

**Research, Engineering and Development Advisory Committee (REDAC) MINUTES**

**Meeting Date and Time:** 10/20/2021 – 10:00 AM **Meeting Location:** Virtual

<b>Purpose</b>	REDAC
<b>Facilitators</b>	Dr. John Hansman, <i>REDAC Chairperson – Massachusetts Institute of Technology, Professor of Aeronautics &amp; Astronautics</i>  Mr. John Dermody, <i>Acting REDAC Executive Designated Federal Official – FAA, Director of Office of Airport Safety and Standards</i>
<b>Note Taker</b>	Mark R. Hale

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**Presentation:** Welcome Address and Opening Remarks

**Presenter/s:** *Dr. John Hansman, Mr. John Dermody*

Dr. John Hansman opened the meeting with administrative comments and thanked attendees for their presence. Mr. John Dermody announced the public meeting notice as required, thanked attendees, and provided prepared updates and remarks from Director Shelley Yak. Mr. Dermody spoke about updates to the Federal Aviation Administration (FAA) Research and Development (R&D) Landscape Product and associated research drivers. He thanked the committee for their assistance and feedback and noted that the R&D Landscape Product will be used moving forward to influence the R&D strategies and portfolio planning.

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**Presentation:** FAA NextGen Perspectives

**Presenter:** *Ms. Pamela Whitley, FAA, Assistant Administrator for NextGen*

Ms. Pamela Whitley delivered a presentation on the FAA's NextGen perspectives. Ms. Whitley began her talk by mentioning efforts underway for a reprogramming of the FAA's organizational structure sent to Congress by the Secretary. This proposal is the FAA's and DOT's response to the 2018 FAA Reauthorization Act calling for the establishment of an Assistant Administrator for R&D and Chief Technology Officer in the Air Traffic Organization. Ms. Whitley outlined the formal processes that this proposal went through and stated that, while the committees are reviewing the proposal, no decisions have been made yet.

Ms. Whitley then addressed the status of NextGen noting that most major NextGen Programs are in an acquisition state or are being deployed. Ms. Whitley described the latest technology transfer of the Air Traffic Demonstration 2 (ATD-2) from the National Aeronautics and Space Administration (NASA) to the FAA. ATD-2 will be part of the FAA's Terminal Flight Data Manager (TFDM) Program and will help to inform acquisition decisions. Ms. Whitley offered that this was very exciting because it represents the last major NextGen investment. Although software enhancements will continue to be made to NextGen platforms, the FAA is now in a position to begin talking about what happens in the post-NextGen environment.

Ms. Whitley described an upcoming vision document that will start to lay out the vision beyond NextGen. This document, titled “The Info-centric National Airspace System (NAS)” is in final stages of approval at the department level and will be shared with the Committee and stakeholders once this information goes public. Ms. Whitley added that NextGen, and the important work being done at the FAA, has never solely been about getting the systems in place, but also what the FAA can do with those systems. For example, there will be advancements in near real-time information to support decision making and information sharing across the enterprise – providing a common vision in terms of using data proactively. Ms. Whitley stated that it will take time to develop this common approach to how the FAA and stakeholders can best use the data. Ms. Whitley stated that the FAA will start to talk about integrating Artificial Intelligence (AI) and a big picture approach to cybersecurity to evolve the NAS for all users. She stated that the Committee would have a lot of important work to do in considering these factors.

Ms. Whitley emphasized that the FAA needs to better understand industry directions and investments. She stated that there is a tremendous amount of money being spent by industry in important and emerging areas. According to Ms. Whitley, the FAA must move away from its traditional model where something is identified and the FAA either builds it, or has it built using contract mechanisms, and more fully embrace the direction of industry. She emphasized that the FAA must be in the position of “listener” to industry directions so that it can be more agile and best prepare to enable innovation by industry.

Dr. Hansman asked if the Advanced Air Mobility (AAM) concept would be included as an area being heavily invested in by industry. Ms. Whitley confirmed that AAM is a concept that is high visibility and consequence for industry.

Dr. Hansman suggested that the REDAC Subcommittees should be involved early with understanding these exciting new directions so that the Committee can plan and contribute its understanding. Ms. Whitley supported this comment and stated that the takeaway message is that research going forward should be a shared responsibility between government and private industry.

