Research, Engineering and Development Advisory Committee (REDAC) MINUTES

Meeting Date and Time: 4/11/2019 – 9:00 AM **Meeting Location:** FAA – McCracken Room, 800 Independence Avenue SW, WashingtonDC

Purpose	REDAC Recommendations on the FY 2021 Research and Development Portfolio and Special Assignment Discussions on Emerging Issues and Future Opportunities
Facilitator	Dr. John Hansman, <i>REDAC Chairperson, MIT;</i> Ms. Shelley Yak, <i>FAA WJHTC Director and REDAC Executive Director</i>
Note Taker	Mark Hale

Presentation: Welcome and Opening Remarks **Presenter/s:** Dr. John Hansman, Ms. Shelley Yak

Dr. John Hansman (Professor, REDAC Chair) opened the meeting with schedule and administrative notes. Shelley Yak (Director, FAA William J. Hughes Technical Center) announced the public meeting notice as required and provided an introduction and updates. Ms. Yak thanked attendees for their presence and commitment to REDAC. Ms. Yak continued by updating the Committee on the FAA's FY19 budget status. The FAA budget was submitted at \$74M and enacted at \$191M. She stated that the FY20 budget is \$120M and the FY21 budget is in the process of being developed. She updated the status of the National Aviation Research Plan (NARP), indicating that the 2019 document is complete and in the cycle for approval. She also added that the 2017/2018 NARP is complete but it has not been released yet.

Ms. Yak stated that she briefed the Department of Transportation (DOT) on 4/10/2019 regarding the Annual Modal Research Plan (AMRP). She stated that there is discussion regarding possibly leveraging the NARP as input to AMRP instead of having two separate documents and efforts. Ms. Yak also described a briefing to DOT on the new enacted budget amount (and work to be accomplished), and shared the legislative requirements of the work that the FAA does. She noted that she received questions related to weather research and aviation fuel as well as Unmanned Aircraft Systems (UAS), and noted that the questions were generally more focused on Facilities & Equipment (F&E).

Ms. Yak announced that leadership is currently briefing the FY20 budget to different appropriation Committees and will soon brief the Senate and House Science Committee, who is responsible for appropriating Research, Engineering, and Development (RE&D) funding.

Ms. Yak thanked participants for taking time out of their Subcommittee meetings to participate in the Research and Development (R&D) Landscape development efforts. She stated that the R&D Landscape helps to tell the story of FAA R&D and describe both what is being done and what the roles will be.

Mr. Greg Burke (Deputy Assistant Administrator for NextGen, FAA) welcomed those in attendance. Mr. Burke thanked the REDAC on behalf of Pam Whitley (Acting Assistant Administrator for NextGen, FAA) for their findings and recommendations. He also agreed that research prioritization was an important effort because it allows the Agency to plan appropriately.

Presentation: FAA R&D Landscape Perspectives **Presenter:** *Maureen Molz*

Maureen Molz (Division Manager, FAA Research and Development Management Division) presented a brief overview regarding R&D Landscapes. She defined a landscape as a collection of research drivers that stimulate R&D investment with impacts to industry objectives, emerging technology, and envisioned operations. She stated that she expects a landscape update to be presented in the next round of REDAC meetings. Ms. Molz requested that responses/input to the R&D Landscape effort be emailed to R&D Division (or note Research Portfolio Branch instead). The submissions will help to shape an updated research driver list and inform the R&D Landscape product. Ms. Molz emphasized that the landscape (and underlying research drivers) would be a living product that would advance and mature iteratively as the process continues.

Presentation: FAA R&D Landscape Discussion **Presenter:** *Maureen Molz; All*

Committee members discussed the processes used by each Subcommittee to inform the R&D landscape effort. A synopsis of discussion by each Subcommittee follows.

Leo Prusak (NAS Operations Subcommittee) stated that their Subcommittee broke the information down into four sub areas; 1) items that do not primarily concern their Subcommittee, and three high-level areas that include 2) emergent operations, 3) infrastructure research, and 4) data. These three areas encompass 20 of the items from the proposed drivers list. Under each one of these items they identified three main topic areas to address. This included 1) equipment, 2) architecture, and 3) procedures associated with this research. He stated that their Subcommittee would be submitting their document in the coming week and that they were very pleased with the process and items in the list.

