FEDERAL AVIATION ADMINISTRATION
Research, Engineering and Development Advisory Committee
Subcommittee on Aircraft Safety (SAS)
2023 Spring Meeting Minutes
February 28 - March 1, 2023

The 2023 Spring Research, Engineering and Development Advisory Committee (REDAC) Subcommittee on Aircraft Safety (SAS) meeting was held at RTCA, Inc. Headquarters in Washington, DC on February 28 and March 1, 2023. Attendee sign-in sheets are attached in Appendix I and the meeting agenda is attached in Appendix II. This document summarizes discussions and activities occurring during the meeting. The meeting resulted in four findings and four recommendations (F&Rs), which have been included as part of the official REDAC Chair's submission to the FAA. All presentation materials are available and can be downloaded through the FAA's REDAC website at http://www.faa.gov/go/redac.

Day 1 – February 28, 2023

Introduction/Opening

FAA William J. Hughes Technical Center Deputy Director Dr. Eric Neiderman, the Acting SAS Designated Federal Official (DFO) Mr. Mike Paglione, and Subcommittee on Aircraft Safety Chair Mr. Terry McVenes. President and CEO of RTCA, Inc. jointly kicked off the meeting with opening remarks. Dr. Neiderman introduced the Strategic Outlook for Research (SOR) charts, which are intended to clearly communicate FAA's research and development plans to the REDAC, the Office of Secretary Transportation (OST), the US House Science Committee, Congressional staffers, and the public. A SOR chart illustrates research being conducted or planned in near term; research areas that are of interest in the mid-term; and anticipated long-term changes and technologies that may affect the aviation industry.

Paglione described the purpose of the SAS meeting and gave an overview of the 2-day meeting agenda. McVenes reported on the October 5, 2022 full REDAC meeting. He summarized his cross-cutting observations as environmental and energy research leadership, artificial intelligence and machine learning, and longitudinal tracking of National Airspace System (NAS) performance during the full REDAC meeting. McVenes mentioned that the next REDAC meeting will be held in Washington, DC on April 12, 2023.

Overview of SAS Findings and Recommendations (F&Rs) from August 2022 meeting

Paglione and McVenes reviewed FAA responses to the six recommendations from the August 2022 SAS meeting. The SAS members agreed that the FAA responses have addressed their recommendations.

FAA Roadmap for Artificial Intelligence (AI) and Machine Learning (ML)

Dr. Trung Pham, FAA Chief Scientist and Technical Advisor, presented the plan for developing a roadmap for certification of AI and ML products. Dr. Pham defined the terms AI and ML, as well as provided a historical timeline for both European Union Aviation Safety Agency (EASA) and FAA research activities in the area of AI and ML in terms of safety certification for aviation applications. He mentioned that the

certification of AI and ML products is focused on three properties: intended functionality, correctness, and safety acceptability of AI and ML products.

The major activities of the plan for developing the roadmap include technology assessment, team organization, documentation, interaction with international regulation authorities, collaboration with industrial and research communities, FAA approval, and rollout of the roadmap by October 2023.

Dr. Pham then briefed the supporting research projects being conducted in FY23 and planned for the 2025-2029 period. A copy of Dr. Pham slides is available at the FAA's REDAC website at http://www.faa.gov/go/redac.

Research Forecast Dialog with SAS members

Mark Orr of the FAA Safety Management and Research Planning Division led the review of research forecast dialog. During this session, attendees continued the dialog to better understand SAS research forecast inputs from the March 2022 meeting. The SAS research forecast inputs include SAS comments on Fire Safety and Research; Propulsion and Fuel Systems; Advanced Materials/Structural Safety; Continued Airworthiness; Digital System Safety; Aircraft Icing; Alternative Fuels for General Aviation; Aeromedical Research; Flight deck, Maintenance, and System Integration Human Factors; Aeromedical Research; System Safety Management; Terminal Area Safety; and Unmanned Aircraft Systems. The FAA plans to use SAS members' comments and industry perspectives received during this session along with other information to update its research portfolio.

Day 2 – March 1, 2023

Research Forecast Dialog with SAS members (continued from Day 1)

During this session, attendees continued the dialog to better understand SAS research forecast inputs from the March 2022 meeting. On Day 2, the focus was on Aeromedical Research; Flight deck, Maintenance, and System Integration Human Factors; Aeromedical Research; System Safety Management; Terminal Area Safety; and Unmanned Aircraft Systems. The FAA plans to use SAS members' comments and industry perspectives received during this session along with other information to update its research portfolio.

