Research, Engineering and Development Advisory Committee (REDAC) MINUTES

Meeting Date and Time: *4/22/2015 – 9:30am* **Meeting Location:** *FAA – McCracken Room, 800 Independence Avenue SW, Washington DC*

Purpose	REDAC Recommendations on the FY 2017 Research and Development Portfolio and Special Assignment Discussions on Emerging Issues and Future Opportunities
Facilitator	Dr. John Hansman, REDAC Chairperson; Massachusetts Institute of Technology (MIT)
Note Taker	Mervette Saadia Abdu

Mr. Dennis Filler, FAA Research and Development Executive Director, opened the meeting by welcoming everyone and reading the public meeting announcement.

Presentation Welcome and Opening Remarks **Presenter/s** *Dr. John Hansman, Mr. Dennis Filler*

Following the public meeting announcement from Mr. Filler, Dr. John Hansman provided an overview of the agenda and noted that since the Deputy Administrator, Michael Whitaker, will not be able to attend for the opening remarks, we may be a little ahead of schedule.

Prior to Edward Bolton's NextGen update, Dr. Hansman asked what the remarks would include, stating that he would like to hear an update on what NextGen's goals are and its current direction. Dr. Hansman also mentioned that John Hickey would be joining the meeting after lunch and was interested in discussing Human Factors.

Presentation NextGen Organization Update **Presenter** *Mr. Edward Bolton*

Discussion: Mr. Bolton began his presentation by reiterating that Mr. Michael Huerta and Mr. Michael Whitaker regretfully had to decline attending the full Research, Engineering and Development Advisory Meeting (REDAC). After thanking the members for their contributions and participation he stated that he will not necessarily summarize what the NextGen program is, but rather, that he will discuss the challenges that NextGen is facing.

When introducing "Delivering Major NextGen Investments" Mr. Bolton addressed the benefits and challenges in general, of NextGen as compared to the Legacy System, then provided more detail about what steps are involved in scaling up infrastructure. Mr. Bolton explained that NextGen is focused on infrastructure improvements for a large geographic region. There are 22 major areas in the National Airspace (NAS). He described a graphic in the presentation that began with tower control, from there to the terminal; from there the aircraft is en route, arriving

in the destination airspace at the terminal, and ending with the tower as the parking lot. He discussed funding that has been spent on it so far on this phase.

For the NextGen Budget Profile (FY 2007-FY2016), Mr. Bolton described the funding that has gone into the infrastructure set up. He asked, "What is the risk? He then began to explain the funding requirements needed to undertake such a huge endeavor. Mr. Bolton referred to the color coding in the graphic chart, showing the amount of funding needed per fiscal year compared to the actual funding allocated.

Going into further detail of the NextGen budget, Mr. Bolton stated that the NextGen developers thought they would receive $1.5 billion but the amount received is much lower, and as a result, there will be less delivered. There is currently a shortage of about $4 billion. Mr. Bolton said that the FAA infrastructure would be implemented as best as expected with funding provided.

NextGen has undergone program assessments by several internal and external agencies. Mr. Bolton discussed the McKinsey study which showed that there will be a benefit of at least $133 billion to the overall airline industry by 2030 but the challenge is that this will not happen all at once and that these benefits are dependent on the phases of NextGen being funded and implemented. FAA has responded to 96% of the Inspector General (IG) recommendations. Much of the issue is not in taking on recommendations, but rather on communicating it to the general public and external audiences. The joint FAA/McKinsey team developed business cases delivered to each major U.S. carrier and derived from this a powerful business case for NextGen.

NextGen partnered with MITRE in looking at how to build a sustainable National Airspace (NAS) for all and how focus has shifted over time. MITRE researched and looked at what can currently be done based on the current systems and what improvements have been made, so it is a more phased in system. Mr. Bolton stated, "As you have the foundation in place, and the most capability as one can get, there can then be a NAS wide integration of operations and performance. From there they will work on enabling advanced aircraft – centric operations."

Mr. Bolton went into further discussion of the NextGen priorities. Despite the presentation showing a May 2014 start date, the timeline really started in June 2013 when Mike Whittaker came on board. There was sequestration during that time. In anticipation of sequestration, Mr. Whitaker during that time took an opportunity to communicate with stakeholders and asked them to identify priorities. There was a process that involved costs, metrics, and priorities of these goals and based on location. The report was published and there is another report that goes over how this will be implemented over the next 1-3 years. The first phase of the goals involves 56 new Air Traffic Control towers.

