NAS Operations Subcommittee | MINUTES

Meeting date & time: *March 8-10, 2016*
Meeting location: *Washington DC*
Purpose: *Review of FY18 Proposed Portfolio and Provide Recommendations; Program Deep Dives*
DFO: *Maureen Molz*
Note Taker: *Anton Koros*
Next Meeting: *August 9-11, 2016, Washington, DC*

Minutes from Day 1 – March 8, 2016

Welcome/Kickoff

- The next REDAC NAS Ops Subcommittee meeting is August 9-11, 2016.
- Andres Zellweger and Mark Weber attended the FAA Unmanned Aircraft System forum for REDAC on February 22nd and distributed a summary of the event to the subcommittee members.

Review of REDAC Recommendations, Responses and Open Actions

Presenter *Steve Bussolari/Maureen Molz*

Summary: r. Bussolari discussed the status of prior REDAC NAS Ops recommendations. Recommendations on Runway Incursion Reduction Program and Integration in the NAS UAS remained open, pending the FAA Administrator's Signature. Detailed information on recommendations will be posted to the REDAC database.

Presentation Budget Overview

Presenter *Mike Gallivan*

Summary: This briefing began with a discussion of the FY 2016 Research, Engineering and Development budget request ($167.5M) and the appropriation of $166M, signed on December 18. Budget conference language addressed issues including UAS test sites; UAS Center of Excellence and sharing of safety data; alternative fuels for GA; and environmental sustainability. The brief included observations regarding the impact of sequestration and the potential for FY17 to begin under a continuing resolution. The subcommittee observed that funding has increased for the UAS and Environmental Centers of Excellence while human factors funding has been reduced. The subcommittee discussed the potential effect of reduced human factors funding on NAS operations.

Presentation 1A10D NextGen – New Air Traffic Management Requirements

Presenter *Francisco Bermudez*

Summary: This program focused on development of requirements for procedures, tools and systems that support new operational air traffic management operations. Examples of near-term activities include finalizing performance requirements document for Multi-function Phased Array Radar (MPAR), conducting ACAS Xu proof of concept activity to inform RTCA SC-228 standards development, supporting the development of the L-band Digital Aeronautical Communication System (LDACS) specification, and

developing the Satellite-based Push-to-Talk Communications Standards Test Plan in collaboration with international partners. FY18 plans include the development, validation, and allocation of aviation requirements for weather; as well as assessing COTS display capabilities and conducting a gap analysis.

Round Table Discussion

Presenter *Shelley Yak*, FAA Technical Center Director

Summary: Ms. Yak, Director of the FAA Technical Center, noted that legislation is being considered for a 60-day turnaround for REDAC meeting minutes. She confirmed that the FAA Research Executive Board reviews all REDAC recommendations. In response to a subcommittee query, Ms. Yak noted that the NARP is the basis for all budget lines, work packages, and the budget structure. However, the FAA still has some flexibility in funding specific research needs. Members of the subcommittee noted the importance of committed long-term out year funding to support the agencies strategic goals. Committee members noted that funding has been designated to support UAS certification and other important initiatives; however resources are also important to support the integration of UAS into the NAS. This topic was the first in a series of discussions that resulted in the subcommittee's subsequent development of a UAS finding and recommendation delivered to the FAA.

Presentation 1A01C - Operations Concept Development & Infrastructure

Presenter *Rob Hunt*

Summary: The Operations Concept Development & Infrastructure program leverages analyses to validate future NextGen system requirements and establishes methods that demonstrate modernized systems meet operational needs. Mr. Hunt described the Operational Integration Analysis project which focused on opportunities to reduce operational risk as mid-term enhancements are implemented. In support of this activity, subject matter experts reviewed several operational scenarios, identified key integration and interoperability risks, and identified potential mitigations. Mr. Hunt described another representative project, the Terminal Sequencing and Spacing (TSAS) operational integration assessment. This joint FAA/NASA assessment was conducted at the William J. Hughes Technical Center under the Air Traffic Demonstration (ATD)-2 program. The subcommittee discussed funding requirements for simulations and requested a presentation on ATD-2 at the next REDAC NAS Ops subcommittee meeting. In closing Mr. Hunt identified trajectory-based operations, operational integration analysis, and RTCA support as emerging FY18 focal areas.