Safety Continuum as Applied on Type Certification

Bruce DeCleene, Deputy Director of FAA's Policy and Innovation Division, briefed attendees on applying safety continuum on type certification. The safety continuum spans the acceptable levels of safety risk across all aviation sectors. It illustrates different levels of acceptable risk for different types of aircraft and operations. The FAA uses the safety continuum to regulate, certify, and conduct surveillance. DeCleene presented current FAA guidance on the applied safety continuum. A copy of Mr. DeCleene slides is available at the FAA's REDAC website at http://www.faa.gov/go/redac.

FAA Budget Update

Elizabeth Delarosby, Manager of Research, Engineering, Development (R,E&D) Budget Formulation Section (ABP-310), presented the FY23 budget for FAA's R,E&D. Delarosby mentioned that The House of

Representatives and The Senate funded FAA's R,E&D at $260.5 million and $266.1 million, respectively. However, the enacted budget signed on December 29, 2022, funded R,E&D at $255 million. Delarosby briefed attendees on the House and Senate language in the enacted 2023 budget.

The budget target levels for FY25, FY26, FY27, and FY28 are yet to be determined. Delarosby mentioned that the current FAA Authorization legislation signed by the President on Oct 5, 2018 extends the authorization through September 30 2023. A copy of Delarosby's slides is available at the FAA's REDAC website at http://www.faa.gov/go/redac.

Improving Aviation Safety through Remotely Piloted Aircraft Technology

Mr. Brandon Suarez, Co-Chair of RTCA SC-228, Minimum Performance Standards for Uncrewed Aircraft Systems, briefed attendees on digital flight (DF) operation. Suarez reviewed recent activities in government and industry to demonstrate gathering momentum for DF. He then focused on the need for digital flight rules (DFR). The need for DFR is due to the gap between Visual Flight Rules (VFR) and Instrument Flight Rules (IFR). VFR provides operational freedom but limits low visibility operations while IFR allows low visibility operations but limits operational freedoms; and that both significantly rely on human decision-making to cover everything not explicit in the rules.

He then described the benefits of DFR, i.e., aircraft operating under DFR operate like VFR without natural human vision on board and it would greatly increase the number of missions able to be conducted by Unmanned Aircraft System (UAS) and Advanced Air Mobility (AAM). Suarez mentioned that the REDAC can provide endorsement of the DFRs Concept to FAA and NASA; can support FAA R&D efforts on enabling technology and capabilities; and can continue to show interest in the topic, requesting briefs from NASA, FAA, R&D, and Industry proponents. A copy of Mr. Suarez slides is available at the FAA's REDAC website at http://www.faa.gov/go/redac.

Commercial aviation safety culture

Dr. Amy Pritchett of the Pennsylvania State University briefed attendees on emerging safety trends in aviation. This study is being conducted in response to the Consolidated Appropriations ACT of 2021
SEC. 132. Emerging Safety Trends in Aviation.

Year 1 study objectives were: a high-level assessment of domestic public and private sources of data and analysis methods for assessing emerging risks, and to identify approaches the committee will pursue in subsequent biennial reports to identify emerging aviation safety trends. Dr. Pritchett presented the analysis process used for assessment of data sources and processes and in turn she summarized the study findings.

Potential sources of new emerging safety trends include: *changing business models* such as pilot and staff training; experience in safety; *climate* such as extreme weather; alternate fuel; *new technologies* such as additive manufacturing; *new entrants* such as UAS, AAM; and *increasingly complex systems* such as autonomy and software inter-dependencies. A copy of Dr. Pritchett slides is available at the FAA's REDAC website at http://www.faa.gov/go/redac and the report Dr. Pritchett referred to is available at the Transportation Research Board site, https://www.trb.org/Main/Blurbs/182796.aspx.

Closeout Discussion

Paglione and McVenes led the close-out discussion, including potential findings and recommendations in the area of: applications of wearable sensors, physiological monitoring, and “scalable autonomy” to aviation operations and safety; cyber resiliency for digital safety systems; use of digital twin systems; and hydrogen powered propulsion. Attendees decided to hold the Summer/Fall meeting on August 8-9 at the FAA William J. Hughes Technical Center and to hold the Winter/Spring meeting at to-be-determined location on March 12-13, 2024.

