Research, Engineering, and Development Advisory Committee (REDAC)
National Airspace System (NAS) Operations Subcommittee | MINUTES

Date: *August 31 – September 1, 2021*
Location: *Virtual Meeting*
Purpose: *Review of FY21-24 Proposed Portfolio; Provide Guidance and Recommendations; Informational Briefings or Updates*
Facilitator: *Phil Yeung, Designated Federal Officer (DFO)*
Chairperson: *Jim Kuchar*
Note Taker: *Joe Bertapelle*
Upcoming Meetings: *March 15 – 16, 2022*

Day 1 – August 31, 2021 (Virtual Meeting)

Welcome / Review of Actions

Presenters: *Jim Kuchar / Phil Yeung*

Summary:
Phil Yeung, the NAS Ops subcommittee Designated Federal Official (DFO), and Jim Kuchar, Subcommittee chair, welcomed the Subcommittee members and the presenters to the meeting.

The Subcommittee reviewed the action items from its last meeting and the upcoming agenda. Jim thanked the FAA for sending the briefings in advance as it was very helpful. This meeting was the fourth remote session the NAS Ops Subcommittee had conducted on Zoom.

Open items from the Fall 2020 NAS Ops report meeting were closed out. There were three open items from the Spring 2021 NAS Ops meeting:

1- The Subcommittee is still waiting for a copy of the FAA Charting Aviation's Future: Operations in an Info-Centric National Airspace System (NAS 2035 Vision as the document is still undergoing the agency review process. This will continue as an open item.
2- The Subcommittee requested deep dives into several topics for this meeting and the agenda addressed the request. It was anticipated that this would be closed out at the end of this meeting.
3- The Subcommittee had previously recommended a refocus of funding to the weather research program as funding was severely reduced without explanation in the past. It was noted that this would be covered in a later briefing by Randy Bass (FAA) in the agenda.

Presentation: 1. Director Remarks

Presenter: *Shelley Yak*

Summary:
Ms. Yak provided a welcome to the NAS Operations Subcommittee and focused comments on the remote work subject and plans for return to office schedule. In general, the COVID effect on remote work continued with some degree of return. As of this meeting, the FAA William J. Hughes Technical Center plans to bring back one-third of the work force in Oct '21, second one-third in Nov '21 and the final one-third in Jan '22. The proposed plan was subject to change with the increased Delta variant affects ongoing.

Ms. Yak then asked for feedback as to how the Subcommitte representatives were handling the same situation.

Jim Kuchar, LL, reported they were still working remotely and planned to blend into the office in the future.

Joe Bertapelle, retired JetBlue, reported the airline headquarters were returning to the office this year. The airlines continued to service the daily schedules (crew hotels, recurrent training). New pilot and Flight Attendant training was increasing. Other organizations, such as A4A have returned to the office already.

Monica Alcabin, Boeing, reported the Seattle office was remote with one day/week in office. Avionics workers work every other day in office so spread out 50% in office.

Emily Stelzer, MITRE, reported the McLean office was open with requirements that everyone, including guests, show proof of vaccination. In addition, two people could not be in one office.

It was also noted by Joe Bertapelle that the Miami Metroplex deployment was hosted at MITRE. While this was a 12-year project with many airspace changes, it was deployed during COVID with collaboration from FAA, MITRE, Airline representatives and a bright spot at the NextGen Advisory Committee Working Subcommittee (NACSC) meeting and anticipated future agenda item at the upcoming NAC meeting.

Ms. Yak thanked the Subcommittee for their feedback.

Presentation: 2. Budget Briefing
Presenter: *Beth Delarosby*

Summary:
Ms. Delarosby (FAA) presented information on the Research, Engineering and Development (RE&D) budget and Congressional conference language. The President's 2021 enacted budget was reviewed. FY 2022 President's Budget was submitted to Congress last May with increased funding, which included Covid response supplement. House RE&D funding was increased and the Senate appropriation was to be determined.