Mr. Terry McVenes asked Ms. Whitley to explain the bigger picture approach to cybersecurity. Ms. Whitley offered that the FAA needs to think about cybersecurity as part of the vision moving forward. This is because cybersecurity evolves at a rapid pace. Ms. Whitley talked about zero tolerance and isolated environments and planning out the future of the NAS with a holistic cybersecurity approach in mind.

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**Presentation:** FAA Airport Research Strategic Roadmap

**Presenter:** *Dr. Michel Hovan*, FAA, Manager, Airport Technology Research Branch

Dr. Michel Hovan began his talk on the Airport Strategic Roadmap by providing some background regarding its development. Dr. Hovan stated that while there are very detailed research plans regarding the numerous research projects in the Airport Technology Research Branch, there was a need to develop a single, high-level roadmap that encompasses all of these efforts. Dr. Hovan presented an overview of the subordinate roadmaps and provided context for their evolution. Dr. Hovan then presented a slide detailing the FAA’s stakeholder-driven approach by identifying the various stakeholders and drivers of research and the process by which the R&D Landscape drivers

may be incorporated to optimize the R&D portfolio. Dr. Hovan stated that they must balance the current research needs of U.S. airports while also supporting innovation and implementing new technologies. Dr. Hovan then presented a chart that mapped out the airport of today, the FAA's current focus, and the airports of tomorrow (2030 and beyond) organized by research categories. The three main research categories in the chart were organized by airport pavement research, airport of the future research, and emerging entrants research.

Next, Dr. Hovan shared an Airport Evolution Roadmap and noted the difference between industry-led research and FAA-led research. Dr. Hovan highlighted a number of near-term efforts such as pavement structures, airport safety testing, use of AI and Machine Learning (ML), electric and physical infrastructure, and UAS integration at airports. He continued by highlighting mid-term research on novel and environmentally friendly pavements, AI and ML use in autonomous systems, new inspection techniques, energy system needs for electric or fuel cells, and AAM. Dr. Hovan then spoke about long-term research on smart airports, autonomous airport support functions, energy grids at airports, and highly automated AAM services and UAS applications. Dr. Hovan concluded the presentation by providing a more detailed view of the previously described activities organized by airport pavement, airport of the future, and emerging entrants activities.

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**Presentation:** Environment and Energy R&D Updates

**Presenter:** *Dr. James Hileman*, FAA, Chief Scientific and Technical Advisor for Environment and Energy

Dr. James Hileman presented an overview of the Environment and Energy (AEE) R&D Portfolio to the REDAC. Dr. Hileman, started the presentation by giving an overview of AEE's organizational structure and sharing their mission, vision, activities, and programs. Dr. Hileman then gave an overview and relative funding of the work organized by three Budget Line Items (BLIs) including: the Environment and Energy BLI, the NextGen – Environmental Research – Aircraft Technology and Fuels BLI, and the Aviation Climate Research BLI. Dr. Hileman continued his presentation by giving broad highlights of ongoing AEE R&D efforts and noted the considerable inter-agency coordination and collaboration to address carbon dioxide (CO<sub>2</sub>) emissions.

Dr. Hileman presented detailed slides that were created in partnership with NASA on the environmental impacts of aviation. The presentation slides emphasized emissions from the aircraft's perspective and examined all environmental aspects including those effects due to combustion, atmospheric chemistry and physics, aircraft noise, emissions from fuel production, global climate change, and population exposure and health impacts. Dr. Hileman stated that AEE is also examining the impacts of future aviation to the ozone layer. He stated that generally commercial aviation does not have a significant impact on the ozone layer, but rather impacts will result from emerging operations such as the introduction of supersonic transport, and continued evolution of commercial space transportation.

Dr. Hileman discussed current global competition and environmental pressures on the aviation industry, and particularly on airlines. He stated that the airline industry was hit hard by the COVID-19 pandemic. While global competition is increasing in aviation leadership, there has been limited investment in environmental R&D by industry because of the pandemic. While the pandemic may have impacted investments in these research areas significantly, Dr. Hileman noted that societal

pressure is still growing to reduce emissions and noise. Dr. Hileman then noted that “technological innovation is essential to enable sustainable growth and maintain U.S. global leadership in these areas.”

