

Subcommittee on Environment and Energy | MINUTES

Meeting date & time *April 4-5, 2016*

Meeting location *A4A, Washington D.C.*

Purpose E&E Subcommittee Guidance & Review of FY18 R&D Budget

Facilitator Jim Hileman, DFO

Note taker Jim Hileman

Timekeeper Jim Hileman

Minutes from Meeting

Presentation Chair Opening Statements | Presenter *Mahendra Joshi*

Discussion: Mahendra welcomed everyone and established the meeting logistics. The meeting documentation is due in two weeks (April 19).

The full REDAC is currently thinking deeply about UAS. From an E&E perspective, there is not much on UAS outside of noise. Please do keep in

Presentation What's New in FAA and AEE | Presenter *Lourdes Maurice*

Discussion: Lourdes discussed staffing within the office. Lynne Pickard retired on April 1 and AEE are looking to hire a Senior Policy Advisor to replace her that is nationally known with considerable policy experience. Prior to Lynne leaving, we had all of our positions in the office filled.

Noise continues to be a challenge on multiple fronts. The Administrator is involved. We will be releasing our community involvement manual soon. We have a noise initiative that Becky will be discussing. We have much ongoing with climate and there is considerable excitement with regards to alternative fuels with a new approval recently occurring. CLEEN is also progressing well.

Presentation ICAO Update | Presenter *Lourdes Maurice*

Discussion: We have a CO2 standard and the research we conducted paid off as we were very well prepared to do considerable analyses, including much last minute research. We also developed a first-ever PM standard.

We tried to streamline the work program of ICAO CAEP. This included combining MDG and FESG as well as combining GMTF and AFTF. There were both blocked at the meeting. The

groups will meet jointly though. The US volunteered to lead AFTF and FESG. Jim Hileman of FAA and Roger Schaufle of FAA APO will be the co-rapporteurs of AFTF and FESG, respectively. There was also a change in the leadership of the ISG with Vic Sparrow of PSU becoming the co-rapporteur.

We now have two new CAEP members in Indonesia and UAE.

There has been much work on the Global Market Based Measure. At present the GLADs are taking place in advance of the Assembly in September.

The US will be hosting a number of Working Group meetings. The US might be hosting the first Steering Group meeting.

Presentation *Industry Perspective* | **Presenter** *Steve Alterman and Nancy Young*

Discussion: The Subcommittee discussed the following items. There were no slides.

There are continuing noise issues that are important from general industry perspective. Noise is having an impact on NextGen and the ability of the FAA to modernize the system. Industry wants NextGen to happen and noise is having a big impact on redirecting routes.

The FAA reauthorization bill will go to the Senate floor tomorrow. The House and Senate bills are quite different and as such there is a good chance that reauthorization will be delayed.

In 2013, the Assembly said that there should be a MBM to fill the gap to ensure international aviation meets its CO2 goals. ICAO have been working on a global MBM ever since following the “straw man” approach. A current issue is how we split out the offsetting responsibilities associated with carbon neutral growth from 2020. There are both individual and sectoral responsibilities. The GMBM TF has three subgroups to do analysis and to consider the Monitor Reporting and Verification (MRV), Emissions Unit Criteria (EUC). In December, the ICAO President gave another version of the Strawman but in language that is appropriate for the Assembly. It is hoped that the Assembly will agree on the key elements of the GMBM when they meet in September.

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

Discussion: Jim walked through the existing findings and recommendations from the past two meetings (March and August 2015). All of the recommendations were closed except for recommendation #5 from the August 2015 meeting. The Subcommittee also asked that Recommendation #7 from the August 2015 meeting be converted to an action item. Jim also walked through the action items from previous meetings. Those that are still open are copied below.

Jim walked through the action items and the Subcommittee agreed that most were closed with the exceptions that are listed below.

