Research, Engineering, and Development Advisory Committee (REDAC)

HYBRID SESSION

Wednesday, October 4, 2023

Meeting Minutes

Federal Aviation Administration (FAA) Headquarters
800 Independence Ave, SW, Washington, DC
MacCracken/Huerta Collaboration Center, FOB 10A, 10th Floor

Purpose	REDAC Findings and Recommendations on the FY 2026 R&D Portfolio
Facilitators	• Dr. R. John Hansman, *Research, Engineering, and Development Advisory Committee (REDAC) Chairperson, Massachusetts Institute of Technology (MIT)* • Ms. Shelley Yak, *FAA William J. Hughes Technical Center (WJHTC) Director (ANG-E) and REDAC Executive Designated Federal Official*
Note Taker	Ms. Beth Arnz

Presentation: Welcome Address and Opening Remarks | **Presenters:** Dr. John Hansman, *REDAC Chairperson, MIT,* and Ms. Shelley Yak, *WJHTC Director ((*ANG-E) *and REDAC Executive Designated Federal Official, FAA*

Dr. R. John Hansman opened the meeting with a brief introduction, mentioning that it was Mr. Terry McVenes' last Full REDAC meeting prior to his retirement, and that it was also Ms. Shelley Yak's birthday. Ms. Yak thanked Mr. McVenes and the Full REDAC Committee for the time and effort to support the REDAC and Subcommittees. Ms. Yak announced the public meeting notice posted in the *Federal Register* on August 30, 2023, as required.

Presentation: Welcome Address | **Presenters:** Mr. Paul Fontaine, *Assistant Administrator for NextGen, (ANG-1) FAA*

Mr. Paul Fontaine echoed the opening remarks about the time commitment members devote to the REDAC in addition to their day jobs. Mr. Fontaine stated that, on behalf of the FAA Administrator, he appreciated the support and recommendations that come from the Committee.

The Agency and aviation industry are in a time of transition. Mr. Fontaine focused his remarks on conversations happening now within the FAA. He explained that, in the 2023 FAA Reauthorization Act (which has yet to be passed), the NextGen epic is ending in the 2025 timeframe. NextGen was the most comprehensive update to Air Traffic Control (ATC) up to that point in time. NextGen successfully transformed ATC from a voice environment to a digital environment. However, the NAS is a distributed air/ground environment and compatible

avionics are needed to exploit what is done on the ground (Mr. Fontaine shared that FAA funding is predicated on ground operations with minimal control over the air part). He referred to the example of Automatic Dependent Surveillance–Broadcast (ADS-B) Surveillance; the Agency got the "Out" part; the "In" part is still evolving.

Under NextGen, the Agency changed automation platforms from top to bottom. Mr. Fontaine said that 2024 will be a year of looking back and taking stock of what the Agency is deploying. He reiterated that the language in the House and Senate FAA Reauthorization Acts is clear; by 2025, NextGen is done, and Congress would like to know what the next steps. The Information-Centric NAS, or Info-Centric NAS, is defining that future world.

Mr. Fontaine stated that at an offsite meeting, executives worked to define operational environments for the future (from 100,000 ft. down to zero). The Agency has defined Concepts of Operations (ConOps) for Commercial Space (including above 60,000 ft), the NAS as it exists today, Advanced Air Mobility (AAM) with various applicants are moving through the certification process, and the operational environment/infrastructure to support the new ecosystem (e.g., vertiports). The Agency has also been conducting a series of demonstration activities using Virginia and New York test sites to examine Unmanned Aircraft System Traffic Management (UTM). Mr. Fontaine stated that Dallas will likely be the Agency's first large metro area for operational evaluation of UTM. Tests will show how 3rd party systems can be used to help control the UTM environment. These concepts make up the Info-Centric NAS and represent domains of what and how information is exchanged in ways never seen. Additionally, consideration of how systems are architected to take advantage of data coming in also sets the stage for the Info-Centric NAS.

Mr. Fontaine emphasized that the FAA would need help to communicate the Info-Centric NAS effort s as it took years to get different stakeholder groups to understand NextGen. Success will be measured on how many big programs are deployed. With movement to an Info-Centric environment, backbone communications infrastructure will evolve. Examples include replacing the FAA Telecommunications Infrastructure (FTI) contract with the FAA Network Enterprise Services program (FENS) - an essential piece of how the data is moved around, better use of cloud-based technologies, use of standardized tools, etc. Mr. Fontaine emphasized that the question is how do we explain moving from a software-based model to this new technology to various decision makers at all? How do you move and blend information to make it seamless and move it to new places? Mr. Fontaine anticipates some communications struggle as the Agency attempts to explain this new methodology. However, it is essential work; the system needs to continue to evolve. Cycle times need to continually be reduced to keep up with the times.

Dr. Hansman asked Mr. Fontaine if there are ways to get capability performance metrics as metrics of success. He responded that it would be the ability to deploy smaller slices of capabilities on a more rapid basis. Mr. Fontaine stated that the transition period should last for the next several years and that he looks forward to continuing to discuss the new paradigm at REDAC. Dr. Hansman mentioned that while Mr. Fontaine talked a lot about new entrants (e.g., AAM), another key force for the system is sustainability and environmental pressures. As the Agency thinks about the next steps, what is it doing in response to pressure from industry and others? Mr. Fontaine responded that the FAA is working to make the system more efficient as environmental issues/pressures become more urgent. He referred to performance improvements over the years; as the NAS transitions to an Electric Vertical Takeoff and Landing (eVTOL)

environment, the Agency is at the early stages of a wave with potential for new and cleaner fuels (e.g., hybrid, hydrogen). These are all in the forefront of the greening of aviation over time. He said there is not one silver bullet, but lots of potential across the board. Dr. Hansman recommended that the FAA think about things it can control. Climate impacts will be made on longer-haul flights. Consider how can the FAA modernize in a way that can pay for itself from a sustainability standpoint. There is opportunity in moving away from capacity to sustainability to support NAS modernization. Mr. John Dermody (ARPTS) mentioned that each FAA line of business is working on sustainability initiatives. In the Airports portfolio, they are researching more sustainable asphalt, low carbon concrete, recycled products, etc. to see what will work in the future. Mr. Fontaine concluded his remarks by describing past research successes that are applicable to the Info-Centric NAS; as the FAA saw research benefits, they were incorporated on a wider basis.

Presentation: Public Forum Comments – Aviation Impacted Communities Alliance (AICA) |
Presenter: Ms. Darlene Yaplee, *Co-Founder of AICA*

Ms. Darlene Yaplee stated that AICA submitted a comment (Docket ID No. FAA-2023-0855-2206) regarding the FAA's request for comments on the Civil Aviation Noise Policy. AICA includes 70+ groups across the country dedicated to protecting communities from harmful levels of aviation noise and pollution through legislation and industry change nationwide.

Ms. Yaplee shared key items from National Public Radio (NPR) comments to inform REDAC's advice and recommendations to the FAA and read directly from AICA's letter to the REDAC. Recommendations include:

1. Evaluate NextGen impacts: Airspace restructuring with NextGen moved flight tracks, concentrated air traffic, lowered altitudes, and implemented speed reductions over communities.

