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

Date: *August 30 – 31, 2022*
Location: *Virtual Meeting*
Purpose: *Review of FY22-25 Proposed Portfolio; Provide Guidance and Recommendations; Informational Briefings or Updates*
Facilitator: *Phil Yeung, Designated Federal Officer (DFO)*
Chairperson: *Jim Kuchar*
Note Taker: *Jim Kuchar*
Upcoming Meetings: *March 14 – 15, 2023*

Day 1 – August 30, 2022 (Virtual Meeting)

Welcome / Review of Actions

Presenters: *Jim Kuchar / Phil Yeung*
Summary: Jim Kuchar (FAA) welcomed the Subcommittee members and thanked them and the FAA representatives for their time and commitment to supporting the REDAC. Phil Yeung (DFO) reviewed prior action items and the agenda for the two-day meeting.

Presentation: 1. Director Remarks

Presenter: *Eric Neiderman*
Summary: Eric Neiderman (FAA) provided a brief update on FAA operational status in light of the continuing COVID pandemic. He also highlighted the FAA RE&D budget, which has been increasing steadily to approximately $260M in FY23 with particular emphasis on environmental impact mitigation, UAS integration, and workforce development. He then introduced enhancements to the R&D landscape process and focus on leveraging industry-driven R&D to augment the FAA's impact, with new roadmap visualizations including a "slash chart" view of near, mid, and long-term research topics. Finally Mr. Neiderman reviewed the REDAC's recent tasking to provide feedback on the UAS/AAM Integration Research Plan.

Jim Kuchar thanked Mr. Neiderman for his introductory comments.

Presentation: 2. Enterprise Concept Development

Presenter: *Steve Bradford*
Summary: Steve Bradford provided an overview of the Enterprise Concept Development portfolio. The portfolio includes Extensible Traffic Management (xTM) analysis to explore differences between new entrant traffic management and conventional air traffic management. Working toward exploring certification of artificial intelligence (AI) in decision support tools. In future years the effort will also focus on dynamic trajectory based operations (TBO) and a concept of operations for smart

airports (including smaller GA airports, possibly non-towered – e.g. Wi-Fi connectivity, shared surface and airspace situational awareness).

Presentation: 3. New Air Traffic Management Requirements
Presenter: *Steve Bradford*

Summary: Mr. Bradford provided an overview of the New ATM Requirements portfolio. Accomplishments include data distribution platform requirements for the connected aircraft concept, AI/ML certification scenarios (especially for air traffic management), and flight and flow information for a collaborative environment. The Subcommittee requested a copy of the AI/ML certification framework. Weather transition work includes analysis of weather requirements and UAS-specific weather information and approval of third-party weather information providers for UAS. Other work includes command and control in the cloud, synchronization of air/ground SWIM, next-generation input devices, and IP-based command and control data links. Mr. Bradford also played a video highlighting the vision for the transition to an info-centric NAS.

Presentation: 4. Informational Briefing: Info-Centric NAS, Data Exchange Ecosystem
Presenter: *Steve Bradford*

Summary: Mr. Bradford led a requested deep-dive presentation on Connected Aircraft to accommodate the expected growth in demand for information exchange. He also reviewed Internet Protocol Service for exchanging messages and activities underway for Flight and Flow Information for a Collaborative Environment (FF-ICE). Monica Alcabin and Bruce Holmes thanked Mr. Bradford for the FAA's work on the range of data exchanged technologies that he covered. Mr. Holmes raised the concept for third-party datacomm and reroute service providers to augment the FAA's infrastructure. Mr. Bradford agreed that this type of operation could be accommodated.

Presentation: 5. Budget Briefing
Presenter: *Beth Delarosby*

Summary: Ms. Delarosby provided an update on the RE&D budget, which has increased to $260M in FY23. The Subcommittee discussed several changes in RE&D line funding and was overall pleased to see that funding levels remain strong or growing.