Action items (from previous meetings) **Person responsible** **Deadline**

Present historical data on noise exposure – go back at least 10-15 years using AEDT2b	Rebecca Cointin	August 2016
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Action items (from previous meetings)	Person responsible	Deadline
Create ASCENT fact sheet for sharing with community	Jim Hileman	August 2016
Leverage the roadmapping efforts at NASA and FAA to update the White House National R&D Plan	Jim Hileman	August 2016
Report out on research being done by the FAA to develop technology that enables integration of relayed information (e.g., weather, 4D trajectories, etc.) with cockpit information. This will enable higher levels of onboard automation and the ability to further reduce the environmental impacts from aviation.	Jim Hileman (in consultation with ANG)	August 2016

Presentation FY16/FY17 Budget Update | Presenter *Mike Gallivan*

Discussion: Mike presented budget details on budget for FY16. The Environment and Energy program received a plus-up with a requirement with regards to the COE Program.

The FY17 Presidents Budget has gone to Congress. There is also a deal within Congress for FY17 to set the overall budget for the entire government. There is considerable uncertainty regarding the FY17 budget.

Mike presented the timeline for the development of the FY18 budget that culminates in the FY18 budget being presented to Congress on February 6, 2017. This date could change as this is a presidential election year. Mike also gave the FY18-FY22 funding targets for the overall RE&D appropriation.

There is much going on with FAA Reauthorization as well. There are many issues to resolve prior to the current expiration expires.

Presentation FY18 Program Proposal | Presenter *Jim Hileman*

Discussion: Jim gave an overview of the Environment and Energy Research to refresh the Subcommittee on the research program. This includes the goals for the program, the overall strategy and plan, the contract mechanisms wherein the work gets done, and where the money comes from to do the work. This includes the ASCENT Notice of Funding Opportunities .

There was considerable discussion on the subject of the noise goal that is based on population exposure to DNL 65. Jim noted that DNL has been used for many years and has been used to track the number of people exposed to significant noise. This is important because even though the number of people exposed to DNL 65 has decreased from 7 million in the 1970s to roughly 300,000 today, the opposition to aircraft operations caused by noise has not decreased. Several committee members noted that noise and the community reaction to it is becoming a constraint on the rollout of Performance Based Navigation. There was discussion with committee members noting that we might need to develop supplemental noise metrics. A subcommittee member requested that the FAA modify its E&E brochure to include the population exposure in the 1970s and today.

During the discussion on the NARP Milestones, a subcommittee member noted that AEE is doing much work on supersonic aircraft and it would be good to have a milestone tied to this research activity that is toward the end of the decade.

There was also a note that the PM standard effort is for an engine exhaust PM standard. Jim noted that he would revise this throughout the briefing. Along these lines, there was a request to use consistent terminology with respect to the exploration of noise metrics.

Jim presented on the historical budget levels as well as the FY16 enacted budget, the FY17 Presidential budget, and the FY18 target. The budget section gave a breakout of the funding by research topic. This included an above target request for \$3M for year from FY18 onward that would bring the funding level of CLEEN II to the level that was provided during the first phase of the CLEEN Program.

Jim closed the briefing with a presentation on recent accomplishments that were funded by the Environment and Energy program.

Action items	Person responsible	Deadline
Carefully consider NARP milestones on noise metrics	Jim Hileman	March 2017
Add a NARP milestone on supersonic aircraft	Jim Hileman	March 2017
Ensure verbiage for PM standard is engine exhaust PM standard	Jim Hileman	March 2017
Revise E&E brochure to capture significant population exposure in 1970s and today	Jim Hileman	March 2017

Presentation Airport Technology Research - Environment Projects | Presenter
Lauren Collins and Tom Cuddy

Discussion – Lauren presented on the Airport Technology Research program and its efforts related to safety, pavement, and environment (new effort in FY16). Tom provided information on the Aviation Environmental Research (AER) program. This includes the objectives for the program, the five FY16 projects, and the future direction of the program.

There was a clarification given by an FAA staff member that Equivalent Lateral Spacing Operations is currently being implemented to increase throughput but it could also help reduce noise.

There was also much discussion about the need for aircraft guidance for climate adaptation and resiliency, which is another project for FY16. This included a discussion on efforts at various airports to look at past disaster responses as this could improve our ability to be more resilient to disasters in the future. ACI would be willing to share these information.

A subcommittee member noted that ACRP did a comprehensive review of potential environmental project. Tom stated that they intend to look at this.

Presentation Noise Research – Roadmap and Update | Presenter Rebecca Cointin

Discussion: Becky presented research being done within the noise research roadmap. She focused on Supersonics, Unmanned Aircraft Systems (UAS), Research on Aviation Noise Impact on Sleep, and Community Noise Survey Update.