In the House language it was noted that an increase in funding towards Aviation climate and noise research was spread into multiple exiting research programs that strive to advance existing research portfolio program. It was noted the Weather research program funding was increased as the Subcommittee requested.

The Subcommittee thanked the FAA for the briefing.

Presentation: 3. Enterprise Concept Development
Presenter: *Steve Bradford*

Summary:
Mr. Bradford (FAA) provided an overview of the Enterprise Concept Development effort. This effort focuses on new ideas requiring development of Concept of Operations (ConOps) documents and Validation of Concepts, to assess their feasibility and budget requirements if they are selected to move forward into an acquisition program.

Mr. Bradford summarized the work on Urban Air Mobility (UAM) research. The UAM Initial ConOps v1.0 was completed. The Extensible Traffic Management (xTM) initial framework analysis was also developed. The Subcommittee requested a briefing about xTM at the Spring 2022 REDAC meeting in anticipation.

Current research plans to develop scenarios that help pull the 2035 vision for Air traffic Management Services in an operational context are in three areas:
1-Class E airspace Management (ETM) concept development where more traffic is expected with supersonic aircraft and other commercial demands are anticipated.
2- UAM concept development are in the lower airspace where a blending of new entrants, new technologies for communication will emerge in the future.
3-NextGen Notice to Airman (NOTAM) Modernization

Future research will concentrate on Artificial Intelligence (AI) and Machine Learning (ML) concepts from global perspective including ICAO requirements for global aircraft tracking and network communication.

Presentation: 4. New Air Traffic Management Requirements
Presenter: *Steve Bradford*

Summary:
Mr. Bradford (FAA) next briefed the Subcommittee on NextGen – New Air Traffic Management Requirements. This Budget Line Item (BLI) is focused on the requirements development preceding NAS deployment and implementation.

Accomplishments included in Mr. Bradford's overview addressed

- AI/ML research plan to assess FAA software assurance requirements
- Distribution platform requirements surrounding Air to Ground System Wide Information Management (A/G SWIM)
- Completed analysis on connected aircraft safety, risk, performance, and security requirements
- Messaging analysis for various FAA systems
- Started work on:
    - Flight and Flow Information for a Collaborative Environment Release 2 (FF-ICE/R2) advancements
    - NextGen input devices to support the concept development for an enterprise solution to next generation input devices for NAS automation systems
    - Modernize surveillance infrastructure
    - Future Weather needs and requirements

Future research included work with International Civil Aviation Organization (ICAO) on Flight/Flow concept and the need to replace the surveillance infrastructure as it nears end of life. The weather research focused on the near-term to evaluate redundant systems and what capability would be on the controller workstation.

Joe Bertapelle asked in the context of the briefing if NAS included Enroute Automation Modernization (ERAM), Advanced Technologies and Oceanic Procedures (ATOP), MICRO-EN ROUTE AUTOMATED RADAR TRACKING SYSTEM (MEARTS), and Standard Terminal Automation Replacement System (STARS) platforms. Mr. Bradford acknowledged it did include all platforms. Jim Kuchar asked about the weather program and whether its focus was just on tactical operations. Mr. Bradford acknowledged it was and the risk is low in strategic operations.

Jim Kuchar also asked about distributive computing capability and move to a cloud-based system. Mr. Bradford said it is in the work plan to analyze such requirements.

The discussion continued around SWIM, Electronic Flight Bags (EFB), Internet Protocol (IP) command and control with coordination with ICAO.

Jim Kuchar requested that the Subcommittee receive the FAA's AI/ML Certification Requirements Research Plan document prior to its next meeting.

Presentation: 5. Enterprise Human Factors
Presenter: *Tara Gibson*

Summary:

Tara Gibson (FAA) briefed Enterprise Human Factors. This BLI research focuses on successful integration of systems developed and deployed to enable NextGen concepts.

