# **Research. Engineering and Development Advisory Committee (REDAC) MINUTES**

**Meeting Date and Time:** 07/09/20 – 9:00 AM – 2:00PM **Meeting Location: VIRTUAL** 

Purpose	REDAC Recommendations on the FY 2022 Research and Development Portfolio
Facilitator	Dr. John Hansman, <b>REDAC Chairman , MIT</b> Ms. Shelley Yak, <b>FAA WJHTC Director and Research and Development</b> <b>Executive Director</b>
Note Taker	Latasha Monique Reddick

Presentation: Welcome and Opening Remarks Presenter(s): Dr. John Hansman, *REDAC Chair*, Ms. Shelley Yak, *WJHTC Director* 

The Full REDAC meeting was conducted virtually on this day in adherence to remote distancing guidance as a result of the COVID-19 pandemic. Dr. John Hansman acknowledged and welcomed the REDAC members, presenters and observers. Director Shelley Yak read the Public Announcement that was posted in the Federal Register to officially initiate the day's events.

**Presentation:** FAA Administrator Address/NextGen Perspectives **Presenter:** Ms. Pamela Whitley, *Acting Assistant Administrator for NextGen, ANG-1* 

# **Discussion:**

Ms. Whitley thanked the REDAC for their dedication and diligence in providing advice through recommendations in support and improvements of the FAA's Research and Development portfolio. In response to Dr. Hansman's inquiry regarding opportunities, needs or NextGen issues because of COVID-19, she addressed the scope of the various impacts felt agency-wide. She indicated her awareness of the continued discussions regarding access to FAA facilities, changes in program schedules and operations. The FAA is very aware of the need to ensure safeguards for the flying public in support of the restoration requirements for air travel.

**Presentation:** Human Factors – Automation Interactions **Presenter:** Dr. Kathy Abbott, *Chief Scientist and Technical Advisor, Flight Deck Human Factors* 

#### **Discussion:**

Dr. Kathy Abbott, CSTA - Human Factors, provided a briefing on the Human Factors (HF) and Automation Interaction. She emphasized the important themes during this briefing that reinforced: 1. Resurgence of interest in HF and automated/systems/autonomy; 2. The need for a more nuanced view of "automation"; 3. Complexity as a factor; 4. Need to address challenges and emerging issues, and 5. Broad, integrated perspective needed – design, training, operations, maintenance, regulatory, etc. She stated that the FAA has a variety of research needs that are different from the private sector. One being a need for HF research and researchers, and another is the need for access to research to performers.

Dr. Abbott discussed how things are changing for pilots. Some of the changes are simpler, some are more complex, some add additional tasks for the pilot, and some have more use of automated systems. She stated that automation is not the same as autonomous. She emphasized that there is a need more a more nuanced view of "automation." The greatest growth in automation of information-related tasks; such as, moving map displays, alerting systems and different controlled automation.

She spoke about complexity being more of an issue than automation. She commented that the FAA started using different methods and certification. She indicated that the FAA should limit thinking to automated systems but look at how it makes things challenging for the people that have to use the systems. She explained the difficulties of giving an overabundance of information and the frequent changes for pilots and air traffic controllers (ATCs) which causes fatigue and may result in people ignoring the changes.

Dr. Abbott discussed current and emerging issues; which included pilot error, managing information in the flight deck, regulatory issues – who is responsible for the safety of flight, failure of any system which can have consequences, and safety culture – managing safety systems. She noted that more attention is starting to be paid to pilots and controllers mitigating risks on a regular and ongoing basis. She mentioned National Aeronautics and Space Administration's (NASA) research on the amount of information in the flight deck to pilots and how it is displayed. In illustrating this point, she displayed an image of a DC10 flight deck (older model) and a MD11 (newer model). Although the DC10 looked as though it had more information due to the layout, the MD11 had more than twice as much information with a much more user-friendly layout.

Dr. Abbott discussed the responsibility and liability of the pilot and/or engineer/company. She stated that the pilot is responsible for the safety of the flight. Liability is not FAA's concern, but the responsibility is. She addressed the challenges with infrastructure being able to support the automated systems autonomy and providing detailed mapping data that can be accessed quickly and accurately. She noted that change management is another challenge; how to look for risks related to change is critical, and what methods, tools, and data that can be used.

Dr. Abbott discussed the issues with autonomy. She stated that autonomy does not get rid of humans, it only changes their roles. As machine intelligence advances, the need for better human

interfaces increases. It takes more staff to control an Unmanned Aircraft System than a manned aircraft system. She relayed the three myths of autonomy. The first being the myth of replacement. It is not a simple one-to-one replacement. Dr. Abbott's example, "if a function is automated in a flight deck, the pilot will have to monitor that function fails, and must also be prepared to perform the contingency situation if the function which means more roles for the pilot." The second is the myth of linear progress, and the third is the myth that autonomy is the highest level of technology.

Dr. Abbott discussed where to put risk mitigation, design engineer or the pilot. She displayed a continuum chart which illustrated if you put it in the hands of the pilot, there will be more human error, but the human has the ability to adjust and make changes.

#### **Questions and Comments**

Dr. John Hansman asked Dr. Abbott whether she was able to get people; if so, what are their roles? Dr. Abbott indicated that they have eight slots to fill with over a thousand applicants. Their roles will be defining policy and flight test, not in the research itself. They will not be hiring researchers.

