Subcommittee on Environment and Energy | MINUTES

Meeting date & time *March 17-18, 2020*
Meeting location *Virtual Meeting*

Purpose	Review FY2021 R&D portfolio
Facilitator	Jim Hileman, DFO
Note taker	Jim Hileman
Timekeeper	Jim Hileman

Minutes from Meeting

Presentation Chair Opening Statements | **Presenter** *Ian Redhead*

Ian Redhead welcomed everyone.

Presentation FAA AEE Update (AEE Update) | **Presenter** *Becky Cointin*

Becky Cointin noted that FAA AEE staff are doing their best to work through the challenges posed with the COVID-19 outbreak. She gave an update on the Part 36 rulemaking on supersonic aircraft noise and noted that it may be delayed due to the current situation. She shared the fact that the CLEEN solicitation has been released, but with some delays due to contracts issues.

Kevin followed with a note that we are working to understand how to work remotely effectively.

A member asked if there are any insights even this early on how comments periods may be affected by the current situation. Becky did not know for sure, but was not sure how remote teleworking would affect responding; however, other factors could impact them.

Presentation Update on ICAO and CORSIA Implementation | **Presenter** *Dan Williams*

Dan Williams presented an update on what has transpired since the last meeting, including Assembly, CAEP SG, and Council meetings.

Regarding supersonic aircraft, Dan noted that we had a good outcome from Assembly to continue working on the exploratory study. During steering group, we also agreed to keep moving forward. Unfortunately, we had to cancel a dedicated meeting with the ICAO Council to share information on supersonic aircraft due to the COVID-19 outbreak.

Dan provided an update on progress with respect to CORSIA and efforts on CORSIA Eligible Fuels. This included the challenges faced during the Assembly meeting and the progress made at Council.

A Subcommittee member asked, “Given that despite our best efforts things will be impacted, what is your triage / priority for what must be done first?” Dan noted that this is a challenge

internationally and Kevin added that sustainability is important. Kevin also noted that adjustments might need to be made to CORSIA due to the current COVID-19 outbreak.

Dan gave a report out on the new effort to explore the feasibility of a Long Term Aspirational Goal (LTAG) for international CO2 emissions. A work program was developed at SG/1 and this was just approved by ICAO Council last week and so we will start work on this front. Kevin followed up on this to state how this work relates to other aspects of the CAEP work program.

A Subcommittee member asked, “Where are we in the process relative to certifying US manufactured aircraft under CORSIA. What is the status of EPA's need for an underlying endangerment finding relative to aviation emissions and in turn emission requirements?” Kevin clarified this is on the CO2 standard, noted that it should have gone into effect on Jan 1, 2020, and that FAA and EPA are in the process of implementing it. He also remarked that while it has taken longer than we had hoped, EPA is now well positioned for doing their part of the rule-making in the next 3-6 months and that the FAA will follow shortly thereafter.

A Subcommittee member asked, “How is the FAA planning to integrate research at various TRL levels across FAA/NASA/ARPA-E when defining potential improvements when setting the LTAG?” Jim noted that the work plan will look at varying technologies and fuels and that it will be important to look at costs and fleet turnover.

Dan continued with a discussion on the domestic implementation of CORSIA.

A Subcommittee member asked, “Can someone comment on the options recommended for CORSIA’s sustainable fuels? How "independent" is the independent committee? What is its composition? Will their recommendations carry weight or will they be challenged by others beyond FAA?” The DFO noted that we would try to cover this during the discussion on fuels.

Presentation Responses to REDAC Recommendations & Actions | **Presenter** *Jim Hileman*

Jim Hileman walked through the action items from previous meetings. Open action items are listed below. He then walked through the existing findings and recommendations from the Summer 2018 meeting and later he covered all of the recommendations from the September 2019 meeting. The Chair agreed to close all the recommendations.

There was a discussion on staffing at FAA and in ICAO. The FAA noted that hiring new staff is a priority within Office of Environment & Energy (AEE) as evidenced by a large number of job openings being posted and new staff being brought on-board.

Action items	Person responsible	Deadline
Share ASCENT NFO with REDAC E&E Subcommittee (on an annual basis)	J. Hileman	Ongoing
Leverage “right-to-left” thinking in developing roadmaps wherein we start by thinking about the endpoint (goal) that is desired and decide how to get there	J. Hileman	Ongoing

Action items	Person responsible	Deadline
Monetize the air quality and climate benefits of having an alternative jet fuel with reduced sulfur and naphthalene content.	J. Hileman	July 2020
Leverage the road mapping efforts at NASA and FAA to update the White House National R&D Plan.	J. Hileman	On hold
Develop a means to communicate information on AEDT to the layperson. This could include its noise and emissions modeling capabilities and how it reduces the need for noise and emissions monitoring.	F. Grandi	July 2020
Develop a means to communicate successes from E&E Portfolio summary slide.	J. Hileman	Ongoing
Examine indirect environmental impacts from aviation that result from modifications to supply chains.	J. Hileman	July 2020
Provide feedback to the Subcommittee Chair and DFO on the draft R&D landscape document.	Subcommittee Members	May 2020

Presentation Budget | **Presenter** *Beth Delarosby*

Beth began by giving an update on the RE&D budget for FY20. The FY20 budget was enacted on December 20, 2019 and received $192.7M for RE&D funds. She provided a detailed comparison of the ops, F&E, Grant-in-Aid, and RE&D accounts among the President's budget, subcommittee markups, and the final conference language.

Beth continued by providing an update on the FY21 budget. She reported that the budget has been submitted to congress the week of February 10 and that it will need to be agreed to or the agency will have to go ahead based on sequester levels.