Performance Based Navigation (PBN) is a key aspect of these goals. Described by Mr. Bolton, it is **"**Based on when you have large airports and smaller airports in the area, 5 of the 10 worst city pair's delays either start or end in NYC airports." 'City Pairs' refer flight paths that are commonly travelled. Surface involves having the right data to the right person at the right time and making it predictable. To illustrate this point, Mr. Bolton told a story about how on a recent flight from Atlanta, he was told he would be in the air for 120 minutes but with NextGen, he was only in the air for 80 minutes. This was because of the performance based navigation and surface

data.

Mr. Bolton discussed the how NextGen will bring regional benefits to various metroplexes. The presentation showed the immediate areas that are being worked on, they include: Northern California, Atlanta and Charlotte first. He was asked why the New York metroplex was not on the list and Mr. Bolton responded that it is too hard a large a challenge right now so there is a focus on more manageable areas. Next, the NextGen regional benefits as regards to Wake RECAT were briefly touched on with Mr. Bolton mentioning that NextGen can provide more detailed information for savings in taxi time, flight time, resulting in increased throughput and estimated annual savings to operators. FedEx said their throughput was increased by 17%. For the Atlanta metroplex, Delta briefed and said they are getting 6 additional arrivals per hour and was very excited about the increased productivity.

For NextGen's future, there is a document being developed which is still in the rough draft stage. It is looking at what is coming after 2025. Cyber-security is a big issue and becoming more of a challenge. The areas are divided into: "ongoing progress", "emerging challenges" and "lessons learned". For general aviation, a major issue has been the costs with aircraft repair. Many aircrafts are hand me downs from the 1950s and 60s, so repairs can be costly.

Mr. Bolton came back to the topic of ERAM, stating that, "If it is done well, the ATC can be done from anywhere. It takes about 2 years to train someone in ERAM, but once they can do it, these ATCs can work anywhere."

There was some discussion about NAVCAM and commercialization, with the following points made:

1. We have the largest, most complex, busiest air space in the world;

2. Unlike NextGen, there should be a plan in place;

3. There should be a succession plan, and;

4. "That whatever is done, it should be done right".

In conclusion, Mr. Bolton shared the general road map to the future of NextGen from 2014 to 2018. The first phase establishes the foundational infrastructure (ERAM, TAMR, ADS-B Out and SWIM), then moving to expanding NextGen, followed by NAC priorities to expand PBN, initial data communication and increased surface efficiency, then on to an agile and resilient NAS. By 2020, the team hopes to lock in NextGen from 2020 – 2025, then plan out the post mid-term phase from 2026-2028.

<u>Questions and Comments</u>

Dr. John Hansman asked how the $4 billion shortfall will affect the implementation. Mr. Bolton restated the question to ask and clarify if he is asking what exactly will be delayed. The answer is that whereas before there had been an implementation plan to have all the implementation complete by 2025 and then the Human Factors could be phased in, now that there is a budget

shortfall, the entire timeline is longer. There was an implementation plan for a 1-3 year time frame. Dr. Hansman stated that he understood Mr. Bolton comments and they discussed the differences in expectation. Mr. Bolton also said in reference to En Route Automation Modernization (ERAM) and Terminal Flight Data Manager (TNFM) that it impacts reroutes and the infrastructure gives the (Air Traffic Controller) ATC a significant advantage. ERAM can help the ATCs and by getting updates of real time weather conditions much more quickly (updated every ½ second) and the other system takes about 5-8, or 12 seconds to update. Part of the challenge is that one will have to be in the environment of NextGen infrastructure to implement human factors. He used the example of flight strips looking the same if they are electronic or paper. Until there is an integrated infrastructure system, one cannot fully implement.

Dr. Hansman asked about a research component to study the metroplexes. Mr. Bolton said that there were 14 deliverables that were due and they completed them on time and with two of them earlier than scheduled. He asked, "Can the thinking be expanded to involve the learning, implementation and steps afterwards?" The other metroplexes are: Houston, North Texas, DC, Southern CA, Cleveland/Detroit, Phoenix, Denver, and Southern/Central FL.

