

Research, Engineering, and Development Advisory Committee (REDAC)

May 31, 2017

Meeting Minutes

Federal Aviation Administration (FAA) National Headquarters
10th Floor Round (McCracken) Room
800 Independence Avenue, SW
Washington, DC 20591

Note Taker: Dennis Flath

09:30 am – Welcome and Opening Remarks

Shelley Yak (FAA, Director, FAA William J. Hughes Technical Center) (REDAC DFO), and
Dr. John Hansman (REDAC Chair; Professor of Aeronautics and Astronautics, Massachusetts Institute of Technology)

Shelley Yak conducted a reading of the official Federal Register posting as required.

Shelley continued with her opening statement with a “Thank you” to committee members (and by extension, the Subcommittees) for taking time away from their normal activities to engage 100% by helping FAA in discussing its research activities. Shelley made note of having attended all but the Human Factors Subcommittee meetings and the benefits she derived from having done so being both informative, of great value and high interest.

Ms. Yak expressed her appreciation for each of the Subcommittees having provided time to present the status of the redesign of the National Aviation Research Plan (NARP) and the feedback provided. She informed REDAC that a more in-depth discussion will be discussed later in the meeting.

Dr. Hansman reviewed the meeting agenda and provided additional emphasis on UAS and the NARP redesign.

John made note that the Administrator would be joining REDAC shortly and will have prepared remarks. In light of that opportunity, he queried the Committee as to questions or areas of concern they might pose where REDAC could be useful to the Agency. He noted that it was easy to criticize and remark that there was not enough money in a given area. The value added that REDAC has is providing outside technical operational input.

A major area of concern coming up lately is cybersecurity in aircraft systems and it is not entirely clear as to how best to deal with the challenge. Shelley interjected that the FAA was currently developing a cybersecurity research development plan expected to be completed in the July timeframe. She indicated that perhaps REDAC would like to review the plan providing feedback for items missed or considered for inclusion.

John posed a rhetorical question to the Committee: Would they, as a full Committee, prepared to review the document or should a Cybersecurity Subcommittee be added to our roster with technical expertise. Shelley interjected that the REDAC keep in mind the NARP redesign and how the Cybersecurity Plan affect the established Goals and Objectives or influence the structure.

09:40 am – Welcome and Administrator Remarks

Michael Huerta (FAA Administrator)

Administrator Huerta expressed thanks for REDAC’s help keeping FAA’s research efforts in line and on track, adopting longer-term perspectives where the Agency has been, particularly in this climate right now, focused on the narrow, tactical and right in front of them. He said, “We need to put greater focus on the future; that’s what government entities are supposed to do.”

The Administrator made note of areas where REDAC has helped or is currently helping and planned to discuss some areas in the future that the FAA needs to put on greater focus.

“First, as you know, time and effort has been expended with respect to aircraft noise. There are two dimensions to this: 1) changing airspace over people who haven’t previously been impacted; and making tradeoffs and choices which is extremely important to FAA and, 2) recent documentation that there is higher degree of sensitivity to noise, with public policy issues well beyond FAA. It becomes a question of we as a society – what we want and what is the right balance. He attended numerous community groups and its often difficult reminding them that airports are noisy – simply a fact of life. Airport authorities are being proactive and doing such as working with land use authorities and ensuring property buyers full disclosure – approximation to the airport. REDAC’s suggestions have been quite helpful.”

Administrator Huerta also thanked committee members for their endorsement of the CO₂ emission standard. He said, “The agreement between industry and government is extremely important because we were hearing that industries fear was of a patchwork of standards through the world with regulatory uncertainties.”

His comments continued, “ REDAC has suggested refining our aircraft safety research and recommended more effective collaboration with government, as well as industry in the area of UAS traffic management. It was your help in providing advice that continued to move us forward. “

“You’re currently involved in some of the key challenges we’re dealing with right now. One is the growth and complexity of aircraft manufacturing (rulemaking completed on PART 23), which should serve as a template of how we approach oversight of how manufacturing should be done. Frequently asked when FAA be done with this work and my response is that as industry continues to evolve so will the standards and how to establish baseline framework. It’s a result of these collaborative efforts that aviation remains so safe.”

“We’re also been focused on priority issues such as NextGen with emphasis on the Northeast corridor but further out we know that we’ll be based on trajectory operations; there’s the integration challenge and commercial space - both in the news. Each is done by exception and requires us to coordinate and protect significant airspace concerns. We see an increased proliferation of states and localities that see commercial space as an economic boom in space ports much to the consternation of the adjacent airports. These are policy decisions that abound, but we’re making headway in classifying airports, but ultimately we have to be focused on achieving the goal of integration. The use of data to drive down safety risk will always be with us and driving our international agenda. That’s why recently we’ve been focused on the Caribbean region by request of air carriers – no end of issues such as airport safety, managing airspace corridors, working collaborative with our defense department, and smaller countries having competing differing objectives in how they want to manage their airspace.”

“Some of the things I’d like your help on addressing how to manage some of these emerging challenges, that may sound far off, but aren’t. One that we’ve started to talk about is what comes after the jet engine? What technologies should we be talking about and how quickly can we bring them into use as that next generation of propulsion system. It does bring on another set of issues, that of noise and emissions. There is a lot of promising work on alternative propulsion systems...what should we be focused on and help innovators bring them to market.”

“I continue to be concerned about cybersecurity. NAS is considered an incredible critical piece of our nations’ infrastructure and we need to be constantly vigilance about both the outsider and insider threat. We have increased use and interdependence of the NAS and how it ties to the operations system of air carriers and their reservations systems. If we want to build these linkages, particularly as we deploy technologies like Data Comm, we’re building potential gateways of interconnected systems. How do we protect and contain that? Traditionally the question has been how to keep the bad guys out? Now it’s evolved to recognizing and best

manage it when they do get in and ensure that you protect the critical systems. We can never be comfortable, nor will we fully understand it because the threat will continue to evolve. So the challenge is how to stay ahead of it, and how we adopting best practices and the industry, as a whole, is working collaboratively to best address these problems. Ideally the best way is to make sure systems aren't linked but that isn't realistic. Given that, in order to take advantage of advancements in technology the best way is to make it more robust with real-time data sharing and much tighter linkages with users of the system. Yet, we must keep up with threats and still manage the system."