Presentation: 6. Informational Briefing: Enterprise Architecture Overview
Presenter: *Annie Augustin*

Summary: Ms. Augustin provided an overview of the NAS Enterprise Architecture (EA). She reviewed the major purposes and components of the NAS EA, and walked the Subcommittee through the process by which the EA is generated and updated. Ms. Augustin also described the new hybrid roadmaps that are currently being developed to better show a holistic view of the various activities. Mr. Holmes asked if the EA translates into a formal work breakdown structure. Ms. Augustin replied that the

program managers for each line would make that mapping into a Work Breakdown Structure (WBS). Emily Stelzer asked whether the EA would be transitioning into a more digital set of enterprise tracking tools. Ms. Augustin replied that yes, the FAA is moving toward newer tools to manage and track the EA in a more effective manner.

Presentation: 7. Enterprise Human Factors
Presenter: *Tara Gibson*

Summary: Ms. Gibson presented material on the Enterprise Human Factors F&E portfolio, including concept development for NAS programs in the pre-Investment Analysis Readiness Decision (IARD) phase. Accomplishments include work on regional traffic management unit (TMU) decision-making and the effect of TBO on TMU operations. She also provided an overview of anticipated research and research products starting in FY23 - FY25. Mr. Kuchar asked whether the TBO studies would explore challenging operational conditions (e.g. strong windshear or convective weather). Karl Kaufmann responded that at this initial stage the focus is primarily on baselining human performance under nominal conditions.

Presentation: 8. Air Traffic Control/Technical Operations Human Factors
Presenter: *Tara Gibson*

Summary: Ms. Gibson presented material on the Air Traffic Control / Technical Operations portfolio focusing on complex ATC systems and controller selection and training guidance. Accomplishments included an alarms and alerts handbook, human factors job aid, and evaluation of new color palettes for ATC displays. Future anticipated research includes work on AI/ML human factors and enhanced automation. Mr. Joe Bertapelle asked whether there had been a COVID-related slowdown in research progress. Ms. Holmes said there have been some areas that were delayed but the group is responding and looking to streamline efforts where possible.

Presentation: 9. FAA AST Research Alliance and R&D Roadmap Overview
Presenter: *Brian Rushforth*

Summary: Brian Rushworth presented a requested deep-dive on the Office of Commercial Space Transportation (AST) research alliance and R&D roadmap. The Center of Excellence program for AST recently closed down and is being replaced by the research alliance. Work on Space Situational Awareness is currently on hold, potentially focusing on orbital debris in the future. The NAS Integration research task includes interoperable air and space traffic management. Transition to research alliance broadens the community involved to include industry, academia, research labs, and other government organizations, modeled on Department of Energy research consortium. NAS-relevant research topics in the future may include hazard area reduction, spaceport-to-spaceport high-speed transport, and infrastructure safety and resilience. Mr. Bertapelle asked about the potential to use Automatic Dependent Surveillance-Broadcast (ADS-B) for hypersonic vehicles and whether AST has approved that surveillance source and its potential to make use of airspace more efficient. Mr. Rushforth noted that the FAA is not requiring any particular surveillance source for space operations but they are pursuing research into ADS-B performance.

Presentation: 10. NextGen – Weather Technology in the Cockpit (WTIC)
Presenter: *Gary Pokodner*

Summary: Gary Pokodner provided an overview of the WTIC program and responses to the REDAC's prior findings and recommendations. He then reviewed recent accomplishments which include industry perspective on weather information in the cockpit, a Pilot Weather Report (PIREP) voice submission tool, ADS-B turbulence, augmented reality learning technologies for pilots, and application of AI/ML to fill in weather conditions in regions that are not directly observed. Mr. Pokodner also reviewed upcoming research plans for FY23-FY25 across the various research tasks. Mr. Holmes asked whether dynamic weather information tools might be applied in FAA's other educational programs (e.g., WINGS). Mr. Pokodner replied yes, there is a lot of interest in using these products in a variety of courses. Matthias Steiner asked if weather information for remote pilots is in scope of WTIC. Mr. Pokodner replied that remote pilots and UAS are not in scope of WTIC, but virtual reality views of weather are being explored.