#### Presentation: NASA Update

#### Presenter: Mr. Ed Waggoner, NASA Deputy Associate Administrator for Aeronautics Programs

#### **Discussion:**

Mr. Ed Waggoner, NASA Deputy Associate Administrator for Aeronautics Programs, briefed the Full REDAC on the NASA Aeronautics fiscal year (FY) 2021 Congressional Budget. He discussed NASA Aeronautics priorities for FY 2020 and 2021, and the need to successfully complete and communicate the benefits on the Air Traffic Management (ATM) Technology Demonstration Project, Advanced Composites Project, Unmanned Aircraft Systems (UAS), and UAS integration into the NAS Project. He stated that NASA is focusing on advance technology with progressive partnerships.

He discussed a few strategies for NASA Aeronautics research. He stated that there is a thesis written for each strategy. He noted that key commitments are monitored at the headquarters level and having an understanding of risk mitigations and awareness of when to intervene is critical to program efficiency and execution. He emphasized and highlighted three of the strategies: 1. Safe, efficient growth in global operations, this strategy captures the requirement to enable diverse new aviation business models; 2. Ultra-efficient subsonic transports, this strategy consolidates alternative propulsion with subsonic vehicles to reflect integration focus, and 3. Safe, quiet and affordable vertical lift air vehicles, this strategy captures community opportunities and requirements in new missions and markets.

Mr. Waggoner discussed global challenges that NASA is facing. One of those challenges is the new era of supersonic air travel that will further connect the world and establish a new market segment for the United States industry. Some of the other challenges he mentioned were: 1. A new design for the supersonic vehicles; 2. The increasing pressures from air travel and ensuring there is a market

place to support the global travel which is predicted to double in twenty years; 3. The erosion of Boeing's market share due to new market share coming from China and Russia, and 4. The need for "deep pockets" that the United States does not have to launch new products.

Mr. Waggoner discussed NASA's approach to some of these challenges. One of which is the new era of innovation that is emerging for long haul aviation. Mr. Waggoner stated that NASA is finishing some work with UAS flying in the NAS which has been highly successful and has a lot of private sector investments. He talked about Low Boom Flight Demonstration Mission which focus on enabling commercial supersonic flight, and ensures that data reduction techniques are not biased, understanding issues with community noise, and that the third phase of the mission was to gather and analyze a lot of data that will be shared with FAA and other stakeholders to determine whether a new standard can be adopted. He also mentioned that Supersonic is okay over water, but not okay over land due to the issue with noise.

He discussed another challenge, the Subsonic Transport Airplane market. There are four key Subsonic transport technologies: 1. Electrified aircraft propulsion for improved efficiency/emissions; 2. Small core gas turbine to increase gas turbine efficiency; 3. Transonic trussbraced wing to increase aerodynamic and structural efficiency, and 4. High rate composite which is critical to US competitiveness because it reduces time/cost to market with increased performance. He stated that the global competition and environmental pressures are expanding, partly due to a lot of international competition. NASA is working to minimize those international environmental concerns and pressures. Mr. Waggoner displayed a graph to illustrate how Boeing, which was once a leading competitor, is losing its edge and its leadership is at risk. He also discussed another challenge, a new campaign advocating for people not to travel by airplane.

Mr. Waggoner spoke about Urban Air Mobility (UAM) and the community integration within the UAM vision and framework. He discussed the Advanced Air Mobility (AAM) framework and barriers by displaying a chart which demonstrated density levels through a series of partnerships between now and the next decade from a vehicle and air space management point of view. He also discussed NASA's collaborative efforts with FAA on the Airspace Technology Demonstration 2 (ATD-2). The research needed severe weather and dense traffic. Due to COVID-19, was unable to produce the dense traffic.

He discussed UAS Traffic Management (UTM) technical capabilities level (TCL) progression that he stated was highly successful. Beginning with a UTM convention in 2015, NASA has completed a series of UTM TCL demonstrations which he demonstrated via a chart illustrating the four phases, TCL 1 – TCL 4 which were completed in Reno, NV and Corpus Christi, TX. Last year, TCL 5 was completed. This work will be leveraged out as part of the advance mobility effort. He also spoke about Hypersonic Technology and the key role that NASA has played in the development of hypersonic programs. NASA has a lot of expertise and capabilities in hypersonic and has had a robust budget of over 30 billion. Mr. Waggoner stated that NASA is looking to cast a wide net for partnerships (old and new), in order to energize the U.S. aeronautics innovation pipeline.

# **Questions and Comments**

Mr. Rany Azzi, FAA, asked whether reports were generated and are they accessible? Mr. Waggoner replied, "Yes, and they are available." Mr. Waggoner stated that he will point Mr. Azzi in the right direction on how to get access.

Dr. Hansman stated that he would like to receive some of the NASA/FAA executive committee reports.

Mr. Chris Oswald gave praise to Mr. Ed Waggoner for NASA's efforts.

Ms. Colleen Donovan, FAA AVS, commented that we have underinvested in the Human Factors' integration, and the frequent hiring of people with minimal knowledge of human factors. Dr. Hansman concurred with Ms. Donovan that there is a need for continued human factors expertise.