Dr. Hileman discussed a series of slides related to noise R&D that is currently ongoing. He informed the Committee about a Federal Register Notice (FRN) that provided a comprehensive overview of FAA R&D noise research including the effects of noise on individuals and communities, noise modeling and metrics, and reduction, abatement, and mitigation of aviation noise. Included in this discussion were the results of the neighborhood environmental survey which received 4,162 public comments. He also discussed enhancements to the aviation noise website and the extensive outreach performed on the FRN in February 2021. Dr. Hileman then continued by presenting noise research considerations for helicopters, UAS, AAM, Supersonic Aircraft, Hypersonic Civil Aircraft and Commercial Space that include understanding emissions, reducing emissions at the source, and mitigating emissions through alternative fuel sources and policy implementation. Dr. Hileman continued by emphasizing that the work being done in the AEE Portfolio is useful in supporting decision making and informing regulatory and standards setting bodies such as the International Civil Aviation Organization (ICAO). Dr. Hileman concluded this portion of the presentation by discussing efforts relating to analytical tool development and specifically the Aviation Environmental Design Tool (AEDT). The AEDT computes noise, fuel burn, and emissions simultaneously on the airport, regional, national, and global scales and is required for all regulatory actions. Dr. Hileman presented the AEDT development plan which contains an annual release cycle to continuously improve the tool.

Dr. Hileman pivoted the conversation to efforts related to combatting climate change. He stated that the current Administration took action to rejoin the Paris Agreement and released an executive order to tackle the climate crisis. According to Dr. Hileman, this executive order puts the U.S. on a path to achieve net-zero emissions economy-wide by no later than 2050. Dr. Hileman spoke about a Sustainable Aviation Event in September 2021 and the inclusion of a factsheet produced by the Biden Administration on sustainable fuels in American aviation. According to Dr. Hileman the NAS is operating much more efficiently than 30 years ago with an average fuel efficiency of 57.5 passenger-miles per gallon. He continued by outlining domestic aviation emission sources and emphasized that commercial aircraft, in the en route environment, are the biggest contributors to aviation emissions. He noted that while it is worthwhile to reduce emissions across the board, the answer to decreasing the bulk of aviation emissions and meeting prescribed goals is undoubtedly centered on this segment of operations.

Dr. Hileman highlighted a significant opportunity to develop a “clean sheet design” for a single aisle aircraft in the early 2030s. Dr. Hileman noted the importance of this opportunity as it would be significant step change improvement rather than an incremental evolutionary improvement. Dr. Hileman stated that the success of this work will reduce environmental impacts for decades to come and would lead to a 25%-30% improvement in fuel burn, subsequent greenhouse gas emissions, and a 15 decibel reduction in noise over today’s best in class aircraft.

Dr. Hileman continued by discussing the complementary nature of research between NASA and FAA through the Sustainable Flight National Partnership (SFNP) and the Continuous Lower Energy, Emissions, and Noise (CLEEN) programs. He provided links to a comprehensive report detailing the accomplishments of CLEEN and provided a description of CLEEN Phase 3 technologies. Dr. Hileman concluded his presentation by discussing the Sustainable Aviation Fuel (SAF) Grand Challenge. The SAF grand challenge is a U.S. government-wide effort to reduce the cost, enhance

the sustainability, and expand production and use of SAF to meet 100% of aviation fuel demand by 2050.

Dr. James Kuchar asked how the significant increase in AEE's funding would be used. Dr. Hileman indicated that a portion of the money would be used to expand the CLEEN program and accelerate its research outcomes. In addition, he indicated a portion of the money would allow the FAA to work closely with the Aviation Sustainability Center (ASCENT) Center of Excellence (COE) to exceed the 50% fuel blend wall and get to certification of 100% SAF as soon as possible. This accelerated work will also decrease the cost of SAF production which is currently a significant barrier to acceptance and adoption.

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**Presentation:** NASA Updates

**Presenter:** *Dr. Edgar Waggoner*, NASA, Deputy Associate Administrator for Programs

Dr. Edgar Waggoner began his presentation by giving an overview of NASA's vision for global, sustainable, and transformative aviation in the 21<sup>st</sup> century. NASA's Aeronautics Research Mission Directorate (ARMD) continues to evolve and execute NASA's aeronautics strategy in six major thrust areas that include safe, efficient growth in global operations; safe, quiet and affordable vertical lift air vehicles; innovation in commercial supersonic aircraft; in-time system-wide safety assurance; ultra-efficient subsonic transports; and assured autonomy for aviation transformation. Dr. Waggoner stated that this is an opportunity for U.S. leadership in a new era of flight. Next, he outlined the five ARMD program areas which included Airspace Operations and Safety, Advanced Air Vehicles, Integrated Aviation Systems, Transformative Aeronautics Concepts, and Aerosciences Evaluation and Test Capabilities.