Presentation: 11. Weather Program
Presenter: *Randy Bass*

Summary: Randy Bass presented the Weather Program portfolio and reviewed major accomplishments from FY22 on topics including convective storms, inflight icing, model development and enhancement, and turbulence, ceiling and visibility, advanced weather radar techniques, terminal area icing, high ice water content, UAS weather, weather observations, and quality assessment. Mr. Bass also reviewed anticipated research topics for FY23-25. Matthias Steiner asked what other R&D would be pursued if additional funding were available, and also what climate-related R&D might be possible? Mr. Bass replied that they are looking to start R&D into space weather, volcanic ash, and potential expansion in more turbulence research. They are also exploring pathways to transition technologies into industry to accelerate the injection of weather research into operations.

Presentation: 12. Informational Briefing: Weather R&D for UAS / UTM / AAM
Presenter: *Kevin Johnston / Randy Bass*

Summary: Kevin Johnston provided a requested deep-dive into UAS weather R&D including ongoing projects, timelines, and challenges. A major effort is ASTM F-38 standard specifications for weather information. Mr. Johnston's presentation included a mapping of UAS weather R&D programs to the UAS/AAM Integrated Research Plan as well as to other activities at NASA, NOAA, and ASTM. Mr. Steiner asked whether the UAS R&D is being coordinated with DoD, DHS, and other government organizations. Mr. Johnston replied that they have not directly connect to those agencies but there are indirect connections through the other partners on these efforts.

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

Summary: The Subcommittee reviewed the day's presentations and began discussing the process by which they would be reporting out on their recommendations regarding the UAS/AAM Integration Research Plan. Discussions were then adjourned until the following day.

Day 2 – August 31, 2022 (Virtual Meeting)

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

Summary: Jim Kuchar welcomed the Subcommittee members and engaged in a brief discussion of potential findings and recommendations based on the prior day's presentations.

Presentation: 13. NextGen – Flight Deck Data Exchange Requirements
Presenter: *Nouri Ghazavi*

Summary: Nouri Ghazavi provided a presentation on Flight Deck Data Exchange Requirements, which focuses on cyber security and data integrity for electronic flight bags, aircraft interface devices, and Internet Protocol datalinks. Key accomplishments include the development of the Connected Aircraft Security Controls (CASC) tool and a description of different connected aircraft architectures.

Presentation: 14. Informational Briefing: UAM Overview
Presenter: *Nouri Ghazavi*

Summary: Mr. Ghazavi provided an invited presentation on Urban Air Mobility (UAM) concept development, including a focus on the incorporation of UAM operations into the NAS and traditional ATC operations. The presentation articulated where the FAA was focusing its efforts relative to NASA and reviewed initial analysis of airspace utilization and UAM corridor concepts. The Subcommittee engaged in a series of questions and discussion regarding assumptions and operational alternatives, especially from the standpoint of potential impacts or constraints on general aviation operations. The Subcommittee requested that they receive a status update on the UAM Airspace Demonstration Project at the upcoming spring meeting.

Presentation: 15. NextGen – Wake Turbulence
Presenter: *Jillian Cheng*

Summary: Jillian Cheng provided a presentation on the NextGen Wake Turbulence RE&D program. This program focuses on data collection and research, assessments of new aircraft types, and absolute wake encounter metrics. As concepts mature from this program area, they move to the Re-Categorization program. Mr. Kuchar asked whether there were plans to begin R&D into UAM wake risks during vertical take-off and landing (VTOL) operations at vertiports. Ms. Cheng replied that in the short-term they are

exploring wake separations along current conventional flight patterns but work has started with aircraft manufacturers to begin to understand other types of operations. Mr. Steiner also raised concerns about potential wake interaction with buildings. Mr. Bertapelle suggested that industry should have a role in data collection and analysis relative to their vehicle wake risks. Ms. Cheng also provided information in response to a request from the Subcommittee to describe wake data collection in more detail. Mr. Bertapelle asked if wake research was underway for supersonic aircraft. Ms. Cheng replied that those vehicles are not in scope right now but will also be part of future planning.

Presentation: 16. Wake Turbulence Re-Categorization
Presenter: *Jillian Cheng*

Summary: Ms. Cheng provided a presentation on the Wake Turbulence Re-Categorization F&E program. This program focuses on enhanced methods for wake separation including static categorical separation, pairwise separation, and dynamic separation using wind information. R&D on dynamic wake separation will be ending after FY23 and transitioning to the Air Traffic Organization (ATO).