Accomplishments focused on Trajectory Based Operations (TBO) impact on the Traffic Management Unit (TMU), which was a NAS OPS past recommendation. Jim Kuchar acknowledged this good work and the Subcommittee's interest to track. He requested a review of the TBO impact on TMU document for the Spring '22 agenda. Recent work on large 43" screens that were used in FAA Minneapolis (ZMP) was discussed and issues that were detected.

In future research, TBO P2 will expand this concept beyond the TMU from terminal to enroute TMUs with regional coordination. Joe Bertapelle asked if this work included oceanic positions. Ms. Gibson said it did not, just domestic.

Presentation: 6. Air Traffic Control/Technical Operations Human Factors
Presenter: *Tara Gibson*

Summary:

Ms. Gibson's second presentation was on Air Traffic Control/ Technical Operations HF. This BLI research focuses on near-term needs (3-5years) and is all RE&D funded.

Recent accomplishments were in the following research areas: improved safety and error mitigation in Air Traffic Control (ATC), automation effects and controller performance, improved design and operation of ATC systems, improve controller selection and training, and controller and technical operations workforce optimization, Notice to Air Missions (NOTAM) specialist job/task analysis. Additional research centered around inclusion of ATC Command Center training needs. This was a focus of the NAS Ops recommendation and welcomed news.

Jim Kuchar asked, with the increase of volume and variety of future traffic if the Human Factors work focused more on tactical or with the inclusion of Command Center if it was more strategic. Ms. Gibson said it was both.

Presentation: 7. Runway Incursion Reduction Program (RIRP)
Presenter: *Rob Higginbotham / Giovanni Dipierro*

Summary:

Mr. Higginbotham (FAA) provided updates to the RIRP program. This BLI is safety focused on runway environment.

Recent accomplishments included the following: Small Airport Surveillance Sensors (SASS) was coming to an end. Runway Incursion Prevention through Situational Awareness (RIPSA) was close to a contract award. Surface Taxi Conformance Monitoring (STCM) was in mid phase with Human-In-The-Loop (HITL) experiments with industry involvement (FD CDM)

Jim Kuchar asked if STCM instructions would be “in the system” in the HITL or if it was still a manual process. Mr Higginbothham said it was manual, someday pre clear TXO was intended to be automated. Joe Bertapelle commented if RIPSA used Space Based ADS-B and if this capability was considered as a data source to surface data.

Jim Kuchar asked if the RIPSA situational awareness was for the pilot or the controller. Mr. Higginbotham stated that it was for the pilot. Jim Kuchar asked what the target airport class for RIPSA is. Mr. Higginbotham responded that it was for larger towered airports.

Presentation: 8. Operations Concept Validation & Infrastructure Evolution (ATDP)

Presenter: *Guillermo Sotelo*

Summary:

Mr. Sotelo (FAA) provided an update on Operations Concept & Infrastructure Evolution (ATDP) followed by a deep dive into the NAS Integration of Transiting Operations (NITRO) research program. These two BLIs work on TBO NAS integration Future Flow Management (FFM) to include Oceanic, UAS, UTM and UAM new entrants, with emphasis on upper E airspace and lower airspace.

Jim Kuchar noted that the research in Steve Bradford’s program with xTM will need to be included but that timing is to be determined. Jim Kuchar also noted the Subcommittee would like to review the ATDP report when it is available.

Work in NITRO program was about upper E where advanced vehicles will add complexity of new vehicles with high performance (supersonic) and long endurance (slower) performance vehicles. This research was focused on launch, transitional and optimum routes. The work plan is in the 3-5 out years.

Jim Kuchar asked if a target level of safety had been defined and it was noted that there was not to date. Joe Bertapelle asked if new Automatic Dependent Surveillance-Broadcast (ADS-B) requirements were needed, and the response was analysis was needed.