Ian Redhead (Environment and Energy Subcommittee) spoke about how their Subcommittee handled this exercise. They focused on four particular items from the list. Specifically they considered the research drivers that would be the impactful over the next 10 years. He indicated that 1) supersonic flight, 2) Urban Air Mobility (UAM), 3) new vehicles and their components, and 4) advances in electric/hybrid electric propulsion would have the biggest impact on his Subcommittee.

Chris Oswald (Airports Subcommittee) described their Subcommittee's work on the R&D landscape effort. Their Subcommittee ranked all of the research drivers and identified three additional novel drivers including aviation systems and sustainability (economic and social sustainability), aviation system capacity, and airport security (particularly related to UAS). Mr. Oswald indicated that many of the research drivers discussed by his Subcommittee required significantly more time and conversation to consider. He also offered that there was a significant amount of overlap between drivers and suggested that it would be useful to combine drivers, where possible, to enable a better response from his Subcommittee.

Terry McVenes (Aircraft Safety Subcommittee) described that their Subcommittee identified major categories of drivers during their meeting to include, urban air mobility, aircraft command and control using automation and remote sensing technology, new vehicles and components, and the certification of new vehicles and components. Mr. McVenes stated that advances in hybrid/electrical-hybrid propulsion are key from aircraft safety and cybersecurity perspectives. He also cautioned that the industry is developing rapidly in these areas and that the Subcommittee on Aircraft Safety needs to make sure that they do not get in the way of rapid technological development.

Barbara Holder (Human Factors Subcommittee) discussed the challenges of this exercise from their Subcommittee's perspective. Ms. Holder reported that because human factors is a vast topic, and touches almost all areas, it was challenging to formulate a response.

She discussed their group's emerging issues list and stated that they approached their landscape input in the context of that list. Ms. Holder then stated that they did not add any research drivers because their emerging issues list mapped well to the provided drivers list. She then added that their Subcommittee did slightly modify the remote and virtual technologies driver – splitting it into two separate drivers – one for ATC, and one for aircraft. She added that they identified drivers associated with the mid-term timeframe. She also noted that they would then come back and map to the driver categories after attempting to scope the request. For example, UAM is very broad and their group needs more specific scoping and instructions to provide input.

Dr. Hansman asked the full Committee why capacity and other traditional drivers were not included in the drivers list. He then stated, "I think it's a strategic error not to include those things." Dr. Hansman requested to see the next iteration of the research drivers list before the document is finalized. This should be a dynamic version of the list based on input and will help make the strongest argument for why the FAA is doing what it is doing. There was general agreement with the request to share these working documents with REDAC in a collaborative fashion moving forward.

Presentation: Subcommittee Report: Human Factors **Presenter:** *Barbara Holder*

Barbara Holder discussed the Human Factors (HF) Winter/Spring 2019 Subcommittee meeting in California. Ms. Holder stated that because the HF Subcommittee was relatively small that they were looking to identify gaps in expertise and to add additional members to the Subcommittee to help address those gaps. Ms. Holder stated that the Subcommittee was given a "deep dive brief" from Tom Prevot (Uber elevate) about the HF of Urban Air Mobility (UAM). The Subcommittee also discussed landscape drivers and how to use their emerging issues list to inform their R&D landscape input. The Subcommittee discussed findings and recommendation ahead of the full REDAC meeting.

Ms. Holder discussed their Subcommittee's finding that the human factors emerging issues list is well represented in the portfolio, and there are very few gaps at this time. The two areas identified as gaps are Trajectory Based Operations (TBO) and cyber security. Ms. Holder recommended that the human factors emerging issues list continue to be used and if there are questions or comments that they continue the dialog.

Dr. Hansman commented, "the human factors list needs to be incorporated into the drivers list."