Presentation 1A11 NextGen – Ops Concepts Validation Modeling (OCVM)

Presenter *Wes Wright*

Summary: Mr. Wright provided an overview of the status of OCVM programs and related programs which included: Statistical Methods for Departure Predictability (SMDP); Space Vehicle Operations (SVO); TMI Attribute Standardization (TAS); Enhanced Services to Small Communities (ESSC); Performance Based Trajectory Allocation (PBTA); Unmanned Aircraft System (UAS) and Vertical Conformance Verification (VCV). Mr. Wright noted that beginning in FY15 any new OCVM program-

related activities are funded under NextGen portfolios. The subcommittee voiced an on-going concern related to Operational concept funding levels and the importance of defining what NextGen looks like, what research is needed, and how it will be implemented. The FAA is developing a NAS vision document that addresses these areas and the subcommittee requested they be provided an overview presentation on the NAS Vision at the next REDAC NAS Ops meeting in April 2016.

Presentation Commercial Space Transportation (CST)
Presenter *Mike Romanowski*

Summary: Mr. Romanowski stated that the CST Program is responsible for licensing, experimental permits, safety approvals, environmental review, liability determination, rulemaking, infrastructure development, and research. Of note was that FY16 was the first year that the President's budget request included a Commercial Space Transportation Safety RE&D budget line. The $2M budget will be equally applied to new programs and the Space Center of Excellence. Mr. Romanowski described ongoing research to improve the timing and prediction of debris hazard zones (aircraft hazard areas) to minimize the impact to NAS operations. This program is continuing to compile lessons learned by leveraging data from recent unsuccessful space missions to improve future hazard zone predictions. Mr. Romanowski also briefly discussed the significant implications for the NAS when collocating space ports at large commercial airports.

Presentation Aviation Weather Research Program (AWRP)
Presenter *Steve Abelman*

Summary: The AWRP performs applied research to minimize the impact of weather on the NAS. This includes specific initiatives to support NextGen, collaborative issues with the National Weather Service, and focused initiatives to mitigate known NAS safety and/or efficiency issues. AWRP convective weather initiatives include offshore precipitation detection, oceanic guidance improvement and a study of lightning impacts to NAS efficiency. Mr. Abelman reported that tools developed for the CONUS do not transfer well for use in Alaska, so specific icing and turbulence guidance products are developed for use there. Important research continues to improve atmospheric modeling capabilities which are foundational for improving aviation specific weather forecasts. AWRP key research performers include MIT Lincoln Labs, National Center for Atmospheric Research (NCAR), and NOAA Earth System Research Laboratory (ESRL). A portion of the AWRP budget is shared with FAA Flight Safety (AFS) who prioritize weather safety issues for their own research initiatives. These include developing terminal area icing weather information, mitigating the ice crystal weather threat to aircraft turbine engines, researching convectively induced turbulence, and developing an airport wind-based wake vortex separation advisory system.

Presentation A12.e NextGen – Weather Technology in the Cockpit (WITC)
Presenter *Gary Pokodner*