Presentation: 9. Informational Update: NAS Integration of Transiting and Higher Space Operations (NITRO)

Presenter: *Guillermo Sotelo*

Summary:

Combined with #8

Presentation: 10. Weather Program
Presenter: *Randy Bass*

Summary:
Randy Bass (FAA) provided an overview of the Aviation Weather Research Program including its current portfolio, recent accomplishments, and future research plans. This was an area of reduced funding in the past and was a concern to the NAS Ops Subcommittee. This BLI has eleven accomplishments in ’21 and the ‘22 future program covered an additional twenty areas.

There is new emphasis on environmental impact due to airline weather delays. Funding has been restored to and work program reflects such. Previous NAS Ops recommendation related to strengthening relationships with other organization (TBO, Future Flow Management (FFM)). Mr. Bass stated there were monthly meetings with sub-groups and the new process was working well.

Jim Kuchar stated the work program covered a lot but did not see wind observation or forecasting research, which may be important for new capabilities such as TBO, included anywhere. Mr. Bass stated that the work was being done in other programs.

Presentation: 11. NextGen – Weather Technology in the Cockpit (WTIC)
Presenter: *Gary Pokodner*

Summary:
Mr. Pokodner (FAA) presented an update on research activities within the WTIC program. The Remote Oceanic Meteorological Information Oceanic (ROMEO) program was completed, and tech transferred, ADS-B turbulence has made progress, Pilot Report (PIREP) voice recognition continues to name a few. It was noted that there has been a lot of work in the area with relatively little RE&D funding.

Presentation: 12. Informational Deep Dive Briefing: UAS Automation & Intelligent Systems
Presenter: *Bill Oehlschlager*

Summary:
Mr. Oehlschlager (FAA) briefed this lively discussion on Unmanned Aircraft System (UAS) systems. The emphasis is on larger classification of aircraft with research on automation systems that will drive policy, safety and certification processes for aircraft, pilots, controllers, and airspace.

Jim Kuchar asked if the research included UAS, Advanced Air Mobility (AAM), electric Vertical Takeoff and Landing (eVTOL), and Urban Air Mobility (UAM), and clarification was given. He said it was also unclear why the Vertical Motion Simulator (VMS) was being used – the rationale for collecting data on human vestibular response for electric vertical takeoff and landing (eVTOL) aircraft was not clearly stated in the briefing, especially given all the other potential research topics having to do with automation systems for UAS, AAM, eVTOL, and UAM.

Bruce Holmes asked how interaction with Industry participants was proceeding. Response was that interaction was mostly between NASA and FAA. A discussion followed about separation standards, airspace implications and Communications, Navigations, and Surveillance (CNS) requirements.

Akbar Sultan (FAA) stated the Vertical Motion Simulator work has been concentrated on traditional aircraft.

In general, the Subcommittee questioned why this topic was chosen for research when there were so many more areas to cover. The motivation for the request originated from the observation that the evolving "simplified vehicle operations (SVO)" will convey requirements on NAS procedures and pilot-controller interactions.

Bruce Holmes suggested a future brief on S2A2 (the NASA ULI Project – Secure and Safe Assured Autonomy, led out of NC A&T University)

Presentation: 13. Informational Deep Dive Briefing: Established Recommendations for Pilot Certification Requirements for Multi-Unmanned Aircraft Systems (UAS) Operations
Presenter: *Bill Oehlschlager*

Summary:
Mr. Oehlschlager (FAA) briefed a second deep dive topic on Pilot Certification requirements for multi-Unmanned system (UAS) operations.

Accomplishments include an initial report and Human in the Loops (HITLs) are next, with a focus on how many and what type of UAS can one person control. Different tasking will be considered.

Bruce Holmes commented this research is good and timely and questioned on what the committee should ask for next.

Presentation: Findings and Recommendations Discussion
Presenter: *Jim Kuchar / NAS Ops Subcommittee*

Summary:
Bruce Holmes provided a clarification comment on UAS eVTOL passenger size and the Subcommittee requested a future briefing from Sabrina Saunders-Hodge (FAA/UAS) on the FAA's current UAS Integration Strategy.