Dr. Waggoner presented budget information and spoke about Fiscal Year (FY) 2022 changes that included increased funding. He stated that increased funding would accelerate and expand key components of the Sustainable Flight National Partnership (SFNP) to ensure that technologies will be ready by mid-to-late 2020s to transition to the U.S.'s next generation single aisle aircraft.

Dr. Waggoner concluded his presentation with discussion of SFNP, NASA's Low Boom Flight Demonstration, AAM, Hypersonic Technology, and Energizing the U.S.'s Aeronautics Innovation Pipeline.

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**Presentation:** Subcommittee Report – Environment and Energy

**Presenter:** *Mr. Ian Redhead*, KCMO

Mr. Ian Redhead started the Environment and Energy Subcommittee report by acknowledging the great work being done as demonstrated by the two previous presentations. Mr. Redhead stated that the Subcommittee held its fourth consecutive virtual meeting and received updates on major components of the AEE R&D Portfolio. He reiterated previously shared information related to the current administration's emphasis on climate change and particularly Executive Order 14008 on tackling the climate crisis. He stated that the AEE R&D Program is doing a great job maintaining a balanced R&D Portfolio and noted a number of new research programs added to address concerns of aviation noise and new entrants. He emphasized the collaboration between NASA and FAA being



the key component to success for this research.

Mr. Redhead presented the Subcommittee's first Finding and Recommendation regarding SAF. The Finding recognized the importance of SAF and the previously discussed SAF Grand Challenge. The recommendation from the Subcommittee was that the FAA should maintain a leadership position on SAF and strongly recommended that any additional federal funding be used to accelerate this program.

Mr. Redhead presented the Subcommittee's second Finding and Recommendation that centered on the need to rely on increased public and private partnerships like CLEEN, the Commercial Aviation Alternative Fuels Initiative (CAAIFI), and ASCENT Programs. The Subcommittee recommended that the FAA's AEE R&D Portfolio have the flexibility to utilize any additional federal funding to enhance and accelerate existing research to best address federal mandates. The third Finding and Recommendation was the acknowledgement and continued support for U.S. global leadership on the ICAO Committee on Aviation Environmental Protection (CAEP). The Subcommittee maintains that U.S. leadership in this role allows the U.S. to influence policy and rulemaking. The final Finding and Recommendation acknowledged the successes in creating more fuel efficient and quieter aircraft. The Subcommittee emphasized the continued prioritization of noise research. Mr. Chris Oswald commented that the Airports Subcommittee concurred that there should be a prioritization of noise research.

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**Presentation:** Subcommittee Report – Aircraft Safety

**Presenter:** *Mr. Terry McVenes*, RTCA

Mr. Terry McVenes briefed the Committee on the various presentations given to the Subcommittee on FY 2021 accomplishments, strategic planning, and industry inputs on AI and ML, UAS research, and COE research. Mr. McVenes stated that the Subcommittee was closing a previous Recommendation related to AI and ML due to briefings and materials received by the Subcommittee and talked about broadening the Subcommittee's membership to increase its representativeness.

Mr. McVenes presented the Subcommittee's Findings and Recommendations next. The first Finding focused on NAS-related technology transfer from NASA to FAA. Mr. McVenes stated that some of these technologies have not reached a NASA Technology Readiness Level (TRL) 6 and therefore have not been tested in a relevant environment. In addition, some of these technologies have been placed in FAA projects funded by the Facilities and Equipment (F&E) budgetary account, and therefore, are not presented to the Subcommittee for review and advice. This Finding had two associated Recommendations. The Subcommittee requested that all NASA technology transfers to FAA that have not reached a TRL 6 be included in future Subcommittee briefings. The second Recommendation was that NASA provide periodic briefings to the Subcommittee on areas of high importance.

Mr. McVenes presented the second Finding related to electric aircraft research. The Subcommittee commented that the UAS Landscape is timely and appropriate and Recommended that a new BLI be added for electric powered aircraft as technology advances. The third Recommendation stated that the FAA should conduct research exclusively on electrically powered UAS including fuel planning requirements and a correlation of battery level to an emergency, or minimum, fuel equivalent.