Dr. Hansman asked why the New York (NY) metroplex is not being worked on now and further stated that if Mr. Bolton just finished saying that NY was the main reason for five of ten major delays, then perhaps NY should be more of a priority. Joseph Bertapelle added to the discussion by saying that the challenge of NY is that it is really a large tri-metroplex and there are many challenges unique to that area so it is more feasible to approach it from the outside in.

John Dermody mentioned some of the other challenges in the NY metroplex system. There are political, cultural, environmental issues. The NY/NJ Port Authority is also studying the infrastructure issues. Mr. Dermody added that, "NY is really a jigsaw and there are many challenges, one of which is figuring out the direction to go."

New York is getting electronic flight strips and then will get subscription to the data. By starting with the surface domain, it will be less political and challenging than beginning with the PBN which is a very political process.

Dr. Hansman asked why this information about the regional metroplexes could not be put on the FAA/NextGen website. Mr. Bolton responded that there is a lot of pushback from the airlines industry and with research there are issues with competitive advantage. Research can harmonize and/or be delayed. The research is focusing on the 30 airlines that account for 90% of the air travel.

Presentation Chairman's Overview **Presenter** *Dr. John Hansman*

Discussion: Dr. Hansman provided a quick overview. In the discussions with the subcommittees there were questions about what happened with the strategic goals. Dennis Filler said that these recommendations were effective and is relatable to current events. One of those recommendations mentioned had to do with data integrity and cyber-security. Commercial space, UAS, and cyber-security are all areas where Mr. Bolton has focus and are now becoming

larger goals of the FAA. One of the strategic questions had to do with whether there would be enough people trained to work in cyber-security. There are partnerships in the works with Department of Defense (DoD), Department of Health and Human Services (DHS), and people are being trained and acquired with those skills. The FAA works at a slow pace but they are working towards that direction. Cyber-security has to be worked into the overall technology.

An area with a lot of challenges is Human Factors. Mr. Filler stated that our story is not resonating with Office of Management and Budget (OMB), and that program continues to be targeted and loses about $2 million a year. There has been a shift in priorities as a result.

Questions and Comments

Dr. Hansman asked if the issues for Human Factors losing money are related to the Office of Management and Budget (OMB) not appreciating the importance, or if it is a communication issue. What are the reasons for Human Factors having these funding issues? Mr. Filler responded that all the programs say they have human factors in their research, so it has diluted the efficacy of a coherent program dedicated to Human Factors. When all the human factors work is aggregated up it looks like hundreds of millions of dollars is spent on Human Factors when in reality that's not what it is. He also said that there is a cultural issue with the technology that causes issues with Human Factors; he used the example of the keyboards being outdated.

Dr. Steve Bussolari said that he understands the budget challenges and constraints when making subcommittee recommendations; it is hard to work within the Budget Line Item (BLI) structure. What are the paradigms? How will we operate? Mr. Filler responded that the nature of research is hard to predict five years out from now. The research priorities also have to respond to what is going on the world so there needs to be consideration for aligning but budgetary goals with real world issues. The FAA is tasked with being knowledgeable of all aviation issues and making policy recommendations based on that.

Presentation Subcommittee Report: Environment and Energy **Presenter** *Mr. Mahendra Joshi*

Discussion: Mr. Joshi began his presentation with some remarks about today being Earth Day. He provided an update on their recent Subcommittee meeting on March 17th and 18th, For the first day of the meeting, the Subcommittee worked on all of the tasks put in place to reduce emissions. On the second day of the Subcommittee meeting, there was participation by the ATO manager. They talked about the scope of the best procedures.

From there, Mr. Joshi began his first topic and went into further detail about noise complaints. Noise complaints are increased; however, this is not a task solely for the FAA to address since local jurisdictions play a role too. He also stated that with PBN implementation, more noise challenges are possible.

For the second topic, Mr. Joshi discussed the working relationship between the Environment and Energy and Air Traffic Organization divisions at the FAA and reported that it is going well. This includes integration of assessment models that can be used in PBN procedures. They are also

recommended that ATO implements what recommendations are made in subcommittee meetings.