Jim Kuchar suggested, for the next meeting, a briefing on the higher-level view of the bigger issues in the overall UTM landscape, including the research plans to address them at a high level. Phil Yeung (NAS Ops DFO) suggested Sherri Magyarits (FAA) could brief at the Spring 2022 meeting.

Day 2 – September 1, 2021 (Virtual Meeting)

Presentation: Review Findings and Recommendations
Presenter: *Jim Kuchar / Subcommittee*

Summary:
Introduction of second day agenda noted four deep dives. UTM roadmap is the second time the Subcommittee has been briefed on that subject. Environment and Energy is a new topic. Two new HF briefings on Air Ground Integration and Core Flight Deck.

The Subcommittee suggested that a future agenda topic also include an update on the ASSURE COE research.

Presentation: 14. Informational Update: UTM Roadmap
Presenter: *Peter Sachs*

Summary:
Mr. Sachs (FAA) briefed the FAA's UAS Traffic Management (UTM) roadmap as defined as airspace below 400 above ground level (AGL). FAA UAS Beyond Visual Line-of-Sight (BVLOS) Operations Aviation Rulemaking Committee (ARC) was underway which covered, among other topics, flight rules, ground rules of operation (right of way), and training requirements. The ARC report was due Oct '21. This will follow into rule making committee work with final report estimated in 2 years. Mr. Sachs reported the UTM Pilot Program Phase 2 (UPP 2) report was published and provided a link in his presentation where key points included conflict detection alert, no clear right of way rules, and inconsistent altitude. In addition, it was noted to date there was no community involvement through roundtable outreach. The work to date was user driven by need and Congress instructing FAA to work for companies.

Bruce Holmes questioned the scope of larger UAS aircraft; response was today's focus is on small UAS. He also commented on NASA/FAA's merge con-ops of AAM effort. Suggested future agenda item request of AAM.

Monica Alcabin commented on the surprising results of the Johns Hopkins simulation regarding the expected rate of unmitigated UAS collisions in airspace.

Bruce Holmes commented on communication requirements for UAM/AAM below 400'. How communication would be handled, with 5G providers like Comcast/Verizon or dedicated frequency bands. Mr. Sachs said the work is not focused on communications.

Presentation: 15. NextGen – Flight Deck Data Exchange Requirements
Presenter: *Nouri Ghazavi*

Summary:

Nouri Ghazavi (FAA) provided an overview and update of the Flight Deck Data Exchange Requirements (FD DER) BLI. This BLI focuses on cybersecurity risk assessment for flight data exchange of flight critical data. In the requirements approach there is an expectation that FD-CDM would identify implementation. Joe Bertapelle asked about the "CDM" definition, as it is an operational program at the FAA Command Center.

Presentation: 16. NextGen – Wake Turbulence
Presenter: *Jillian Cheng*

Summary:
Jillian Cheng (FAA) provided a presentation summarizing the Wake Turbulence BLI, which assesses aircraft wake encounter risks at all flight levels, including en route as well as terminal operations.

A lot of the funding was for new aircraft assessment, as there were typically 60-100 new aircraft added to the data base per year, mostly in the General Aviation (GA) fleet.

Joe Bertapelle asked if this work was with the Multiple Airport Route Separation (MARS) concept, which was not.

Jim Kuchar asked if Flight Operational Quality Assurance (FOQA) data was being merged with wind vortex measurements at SFO and JFK to help validate models of the effects of wake encounters – the answer was no. Akbar Sultan stated that NASA also has data and offered to coordinate.

Akbar Sultan also asked with the end of data collection phase of the program, is that the end state of the objective, answer was no.