2. Follow up on Nicholas Miller's comment: FAA changed airspace use, moved dispersed operations to single tracks, basically giving communities the double whammy of not only eliminating the benefits of months and years of effort, but increasing many areas of noise exposure. Only FAA knows the details of how and why detrimental to the community noise exposures were taken, and I can only guess. Nevertheless, let me suggest some possible FAA actions (exclusive of noise policy revisions). First with noise measurements. I have found that very few people understand the value of carefully designed noise measurements. (As Ken Plotkin used to say, the only facts we have are the measurements collected in the field.) I propose checks of the accuracy of the noise model database. Measure time histories, and maximum sound levels of single overflights, by aircraft type, by time of day at selected locations. Also collect associated altitude information. Compare what the model says the maximums should be for that aircraft type at that location and altitude.

A second effort would be to analyze in detail, how much distance, time and fuel are saved with the Area Navigation (RNAV), Performance Based Navigation (PBN), Metroplex, NextGen or whatever the current procedures are called. This effort must apply to specific procedures, not generic ones. If only minor savings are found, go back to the prior guidance (vectors?). It's a bit hard to believe the new ones are much safer – were the previous ones less safe?

3. AICA recommends the decision-making metric to replace Day Night Average Sound Level (DNL) for overflight communities should be N-Above (Ambient+Offset): For the peak day of the year using LMAX as the maximum noise level of an event. Notationally, for example N-Above-Ambient+10 or NAA+10 would be the number of events over Ambient + 10 dB using A-weighting or C-weighting whichever is higher. Can REDAC perform independent and robust analysis of existing data from many airports and researchers?

4. The Neighborhood Environmental Survey (NES) data showed a strong correlation between N-Above 50 dB (NA50): and the level of annoyance. Can REDAC perform and publish the analysis of the NA50 as a single independent variable using NES data as this information informs the new noise policy?

5. FAA recently analyzed census tracts and data for noise exposure levels down to DNL 50 dB: around the 30 largest US airports that represented 70% of the people affected. Can REDAC analyze this data and share findings?

6. Identify how to improve Aviation Environmental Design Tool (AEDT) to accurately model impacts and in the meantime display the error bars in modeled assessments: AEDT is not accurate beyond a few miles from the airport, especially for arrivals. AEDT is based on a Noise Power Distance (NPD) model, which assumes that airframe and engine noise correlate with thrust. The NPD model is not as sophisticated as the Aircraft Noise Prediction Program (ANOPP) model that simulates aircraft noise based on various aircraft components. Airframe noise is the dominant noise source on arrivals, not engine noise. Recent MIT research, sponsored by the FAA Center of Excellence for Alternative Jet Fuels and Environment (ASCENT) project 44, shows that delayed deceleration techniques could potentially reduce noise by 3 to 6 dB on average across different aircraft types in areas beyond 8 nautical miles from an airport. The AEDT model uses descent profiles that underestimate the use of flaps or slats over overflight communities, especially 10 or more miles away from the airport. See the Giladi and Menachi's paper on validating noise models states that "...the AEDT model underestimates noise levels, sometimes considerably, by 4 to 7 dB(A), even when using an accurate flight path for its input."

7. Perform analysis of airframe noise given it is the dominant noise source on arrivals, not engine noise. Focus on airframe noise.

8. Model benefit if all domestic aircraft's Flight Management Systems (FMS): were upgraded in order to allow the FMS to accommodate multiple departure, approach, and arrival instrument paths for the purpose of rotating path usage in order to disperse aviation noise more equitably than NextGen today.

9. Impacts and assessment of visual pollution of aircraft: including vehicle types and elements of aircraft operations for general aviation today and future AAM.

We shared many ideas for REDAC to consider for a balanced, independent, and inclusive analysis and/or research. We are available to support your efforts.

Dr. John Hansman thanked Ms. Yaplee for the detailed comments. He responded that there is work underway on some of the initiatives mentioned today and in previous AICA comments, e.g., AEDT validation/modernization. He clarified that REDAC does not perform the independent analysis mentioned in the AICA comments; but it can suggest it, or comment on it.

Mr. Chris Oswald commented that the visual issues raised are those that Airports are focused on as well.

Presentation: Integrating Advanced Air Mobility in the NAS – Innovate 28 and Autonomy|
Presenter: Mr. Praveen Raju, *General Engineer, Communications Branch, FAA (ANG-C53)*

Mr. Praveen Raju provided a briefing on near-term integration of Advanced Air Mobility (AAM) into the NAS – colloquially named Innovate 28. Version 1 of the AAM Implementation Plan was recently released and contains many of the details. Mr. Raju walked through an AAM overview. The first Electric Vertical Take-Off and Landing (eVTOL) aircraft is expected to be certified in the 2025 timeframe, with AAM predicted to be a $30B market by 2030. Today, the industry is venture capital backed – lots of companies are based out of Silicon Valley. Mr. Raju stated that there are a few initial business cases for eVTOL from these operators. Examples include:

1. Air Taxi Operations: Airport to city pair (e.g., Chicago O'Hare, Dallas/Fort Worth, New York, San Francisco/San Jose). Manufacturers/original equipment manufacturers (OEMs) are looking to expand across the U.S. and abroad.

2. Cargo: Longer operations along coast lines and through areas allowing easy access to the market for cargo operations.

3. Medical Transport: Initial operations look like helicopter/general aviation, but there is a focused approach to more autonomous operations.

Mr. Raju emphasized that AAM is a unique challenge for the FAA as the ecosystem has yet to be built and will require support from a wide array of FAA lines of business, and within the community. For example, in the case of vertiports, questions include what infrastructure needs to be stood up, charging resources, existing route updates, new routes, automation needs, and technologies. The FAA goal is to balance the pace of AAM innovation while ensuring safe and equitable operations.

Many eVTOL new entrant companies have aligned with established aircraft companies. Traditional carriers are also integrating eVTOL into their vision. Dr. John Hansman commented that FAA should not be in the charging business unless there is a need for charging standards or because of safety issues. Additionally, he noted that unless there are a lot of eVTOLs, there seems to be little difference between these vehicles and helicopters. Dr. Hansman asked, from an FAA and safety standpoint, what research needs to be done to appropriately assess an applicant that comes to the Agency with an unsafe suggestion. He pointed out that one of the challenges in the space is that there are lots of bad ideas currently due to the venture capital mentality (go fast and break things) coming up against regulatory Agency obligations. Dr. Hansman also believes that the $30B market estimation is unrealistic as only two vehicles have been sold so far. The Agency will have time to react; Dr. Hansman cautioned the FAA not to overreact to hypothetical ConOps. Mr. Raju reported that the Agency is taking an integrated approach to AAM. Dr. Hansman stated that automation will change the interface between the FAA and Advanced Air Mobility (AAM) vehicles on an operational basis. Certain levels of automation will change the dynamics of approval. Mr. Paul Fontaine emphasized that the FAA's bottom-line approach is to be ready for the safe introduction of these technologies into the marketplace. He compared AAM to the introduction of the railroad; there were lots of players at the dawn of the industry and then

consolidation, standards coalesce, etc. The marketplace will unfold over time and will look different. Dr. Hansman agreed with Mr. Fontaine's remarks and taking a rational and not overly restrictive stance as an Agency.