A subcommittee member noted that supersonic flight is going to happen far sooner than many realize and that work is needed now to facilitate this.

There was much discussion about the potential for UAS to have noise issues with the FAA noting that it is hard to know whether or not there will be a problem as there are few UAS platforms that have been made available for noise measurements.

There was a discussion on the close collaboration between NASA and FAA in terms of supersonic aircraft, UAS, and helicopters.

Several Subcommittee expressed interest in the sleep study and all agreed that the second airport name should not be released. This work is directed to a nationwide sleep survey that would be funded by ATR.

Becky confirmed that the national noise survey is going well and we are on track in terms of our expected rate of getting responses.

There was considerable discussion about the level of coordination between AEE and other offices in the FAA with respect to noise and the nature of the work being done. A subcommittee member noted that AEE are doing the right type of work to inform potential policy changes with respect to noise.

Presentation UAS Research - ASSURE COE & Outcomes of UAS Expo | Presenter Sabrina Saunders-Hodge

Discussion: Sabrina presented on the ASSURE COE. This included information on the ASSURE structure including its membership and the research topics being addressed. Sabrina shared information on future UAS meetings.

Presentation Operations Research - Roadmap and Update | Presenter Julie Marks and Stephen Merlin

Discussion: Julie introduced the overall research effort for operations. This includes the development of a meeting that would function as a technical review of the ops research roadmap.

A subcommittee member noted that the ops roadmap is very good, but that all of the roadmap development efforts within AEE would benefit from a slightly different thought and reverse the roadmap. In short, to think about developing roadmaps that go from right to left with a focus on the desired outcome and how we are going to get there.

Julie also noted that we are in the process of setting up a technical review of the operations work. Stephen noted we are seeking to have this meeting in the late spring. Jim noted that we are trying to establish this across the work program to seek technical expertise to review our work program.

Stephen presented details on the efforts on developing analytical environmental capabilities to model UAS procedures, the evaluation of cruise altitude and speed optimization (CASO) and its

potential use as an electronic flight bag, the development of delayed deceleration approach procedures, surface metering, continuous climb operations, and the evaluation of steeper glide slopes and displaced thresholds.

There was a question on whether or not the researchers are considering human factors in the development of the electronic flight bag for the CASO concept. Chris Dorbian noted that the research team is considering human factors from the pilot perspective.

There was a question on the integration of the DDA concept with Traffic Based Flow Management. Stephen noted that the researchers are well aware of the issues but have not reached the point of integration as yet.

There were several discussions on the steeper glide slope concept. This included whether it would have negative impacts on fuel burn and/or separation minima.

Action items	Person responsible	Deadline
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.	Jim Hileman	March 2017

Open Discussion | Lead *Mahendra Joshi*

Discussion: A member noted that it is important that FAA continue its communication efforts with stakeholder and the community on PBN and noise research. They further noted that FAA is doing a good job of working with others and this collaboration needs to continue.

The Subcommittee chair asked two questions to the group. Is there anything that we saw today that is not adequate or needs a change of direction? Is there anything that is being done that does not need to be done as the problem is solved?

A member noted that UAS in the NAS is a big issue but it is also a big potential funding sink. Given limited resources, we need to distribute resources between the new thing and what needs to be done now. We cannot put all of our resources into this one activity.

There was discussion on whether growth and environment are mutually exclusive.

A member proposed the following question. Since noise is viewed as a constraint, should we have a noise wedge chart? This would be something that conveys how operations and technology can work together to reduce impact. Another member noted that one would have to account for changes in population exposure in such a future looking chart.

A member asked the meeting whether or not there are ways to tweak the research program to address noise and emissions where they are a problem as opposed to looking for universal solutions that apply everywhere. This led to much discussion within the group but no clear conclusion.

A member noted that the subcommittee should consider recommendation #1 from the August 2015 meeting in their development of recommendations.

Presentation Analysis & Tools – Roadmap and Update | Presenter Jim Hileman

Discussion: Jim presented the timeline for the tools and analysis roadmap as well as efforts to develop analytical capabilities within AEE. He walked through efforts to advance AEDT. This included both expected service pack releases for AEDT2b and the evolving work plan for AEDT3. He also presented the initial plans for the new FLEET-Builder tool that will eventually replace the APMT-Economics tool. Finally he showed the results from the recently completed PARTNER Project 26 report which calculated the US fleet fuel burn benefits of the CLEEN Program. There were extensive discussions on the presentation.