Regarding the $170M target for FY22 she noted that it will be delivered to OST in June 2020. Submission to OMB is expected for mid-September and delivery of the President's request to congress in February 2021. She also added that the targets established in February 2020 out to FY26 are still for $170M, but that changes can be expected.

Lastly, Beth reminded the Committee that the current Authorization signed by the President on Oct 5, 2018 extents the authorization through 2023.

Presentation Industry Perspective | **Presenter** *Steve Alterman*

Steve Alterman discussed issues facing the industry, but everything is in background until things are straightened out with respect to COVID-19. Industry wants to work with FAA on environment issues.

There was a discussion on the budget for the FAA and RE&D in particular. Jim noted that we are working to execute the FY2020 budget as quickly as possible and nothing has changed on that front. Kevin noted his thanks to Steve for joining.

Presentation REDAC Season | **Presenter** *Shelley Yak, WJHTC Director*

Shelley Yak thanked everyone for joining in these changing times. She noted that work was continuing on the landscape document. She discussed the research drivers and NARP goals and the fact that she has asked people in FAA to cross-list research programs with drivers and goals.

Shelley said that DOT was looking at the advisory committees to see what was working well and what was not working. While the REDAC is legislatively required, she would ask us to still think about this question. She would like to talk about what is working well and what could be improved. She would then bring this up for discussion with the DFOs.

Chinita Roundtree-Coleman, REDAC lead followed up by noting that the various subcommittees have been brainstorming on this and compiling their lists. Ian asked that this also be a topic of discussion at the full REDAC.

She also noted DOT have asked that future meetings be in the DC area. This should not be a problem for the E&E Subcommittee as their meetings are planned for the DC area.

Action items	Person responsible	Deadline
Subcommittee members provide feedback to Ian/Jim on the REDAC – what works well, what does not, and what could be improved.	Subcommittee	April 15

Presentation E&E Research Update | **Presenter** *Jim Hileman*

Jim Hileman provided an overview presentation on the overall Environment and Energy Research and Development portfolio. He began by reminding where the Office of Environment and Energy (AEE) was located within the FAA organization and then provided an update on new staffing changes. He reported that Kevin Welsh is on a 6-month temporary assignment at OST, Don Scata is now the new Noise Division Manager, and that Dan Williams is acting as the Senior International Advisor.

Jim proceeded by giving an overview of the background context, aviation's economic and environmental significance, and how the E&E R&D portfolio and programs have been set up to serve the AEE Mission and Vision. He then continued by highlighting what are the emerging aircraft technologies the office has to take into consideration and provided more details on AEE's ongoing efforts on noise, emissions, jet fuel, aircraft technology, model development, and modeling activities in support of decision-making. He then concluded by providing highlights of ongoing R&D efforts and the list of outreach materials.

The Chair asked if funding had been already committed by the CLEEN industrial partners for the third phase of the CLEEN Program. Jim noted that funding had already been committed by industry for the first two phases of CLEEN; however, he could not discuss CLEEN Phase 3 as the solicitation process is currently underway.

Jim then presented an update on the ASCENT COE activities. He first provided an update on domestic and international collaborations and an overview of the ASCENT CoE program. He then gave an update on the CoE funding profile, grant approval process, and grants approval status. Jim then completed the ASCENT related portion of the presentation by covering an overview of the research projects portfolio by research focus area, an highlight of the supersonic related projects, and the overall status and direction of the program.

A member asked if ASCENT universities have any requirements on the number of students that must be supported. Jim responded that there is no fixed requirements and that the number depends on the projects. Another member asked if there are plans to incorporate the research projects conducted under ACRP focusing on improving modeling in AEDT. Jim said yes and indicated that a fuller answer will be provided during the AEDT presentation.

Jim continued his presentation with a review of the E&E R&D Portfolio budget profile. He first provided graphics reporting the five-year view of the funding split by BLI. He then proceeded with an overview of the major activities, accomplishments, and goals planned for FY21 for both the Environment & Energy and the NextGen – Environmental Research – Aircraft Technology and Fuels BLIs, noting that in FY21 they will have new identifier codes (A.s and A.t respectively).

He concluded the presentation by providing a list of recent successes and the list of FAA presentations remaining in the agenda for the meeting.

Action items	**Person responsible**	**Deadline**
Update Slide 7 and extend the period covered by the graphics to current day.	Jim Hileman	July 20
Update slide 17 to reflect that NFO-2020-C is now P77	Jim Hileman	July 20
Create ASCENT materials to include a list of the number of projects undertaken under the CoE, the value of the program in terms of the number of educated individual it contributes to the industry, and identify the entities that recognize the value of partnering on ASCENT projects.	Jim Hileman	July 20

Presentation Noise Research | **Presenter** *Don Scata*

Don Scata started his briefing by noting that much of the AEE work will be covered during other parts of the meeting and his briefing is dedicated to aspects that will not be included elsewhere.

His briefing focused on how the E&E R&D portfolio is supporting the development of materials to respond to reauthorization requests, many of which are focused on noise.

Don provided details on the work to examine the sleep and health impacts of noise. He also briefly discussed commercial space.

There were discussions on commercial space data and what has been provided by the operators in terms of fuel composition. Jim stated that we do know what the fuel composition is, but do not know what the resulting emissions amounts are, especially the particulate matter. Ian indicated

that it could be a topic to be funded under the AEE budget and that we could also possibility fund noise measurements from these vehicles. Natalia Sizov reported that there is already a completed ACRP noise measurement project and that the results are now being used to validate modeling tools.