Mr. Ian Redhead commented that one of the topics discussed in last REDAC was the breakout or differentiation between all the unmanned vehicles (some only move packages, etc.). He asked what delineations/definitions the is FAA working from or using to distinguish these differences. Mr. Raju responded that the FAA is working on powered lift proposed rulemaking to address these newer aircraft types. Dr. Hansman clarified that Mr. Redhead's question had more to do with the question of autonomy. There is not a clean delineation right now. Mr. Raju stated that the FAA is currently working on autonomy R&D efforts. They are formulating an autonomy working group and there is a DOD-led automation working group; the Agency plans to build from that. The FAA is in relative infancy on delineating autonomy. Mr. Redhead stated that research will be driven on how the new vehicles are defined.

Mr. Raju reviewed the Agency's safety focused approach to AAM. It is a whole of government approach to support integration/operations of new vehicle types. As part of this effort, the Agency stood up Innovation Teams (ITeams) which are made up of various lines of business within the FAA, including airports, air traffic, environmental, etc. ITeams is a portfolio/programmatic approach to tackling AAM near-term with an eye on the mature term. The Agency is also aware of the need to update the regulatory framework as operations come to fruition. The Department of Defense (DOD)-led AAM interagency Working Group (security, power and energy, infrastructure, etc.) is a national strategy. An RFI in the Federal register closed in August 2023.

To enable the ecosystem, Mr. Raju emphasized some key, near-term steps including (a) the recognition of piloted command experience (final rule in September 2022); (b) update to air carrier definitions (effective September 2023); (c) airmen certification standards (comment period ended in February 2023); and, (d) notice of proposed rulemaking with special federal aviation regulations for integration of powered-lift operations and associated pilot certification (comment period closed August 2023). In terms of a planning/portfolio management approach, the FAA has developed the UAM ConOps v2.0. This was followed by the Advanced Air Mobility (AAM) Implementation Plan v1.0. The AAM Implementation Plan will be updated over the next year as the Agency learns more from the OEMs and operators about the future vision. Also, the FAA is planning to develop an integrated simulation and testing environment (partnering with DOD and NASA). It has developed an approach to integrate the DOD test data into the FAA R&D environment. Mr. Raju explained that this ties into the Info-Centric NAS concept – how is data harnessed and made usable to support decision making? The FAA is leveraging R&D teams at the William J. Hughes Technical Center to develop the test bed for simulation activities.

From an airports perspective, interim guidance for vertiport establishment was published through an engineering brief (September 2022). The team has been moving towards performance-based guidance to culminate in an advisory circular/policy definition in the 2025 timeframe. Dr. Hansman asked Mr. Raju how flight standards factors into the process - for fundamental issues such as what is the dispatch energy requirement? Mr. Raju answered that flight standards plays a key role. Mr. Bruce DeCleene (AIR) added that coordinated activity is ongoing with aircraft certification and flight standards. They are also looking at the aeromedical aspects (e.g.,

requirements of crew members may be different) to stay engaged across whole gamut of activity. The Agency goal is to be prepared to ensure the safe introduction of technologies at the pace industry wants to move. Dr. Hansman referred to the energy dispatch problem; what are the considerations and how do you prove you have enough, what are the options? – the Agency must have research to support ideas that are not sound. Mr. DeCleene mentioned that the Agency is addressing flight planning energy reserves. For example, it has issued several proposed certification bases for comment. One item is related to energy reserve planning and operations.

Mr. Raju then reviewed potential initial AAM operations locations and emphasized that it was not an all-inclusive list, but places where the FAA has seen demand (locations include Los Angeles, the Bay Area, Chicago, Houston, New York, and South Florida). The goal for near-term operations is to enable AAM operations in locations determined by industry leading up to 2028, and to allow for repeatable processes for easier implementation in other locations. Mr. Joseph Bertapelle asked Mr. Raju whether these initial locations are mini metroplexes. Mr. Fontaine answered that these locations reflect what the FAA is hearing from industry/OEMs; meetings are ongoing to ensure coordination. Many places want to be a test site. Resources will be concentrated on what is "real" to ensure safe introduction into operational service. Mr. Chris Oswald asked whether the locations represent commercial passenger AAM operations, and not cargo or regional. Mr. Fontaine answered that the locations reflect direct discussion with OEMs. Mr. Terry McVenes commented that even on a good day, some of this airspace is extremely challenging. He then asked how AAM operations will impact current operations as some in industry think that current operations will not be impacted by AAM at all. Mr. Raju responded that the AAM industry is in its infancy; there are lots of tech-based companies that are learning the language of aviation (what do operations look like at specific airports, that one environment is not the same as another, etc.). Additionally, some OEMs may not have had conversations with local airports. Mr. Fontaine emphasized that, for the FAA, there are many pieces that have to be there to enable AAM. All lines of business will be impacted. The Agency is prepared to have a dialog with vendors as they describe what they want to put into operations, however there are unknown unknowns (e.g., operations in a wake environment). Advanced Air Mobility (AAM) operations will be prototyped in select locations and rolled out across the country to minimize impact to current operations. Mr. McVenes made the point that certifying aircraft, while difficult, is the easy part – integrating operations into airspace is a huge undertaking. Dr. Hansman agreed with Mr. McVenes and stated that another component of this is Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) operations. IFR operations cannot be done unless separation standards are changed. It is a lack of understanding of the system. Regarding the Key Innovate 28 activities, Dr. Hansman recommended that the FAA prioritize core activities such as charging, airport density, IFR/VFR; the laundry list is too big, and prioritization is necessary. Mr. Fontaine agreed with Dr. Hansman and added that the Agency understands the industry use case, is modeling/simulating that use case, yet operations will look different over time (a crawl, walk, run strategy). The use cases will continually evolve. Ms. Shelley Yak added that the AAM conversations are similar to conversations about UAS when it started – many of the questions are the same (where the industry is going, how can the Agency be prepared, how to prioritize, etc.).

Mr. Raju then spoke about FAA ongoing engagement with sister agencies, at the workforce partner level (NASA, NATCA), at state/tribal governments, and with industry consortiums. He also discussed the FAA's plan to support near-term AAM operations. Some OEMs want to

operate tomorrow, some in the 2030 timeframe. The focus will be on development of repeatable processes for ease of implementation.

From a portfolio management perspective, the FAA outlined a near-term timeline for an operator or partner as they are looking at entry into service, with beginning to end activities. Mr. Raju explained that the Agency will have to tackle all of these pieces, but it is meant as a showcase for details OEMs will need to complete; certification is important but so are other pieces. Mr. Fontaine added that all FAA lines of business have integrated master schedules across each applicant tailored to what they are trying to put into service. The schedules are used monthly to brief the Administrator. The FAA is focusing on service delivery in a public/private partnership.

Mr. Raju provided insight into AAM workstreams, for near-term, mid-term, and mature stages of AAM. Near-term, the FAA is engaging with industry to determine operational needs, researching impacts to air traffic services, tailoring implementation plans to initial OEMs, performing research and engineering to support UAM ConOps maturity, and establishing workstreams for mid- and mature-term operations. Mid-term, the FAA is exploring operational efficiency through strategic employment of modeling and simulation to effectively manage large-scale operations, developing policies and standards based on learned performance, establishing standards and requirements for enablers such as information exchanges, communications/navigations/surveillance and supporting industry development of supplemental services. Long-term, the FAA is performing research and engineering to validate enhancements to separation management, refining policies and standards based on advanced aircraft capabilities, deriving requirements for infrastructure and automation capabilities, and refining the mature-state UAM ConOps, incorporating findings from the Autonomy Working Group (AWG) to integrate autonomous operations. Dr. Hansman asked for more information about what the AWG is supposed to do. Mr. Raju responded that the FAA is formulating the AWG currently, but it will address some of the challenges with automation, requirements from a service approval process, definition of the automation process (e.g., will it be provided by a third party), and to answer R&D questions regarding autonomy.