Presentation: COVID-19 Impact on FAA Research Programs

**Presenters:** Melchor Antunano, *FAA CAMI*; Michel Hovan, *FAA Airports*; Patricia Hiatt, *FAA Airports*; James Hileman, *FAA Office of Environment and Energy*; Mark Orr, *FAA Office of Aviation Safety*; Mike Paglione, *FAA Research and Development*; Vaughn Yates, *FAA NAS Lifecycle Planning* 

#### **Discussion:**

There was a panel discussion addressing the COVID -19 impact on FAA research programs. The discussion was moderated by Mr. Eric Neiderman, ANG-E4. He emphasized that safety, health and well-being were paramount considerations for the Agency during the pandemic. The objective was to have a preliminary dialogue on R&D programs and possible impacts due to COVID-19. Mr. Neiderman stated that he is getting a better idea of what the impacts are at this time. The William J. Hughes Technical Center (WJHTC) is yet in Phase Zero. He discussed the R&D domain groups. He noted that the AVSTEM program has gone completely virtual, which has allowed for a broader reach than in person, it supports virtual science day and other activities.

Ms. Patricia Hiatt and Mr. Michel Hovan represented the FAA Airports organizational perspectives. Ms. Hiatt also acknowledged the REDAC members for their professional insights in support of the Airports domain. Mr. Michel Hovan provided a COVID-19 update to REDAC. He stated that everything that is lab related where a physical presence is needed, is on hold. Pavement testing is on hold. The new Aircraft Rescue and Firefighting (ARFF) facility is on pause. He informed the group that he is using announcements to obtain ARFF candidates. He indicated that work did not stop 100%. The reopening plan will be a phased approach where a limited number of people, only those who need to be there, will return. People who do not need to be at work on site will continue to telework. Seventy percent (70%) of the people are able to telework with no problem, while thirty percent (30%) are lab related. Although there has been an impact, it has been limited. He shared that the employees in his organization are handling the circumstances well. Mr. Chris Oswald thanked him for his efforts and wished him the best of luck.

Mr. Mark Orr, AVS, provided REDAC with an Aircraft Safety organization COVID-19

perspective. He stated that represents the sponsor side or user end. Coordination efforts in his area have been hampered because of the inability to have a physical presence due to COVID-19.

Mr. Mike Paglione, ANG-E2, discussed the various COVID-19 impacts of research and development program areas to the REDAC participants. He stated that most employees are successfully teleworking at ninety percent (90%). Undoubtedly, some of the research and physical testing cannot be done via telework. Instead, they are preparing for return to full capacity by writing test plans and working with other states and regions remotely. They are now looking for other opportunities, such as virtual meetings and design improvements. Twenty-five of the labs are suspended. There is a small percentage of employees that are yet going into the laboratories to address essential components of the mission. An example is at the pavement test facility, the large pavement equipment must run periodically because it cannot sit idle for months. There are lithium batteries and rigs that need to be checked to ensure they are in a safe state.

Mr. Paglione discussed the different research domains and how they were dealing with the impact of COVID-19. In the Fire Safety organization, most of the work is typically performed in a lab setting. He stated that it was an element of culture shock having to telework, but the employees had adapted. They have collaborated with partners (domestic and international) for re-planning and refining test plans to be used upon return. The annual conference met virtually. Aircraft Structure that includes maximum use of the Centers of Excellence. Joint Advanced Materials and Structures (JAMS) had been conducting virtual meetings. Various programs had delays in projects when equipment could not be shipped to partners. Terminal area safety continued to work with their lab partners and planning for Phase I since it will be one of the projects that will start during Phase I.

Other interesting research programs continue to adjust and progress, as well. For the improved helicopter simulation models, they are working on the data they have. Cybersecurity is collaborating with partners at MIT. The team successfully accomplished a major milestone in June with the completion of a methodology document. There are some projects that have been suspended because they cannot get to the data feed at the William J. Hughes Technical Center (WJHTC). Employees had been teleworking since mid-March, 2020. All his staff are working remotely. He stated there was a bit of a hiccup in the beginning, but his organization has adjusted accordingly. Mr. Paglione shared that they have held virtual research consortium meetings which has allowed more people to get involved. Noise work has continued with challenges. He noted that international meetings are all online and can be challenging because agreement among participants in virtual settings can be difficult. Physical work or measurements have slowed or stopped. He stated that there are financial aspects of the pandemic, i.e., a lot of partners have stressed concerns of the economic impact due to pandemic.

Mr. Melchor J. Antunano, CAMI, provided a COVID-19 update to REDAC that focused on the Aeronautical Center environment. He stated that they are receiving guidance for in-person participation. He had considered that prospective partners may only want to participate for monetary gains, not because of research. He shared that they are partnering with private industry and academia on COVID-19 research. Researchers were still busy, although they cannot get human collection. He stated that he is a part of different groups and organizations to discuss what the Agency should be doing. He has not explicitly redirected funds. Dr. Hansman emphasized the need to restore public confidence in the aviation industry and those individuals that want to fly.

Mr. Vaughan Yates, NAS Lifecycle Planning, also provided REDAC with a COVID-19 update. He stated that planning did not get impacted due to the pandemic. Research execution was impacted, partly due to the inability to travel and some of the facilities were inaccessible. He stated that his organization took the time to start discussions to re-plan and refocus to perform effective testing. Phase III has been delayed for a year. The plans to test a mobile application was put on hold. FAA was in the middle of budget planning when the pandemic started. The Agency does not know what the impact of FY 2020 and FY 2021 is going to be.

Dr. Hansman commented that the industry is about to go into a crisis, so any positive work done will be beneficial.

