

RTCA- 228
Summary of Plenary #26- RTCA Paper No. 296-20/SC228-078
VIRTUAL
11:00 AM EST, October 30, 2020

The twenty-sixth plenary of RTCA Special Committee 228 was called to order by SC-228 Co-Chair, John Moore at 11:00AM (EST) on October 30, 2020 using WebEx audio and web conferencing only due to COVID-19 restrictions.

1. Agenda Item #1- Call to Order: Welcome
 - 1.1. John Moore, co-chair welcomed everyone to the Plenary and stated the purpose of the out of cycle meeting was to approve two documents to the PMC and one document to enter FRAC. We will also have a briefing on MOSAIC and the FRAC process. John called for new business and no one had anything to add.
2. Agenda Item #2- Review RTCA meeting guidelines
 - 2.1. Al Secen welcomed everyone.
 - 2.2. Al reviewed the Anti-Trust Policy, the Proprietary Policy and the RTCA Committee Participation Membership Policy
 - 2.3. Al also briefed some meeting tips to ensure a successful virtual meeting
 - 2.4. Al then briefed self-rostering feature online at <https://workspace.rtca.org/kws>. Thank you to all who self-roster!
3. Agenda Item #3- Opening remarks/ introductions
 - 3.1. John stated there are currently 148 unique organizations and 694 registered members.
 - 3.2. Matt Spanos, Transport Canada was welcomed as the new WG1 secretary.
 - 3.3. James Foster, FAA was welcomed as the new WG3 co-chair.
 - 3.4. All attendees introduced themselves; the list of session participants is listed in Appendix A
 - 3.5. John recognized Dr. Ray Young's passing, and his support, accomplishments and contributions to RTCA and industry
4. Agenda Item #4- Approve meeting minutes from Plenary Meeting #25
 - 4.1. Christina Westover stated there were no comments received. There was a call for motion to approve meeting minutes from the last plenary
 - 4.2. John called for a motion to approve the minutes. Mark Reed moved to approve the minutes, Rose seconded.
 - 4.3. There we no objections noted, minutes approved.

5. Agenda Item #5- WG2: Approval to Exit FRAC for C2 Link MOPS (Terrestrial) DO-362A
 - 5.1. Jim Williams, co-chair presented what would be covered and introduced Tyler Barney who shared the status below.
 - 5.2. Key take-aways
 - 5.2.1. Non-concur and high comments resolved
 - 5.2.2. Medium, Low, and Editorial comments resolved or have path forward
 - 5.2.3. Six test procedures missing, FAA has agreed to be defined in TSO
 - 5.2.4. Significant reorganization done to co-locate related content
 - 5.2.4.1. Frequency management content moved from sections 1 & 2 into appendix V
 - 5.2.4.2. Changes are minor other than relocating content
 - 5.2.5. All non-concur resolutions confirmed by comment submitters
 - 5.3. Non-Concurs
 - 5.3.1. Broadened scope of section 1 to not assume a specific solution for how a pilot remains in contact with ATC/CTAF
 - 5.3.2. Reworded 2.1.x requirements to ensure requirements are verifiable/testable
 - 5.3.3. Expanded equipment class definitions to clearly identify all allowed types and clarify meanings
 - 5.3.4. Improved operating limitations with specific tolerances on all numerical requirements
 - 5.3.5. Removed requirements outside the scope of datalink MOPS requirements
 - 5.3.6. Removed some text that incorrectly stated the intent of section 2 (lines 1211-1214)
 - 5.3.7. Improved test methodology; removed test methods the FAA agreed to produce in TSO; added content so select test procedures; Identified work to include in rev B
 - 5.3.8. Removed left over content related to L-band systems; DO362A does not support L-band systems
 - 5.3.9. Expanded installed equip. requirements to address co-existence w/ AeroMACS
 - 5.3.10. Moved required content to appendix V to locate all frequency/channel management content together. Outside MOPS scope, but important reference
 - 5.3.11. Corrected sensitivity & related specifications from previous analysis
 - 5.4. Resolution Summary
 - 5.4.1. General cleanup
 - 5.4.2. Fixed various tables, formatting issues, typos, misleading jargon, added missing references & clarifications, etc.
 - 5.4.3. Added vulnerabilities section based on examples
 - 5.4.4. Removed unnecessary requirements outside of MOPS scope
 - 5.4.5. Clarified certain requirements to ensure they are testable and verifiable