Summary: Mr. Pokodner described the WTIC program focus as developing, verifying, and validating requirements for incorporation into Minimum Weather Service (MinWxSvc) standards for the cockpit. The program has been performing gap analyses for Part 121/135 per-Bravo timeframe and Part 91 operations with the most recent

analysis focused on oceanic airspace. The program is nearing completion of the pre-Bravo gap analyses and will now focus on developing resolutions and pilot training enhancements to reduce/resolve selected gaps. Another key ongoing program is developing wind and temperature requirements for NextGen 4-D navigation operations. Other recent accomplishments include a successful human over the loop simulation of a tactical turbulence notification. This type of turbulence is very dynamic and so minimal latency in the notification function is critical. The convective weather notification project is oriented at more efficiently avoiding convective weather. Recently completed GA projects have investigated and identified manufacturer/display differences and gaps related to pilot recognition of changes in weather data so current projects are performing trade studies to resolve these "change blindness" gaps. Mr. Pokodner described recent efforts to leverage crowd sourcing and cloud technology to develop improved cockpit weather information (initial focus being on ceiling and visibility) and information access. The project is investigating the use of commercial crowd sourcing infrastructure (Amazon Mechanical Turk) to characterize weather through the use of Alaskan weather cameras suitability of these images for cloud analysis. Funding for the WTIC program is relatively stable at approximately $3M per through FY15 and FY 16, with similar requests for FY17 and 18.

Minutes from Day 2 – March 9, 2016

Presentation Review Findings and Recommendations/New Actions
Presenter *Steve Bussolari*

Discussion – The subcommittee noted no actionable key findings and recommendations to this point.

Presentation 1A11 NextGen – ATC/Tech Ops HF
Presenter *Jerome Lard*

Summary: The NextGen ATC/Tech Ops Human Factors collaborates with several organizations including FAA Civil Aerospace Medical Institute (CAMI) and the FAA Research, Development and Human Factors Laboratory (RDHFL). The HF program has received very limited funds since FY15, relying on its Federal Workforce to accomplish its goals. Mr. Lard reviewed the outcomes and accomplishments from the approximately ten programs for which funding was terminated in FY14. These included Process Development for NextGen Flight Data Presentation, NextGen HF Guidance on Display of Information from ATC Time-Based Systems, HF Guidance for NOTAMS display in Information Display Systems, and En Route/TRACON Common Function Assessment. Funding requests have been submitted for FY16 and FY17 RE&D funds under the Integrated NAS Design and Procedure Planning (INDP) and Separation Management (SEPMAN) portfolios.

Presentation A11.i Air Traffic Control/Technical Operations Human Factors
Presenter *Nick Lento, Dan Herschler*

Summary: Mr. Hershler identified the core focus areas of the ATC/Tech OPS Human Factors program as HF standards, workforce optimization, improved safety, human

factors in NAS technology integration, and human performance enhancement. The program also supports Human Factors for FAA acquisition programs through ISR Checklist human factors approval responsibility and AMS policy updates. Funding for the human factors program has been progressively constrained, representing $131k in FY16 with no funding anticipated for FY17 and FY18. Mr. Demagalski provided an overview of the HF research prioritization process conducted at the annual HF roundtable stakeholders meeting. Mr. Demagalksi described the need for a HF issue tracking database to support this and other agency HF initiatives; however he indicated that there were no funds to support this activity.

Presentation UAS Strategic Plans and Near Term Opportunities
Presenter *Maureen Keegan*

Summary of Briefing: Ms. Keegan presented the status of the UAS ATM research activities including operational focus areas, the UAS maturation plan, prioritized concept maturation activities, and planned FY16 and FY17 activities. Key near tem activities include optimal display of contingency information, relevant model aircraft operations, and differentiation of non-cooperative UAS with small radar cross sections. Ms. Keegan noted that as products are developed they are implemented as soon as practical. For example, the “lost link” beacon code has already been assigned and is currently being coded into NAS automation. Subcommittee members recommended that the FAA share the UAS operational scenarios with the subcommittee and the UAS user community. The subcommittee also noted that funds are being directed to essential UAS airframe certification and other important research areas; however, UAS air traffic management research is also essential. The sub committees concerns culminated in a finding and recommendation that the FAA immediately engage with external stakeholders of the UAS community and that the agency establish high level system engineering leadership focused on UAS integration in the NAS.