There was also a comment regarding the wording of Ms. Holder's presentation. According to the way it was worded, it stated that the "emerging issues list will drive research requirements." This approach is contrary to the stated purpose of the R&D Landscape research drivers that the group is currently engaging in.

There was then discussion regarding FAA's ANG-E41's responsibility to put all findings and recommendations in the NARP and track their progress until they are closed. This means that if findings are open-ended and are not easy to close, that they may sit in the NARP for many years until closed.

Dr. Hansman stated that he thought that the process of trying to get feedback on the landscape was important and that the issue of closing research items was not one for the REDAC to ponder. He then stated that some of the advice from REDAC was not necessarily actionable, but rather more things to think about. Dr. Hansman used the example of the Agency having difficulty attracting talent in the area of digital avionics. He then questioned if this was still an open issue. Dr. Hansman spoke to the incongruence of tracking these items from a R&D management perspective and the reality that some research issues and recommendations may linger for a very long time. Dr. Hansman said, "I would rather have issues open because they are issues for the Agency, for awareness."

Ms. Holder agreed to reword their one of their recommendations ("continue to use emerging issues list") and move to language that was consistent with "R&D Landscape recommendations."

Ms. Holder stated that their second finding was related to Trajectory Based Operations (TBO). This area has direct and significant impact on NextGen. The scope of this work is very large and the budget currently appears to be insufficient to cover the scope of the work. They believe the work is on track but they are concerned that some issues may not be able to be addressed if the budget is insufficient. Their recommendation is to continue as planned and identify any gaps that are not covered. Ms. Holder stated that they would track items that could not be covered for follow up at a later time.

Presentation: Subcommittee Report: Aircraft Safety Presenter: Terry McVenes

Terry McVenes offered a synopsis of his Subcommittees work. He stated that most of his Subcommittee's time during their meeting was spent on addressing the R&D Landscapes. He stated that accident investigation is driving a lot of their emerging issues and research and development needs. His group added a driver to the list for high-energy storage devices (batteries). They did not have any findings and recommendations for this meeting because their meeting was truncated due to the furlough/government shutdown.

Presentation: Subcommittee Report: Airports **Presenter:** *Chris Oswald*

Chris Oswald (Subcommittee on Airports) described the Subcommittee's efforts on research drivers and presented their findings and recommendations. He stated that there was a need for an update to the FAA Airport Pavement Research Program Plan. Mr. Oswald recommended that the FAA work to better understand "smart airports," a term used to refer to the increased use of connected and interactive technologies at airports to manage operations, facility maintenance,

improve customer service, and enhance efficiency.

Dr. Hansman asked if the Subcommittee had considered the notion of autonomy on the airside surface. Dr. Hansman stated he saw this as an emerging research issue. He continued, "The airside is a very interesting area of interactive automation and human collaboration because it's a semisterile environment. It is probably going to be an early adopter." Dr. Hansman then stated that this notion raised all kinds of issues.

Mr. Oswald stated that they did include airside surface and within terminals as well. Mr. Oswald agreed with Dr. Hansman's assessment and informed the Committee that the Airport Cooperative Research Program (ACRP) is currently conducting an automated airside-ground vehicle study and offered to report on that research at a later time.

Mr. Prusak interjected and offered, "PASSUR Aerospace, Inc. is looking at smart airports and the management of movement of aircraft themselves." He stated that they believe that things that are happening landside are early indicators of disruption on the airside. "For example, looking at massive aggregate data on cell phone users, you can follow crowds nowadays. You know early on when people are not moving and should be. That is an early indicator of something on the airside that is going to be delayed or disrupted."

Mr. Oswald then spoke about alternative forms of firefighting foam that need to be researched to put together a scientific case to continue using Aqueous Film Forming Foam (AFFF) instead of the preferred Fluorine Free Foam. There is a lot of visibility and public pressure regarding this issue as it relates to the environmental impact of AFFF. This research is mandated by FAA statutory requirements contained in the 2018 FAA Reauthorization Act.

Dr. Hansman asked if there are alternatives that are not currently approved or if they needed relief on the technical specifications of firefighting foams.