"We also need to contend with the uncertainty of our larger national aviation and airspace policy, as well as budgetary implications that we in the government need to struggle with. That means we always need to be focused on being smarter, on how we foster more innovation, how we use more data, but equally important - we need to be and remain flexible, and adapt to circumstances. I've always felt that collaboration is the key, staying close to our stakeholders; everyone having the same information and sharing the same understanding about how life is evolving, putting us in a better position on how to deploy resources moving ahead."

Once again, Administrator Huerta recognized and thanked the committee members for their counsel, hard work and contributions. He asked that REDAC try and frame a way for the Agency to make sense of the many changes and the best way to respond to those changes.

Michael noted that it has been close to seven years that he has been in the Agency. He remarked that in that relative short period of time, aviation has gone through a period of unprecedented change.

He noted, "We're fundamentally redefining what the aviation industry is. Think about how we integrate unmanned systems and commercial space and the different users. We're redefining what partnership means. We're moving towards a system of shared responsibility for ensuring the safety; a system moving from control to airspace traffic management; one where there is not that adversarial relationship between the regulator and the industry that we regulate. That's a positive thing but I counsel my team that changes mean being uncomfortable. We should adapt to that...because when we become too comfortable it probably means we're being too cautious. We need a culture that embraces change...what it means and how to respond to it. There have always been two fundamental things: how we harness innovation, and collaboration between public and private stakeholders, manufacturers and operators. Again, we need to stay focused and we thank you for your efforts."

John Hansman responded noting that the Administrator brought up the issue of cybersecurity and that, in fact, it was the topic of discussion just prior to his joining the meeting. He stated, "REDAC recognized that like most of industry we may not be well prepared in the cyber domain, so we're going to go offline and figure out how to build up our competency. We also recognize that people who are good at cyber are not "typical" people. So we need to discuss how to make it an attractive path to the experts."

Michael Huerta cited that the FAA experiences the same cultural dynamics with the unmanned aircraft industry in that many come from tech where the objective is to get product out quickly, as early as possible, and improve on it later. He cited as an example our personal cell phones; having to install numbers of patches after the fact. He proceeded with a number of other anecdotes demonstrating the different cultures and perspectives and how we adapt and the fact that we must.

John interjected how the aviation culture is different by comparison where aviation concerns the safety of lives as opposed to that of building a website.

The Administrator spoke of a day long forum of CEOs of car companies and CEOs of airline. The 'ah ha' moment came when unprompted all of the airline CEOs said at one time or another "we don't compete on safety". Interestingly, one of the car company CEOs said "We do". They used the example of the five-star rating of the

automotive industry. Their takeaway was the lack of culture of sharing of data of safety hazards and that was a basic threshold point.

A discussion ensued concerning mitigation and the question of certifications standards for drones. Insurance companies reflect a concern about managing risk and market forces.

The REDAC Chair raised questions of alternative energy, electric engines and FAA's certification and regulation and of electric systems...such as the dispatch of charging on a an airplane that's flying IFR flight plan. What are the certification questions – are they operational and regulatory?

Mr. Huerta posed that it might be a policy question; for instance, does it start with a question of having it reach a level of equivalence (and what is equivalence) of something we previously certified or do we establish a class of operations different from that and would the markets be favorable to that? He cited the recent effort towards remote mobile tower performance and validating technology that would be indistinguishable from visual (out-the-window) and compare it to instruments. It is reasonable to establish a lower level of performance and technology for lower activity facilities versus absolute equivalence.

The REDAC Chair thanked the Administrator for his insights and participation.

10:15 am – Unmanned Aircraft System (UAS) Integration - Progress Update

Bill Crozier (FAA - Deputy Director, UAS Integration Office)

Bill Crozier thanked the Committee for being invited back, stated that he would be providing another update since the last meeting and began with a presentation of slides.

He provided an overview of 2017 accomplishments and cited the significant items, that:

- UAS registrations have continued to grow – now over 835,000 drones (as compared to 500k in October),
- pilot certificates are roughly 47,000, (13k in October)
- waivers have been extended 'line-of-sight', and
- first release of the issuance of UAS facility maps.

Bill went into detail accompanied by the PowerPoint slide "[UAS by the Numbers](#)" highlighting the Top 5 waiver requests, and the airspace waivers by airspace class and the numbers and categories of UAS registrations. He also mentioned the recent court decision on registration and remarked that the FAA is considering what it means and next steps. Despite the ruling which came out on a Friday, roughly a thousand more registrations poured in over the weekend.

[Meeting the Challenge](#) talks to the volume and pace, and establishing performance-based regulations. The FAA and industry has a shared commitment to safety; it is the only way to keep up by working together.

[UAS Facility Maps](#) (UASFM) provides one graphic example of air traffic use maps reflects requests for E, C, and D in a pictorial approach that the facility managers and air traffic came up with. Air traffic would use these maps to process the requests (as surface requests – Class E). The numbers reflect what altitude would be acceptable. This is a tool, not necessarily that authorization would automatically be granted. Bill stated, "We plan our next release on June 22 for classes C or D. This is a baby step forward, but will provide a foundation for automation of approvals moving forward."

The Chairman asked and was informed that high value operations would be considered for waivers beyond this 'restriction'.

These were developed by local management and controllers knowing their airspace requirements.