**Presentation:** Subcommittee on Airports **Presenter:** Mr. Christopher Oswald

#### **Discussion:**

Mr. Chris Oswald briefed REDAC on the discussions and outcomes of the Airport Subcommittee meeting. Mr. Oswald acknowledged Ms. Chinita Roundtree-Coleman for putting the Findings and Recommendations together on the slides. He stated that he was pleased to get the crosscutting updates on Cybersecurity and Unmanned Aircraft Systems (UAS), as Cybersecurity remains a critical issue.

Mr. Oswald discussed the proposed Airports Findings and Recommendations for the Winter-Spring 2020 meeting. There were only two items that he wanted to discuss. The initial Finding pertained to UAS Research and Air Mobility Systems. He stated that the Airports Subcommittee was extremely interested in the Airport Technology Research Program's involvement in UAS research, both from the perspective of beneficial use at and in the vicinity of airports, and from the perspective of managing the safety and security risks associated with unauthorized use of these in the vicinity of airports. They recognized the growing interest in Advanced Air Mobility systems (AAM), also known as Urban Air Mobilitysystems. AAM, like UAS, represents a new class of aircraft that will need to share use of airspace on and in the vicinity of airports.

In both cases, there is a need to ensure ongoing research is effectively coordinated across multiple FAA research portfolios, across federal agencies (e.g., risk mitigation of unauthorized UAS operations), and across a number of external stakeholders. The Subcommittee recommended allocating time during each of its semi-annual meetings for discussion on these emerging vehicle types and the ongoing research associated with them. They also recommended that the Airport Technologies Research Program look to the Subcommittee to provide airport stakeholder input and insight into its UAS and AAM research activities.

Mr. Oswald stated that there is a need to understand how to appropriately accommodate the system and how they can be integrated into traditional requirements. He then discussed the scope of the second Findings - Airport Pavement Research. He stated that the Subcommittee remains committed to the FAA's global leadership in Airport Pavement research and has been highly supportive of the Airport Technology Research Program's efforts to expand its testing and research capabilities with a pavement material testing lab. The airfield pavement experts on the Subcommittee agreed that understanding how new types of pavement materials and additives can enhance both rigid and flexible airfield pavements. He stated that is imperative that the United States maintain leadership in airports pavement and design. The Subcommittee recommended setting aside time during their Summer 2020 meeting to discuss how the focus on emerging pavement materials and additives can be increased in airfield pavement research.

# **Presentation:** Subcommittee on Human Factors **Presenter:** Dr. Barbara Holder

#### **Discussion:**

Dr. Barbara Holder briefed the REDAC participants on the Human Factors Subcommittee meeting. She stated that the meeting at NASA ARC was cancelled due to COVID-19, and the meeting was held virtually on March 10 -11, 2020. During the pandemic, they have reviewed research requirements and collected input on REDAC protocols for Shelley Yak that they hope will help facilitate future improvements. The Subcommittee created three Findings and Recommendations, two Actions and one general observation.

Ms. Holder discussed the suggested Subcommittee's Findings and Recommendations. The first topic discussed was Urban/Advanced Air Mobility (AAM) Research. The Subcommittee was pleased to see AAM-related Human Factors (HF) research was planned for FY 2022. Comments presented the perspective that NASA's work may be insufficient to address all the HF issues needed to prepare the FAA for efficient AAM approval and safe operations. To mitigate any shortfalls, the FAA HF should take an active role to help define future versions of the Concept of Operations, standards, roles of humans, and roles of automated systems, pilot-operator training and qualification requirements, and cockpit simplification acceptability.

Discussions focused around the following aspects of HF research: a) prioritizing and accelerating AAM HF research to ensure HF issues are identified and addressed during concept and use case maturation, and during designand development; b) coordinating with NASA to identify specific HF research needs and timelines to support near-term Entry-Into-Services (EIS) targets and NAS integration. There is a need to identify HF research areas not being covered by FAA or NASA, but critical to the success of AAM, because additional investment may be required to address those gaps. c) Also, AAM HF research definitions should be considered a high priority emerging issue. The Subcommittee found that the consequences of disregarding the recommendations would mean that decisions will be left to companies developing these vehicles that will have limited expertise and lack a balanced industry-government perspective.

Ms. Holder then discussed the Subcommittee's Findings and Recommendations Two (2). It emphasized the need for access to FAA research artifacts. FAA HF research generates many valuable artifacts; however, these are not readily identifiable or accessible to interested parties. The Subcommittee profoundly expressed that there should be access to FAA research output. According to many, there does not appear to be a centralized repository to search for key topics or specific reports. It would be a beneficial to have a way to access information. Sharing research findings and artifacts with industry and research institutions help advance the FAA's research influence and contribution to the body of aviation knowledge and expertise. The Subcommittee recommended providing a means to search and access FAA HF research artifacts in a simple and efficient manner, possibly via a centralized repository. If not, the consequences would be reduced learning, duplication of work, limited advancement of research.

Ms. Holder then discussed the Subcommittee's Findings and Recommendations Three (3). This item identified the proposed prioritization process where coordinated dependencies should be addressed.