- 5.4.6. Significant re-organization of sections 2.1.18-2.1.24 (see NC comment on App V)
- 5.4.7. Move content related to frequency assignments into Appendix V
- 5.4.8. Better defined transmit characteristics to avoid ambiguity in requirements
- 5.4.9. Identified scope deferred to rev B, in addition to planned work
- 5.4.10. Corrected emissions mask and related requirements, diagrams, info, etc
- 5.4.11. Identified test procedures sections for the FAA to include within TSO non-concur & related high
- 5.4.12. Aligned requirements between GMSK and QPSK for consistency
- 5.4.13. Installed equipment requirements clarified (section 3.2)
- 5.4.14. Cleanup in appendices
- 5.4.15. Better defined transmit characteristics to avoid ambiguity in requirements
- 5.4.16. Identified scope deferred to rev B, in addition to planned work
- 5.4.17. Corrected emissions mask and related requirements, diagrams, info, etc
- 5.4.18. Identified test procedures sections for the FAA to include within TSO non-concur & related high
- 5.4.19. Aligned requirements between GMSK and QPSK for consistency
- 5.4.20. Installed equipment requirements clarified (section 3.2)
- 5.4.21. Cleanup in appendices
- 5.5. Request Consensus from the Plenary
 - 5.5.1. Request approval of the SC-228 Plenary to Exit FRAC for DO-362A “Command and Control (C2) Data Link Minimum Operational Performance Standards (MOPS) (Terrestrial)”
 - 5.5.2. Subject to incorporation of all resolved comments as agreed during WG-2 discussions held 10/26-10-29 2020.
- 5.6. DO-362A Post Plenary Schedule
 - 5.6.1. All FRAC resolutions implemented NLT 11/5 COB
 - 5.6.2. Section leads review week of 11/9
 - 5.6.3. Submit any changes to Donna NLT COB 11/11
 - 5.6.4. Only Donna will accept document changes
 - 5.6.5. Comment spreadsheet completed NLT 11/13
 - 5.6.6. Section leads must ensure all comments have been implemented and inform Donna comment implementation complete
 - 5.6.7. Submit to RTCA on 11/14, RTCA submit to PMC by 11/17
 - 5.6.8. Intent is to have cover to cover review by editorial team between 11/17 - 12/11
- 5.7. Jim asked for any questions and there were none. Jim made a motion to approve document to the PMC and Exit FRAC. John called for any questions/clarifications. John seconded the motion and the document was approved to the PMC.

- 5.7.1. Martin Kearny Fischer requested future document updates include an appendix or supplemental document to provide a differences report from the revisions. Bruce Eckstein suggested the section two requirements might be the only feasible place to track changes.
- 5.7.2. AI stated he would bring this up at the December PMC.
6. Agenda Item # 6- Working Group 2 Update
 - 6.1. Jim shared the current WIP
 - 6.1.1. DO-362A Command and Control (C2) Data Link MOPS (Terrestrial) FRAC complete
 - 6.1.2. DO-377A C2 Link Systems MASPS work ongoing and on track for entry into FRAC in January 2021
 - 6.1.3. AeroMACS – SC-223 Plenary Meeting Next Week to propose solution to the SC for a MOPS update to resolve the issues – PMC approval required
 - 6.1.4. LTE C2 Link System MOPS planning is in process
 - 6.1.4.1. Discussions with GUTMA/GSMA Airborne Connectivity Joint Activity group continuing
 - 6.1.4.2. Discussions with EUROCAE WG-105 on the possibility of a joint MOPS ongoing
 - 6.1.4.3. PMC authorization required for joint document & possible schedule change
7. Agenda Item # 7- DO-365B Exit FRAC- Approval to PMC
 - 7.1. Don Walker started by sharing the history of DO-365
 - 7.1.1. Original content included: Operational environment includes Class D/E/G transit to/from Class A or Special Use Airspace; also known as “En-Route Operations”; Class 1 and Class 2; Remain Well Clear function with optional Collision Avoidance function (TCAS II). TCAS II supports vertical Resolutions Advisories from Active Surveillance sensor. Surveillance sensors include Active Surveillance, ADS-B IN, and Air-to-air Radar (ATAR)
 - 7.1.2. DO-365A included everything from DO-365 plus: Updates operational environment to includes departures/ straight-in approaches into Class C/D/E/G airspace and transit through Class B airspace. Includes Class 5, requirements for alerting and guidance for “Terminal Area Operations” functionality. Updates to surveillance sensors include a Ground-Based Surveillance System (GBSS) and ground-based ADS-B IN; allowing for Class 6, 7, and 8 DAA systems.
 - 7.1.3. DO-365B Changes include: Everything from DO-365A. Includes Class 3 (ACAS Xu); including both horizontal and vertical Resolution Advisories from all sensor types (for En Route use only) New Non-cooperative well clear definition applicable to all classes (Expands the ownship speed envelope to 250 KIAS (ATAR Class A1)). Updates to surveillance sensors include ATAR class designation (Class A1, A2, A3, B)
 - 7.2. Three non-concurs and resolution summaries