Presentation NASA Topics- NASA Aeronautics FY 2017 Budget Request Investing in our Future
Presenter *John Cavolowsky*

Summary: The briefing presented an overview of NASAs approach to promote a stabilized funding stream in support of their aeronautic vision. The overarching theme was the need for the US to lead the international aviation community in the upcoming challenges of managing new entrants, integrating technology advances, and leveraging opportunities for commercial supersonic flight. The presentation included examples of NASA initiatives with major airlines and US airports. It described 6 strategic thrusts: Safe, Efficient Growth; Innovation in Commercial Supersonic Aircraft; Ultra- Efficient Commercial Vehicles; Transition to Low-Carbon Propulsion; Real-Time System-Wide Safety Assurance and Assured Autonomy for Aviation Transformation. The presentation included a ten year investment plan to accelerate the agencies aeronautics goals which, in conjunction with several meetings, was reported to result in a more stable funding environment.

Presentation Unmanned Aerial System Traffic Management Concept (UTM)
Presenter *Parimal Kopardekar, Joey Rios*

Summary: This presentation described NASAs Unmanned Aerial System Traffic Management (UTM) concept for managing UAS in low altitude airspace. The concept is limited to UAS operations within, and beyond, visual line of sight at or below 500 feet. UTM encompasses research software prototype that is being developed to validate airspace operations requirements and facilitate prototype implementation. The prototype is envisioned to enable operators to submit UAS flight plans and approve acceptable operations via segregated geofences in airspace between 200 and 500 feet. Key challenges include airspace operations requirements (both technology and procedures), safety, privacy policy, security, noise, and public perception. The presentation included a functional flow mapping that represented key system users and service providers. UTM capabilities were mapped to four notional stages progressing from operations over unpopulated areas, to sparsely populated areas, to moderately populated areas, and ultimately over urban environments in 2019. Limited UAS integration in the NAS would be initiated in 2018. NASA reported collaborating with working groups on flight planning, conformance monitoring, separation assurance, public safety, and MultiUTM.

Presentation 4DT Demonstration
Presenter *Mark Hollinshead*

Summary: This activity is focused on demonstrating the feasibility and value of advanced TBO services enabled by ATN-baseline 2 technologies (Dynamic- RNP, Advanced Interval Management, and ATC winds). Planned events for 2016 and 2017 include continued system architecture development, prototype development with live flight trials beginning in FY18. The subcommittee expressed a lack of understanding of the overarching objectives of the demonstration and the utility of the effort. As a result the subcommittee requested a one page white paper to provide additional information on the goals, the data that will be collected, and how the results will be leveraged to promote 4D trajectories in the NAS. Mr. Hollinshead will prepare the information in the very near term for delivery to the subcommittee.

Minutes from Day 3 – March 10, 2016

Presentation Review Findings and Recommendations/New Actions
Presenter *Steve Bussolari*

Discussion - The subcommittee identified UAS as one topic warranting a finding and recommendation. Further discussion centered on the content of this product. The members confirmed the need for additional information on the planned 4D trajectory demonstration.

Presentation 1A01A Runway Incursion Reduction
Presenter *Matt Royston*

Summary: This program was initiated in response to NTSB Recommendation A-00-66. The goal is to reduce Category A & B runway incursions at small and medium airports. Current efforts are focused on developing a toolkit of technology options for those airports. Mr. Royston presented ongoing activities to refine specific airport incursion reduction needs in support the development of a highly reliable benefits pool estimation. After some discussion it was clear that the subcommittee requires an estimate of the benefits pool for runway incursions at airports falling under the scope of this program. The members suggested that the estimate should include material and aircraft costs, human costs, and other definable costs at airports with commercial passenger service.