Appendix 1

Attendee Sign-In Sheets (Day 1)

Hossein Eghbali	Rick Whedbee	Doug Rodzon
Mike Paglione	Jerry Crutchfield	Kathy Abbott
Matt Teyssier	Jeff Warner	Paul Strande
John Crowley (SAS Member)	Rany Azzi	Thomas A Van Dillen
Chuck Perala	James Layton	Patrick Kong
Dhaval Dadia	Tracy Lamb	Larry McDonald
Frank Wondolowski	Kendall Laster	Jeff Gardlin
Hank Marek	Danielle Stephens	Ezgi Oztekin
Trung Pham	Srini Mandalapu	Carla Hackworth
Thomas Nesthus	Jimmy	Hector Rea
Jonathan M Doyle	Paul Tan	Ahmet Oztekin
Daniel Keslar	Eric Neiderman	Beth Delarosby
Richard Hill	Lindsey Anaya	Lynn Pham
Kevin Stonaker	Steven Rehn	Huasheng Li
Monique Moore	Tong Vu	Tara (Holmes) Gibson
Tina Emami	Chris Dumont	Rich Golden
Manuel Rios	Isidore Venetos	Richard Ji
Dan Dellmyer	Todd Lewis	Robert J McGuire
Caprice Brown	Yongzhe Tian	Carleen Houston
Frank Hahn	Daniel Cordasco	Warren Underwood
Ken Alexander	Thomas Maloney	Andrew Cheng
Frank Hahn	Bill Kaliardos	Dave Stanley
Rob Steinle	Don Kauffman (Honeywell)	Traci Stadtmueller
Kenneth Allendoerfer	Robert Ellis	Somil Shah
John Bakuckas	Steve Summer	Lisa Smith
Mark Orr	Okoineme Giwa-Agbomeirele	Anita Murugesan
Tracy Lamb	Tom Dolan	Eddie Austrian
Andrew Ferraro	Hao Ren	Sohrob Mottaghi
Cristina Tan	Drew Stewart (Honeywell)	Robert Ireland
Walt Sippel	Thandava Edara	Aeon S Brown
Srivatsan Varadarajan (Honeywell)	Anthony Long	Joseph Pellettiere
Devesh Bhatt	Edward Weinstein	Larry Ilcewicz
Katrina Avers	Tom Flournoy	Sohrob Mottaghi
Cindy Ashforth	Richard E Lyon	Anthony Tvaryanas
Jorge Fernandez	John Mixon	Muharrem Mane
Dan Diessner (SAS member)	Sabrina Saunders-Hodge	Bimal Aponso
Todd Truitt	Maria DiPasquantonio	Tim Owen
Edward Johnson	Ansel S James	

Attendee Sign-In Sheets (Day 2)

Hossein Eghbali	Tim Salter	Srini Mandalapu
Daniel Diessner (SAS Member)	Ezgi Oztekin	Caprice Brown
Frank Wondolowski	Mark Hale	Mike Paglione
Jeff Warner	Eddie Austrian	Timothy G Smith
Patrick Kong	Rany Azzi	Todd Truitt
Jimmy Bruno	Matthew Teyssier	Anthony Tvaryanas
Steven Rehn	Edward Johnson	Jorge Fernandez
Trung Pham	Jerry Crutchfield	Chuck Perala
Doug Rodzon	Mark Orr	Manuel Rios
Thomas Maloney	Victor Quach	Carla Hackworth
Rich Golden	Andrew Ferraro	Sohrob Mottaghi
Kevin Stonaker	Tara Gibson	Hector Rea
Todd Lewis	John Bakuckas	Susan Jay
Jeff Gardlin	Danielle Stephens	Ken Alexander
Lynn Pham	Muharrem Mane	Akbar Sultan (SAS Member)
Tracy Lamb	Dave Galella	Okoineme Giwa-Agbomeirele
Joseph Pellettiere	Scott Nicholson	Don Kauffman (SAS Member)
Robert Ireland (SAS Member)	Trish Ververs	David Moorcroft
Robert Ireland	Isidore Venetos	Russell J Lewis
Andrew Cheng	Bill Kaliardos	Cory Yeager
Paul Strande	Steve Summer	Kyle Copeland
Larry McDonald	Cliff Johnson	Barbara Holder
Huasheng Li	Vicki Ahlstrom	Tim Marker
Vasudeva Kolli	Somil Shah	Lisa Smith
David Weed	Dhaval Dadia	Aeon S Brown
Daniel Keslar	Ahmet Oztekin	Daniel Cordasco
Bob McGuire	Carleen Houston	Andrew Cheng
Tom Flournoy	Dan Dellmyer	Stafford G Duncan
John Mixon	Lisa Thomas	Grant Morfitt
Robert Ellis	Tong Vu	Walt Sippel
Katrina Avers	Traci Stadtmueller	Rob Steinle
Sabrina Saunders-Hodge	Bimal Aponso	Matt Shea
Beth Delarosby	Chris Dumont	Sumnima Gautam
Richard E Lyon	Hank Marek	Adrienne Choi
Chris Dyer	Sohrob Mottaghi	Amy Ruth Pritchett
Tracy Lamb	Scott Chapman	John Reba