UAS Low Altitude Authorization and Notification Capability (LAANC): This represents partnering with industry vendors in automating establishing notifications and authorizations for PART 101/107. This incorporates the facility maps mentioned earlier and allows checking against the data. This supports manual authorization of real-time request and real-time authorization

Managing the Airspace Access - UTM (UAS Traffic Management): This reflects the need to be able to communicate and locate each other. Obviously, without pilots onboard (UAS) managing the airspace is more interesting. UTM is generally below 55 lbs. operating beyond the visual line-of-sight, in lower altitudes below 400 ft. in all classes of airspace except Class A. There's more information on the website.

John Hansman inquired if this is a regulatory process or a waiver process. Sabrina Saunders-Hodge (as a member of the Research Transition Team) remarked that this is a data-sharing effort – government/industry partnership. Certainly, FAA is not relinquishing its' regulatory responsibilities. Part 107 covers restrictions and FAA is processing waivers. A discussion ensued about the process of policy and regulation, and a participatory system.

UAS Integrated Gateway: With technology intense environment, the desire for users to 'do all things UAS' through a common integrated gateway. It is mostly about data management which will help with FAA's productivity to streamline the process and create a better user experience.

UAS Identification and Tracking (ARC): This goes back to last fall on introduction notice of proposed rulemaking for interagency coordination on operations over people; Bill stated that they received a lot of comments about the security implications. Aside from the Congressional mandate, this would give a voice to the concerns of security federal and local partners.

There are three subgroups: 1) Exiting and Emerging Technologies Group (WG1) - covering technology that's currently available, 2) Law Enforcement and Security Group (WG2) – asking what do you need to do your job where UAS will be hazard or threat to security, and 3) Implementation Group (WG3) - asking what users need to do their job from cost and viability basis.

A question was posed by the REDAC Chair as to where this fits into the rulemaking given that this is an ARC. The answer was that it may not necessarily result in a rule. The FAA is asking the committee to provide recommendations what technology is out there, what technology is needed for law enforcement and what would be feasible in cost and timeliness. It may be an industry solution. Bill said, "We'll take what comes out of the committee and see if it's a recommendation, determine if it's a rule, a certification or industry best practices. Bill informed REDAC that September is the timeframe for the ARC product on UAS ID tracking."

UAS in Controlled Airspace (ARC): Starting later this summer and running for about 15 months would be considering larger UAS operating in controlled airspace, specifically Class A. "We'll be asking this group for scenarios for encompassing the most desirable operations of aircraft, air traffic and FAA capabilities.", Bill mentioned.

Stakeholder Collaboration: Bill stated, "We've found the collaboration to be good public policy, so this slide highlights the representations of the Drone Advisory Committee (DAC) and Unmanned Aircraft Safety Team (UAST)."

Legislative Activities: FAA Extension, Safety and Security Act – Public Law 114-190. This slide highlights the activities and sections. Bill added, "Section 2202 will be met through the UAS Identification and Tracking ARC; 2206 will be addresses by Marke Gibson; 2208 – the UTM Research Plan is on the FAA's website; 2209 – we're working with DOD, and the last three (2211, 2212, 2213) will be addressed by Sabrina Saunders-Hodge. "

Marke opened with, “There were a number of legislative actions that addressed what we’ve been doing in UAS. As you know, ops over people were stalled or held up for security concerns. So to satisfy some of our federal partners, we stepped back and moved a number of initiatives to the left such as 2202, 2209 and airspace initiatives.”

Marke identified a number of individuals in the room and elsewhere that have been working the issues. He cited 2206 specifically – and said the effort started at the Technical Center, then partnered through interagency with the FBI and JFK, and moved to the Denver Metroplex and concluded work at Dallas-Ft. Worth. Denver had four vendors and involved three technologies: radar, RF (to detect), and integrating for tracking.

Marke stated, “We did some observations at Quantico when MITRE did their UAS challenge and learned some things. We’ve been part of Black Dart which is an annual exercise held by DOD with 12-20 vendors at Eglin AFB and set up a mobile tower. We also attended Desert Chance in Arizona sponsored by Army and Marine Corp and gained some knowledge in that area as well. Helsinki had a system up at the International Airport in Denver so we sent our defense attaché and European rep go there; I was most interested in CONOPS; and what we’re doing in this call-test is a suitability assessment taking the technology DOD has and put it into a civil environment and finding out what challenges you meet, not surprising most legal. Most of you are aware that Title 18 limits actions you can take against aircraft and the RF techniques in our test...when we get relief that may expand our view.”

He added, “And lastly, we’ve partnered with DHS, co-chaired with the group that meets and their technologies in working closely with DOD. Our federal partnerships have been very significant in our research. They did a large test in New Orleans closing off areas around the Superdome and involving the port area sponsored by DHS but run by the Army which was very useful. We’ve also partnered with test sites flying in and around airports as part of our operational evaluations. We experienced a lot of cooperation with the airports.”

“The Center of Excellence - ASSURE is doing most of the data reduction – we’re due a report back to Hill January ’18 but hope to have it completed by October.”, he remarked.

Marke mentioned, “Under the larger component of UAS security – we’ve hit a point in discussions of our testing, especially with our federal partners pulling in Title 18 and other measures are getting ready to expand into this new form of aviation and a national discussion on UAS security. Of course, besides the fact that we’re not sure we’ll get near to 100% probability of detection even if we had everything right; due to clutter and other limitations. The cost is formidable and the number of airports we need to cover and the impact to the local community which could be perceived as invasive.”

“I was reviewing feedback on CONOPS; we were doing two pieces - interagency which is to tease out responsibilities and roles. What are the roles of FAA and DHS in and around airports and who is going to pay for all that stuff? Essentially we’d basically have CONOPS inside the fence line, and that gets inside the tower and who gets to make decisions and based on what? There are a lot of issues out there – from integration and logistics, ownership, deployment, cost –benefit., “ as pointed out by Marke.