The Human Factors (HF) Subcommittee was pleased to receive a briefing on the AVS proposed research prioritization process. The Subcommittee noted that FAA HF research generally considers perspectives of each technical research office separately. The AVS proposal did not include HF research collaboration and coordination processes across budget line items (BLIs) in the Agency to meet objectives. She stated that HF occurs across different BLIs. The dependencies of the research projects will impose upon or add strength to another project. The work should be coordinated across the line items to make sure that it does not cut the research of another program. The Subcommittee recommended that the prioritization process be updated to include HF needs identification and priorities within a BLI but also for HF research that specifies cross-domain impacts. If not, the Subcommittee advised that the consequences would have the potential for inefficient funding, duplication of effort, uncoordinated research, and omission of overarching HF issues in the R&D portfolio.

The Subcommittee proposed two actions and one general observation. They were the following: Action 1) The Subcommittee was pleased to learn that FAA will provide a BLI for emerging issues. The Subcommittee requested an update on the planned process for identifying and prioritizing emerging issues to be funded. They would like more details at the next level to appropriately advise. Action 2) The Subcommittee was pleased to receive briefings on the FY22 HF research areas and is in agreement with directions that the FAA has selected. Additionally, the Subcommittee requested an enhanced briefing on planned FY22 HF research descriptive of the research questions and execution plans for identified research areas. The observation noted that efforts occur that should be included as Human Factors but may not be categorized as such. The Subcommittee requested the FAA share an overview of the HF research being done across the Agency, even if it is not cited in this manner, so that the HF Subcommittee may obtain a big picture perspective. The Subcommittee recognized that without a big picture view it is challenging to advise the FAA on Human Factors research gaps, needs, and priorities.

# **Questions and Comments**

Dr. John Hansman, REDAC Chair, commented that it is important for the FAA to decide what the certification and operation requirements are going to be for these vehicles. He stated that he does not think anyone knows what is allowable, or what is limited. He then asked, "What are the operational and procedural standards that are currently not able to be addressed by FAA? There may be controller issues. How does a controller deal with the cohort of automation systems?"

Dr. Holder responded that there are very rapidly moving areas. Several Human Factors issues exist across users and operators. She concurred with Dr. Hansman's comment on BLIs for emerging issues. Director Shelley Yak stated that at the last couple of Subcommittee meetings there had been conversations about the creation of an emerging technology BLI so that there is the flexibility to allocate funds and resources where and when most needed. Dr. Hansman said that COVID-19 is an example of an emerging issue, stating that there is plenty of experience where the world has changed but the budget does not support it.

There were in-depth discussions regarding the accessibility of research data and output. Dr. James Kucher commented that it is especially important that some of the research going on be visible to other programs so that it would be possible to leverage the work. Dr. Hansman asked whether there should be more published literature or more access to internal documents. Ms. Holder responded that

she would like to see more of both. Ms. Stacy Zinke-McKee replied that the Civil Aerospace Medical Institute (CAMI) does have published reports and that the documents are accessible on CAMI's website. Ms. Yak shared that the researchers are obligated to publish via DOT research portals. Dr. Hansman asked if there is an incentive to publish on DOT portals, and whether or not there is a place for performance reviews. He also stated that FAA program managers and contractors should get credit for the works being published. Dr. Eric Neiderman responded that Technical Transfer tracks all work products that gets published.

**Presentation:** Subcommittee on Aircraft Safety **Presenter:** Mr. Terry McVenes

# **Discussion:**

Mr. Terry McVenes, briefed the REDAC on the Aircraft Safety (SAS) Subcommittee meeting that was held on February 25 - 26, 2020. During this meeting the Subcommittee discussed the safety elements of the FAA Research and Development (R&D) FY 2022 portfolio, the Fatigue Management Working Group (FMWG), and the tentative Findings and Recommendations that were generated by its members. Mr. McVenes stated there may be considerations for some future meetings to be held in conjunction with other Subcommittees to allow deep dives and knowledge-sharing to ensure cross-cutting programs are identified. Due to the changing environment, the Subcommittees want to ensure that they have right people and resources to cover the span of technical topics. Dr. Hansman emphasized "the right people with the right areas of expertise." Mr. McVenes stated that the industry needs to get a more holistic view, a multi-year plan versus a one fiscal year plan outlining the FAA's objectives.

Mr. McVenes discussed the proposed Subcommittee's Findings and Recommendations. The first one addressed the scope of the Fatigue Management Working Group. The Subcommittee received a briefing that included several studies into fatigue issues. There was not enough detail to determine whether those studies have been proposed, funded, or initiated. Budgetary information presented showed several fatigue research requirements appeared to be unfunded in FY 2022. However, the Subcommittee was impressed with the progress that had been made within various FAA research organizations and the levels of support obtained from FAA leadership. The Subcommittee requested additional information on the FAA's fatigue-related projects to enable a better understanding of funded research objectives and deliverables. This information could be provided via supplemental material, Aircraft Safety Subcommittee (SAS) in the FMWG, annual updates to the SAS, or scheduled deepdives. The Subcommittee remained concerned with the long-term commitment of fatigue-related projects.