During the discussion on the roadmap, one member commented that it would be useful to add aircraft conceptual design tool needs to the roadmap and how these then link to NASA tools. Another member specifically requested that FAA provide information on the outputs from the tools being used for CAEP and how they are used within the CAEP process.

During the discussion AEDT, a member asked if was possible to provide AEDT2b to U.S. States at a discounted price as they have difficulties paying \$1000 for software. Several members engaged in a discussion on the tradeoffs in fidelity with a new AEDT. One member stated that he would like to see a lightweight version of AEDT that is similar to EDMS. Someone from the FAA noted that there are a wide range of AEDT users that range from “quick-and-dirty” analyses, regulatory analyses, and those who want very accurate representations of changes to aircraft operations. Another member noted that the FAA should engage industry to get better data on aircraft operations and this could require data agreements. Someone from the FAA suggested that this could be done through an SAE committee that works on these issues.

Action items	Person responsible	Deadline
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Provide additional details on data hand-offs among tools within the CAEP standard setting process.	Jim Hileman	August 2016
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Presentation Emissions Research - Roadmap and Update | Presenter Ralph Iovinelli

Discussion: Ralph presented on efforts to relating to the emissions research roadmap. He walked through areas of research in AEE. He presented a summary of the CO2 standard that was agreed upon at the CAEP/10 meeting.

Several Subcommittee members agreed that the tools and data developed by AEE were critical to the US leading the development of the CO2 standard at CAEP/10 meeting. A member stated that US Government leadership was obvious to all in attendance.

Daniel presented extensive details on the non-volatile Particulate Matter (PM) standard that is being developed by ICAO CAEP. He explained that the CAEP/10 PM standard uses a new standardized measurement system and that the standard is actually an all-pass standard that changes the measurement technique while ensuring that engines meet the existing visibility requirements. This is important as the previously used smoke number measurements are time-consuming measurement and the new PM measurements can be done at the same time as the gaseous measurements, (e.g., NO_x). The end result is that the new PM standard reduces the emissions certification time by half.

Daniel explained how the new standardized PM measurement system works and the steps that are going to be required to develop the CAEP/11 PM standard.

Several members asked questions about the ability to get the work done in time.

Presentation Aircraft Tech – CLEEN Update and CLEEN II Status | Presenter Jim Skalecky and Arthur Orton

Discussion – Jim presented an overview of the first phase of the CLEEN Program and the individual technologies that have been matured. Arthur presented on the second phase of the CLEEN Program (CLEEN II).

One of the members noted that the CLEEN communication strategy has been very effective as he has heard directly from individuals in the community about the benefits that it is bringing. The member requested that the FAA to continue to think about how to both communicate the good work of CLEEN while also communicating that there will be a time lag before these technologies penetrate the fleet.

One of the members noted that the technology suite for CLEEN I was focused on fuel burn and he asked about the relative priority of noise, NO_x and fuel burn in CLEEN II. The FAA noted that there are a number of technologies in CLEEN II that will reduce noise and NO_x emissions.

One of the members applauded the overall package and the entire subcommittee was complimentary of the CLEEN II set of technologies. The member noted that FAA needs to carefully consider how the benefits for these technologies are stated to ensure that they are consistent. Someone from the FAA noted that the CLEEN II program follows the guidance from the REDAC Subcommittee in that a small portion is on high risk, high reward technologies and the remainder is on technologies that will advance technologies that will reduce NO_x emissions, noise, and fuel burn.

Presentation Overview of NASA Aeronautics | Presenter Jay Dwyer

Discussion: Jay gave an update on NASA Aeronautics efforts. He focused on plans that are being developed based on the FY17 budget. He highlighted efforts on flight testing and tool development that is being planned.

A Subcommittee member asked about the potential for increasing the use of modeling to aid certification. The member noted that this could be an area for collaboration between the FAA and NASA.

There was discussion on the planned supersonic flight demonstrator and it was clarified that the recently agreed-upon CO₂ standard is only for subsonic airplanes. It does not apply to supersonic aircraft.