- 7.2.1. Northrup Grumman wanted to expand the language around a single navigation source providing all position/velocity state data.
 - 7.2.1.1. Resolution: "For all of the following ownship parameters, the UA DAA processor shall (020) (1) use the data produced by a single navigation source for a single time epoch, or (2) use data from multiple navigation sources in a way that ensures a common time of applicability of the solution within 50 ms."
- 7.2.2. NASA desired additional validation of the alternate late alert criteria for Non-cooperative DWC (and by association Terminal DWC)
 - 7.2.2.1. Resolution: NASA modeling and simulation to provide a new alternate late definition and associated test procedure changes by Nov 6
- 7.2.3. Airbus stated that requirements were missing for the display and guidance cases where ownship vertical performance could not meet ACAS Xu vertical commands
 - 7.2.3.1. Resolution: JHAPL & MITLL to provide new guidance requirement that displays bands consistent with ownship vertical performance
- 7.2.4. DO-365B FRAC Resolution Schedule
 - 7.2.4.1. FRAC resolution open items complete, November 6
 - 7.2.4.2. Editing complete, November 17
 - 7.2.4.3. WG1 quality control check complete, December 2
- 7.2.5. DO-365B Approval to Exit FRAC
 - 7.2.5.1. Don asked plenary for approval. Mark Reed made a motion, Jim Williams seconded. Motion passes to PMC upon completion of minor edits outlined above.
 - 7.2.5.2. John Called for any questions or concerns, there were none.
- 8. Agenda Item # 8- EO/IR MOPS- Approval to Enter FRAC
 - 8.1. Don continued with EO-IR status
 - 8.1.1. RAC : All comments resolved and document updated; last editorial verification to be done
 - 8.1.2. All appendices available
 - 8.1.3. Tests procedures updated
 - 8.1.4. FAA Tech Center is validating proposed EO/IR tracker performance proposed by Safran
 - 8.2. Technical Highlights
 - 8.2.1. Tracker integrated in the EO/IR sensor; sensor provides position, velocities, and uncertainties in sensor body frame. DO-365 will need to provide transformation to aircraft reference frame
 - 8.2.2. Clarified operational assumptions and applicable atmospheric conditions with quantified criteria
 - 8.2.3. Two classes of equipment defined (day and day/night)