The third topic for discussion was on F&E funding reductions. Due to the funding cuts, the FY 2015 and FY 2016 plans have been impacted. There has been an impact on some programs and planning is affected. The amount of funding has affected how program managers prioritized their programs and plans. The Subcommittee will make recommendations on funding. Dr. Hansman responded that, in general, the REDAC only has so much influence on making financial recommendations but what will go further is making recommendations on priorities from a research standpoint.

The fourth topic was an overview and report on how the Aviation Sustainability Center of Excellence (ASCENT COE) was functioning. Mr. Joshi stated that it was proceeding efficiently and that the FAA has done a good job of transitioning to ASCENT. In the matter of a year much of it has been implemented.

Mr. Joshi also reiterated that US Leadership in the International Civil Aviation Organization/Committee on Aviation Environmental Protection (ICAO/CAEP) is essential. He stressed that higher priority should be given to developing tools, and making recommendations for environmental protection in aviation. The ICAO CO2 sated development is also progressing well. This is one of the areas where the tools are available and standards should be utilized. EPA levels of CO2.

Questions and Comments

Dr. Hansman opened the floor for questions and discussed some points regarding the noise issues. Carl Burleson talked about developing metrics going forward and that is part of the plan to do multiple things with various airports. The noise issues are not at areas of direct environmental concern, but it has a more immediate impact and is more noticeable to the average person. Most airport communities do not care about the benefits of NextGen because it does not impact people's daily lives. There was some discussion between Mr. Burleson, Dr. Hansman, and Joseph Bertapelle about the noise challenges and what it has to do with runway locations and local governments, and what the impact on local zoning issues is. The FAA is not involved in zoning issues yet has to deal with many of the noise issues. To this Mr. Burleson asked "How do we use a balanced approach to implement NextGen with local issues? People get upset about low flying aircraft but there complaints are usually related to safety. There is sociology of air noise".

Chris Oswald responded that there is a lot of support among local communities for air flight and construction, and while there needs to be more outreach to local communities it should not negatively impact PBN implementation. Mr. Burleson then said, "Among some Congress members, there is some pressure to spend less time on the science and research side and just work on implementation". Mr. Burleson also said he appreciates the support from the subcommittee and agrees with the goals and recommendations. Noise issues are a huge challenge but there has been some reasonable success. 2014 was the 100th anniversary of the first commercial flight, but the first report of noise complaints in the media came in 1911, so these complaints have been around since the beginning of commercial air flight.

Chris Oswald mentioned that some of this will be restated in the Airports subcommittee report later in the REDAC meeting, but in the future, there should be representatives attending each other's meetings so that information replication is not minimized.

Presentation Subcommittee Report: NAS Operations **Presenter** *Dr. Steven Bussolari*

Discussion: Dr. Bussolari began by stating the subcommittee's summary will be based on two parts; general observations and findings/recommendations. For the general observations, Dr. Bussolari stated that the Data Visualization Analysis and Reporting System (DVARS) provides a data processing capability that adds significant value to the analysis for the 4D trajectory models, in particular, for the verification and validation of trajectory models. The DVARS data architecture concept is well aligned with the global transition towards net-centric technologies. Because of this, the system provides a foundation for scalability for example, "for the rest of airspace". The next set of observations has to do with research opportunities.

For their findings, with respect to what the NAS OPS decided to do in this matter was to focus on one area that they felt was very important and chose to go with trajectory based observations (4D TBO) because of its future importance and relevance to NextGen. There was a briefing on a paper that was presented on trajectory based operations but also raised many research questions and challenges. For example, the question was posed about when a modeling method fails based on nominal and off nominal instances. What about when it fails and there is human involvement, what happens? The subcommittee has expressed some concern about the reduction in human in the loop research and these new concepts will be pushed further. Dr. Bussolari stated the FAA's stand on the TBO concept is a good start but should go a step further.

<u>Questions and Comments</u>

Dr. Hansman asked Dr. Bussolari about how Unmanned Aircraft Systems (UAS) are addressed. Dr. Bussolari replied that there was a discussion but it would be brought up at their next meeting. Mr. Filler discussed the similar challenges with PBN and TBO. Dr. Hansman raised a point about multiple trajectories, resulting in further conversation on the topic between him, Dr. Bussolari and Mr. Filler about technical issues and whether environmental assessment can be done early on and how? This is the issue Mr. Burleson brought up and cited an example of how the Seattle metroplex approached this. "How do we do the environmental impact assessment?" Mr. Burleson asked, "The local communities should help decide that." Mr. Filler said that there are two Human Factor elements; human perception of noise and how to approach that challenge. Dr. Bussolari agreed, stating that these are various parts of a whole.