Presentation: 17. Wake Turbulence Re-Categorization
Presenter: *Jillian Cheng*

Summary:
Ms. Cheng followed up with a presentation on the Wake Turbulence Re-Categorization program, where the focus is on increasing runway capacities during Instrument Flight Rules (IFR) operations.
Current research is in a dynamic pair wise separation with simulation at the William J. Hughes Technical Center. Most interested applications would be airports in the NE NAS.

Jim Kuchar asked when the application would be used will longer-term forecasts be included, e.g. for setting Airport Arrival Rate targets? The answer the FAA is working with Lincoln Laboratory on that topic which will be part of the ’22 program.

Presentation: 18. Informational Briefing: Research on Operational Procedures
Presenter: *Chris Dorbian*

Summary:
Chris Dorbian (FAA) briefed this new focus program to manage and reduce environmental impact of Global aviation. While great progress has been made on individual aircraft it was noted that the issue has changed focus to aircraft concentration and perception of noise. This is a new item of focus at the Nextgen Advisory Committee (NAC) as well. The briefing tailored around FAA program with BOS MASSPORT and MIT.

Joe Bertapelle acknowledged this and was part of this as well as community round tables in NY. While there are future aircraft design, in general this work is about shifting noise and perception of noise. Many examples were noted from different cities (BOS, LGA, DCA, MSP, SFO, LAS DFW, ORD) In the end opportunities for BOS were noted, Zoning changes, ability to fly over parks, effect on AAR, vortex generators, use of more runways 22s.

Jim Kuchar asked about dispersion of flight tacks and examples were given as a result of airspace design. Also noted was the noise increase on arrival is the effect of flap extension, as alternatives are being looked at.

Presentation: 19. Informational Briefing: NextGen – Air Ground Integration Human Factors

Presenter: *Victor Quach*

Summary:

Victor Quach briefed the NextGen Air Ground Integration HF work.
There are many TBO Data link accomplishments including aircraft systems, Pilot skills, N/G instrument procedures and advanced vision systems.

Jim Kuchar asked if the program only covers conventional aircraft types, the answer was yes.

Presentation: 20. Informational Briefing: Core Flight Deck Human Factors

Presenter: *Chuck Perala*

Summary:

Chuck Perala briefed Core Flight Deck HF. This research is focused in the near term on advanced vision systems that would lead to increased arrival rates in low visibility. In addition, the program addresses fatigue mitigation inflight Operations.

Bruce Holmes asked if maturity of “digital twin” is included as part of this program, it is not.

Presentation: Findings and Recommendations Discussion

Presenter: *Jim Kuchar / Subcommittee*

Summary:

The Subcommittee closed the meeting with a discussion of several observations and findings/recommendations to be developed for the Fall Full REDAC meeting in October. Assignments for writing up these points were given and the dates for the Fall 2022 meeting were set for August 30 and 31, 2022.

Jim Kuchar and Phil Yeung thanked the presenters and subcommittee members for their time, and adjourned the meeting.

REDAC / NAS Operations Subcommittee Meeting Agenda

Date: August 31 – September 1, 2021
Location: Remote only | See last page for phone and video conferencing details
Purpose: Review the R&D portfolio developed based on the subcommittee's strategic guidance from the Spring Meeting. The FAA briefs the proposed R&D FY+3 years.

Tuesday, August 31st

9:00am	0. Welcome / Review of Actions	Jim Kuchar / Phil Yeung
9:15am	1. Director Remarks	Shelley Yak
9:20am	2. Budget Briefing	Beth Delarosby
9:30am	3. Enterprise Concept Development	Steve Bradford
10:00am	4. New Air Traffic Management Requirements	Steve Bradford
10:30am	Break	
10:45am	5. Enterprise Human Factors	Tara Gibson
11:15am	6. Air Traffic Control/Technical Operations Human Factors	Tara Gibson
11:45am	7. Runway Incursion Reduction (RIRP)	Rob Higginbotham / Giovanni Dipierro
12:15pm	Lunch	
1:00pm	8. Operations Concept Validation & Infrastructure Evolution (ATDP)	Guillermo Sotelo
1:30pm	9. Informational Update: NAS Integration of Transiting and Higher Space Operations (NITRO)	Guillermo Sotelo
2:00pm	Break	
2:15pm	10. Weather Program	Randy Bass
2:45pm	11. NextGen – Weather Technology in the Cockpit (WTIC)	Gary Pokodner
3:15pm	Break	
3:30pm	12. Informational Briefing: UAS Automation & Intelligent Systems	Bill Oehlschlager
4:00pm	13. Informational Briefing: Establish Recommendations for Pilot Certification Requirements for Multi-Unmanned Aircraft Systems (UAS) Operations	Bill Oehlschlager