A subcommittee member asked FAA to speculate on the potential timing of a noise stage 6 standard. The member noted that about 30 years passed between the establishment of Stage 3 and 4, but only about 10 years between Stage 4 to 5. FAA noted that Stage 5 just came into effect, but that some countries in Europe are interested in examining stringency scenarios in the next few years. The DFO noted that any work on a noise standard would likely have an impact on fuel burn and there will need to be a consideration of interdependencies with the CO2 standard.

Presentation ATR Environmental Research - Update | **Presenter** *Lauren Vitagliano, Tom Cuddy, Kent Duffy, and Keith Bagot*

Lauren Vitagliano gave an overview of the Airport Technology Research program, which is sponsored by the Office of Airports. Portions of this work are being done in coordination with AEE. She noted that roughly $2M of the total ATR budget is dedicated to noise and environmental issues. The current ATR projects include three projects on noise (National Noise Annoyance Survey, National Sleep Disturbance Survey, and Noise Level Reduction Test Methods) and three projects on environment (Geospatial Environmental Map Tool (AppMap), Sustainability Synthesis, and Future Climate Scenarios for Runway Length).

Tom Cuddy provided additional details on the sustainability synthesis. A draft report was submitted in Nov 2019 and ARP is planning next steps.

A Subcommittee member noted that she has already heard concerns about airports tightening belts on budgets and about how they're going to move forward with capital projects that are under way. She noted that this sustainability work could have a role in helping to protect sustainability elements so that they're not value-engineered out. The FAA said they would be happy to work together on this topic.

Kent Duffy provided further information on the project to look at Future Climate Scenarios for Runway Length. They have asked UC Berkeley and MIT to examine the advisory circular runway length analysis procedures. He also discussed the FAA AppMap tool, http://appmap.faa.gov, and its environmental query capabilities.

A Subcommittee member asked if the AppMap tool is available externally, and FAA noted that it is still under development, and as such, is currently an FAA-internal tool.

Keith Bagot provided an update on efforts related to aviation firefighting foams (AFFF). He started by covering the history of Perfluorinated Surfactants, their ability to break down in the environment, and how they are being phased out. He provided information on SEC. 332 from the FAA Reauthorization Act of 2018 on PERFORMANCE STANDARDS FOR FIREFIGHTING FOAMS. He then gave details on the Aircraft Rescue and Fire-Fighting (ARFF) Fire Test Facility. He also provided information on how FAA is changing the guidance to airport inspectors. He concluded with a proposed research timeline for the work.

Based on a question, Keith noted that the FAA would like to stay within the milspec guideline, but there are many questions that need to be answered before FAA can say anything for certain.

The DFO noted that the briefing on AFFF was provided at the request of the Subcommittee and he thanked the presenters for joining and giving an update.

Presentation AEE Research Update: Helicopters, UAS, and UAM | **Presenter** *Eric Elmore and Don Scata*

Don Scata started the briefing with a summary of efforts on helicopter research. This included a summary of modeling efforts through ASCENT Project 38, testing and validation efforts on noise with NASA, and the Fly Neighborly program. Don noted that under ASCENT Project 38, Pennsylvania State University (PSU) in conjunction with Continuum Dynamics has developed a physics based model CHARM/HELOSIM/PSU WOP-WOP (a.k.a., PSU-WOPWOP). He continued with a discussion on the NASA/FAA noise testing being conducted to develop noise abatement procedures and provide test data. Data from measurements performed in 2017 are being used to validate and refine the model and an additional test was conducted in 2019 to obtain data on heavier helicopters. He concluded with a summary of the work that FAA and Volpe are doing together to develop Noise Abatement Procedures that can be tailored to individual heliports by the operators and to promote those procedures to helicopter operators and pilots.

Eric Elmore and Don provided an update on efforts on UAS/UAM. They started with a list of the questions that needed to be answered. They also covered efforts related to UAS/UAM Noise Certification, ASCENT Projects 9 and 49 on noise modeling from these vehicles, the UAS Integration Pilot Program (IPP), and other UAS noise measurement efforts.

A Subcommittee member asked if shielding and/or rotor-rotor interaction noise was being included. The FAA noted that rotor-rotor interaction noise is included in Project 49, but shielding was not in the year 1 work. Another Subcommittee member indicated that there are rotor-rotor experimental capabilities at NASA facilities that could be brought forward to aid these efforts. FAA further reported that they are standing up a project with Penn State to obtain noise measurement data with an industrial partner. The FAA also noted that they could look at shielding as a part of the year 2 work in Project 49. The Subcommittee member thanked the FAA for these efforts and said that shielding would be great, but Validation and Verification of the noise modeling was more important.

Presentation Operations for Reduced Noise | **Presenter** *Chris Dorbian*

Chris Dorbian provided an overview of the research FAA is doing to develop operational procedure concepts to reduce noise. This includes work by MIT through the FAA-Massport MOU, ASCENT research, and Airport Technology Research (ATR) projects. He noted that FAA are investigating operational opportunities for noise reduction; validation of noise abatement procedures; and advancements of tools, processes, and policies. He provided an extensive update on the work that is being done by these researchers and its implications.

He started with a preview of the report on aircraft speed that will respond to Section 179 of the 2018 FAA Reauthorization. This report will summarize the work that MIT has done. Chris provided the latest results on reducing speed on takeoff. Based on a collaborative effort among MIT, NASA, Boeing, and FAA, there is now an understanding that reducing takeoff speed will not in fact reduce noise.

Chris followed up with a discussion on delayed deceleration approaches (DDA - also known as low power low drag operations) that could provide noise benefits further from the airport on approach. This procedure was flown successfully via the ecoDemonstrator program. Additional work is needed on it to overcome a few challenges before DDA could be implemented in the NAS.