Mr. Fontaine summarized the approach to Advanced Air Mobility (AAM) into three steps: Step 1 – take a conceptual environment and break it down into future requirements; Step 2 – define any shortfalls; and Step 3 – help develop work plans to close the gaps to support autonomous environments. Dr. Hansman asked whether the Autonomy Working Group (AWG) is an information exchange group or an attempt to gain consensus on the needs or requirements of the environment; Mr. Fontaine stated that it is the latter. Mr. Phil Smith recommended that the FAA make connections to the existing AAM research. Mr. Bertapelle asked about standards work and what groups are addressing AAM (e.g., RTCA). Mr. Fontaine responded that standards work is all over the place and that lots of pieces in different states of maturity are underway. They will need to be organized into a workplan from which decisions can be made and standards work can be completed. Mr. McVenes added that at RTCA, they are starting community workshops to define what may be needed and what standards currently exist that may need to be modified. The intent is not to duplicate efforts with other standards bodies; discussions are ongoing here also. Ms. Yak challenged the Subcommittees and REDAC that as preparations begin for the April meeting season, what does your agenda look like? What is autonomy? What do you need to discuss with FAA researchers? Mr. Ian Redhead agreed with Ms. Yak and added that lots of entities are working on the same AAM challenges and will need the same backdrop.

Regarding slide 9 (Portfolio Management for Each AAM Project), Dr. Hansman asked who will perform the coordination? Mr. Raju responded that for AAM, NextGen is leading the coordination and integration, pulling in the lines of business and/or subject area leads as needed. Dr. Hansman asked what the point of entry is for an OEM to get a "project?" Mr. Fontaine answered that the challenge the Agency is having is that everyone wants to do AAM. There are lots of applicants and it's an economic problem of scarce resources. Dr. Hansman clarified his question and asked if for applicants, is there a group running high cover on the entire spectrum of AAM? Mr. DeCleene clarified that the Emerging Technologies organization does outreach for applicants/pre-applicants who seek AAM approval. It is designed to get early engagement on projects. Dr. Hansman stated that he would like more clarity on the process as it can be confusing from an applicant standpoint.

In summary, Mr. Raju acknowledged that AAM is a wide topic with an array of concepts. The Agency is working to build out a safe AAM ecosystem to keep with the pace of industry – standing ready when industry is ready to operate. Mr. McVenes applauded the FAA for what it is doing and the incredible, collaborative work over the last 12 to 18 months to get ahead on AAM; it is helpful for the industry. Dr. Hansman echoed Mr. McVenes' comments.

Presentation: Subcommittee Report – Airports | **Presenter:** Chris Oswald, *ACI-NA*

Mr. Chris Oswald began the Airports Subcommittee briefing by giving an overview of the agenda and topics discussed during the September 2023 meetings. The Subcommittee focused on the visual guidance portfolio, wildlife hazard mitigation and safety program, among other topics. There is concern about the path forward after Acting Administrator Nolen's safety summit. This will be a richer area going forward. Regarding the Research and Development Program Overview slide, Mr. Oswald communicated that the Subcommittee is supporting funding and staff support on Noise and Environmental programs (but stated that Mr. Redhead's Environment and Energy Subcommittee would report back on this). He also alluded to Airport innovation, including smarter airports, and standards for automated ground vehicles.

The Subcommittee made five observations, including building out Strategic Outlook for Aviation Research (SOAR) charts. Mr. Oswald congratulated the FAA for bringing some of the Subcommittee's observations forward (he specifically referred to ground vehicle automation as this topic has a lot of pressure and interest for airport operators and vendors and there is interest in a roadmap going forward to make this a reality). He also referred to the Aircraft Rescue and Fire Fighting (ARFF) Advisory Group moving forward on fluorine free foam approvals for one product. Two or three more products are expected from DOD; DOD has the lead for approving the products for use and listed on a qualified product list. Mr. Oswald stated they are now in transition and are working to provide guidance back out to Airports on transition plans.

The Subcommittee continues to be impressed with the management and execution of the Unmanned Aircraft Systems (UAS) Detection and Mitigation Systems, with detection systems of considerable interest to Airports. The work will help to answer questions such as what is realistic technology to deploy? There is no final report yet – and no single silver bullet detection technology that will work for all applications.

The Subcommittee also praised the productivity of two affiliated research programs with separate funding streams – the Airport Asphalt Pavement Technology Program (AAPTP) and the

Airport Concrete Pavement Technology Program (ACPTP). Both are managed by the FAA but funded separately. There is an array of projects ongoing.

Mr. Oswald reviewed the Subcommittee's only Finding and Recommendation (F&R) regarding the FAA software tool (ProFAA) for assessing pavement roughness. It addressed the FAA expansion of the ProFAA software modeling framework to accommodate more aircraft types and variable aircraft speed profiles. Dr. John Hansman asked Mr. John Dermody if the recommendation made sense. Mr. Dermody responded that it did. Dr. Hansman asked about safety data mining – and whether there is an opportunity for richer stream of Safety Management System (SMS) data? Mr. Oswald responded that the data is not there yet. Airports are empowered to define within a set of broad constraints how their SMS will function. There is value in defining key metrics to be collected at a national level. Dr. Hansman agreed. Mr. Dermody stated that he met with large air carrier yesterday – and they had similar questions about safety data. Dr. Hansman had no further questions about the Subcommittee report.

Presentation: Subcommittee Report – Human Factors | **Presenter:** Phil Smith, *Ohio State University*

Dr. Phil Smith began the Human Factors Subcommittee briefing by providing an overview of the agenda and topics discussed during the August 2023 hybrid meetings. The focus was on Advanced Air Mobility (AAM) for Human Factors considerations (they received three briefings on the topic). Dr. Smith then reviewed the Subcommittee's five Findings and Recommendations (F&Rs).

The first Finding and Recommendation (F&R) pertained to the urban/Advanced Air Mobility (AAM) research timeline, which the Subcommittee believed may be slower than the pace of industry. Dr. Smith stated that the AAM related research projects should be funded in 2024 or as early as possible to meet the evaluation timelines expected by the OEMs. He emphasized that there is lots of pressure surrounding this topic. Dr. John Hansman emphasized that the REDAC does not tell the FAA that it should spend money specifically on certain research topics but can stress that it is important to move quickly (he applauded the words that Dr. Smith used: "if possible"). The FAA has to deal with funding issues separately.

The second recommendation dealt with competency-based training (CBTA) and assessment timeline. Operator training is changing, and the FAA needs to understand how CBTA is being implemented so it can assess its effectiveness in developing, maintaining, and applying required operational knowledge and skills for all work groups during airline operations. Dr. Smith emphasized that there is an opportunity for greater efficiency and reduced cost with a focus on safety. Data-driven research is needed to provide CBTA guidance to the various organizations involved in training such as operators and OEMs. Dr. Smith emphasized that organizations are moving forward with CBTA with or without guidance. Mr. Chris Oswald stated that he agreed with the recommendation and that it is important to airports on the ground.