Presentation A12.a NextGen – Wake Turbulence;
1A05D NextGen – Wake Turbulence Re-categorization
Presenters *Jeff Tittsworth, Paul Strande*

Summary: The presenters described the wake turbulence (RE&D) and Wake Re-Categorization (Re-Cat) programs and identified increasing capacity as a key priority of the programs. Mr. Tittsworth illustrated international collaboration by sharing the joint US / European experience defining wake standards for the A380 aircraft. Recently efforts were initiated to characterize UAS wake in preparation for integrated UAS NAS operations. Early research suggests UAS may be more susceptible to wake turbulence than other aircraft. Mr. Strande reported that the recategorization program is continuing to be rolled out. Nine airports are using the new procedures and approximately 4-5 new airports are implemented annually. The new procedures sort aircraft into 6 wake categories. Research is planned to assess the benefits and human limitations of expanding this into additional categories. Upcoming research will also be focused on the feasibility and technical challenges of using a subset of aircraft as sensors to downlink real-time data on winds, temperature, wake turbulence encounters and other parameters.

Presentation Complete Recommendations/ Wrap up
Presenter *Steve Bussolari*

Summary: The subcommittee convened to identify and generate findings and recommendations. Discussion resulted in the development of 1 Finding and Recommendation related to UAS. The subcommittee will determine if information provided by Ms. Merkle to the full REDAC on the “NAS Vision” provides sufficient details on the agencies future plans or if additional information is needed.

PRIOR ACTION ITEMS

August 2015 NAS Ops Meeting

Action	Assigned	Status
1) Send past 1A01A Runway Incursion Reduction Program briefings to M. Molz	M. Royston	Closed 9/30/15
2) Email Runway Incursion Reduction Program briefings to sub-committee	M. Molz	Closed 10/01/15
3) Add the following topics to the March agenda: a. Runway Incursion Reduction Program b. Commercial Space Transportation Briefing c. NASA Unmanned Aerial System Traffic Management (UTM) concept d. How does UTM fit into NAS?	M. Molz	Closed 3/08/16

CURRENT ACTION ITEMS

March 2016 NAS Ops Meeting

Action	Assigned	Status
1) Add the following topics to the August agenda: a. Deep Dive - Operational Integration Analysis Report (OIAs) (Rob Hunt) (30 minutes) b. Michelle Merkle present 30 minutes on "NAS Vision" Presentation (Michelle Merkle) (30 minutes) c. Deep Dive – Demonstrate Aviation Wx Products (Steve Abelman) (1 hour)	M. Molz	Open

FINDINGS

August 2015 NAS Ops Meeting

Findings	Status
1) Unmanned Aircraft System (UAS)Integration in the NAS	Open – pending official FAA Response
2) Runway Incursion Reduction Programs	Open – pending official FAA Response

March 2016 NAS Ops Meeting

Findings	Status
1) Unmanned Aircraft System (UAS) - External Stakeholder Integration and System Engineering Leadership	Open

Subcommittee Members in Attendance:
Steve Bussolari (Chairman)
R. John Hansman
Joseph Bertapelle
John Cavolowsky
Emily Stelzer
James Kuchar
William Leber
Andres Zellweger
Maureen Molz (FAA, DFO)

Others in Attendance: See attendance list
Kerin Olson
Frank Wondolowski
Francisco Bermudez
Xiaogong Lee
Maureen Molz
Anton Koros
Kim Fitzpatrick
Paul Tan
Wes Wright
Jerome Lard
Jaime Figueroa
Shelley Yak
Mike Gallivan
Rob Hunt
Paul Wilde
Michael Romanowski
Steve Ableman
Gary Pokodner
CAR Coleman
Dan Herschler
Jason Demagalski
Steve Hirshorn

Sherri Magyarits
Maureen Keegan
Jay Merkle
Mark Hollishead
Jeff Tittsworth
Jillian Cheng
Michelle Retman
Wayne Gallo
Paul Strande

Findings/Recommendations from the August 2015 NAS Ops meeting:

ID #: Fall_2015_2
Subcommittee: NAS Operations
DFO Name: Maureen Molz
Recommendation Assignee Name: Steve Bradford

Findings:

UAS Integration in the NAS

The Subcommittee recognizes the significant effort and substantial progress that the FAA has made since 2011 in establishing a concept of operations for routine UAS access to the NAS. This activity has explored important nominal and off-nominal operational scenarios and the critical ATC regulatory and procedural structures necessary to ensure safe and effective inclusion of UAS in the NAS. The Subcommittee was very pleased to see the degree to which the FAA has demonstrated significant flexibility in its concepts for small UAS certification and segregation of airspace for operations. The Subcommittee has the following findings:

1- While the work described above sets the stage, the FAA has yet to substantially engage the UAS stakeholder community on the development of the vision and expectations for operating in the NAS. As UAS markets continue to emerge and technology capabilities accelerate, it becomes increasingly important for the FAA to reach out beyond their capable set of internal subject matter experts and include these new airspace users. These new entrants largely come from the IT community not traditionally experienced in aviation. Their business cadence is much faster, and they are more comfortable with uncertainty and risk-based implementation approaches. This cultural difference must be addressed with early and substantial discussion.

2- The three focus areas chosen for exploration and prototyping (i.e., small UAS within visual line of sight, extended visual line of sight in rural areas, and beyond visual line of sight in rural areas) all contain significant limitations (i.e., through the amount of airspace that can be allocated to these operations and the numbers of UAS that can simultaneously operate within that airspace). With the projection of explosive growth in UAS operations, these limits will be quickly reached and the FAA has not yet established a method by which the limited resources inherent in the concepts will be allocated to users.

3- The FAA has not yet substantially explored future UAS operational concepts that offer significant potential to mitigate the fundamental limitation of the near term focus areas described above (e.g., the NASA UAS Traffic Management concept).

4- In its most recent marks of the FY16 budget, Congress increased the amount of RE&D funding for UAS research and development. However, these RE&D efforts are focused on airframe safety and certification, not the development of operational concepts and procedures that is necessary for UAS operations in the NAS, particularly in the near term. This latter work is contained within the FAA

F&E budget request which was reduced by Congress. This apparent mismatch in funding priorities will likely further delay the integration of UAS in the NAS.

Recommendations:

The Subcommittee has the following recommendations:

1. The FAA should move aggressively to engage the broadest set of external stakeholders of the UAS business community to explore market opportunities, innovative technology developments and implementation paths, and flexible and transparent airspace resource allocation schema. This should be initiated as soon as practical.

2. The FAA should employ the effective Research Transition Team structure to include government entities engaged in UAS R&D and bring the best of breed technologies and operational approaches to safe and effective UAS integration. Include the NASA UAS Traffic Management (UTM) activity in this effort. A near term focus for this effort should be how such future concepts should be designed and certified.

3. During its budget process, the FAA should clearly articulate the relationship between the research and development associated with UAS platform safety and certification and the development and validation of operational concepts, procedures, and systems required for UAS integration in the NAS. This should be presented as an integrated program to enable budget decision makers to avoid potential budget disconnects that could unintentionally delay this integration.

ID #: Fall_2015_1
Subcommittee: NAS Operations
DFO Name: Maureen Molz
Recommendation Assignee Name: Matt Royston

Background:

Runway Incursion Reduction Program - The Subcommittee received a briefing on the Runway Incursion Reduction Program (RIRP) and had findings and recommendations relevant to three projects: Low Cost Ground Surveillance (LCGS), Runway Safety Assessment (RSA), and Small Airport Surveillance Sensor (SASS). The LCGS project is intended to develop a low cost surveillance system for small airports for which a cost benefit analysis does not justify more costly surveillance systems such as ASDE-X. Similarly, the SASS project is intended to provide a secondary (beacon) surveillance system to provide improved controller situational awareness and safety and efficiency at smaller towered airports. Finally, the RSA project is intended as a small airport solution to address the NTSB recommendation A-00-66 (July 6, 2000), which states:

"[The FAA should] require, at all airports with scheduled passenger service, a ground movement safety system that will prevent runway incursions; the system should provide a direct warning capability to flight crews. In addition, demonstrate through computer simulations or other means that the system will, in fact, prevent incursions."