During the discussion of Recommendation Two (2), Mr. McVenes explained that the Subcommittee requested further clarification of the funding profiles and prioritization of fatiguerelated research in the FAA. Additionally, the Subcommittee proposed that the FAA consider restoration of full funding for the research that sustains the effectiveness and utility of a Fatigue Risk Management System / Fatigue Risk Management Program (FRMS/FRMP) and allows the FAA to identify shortfalls and potential enhancements to the current **B**ttime/duty time regulations. Also, options for the airline industry to provide joint funding should be explored. The next proposed item addressed the Aviation Safety Research Portfolio Budget Program Plan. The Subcommittee discussed concerns about the planned elimination of aircrew stress biomarker research at the Civil Aerospace Medical Institute (CAMI). Requirements stressed the urgent need for objective means to identify degraded aircrew performance and health in assessing human factors in accident causation. CAMI has conducted valuable, ground-breaking research into this area. The Subcommittee suggested that the FAA consider the potential short- and long-term benefits of objective genetic- based biomarkers for aircrew stress and impaired performance and evaluate possible funding strategies to support this important and unique forward-looking research program.

# **Presentation:** Subcommittee on Environment and Energy **Presenter:** Ian Redhead

#### **Discussion:**

Mr. Ian Redhead provided an overview of the discussions that occurred at the Environment and Energy Subcommittee meeting that was held on March 17 - 18, 2020. The meeting was virtually conducted due to the COVID-19 pandemic. The Subcommittee acknowledged that the Office of Environment and Energy (AEE) continues to do an outstanding job in the execution of key programs and project areas within their Research and Development (R&D) portfolio. The following focused themes were discussed: maintaining a balanced portfolio; addressing the Noise threat to Aviation; recognizing FAA's global impact at International Civil Aviation Organization/Committee on Aviation Environmental Protection (ICAO/CAEP); ongoing research outlining the importance of Alternative Jet Fuels, and continuing Public Private Partnerships.

The Subcommittee stated that Noise is possibly the biggest threat to the growth of U.S. aviation. Mr. Redhead emphasized the need for the U.S. to keep its dominant ICAO presence. The Subcommittee stated that the Public Private Partnership programs are one key element to U.S. maintaining its Global Leadership position at ICAO CAEP. The Subcommittee expressed concerns over increased growth in Commercial Subsonics, Urban Air Mobility/Unmanned Aircraft Systems (UAM/UAS), Supersonic Civil and Commercial Space vehicles, and Environmental research necessary to guide the establishment of sound policies and procedures. He said that collaboration between FAA and NASA is critical for success, and that there are concerns about the impacts of the COVID-19 pandemic on future research.

During the dialogue regarding the suggested recommendations for Environment and Energy, Mr. Redhead discussed the topics that evolved from membership input. The Subcommittee provided updates on successes that have been realized as a direct result of the collaborative work done with private industry, major universities through Centers of Excellence, other federal departments and foreign governments. Results from these efforts have enhanced the U.S. leadership position at ICAO/CAEP. The Subcommittee continues to endorse the robust funding of Public/Private Partnerships like the Continuous Low Energy, Emissions and Noise (CLEEN), Commercial Aviation Alternative Fuels Initiative (CAAFI) and Aviation Sustainability Center of Excellence (ASCENT) that leverage scarce resources. The Subcommittee believes that the close collaboration between NASA and the FAA has proven to be invaluable.

Mr. Redhead then discussed the criticality of the elimination of funding for the Alternative Jet Fuel

(AJF) Program (including efforts in CAAFI, CLEEN andASCENT) in previous years that would have significantly slowed down the maturation of this industry sector. The Subcommittee was very pleased to see that funding had been restored in the FAA Office of Environment and Energy (AEE) budget and applauded FAA's leadership. He also emphasized that the work on Sustainable Aviation Fuels (SAFs) is critical to the U.S. industry and the FAA must maintain a leadership role in the development of SAFs to ensure that the rules to be considered will be beneficial to the U.S. industry. Since the maturation of the Alternative Jet Fuel Program will be a major environmental benefit for the public, will create a new industry within the U.S. and that will benefit the U.S. aviation industry. The Subcommittee strongly recommended that the FAA support funding for the continuation of this research.

He then addressed the issues related to the Aviation Noise Research efforts. The Subcommittee found that considerable research is yetnecessary to address this ongoing topic. This is considered to be potentially one of the biggest obstacles facing NextGen Modernization of the NAS and presents constraints to the growth of U.S. aviation industry. AEE is looking at the certification requirements for Supersonic aircraft, as well as, large UAM/UAS vehicles. The FAA will need to be able to address the noise, emissions and health impacts of all new entrants. The Subcommittee strongly supports the prioritization of the noise research and encourages continued collaboration with NASA as it moves forward to establish regulatory guidance and sound policy.

Lastly, the Subcommittee found that maintaining the U.S. Global leadership position and influencing policy at ICAO/CAEP is essential to protecting U.S. aviation interests. The Subcommittee recommends the prioritization of all research programs that will allow the FAA and the U.S. to maintain its current global leadership position at ICAO/CAEP. The successful work that has been completed in Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) provides a good example of how sound research influences policy and rulemaking.

**Presentation:** Subcommittee on NAS Operations **Presenter:** Jim Kuchar

# **Discussion:**

Dr. Jim Kuchar, provided a synopsis of the NAS Operations Subcommittee virtual meeting that was successfully held on March 24 – 25, 2020. This meeting was conducted via the WebEx platform. Topics discussed during this session included an FAA Budget Overview, Introduction to NAS 2035 Vision, New Air Traffic Management Requirements, Enterprise Concept Development, Runway Incursion Reduction Program, Enterprise Human Factors, ATC/ Technical Operations Human Factors, Operation Concept Validation and Infrastructure, Weather Program, Weather Technology in the Cockpit, Wake Turbulence, Flight Deck Data Exchange Requirements, and deep dives into the ASSURE COE research program.