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

Discussion: Mr. Oswald stated that the subcommittee's feedback is captured in four findings and three recommendations.

Mr. Oswald discussed the first two findings concurrently as both are related to both the planning subject matter and environmental issues. The first finding states that the subcommittee generally accepts and supports the Airport Technologies program's FY 2017 budget. However research needs identified by FAA staff in the field of Airport Planning (RPD 132) appears to exceed the amount allocated to this research project area.

The first recommendation made is that the FAA reviews the RPD 132 budget and determines if sufficient funding exists to meet the FY 2017 needs.

The second finding discussed is on the planning side, and builds on some previously discussed issues. Mr. Oswald reported that the while the subcommittee supports many of the new environmental research projects, both safety and capacity must be considered when assessing new types of noise mitigation.

FAA's near space simulation model is the basis for many of the findings and help with planning. CFAA would like to look at ways to increase the budget for airport planning and/or ramp down the research. One of the needs identified is to look at critical aircraft design, modernizing the FAA's runway exit interactive design.

The second recommendation states that the FAA takes steps to incorporate safety and capacity assessments into the RPD 157 research program and better define how the perspectives from the pilot, air traffic, flight standards and airport operators will be incorporated onto its research plan.

The third finding is dealing with the low cost ground surveillance system (LCGSS). The subcommittee appreciated the proof of concept work associated with LCGSS, especially the testing being done in Seattle. Mr. Oswald stated that there is a $1 million set aside budget for environmental issues related to airport planning. There were a number of alterative flight techniques to mitigate noise. These techniques and research can be cross cutting to include safety and capacity considerations, also incorporating prior research can benefit the work being done by Environment and Energy (E and E).

The third recommendation has to do with surface safety, and recommends that Branch staff develop a concept of operations that defines the roles and applications of the LCGSS in the National Air Transportation System. Dr. Bussolari mentioned that one of the lessons learned is that sometimes what once was thought of as a low cost program turns out to be very expensive so he suggested to Chris Oswald (CO) to really look closely at the costs in the assessment process. Optical test system in Seattle has been put in place by FAA and is helpful in looking optical systems for safety and that they are effective. The Seattle example really looks at the frontal gates, line of sight and runway.

The 4th finding addresses braking systems and Aircraft Braking Friction. Mr. Oswald concluded with stating that the committee on 2017's budget they are comfortable with where things are.

Questions and Comments

John Dermody said that from the FAA's side on airports, they are on the same page as Mr. Oswald's report and are in support of the findings and recommendations. On the planning side, there needs to be more meat on the bones of what needs to be done. There is a need for additional money. For the strategic research areas, they not only developed a list of general areas but also the more focused, "in the weeds" ones too.

Dr. Hansman reminded Mr. Oswald that instead of asking for more money, the request can be reframed to present it from a prioritization standpoint and there can be internal discussions between the subcommittee members and their FAA counterparts.

Mr. Dermody stated that there needs to be more research on optimization. Dr. Hansman replied that this ties into RECAT, for certain airports this is a research priority and topical. For example, Frankfurt has a bad runway design.

Mr. Dermody stated that there is a surface surveillance focus. There are a lot of technologies and there are several vendors that come to the Tech Center and they are looking into various options.

Dr.Hansman followed up and asked a question about the Low Cost Surface Surveillance. Mr. Dermody mentioned that this is a priority and the areas that the Subcommittee mentioned are midterm goals that are working towards long term goals. Dr. Bussolari discussed another lesson learned from the Con Ops and whether it is being used for separation awareness.

Presentation Subcommittee Report: Human Factors **Presenter** *Mr. Jack Blackhurst*

Discussion: Mr. Blackhurst began by stating that the Subcommittee met in February. He thought Ed Bolton's information was extremely helpful and that they are similar to the recommendations that they are making in their report too. The Subcommittee meeting came up with five finding and five recommendations.