John Hansman interjected a comment that he did not fully understand the CONOPS and what is the benefit in the cost-benefit analysis?

Marke and John deliberated the merits and how to measure what are essentially the unknown especially making assumptions about ‘attack rates’. Items talked about included risk probability, malicious, autonomous attacks. Is the risk airborne or an attack on the airport? If there is an attack on the airport, how is that different than an

attack on say a post office? What's the threat, what's the probability? What does the data tell you? Aside from those questions, there's also the question of who owns it...DHS, TSA, FAA? It ranges from aviation safety to security and may require a national risk discussion.

10:55 am – UAS Research Planning

Sabrina Saunders-Hodge (FAA - Manager, UAS Research Division, Office of UAS Integration)

Sabrina began with, "To start, I want to provide a bridge of where we were a year ago both inside and external to the FAA. We have gained a significant amount of traction. There have been significant advancements in the market use of UAS so our research agenda has expanded with industry, our Center of Excellence, test sites (from six to seven and extended), additional bodies and synergy such as the DAC (Drone Advisory Committee), and many others. Sabrina stated that she feels the FAA is very well positioned to do the research plan and have a robust offering."

Sabrina continued on, "As for legislative items, we were asked to work with NASA on UAS modeling and simulation. Our UAS Center of Excellence was already doing simulation on ground-airborne collision research, so we pulled in NASA, DOD, and industry to support those efforts and do peer reviews. We recently completed our airborne collision work; you've likely seen our public release of those results. The airborne collision peer review was just completed so you'll see those results coming out in the summer."

In reference to Section 2213, Sabrina elaborated, "With regard to Section 2213, we were asked to work with National Academies of Science to look at probabilistic metrics to streamline our UAS integration. We are formulating a partnership under contract with the National Academies and we are setting up a committee with a target start at the end of August."

In reference to Section 2211, she stated, "Today's briefing concerns Section 2211 and our development of the UAS R&D Roadmap; but given that we have so many roadmaps, I prefer to use the term "Plan". We are actively working across all FAA with our industry partners and government partners. We have the Pathfinder program (we've learned a lot from that), established Partnership for Safety, agreements with industry who are on the leading edge; U.S. standards body, American National Standards Institute has pulled together a 'one-stop shop' of those working in UAS - IEEE, ATSM, etc. There's also our UAS COE (ASSURE) which (as a national asset) not only supports us but also works with DOD and NASA and industry partners, so we get a lot of input from them about what's going on in the community."

"We are actively engaged with the Test Sites and gain industry intelligence from them and try to leverage our work with them. "

"On the international front, we are working with National Transport Canada, and other international activities. So, again, a year later we feel that we have heightened awareness of what is going on."

Responding to a question by John Hansman about completion of the plan, she stated that it is three-quarters completed and are on target for a release to Congress in July.

Sabrina pulled up and referred to her slide deck stating this is about the "what" and we'll figure out the "how" which could be internal or good be through leveraging our partners.

The Path to Full Integration: All the rulemaking activities on top with operational aspects along the path indicating what the FAA needs to do to support UAS integration.

The Chair inquired about the actual research in the Research Plan to which Ms. Saunders-Hodge discussed the efforts in establishing the requirements process, reaching across all the lines-of-business (LOB) of the agency. A

discussion arose concerning operations over people, the halting of rulemaking due to security concerns and the legislative process. Sabrina continued expanding upon the steps to operational capabilities.

Functional & Cross-Cutting Domains for UAS Integration Research Planning: Lays out the Key Functional Domains FAA UAS Internal Research Partnerships (Alphabet group of organization)

FAA UAS Internal Research Partnerships: Demonstrates that UAS Research doesn't work in isolation, but reaches across the breadth and every line of business of FAA with monthly roundtables.

The Chair asked if there was a list of every existing research underway today. Sabrina replied that the list is being assembled and will be forthcoming; they are teasing it out and mapping it to the operational capabilities. It will be a rolling plan but will be a five-year window.

FAA UAS External Research Partnerships: Sabrina explain, "This slide, again, reflects how we leverage with our external research partnerships. One call out is the UAS EXCOM where we just re-chartered the Science and Research Panel that is a 'tiger team' that can look at cross agency research needs and gaps and jump on those to work. This echo's the synergy to help with our research execution."

"The next few slides (Operations Over People) simply provide examples of how we're decompose the different operational capabilities and understand and define what we mean by "Ops Over People". This is not meant for you to get into the details, but just to give you a framework for the operational capability and we're doing it for each ops capability and will be included in the Plan. And what are the assumptions, limitations and restrictions, and where the research intersects."

Mapping of Key Research Activities: This is a sample mapping of the key activities and operational capabilities that we're trying to achieve. Defining what it means, what are the shortfalls and gaps and what can research support? What are the components and who is best to conduct? Shelley Yak amplified on this concept having been shared a "hot copy" by Sabrina. She explained that the charts in the back of the Plan looked like an operation capability and how it mapped to the research, who was the performer and how they align to the domains. It provides a way to 'slice and dice' and look at it through different points of view.

Ken Hylander remarked that the SAS always struggle with seeing the big picture and that this approach is encouraging. The SAS has developed an approach—how do we understand the research, and what do we really know about the research targets, and understand the resources, and facilities to achieve that, and the highlights and issues. Ken inquired if this Plan would lay this out for them? Sabrina ensured him that was the approach.

ACTION: The Chair remarked that several of the Subcommittees have requested exactly this – the current research and the Plan. Given that, he asked that once the Plan is done or at the next Subcommittee meetings to look at the relevant parts of the Plan. The discussion turned to matching up the schedule with the draft and planned Subcommittee meetings, and that lines up with scheduling for internal review and delivery to Congress. John asked if REDAC can see it while in review.