- 8.2.4. Performances requirements adapted to EO/IR characteristics, Declaration Range, Accuracy requirements adapted to image processing capabilities, and verified vs safety metrics.
- 8.2.5. Bruce Eckstein asked how many classes of DAA equipment; Don replied seven.
- 8.3. EO/IR MOPS FRAC Schedule
 - 8.3.1. Editing complete, December 2
 - 8.3.2. FRAC, December 9- January 15
 - 8.3.3. Mark Reed asked which PMC this will be presented, Don and John replied March
- 8.4. EO/IR FRAC Approval to Enter FRAC
 - 8.4.1. Don requested the plenary approve this document to enter FRAC.
 - 8.4.2. Motion made by Don and seconded by Mark Reed. Motion passes to enter FRAC. John called for any final questions/comments and there were none.
9. Agenda Item # 9- WG1 Update
 - 9.1. GBSS MOPS will be the next documented revision. FAA support is needed.
 - 9.2. Don requested a discussion of the Phase 3 workstatement at next Thursday's leadership team.
 - 9.3. Example, once EO/IR MOPS is approved, DO-365B will need to be revised to include use of EO/IR.
 - 9.4. Don called for any general WG1 questions and there were none.
10. John called for a 10 minute break at 1:10 PM EST; plenary resumed at 1:20 PM EST.
11. Agenda Item # 10- MOSAIC Overview
 - 11.1. Jim Newberger, from the FAA presented
 - 11.2. Project Motivations
 - 11.2.1. As the Small UAS Rule (14 CFR Part 107) was taking shape, the large step from that rule to type & production certification (TC/PC) was evident
 - 11.2.2. Began sketching out proposals in 2016
 - 11.2.3. Congressional mandates:
 - 11.2.3.1. Integrate unmanned aircraft into the NAS; aligned with our approach – reliance on industry consensus standards
 - 11.2.3.2. Enable ops of space support vehicles (aircraft); aligned with our intent for broader amendment of rules for special airworthiness certification
 - 11.3. Objective
 - 11.3.1. Enable safe expansions of “medium-risk” aviation by improving the alignment of certification standards/procedures with risk for manned & unmanned aircraft
 - 11.4. Boundaries

- 11.5. New path to authorize ops of UAS via a special airworthiness certificate based on SOC to consensus standards
- 11.6. Risk-based eligibility generally reflects JARUS SORA-Open/Specific/Certified: Low/Medium/High risk
- 11.7. Does not require: Issuance of a type certificate (TC) for the UAS; Certified equipage
- 11.8. Operations
 - 11.8.1. VLOS operations under parts 91 & 137 without waivers
 - 11.8.2. Continues to rely on Part 91 waivers for BVLOS ops
 - 11.8.2.1. Don asked for clarification regarding part 91 VLOS and when BVLOS waivers are considered. Jim stated the FAA has provided many waivers, but has not published any guidance regarding conditions for waiver approval.
 - 11.8.3. Part 135 not being amended under MOSAIC
 - 11.8.4. Carriage of people prohibited
- 11.9. Key Milestones
 - 11.9.1. Sep 2020 – draft NPRM; Team met this milestone in August
 - 11.9.2. Early 2022 – publish NPRM
 - 11.9.3. Sep 2023 – publish Final Rule; Driven by FAA Reauthorization Act
- 11.10. Special thanks to Jim for joining us today and presenting. Jim took the action to get the answers to two question regarding the ARC and part 91 Waivers. Those answers are below.
 - 11.10.1. Concerning whether the MOSAIC team considered prior ARC recommendations, yes, the ARC’s recommendations were the basis for the part 91 amendments to allow any UAS to comply with the intent of part 91 rules. The preamble will refer to the related ARC proposals.
 - 11.10.2. Concerning the ongoing need for part 91 waivers to enable BVLOS operations, the waiver process will remain unchanged from what it is today. The preamble will include some discussion of waivers for BVLOS-desired ops.

12. Agenda Item # 11- Review FRAC Process

- 12.1. Final Review and Comment overview
 - 12.1.1. The SC confirms in Plenary that the proposed final draft document is “mature” and ready for FRAC
 - 12.1.2. The FRAC period is usually a of minimum 30 days (usually 45 days for joint documents)
 - 12.1.3. Comments filed using the Workspace commenting tool. Contact AI if you have any questions.
 - 12.1.4. The final list of comments and suggested resolutions are downloaded for presentation to the full committee

- 12.1.5. The SC approves the document (in next Plenary), as discussed, for forwarding to the PMC. The SC will not see the whole document again until it is published by RTCA
- 12.1.6. The document is forwarded to the Program Director (PD) for review and final editing at least 45 days before PMC
- 12.1.7. A courtesy review copy is distributed to the editorial committee and leadership for final committee review
- 12.1.8. PD forwards the draft document to the PMC Secretary to distribute to the PMC members at least 30 days before the PMC meeting
- 12.2. FRAC Timeline
 - 12.2.1. FRAC opens>FRAC duration is about 30-45 days> Editorial team> Close FRAC @ Plenary> Final edits and review> Submit to PMC 30 days prior to scheduled PMC meeting date
- 12.3. Comment Priority Types
 - 12.3.1. Non-concur – Commenter believes document is fundamentally flawed.
 - 12.3.1.1. All reminded everyone to use non-concur sparingly. Once your non-concur is resolved, you must send an email to WG chairs and RTCA acknowledging the resolution
 - 12.3.2. High - Commenter feels the document has a major error
 - 12.3.3. Medium - Commenter feels the document has a minor error
 - 12.3.4. Low - Commenter feels the document can be slightly improved
 - 12.3.5. Editorial - Commenter has found grammatical errors