Presentation: 17. Informational Briefing: UAS Integration Research Coordination

Presenter: *Erin Sunshine*

Summary: Ms. Erin Sunshine presented a briefing on UAS / AAM Integration Research Plan (IRP) Coordination, on behalf of Ms. Sabrina Saunders-Hodge. Her presentation provided background on the UAS/AAM IRP and tasking for REDAC feedback.

Presentation: 18. Informational Briefing: ASSURE Overview

Presenter: *Nick Lento*

Summary: Mr. Nick Lento provided an update on the status and activities occurring within the ASSURE COE. The presentation included a description of the contracting vehicles under which Center of Excellence (COE) R&D can be conducted and the universities that are partners in the COE. Discussion occurred related to the institutions that can be funded under the aegis of the COE as well as the scope of the COE to small or large UAS.

Presentation: 19. Runway Incursion Reduction (RIRP)

Presenter: *Giovanni Dipierro*

Summary: Mr. Giovanni Dipierro provided a summary of the Runway Incursion Reduction Program (RIRP). Program areas include runway incursion prevention through situational awareness, surface taxi conformance monitoring, and small airport surveillance sensor. Discussion also took place on future plans for wrong surface landing detection technology.

Presentation: 20. Operations Concept Validation & Infrastructure Evolution (ATDP)

Presenter: *Guillermo Sotelo*

Summary: Guillermo Sotelo summarized F&E funded Operations Concept Validation and Infrastructure Evolution. Accomplishments included artifacts developed for NAS Integration of Transiting Operations (NITRO), UAM, and UTM. Work in FY23 and FY24 will include TFM services and new entrants including AAM. FY25 will include work on ATM evolution and Extensible Traffic Management (xTM). Maria Geffard, Bill Lash, Lakshmi Vempati, and Ming Wang summarized status on NITRO R&D considerations across near, mid, and far term including space launch and reentry and upper-E airspace operations.

Presentation: Recap and Closing

Presenter: *Jim Kuchar / Phil Yeung*

Summary: The Subcommittee discussed findings and recommendations as well as identified documents and briefings to be included for the next meeting in Spring 2023. Subcommittee members were assigned to develop recommendations regarding the UAS / AAM Integrated Research Plan. The date for the summer 2023 meeting was set for 22-23 August 2023.

Requested documents prior to next meeting:

- AL/ML Certification Framework (Steve Bradford)
- Info-Centric NAS ConOps (Steve Bradford)

Requested informational topics requested for the next meeting:

- GA and AAM Future integrated, digital Communications / Navigation / Surveillance industry perspectives on R&D and demonstration needs (Bruce Holmes or designee)
- UAM Airspace Demonstration Project status
- Remote tower development status, including intersection with UAS and AAM research requirements.

REDAC / NAS Operations Subcommittee Meeting Agenda

Date: August 30-31, 2022
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 30th

9:00am	Welcome / Review of Actions	Jim Kuchar / Phil Yeung
9:10am	1. Director Remarks	Eric Neiderman
9:15am	2. Enterprise Concept Development	Steve Bradford
9:45am	3. New Air Traffic Management Requirements	Steve Bradford
10:15am	4. Informational Briefing: Info-Centric NAS, Data Exchange Ecosystem	Steve Bradford
11:00am	Break	
11:15am	5. Budget Briefing	Beth Delarosby
11:30am	6. Informational Briefing: Enterprise Architecture Overview	Annie Augustin / ANG
12:15pm	Lunch	
1:00pm	7. Enterprise Human Factors	Tara Gibson
1:30pm	8. Air Traffic Control/Technical Operations Human Factors	Tara Gibson
2:00pm	9. Informational Briefing: FAA AST Research Alliance and R&D Roadmap Overview	Brian Rushforth / Takisha Brown (AST)
2:45pm	Break	
3:00pm	10. NextGen – Weather Technology in the Cockpit (WTIC)	Gary Pokodner
3:30pm	11. Weather Program	Randy Bass
4:00pm	12. Informational Briefing: Weather R&D for UAS / UTM / AAM	Randy Bass / Kevin Johnston