11:35 – NARP Redesign

Shelley Yak (FAA, Director, FAA William J. Hughes Technical Center) (REDAC DFO)

The subject of Shelley's briefing was the National Aviation Research Plan (NARP); discuss the redesign effort, the feedback received from REDAC and the plan moving forward. Shelley began her speech with, "During my attendance at the many Subcommittee meetings last year, I observed that many of you did not utilize the NARP as part of the discussion of R&D activities and that it didn't give that holistic look at the FAA's research. REDAC also identified that there was a need for a high-level research strategy. At the same time, we had the pleasure of being audited by the Government Auditing Office (GAO) and there were three main findings:

- 1) a need to identify long-research and development priorities - that led me to ask, what is the definition of long-term? Something that we need to look at, and references the work you did for us by focusing on emerging issues. We need to get that back out on the table. Some of the committees have kept that in their focus and have asked if we are making any progress on them.
- 2) the second finding and questions was how are projects selected? I understood the need for that question since they do understand the diversity and priority of those programs (for example environment and energy versus safety) because those programs are so large. They weren't asking so much for consistency as much as prioritization and documentation.
- 3) the third finding actually did us a favor in that they provided a matrix based on the legislation and outlined what we were meeting "fully", "partially" or "not at all" with regards to the NARP and the Annual Review."

She continued with, "At my first meeting (after April) with the Research Executive Board included the proposal to redesign NARP. This team has been remarkable in that I've held numerous off-sites, they are 100% committed and they see the need to communicate the vision and strategy for research. They see that the NARP should be results focused, cross-organizational and not stove-piped. I see already 'Noise', 'UAS' and Airports working together; more of those conversations occurring. We also see that NARP needs to communicate the impact, mitigations and alternative that are needed when funding shortfalls occur."

"I requested input and feedback from REDAC Subcommittees and now I'd like to give you some response or feedback on your view."

Shelley first wanted to establish a reminder of the Research Plan Framework and Terminology (MS PowerPoint slide deck). These Outcomes are NARP principles that align to FAA and DOT Strategy – or the big picture. She went on to explain, "The Goals are the research but there's not a one-for-one match but, may cross over Outcomes. Objectives are for what, who and why we're doing the work. If we were to list all the Outputs, it would likely encompass three huge volumes, so we're only listing the key Outputs. UAS and Cybersecurity plans will be tied to the NARP and integrated at high level. "

"Your feedback was primarily in two areas; that of specific word changes - mainly on Goals and Objectives; and some feedback on the redesign effort itself."

Shelley noted, "With regards to the design, you remarked that:

- the existing NARP is "Too FAA focused", recommending more on the efforts of collaboration with industry and others,
- applying metrics/measurements had mixed results; some recognition about how difficult that might be,
- a need to align our research to results,
- period updates to NARP,
- how to achieve a balanced Research Portfolio"

Shelley broke down the next several REB meetings and how the group was addressing the feedback and reconciled it. She then provided a NARP Redesign Roadmap. "The 2018 NARP reduced the Goals from the existing 25 to 5, and align the Goals, Objectives and Outputs. For 2017, it's all about setting the direction and building it. In 2018, we review and improve, and in 2019 we manage and continue to improve. The slide entitled "NARP Redesign Roadmap" incorporated and identified REDACs feedback and recommendations to which Shelley provided responses."

"Our plans are to get 2018 out the door, and then the 2019 with the Annual Performance Report looking back to 2018. We're looking at a timeframe of both near-term and long term and incorporating into the process prioritizing research and investments.", Shelley explained.

Referencing the “REDAC Design Feedback/Resolution” slide, Shelley stepped through REDAC’s Feedback and discussed the resolutions taken. In short: 1) identifying and aligning applicable work performed by other agencies and industries; 2) considering applying measurements during the 2018 review (a discussion ensued about concerns of ‘bogus’ metrics and success criteria – the Chair stated that it would good to have some clarity and transparency and to publish for external outreach on activities ‘just to track’) and how to achieve that; 3) the 2018 Annual Performance Report will be results focused; 4) Updating and annual review of Goals and Objectives; and 5) to assess in 2019 and adjust if desired/necessary.

Shelley briefly reviewed the Outcomes and Goals as strategic context for agency R&D investments. She then covered Research Goals and Objectives at a Glance with a more granular level of detail with examples of applicable programs and projects. Subcommittee Chairs provided comments specific to their areas of focus and portfolios.

John Hansman remarked that this is a huge step forward, nobody has really gotten their hands around what is in the system, a framework such as this that says ‘here’s what it is’ and how stuff maps into it. Hopefully, it will evolve over time. A question was posed if this includes economics – meaning - industry is always asking what the benefits of concern to industry are. “How do we access if that translates to the outside world, a cost-benefit analysis? For instance, improving our modeling capability...does that translate into an improvement in our economic capabilities?”, asked John. Shelley expressed that being excellent feedback and would be taken into consideration.

In closing, Shelley wrapped up with a review of the schedule for the NARP Redesign Plan and Communication/Feedback Plan. Research Planning Advisory Committee (REDAC) covered whether a redesigned NARP positions REDAC better to review and advice on planned R&D, sharing insights on research activities occurring in industry and academia, and to identify future/long-term &D requirements, emerging technologies and knowledge gags.

13:10 pm – Subcommittee on Aviation Safety (SAS)

Ken Hylander (Chair, Flight Safety Foundation)
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The Subcommittee on Aviation Safety held its 2017 spring meeting in March at the Civil Aeromedical Institute (CAMI) in Oklahoma City, Oklahoma. “We had several objectives - one was to review and provide guidance on the 2019 research portfolio. The SAS has kept the emerging technologies issue from 2014 in our thoughts and guiding us, and it has remained prominent evidenced by the Administrators” comments this morning and the AVS Leadership Team asking for our help in identifying what industry is thinking about and doing.,” Ken stated.