He continued with ongoing efforts wherein MIT and Boeing under ASCENT Project 44 will do datamining to combine Flight Data Recorder (FDR) data and correlate it with noise measurements on the ground.

Chris also provided an update on the implementation of procedures that were developed under the Massport MOU. He noted the challenges that are being overcome to implement these procedures.

He concluded that despite considerable progress in reducing aircraft source noise and community noise exposure, aviation noise remains a concern in many areas. He noted that FAA is exploring operational opportunities to reduce the noise from the current fleet. He stated that the FAA is also developing tools to better assess the benefits of advanced operational procedures and is seeking opportunities to operationally validate and measure concepts with potential to reduce noise.

A subcommittee member asked about the data being presented in Chart 7 and asked to take the discussion offline.

Discussion on Findings and Recommendations | Lead *Ian Redhead*

The Chair led a discussion based on the presentations provided on day 1. The DFO started by thanking all of the briefers for being concise and making this work on day 1. The Chair echoed thanks and said that he was happy with the day although there was obviously less discussion in this venue. The Chair noted that he was pleasantly surprised with the positive response from FAA, especially with respect to AERMOD. He was also happy to see that FAA is working in ICAO and is overcoming the challenges that are being posed. He is also pleased to see AEE are increasing staffing and therefore thinks a recommendation may not be needed.

A Member said briefings were very good and well thought out. He said there was a lot of thought put into these and that the office are out there every day trying to do the right thing. He concluded by saying that the staff are making things very easy to evaluate as they are doing a great job.

The FAA said the program is on an upward trajectory and that it is a function of the support from this Subcommittee.

The Chair noted that AEE has been working with this group for a long time and that has resulted in a good transfer of information.

The FAA noted that this is our opportunity to sharpen and hone our skills on communicating this information to the group. There is a lot that goes into making these decks and he was glad to see the committee are seeing improvements over time.

Another Subcommittee member made a few comments and had questions for the group. He said that news were excellent in terms of the budget and that it was night and day compared to the past. He stated that AEE are on a much more sustainable track. He said that the expanded scope of efforts is

commendable but that he was interested in knowing if this level is sustainable. He recommended to accelerate hiring and to find ways to entice more top quality people. He concluded with saying that he thought the portfolio is very well balanced, but he was unsure of international versus domestic efforts.

The FAA noted that we are looking at people who could meet multiple needs and are thinking how we could do this. The DFO noted that Juan asked if we have a summer intern program and said that AEE are indeed trying to do that.

The DFO provided budget information and information on how we do work domestically versus internationally. There were additional discussion on funding, how the funding profile has been created, and the tradeoffs that have been made. The Chair stated that the FAA has done a good job of balancing the portfolio.

END OF DAY 1

Presentation Emissions Research | **Presenter** *Daniel Jacob*

Daniel Jacob provided a briefing highlighting emissions research efforts that are being done or contemplated by the office. The briefing included an overview of the current work on the emissions research roadmap. He provided details on a number of topics.

He began by giving highlights of the aviation emissions research plan. This plan has work streams on Source Apportionment/ Health Impacts Research; Emissions Tools Development; Emissions Source Characterization; Climate Impacts Research; Certification and Regulations; Aviation Emissions Modeling; and Airport Emissions Compliance.

Daniel covered considerable details on the work of ASCENT Project 02: Emissions Measurements. The work plan will enable the research team to understand the impacts of ambient conditions and fuel composition on nvPM emissions. It will also inform cruise nvPM and NOx emissions modeling efforts. He concluded by reporting that the work is funded but progress on this project is going to be delayed due to the COVID-19 outbreak.

He continued with an update on the work of ASCENT Project 19: Aviation-Specific Dispersion Model Development. He explained the rationale for the new tool and why it is needed. He also gave an update on the model development schedule and current status.

A Subcommittee member asked about the role of the EPA in this work and Daniel noted that they have a clear role in this process but that the FAA is the one putting forward the resources to develop the tool. Ralph Iovinelli later clarified that EPA has a role downstream in the process.

Daniel briefly noted that the work on ASCENT Project 18: Airport Impacts Monitoring has been restarted.

He gave a summary on what is known with respect to aviation induced cloudiness, including contrails, and their climate impacts. He then walked through some potential research that could be done on contrails to advance our knowledge on the subject.

Ralph Iovinelli concluded the briefing with an update on the development of air quality screening criteria for attainment areas.

The Chair asked about teaming efforts and Ralph clarified that we could potentially team with NASA, NOAA, DLR, and FAA Aviation Weather team. A Member noted that we need to be careful with the term NEPA compliance. Instead this is really about NAAQS compliance.

A Member asked if Daniel could discuss if there is an opportunity to reduce uncertainty in the net radiative forcing of contrails by using the large down turn in aircraft traffic due to current crisis to get contracting data related to this issue. Daniel replied that the level of scientific understanding for contrails is low due to a number of reasons and that cloud issues are challenging. He stated that we need to look at the more fundamental aspects of this and that the current natural experiment is of limited use. Based on a subsequent question from the member, Daniel noted that the contrail work is based on actual nvPM data.

A Member asked the FAA to talk about the likelihood of each of the aviation induced cloudiness research activities being executed and their relative timing? The DFO noted that the FAA has responded to a request from the Subcommittee to develop potential research projects but that they are currently not included in our 2020 R&D plans. They could potentially be added to the plans for funding for FY2021. He also indicated that more work may be needed to flesh out the overall plan.