The FAA reported to the Subcommittee that their Joint Resources Council had made a decision to not go forward with the LCGS project because of an unfavorable cost benefit ratio and that an estimate of the safety benefit of LCGS was not included in this ratio.

The FAA reported to the Subcommittee that they were proceeding with technology assessment and development for the RSA and SASS projects in anticipation of a future investment decision.

Findings:

Runway Incursion Reduction Program - The Subcommittee has the following findings:

1- The NTSB recommendation fails to address the cost/benefit assessment that should be considered in any investment decision. It falls to the FAA to make this determination.

2- The FAA has not performed a benefit analysis of either the SASS or RSA project and therefore cannot accurately estimate the potential safety or efficiency benefit pool available to offset the life cycle cost of the SASS or RSA projects. Without this estimate, it is impossible to evaluate the subject technologies for their implementation feasibility.

3- The decision to not include an estimate of the safety benefit in the LCGS investment decision appears inconsistent with the investment decision associated with other safety systems such as Runway Status Lights or ASDE-X, where the benefits were largely attributed to safety.

Recommendations: The Subcommittee has the following recommendations:

1- The FAA should establish and consistently apply a clear policy with regard to investment decisions on airport surveillance and safety systems that establishes what benefits (e.g., safety, efficiency, etc.) will be included and how those benefits will be calculated.

2- The FAA should use this policy to estimate the benefits pool available to the RSA and SASS projects and compare this to a life cycle cost estimate of the RSA and SASS technologies. Further technology development in these projects should be contingent upon a positive cost/ benefit estimate.

Findings/Recommendations from the March 2016 NAS Ops meeting:

ID #: Spring_2016_1
Subcommittee: NAS Operations
DFO Name: Maureen Molz
Recommendation Assignee Name: Steve Bradford

Findings: ***UAS Integration in the NAS***

Finding 1

The Subcommittee appreciated the opportunity to learn about the FAA's UAS plans at the recent session of the UAS Research Expo. It is clear that the FAA recognizes the need for a high level, cross-agency approach to the integration of UAS in the NAS and the Subcommittee strongly concurs and finds that integration of UAS in the NAS will require a strong system engineering approach with centralized leadership that is capable of making the significant technical and procedural decisions necessary to make progress. This system engineering approach must include all aspects of integration of UAS in the NAS, including UAS certification and safety, operational procedures, and supporting technologies.

Finding 2

The Subcommittee finds that FAA has performed significant work to develop a UAS concept of operations and a set of mid-term UAS operational scenarios. The FAA has decomposed these into a set of FAA requirements and operational shortfalls and an evolution strategy for air traffic operations. The FAA has developed a UAS Concept Maturation Plan that focuses on those activities that address existing FAA shortfalls associated with the provision of air traffic services to UAS airspace users in the mid-term and beyond. However, the FAA has not shared this work to any significant degree with the external stakeholder community. The result is that the external community cannot appreciate the specific problems that the FAA is addressing and is unaware of any substantial plan to move toward a solution. In addition, the FAA cannot benefit from the ability of the external stakeholder community to recommend innovative solutions to some of the problems (e.g., through UAS equipage or procedures). As the Subcommittee has already reported to the FAA: "Finding a common approach to addressing routine UAS access to the NAS requires that UAS community develop patience and understanding of the challenges of operating in the airspace and that the FAA develop a greater sense of urgency to allow safe and effective UAS business."

Finding 3

As previously noted by the Subcommittee, the level of effort, as reflected by the allocation of RE&D and F&E funding that the FAA has been given in FY'16 for UAS research and development, appears to be substantially focused on airframe safety and certification and not on the development of operational concepts and procedures that are necessary to close the operational and technical shortfalls identified in the

UAS Concept Maturation Plan. This apparent mismatch will likely further delay the integration of UAS in the NAS.