“It can be difficult given that the safety portfolio is so large with some 70+ projects and tens of millions of dollars. It can be easy to get bogged down because sometimes it can be a ‘pull’ in that AVS has an immediate problem that needs resolution where we can help, but we also need to continue looking down the road towards the future.”

The other objective was that SAS wanted to see what kind of guidance, we as REDAC would like to see in the 2020 AVS Strategic Guidance Document published each year.

Ken continued, “The SAS approach is to continue building upon prior work, meet the advisory needs of AVS management, get outside expertise from Chief Scientists and Technical Advisors (CSTAs) and outside industry or FAA expert, and choose items for a deep-dive based on money and high priority items and those important to the SAS. We also continue to improve the research review process. “

“Agenda spent time on past emerging issues...in one case, Real Time System-wide Safety Assurance. It’s a concurrent activity that NASA is sponsoring this and it’s one of their six strategic thrusts. It’s an opportunity to

make the right safety decisions faster. We also talked about Additive Manufacturing – a recurring theme of our committee for the past several years. The SAS expressed thanks to FAA for being responsive for its work and plans that led to a finding and recommendation on it. We conducted a ‘deep-dive’ into fatigue management. We discussed in depth for the first time General Aviation Safety and had sort of a look to the future. The GA Safety topic acknowledged that things can happen quicker in the GA world and might translate to the larger commercial community.”

“As mentioned earlier, we talked about AVS Strategic Guidance and we got smarter on CAMI and their research portfolio.”

Ken presented the following Findings and Recommendations.

“As for Findings and Recommendations:

Propulsion Materials Research: This was pretty much a carry-over – reducing expenditure and effort on propulsion materials technology. Manufacturers are moving out fast on this and FAA needs to focus on certification; there’s more effort on the aircraft side of advanced materials, i.e. composites, additive manufacturing. We think FAA is not keeping pace on the propulsion side; we recommend achieving a balance between aircraft and propulsion research.”

Fatigue: Great discussion and tour labs, and impressed with genomics and biomarkers – phenomenal work going on. The committee had concerns that there may be sectors of the aviation community not getting attention (i.e. aeromedical, GA or smaller charter) Issues such as commuter time, individual personal differences, is there a knowledge-base for self-assess were discussed. What’s the impact of medications on fatigue? The recommendation is to keep going, expand the scope, and there’s more to learn. The secondary recommendation is PART 117 fatigue rules that went into play...are we looking at the data from big picture and getting the expected result? Encourage follow-on activity and include all stakeholders. Responding to a question from Chairman Hansman, maintenance and ATC would be also included as that activity is happening.”

UAS: SAS reaction was the same as before...we couldn’t see the big picture...it’s still difficult to get a complete picture on total UAS research scope. It just felt like conflicts or duplications...not sure. Give the briefing of this morning, I would recommend that we hold off until we see the UAS Research Plan.”

The REDAC Chair recommended modifying the F&R with an update that there is a UAS Research Plan and to recommend a preview.

At his point, John Hickey remarked about how tight release issues are under the new administration and the FAA doesn’t have the authority to release, Executive clearances are tighter than ever. A lengthy exchange took place with the intent of finding an informal process on ‘pre-release’, or draft review by REDAC. The outcome was an agreed approach that REDAC might receive ‘Overview’ briefings without getting into a release of the specific report, details or a full release. The Chair emphasized that the value added of the REDAC goes away if there’s nothing they can do with regard to review and advice.

John Hickey provided feedback to the SAS F&Rs, in particular – additive manufacturing. He stressed that as an organization the FAA does not advance technology (i.e. perfect additive manufacturing), but is, in fact, to ensure compliance philosophy and compliance.

Ken Hylander noted that the SAS recommendation was not on research and how to do it, but more on how to provide tactical guidance on how to evaluate. FAA needs to keep pace when new inspection techniques come forward.

John Hickey described a transactional environment of certification and compliance where Aircraft Certification is planning to transform the current system – a complete remodeling. He described a new approach wherein the manufacturer will do the work to show compliance to a product. The FAA will do more of a retroactive evaluation of the work done by the manufacturer. There's also an oversight of delegation since the manufacturer will be doing more delegation. John volunteered to take an action.

ACTION: Dorenda Baker (Director, Aircraft Certification Office) will give REDAC a presentation on the plans for Aircraft Certification.

John Hickey provided feedback on SAS F&R on Fatigue complimenting the work, but suggested that cargo be included.

Ken Hylander finished his briefing explaining how SAS developed a more robust review process. The intent was to give higher-level visibility to current and planned research along with a broader financial picture. Through this approach, instead of reviewing 70 quad charts, SAS looked at 15 programmatic areas which was a better technique.

02:00 pm – Subcommittee on Human Factors

Barbara Holder (Chair, Crew Interface Technology/Human Performance and Cognition, Honeywell Aerospace)

Barbara Holder spoke on behalf of the Subcommittee on NAS Ops. She informed REDAC that Jack Blackhurst has stepped down from the Subcommittee, he has transitioned but had planned to be here; through Barbara he expressed his regrets as he had a conflict. Barbara briefed his slides.

Human Factors Portfolio Prioritization and Competencies:

Having received a briefing on previous findings about how human factors research funding for NextGen and UAVs have significantly increased but at the expense of core human factors research in areas like fatigue and training. Although the Subcommittee received a prioritization process briefing, it did not answer the question nor could the HF community tell the Subcommittee how it assesses its technical competencies.

The Subcommittee recommends that the HF community establish a process to define and assess in a manner of Lead, Leverage, Watch or similar construct to be able to respond to the changing FAA priority needs.

NextGen HF Research Support:

The Subcommittee, having made a recommendation for the need for HF research in NextGen, received a briefing and was very pleased with the communities' response and proposed FY 19 research plan, however, due to current budget deliberations the research was reflected as unfunded.