A Member remarked that for work related to the contrail/cirrus work, NASA Earth Science may be a better fit for partnership instead of, or in addition to, NASA Aeronautics. Daniel agreed and noted that FAA have worked with NASA Earth Science previously.

Presentation Supersonic R&D Efforts | **Presenter** *Ralph Iovinelli, Don Scata, and Levent Ileri*

Ralph Iovinelli started the briefing with an overview of interest from industry in supersonic civil transportation and the efforts by the FAA. He discussed differences in subsonic and supersonic gas turbine engines and how a modern supersonic gas turbine engine is very different from that used for the Concorde. Ralph noted that the briefing would cover regulations (current and future); technology (CLEEN Phase III and NASA); operational procedures; remits from ICAO CAEP/12 and the 40th Assembly meeting; and ASCENT research projects.

Ralph continued with a discussion on the emissions standards that are in place for supersonic aircraft and how modern technology would compare to these. Don Scata provided insights on the work related to landing and takeoff noise. He noted that there is a notice of proposed rulemaking coming out on supersonic aircraft, but that we cannot talk about it until it is released this spring.

Levent Ileri gave a brief update on how supersonic aircraft technology is included within CLEEN Phase III. This included the CLEEN Phase III goal to provide certifiable aircraft technology that reduces noise levels during the landing and takeoff cycle (LTO) for civil supersonic airplanes or reduces landing and takeoff cycle (LTO) nitrogen oxide emissions for civil supersonic airplanes.

Don briefly noted the differences in operational procedures that would be used by supersonic civil transport vehicles to accommodate the design choices that are required to enable supersonic flight. Ralph touched on the remits from the 40th ICAO Assembly and the CAEP/12 meeting to conduct an exploratory study for supersonic aircraft. He also gave an update on the work being done therein.

Ralph and Don provided some additional information on the work being done in the ASCENT Center of Excellence on ASCENT projects 10 and 47 that are looking at supersonic civil aircraft design; ASCENT Project 59 that is advancing our knowledge on noise generation from jet exhaust; ASCENT Projects 22 and 58 that will quantify the atmospheric impacts of supersonic civil aircraft; and ASCENT Projects 41 and 57 that are doing a deep examination of the sonic boom that would be generated by a wide range of vehicle designs.

The FAA concluded with a timeline of the work.

A Member asked for the source of the information of emissions for supersonic aircraft operating at Mach 1.4 and Mach 2.2. He further asked whether these are historical data or predicted with models? Ralph responded that these are estimates that were produced by the aircraft manufacturers in 2018. The member applauded the FAA for taking on this comprehensive work plan and he is looking forward to seeing the results from the work. The DFO noted that there is also a new ASCENT project that will help develop lower emissions combustors from supersonic aircraft engines, but that it was not included in the slides for presentation.

Based on a question from a member, the DFO clarified that the CLEEN Phase III program does not have a goal on fuel efficiency for supersonic aircraft.

Presentation Alternative Jet Fuels Research | **Presenter** *Nate Brown and Anna Oldani*

Anna Oldani started the briefing with a reminder that the FAA does work on testing, analysis, and coordination. She noted that the briefing would cover the fuel qualification process, status of fuels within ASTM process, supply chain analysis tools, the ICAO CAEP Fuels Task Group, and commercialization status.

She provided an overview of the ASTM International fuel qualification process and the work the FAA is doing to support it, including the ASCENT Clearinghouse Concept. She continued by giving the current status of different fuels within the ASTM fuel qualification process and the amounts of fuel and time that have been required to get fuel approvals. She provided an update on the various efforts the FAA is pursuing to streamline the approval process, including the D4054 Fast Track Annex.

Anna also gave an update on the work being done by Volpe and ASCENT on supply chain analysis tools. This included the fact that Volpe has made the Freight and Fuels Transportation Optimization Tool (FTOT) publicly available. This is a part of the FAA's overall efforts to make supply chain analysis tools available to the public.

Nate Brown provided information on CORSIA and how CORISA Eligible Fuels fit within it. He provided considerable information on the work of the ICAO CAEP Fuels Task Group that is determining how fuels will be credited in CORSIA. This included the full work plan for the group and progress it has achieved thus far. He also provided an update on the Sustainability Certification Scheme Evaluation Group (SCSEG), which will determine which Sustainability Certification Scheme (SCS) will be eligible to evaluate CORSIA Eligible Fuels. He concluded with a set of charts that show the current state of fuel production and a view of what could be coming online soon.

A Subcommittee member noted that wastes are an important biomass source for alternative fuels, but there are a lot of demands on these waste streams so the potential is significantly higher than the realizable production. He continued by noting that FAA needs to constrain the predicted production volumes such that the estimates are constrained by reality. The FAA acknowledged that this is a challenge, and that we do our best to lay out the assumptions that go into our analyses.

A Subcommittee member asked if there is a time frame for achieving the 15.6B gallon SAF production listed on chart 26. The FAA responded that there is no timeframe and this work simply provides a potential production level with a set of optimistic assumptions leading to increased jet fuel production relative to other uses.

There was a discussion on the status of SAF-specific mandates and policies in use around the world.

Presentation Data Development and Integration | **Presenters** *Fabio Grandi*

Fabio Grandi provided a briefing that covered the challenges and opportunities offered by a data and information rich environment. The briefing covered AEE's plan on tackling data and an overview of the implementation plan.

He provided a summary of the current situation with respect to data about the national air space and how the FAA is modernizing its approach to data and information. He noted that AEE has developed a variety high quality and high fidelity tools and databases and that Agency-wide use of these data and information would improve overall agency consistency on environmental issues.