13. Agenda Item #12- WG3 Update

- 13.1. Randy Willis provided status and was encouraged people are wanting to join this working group.
- 13.2. Anticipated start is Q1 2021.

14. Agenda Item #13- WG4 Update

- 14.1. Joel Wichgers provided status.
- 14.2. Co-Chairman for this working group have been identified- Joel Wichgers and Matt Harris
- 14.3. Seek support from a volunteer to assist in the “secretary” role
 - 14.3.1. If you would like to volunteer, please contact the WG4 co-chairs
 - 14.3.2. If no volunteers, then co-chairman will also cover the “secretary” role
- 14.4. WG4 planning to launch in 2021 after DO-304A update is completed
 - 14.4.1. Note that FRAC completion of DO-304A is currently planned for April 28, 2021
 - 14.4.2. Mark Reed inquired about the TOR, John stated the TOR was published on the RTCA workspace.

15. Agenda Item # 14- Ad Hoc WG Update

- 15.1. John stated the Phase 3 TOR was approved by PMC on June 11, 2020
- 15.2. DO-304 Update
 - 15.2.1. Minor edits required in the main document with most of the updates in Appendix F, the UAS missions/CONOPS
- 15.3. Team Organization
 - 15.3.1. Overall leadership of the Ad Hoc is the Plenary Leadership Team
 - 15.3.1.1. John R. Moore, Collins Aerospace
 - 15.3.1.2. Brandon Suarez, GA-ASI
 - 15.3.1.3. Christina Westover, Boeing
 - 15.3.2. Systems Team
 - 15.3.2.1. Will Johnson, NASA
 - 15.3.3. Operations Team (further divided into scenario writing teams)
 - 15.3.3.1. Fabrice Kunzi, GA-ASI
 - 15.3.3.2. Erin Roesler, Northern Plains UAS Test Site (NPUTS)
 - 15.3.4. Editorial Team
 - 15.3.4.1. Leadership is Plenary Leadership Team- John, Brandon and Christina
- 15.4. Scenario Status provided by Fabrice Kunzi
 - 15.4.1. HAPS
 - 15.4.1.1. Lead: HAPS Mobile/Andy Thurling
 - 15.4.1.2. Starting with SkyTower ConOps (2017)
 - 15.4.1.3. Currently working through Assumptions and Constraints
 - 15.4.2. Linear Survey
 - 15.4.2.1. Lead: GA-ASI/Andrew Videmsek
 - 15.4.2.2. Starting with Business Case Analysis to identify viable mission and viable platform
 - 15.4.2.3. ConOps draft expected next week
 - 15.4.3. Part 135 Large UAS Cargo
 - 15.4.3.1. Lead: UPS and FedEx/John Pass and Terry Jones
 - 15.4.3.2. Starting with review of Joint Task Analysis (?)
 - 15.4.3.3. Broad industry engagement; existing ConOps documents
 - 15.4.4. UAM
 - 15.4.4.1. Lead: Wisk/Phil Coyle
 - 15.4.4.2. Draft ConOps published; First review next week
 - 15.4.5. John called for questions. Bruce asked, where will the analysis occur if 228 is not the committee to address identified gaps? Will Johnson stated he will provide recommendations to the committee leadership.

16. Agenda Item # 15- New Business

- 16.1. Upcoming Plenaries for 2021
 - 16.1.1. 28 January 2021 - 27th Plenary

- 16.1.1.1. EO/IR MOPS Exit FRAC
- 16.1.1.2. DO-377A Enter FRAC
- 16.1.1.3. DO-304A Enter FRAC (First document of Phase 3)
- 16.1.2. 15 April 2021 - 28th Plenary
 - 16.1.2.1. DO-377A Exit FRAC
 - 16.1.2.2. DO-304A Exit FRAC
- 16.1.3. 16 July 2021 - 29th Plenary
- 16.1.4. 14 October 2021 - 30th Plenary

17. Agenda Item # 16- Adjourn

- 17.1. John Called for any final questions/comments, there were none.
- 17.2. Meeting adjourned at 2:37 PM EST.