Mr. Oswald stated that Fluorine Free Foam is being extensively tested in Europe but that it is not as effective as currently used materials (e.g., AFFF). He also added that they would like to see something that takes away from a chemical-based requirement to more of a performance-based requirement.

Dr. Hansman also suggested a performance-based assessment of using foam as opposed to being prescriptive from a chemical standpoint.

Dr. Michel Hovan (Manager, FAA Airport Technology R&D Branch) then addressed the group on behalf of Mr. John Dermody (Director, FAA Office of Airport Safety and Standards) and talked briefly about their new fire test research facility that is under construction. This facility, due to be completed by this fall, will provide a "one of a kind" fire test facility that will help to research the questions posed related to firefighting foam requirements.

Dr. Hansman suggested that the FAA should consider research regarding the specification as opposed to researching if material meets a specification. He added that generally it is up to industry or providers to certify and validate that their materials meet performance requirements. He then concluded by saying, "there may be a need for you to validate testing; that is historically what the Agency does on tests like that."

Patricia Hiatt (Deputy Director, FAA Office of Airport Safety and Standards) introduced herself to the group and indicated that they have been answering questions nonstop related to firefighting foam. She questioned how much information the FAA could gather and leverage from DOT testing on the military specification for firefighting foam.

Presentation: Subcommittee Report: NAS Operations **Presenter:** *Leo Prusak*

Leo Prusak (NAS Operations Subcommittee) described briefings that his Subcommittee received from enterprise concept development and technical operations human factors and found a thread between the two Committees. The Subcommittee found that these two groups should work together on specific items. The first, that enterprise concept development is developing a re-architecture of the US NOTAM system. This is identified as a high priority undertaking because it affects both flight safety and operations efficiency. The Subcommittee recommended that human factors should be consulted during the development of the concept so that human performance issues are considered and mitigated where needed.

Dr. Hansman asked to clarify the human factors concerns. He questioned whether the issues were more related to the dissemination of information or the content.

Mr. Prusak answered that a holistic approach was probably required because this is a system that has needed updates for a very long time now. For example, what information is being gathered, how is data being input into the system, and how actionable is the information?

Dr. Hansman interjected that he did not believe there were many complicated human factors issues here. "The current system is not effective and the challenge is more of a structural one." He stated that he agreed that it was holistic problem but that the human factors research questions were pretty straightforward. He then stated that human factors considerations should drive NOTAM research but that he does not want to delay the upgrade of the system to study human factors issues.

There was discussion with the Committee over the prescriptive nature of the second paragraph of their recommendation. After discussion with the Committee, Mr. Prusak stated that they did not want to prescribe and that they were happy to take out or reword the second part of that the recommendation after discussion with the group.

Mr. Prusak stated that the Weather Technology in the Cockpit (WTIC) program plans to address weather information requirements and surface criteria affecting existing UAS operations. Mr. Prusak then stated that WTIC should include research activities to address weather information requirements – particular when operating in urban airspace over people, structure, or ground vehicles (i.e., UAM).

Mr. Prusak also noted that the integration (versus segregation) of new entrants is a critical area to investigate. He then stated that his Subcommittee is not sure these issues are being addressed currently.

Presentation: Subcommittee Report: Environment & Energy **Presenter:** *Ian Redhead*

Mr. Redhead discussed the processes related to their Subcommittee meetings to see if any of their processes needed to be addressed or improved. He stated that their Subcommittee meets twice a year. During one of their meetings, they receive "deep dive" briefings to understand pertinent issues. During the other meeting they spend a majority of their time examining the overall research portfolio. Mr. Redhead also stated that the furlough has substantially affected the ability to get approvals for grants with some grants stuck in the pipeline.

Mr. Redhead stated that his Subcommittee identified noise as one of the largest threats on the growth of US aviation. "There are rapid changes in technologies and we need to make sure the research is ahead of these disruptive changes."