He continued with a discussion on the desired end state with consistent data being provided to everyone. Such data would benefit a number of the FAA's environmental programs: Aviation Environmental Design Tool (AEDT), updated Noise Screening Tool, Environmental Visualization Tool (EVT), and community outreach. Fabio provided high level details on AEE's plan for tackling data through technology welding and deployment, as well as the status on the effort. He followed with details on how this data rich environment could be integrated with AEDT and EVT.

A Member asked if the fleet database includes only registration numbers for US aircraft. Fabio said that the registration data is actually global, but we do not share the registration data outside of the FAA.

Presentation Screening Tool Development | **Presenter** *Sean Doyle*

Sean Doyle provided an update on the development of a new noise screening tool at FAA. He started with the timeline which includes developing a methodology in FY19, validation of the new tool in FY20 and implementation of the tool in FY21. He began with an update on the methodology, and gave an explanation on what is meant with being consistent and conservative. He also discussed the implementation framework for the tool and policy needs for it. He concluded with some thoughts on emerging needs for the noise screening tool.

A Subcommittee Member asked what access different people will have to these tools and the ensuing discussion covered that the tool is in development and how the current tool is used by FAA.

Another Subcommittee Member asked how one knows that they are always conservative and Sean explained the approach of applying various factors to try to ensure conservatism. He indicated he hopes to be able to provide more details at the next meeting. The Member asked for sensitivity analyses, as suggested by Sean, to quantify the level of conservatism that is being provided by the tool.

Presentation AEDT Update | **Presenter** *Mohammed Majeed and Joe DiPardo*

Mohammed Majeed and Joe DiPardo provided an update on AEDT tool development. The briefing started with an update on AEDT 3c which was released on March 6, 2020. This new version of the tool has a number of improvements to the performance module, aviation emissions dispersion modeling updates, and usability improvements.

They continued by outlining the future development goals for AEDT, which was requested by the Subcommittee at the last REDAC Subcommittee meeting. They noted that AEDT 3d will be light in terms of new features and instead will focus on a large backlog of bug fixes and usability improvements. They followed by noting that the AEDT development team is seeking external feedback on the tool and gave details on how this will be facilitated. They also provided information on development goals and timelines for future releases of AEDT 3 and AED 4, which will include both ACRP and ASCENT projects.

Responding to a question from the Subcommittee, Joe noted that two completed ACRP projects will be incorporated into AEDT. The related detailed development planning work by Volpe will start this year and the functionality could be released with AEDT 3e.

A Subcommittee member asked that people who don't regularly use AEDT because of its complexity also be included. The FAA said they would take this on, but will need help from the airport community to identify one to two people to help with it.

Joe provided more information on additional work that will be done on the 3 series of AEDT as well as the current plans for AEDT 4. The development goals for AEDT 4 will be higher fidelity noise characterization, incorporating an improved emissions dispersion tool, and update the GIS engine to reduce development costs. He concluded with the timeline for AEDT development and a short summary of what was provided in the slide deck.

A Subcommittee member asked about the accuracy and fidelity of AEDT. Joe noted the focus has been on BADA 4 performance and noise at lower DNL levels and that this work has been at the aircraft level.

Another Member asked about the external audit team and Joe reported that the firm that has been selected is an IT firm that is focused on agile software development and that they do not have former experience in aviation.

A third Member asked how the user feedback team is being selected and Joe noted that we reached out to the power users of the tool and have also asked airports who are using AEDT.

Presentation Aircraft Technology Update | **Presenter** *Levent Ileri and Arthur Orton*

Levent Ileri started with an introduction of Arthur Orton and noted that his division is now fully staffed. He also provided a summary of the first two phases of the CLEEN program as well as the plans for the third phase of CLEEN, which will start with FY2020 funding. This included a summary of all of the technologies that have been matured by CLEEN, the status of those technologies that are currently being matured, and a summary of the cost share (as requested by the Subcommittee). The cost share summary that Levent shared shows that the CLEEN Consortium companies have more than matched the funding provided by the FAA. Levent concluded the CLEEN portion of the briefing with an update on the status of the CLEEN Phase III solicitation.

Arthur Orton continued the briefing by summarizing the new work on technology that is being done under ASCENT. He started by noting that AEE has expanded the environmental technology research portfolio into our Center of Excellence. This provides a complementary venue for University-led research to advance industry state-of-the-art and expand knowledge broadly. He further reported that projects can be collaborations with industry, but data rights are generally more open than CLEEN. He covered the projects in several broad themes: System-level modeling and design considerations (Projects 37, 52, 64); Propulsion-airframe integration (Projects 50, 63); Combustion (Projects 51, 55, 66, 67, 68, 70, 71) and Turbomachinery (Project 56). He noted that FAA also have technology projects on supersonic civil transport (Projects 10, 47, 59, 74), but these were covered in a previous briefing.

A member asked if we have a list of technologies that have been introduced into the fleet. He thought that a one pager describing this would be very useful. This led to a discussion on how to better communicate the successes of CLEEN to the lay person. There was also a discussion on the development of analytical tools that have resulted from the investments made in CLEEN.

Levent noted that the CLEEN companies have also taken an action to develop a condensed way to communicate the benefits of CLEEN.

Based on a question, the DFO confirmed that the CLEEN companies have made a two-to-one cost share match and the Subcommittee asked that this information be shared in external materials.

Presentation NASA Update | **Presenter** *Barb Esker (NASA)*

Barb gave an update on NASA Aeronautics efforts. She started by providing an overview of drivers moving NASA aeronautics and the overarching programs that comprise NASA Aeronautics. She provided the budget profile for NASA aeronautics and the goals for the coming years. The briefing covered details on work related to supersonics, vertical flight, subsonic transports, and hypersonic flight.