Finding 4

The Subcommittee finds that the UAS technology space and user demand continues to grow at an extremely rapid pace and continues to significantly outstrip the FAA's ability to plan for and conduct the research and development necessary to address the operational and technology shortfalls.

Recommendation 1

The Subcommittee recommends that FAA immediately engage the broadest set of external stakeholders of the UAS community and share with them the FAA's UAS operational scenarios, requirements breakdown and UAS Concept Maturation Plan. The FAA should use this engagement to inform the user community of the technical and operational challenges it faces and revise that plan with input from the community.

Recommendation 2

The Subcommittee recommends that FAA establish and maintain high level system engineering leadership, as described above, focused on UAS integration in the NAS. This leadership should be charged with prioritizing research and development across all the FAA organizations to ensure that UAS integration progresses as rapidly as possible. This leadership must be able to make the significant operational and technical decisions necessary to make this happen. The Subcommittee recommends that this leadership develop an integrated research and development plan for UAS in the NAS and present a progress report on this plan at its August 2016 meeting.

Recommendation Status

a. The following recommendations remain open pending official FAA Response:
   - Runway Incursion Reduction
   - Unmanned Aircraft System (UAS) Integration in the NAS

b. A new recommendation was identified on the following program:
   - Unmanned Aircraft System (UAS) - External Stakeholder Integration and System Engineering Leadership

AGENDA

Tuesday, March 8th (*CSSI- John Thomas Room)

Welcome/Overview	Steve Bussolari Maureen Molz	0830-0900
Review of REDAC Recommendations, Responses and Open Actions	Steve Bussolari	0900-0930
Budget Briefing	Mike Gallivan	0930-1000
Break		1000-1015
1A10D NextGen – New Air Traffic Management Requirements	Francisco Bermudez	1015-1045
1A01C Operations Concept Validation	Rob Hunt	1045-1115
1A11 NextGen – Ops Concept Validation Modeling	Westley Wright	1115-1145
Sub-Committee Discussion	Subcommittee Members	1145-1215
Lunch		1215-1315
Commercial Space Transportation	Mike Romanowski	1315-1345
Aviation Weather Research Program (AWRP)	Steve Abelman	1345-1415
Sub-Committee Discussion		1415-1445
Break		1445-1500
A12.e NextGen – Weather Technology in the Cockpit	Gary Pokodner	1500-1530
Sub-Committee Discussion	Subcommittee Members	1530-1600

Wednesday, March 9 (NASA HQ w/AMES VTC)

Review Findings & Recommendations / New Actions	Steve Bussolari	0800-0830
1A11 NextGen – ATC/Tech Ops HF	Jerome Lard	0830-0900
A11.i Air Traffic Control/Technical Operations Human Factors	Nick Lento Dan Herschler	0900-0930
Break		0930-0945
UAS Strategic Plans and Near Term Opportunities	Maureen Keegan	0945-1015
NASA Topics	John Cavolowsky	1015-1115
Sub-Committee Discussion	Subcommittee Members	1115-1200
Lunch		1200-1300
Unmanned Aerial System Traffic Management Concept (UTM)	Parimal Kopardekar Joey Rios	1300-1400
4D Demonstration	Mark Hollinshead	1400-1430
Break		1430-1445
Sub-Committee Discussion	Subcommittee Members	1445-1515

Thursday, March 10 (CSSI – John Thomas Room)

Review Findings & Recommendations / New Actions	Steve Bussolari	0800-0830
1A01A Runway Incursion Reduction	Matt Royston	0830-0900
A12.a NextGen – Wake Turbulence	Jeff Tittsworth Paul Strande	0900-0930
1A05D NextGen – Wake Turbulence – Re-categorization	Jeff Tittsworth Paul Strande	0930-1000
Break		1000-1015
Sub-Committee Discussion	Subcommittee Members	1030-1100
Complete Recommendations	Subcommittee Members	1100-1200
Sub-Committee Discussion and wrap up	Subcommittee Members	1200-1300