For the first finding, Mr. Blackhurst stated that the Subcommittee is concerned that Human Factors research is not receiving the appropriate priority for the UAS research programs. To this finding, Dr. Bussolari brought up that the Air Force has hundreds of hours of research and millions of flight hours and that this research could be shared. Dr. Bussolari further stated that there are Air Force standards that could be used and there is a body of work and research that could be leveraged. Dr. Hansman pointed out that the research from the Air Force is relevant but cannot be used entirely for civilian air travel.

The recommendation to the first finding was for the FAA to review the Human Factors activities within its UAS research portfolio to ensure it is sufficient and timely.

Secondly, there is a lack of required research to provide guidance and new capabilities to: implement practical Human Systems Integration within FAA Air Traffic (ATC) processes. Mr. Blackhurst expanded on this with the recommendation for a research portfolio to be created under the Air Traffic Control/Technical Operations (ATC/Tech Ops) program to achieve various results. These results include: incremental revisions of training requirements, development of an ATC critical incident analysis capacity, and an early warning tool for consideration of human performance in ATC related safety related reports.

For the third finding, Mr. Blackburn, related that on the New York Traffic Control (NY TRACON) project, the Subcommittee was pleased that Human Factors ATC was called upon. The Human Factors team has proposed a solution that will create more efficient training methods but there is a concern that the amount of resources needed to achieve this capability is at a critical level. The Subcommittee made the recommendation for adequate research to be performed to measure the effectiveness of new methods and tools. Once the tools have been proven at one site, needed research can be employed at other sites.

Another finding the Subcommittee found addresses improvements in throughput; operations efficiency and overall performance are expected in NextGen. Mr. Blackhurst stated, "It's not about more money but rather prioritization". The Subcommittee recommends continuing to pursue Human Factors work focusing on the design of effective flight deck procedures for Performance Based Navigation (PBN). He further stated that work should be collaborative and provide guidelines grounded on an integrated systems perspective.

The Subcommittee's fifth finding addresses recent findings (Spring 2014) that applauded ATC/Tech Ops Core program to ensure a more strategic planning effort, this effort has been suspended due to lack of resources, and the value of this effort would help the FAA uncover emerging risk in both current operations and NextGen implementation. Mr. Blackhurst reiterated that there is reconsideration for the prioritization of human factors work and look at allocating resources to restart this important research planning effort.

Questions and Discussion

Mr. Filler began by stating that some of the findings need to be more focused, there needs to be clarity of program, showing a specific problem to overcome and a plan for how to approach that. Budgets are being cut and PCB (personnel costs budget) is also being cut. There cannot be a broad brush approach but rather have very clear line of sight. Every F&E program in the FAA probably has human factors in their terminology and this dilutes what the actual Human Factors team can do.

Dr. Hansman stated that it is important for the Human Factors department to make clear to the Office of Management and Budget (OMB) that an engineer dealing with Human Factors has a more detailed focus and specialty with human factors and this is different from other programs that deal with human factors in the context of their research area. Mr. Filler replied with, "The Human Factors department needs to clearly articulate how they will address the new technologies like TDO or UAS will be a beneficial tool across the board". Dr. Hansman replied, that maybe 'human factors' isn't the correct term, but because of the nature of research, there has

to be an imagined context where this occurs.
John Hickey agreed with comments about funding issues and shared frustration with it. Mr. Hickey said he will focus his comments on the safety side. He stated that he and Wendell Griffin would rather see Human Factors fundamentally rooted in everything we do. Mr. Hickey used an example of trying to get electronic flight decks in every aircraft (about four years ago) and went into the details of what happened. Because it was very cost prohibitive, they did a human in the loop study to simulate that without ship position, the pilot was spending a lot of time looking down and with the ship position they pilot was able to navigate more easily.

Mr. Hickey went on to state that human factors is another item to consider and he then told Jack Blackhurst that he hopes that they go out of business as a standalone program since they should really be involved in all the programs.

Presentation Subcommittee Report: Aircraft Safety **Presenter** *Ken Hylander*

Discussion: Mr. Hylander began his presentation by stating that since there are over 50 line items of research, the Subcommittee focused on a narrow selection for their three day meeting. They kept in mind that this is a meeting for recommendations as an advisory committee and they spent a fair amount of time to determine the priorities and how to address current issues. Mr.
Hylander stated that some portions of his presentation were already discussed in the fall REDAC meeting and would not be reiterated in this meeting.