Based on a question from the FAA, Barb noted that the truss braced wing appears to be a superior design to the double bubble and the blended wing body.

Based on a question from the FAA, Barb noted that the attendees from the hypersonic workshop had concerns about sonic booms from these vehicles. The participants noted the very good relationship between FAA and NASA on the low boom work for supersonic aircraft.

Priorities Discussion and Development of Findings and Recommendations | Lead *Ian Redhead*

The Subcommittee Chair led a discussion on thoughts about the REDAC.

- A Member stated that he would like to have had more time for discussion and less time spent on briefings. The DFO noted that AEE tried to cover everything at a higher level during the winter/spring meeting and then go into details during the summer/fall meeting. The Chair asked to have a 2 hour block for discussions on both days. Others corrected this to work in more discussion time throughout the meeting instead. The FAA agreed to modify the agenda to have more time for discussion at future meetings.
- Another Member asked if they could hear more from the FAA on what the big issues are and would like to get input from the Subcommittee Members.
- A Member suggested that if the Subcommittee moved to a format where presentations are given only once a year on any given topic, then it would still be helpful to have slides on all topics saved to the REDAC folder each meeting. That would allow anyone to refresh themselves on any topic, but it won't take up time on the agenda. The DFO agreed with the Member's suggestion to continue to provide updates/presentations before the meetings, and to make more time available for focused discussions
- A suggestion was made by a Member to consider asking the presenters to have a common conclusion slide that highlights where they would like insights or feedback from the committee
- An idea was made by a Member to consider developing a single discrete chart, updated at each REDAC, to clearly list issues and put them into buckets such as (i) new potential issues to discuss, (ii) emerging issues that are being watched, (iii) active issues that are being worked, (iv) active issues that we are choosing to ignore, (iv) retired issues that are still being watched. This might facilitate a unified strategic understanding and drive dialogue.
- Members on the Subcommittee also asked the FAA to think about how to effectively onboard new REDAC members. They suggested the FAA to develop a process, potentially with presentations / videos, to bring new members up to speed and make them more familiar with the content and priorities of the program.
- Another Member noted that the FAA did a very good job of presenting the information and that they have been very responsive to the Subcommittee's requests.
- Another Member stated that the Subcommittee needs to remember that, while many in the REDAC have detailed expertise in particular areas, the job of the REDAC is to provide high-level guidance to the FAA. While detailed technical comments can help (and should probably be taken up in separate discussions with the FAA), those rarely rise to the level of a REDAC subcommittee recommendation, which is the product of this group.
- The DFO noted that he asks the same three questions during every summer Subcommittee meeting, copied below, and that there is considerable time dedicated to discussing these questions. He asked the Subcommittee to start working on responses to these questions such that we can collectively have a robust discussion during the July meeting.

Questions for consideration by the REDAC E&E Subcommittee during the Summer Meetings:

- Are there R&D areas within the E&E Portfolio that should be lower / higher priority?
- Are there R&D areas that AEE is not examining that should be added to the E&E Portfolio?
- What do you see coming on the horizon regarding E&E that may require future R&D efforts?

Action items	Person responsible	Deadline
Modify future meeting agendas to build in at least 2 hours of discussion time per day.	Jim Hileman	July 2020
Identify common slides for the briefings to highlight questions for the Subcommittee and potential areas of interest.	Jim Hileman	July 2020
Respond to the three questions posed by the DFO at each of the Summer REDAC E&E Subcommittee Meetings	Subcommittee Members	July 2020

The Subcommittee discussed potential research opportunities being provided by the reduction in aircraft operations that are currently happening. A Subcommittee member and the FAA both noted that there is a lot of satellite data being continuously collected that could be used to examine what happens as a result of the reduction in flight operations. The Member and the FAA both noted that this can easily be done in a retroactive perspective using the satellite data that is collected by NASA and NOAA. Based on a question, FAA clarified that we really need accurate data on ice super-saturation, over a wide range of altitudes, if we are to fully understand the impacts of aviation on climate and identify means to reduce those impacts.

Action items	Person responsible	Deadline
Identify the data that is available to understand how changes in aircraft operations due to the COVID-19 outbreak have effected aviation induced cloudiness and the climate impact of aviation.	Daniel Jacob	April 2021
Reach out to NASA, NOAA, and DLR to understand their research efforts on aviation induced cloudiness and align the research ideas presented by FAA align with these.	Daniel Jacob	July 2021

The Subcommittee Chair led a discussion on potential findings and recommendations.

- The Chair, along with others from the Subcommittee, said that the order of priorities has not changed and that the overall funding priorities for the FAA are appropriate.
- The Subcommittee discussed the importance of the COE and the students that are being supported by it as they are making the entire industry stronger.
- The Subcommittee had a brief discussion on importance of AIC research.
- On Supersonics the Committee noted that it is clear that the US is showing international leadership and that a good balance is being shown in international and domestic settings.

Based on a question on the work to explore the feasibility of a long term aspirational goal for international CO2 emissions, the FAA noted that we expect to play a central role in this work and will utilize our research to do this.

Meeting Close-Out | Lead *Ian Redhead*

Ian thanked everyone for their participation. The dates for the coming meetings were shared.

Subcommittee Discussion of Open Recommendations (Discuss status of FAA response and decide to close or remain open)

All of the recommendations from previous meetings were closed.