4:45pm	Findings and Recommendations Discussion	Subcommittee

Wednesday, August 31th

9:00am	Review Findings and Recommendations	Subcommittee
9:15am	13. NextGen – Flight Deck Data Exchange Requirements	Nouri Ghazavi
9:45am	14. Informational Briefing: UAM Overview	Nouri Ghazavi
10:45am	Break	
11:00am	15. NextGen – Wake Turbulence	Jillian Cheng
11:30am	16. Wake Turbulence Re-Categorization	Jillian Cheng
12:00pm	Lunch	
1:00pm	17. Informational Briefing: UAS Integration Research Coordination	Sabrina Saunders-Hodge / AUS
2:00pm	18. Informational Briefing: ASSURE Overview	Nick Lento / ANG
2:45pm	Break	
3:00pm	19. Runway Incursion Reduction (RIRP)	Rob Higginbotham / Giovanni Dipierro
3:30pm	20. Operations Concept Validation & Infrastructure Evolution (ATDP)	Guillermo Sotelo
4:00pm	21. Discussion of UAS/AAM Integration Research Plan and general Findings and Recommendations	Subcommittee
5:00pm	Recap and Closing	Jim Kuchar / Phil Yeung

Legend Key:

	Informational Briefing or Update

Day 1 Attendee List:

Phil Yeung	FAA
Allen Proper	FAA
Akbar Sultan	NASA
Aruna Gandreti	FAA
Beth Delarosby	FAA
Bill Kaliardos	FAA
Bob Humbertson	FAA
Bob Landberg	FAA
Brian Powers	FAA
Brian Rushforth	FAA
Brianna Kump	AvMet Applications, Inc.
Bruce Holmes	Holmes Consulting LLC
Carleen Adams	FAA
Chinita Roundtree-Coleman	FAA
David Hill	FAA
Denise Bryan	A3 Technology, Inc.
Diana Liang	FAA
Eddie Sierra	FAA
Emily Stelzer	MITRE
Eric Neiderman	FAA
Farzad Davarya	FAA
Gary Pokodner	FAA
Guillermo Sotelo	FAA
Hamza Abshir	FAA
Jason Coon	FAA
Jim Baird	FAA
Jim Kuchar	MIT Lincoln Laboratory
Joe Bertapelle	Joe Bertapelle LLC
Jon Schleifer	FAA
Karl Kaufmann	FAA
Ken Hailston	Booz Allen Hamilton
Kevin Johnston	FAA
Lakaisha Ajaegbulemh	FAA
LaTesha Holloman	Booz Allen Hamilton
Matthias Steiner	NCAR
Monica Alcabin	Boeing
Nattiel Chambers	DIGITALiBiz
Pamela Gomez	FAA
Purvi Sharma	FAA
Randy Bass	FAA
Steve Bradford	FAA
Takisha Brown	FAA

Tara Gibson	FAA
Tiffany Mitchell	ICORE Consulting LLC
Wyatt Element	FAA

Day 2 Attendee List:

Phil Yeung	FAA
Allen Proper	FAA
Akbar Sultan	NASA
Bill Kaliardos	FAA
Bill Lash	MITRE
Bob Humbertson	FAA
Brian Powers	FAA
Bruce Holmes	Holmes Consulting LLC
Caitlin O'Kelly	FAA
Chinita Roundtree-Coleman	FAA
Chris Lawler	Cavan Solutions
David Hill	FAA
Denise Bryan	A3 Technology, Inc.
Emily Stelzer	MITRE
Erin Sunshine	FAA
Giovanni Dipierro	FAA
Guillermo Sotelo	FAA
Hamza Abshir	FAA
Jillian Cheng	FAA
Jim Kuchar	MIT Lincoln Laboratory
Joe Bertapelle	Joe Bertapelle LLC
Lakshmi Vempati	MITRE
LaTesha Holloman	Booz Allen Hamilton
Maria Geffard	MITRE
Matthias Steiner	NCAR
Ming Wang	MITRE
Monica Alcabin	Boeing
Nick Lento	FAA
Nouri Ghazavi	FAA