The Subcommittee's third Finding was concerned with various segments of the radio frequency spectrum that have recently been allocated and assigned for auction. The Subcommittee stated that there can be safety and interference hazards with reassigned frequencies that may be adjacent to those required for manned aviation. The related Recommendation was that the FAA should research and test the radio frequencies that are used by low altitude UAS including those that operate Unmanned Traffic Management (UTM) or Beyond Visual Line of Sight (BVLOS) systems.

The fourth Finding of the Subcommittee stated that UAS airframe icing requires research to close knowledge gaps since these unique designs are vastly different from traditional transport aircraft. The Subcommittee Recommended that the FAA expand the Research Landscape to include UAS icing. This research would cover all types of UAS from small to large, as well as AAM aircraft and include airframe, engine, and rotor icing aspects.

The fifth Finding focused on UAS safety. The Subcommittee stated that it is critical that UAS enter the market with appropriate safety and security technologies to include standardized operational protocols. The Recommendation stated that safety and security features, such as "geofencing," "return to base," "lost link," and other safety risk mitigation technologies should be evaluated and a basis for standardization established from the data.

The final Finding from the Subcommittee related to the role of the Research Landscapes in prioritizing BLIs. The Subcommittee commented that both industry and the FAA place much effort into developing the Landscapes Product but it remains unclear how the FAA is using them in the prioritization process. The Recommendation requested that the Subcommittee receive a briefing from the FAA regarding how it is being used to identify gaps in the R&D portfolio and to prioritize future BLI items for research.

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**Presentation:** Subcommittee Report – Human Factors

**Presenter:** *Dr. Barbara Holder, Honeywell*

Dr. Barbara Holder outlined the work that the Subcommittee completed including their review of the R&D portfolio and an updated "Aviation Industry Directions and Emerging Issues for Human Factors" document. Dr. Holder also spoke about research to improve methods for determining proficiency of operational personnel and improved Air Traffic Control (ATC) learning for cross-facility decisions.

Dr. Holder presented the Subcommittee's two Findings and subsequent Recommendations. The first Finding was that research is needed to improve methods for the effective training and assessment of operational proficiency to account for the increased automation in the ATC and Traffic Flow Management (TFM) environments. The subsequent Recommendation focused on improving this training with an emphasis on recurring training requirements and new ways to effectively assess the development and maintenance of personnel proficiency.

Dr. Holder presented the Subcommittee's second Finding related to updating alerting system standards. Dr. Holder noted that the current flight deck designs and regulatory framework for flight deck alerting systems were based primarily on research conducted in the late 1970s and early 1980s

by aircraft manufacturers. Since this time technology has advanced significantly and new capabilities have been implemented in modern alerting systems. Dr. Holder then presented the Subcommittee's second Recommendation which centered on an update to alerting systems standards. She noted that research is needed to ensure the design of advanced alerting systems supports human cognitive performance for implementation in modern aircraft.

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**Presentation:** Subcommittee Report – NAS Operations

**Presenter:** *Dr. James Kuchar, MIT-LL*

Dr. James Kuchar presented an overview of the NAS Operations Subcommittee's activities including agenda topics, reviews, and deep dive topics for discussion. Dr. Kuchar then presented a general observation regarding the Weather Program's R&D funding. Dr. Kuchar stated that in prior meetings the Subcommittee noted concern over reduction in weather-related R&D funding and Recommended that the FAA aggressively increase visibility into the importance of this research. Dr. Kuchar stated that Subcommittee is pleased to learn that FY 2022 weather-related R&D funding is slated to be restored to more robust levels.

Dr. Kuchar presented the Subcommittee's first Finding relating to the use of new air traffic management procedures that may enable lower noise and lower fuel burn operations without requiring new technologies. This was followed by the Subcommittee's first Recommendation that the FAA continue to foster and strengthen linkages between new initiatives in AEE, the Office of NextGen (ANG), and the Air Traffic Organization (ATO) related to environmental impact mitigation through new technologies for NAS operations.

The Subcommittee's second Finding related to the introduction of activities addressing human factors needs and challenges associated with strategic air traffic management concepts, including TFM. The Finding also further stated that it will be important to define and pursue additional research into systems and procedures for ensuring effective multi-stakeholder collaborative decision-making using uncertain forecast information. Dr. Kuchar then presented the second Recommendation that the FAA continue to grow strategic enterprise human factors R&D funding and activities associated with longer-term strategic TFM and collaborative decision making. The Subcommittee also recommended that human factors considerations associated with the FAA's information-centric vision for the NAS be accelerated.