Next Meetings – Date/Location/Agenda Items to be Included

July 22-23, 2020 in Washington DC

March 9-10, 2021 in Washington DC

Adjourned at 5:30 pm on Wednesday, March 18, 2020

DRAFT FAA REDAC Subcommittee on Environment & Energy
Spring 2020 Meeting Agenda
Virtual Meeting

Purpose:

- Review the R&D portfolio developed based on strategic guidance from Fall 2019 E&E
- FAA to brief the portfolio with a focus on FY + 2
- E&E REDAC to provide recommendations on R&D portfolio and direction

Remote Participation:

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Read Ahead Materials: http://redacdb.faa.gov/browse.cfm

Tuesday, March 17, 2020

Time	Duration	Title	Presenter
10:30	0:05	Welcome	J. Hileman
10:35	0:10	Chair opening statement & Introductions	I. Redhead
10:45	0:15	AEE Update	R. Cointin
11:00	0:15	Update on ICAO and CORSIA implementation	D. Williams
11:15	0:15	Industry Perspective	S. Alterman
11:30	0:30	FY20/FY21 Budget Update	Beth Delarosby
12:00	0:30	Responses to REDAC Recommendations & Actions	J. Hileman
12:30	0:30	Lunch	
13:00	0:15	FAA R&D Update	S. Yak
13:15	1:00	E&E Research Portfolio Overview and Program Proposal	J. Hileman
14:15	0:30	Noise Research	D. Scata
14:45	0:30	Break	
15:15	0:30	ATR Environmental Research - Update	L. Vitagliano, K. Duffy, & K. Bagot
15:45	0:30	Helicopters, UAS, and UAM	E. Elmore et al.
16:15	0:30	Research on Operational Procedures	C. Dorbian
16:45	0:45	Discussion on Findings & Recommendations	
17:30		End of Day-1	

Wednesday, March 18, 2020

10:30	0:30	Emissions Research	R. Iovinelli & D. Jacob
11:00	0:45	Supersonic Civil Aircraft Research	D. Scata, R. Iovinelli, et al.
11:45	0:30	Sustainable Aviation Fuels Resarch	N. Brown & A. Oldani
12:15	0:15	Discussion on Findings & Recommendations	I. Redhead
12:30	0:30	Lunch	
13:00	0:30	Analysis & Tool Development	F. Grandi
13:30	0:15	Screening Tool Update	S. Doyle
13:45	0:15	AEDT Update	M. Majeed & J. DiPardo
14:00	0:45	Aircraft Technology Resarch	L. Ileri & A. Orton
14:45	0:30	Break	
15:15	0:30	NASA Update	B. Esker
15:45	1:45	Discussion on Findings & Recommendations	I. Redhead
17:30		End of Day-2	

Attendance

Day 1	Day 2
Alonso, Juan J.	Alonso, Juan J.
Alterman, Steve	Borener, Sherry
Bagot, Keith	Brown, Nathan
Barry, Shawna	Cointin, Rebecca
Birkan, Gonca	Dassa, Ira
Borener, Sherry	Dipardo, Joseph
Bradley, Veronica	Dorbian, Chris
Brown, Nathan	Doyle, Sean
Cointin, Rebecca	Dudeabout, Rudy
Cuddy, Thomas	Ehudin, Mark
Delarosby, Beth	Elmore, Eric
Dipardo, Joseph	Esker, Barbara
Dorbian, Chris	Etter, Charles
Doyle, Sean	Fleming, Gregg G.
Dudeabout, Rudy	Galina, Joseph
Duffy, Kent	Gillette, Warren
Ehudin, Mark	Grandi, Fabio
Elmore, Eric	Hawthorne, Rangasayi
Esker, Barbara	Hamburg, Steven
Etter, Charles	Hileman, Jim
Fleming, Gregg G.	Hyde, David
Galina, Joseph	Ileri, Levent
Gillette, Warren	Iovanelli, Ralph
Grandi, Fabio	Jacob, Daniel
Hawthorne, Rangasayi	Kosanchick, Melvin
Hamburg, Steven	Lancaster, Sandra
He, Hua	Locke, M.
Hileman, Jim	Majeed, Mohammed
Hyde, David	Mavris, Dimitri
Ileri, Levent	Moore, Monique
Iovanelli, Ralph	Moores, Roxanna
Jacob, Daniel	Murphy, Andrew
Kosanchick, Melvin	Oldani, Anna
Lancaster, Sandra	Orton, Arthur
Locke, Maryalice	Pagliarello, Melinda
Majeed, Mohammed	Partowazam, Kevin
Mavris, Dimitri	Preston, Katherine
Moore, Monique	Redhead, Ian
Moores, Roxanna	Roundtree-Coleman, CA
Murphy, Andrew	Sabnit, Jayant
Oldani, Anna	Scata, Donald
Orton, Arthur	Schiller, Noah H.
Pagliarello, Melinda	Scott, Andrea

Partowazam, Kevin Preston, Katherine Redhead, Ian Roundtree-Coleman, CA Sabnit, Jayant Scata, Donald Schiller, Noah H. Scott, Andrea Shaw, Cecelia Sizov, Natalia Summer, Steve Upadhyay, Jeetendra Vanzante, Dale E. Vitagliano, Lauren Wahls, Rich Walker, Judith Welsh, Kevin Williams, Dan Windhoffer, Laszlo Wuebbles, Don Yak, Shelley Zelina, Joseph	Shaw, Cecelia Sizov, Natalia Upadhyay, Jeetendra Summer, Steve Vanzante, Dale E. Vitagliano, Lauren Wahls, Rich Walker, Judith Welsh, Kevin Williams, Dan Windhoffer, Laszlo Wuebbles, Don Zelina, Joseph