A Subcommittee member stated that he is very impressed by how well the NASA and FAA are working together.

Presentation Alternative Jet Fuels R&D Update | Presenter Jim Hileman and Mohan Gupta

Discussion: Jim gave an update on testing efforts to support ASTM approval of alternative jet fuels. He noted that the approval of a 5th alternative jet fuel, ATJ-SPK, is imminent and these approvals were only possible through the support of the FAA. Jim clarified that green diesel is being considered at less than a 10% blend. Mohan followed this with results that are being produced by the National Jet Fuel Combustion Program as well as plans for the future direction of the program. Jim then gave a brief update on the direction of the ASCENT alternative jet fuel supply chain project. Jim finished the briefing by explaining recent coordination efforts regarding alternative jet fuels and he highlighted that United Airlines is now using alternative jet fuels at LAX.

A member noted that FAA should estimate the monetary environmental benefits of alternative fuels in terms of their benefits to air quality and climate. This is in addition the benefits to water quality that are being considered by PSU.

Action items	Person responsible	Deadline
Monetize the air quality and climate benefits of having an alternative jet fuel with reduced sulfur and naphthalene content.	Jim Hileman	March 2017

Open Discussion | Lead Mahendra Joshi

Discussion: A number of members noted that the briefings were all very good and at the right level. The roadmaps were at the right level. The operation at AEE is running smoothly.

The Subcommittee chair noted that AEE have done a very good in responding to the recommendations of the Subcommittee. We saw several examples of interagency work that is functioning very well. You have done a good job of bringing in others from FAA. The ten year plan from Airports is commendable.

The Subcommittee chair noted that the ICAO CAEP CO2 standard was adopted and the tools AEE developed were important to this. These technical efforts have helped the US to be in a highly influential position in ICAO. A member noted that previous investments in CAEP have reaped large benefits. It is also important to keep a balanced portfolio is needed as needs change with time. The members thought it important to capture the successes of the CAEP/10 meeting.

The Subcommittee chair endorsed the idea of a technical workshop on operations. He also asked the Subcommittee members to review the ASCENT Notice of Funding Opportunities and provide guidance on the work. He further recommended that the FAA provide these NFOs to the Subcommittee in future years.

A member noted that the FAA needs to continue to work on noise.

A member asked whether or not there is a way to run AEDT in a lightweight manner. The FAA responded that there are noise screening tools available that are in fact lightweight. The member clarified that the FAA should add a series of flags to AEDT that would turn on/off functions. This would prevent the FAA from having to create a separate tool. The FAA agreed they would look into it.

The members agreed that it is important to note that the E&E research program and collaboration enables the US to provide leadership at ICAO CAEP. The members noted that this is an important point and it should be highlighted for the Administrator’s suggestion. All agreed that this is a story that should be highlighted.

A member noted that there should be a recommendation supporting the CLEEN program. Someone from the FAA noted that the Administrator would benefit from knowing the REDAC’s views on the technologies that were selected and whether or not they balance the needs to reduce noise, NOx and fuel burn.

Another member noted that there should be a recommendation on collaboration and communication and that it needs to cover the noise roadmap and the community engagement that builds upon Recommendation #1 from August 2015.

Action items	Person responsible	Deadline
Share the ASCENT NFO with the REDAC E&E Subcommittee (on an annual basis)	Jim Hileman	March 2017
Examine ways to improve usability of AEDT. This could include the introduction of “flags” within AEDT that turn on/off functionality.	Jim Hileman	March 2017
Organize a review of tool development / analysis efforts at the summer meeting	Jim Hileman	August 2016
Share noise roadmap at next meeting including aspects regarding UAS noise	Becky Cointin	August 2016

Meeting Close-Out | Lead *Mahendra Joshi*

Jim walked through the action items. Shelly noted that the meeting went very well. Mahendra agreed to create a draft of the Findings and Recommendations, circulate it, and then that will go to the main REDAC.

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

All of the recommendations from the March 2015 meeting were closed. All of the August 2015 recommendations were closed except for recommendation #5.

