approach apparently relies heavily on program specific Special Conditions instead of up to date, comprehensive regulations. The Subcommittee is equally surprised the current regulations apparently do not adequately cover the >15 year old Fly by Wire technology.

Recommendation: The Subcommittee recommends the FAA closely examine all areas of aircraft & engine certification for repeated use of Special Conditions as an indicator of areas where the regulations have not actually kept pace with the “advancing” technology.

Observation 8: Airframe Icing - NASA and the FAA Technical Center have been involved with other organizations in a multi-year SLD technology roadmap to define the SLD environment and to develop engineering tools (codes, icing tunnels) with which airplane manufacturers can predict SLD ice shapes. This capability is critical to the airplane design, flight test, and certification processes. The FAA advisory group is currently conducting a status review of the available SLD engineering tools prior to the rulemaking proposal being issued for public comment. Although there is an "interim" capability for developing SLD ice shapes for freezing drizzle conditions the available tools are inadequate for freezing rain conditions. It is essential that FAA & NASA provide adequate priority and funding to enable completion of the key remaining SLD technology roadmap tasks prior to the regulation being implemented.

Observation 9: Halon Replacement - Industry is still committed to working with the FAA to define an acceptable Halon-1301 replacement for engine/APU applications. This requires continued work with the nacelle fire simulator located at the William J. Hughes Technical Center. In addition to further testing using the FAA/industry-reviewed protocol Minimum Performance Standard - Engines (MPSe) Rev03, it will be necessary to define Rev04 of the MPSe to account for next generation fire extinguishing agents (e.g., higher boiling points, non-gaseous). Lack of support for these initiatives will make it difficult or even impossible to eliminate Halon-1301 from the propulsion fire extinguishing system on future airplanes.

NAS Operations Subcommittee

Briefings were given on the FY10 budget, the R&D prioritization process, the NAS OPS PPT activities (including ConOps development, Human Factors, and Wake), the Weather Office research, an update on demonstration plans, and the Enterprise Architecture.

Portfolio Content

Finding: Neither the July workshop nor the September briefings presented adequate information to determine if, or how, critically important (if very difficult) R&D with system-wide NextGen design implications is being conducted. Specific areas of concern are an apparent lack of R&D devoted to (1) separation responsibility--including the air-ground split, the human-automation split, and the impact of failures or aircraft nonconformance; (2) the impact of new classes of vehicles (UAS, VLJ, CESTOL, etc) on the NextGen design and operation; (3) the development of risk assessment methods and safety analyses for the NextGen ConOps; and (4) the design of NextGen and operations in it to optimally minimize adverse environmental effects.

FY11 Recommendation 1: Use a taxonomy based upon research devoted to these areas to assess the FY 09 and FY10 R&D projects to ascertain whether a re-binning and an increase in funding for FY11 for R&D in these difficult areas is required. If so (and NASOPS believes it is so), consider re-allocating additional resources from other target areas to NASOPS.

Finding: Although there was mention that a plan to establish an avionics roadmap has been drafted, the FAA appears to have no avionics roadmap yet for aircraft equipage, nor incentive to the industry to equip in an integrated fashion. Briefings on the airborne requirements for ATM are not linked to specific performance requirements. Since equipage is a major cost and complexity driver for airlines, this lack needs to be remediated immediately.

FY11 Recommendation 2: NASOPS subcommittee offers to work with the Aircraft Working Group of the JPDO to establish an airborne avionics road-map and FY11 funding requirements for airborne ATM R&D and lead-in re-prioritization of FY10 funding.

Program Funding

Finding: NASOPS is pleased to see the development of an Enterprise Architecture. The EA should enable a portfolio management process that provides some increasing linkage of the R&D that is being performed to some type of requirement, be it an OI or an RPD. Currently, the linkage of the R&D to requirements, and the criteria to select what R&D should be done, still are imperfect. Specifically, the criteria used by the Next Gen review board, as briefed, are too near-term and are risk averse, so important work (such as 2025

ConOps development) fails to be funded. Additionally, it is not clear that any work is actually dropped as a result of the current intuition- and consensus-based approach.

FY 11 Recommendation 3: Continue to fund the EA at an appropriate level, but ensure that it develops into a straightforward tool to map and assess requirements and R&D.

FY11 Recommendation 4: Re-establish funding at \$15M/year for 2025 ConOps development, and develop a less risk averse NextGen Board ranking criterion.

FY11 Recommendation 5: Re-examine lower priority work currently funded with the goal of ending it. A specific recommendation is to stop Common Data and Structure Data (CSSD) work. Another is to re-examine the funding requirement for Common Automation Platform.

Partnerships

Finding: The NextGen design appears to be based on intuition and consensus, rather than modeling, analysis, simulation, and demonstration or testing. The implication from the July workshop is that the FAA intends to start a whole new activity in modeling and simulation, heavily infrastructure based, which was not ready to be briefed to NASOPS in September. This is not the correct approach. Additionally, the demonstration activities (e.g. Florida) need to be explicitly a part of the analysis, simulation, and learning process, and there is no evidence that they are.

FY11 Recommendation 6: Leverage the work of NASA and other government partners, and particularly the considerable investment of the JPDO and its industry partners in the work accomplished by its System Modeling and Design Division, to form the basis from which to start this activity. Re-examine funding plans to develop entirely new simulation capabilities.

FY11 Recommendation 7: Establish criteria for demonstration projects that link them to specific research questions and on-going analysis and simulation to provide validated answers. Provide exit criteria for, and lessons-learned from, each demonstration project. Establish clear funding stream for proof-of-concept tests or demonstrations.