An area of focus for the Subcommittee was future opportunities for System Assurance Systems (SAS). This involves commercial space integration with the national space system. The role general aviation in safety systems development is part of this issue, as well as, and the effects of breakthrough medical technologies on FAA medical certification standards. Mr. Hylander also discussed the identification and funding of strategic research and development as a future opportunity for SAS.

Some of the key questions for SAS the funding requirements in detail with each program. Mr. Hylander shared a very detailed graphic chart that identifies each of the twelve Budget Line Items (BLI) that address SAS. He explained how the chart was organized to break out new requirements per BLI and what the total requested funding is for the entire BLI. Mr. Hylander further explained these points in another chart that provides an initial look at (Fiscal Year) FY 2017 requirements supporting SAS issues. He explained how the differences in funding vary from the overall budget requests.

Another issue discussed by the Subcommittee addresses Emerging - High Density Energy Storage, Management. Mr. Highlander explained that this is a newly emerging area of research and can be suggested to Aviation Safety (AVS) for further research projects.

The Subcommittee found additional findings and recommendations worthy of further investigation. To begin with, the Unmanned Aircraft System (*UAS) Portfolio Flexibility, Research Roadmap Development,* and *Additive Manufacturing Research Acceleration –*

especially with the 3rd goal around composites, there needs to be attention to this soon. Dr. Hansman asked for more clarity about why this is a serious concern and if the material is a homogenous one or not.

Mr. Hickey said that the concern has to do with flaws in the composite, green boundaries; there are a lot of issues around not knowing what kind of flaws can occur under the composite skin. For the recommendation around UAS, they are suggesting coming up with some ability to tackle the unknowns around UAS, and there needs to be a way to have budget flexibility to be nimble and strategically agile. The second recommendation of the Subcommittee deals developing a research roadmap for key strategic issues. It deals with how the research deals with what exists and a more cohesive view of the emerging issues. The third recommendation is to address additive manufacturing and to accelerate the research for this. Mr. Hylander stressed that this is an example where private industry is outpacing government research and encouraged the FAA to develop more robust funding for this area.

Mr. Hylander concluded with a few observations from the Subcommittee. One observation on Human Factors is that they are pleased to see the involvement of FAA Human Factor specialists throughout the AVS research portfolio. They closed out this recommendation since they are pleased with the progress being made in this area and feel no further recommendations are needed.

The other observation came about from having committee members that serve on other committees. Since there is synergy, crosscutting issues and capabilities should be engaged at an earlier stage of setting requirements and concept development.

Questions and Discussion

In response to the recommendation about UAS, Dr. Hansman said there is a need to deal with UAS of varying sizes. Mr. Hickey related an anecdote about how in the 1980s there was a recommendation to not focus on cabin safety and put more focus into not crashing the plane. The FAA did not listen to this and as a result have affected safety more profoundly and prevented many deaths. Dr. Hansman said that it is not practical to regulate all the UAS especially since there are so many small ones. The ones that are small will have more in common with dealing with birds and larger ones of a different scale.

John Hickey said that he is really pleased with the S
subcommittee findings and agrees with the details in it. He and some of the management team planned a trip to General Electric (GE) to see what they are doing with the new composite materials but had to cancel due to snow. The trip is being rescheduled.

Dr. Hansman asked what are the research strategies or questions that are fairly robust. There is an overall flaw in the budget process because there is not a mechanism to have flexibility and be able to respond quickly to emerging issues. To this, Mr. Filler replied that there is an opportunity to drive the research roadmap and not have to act reactively. The example of GE poses an opportunity to reach out to manufacturers but not many companies are open to discussion.

For example, Mr. Filler stated that Amazon has been beating up the FAA in the press, yet they are not being forthcoming. There are many proprietary issues that come up and companies are skeptical to work with the FAA in a research capacity.

Presentation Committee Discussion and Recommendations **Presenter** *Dr. John Hansman*

Discussion: Dr. Hansman began by reviewing some of the cross cutting emerging issues: Unmanned Aircraft Systems (UAS) and National Airspace (NAS) and noise reduction. He agreed that Trajectory Based Operations (TBO) is also a good one but more of an internal strategy.