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

August 30-31, 2016 in Washington DC

February 28-March 1, 2017 in Washington DC

Adjourned at 3:00 pm on Tuesday, April 5, 2016

**FAA REDAC Subcommittee on Environment and Energy
Spring 2016 Meeting Agenda
Airlines for America
1275 Pennsylvania Avenue, NW, suite 1300
Washington, DC 20004**

Remote Participation:

Telephone:

- US toll-free call in and passcode: (877)336-1831 -- 5328119
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- Select "Participant" and click submit
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Meeting materials:

<https://redacdb.faa.gov/browse.cfm>

Monday April 4, 2016

Time	Duration	Title	Presenter
8:00	0:30	Check-In	
8:30	0:05	Welcome	
8:35	0:10	Chair opening statement & Introductions	M. Joshi
8:45	0:15	What's new in FAA & AEE	L. Maurice
9:00	0:30	ICAO Update	L. Maurice
9:30	0:30	Industry Perspective	S. Alterman
10:00	0:15	Break	
10:15	0:15	Responses to REDAC Recommendations & Actions	J. Hileman
10:30	0:15	FY16/FY17 Budget Update	M. Gallivan
10:45	0:15	Discussion	
11:00	0:30	FY18 Program Proposal	J. Hileman
11:30	0:30	Discussion	
12:00	1:00	Lunch	
13:00	0:30	Airport Technology Research - Environment Projects	R. King
13:30	0:15	Discussion	
13:45	1:00	Noise Research - Roadmap and Update (Supersonics, UAS, Sleep Study and Annoyance Survey)	R. Cointin
14:45	0:15	Discussion	
15:00	0:15	Break	
15:15	0:30	UAS Research - ASSURE COE & Outcomes of UAS Expo	S. Saunders-Hodge
15:45	0:15	Discussion	
16:00	0:45	Operations Research - Roadmap and Update	J. Marks and S. Merlin
16:45	0:15	Discussion	
17:00		End of Day-1	

Tuesday, April 5, 2016

Time	Duration	Title	Presenter
8:00	0:30	Check-in	
8:30	0:30	Analysis & Tools - Roadmap and Update	J. Hileman
9:00	0:15	Discussion	
9:15	0:45	Emissions Research - Roadmap and Update (PM Standard - Measurements and Analysis)	R. Iovinelli and D. Jacob
10:00	0:15	Discussion	
10:15	0:15	Break	
10:30	0:45	Aircraft Technology - CLEEN & CLEEN II Update	L. Ileri, J. Skalecky, and A. Orton
11:15	0:15	Discussion	
11:30	0:30	NASA Update	J. Dryer
12:00	0:15	Discussion	
12:15	0:45	Lunch	
13:00	1:00	Alternative Jet Fuels - Analysis, Testing and Coordination Efforts	N. Brown, M. Gupta, and J. Hileman
14:00	0:15	Discussion	
14:15	0:45	Summary of Action Items and Findings & Recommendations	M. Joshi
15:00		End of Day-2	

Attendance List:

Name	Affiliation	April 4, 2016	April 5, 2016
Lauren Collins	FAA	X	
Mohan Gupta	FAA	X	X
Jim Skalecky	FAA	X	X
Arthur Orton	FAA	X	
Jim Hileman	FAA	X	X
Leslie Riegle	AIA	X	X
Charles Etter	Gulfstream	X	X
Rebecca Cointin	FAA	X	X
Jennifer Duke	Pratt & Whitney	X	X
Chris Roof	Volpe Center	X	X
Sandy Lancaster	Dallas Forth Worth Airport	X	
Julie Marks	FAA	X	X
Dimtri Mavris	Georgia Tech	X	X
Mike Gallivan	FAA	X	
Tom Cuddy	FAA	X	
Katherine Preston	ACI-NA	X	X
Alex Menotti	A4A	X	X
Ian Redhead	Kansas City Airport	X	X
Darcy Zarubiak	Leigh Fisher	X	X
Steve Alterman	CAA	X	X
Nancy Young	A4A	X	
Ralph Iovinelli	FAA	X	X
Shelly Yak	FAA	X	X
Sabrina Saunders-Hodge	FAA	X	
Chris Dorbian	FAA	X	
Jay Dryer	NASA	X	X
Stephen Merlin	FAA	X	X
Chinita Roundtree-Coleman	FAA	X	X
Daniel Jacob	FAA		X
Mahendra Joshi	Boeing	X	X
Jaime Figueroa	FAA	X	X