Dr. Kuchar then presented the Subcommittee's Finding on flight dynamics research related to AAM. This Finding described a briefing to explore issues related to flight control of eVTOL (Electric Vertical Take-off and Landing) vehicles using NASA's Vertical Motion Simulator (VMS). The Subcommittee observed that the current FAA R&D activities using the VMS seem mismatched to the potentially different flight dynamics of future vehicles. The third Recommendation stated that the FAA and NASA articulate and evaluate requirements for using piloted motion-based simulators for R&D of eVTOL aircraft entering AAM markets.

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**Presentation:** Subcommittee Report – Environment and Energy

**Presenter:** *Mr. Chris Oswald, Airports Council, NA*

Mr. Chris Oswald began his briefing by detailing the Airport Subcommittee's meeting agenda and



discussed their R&D Portfolio review. Specific research briefings to the Subcommittee included the topics of vertiports, airport firefighting research, sustainable airfield pavements, airport design and sustainability projects, pavement testing, and noise research. Mr. Oswald stated that the Subcommittee was pleased to see the focus on time-critical projects including the evaluation of aircraft firefighting agents and assessment of UAS, both of which are legislative requirements. The Subcommittee also noted the work being done on new airspace entrants, the impact of climate change on airport operational infrastructure needs, and sustainable airfield pavement research.

Mr. Oswald provided the Subcommittee's first Finding relating to alternative firefighting agent research. The Subcommittee noted concern because the project's results were needed to support FAA action regarding the FAA Reauthorization Act of 2018. The deadline has passed and the FAA has not demonstrated that there are non-fluorinated foams capable of meeting current DOD foam standards. He then presented the first Recommendation that the FAA prioritize assistance and support for DOD research efforts regarding a new performance standard for non-fluorinated foams.

The second Finding stated that the Subcommittee appreciated the categorization of several of the program's underlying projects in terms of sustainability and resiliency – as this is a priority for U.S. airport operators. Mr. Oswald presented the second Recommendation encouraging the FAA to continue to prioritize research projects that enhance airport sustainability and resiliency particularly within the advanced pavement materials, extended pavement life, airport planning & design, and environmental tools & guidance.

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**Presentation:** Committee Closing Discussion, F&Rs, Future Actions

**Presenter:** *Dr. John Hansman; All Committee Members*

Dr. Hansman thanked the Committee and those in attendance. The Committee discussed global comments and themes arising from the meeting. Dr. Hansman concluded the meeting with a summary of meta-points which included the successful continuation of the FAA's R&D work during the pandemic; achievements made within the AEE Portfolio and related environmental projects, the impacts of AAM and UAS, and concerns of frequency spectrum usage and interference.

Research, Engineering and Development Advisory Committee Federal  
Aviation Administration (FAA)  
VIRTUAL MEETING  
OCTOBER 20, 2021  
Agenda

<b>Time</b>	<b>Topic</b>	<b>Presenter(s)</b>
10:00 AM	Welcome Address and Opening Remarks	R. John Hansman John Dermody
10:15 AM	FAA NextGen Perspectives	Pamela Whitley
10:30 AM	FAA Airport Research Strategic Roadmap	Michel Hovan
11:00 AM	FAA Environment and Energy R&D Updates	James Hileman
12:00 Noon	<i>BREAK</i>	
12:30 PM	NASA Updates	Ed Waggoner
1:00 PM	Subcommittee Report – Environment and Energy	Ian Redhead
1:30 PM	Subcommittee Report – Aircraft Safety	Terry McVenes
2:00 PM	Subcommittee Report – Human Factors	Barbara Holder
2:30 PM	<i>BREAK</i>	
3:00 PM	Subcommittee Report – NAS Operations	James Kuchar
3:30 PM	Subcommittee Report - Airports	Chris Oswald
4:00 PM	Committee Closing Discussion - – Recommendations – Future Actions	R. John Hansman Committee Members
5:00 PM	Adjournment	R. John Hansman