Dr. Hansman asked Ken Hylander if the last two points from the Safety Subcommittee related to additives and UAS should be added to the cover letter to the Administrator so that it is brought to his attention to which Mr. Hylander stated that they should. There was some discussion about the additive manufacturing and Dr. Bussolari said that there should be some attention on certification of additive manufacturing.

Dr. Hansman said, as a practical matter, the issues around Human Factors awareness across the board tend to be ignored in the early stages. He reiterated what Mr. Bolton said this morning about Human Factors not being part of the early process because it is dependent on implementing infrastructure.

Mr. Filler said services will be delivered on the platform and along that flow of programs the humans will come into play since humans operate the entire infrastructure. Crosscutting issues such as big data and cyber-security were brought up again.

Mr. Hylander suggested the following statement, "All of these goals and recommendations are highly dependent and there is need to recognize this since they are complex. The Committee sees approaches opportunities for crossing cutting collaboration across the agency in various areas such as big data, UAS, cyber-security, etc."

Dr. Bussolari provided an example from 1969 when the FAA proposed new changes to the NAS program and with very broad categories but it didn't go into enough detail.

Dr. Hansman asked Mark Orr for clarification about the sponsored areas and funding for AVS. He also brought up concerns about there not being an integrated approach to research across R, E
&D.

There was a discussion between Dr. Hansman, Mr. Filler and Mr. Hylander about how best to operationalize the topics in determining research priorities. Within the subcommittee meetings, not everything is looked at, AVS, for example, has such a large portfolio, so they are really only looking at a fraction of it.

Dr. Hansman concluded the meeting by thanking the attendees for their participation. The

meeting was adjourned at 2:45pm.

Action Items

Dr. Hansman asked for attention to be given to:

- A big picture of what is in the portfolio for each subcommittee.
- A summary of the agreed upon cross cutting issues.

Committee Members in Attendance

Joe Bertapelle
Jack Blackhurst
Dennis Filler
John Hansman (Chair)
Ken Hylander
Mahendra Joshi
Chris Oswald
Ken Hylander
Joseph
Bertapelle
Jaiwon Shin

Additional Attendees

Ed Bolton
John Hickey

Mervette Saadia Abdu, FAA
Carl Burleson, FAA
Daniel Brock, FAA
Jimmy Bruno, FAA
John Cavolowsky, NASA
Sherry Chappell, FAA
Nancy Clarke, FAA
John Dermody, FAA
Colleen Donovan, FAA
Jaime Figueroa, FAA
Julia Frasure-Sanchez, FAA
Mike Gallivan, FAA
Wendell Griffin, FAA
Mike Hawthorn, Noblis
Jim Hileman, FAA
Urmila Hiremath, MITRE
Michel Hovan, FAA
Robert Humbertson, BAH
Maureen Molz, FAA
Monique Moore, FAA
Eric Neiderman, FAA
Ralph Nicosia Rusio, FAA
Kerin Olson, FAA
Lee Olson, FAA
Mark Orr, FAA
Fernando Pinzan, BAH
Al Pollard, MD State Airports
John Reinhardt, FAA

Chinita Roundtree-Coleman, FAA
Rachel Seely, FAA

Chris Seher, ARA
Mark Slimko, Zodiac Aerospace
Emily Stelzer, MITRE
Patty Swenor, FAA
Paul Tan, FAA
Ben Thielen, FAA
Frank Wondolowski, FAA
Michelle Yeh, FAA

Research, Engineering and Development Advisory Committee Federal Aviation Administration (FAA)

FAA Headquarters, 800 Independence Avenue, SW Washington, DC – 10th Floor Round Room

April 22, 2015

Agenda

9:30 am	Welcome Address and Opening Remarks	John Hansman Dennis Filler
10:00 am	Update - NextGen	Edward Bolton
10:30 am	Chairman's Overview	John Hansman
10:45 am	Break	
11:00 am	Subcommittee Report – Environment and Energy	Mahendra Joshi
	Subcommittee Report – NAS Ops	Steve Bussolari
11:30 am		
12:00 noon	Lunch	
1:00 pm	Subcommittee Report – Airports	Chris Oswald
1:30 pm	Subcommittee Report – Human Factors	Jack Blackhurst
2:00 pm	Subcommittee Report – Aircraft Safety	Ken Hylander
2:30 pm	Committee Discussion - Recommendations - Future Committee Activity Adjourn	John Hansman
4:00 pm		