The third F&R addressed concerns related to the integration of Artificial Intelligence (AI) and Machine Learning (ML) Human Factors into FAA software to support air traffic control, traffic flow management, technical operations, and other areas. For FY25 and FY26, none of the focus areas included human factors associated with AI/ML. The Subcommittee thought that this was a deficiency. Dr. Smith reported that the best AI/ML Human Factors research done so far is in

healthcare. Research is showing nice potential for technology to improve performance. For example, only 78% time did the radiologist accept the AI conclusion when it was correct; 28% of the time the radiologist accepted the AI conclusion when it was incorrect. Technologies are potentially valuable in FAA software but aren't understood well enough from a Human Factors standpoint to do it well at this point. The recommendation was that the FAA should continue to conduct research necessary to identify how to address human-AI integration through all development phases. Human Factors should have a leading role in guiding the design, evaluation, and use of AI/ML in support of air traffic control, traffic flow management, technical operations, and other potential technical applications (as the AI/ML software is useful but fallible).

The fourth F&R was training and checking program changes due to changing pilot entry-level experience. The Subcommittee voiced concern in the pipeline of pilots, training experience, etc. Entrants have changed and more challenges have appeared in training (due to more automation; how and what should we be training). Dr. Smith stressed that experience and training is critical for pilots to move up so there is a need to ensure it is being done correctly. The recommendation was that the FAA should conduct research to determine the degree to which operators are effectively managing safety threats associated with the lower level of experience for part 121 pilots. Methodology should include measuring entry skills/knowledge, conducting gap analyses, and adjusting training and checking curriculum to close identified gaps. Dr. Smith stressed that the world is changing in terms of people coming into the pipeline. Dr. Hansman thought that the recommendation was good. His question was about the type of experience referred to in the recommendation? In some sense, pilots have more experience now because of the mandatory 1500-hour rule. But the underlying skill is different, e.g., the ability to do math estimation in their head is lower as they've always had a calculator. Dr. Smith clarified that the recommendation was around the point of how a pilot understands the systems (knobs and dials) well enough to deal with an issue.

Dr. Hansman added that the cohort has different skill levels (e.g., they are better at computer games, but weaker in other ways). Dr. Hansman wondered whether these are manifestations of how we intentionally designed the training or is it the changing/emergent backgrounds of pilots. Mr. Joe Bertapelle added a question of how flight training schools adapt for these issues. Dr. Smith referred to a study that showed pilot training to understand the underlying systems is not as good as it could be. It is also a function of the background of the person coming in, which needs to be better understood. Mr. Terry McVenes added that the world of flight has changed, and research is needed to deal with the changes. Mr. Bruce DeCleene asked whether the recommendation implies that level of experience for 121 pilots has moved. Is the Subcommittee addressing the demographic of 121 pilots? Or to the different experience or the lower experience? Dr. Hansman recommended that the Subcommittee take away the words "lower level" from the recommendation. The issue is a combination of changes in the incoming population, changes in training systems themselves, and potentially changes in the expectations of the trainers. Dr. Smith agreed that the Subcommittee would further refine the fourth F&R.

The fifth and final F&R dealt with the AVS strategic research thrust and that Human Factors should be included explicitly. The AVS research strategy implementation plan should include Human Factors and identify its alignment with currently funded Human Factors research and the proposed research for funding for FY24 and FY25. The Subcommittee thought there was good

research being done on Artificial/Machine Learning (AI/ML) on Traffic Flow Management and Technical Operations. However, what is the decision problem being dealt with? What are the information requirements? And what is the contribution that ML/AI can make to deal with the decision? Dr. Hansman agreed that Human Factors must be factored into the entire project from beginning to end; this is an ongoing problem. The strategy of putting in a Human Factors bullet does not work. Human Factors should be embedded into the decision-making process for all these activities. He believes that the FAA Human Factors concept is too broad and too general. Dr. Hansman further stated that the FAA should work on human factors issues that are matched to those safety critical systems due to limited research budgets. Mr. Bruce DeCleene added that there was a rich discussion in the Subcommittee; from a safety standpoint, he emphasized that the Agency is very attentive to Human Factors issues and it is a priority. The challenge is to ensure that Human Factors is integrated into the rest of the activities that need to occur.

Dr. Smith disagreed and emphasized that the FAA focus should be what is the problem to be solved and how can technology help to solve that problem. Human Factors should be woven into the process earlier and the FAA needs to accomplish its priorities in way that embraces Human Factors. Mr. DeCleene asked Dr. Smith how he sees this manifesting and how can a separate Human Factors thrust help address that need? Dr. Smith replied that the Agency should ask how these technologies can support the type of decision making needed for Air Traffic Flow Management. Then, look for generalizations (what needs, or decision processes are involved); that is fundamental Human Factors research. Dr. Hansman stated that he does not know what a Human Factors "thrust" is. He would like the recommendation to make a broader statement to include Human Factors in all of the FAA research "thrusts." The FAA will not execute on a generic Human Factors research portfolio as it would not get through the priority stack/will not achieve the objective. Mr. Terry McVenes equated it to the design and certification process; it is not ideal to hand a design over to Human Factors people and say is it good enough? The priority should be to have Human Factors integrated into the entire process. Ms. Shelley Yak stated that this conversation has come up several times. There is a Human Factors Subcommittee – it is that important. It is embedded in all the FAA strategic thrusts (Environmental, Airports, etc.), the domain messaging, and in the Subcommittee work. It doesn't need to be a line item in everything.

Dr. Smith said that the good news is that all have the same goal – to successfully achieve Human Factors within the goals. His perception is that it is often the case that Human Factors is not represented at the appropriate stages. Dr. Hansman clarified that this should be in the recommendations; look for mechanisms to incorporate human factors appropriately; it is a more systemic and subtle issue that has been around for a long time. Dr. Hansman thanked Dr. Smith (and Dr. Holder) for the F&Rs and thought it was the best Human Factors report in some time.

Presentation: Subcommittee Report – Aircraft Safety (SAS) | **Presenter:** Terry McVenes, *RTCA*

Mr. Terry McVenes started the discussion by stating that Mr. Chris Dyer, Pratt & Whitney, is his proposed replacement to chair the SAS Subcommittee. He briefed the Full REDAC Committee on the SAS Subcommittee hybrid meetings held in August 2023 at the William J. Hughes Technical Center.

During the August meetings, the Subcommittee received a briefing on the impact of spectrum on avionics system. The bulk of the day taken up by a series of briefings requested by the SAS members and was a cross-section of topics on the minds of the SAS members. During the second day, SAS received a briefing from the FAA Artificial Intelligence Chief Scientist (Dr. Pham) on the Artificial Intelligence/Machine Learning (AI/ML) Roadmap. He requested a briefing on the use of wearables (Crowley/Mangie) to focus on the Finding & Recommendation and the safety case. SAS also received a briefing on the FAA research portfolio and the strategic thrusts from Mr. Bruce DeCleene.