**REDAC Summer-Fall 2021 Meeting Attendees:**

<b>NAME</b>	<b>AFFILIATION</b>
<b>CA Roundtree-Coleman</b>	<b>FAA</b>
<b>Michel Hovan</b>	<b>FAA</b>
<b>Antonio Chiesa</b>	<b>TCCA</b>
<b>Barbara Holder</b>	<b>Honeywell</b>
<b>Ben Huddle</b>	<b>OST</b>
<b>Bill Kaliardos</b>	<b>FAA</b>
<b>Brittaini Maul</b>	<b>GAO</b>
<b>Carla Hackworth</b>	<b>FAA/CAMI</b>
<b>Christopher Oswald</b>	<b>ACI-NA</b>
<b>Christopher Loring</b>	<b>FAA</b>
<b>Colleen Donovan</b>	<b>FAA</b>
<b>Doug Rodzon</b>	<b>FAA</b>
<b>Ed Waggoner</b>	<b>NASA</b>
<b>Eric Neiderman</b>	<b>FAA</b>
<b>Hamza Abshir</b>	<b>FAA</b>
<b>Hossein Eghbali</b>	<b>FAA</b>
<b>Ian Redhead</b>	<b>KCMO</b>
<b>Isidore Venetos</b>	<b>FAA</b>
<b>Jason Coon</b>	<b>FAA</b>
<b>Jean Cook</b>	<b>GAO</b>
<b>Jeffrey Gagnon</b>	<b>FAA</b>
<b>James Kuchar</b>	<b>MIT/LL</b>
<b>Jim Patterson</b>	<b>FAA</b>
<b>Joseph Bertapelle</b>	<b>JBC</b>
<b>John Dermody</b>	<b>FAA</b>

<b>Jon Schleifer</b>	<b>FAA</b>
<b>Jorge Fernandez</b>	<b>FAA</b>
<b>Josh Larson</b>	<b>ALPA</b>
<b>Kathy Abbott</b>	<b>FAA</b>
<b>Katie Constant - Coup</b>	<b>FAA</b>
<b>Kieran McCarthy</b>	<b>GAO</b>
<b>Lee Olson</b>	<b>FAA</b>
<b>Mark Hale</b>	<b>JMA</b>
<b>Marlo E. Allen</b>	<b>FAA</b>
<b>Martha Chow</b>	<b>GAO</b>
<b>Mike Paglione</b>	<b>FAA</b>
<b>Molly Laster</b>	<b>GAO</b>
<b>Monique Moore</b>	<b>FAA</b>
<b>Murphy Flynn</b>	<b>FAA</b>
<b>Nancy Clarke</b>	<b>JMA</b>
<b>Nick Nadarski</b>	<b>GAO</b>
<b>Pamela Whitley</b>	<b>FAA</b>
<b>Paul Aussendorf</b>	<b>GAO</b>
<b>Paul Strande</b>	<b>FAA</b>
<b>Phil Yeung</b>	<b>FAA</b>
<b>Rany Azzi</b>	<b>FAA</b>
<b>Rich Golden</b>	<b>FAA</b>
<b>Robert Ochs</b>	<b>FAA</b>
<b>Ryan King</b>	<b>FAA</b>
<b>Steve Summer</b>	<b>FAA</b>
<b>Tara Holmes-Gibson</b>	<b>FAA</b>

<b>Terry McVenes</b>	<b>RTCA</b>
<b>Todd Lewis</b>	<b>FAA</b>
<b>Hannah Baumgartner</b>	<b>FAA</b>
<b>James Hileman</b>	<b>FAA</b>
<b>Lauren Thomas</b>	<b>FAA</b>
<b>R. John Hansman</b>	<b>MIT</b>
<b>Dave Atwood</b>	<b>FAA</b>
<b>Caprice Brown</b>	<b>FAA</b>
<b>Annie Augustin</b>	<b>FAA</b>
<b>Laurence Wildgoose</b>	<b>FAA</b>
<b>Sylvia Palmer</b>	<b>ACC</b>
<b>Benjamin Thielen</b>	<b>FAA</b>
<b>Ludovic Aron</b>	<b>EASA</b>
<b>Jonathan Munetz</b>	<b>GAO</b>
<b>Thomas Van Dillen</b>	<b>FAA/CAMI</b>
<b>Maria DiPasquantonio</b>	<b>FAA</b>
<b>Caitlin O’Kelly</b>	<b>FAA</b>
<b>Lisa C. Thomas</b>	<b>FAA</b>
<b>John Mixon</b>	<b>FAA</b>
<b>Anthony Tvaryanas</b>	<b>FAA/CAMI</b>
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