Mr. Redhead stated that the FAA involvement of International Civil Aviation Organization/Committee on Aviation Environmental Protection (ICAO CAEP) and the presence as a global leader was important for the future of the US aviation industry. Increased growth in new entrants (e.g., commercial space flight, UAV/UAM, etc.) is consistent with the landscape research drivers and issues identified previously by their Subcommittee. He then stated that we have to drive development so that we can dictate what policies go forward at an organizational level and not slow down technological development. Mr. Redhead mentioned that their Subcommittee was very happy with the level of partnerships that the Agency is engaging in with industry, academic, and other government agencies (e.g., NASA).

Mr. Redhead offered that his Subcommittee strongly recommends continued involvement and funding of the fledgling alternative fuels industry. This Subcommittee believes this is important at an environmental level but also to help drive the future of US aviation.

Mr. Redhead reported that their Subcommittee recommends continued partnerships with Centers of Excellence (COEs) to leverage their matching funds in order to get the most out of the research. They strongly support continuing to do this. However, he noted that there is currently an inability to expedite the approval process for grants due to the furlough. He reiterated that the FAA must get grants approved in a timely manner so that COEs have predictable funding for their students and faculty to perform the work.

Dr. Hansman agreed that the delays in the grant approval process is problematic because money is tied up and performers are left in the dark with regards to funding.

A Committee member offered that there is a new approach to attempt to expedite the process through an idea solicitation from the Continuous Lower Energy, Emissions, and Noise (CLEEN) consortium. This feedback was then rank-ordered and sent to ALP-1 for consideration. Preapproval should make things move much more quickly.

After further discussion of the delays in funding these COE grants, the Committee agreed that there was progress being made compared to previous year. This is a critical issue because there is a lot of interest in this partnership mechanism and the FAA receives many questions about the COE program. In addition, some COE research is focused on issues that are pressing – such as the integration of new

entrants.

Mr. Redhead then spoke about the Airport Environmental Design Tool (AEDT) improvements that will enable enhanced usability and improved airspace and airport design through better data sharing.

Mr. Jim Hileman (Chief Scientific and Technical Advisor for Environment, FAA) then spoke about a new requirement from the Environmental Protection Agency (EPA). The EPA has a new requirement (hourly compliance) for noxious emissions/air quality. The AEDT relies on an EPA tool called the Air Quality Dispersion Modeling (AERMOD) system that currently has issues with data quality. The Subcommittee was informed of this and agreed that action has to be taken so that this regulatory tool is providing accurate compliance data. There is currently a work program to make sure the tool is getting good information. This work will be presented at the summer meeting.

Presentation: Committee Closing Discussion, F&Rs, Future Actions **Presenter:** *Dr. John Hansman; All*

Dr. Hansman initiated the last portion of the meeting by reviewing critical items captured from the presentations and discussions. Dr. Hansman highlighted the impact of the government shutdown and its effect on the Safety Subcommittee meeting. He noted that there was no significant report from that Subcommittee due to their truncated meeting. He then stated that REDAC supports the approach used for informing the R&D Landscapes product but also encouraged flexibility in the approach. Dr. Hansman noted the grant approval process issues need to be addressed as it is undermining the process and function of the COEs.

Research, Engineering and Development Advisory Committee Federal Aviation Administration (FAA) FAA Headquarters, 800 Independence Avenue, SW, Washington, DC MacCracken/Huerta Collab. Ctr. – 10th Floor April 11, 2019

Agenda

9:00 am	REDAC Chairman Welcome Address	John Hansman
9:15am	FAA Opening Remarks	Shelley Yak
9:30am	FAA Research and Development Landscape Perspectives	Maureen Molz
10:00am	FAA Research and Development Landscape Discussion	Maureen Molz
11:15am	Break	
11:30 am	Subcommittee Report – Human Factors	Barbara Holder
11:45 am	Subcommittee Report – Aircraft Safety	Terry McVenes
Noon	Lunch	
1:00pm	Subcommittee Report – Environment and Energy	Ian Redhead
1:15pm	Subcommittee Report – NAS Operations	Leo Prusak
1:30 pm	Subcommittee Report – Airports	Chris Oswald
1:45 pm	Committee Closing DiscussionFindings and RecommendationsFuture Actions	John Hansman
2:15 pm	Chairman's Final Remarks	John Hansman
2:30pm	Adjournment	