The Subcommittee supports this research and recommends that the FAA assess the priority and funding and report out the results at the next meeting.

Mixed-Capability NextGen Environment:

The REDAC committee identified, two years ago, that mixed equipage as one of the top issues the FAA would face in the next ten years. At the March 2017 meeting, this issue was a point of discussion.

The Subcommittee recommends that at the next meeting, the FAA summarize research that has been conducted. This would allow the HF Subcommittee to ascertain the extent to which the human role has been accounted for in the NextGen environment. The Subcommittee can then determine where more specific HF research may be warranted. The REDAC Chair suggested rewording to make it clear that the subject is mixed equipment to avoid vagueness or confusion.

14:10 pm – Subcommittee on Environment and Energy

Mahendra Joshi (Subcommittee Chair, Chief Engineer, Noise & Emissions, Boeing Commercial Airplanes)

The Subcommittee on Environment and Energy met on February 28 and March 1, 2017. The Subcommittee reviewed the R&D portfolio based on strategic from the fall meeting and reviewed the FAA proposed R&D portfolio for FY+2 and made recommendations. Mahendra stated, “We selected deep dives and special topics: NARP Redesign; Operational Procedures research program; AEDT tool and developmental plan; and airport environmental research”

As for Findings and Recommendations:

Noise:

“Good progress has been made in studies related to understanding of aviation noise on annoyance, sleep, health and children’s learning. A lot of data has been gathered with many participating in surveys to 20 airport communities (thousands participating), is being analyzed with the results expected by the end of the year. The noise team is also planning to collecting data on related noise from supersonic aircraft, UAS and commercial space.”

“These studies involve other agencies and may involve a major policy change. It’s likely to result in an NPRM with comments by the public. We estimate that it would go out late this year or early next, and not be in a position to adopt anything until end of 2018. This involves long term exposure. These studies are highly sensitive and will be highly visibility. The studies and analysis must be congressionally-scientifically sound, a prime example of why research is so important...how to influence Policy.”

Aviation Environmental Design Tool (AEDT):

This concerns proposed improvements in the tool to enhance usability, improvements and features for improved airspace and airport design. The tool will aid improved aircraft performance, especially as new aircraft are introduced into the fleet.

The Subcommittee recommends that the FAA continue the simultaneous balanced development in the near term.

E&E R&D Programs:

The Subcommittee recognized the high-leveraging of the Environment & Energy R&D program thru partnership with industry and other government agencies. 50% to 70% of the research projects in this portfolio have at least 800% cost-match with partnerships like CLEEN, CAAFI and the COE ASCENT.

The Subcommittee recommends setting up similar programs that capture matching and leveraging.

E&E Operational Research Program:

This is recognizing how important and impactful this program is, how it started off well but was impacted by F&E funding. FAA has rebalanced F&E funding and put some critical paths back in. Of particular note is the collaboration with NASA, MassPort, etc.

The Subcommittee encourages FAA to continue this research recognizing the near term environmental benefits.

E&E Research Team:

The E&E research team is not adequately staffed to accomplish growing statement of work related to CO2 and non-volatile particulate matter, global market based measures, noise roadmap, etc.

The Subcommittee recommends filling vacant positions as soon as possible. Although, freeze on hiring is officially lifted, there are procedural issues.

Water Research:

E&E stakeholders recognize that water research is an important environment topic. It does not seem to be a priority in the Airport Technology Research Plan.

The Subcommittee recommends E&E REDAC DFO coordinates with other DFOs on research topics that have environmental relevance but may be in the domain of other Subcommittees. A discussion followed concerning airport pollutants and water quality, i.e. oil spills, fire-fighting foams, jet fuel pollution. Best practices were mentioned about what may be in place and not require additional research.

14:45 pm – Subcommittee on NAS Operations

Leo Prusak (Chair & VP, Air Traffic Management Products and Strategy, PASSUR Aerospace)

Leo Prusak introduced himself as the new Chair for the Subcommittee on NAS Operations. As part of the introduction, Leo talked briefly of his 34 years of experience as FAA in NAS operations in air traffic control and air traffic management in New York.

Mr. Prusak reported out the Findings and Recommendations.

Operations Concept Validation:

The Subcommittee received briefings on Operations Concept Validation Modeling and Operations Concept Development & Infrastructure, considered them of high quality and excellent research and development work. The Subcommittee observed that the priority given to ops concept validation projects has been in decline over recent years.

Consequently, the recommendation is that FAA increase the priority given to ops concept validation investments, particularly those that are closer to implementation. The savings in time and implementation cost more than offset the relatively low cost of increased concept validation.

Runway Incursion Reduction Program (RIRP):

The Runway Incursion Reduction Program was developed to address an NTSB recommendation in 2000. In 2015, the Subcommittee recommended that the FAA estimate the potential benefits of the Runway Safety Assessment and Small Airport Surveillance Sensor projects; this was in response to NTSB's failure to address the cost/benefit assessment. In response, the FAA conducted a causal factor analysis and technology evaluation study under the Runway Incursion Prevention Shortfall Analysis (RIPSA).

The finding of the Subcommittee is that the RIPSA project did not estimate the benefits pool available to runway incursion prevention technologies. Therefore, the FAA cannot perform cost-effective research and development of runway incursion prevention technologies in the absence of any knowledge of the potential benefits pool that such technologies target.

The Subcommittee recommends that The FAA should not invest any more funds in runway incursion prevention technologies until they have estimated the benefits pool. Further technology development in these projects should be contingent upon an initial positive cost/benefit estimate.

One outgrowth was a discussion point that technology implementation and integration is an issue...bringing in new technology impacts the current workload – a human factors issue.