There were three SAS general observations (Strategic Research Planning, AI/ML, Wearable Sensors and Aircraft Automation Technology) and three F&Rs (Cyber Resiliency for Digital Safety Systems, Reduced Crew Operation, and Detection of Bleed Air Contaminants). Mr. DeCleene's presentation on strategic research planning was very well-received and the Subcommittee supports evolution of the strategic thrusts. Dr. John Hansman asked Mr. DeCleene to explain how the strategic thrust strategy will be implemented and used. Mr. DeCleene said that the Agency wants a longer-term focus on where research is going. For example, strategic priorities within Aviation Safety will inform yearly priorities. The intent is to identify a set of priorities to move the needle on. Mr. DeCleene referred to the good engagement in SAS and in the Human Factors Subcommittees on this topic. The plan is to complete v1 of the Strategic Research Plan by end of 2023 and it will be updated annually. Ms. Shelley Yak also mentioned that the effort cuts across all the lines of business and the plan is to integrate, align, and synchronize with other lines of business.

Mr. McVenes stated that the Subcommittee on Aircraft Safety (SAS) appreciates work the FAA has done as follow-up to the previous Artificial Intelligence/Machine Learning (AI/ML) Findings and Recommendations (F&Rs). The Roadmap for AI Safety Assurance Workshop took place with industry a few weeks ago. It received good feedback and the ability for industry to comment on the FAA roadmap was great. Regarding wearable sensors and aircraft automation technology, Mr. McVenes communicated that the Subcommittee concluded that SAS would not submit this as an F&R at this time. The topic has potential to have an impact on safety down the road (e.g., with pilot shortages, getting pilots back into the cockpit sooner, etc.). Mr. McVenes stated that there is industry work ongoing and the FAA should continue to watch this from a certification standpoint. Dr. Phil Smith mentioned that Human Factors has also considered wearable sensors and aircraft automation technology, and also recommended that the Agency watch this area.

Ms. Yak asked where this topic would go on a SOAR chart (would it be 6-10 years out)? Mr. McVenes answered that it depends on the industry use case but that researchers need to start learning what is going on in that area of technology now. Mr. Joe Bertapelle asked for clarification on what constitutes wearable technologies? Dr. Hansman said it could be an Apple Watch or another type of sensor. Dr. Hansman asked whether there was funding to send researchers to a conference to learn about emerging topics like this. Ms. Yak replied yes. Dr. Hansman further questioned that if there is an emergent technology that the Agency wishes to monitor, whose job is it to learn about them? Ms. Yak clarified that the go-forward process would be to highlight emergent areas at the REDAC, SOAR charts with REDAC input would be updated, and then the FAA would send personnel to learn more about these emerging areas. Mr. Mike Paglione echoed Ms. Yak's approach. His team works closely with the FAA Chief

Scientist and often goes to conferences with them (lead researchers and other team members). This is why it is important to lay out the vision for the strategic research areas and then prioritize efforts accordingly.

The first SAS Finding addressed Cyber Resiliency for Digital Safety Systems, which was an F&R first made in the Spring meeting where SAS reviewed funding allocations. The FAA responded that no RE&D funded research was required since the recommendation is already being or will be addressed by the FAA's Program Management Office. Therefore, SAS decided they needed more info on the FAA's plan for cyber resiliency as there is lots of activity going on in this area already. Mr. McVenes said that SAS requests an FAA briefing on the topic during the next Subcommittee meeting.

Mr. McVenes then covered the second Finding related to Reduced Crew Operations, a topic being explored by aircraft manufacturers, avionics manufacturers, and airlines. SAS acknowledged that there is not a lot of scientific research on this currently and that there is a gap in current knowledge dealing with fatigue management and flight time limitations with crew complements different than those currently used in airline operations. Dr. Hansman asked whether this is defined by crew operations. Mr. McVenes replied that it is the whole gamut (single pilot to reduced crews in cruise flight, crew rest, etc.). He also stated that while it was not the FAA's responsibility to look at the mature science behind some of these, it was important for the Agency to be ready for new technologies that will support it. Therefore, the SAS second recommendation was that the FAA assess the potential applications of Extended Minimum Crew Operations (eMCO) to aviation operations and safety. Dr. Hansman asked a clarifying question regarding part 121 operations minimum crew duty times: are they defined in the operating approval or in regulation? Mr. McVenes replied that they are defined in regulation. A change in minimum crew would require a change in regulation, but there is controversy here. Dr. Hansman asked what are the research issues that could/should be addressed? He recommended that the area be watched – what are the means of compliance? What would the research plan and roadmap look like? What concept of operations (ConOps) would be needed to evaluate the issues and understand? Mr. McVenes thought these were good questions and further asked if the FAA has enough knowledge today to know the means of compliance? How will the FAA prepare for it? What are the likely applications for this?

Mr. DeCleene clarified that this problem set is not a priority for his organization; it is up to industry to decide what they want to do and for the Agency to be prepared. This would require a petition for exemption – and an explanation of why this would work. It is a similar yet different set of questions – from a safety standpoint, highest level of safety in crew operations is a well-trained two-person crew. Mr. DeCleene asked how the FAA achieves the safety value of that operation in a single pilot application? He is interested in how automation can improve safety – a strategic thrust. There will be more to share as concepts mature.

The third Finding discussed the detection of bleed air contaminants (an ongoing issue with a lot of work under way). Mr. McVenes communicated that research is required to determine a correlation between exposure to cabin air, beyond engine bleed air, and reported illnesses in well-maintained aircraft. The current FAA Reauthorization Act addresses this. The third recommendation was to build on previous work that identified chemical compounds and substances present in engine bleed air to include additional constituents. Research to correlate cabin air to illness is needed (and not just bleed air, but all cabin air). Currently, there is not a lot

of research to support standards development. Dr. Hansman agreed that this topic comes up a lot. He wondered about when the transition to sustainable aviation fuel (SAF) occurs, what happens then?

Mr. McVenes concluded his remarks. by stating that the next SAS Subcommittee meeting will be in March 2024 in the Washington, DC area.

Presentation: Subcommittee Report – Environment and Energy | Presenter: Mr. Ian Redhead, Deputy Director, *Operations and Maintenance/COO, Kansas City International Airport*

Mr. Ian Redhead briefed the Full REDAC Committee on the Environment and Energy Subcommittee meetings held in September 2023. He also mentioned that Airbus reported that it is designing aircraft for 100% sustainable aviation fuel (SAF). Additionally, Mr. Redhead reported that Airbus has never been invited to participate as a member of the REDAC. Dr. John Hansman said they would cross check that.

Mr. Redhead mentioned that they lost an industry icon from Subcommittee with the retirement of the Cargo Air subject matter expert. He made a great contribution to REDAC and aviation in general. Within six months, the Subcommittee lost key members (executives, Chief Scientist, and department heads). He noted that this is not sustainable long term. Additionally, the Subcommittee is attempting to recapture a Chair position at the International Civil Aviation Organization (ICAO) that was lost due to attrition. Mr. Redhead stated that the Subcommittee is happy with work being done at the FAA; although they are understaffed, they continue to produce high-quality work. Mr. Laurence Wildgoose, Assistant Administrator for Policy, International Affairs and Environment, attended the Subcommittee meetings in September and reinforced FAA support for the REDAC. The Subcommittee presented six findings and recommendations (F&Rs) to the FAA.

The first Finding and Recommendation (F&R) was Subcommittee agreement for the mandate proposed by the current Administration that the work on Sustainable Aviation Fuels (SAF) is a critical component for the reduction of aviation sector emissions. Mr. Redhead urged the Agency to maintain the work to ensure it is completed.