The dialogue among the members during this event generated various perspectives from the technical subject experts and yielded advice to be submitted for review by the parent REDAC. Dr. Kuchar briefed REDAC on the NAS Operations Subcommittee Findings and Recommendations. The Subcommittee found that in 2015, FAA and NASA conducted an analysis to characterize a range of potential future environments resulting in the "NAS Horizons" report. Efforts included interviews with more than eighty (80) leaders and strategic thinkers from government, research organizations,

and industry. Currently, the FAA NextGen organization is now developing a dynamic NAS 2035 Vision document. Transition to performance-based operations, managing new entrants, leveraging advances in vehicle performance, Datacomm, analytics, and information-systems technologies are paramount considerations.

This vision document represents a transformation of the current NAS that will lead to a significantly different future system impacting a growing set of aerospace system stakeholders. It will also enable a rapid introduction of industry provided services and technologies to the NAS. A preliminary 2035 vision is currently being drafted by MITRE CAASD with scheduled completion during the March 2020 timeframe. Following refinement and an FAA-internal review, the final 2035 Vision anticipated delivery is slated to be delivered as an FAA product at the end of FY2020.

Subcommittee discourse addressed the broad implications of a transition of the NAS toward 2035 involving an increasingly complex web of vehicle types, operational models, and industry involvement and provision of services. The group acknowledged that the FAA should continue to engage with the wider aviation/aerospace community while shaping their 2035 vision. A failure to engage stakeholders early in the process may lead to a vision that does not align with user needs or which may not take advantage of external trends and opportunities. The Subcommittee recommended that the community engagement process described in the 2011 REDAC Culture Change study be adopted. The study stated that "NextGen operational transformation involves diverse stakeholder communities, all of which must be fully engaged and have a shared vision of NextGen.

The common vision must be shared by the stakeholder communities, and critically, it must be a vision of shared interest and shared responsibility among the stakeholders. Successful transformation requires stakeholders to synchronize their implementation activities with those of other stakeholders. This synchronization is key to success and can only result from a shared vision of NextGen implementation. An environment that encourages and avidly supports community engagement to determine a collaborative shared vision of and a collaborative plan for NextGen will result in a trusted partnership with industry for NextGen implementation."

Dr. Kuchar shared the assessment of the NAS Operations Subcommittee regarding the ASSURE Center of Excellence (COE). The Subcommittee found that ASSURE COE includes an effort focused on developing a schema for data collection across a wide range of Unmanned Aircraft Systems (UAS) operations and test activities, including defining metadata and other structures to aid in organizing and applying the collected information in an effective manner. This effort will lead to a very rich set of UAS-specific data including vehicle performance, traffic encounter characteristics, weather and environmental impacts, surveillance and navigation, and command and control system performance. As the evolution of the UAS efforts occur the information developed through ASSURE will provide a sound benefit to the community.

As the FAA considers the expansion of the ASSURE efforts, there will be an increased opportunity for storage and retrieval of UAS related data and subsequent information. A clearinghouse platform was proposed that would facilitate the researcher's ability to utilize and share information to optimize relevant research. This would enable the FAA to leverage a

broader scientific and industry community.

The next NAS Ops Subcommittee meeting is scheduled for September 1-2, 2020. The Subcommittee would like to review as read ahead documentation prior to the session the: UTM ConOps 2.0, FAA Cyber Research and Development Plan and Commercial Space Concept of Operations. Proposed themes and briefings to be discussed at that time will include: NAS 2035 Vision (FAA or MITRE), NASA/NAS 2045 Vision, Enterprise Concepts, ETM Concept of Operations; ETM/UTM/ATM Cross Dependencies Analysis; and UAM Integrated Research Planning. Cybersecurity Planning and Weather Programs Prioritizations.

#### **Questions and Comments**

Dr. Hansman commented that he liked the proposed inclusion of additional airspace analysis.

**Closing Discussion and REDAC Chairman Comments:** 

Presenter: Dr. John Hansman; All REDAC Members

# **Discussion:**

Dr. Hansman noted that he appreciated the proposed Findings and Recommendations generated by the various Subcommittees. He suggested that Mr. Terry McVenes amend his Finding and Recommendation to provide additional clarity and incorporate positive language. Mr. McVenes made the changes during the presentation and submitted the changes prior to the conclusion of the Full REDAC.

During the closeout discussion, Dr. Hansman also said that the FAA Research and Development (R&D) professionals had done a good job. Accomplishments were as well as could have been expected given the climate with COVID-19. He appreciated the information coming from the FAA panel regarding the impacts of COVID-19 and the Agency's adaptations for continued work during the pandemic. He expressed how having a BLI for emerging issues will allow the FAA to be resilient and responsive to unanticipated emerging issues, like COVID. He stressed the importance of using this as a research opportunity.

He stated that there will be continued research needs stemming from emerging technologies and future automation. Examples include new vehicle development through Advanced Air Mobility (AAM) and Supersonics. He also reinforced how facilitating access to critical FAA research is a key success factor. He suggested that there should be a push to be more outward facing. He recommended incentivizing outreach and publication. He stated that there should also be related performance metrics. Dr. Hansman commented that it sounds like there is subtle movement. He also shared that the FAA could be better at stating what their technology needs are in anticipation of future efforts.