15:00 pm – Subcommittee on Airports

Christopher Oswald (Chair; Vice President, Safety & Technical Operations, Airports, Council International-NA)

The Subcommittee met on March 14 at both the FAA William J. Hughes Technical Center and via web conferencing. It turned out to be an unusual meeting due to disruptive events in the aviation system with a snowstorm blizzard that came through Philadelphia and Atlantic City. As a result, the meeting was somewhat abbreviated with the inability of most members traveling to the Technical Center. The committee, however, did have the opportunity to discuss the status of the FAA's Airport Technology Research Program, the FY 2019 budget and future research needs.

Findings and Recommendations

NARP Redesign:

Christopher officially acknowledged Shelley's presentation on the NARP Redesign and the Subcommittee wished to formally recognize some of the key priorities on their side such as cybersecurity, UAS, time-based flow management, management of operations and aviation safety management.

The Subcommittee recommends that the FAA seek additional opportunities to utilize cross-cutting approaches to R&D drawing on skills and expertise from multiple research programs.

The Subcommittee placed a high-priority on research into UAS and commercial space vehicles and their potential impact on airport safety, operations, and infrastructure. Research priorities were the key focus during this spring meeting with key interest (1) by the Airline Pilots Association on LED lighting perception and systems, (2) aircraft rescue and firefighting agents – impact on environmental issues, (3) runway incursion prevention technologies, and (4) development and refinement of noise standards – noise annoyance data collection.

The Subcommittee recommends that FAA Office of Airport continue to place a high priority on the aforementioned research and construction of the fire safety building (to facilitate aircraft rescue and firefighting test equipment and vehicles).

The Subcommittee recognizes that notional timelines for research have inherent risks with uncertainties, but want to see progress, and how research progress proceeds (where we are now) whether in dollar amounts or conclusion points. Feel strongly that priority be given on research projects that can be moved along to completion (wrapping up for standards); for example, trapezoidal grooving.

The REDAC Chair inquired about the committees' stand on braking/runway friction. Chris stated that, although still in the forefront, they did not receive a briefing at the meeting – looking forward to a deep dive. Michel Hovan added that on round two of the Working Group is looking at what the manufacturers and others are doing (i.e. Airbus) and focus on them. He projected that they will have information and consensus by the August Subcommittee meeting.

John Hansman stated that this research has taken five years and that the industry is way ahead. Is FAA prepared to shut the program down, redirect funding and place efforts elsewhere? After an exchange with Michel and contributions by REDAC members, Chris suggested that once the deep dive is rendered the Subcommittee will be in better position for 'go/no-go' recommendation. Some of the delay was due in part to inclement weather conditions during data collection and didn't have adequate information.

The Subcommittee on Airports also requested that FAA take the following additional actions prior to the summer meeting: (1) to summarize "pop-up" research projects and new project starts in pre-briefing materials, (2) deep-dives on the 10 Planning & Environment Research Plan, LED light research, braking friction research, and noise research portfolios within Airports and Energy & Environment's offices.

15:15 pm – Committee Discussions and Conclusions

John Hansman (REDAC Chair; Professor of Aeronautics and Astronautics, Massachusetts Institute of Technology)

John Hansman talked about compiling the outcomes of the meeting, that:

- REDAC acknowledge and submit positive comments concerning the NARP Redesign,
- a reflection about Administrator's comments with respect to the cyber plan. The members discussed the value, balance and approach of adding cyber expertise to the Subcommittees or adding full dedicated cybersecurity-specific Subcommittee. A question was raised whether a separate group be able to address issues/infrastructure, aircraft, airport, airline since they are all integrated and not 'talk to themselves'.

John stated that REDAC is a more holistic group, and, although many members have knowledge of UAS (as an example), few have the knowledge or skills inherent in cybersecurity discussions. Cyber is more of an expertise issue and due to 'color of money' and other issues, it appears to REDAC that not much is happening.

There was a specific request for help by the Administrator. REDAC discussed the possibilities of a special working group, task group, call-out or other solution that needs to be explored. In response to a question, the Chair stated that REDAC feels there are cyber research and capability deficiencies within the FAA, and a deficiency with capability on cyber within REDAC.

It was suggested that a level-setting briefing to REDAC by FAA on what is being done as a first step. The Chair suggested that the Subcommittees canvass to see if there are resources with cyber capabilities in addition to receiving a brief on the Cybersecurity Research Plan by Shelley Yak during the next Subcommittee cycle.

- REDAC is anxious to see the content of the UAS Research Plan (and how) in order for REDAC to add value.

ACTION: Shelley Yak suggested that a method be explored to do a brief of the UAS Research Plan at the same summer meetings and take that action.

15:00 – *Adjournment*

**Research, Engineering and Development Advisory Committee
Federal Aviation Administration (FAA)
FAA Headquarters, 800 Independence Avenue, SW
Washington, DC – 10th Floor Round Room
May 31, 2017**

Agenda

9:30 am	Welcome Address and Chairman's Overview	John Hansman Shelley Yak
9:45 am	FAA Administrator's Address	Michael Huerta
	FAA UAS Update	
10:00 am	• Office of UAS Integration	Bill Crozier
10:20 am	• Office of Deputy Administrator	Marke Gibson
10:40 am	• Office of UAS Integration	Sabrina Saunders-Hodge
11:00 am	Break	
11:15 am	FAA NARP Redesign Update	Shelley Yak
12:00 noon	Lunch	
1:00 pm	Subcommittee Report – Aircraft Safety	Ken Hylander
1:30 pm	Subcommittee Report – Human Factors	Barbara Holder
2:00 pm	Subcommittee on Environment and Energy	Mahendra Joshi
2:30 pm	Break	
2:45 pm	Subcommittee on NAS Operations	Leo Prusak
3:15 pm	Subcommittee on Airports	Chris Oswald
3:45 pm	Committee Discussions - Recommendations - Future Actions	ALL
4:15 pm	Chairman's Final Thoughts	
4:30 pm	Adjourn	

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Research, Engineering, and Development Advisory Committee Meeting – W/S 2017
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