Mr. Redhead presented the second F&R which endorsed public private partnerships (such as the Continuous Lower Energy, Emissions, and Noise (CLEEN) program, the Commercial Aviation Alternative Fuels Initiative (CAAFI), and the Center of Excellence for Alternative Jet Fuels and Environment (ASCENT)) to leverage resources. He urged the FAA to continue to allocate robust funding for these programs. This recommendation has come up before and is yet needed.

The third Finding and Recommendation (F&R) was to continue strong support of all research efforts/programs that allow the FAA and the U.S. to maintain its current leadership position at the ICAO Committee on Aviation Environmental Protection (CAEP). Mr. Redhead stated that leadership at this organization will contribute towards rule making backed by science.

Mr. Redhead presented the fourth F&R which was strong support for the prioritization of noise research that will support informed decision-making, the introduction of new entrants into the NAS, and enable NextGen deployment. He stated that F&R opinion mirrored AICA's public comment on the Aviation Environmental Design Tool (AEDT). He also referred to aircraft

configuration as an interesting point brought up by AICA and there may be a need to look at this further.

The fifth F&R identified staffing concerns – especially for key staff. The Subcommittee strongly recommends that the FAA carefully examine the workload on its current staff and act quickly to ensure that it has sufficient staff to support additional priorities and projects added to the portfolio. Mr. Redhead mentioned that while there is an offer out for the Chief Scientist, many executives and subject matter experts have left the Agency. This causes an increased demand on people to fill multiple roles at the same time, ultimately resulting in burnout.

The sixth and final F&R identified continued issues with awarding grants; the topic has been on the Subcommittee list for the last three meetings. Mr. Redhead stated that there are still challenges on the grant approval process (and the timely awarding of grants). It is a significant concern.

Dr. John Hansman stated that the REDAC does not make recommendations about management, but that it is worthwhile to highlight the issues related to workload as an example. Mr. Wildgoose addressed the Full REDAC Committee and reasserted his focus, his team's focus, the Acting Administrator, and the DOT Secretary to continue the conversation. While Mr. Redhead had mentioned that an offer was extended for the Chief Scientist, Mr. Wildgoose reported that the offer was accepted in the last few days. He stated that the REDAC should be pleased with the selection. He also announced that Ms. Julie Marks has been accepted by ICAO CAEP to be the U.S. Representative. Mr. Wildgoose ended his remarks by stressing that the FAA does not want to lose a step on these initiatives. Additionally, it is anticipated that the new FAA Administrator would be forthcoming shortly. The tenure of the Acting Administrator was completed as of October 25th. The FAA is also hoping for a full year of appropriations as quickly as possible. The Agency is working with its Congressional partners to enact a long-term FAA Reauthorization Bill.

Presentation: Subcommittee Report – NAS Operations | **Presenter:** Dr. James Kuchar, *MIT-Lincoln Laboratories*

Dr. James Kuchar began the NAS Operations Subcommittee briefing by providing an overview of the agenda and topics discussed during the August 2023 hybrid meetings. A variety of usual and new topics were covered. He mentioned two programs that had been discontinued: the Wake Recategorization Program (funding was zeroed out next year) and the Weather Technology in the Cockpit (WTIC) Program have been discontinued. The Subcommittee also received informational briefings on Innovate 28, Joby Aviation's vision for Advanced Air Mobility (AAM), AAM R&D needs from General Aviation Manufacturers Association (GAMA), and a NASA update. The Subcommittee had two observations. Dr. Kuchar mentioned that they were happy to see the Innovate 28 framework to provide context for FAA and industry engagement and that it looks forward to seeing how it will mature over time. Additionally, the Subcommittee looks forward to learning more about the Strategic Outlook for Aviation Research (SOAR) as an overarching view of the FAA portfolio seems to be missing (the Subcommittee would like to see budget line items (BLIs) represented in a different way). The Subcommittee had five Findings and Recommendations (F&Rs).

Dr. Kuchar presented the first F&R regarding Airport Surface Safety Human Factors. Recent runway incursions are concerning, and a larger set of Human Factors issues should be examined. Research should examine Human-Factors-related causes and potential mitigations for runway incursions, wrong surface approach alignments, and related incidents during takeoff and landing operations.

The second Finding also related to Airport Surface safety. Dr. Kuchar said that larger airports are not complete in terms of mitigations that may be deployed at other small and medium-sized airports. The Subcommittee recommendation was to maintain a longer-term research roadmap laying out the landscape of runway incursion and surface safety and to reevaluate considerations for larger airports.

Dr. Kuchar presented the third finding which dealt with the limits of Visual Flight Rule (VFR) operations under AAM concepts. He recommended that the FAA look at scalability of VFR operations for AAM, including capacity guidelines and changing separation standards. The Subcommittee questioned whether and how AAM operations will start interfering with current operations. Therefore, the third recommendation was that the FAA conduct research to determine limitations on achievable, conventional VFR operations as the number and complexity of VFR AAM aircraft operations increases and to identify mitigations that could extend the scope of VFR operations for AAM. Dr. John Hansman questioned whether the hypothesis is that the rules must change or is it a Joby problem? Today, VFR operates as if an aircraft cannot be accommodated, it has to hold outside the airspace (reliability issue). Dr. Hansman is skeptical that the traffic will be overly busy, and he would guess that it can be handled the way helicopter traffic is handled today. He is not convinced that this is an FAA problem; the applicant is responsible for proposing alternative procedures or workarounds for how they plan to operate. Mr. Terry McVenes commented that in both NASA and FAA work is a call for digital flight operations – it's not VFR or IFR but something else based on the capability of the aircraft. NASA has been working on this for 10 to 15 years. It is referenced in both FAA and NASA's work. Mr. Joe Bertapelle stated that he is not sure he agrees that it is a Joby problem if the demand is there. Dr. Hansman replied that the demand is not there. Mr. Bertapelle answered that, if and when the demand comes, the FAA would need an answer. Dr. Hansman stated that it is good to know limitations of VFR but thinks that it will take long enough for the demand to come up as there will not be 10,000 Advanced Air Mobility (AAMs) vehicles flying. Joby has only produced one to two aircraft so far. The trickier thing, in Dr. Hansman's opinion, is Instrument Flight Rules (IFR); when visibility starts going down, issues will begin.

The fourth finding was related to Wake risks under AAM concepts, which was prompted by the Joby discussions. AAM wakes at low altitude, coupled with novel aircraft performance characteristics and flight profiles, may require new approaches to defining wake separation criteria for AAM operations. The recommendation was that Wake programs begin research to understand how wakes might affect electric Vertical Takeoff and Landing (eVTOL) aircraft transiting across the runway, approach, and departure environments during intervals between conventional takeoff and landing operations. Dr. Hansman asked that the Subcommittee clarify the level of precision for this recommendation as it is an interesting thought, but concerns are whether resource investments should occur now. Joby is talking about this but there is no research area for it yet – wake analysis/separations is fine. It needs to be a generic AAM issue. What level of specificity is needed? What ConOps are there – is it a new type of crossing

exposure? Dr. Hansman asked the Subcommittee to elevate this to an observation instead of a recommendation or take Joby out and keep the recommendation. Additionally, Dr. Hansman thought that the 2nd bullet of the recommendation was too detailed (e.g., decay modeling). Dr. Kuchar stated that the Subcommittee will make the changes to the recommendation.