Mr. Waggoner commented that perhaps the FAA should use workshops, etc. to communicate information and create a dialogue around it. Dr. Hansman stated that they should articulate what the

needs are to continue and enhance aviation research. This would include the identification of barriers and what are the requirements that the FAA needs to develop enhanced capabilities to go to the next level.

Mr. Waggoner asked FAA WJHTC Director Shelley Yak about the latitude that she has when asked questions or given comments concerning the budget. Ms. Yak responded that, "There is not much; when there is support of a program, there is help with a program for a budget that it is building". Dr. Hansman added that REDAC has made little impact and is ineffective when discussing the budget; instead REDAC should focus on the quality and importance of the research conducted. This is where value is added.

Mr. Yak advised that she is looking at all of the federal advisory committees/subcommittees to see if there should be consolidations, or other changes, in anticipation of defining future proposals for REDAC.

Dr. Hansman asked where when was the next full REDAC meeting. Ms. Chinita Roundtree-Coleman stated that the next meeting is tentatively scheduled for October 8 or 9, 2020. Dr. Hansman asked if she could get the date locked down within the next month. Mrs. Roundtree-Coleman replied that she had obtained preliminary approval for the next full REDAC meeting and would finalize approval request and share the selected date with the Committee and other interested entities.

Adjournment: 2:00pm

# Research, Engineering and Development Advisory Committee Federal Aviation Administration (FAA) VIRTUAL SESSION July 09, 2020 Agenda

9:00 am	Welcome Address and Opening Remarks	John Hansman Shelley Yak
9:15 am	FAA Address/NextGen Perspectives	Pam Whitley
9:30 am	Human Factors – Automation Interactions	Kathy Abbott
10:00 am	NASA Update	Ed Waggoner
10:30 am	Break	
10:45 am	COVID-19 Impact on FAA Research Programs –Panel Discussion	Melchor Antunano, Michel Hovan, Patricia Hiatt, James Hileman, Mark Orr, Mike Paglione, Vaughan Yates
11:45 am	Lunch	
12:15 pm	Subcommittee Report – Airports	Chris Oswald
12:45 pm	Subcommittee Report – Human Factors	Barbara Holder
1:15 pm	Subcommittee Report – Aircraft Safety	Terry McVenes
1:45 pm 2:00 pm	<b>Break</b> Subcommittee Report – Environment and Energy	Ian Redhead
2:30 pm	Subcommittee Report – NAS Operations	Jim Kuchar
3:00 pm	Committee Closing Discussion Findings and Recommendations Future Actions	Committee Members
3:30 pm	Chairperson's Closing Remarks	John Hansman

# Research, Engineering, and Development Advisory Committee (REDAC) Winter/Spring 2020 Virtual Meeting Attendees

Thursday, July 9, 2020

Name	Affiliation	Name	Affiliation
Abbott, Kathy	FAA	Neiderman, Eric	FAA
Antunano, Melchor	FAA CAMI	Ologhobo, Olufemi	HTWR
Azzi, Rany	FAA	Olson, Lee	FAA/NASA
Baker, Jodi	FAA	Orr, Mark	FAA
Bernacki, Maryanne	FAA	Oswald, Chris	ACI-NA
Beth		Paglione, Mike	FAA
Brock, Dan	FAA	Pezzella, Matthew	ASTM, Int.
Brown, Caprice	FAA	PlaneEnglish	
Butler, Lakeesha	FAA	Powers, Brian	A3T, Inc.
C. Jason	FAA	Reddick, Latasha M.	FAA
Clarke, Nancy	JMA	Redhead, Ian	КСМО
Cunha, Jason	Concepts Solution, LLC	Rodzon, Douglas	FAA
Donovan, Colleen	FAA	Sayyed, Ruby	IATA
Doneliya Deneva Raza	FAA	Seely, Rachel	FAA
Eghbali, Hossein	FAA	Smith, Lisa	FAA
Espinasse, Sylvie	ESA	Summer, Steve	FAA
Figueroa, Jaime	FAA	Tvaryanas, Anthony	FAA/CAMI
Frisbie, Frank	Double F Consulting, LLC	Updyke, Craig	ASTM, Int.
GO DAWGS		Waggoner, Ed	NASA
Hackworth, Carla	FAA/CAMI	Whitley, Pam	FAA
Hansman, R. John	MIT	Yak, Shelley	FAA
Hayes, Phillip	FAA	Yates, Vaughan	FAA
Hendrickson, Adam	FAA	Yeh, Michelle	FAA
Hiatt, Patricia	FAA	Yueng, Phil	FAA
Hileman, Jim	FAA	Roundtree-Coleman, CA	FAA
Holmes, Tara	FAA	Tvaryanas, Anthony	FAA/CAMI
Hovan, Michel	FAA	Waggoner, Ed	NASA
Kaliardos, Bill	FAA	Whitley, Pam	FAA
Keller, Joseph	APA	Yak, Shelley	FAA
Knopp, Ken	FAA	Yates, Vaughan	FAA
Kuchar, Jim	MIT	Yeh, Michelle	FAA
Martinez, Paula	FAA	Yueng, Phil	FAA
Matthews, Suzette	WPG	Zinke, Stacey	FAA/CAMI
McVenes, Terry	RTCA		1-202-316-6454
Mixon, John	FAA		1-765-464-9546
Moore, Monique	FAA		1-202-734-6902
Mumford, Geoff	APA		
Nadarski, Nick	GAO	Roundtree-Coleman, CA	FAA