Appendix II

2023 Spring REDAC SAS Meeting
Agenda
Feb 28 – March 1, 2023

Location: RTCA HQ Located at 1150 18th St NW Suite 900, Washington, DC 20036
Zoom: Click to Join: https://faavideo.zoomgov.com/j/1603749540
Passcode: 298041
Phone Audio Only: Call 1-888-924-3239; enter Meeting ID: 160 374 9540; Passcode: 298041

Feb 28 (Tuesday)		
0800 - 0815		Arrival to virtual meeting/ RTCA Conf. room
0815 - 0825	Opening Remarks	Eric Neiderman (WJHTC Deputy Director)
0825 - 0835	Opening remarks/Purpose of the Meeting	Mike Paglione (Acting FAA DFO)
0835 - 0845	SAS Chair Opening & Report on REDAC Meeting	Terry McVenes (SAS Industry Chair)
0845 - 0915	Overview of August 2022 F&Rs	Mike Paglione/Terry McVenes
0915 - 1000	Update on SAS F&R titled "Detail Phased Roadmap for Artificial Intelligence (AI) and Machine Learning (ML)"	Dr. Trung T. Pham
1000 - 1015	Comfort Break	
1015 - 1030	Introduction to research forecast dialog	Mark Orr/ Mike Paglione
1030 - 1200	Domain: Aircraft Safety Assurance • Fire and Safety Research • Propulsion and Fuel Systems (including Aircraft Catastrophic Failure) • Advanced Materials/Structural Safety • Continued Airworthiness	FAA/SAS dialog
1200 - 1300	Lunch Break	
1300 - 1330	Continue – Domain: Aircraft Safety Assurance domain discussion	FAA/SAS dialog
1330 - 1530	Domain: Digital Systems and Technologies • Digital System Safety	FAA/SAS dialog
1530 - 1545	Comfort Break	
1545 - 1600	Domain: Environment and Weather Impact Mitigation • Aircraft Icing • Alternative Fuels for General Aviation	FAA/SAS dialog
1600 - 1630	SAS F&R discussions and feedback (Day 1)	SAS members
1630 - 1645	First Day Review – Homework Assignments	Mike Paglione /Terry McVenes
1645	Adjourn	

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March 1 (Wednesday)

0800 - 0815		Arrival to virtual meeting/ RTCA Conf. room
0815 - 0845	Review of homework from first day	All
0845 - 1045	Domain: Human and Aeromedical Factors • Aeromedical Research • Flight deck/Maintenance/System Integration Human Factors	FAA/SAS dialog
1045 – 11:00	Comfort Break	
11:00 - 11:30	Domain: Aviation Performance and Planning • System Safety Management/Terminal Area Safety • Unmanned Aircraft Systems	FAA/SAS dialog
1130 - 1200	Safety continuum as applied on type certification	Bruce DeCleene
1200 - 1300	Lunch Break	
1300 - 1330	FAA Budget Update	Beth Delarosby
1330 - 1415	Improving Aviation Safety through Remotely Piloted Aircraft Technology	Brandon Suarez from Reliable Robotics
1415 - 1430	Comfort Break	
1430 - 1515	Commercial aviation safety culture	Amy Pritchett Pennsylvania State University
1515 - 1545	SAS F&R discussions and feedback (Day 2)	SAS members
1545 - 1600	Closing remarks	Terry McVenes/ Mike Paglione /Mark Orr
1600	Adjourn	