The fifth and final F&R connects to Dr. Phil Smith's discussion on Human Factors with a move towards a more automated NAS. There are several challenges that deserve attention and research. The Subcommittee would like to see a connected roadmap of Human Factors research with transition to a more autonomous NAS/AAM. This will be coordinated with the Human Factors Subcommittee. Dr. Kuchar summarized that there are lots of pieces of Human Factors research, but they are not seeing how they are connected. Dr. Kuchar stated that the next NAS Ops meeting would be in March 2024. He requested an updated UAS/AAM Integration Research Plan (if/when updated beyond the March 2022 version).

Presentation: Committee Closing Discussion: Meta Topics, Findings and Recommendations, Future Actions, and Chairperson's Closing Remarks | **Presenter:** Dr. John Hansman and Committee Members

In the general discussion of Findings, Recommendations, and global topics, Dr. John Hansman suggested synthesizing the emergent points made in the meeting (not the details) for the REDAC Findings and Recommendation (F&R) letter to the FAA Administrator.

Dr. Hansman noted that there was general, positive support for the FAA's Innovate 28 approach. Dr. Phil Smith recommended adding planned industry and academic outreach to the Innovate 28 initiatives. Dr. Hansman is not sure there is something to be said at the meta level about Human Factors unless its importance is considered in research roadmaps/cross-cutting areas at appropriate stages. Dr. Phil Smith stated that Human Factors is not represented in those high levels explicitly. Ms. Shelley Yak recommended stating that Human Factors is a cross-cutting area impacting all areas of FAA research. Dr. Hansman stated that it is really important to consider Human Factors systematically through a concept of operations (ConOps) for the research. For example, weather is cross-cutting, but Human Factors is not the same. Dr. Hansman wants to get Human Factors on the table for consideration since it comes up as a topic so often. Mr. Joe Bertapelle emphasized the importance of including Human Factors in the letter with the correct wording. It is important to raise fundamental issues of the human/machine system interactions as humans are involved in critical roles (especially for safety). Human Factors should be considered early in the design, not after the design. Mr. Bruce DeCleene asked the Committee if this something the Full REDAC Committee sees the FAA *not* doing now, or is this considered a strength and something the Committee wants to continue? Dr. Jim Kuchar emphasized a need for a Human Factors architect across the whole ConOps, with coordinated and not piece-meal research.

Dr. Hansman mentioned that the last point he had on his list was ANG-1 comments regarding what comes after NextGen; there is an opportunity to consider what the research strategy is for future initiatives. It is to enhance system safety as it changes with new entrants while addressing sustainability and environmental considerations. Mr. Joe Bertapelle added that he would include more rapid deployments of new technologies. Things have slowed down a bit, but now Advanced Air Mobility (AAM) is coming in at lower altitudes. How do you stay agile to adapt and introduce new concepts into the system? It was suggested to add these points to the

comments about Innovate 28. Research is needed so that the FAA can be informed to deal with the applicants and be prepared for what operational ideas they will bring to the table.

Mr. Terry McVenes (Subcommittee on Aircraft Safety – SAS) concluded the Full REDAC Committee meeting by thanking them for the help and guidance he received. He commented that not everything he does as a president of RTCA is fun, but serving on the REDAC for five years was. It was great working with his Subcommittee, the Subcommitee Chairs, the great leadership of Ms. Yak and Dr. Hansman, and with the help of Ms. Chinita Roundtree-Coleman. Mr. Mike Paglione and Mr. Mark Orr also thanked Mr. McVenes for his time and efforts on the REDAC.

Ms. Yak and Dr. Hansman concluded the meeting and thanked the Committee members for their participation.

Action Items for Follow Up:

Action Item	*Person Responsible*	*Date (if applicable)*
Schedule an FAA briefing on what development activities funded or planned may address the various Subcommittee questions listed in the original F&R.	Chris Dyer	Spring 2024 REDAC SAS Subcommittee meetings.
Receive an updated UAS/AAM Integration Research Plan (if/when updated beyond the March 2022 version).	Jim Kuchar	March 2024 REDAC NAS Ops Subcommittee meetings.

HYBRID SESSION
FAA Headquarters/Zoom
October 4, 2023
Final Agenda

FAA HQ (FOB 10A)
MacCracken/Huerta Collaboration Center, 10th Floor

Time	Topic	Presenter(s)
10:00 AM	Welcome Address and Opening Remarks	John Hansman Shelley Yak
10:15 AM	Welcome Address – FAA Assistant Administrator for NextGen	Paul Fontaine
10:30 AM	Public Forum Comments	Public Participants
10:45 AM	Integrating Advanced Air Mobility in the NAS – Innovate 28 and Autonomy	Praveen Raju Noureddin Ghazavi
12:00 PM	*LUNCH*	
1:00 PM	Subcommittee Report – Human Factors	Barbara Holder
1:30 PM	Subcommittee Report – Aircraft Safety	Terry McVenes
2:00 PM	Subcommittee Report – Airports	Chris Oswald
2:30 PM	Subcommittee Report – Environment and Energy	Ian Redhead
3:00 PM	Subcommittee Report – NAS Operations	James Kuchar
3:30 PM	Committee Closing Discussion - Meta Topics - Findings and Recommendations - Future Actions	John Hansman FULL Committee
4:30 PM	Chairperson's Closing Remarks	John Hansman
5:00 PM	Adjournment	

List of Attendees

First Name, Last Name	Affiliation
Okoineme Giwa-Agbomeirele	FAA
Beth Arnz	Changeis
Ludovic Aron	EASA
Rany Azzi *(virtual)*	FAA
Jodi Baker *(virtual)*	FAA
Joseph Bertapelle	JB Consulting
Tennille Blackwell	FAA
Steve Bradford	FAA
Nancy Clarke	Changeis
Chinita Roundtree-Coleman	FAA
Mel Davis *(virtual)*	NATCA
Bruce DeCleene	FAA
John Dermody	FAA
Colleen Donovan	FAA
Chris Dyer	Pratt & Whitney
Hossein Eghbali *(virtual)*	FAA
Jorge Fernandez *(virtual)*	FAA
Jaime Figueroa	FigAero Consulting
Murphy Flynn *(virtual)*	FAA
Paul Fontaine	FAA
Tara Holmes Gibson *(virtual)*	FAA
Fabio Grandi	FAA
Mark Hale	Diakon Solutions
John Hansman	Massachusetts Institute of Technology (MIT)
Julie Holmes	FAA
Paul Jaramilla (*virtual*)	FAA
Bill Kaliardos	FAA
Dominique Khan	Avyance
Brittney Kohler	NLC
Jim Kuchar	MIT Lincoln Laboratory
James Layton *(virtual)*	FAA
Muhareem Mane *(virtual)*	FAA
Julie Marks	FAA
Stacey Zinke-McKee *(virtual)*	FAA
Terry McVenes	RTCA
Monique Moore	FAA
Eric Neiderman	FAA
Mark Orr *(virtual)*	FAA
Chris Oswald	ACI-NA
Mike Paglione *(virtual)*	FAA
Alexandra Papantoniou (*virtual*)	FAA
Praveen Raju	FAA
Ian Redhead *(virtual)*	KCMO

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