4:30pm	Findings and Recommendations Discussion	Subcommittee

Wednesday, September 1st

9:00am	Review Findings and Recommendations	Subcommittee
9:15am	14. Informational Update: UTM Roadmap	Peter Sachs/AUS
9:45am	15. NextGen – Flight Deck Data Exchange Requirements	Nouri Ghazavi
10:15am	Break	
10:30am	16. NextGen – Wake Turbulence	Jillian Cheng
11:00am	17. Wake Turbulence Re-Categorization	Jillian Cheng
11:30am	18. Informational Briefing: Research on Operational Procedures	Chris Dorbian/AEE
12:00pm	Lunch	
1:00pm	19. Informational Briefing: NextGen – Air Ground Integration Human Factors	Victor Quach
1:30pm	20. Informational Briefing: Core Flight Deck Human Factors	Chuck Perala
2:00pm	Findings and Recommendations Discussion	Subcommittee
3:00pm	Recap and Closing	Jim Kuchar / Phil Yeung

Legend Key:

	Informational Briefing or Update

Day 1 Attendee List:

Chinita Roundtree-Coleman	FAA
Jim Kuchar	MIT Lincoln Laboratory
Phil Yeung	FAA
Gwen Mazzotta	SAIC
Brian Powers	A3 Technology
Emily Stelzer	MITRE
Joe Bertapelle	JetBlue
Kristina Carr	FAA
Steve Bradford	FAA
Monica Alcabin	Boeing
Philip Hays	FAA
Sadaf Alam	A3 Technology
Shelley Yak	FAA
Adam O'Hara	SAIC
Bill Kaliardos	FAA
Eddie Austrian	Fort Hill Group
Hunsi Idris	NASA
Jon Schleifer	FAA
Marlo Allen	Quasars, Inc.
Michael Reininger	FAA
Rob Higginbotham	FAA
Vanessa Aubuchon	NASA
Vartan Tenkerian	FAA
Vernol Battiste	NASA
Victor Quach	FAA
Karl Kauffman	FAA
Akbar Sultan	NASA
Bruce Holmes	Holmes Consulting LLC
Elizabeth Delarosby	FAA
Tara Holmes Gibson	FAA
Guillermo Sotelo	FAA
Bill Oehlschlager	FAA
Giovanni Diperro	FAA
Ben Marple	FAA
Randy Bass	FAA
Gary Pokodner	FAA

Day 2 Attendee List:

Chinita Roundtree-Coleman	FAA
Gwen Mazzotta	SAIC
Brian Powers	A3 Technology
Akbar Sultan	NASA
Bruce Holmes	Holmes Consulting LLC
Steve Bradford	FAA
Emily K. Stelzer	MITRE
Jim Kuchar	MIT Lincoln Laboratory
Joe Bertapelle	JetBlue
Nouri Ghazavi	FAA
Karl Kauffman	FAA
Michael Reininger	FAA
Monica Alcabin	Boeing
Phil Yeung	FAA
Philip Hays	FAA
Chris Dorbian	FAA
Victor Quach	FAA
Chuck Perala	FAA
Sadaf Alam	A3 Technology
Jillian Cheng	FAA
Chris Lawler	Cavan Solutions