List of SC-228 Leaders

John Moore	SC-228 Co-Chair	Collins Aerospace
Brandon Suarez	SC 228 Co-Chair	General Atomics Aeronautical Systems, Inc
Don Walker	SC-228 WG1 for DAA, Co-Group Lead	A3 by Airbus
Fabrice Kunzi	SC-228 WG1 for DAA, Co-Group Lead	General Atomics Aeronautical Systems, Inc.
Matt Spanos	SC-228 WG1 for DAA, Secretary	Transport Canada
Steve Van Trees	SC-228 GAR, WG2 for C2, Co-Group Lead	FAA, AIR-130
Jim Williams	SC-228 WG2 for C2, Co-Group Lead	Unmanned Solutions
Lee Nguyen	SC-228 WG2 for C2, Secretary	FAA
Al Secen	SC-228 Program Director	RTCA
Christina Westover	SC-228 Secretary	Boeing
Randy Willis	SC-228 WG3 for Lost Link, Co-Group Lead	Northrop Grumman
James Foster	SC-228 WG3 for Lost Link, Co-Group Lead	FAA
<i>TBD</i>	<i>SC-228 WG3 for Lost Link, Secretary</i>	<i>TBD</i>
Joel Wichgers	SC-228 WG4 for Navigation, Co-Group Lead	Collins Aerospace
Matt Harris	SC-228 WG4 for Navigation, Co-Group Lead	Boeing
<i>TBD</i>	<i>SC-228 WG4 for Navigation, Secretary</i>	<i>TBD</i>

Appendix A- List of SC-228 Plenary Participants

ATTENDEES

Company	Name
A3 by Airbus	Don Walker
ACES, Inc.	Alfonso Malaga Michael Neale
Adaptive Aerospace Group	Jack Devin Keith Hoffler
ALPA	Mark Reed
Aircraft Owners & Pilots Association (AOPA)	
AiRXOS	
Archangel Aero	Rose Mooney
ARCON Corporation	Siva Sivananthan
Avionics International	
Bihrl Applied Research, Inc.	
The Boeing Company	Cesar Suarez Christina Westover John Vian Martin Kearney-Fischer Tim Murphy
Calhoun Analytics	
Capital Sciences, LLC	
Cavan Solutions	
Cobham Aerospace Communications	
Collins Aerospace	Joel Wichgers John Moore Randy Jacobsen Tyler Barney
COMAC	
Constellation Aviation Solutions, LLC	
Esterline CMC Electronics	Jean-Pascal Joary
Electronics & Navigation Research Institute (ENRI)	
Federal Aviation Administration (FAA)	Bart Angle David Chen Don Nellis Ferne Friedman- Berg James Newberger Lee Nguyen Matt Haskin Paul Campbell Peter Georgiou Ravi Jain Ray Mei Rose Merchant- Bennett Ruth Hirt Shelia Mariano

Company	Name
	Steve Van Trees Stuart Searight Tony Long
Federal Communications Commission (FCC)	Tim Maguire
FedEx	
FirebirdSe LLC	Bruce Eckstein
Garmin LTD.	Ben Peetz
GE Aviation	

General Atomics Aeronautical Systems, Inc	Andrew Videmesk Brandon Suarez Fabrice Kunzi Naiei Askar Tim Grebe TojumiOluwa Adegbyega Xaviar Aloysius Redondo
Honeywell International, Inc.	David Counts Jan Prokopec Ruy Brandao
Information Systems Delft	Erik Theunissen
INMARSAT	Kristen Mineck
Iridium	Joseph Darden
Japan Radio Air Navigation Systems Association	Hiroshi Okochi
JHW Unmanned Solutions, LLC.	Jim Williams
The Johns Hopkins University	Charles Leeper
Korea Advanced Institute of Science	Sam Smearcheck
L3Harris	Jessica Sagar
Ligado Networks	
MIT Lincoln Laboratory	Maria Picardi Kuffner Matt Edwards Randal Guendel
The MITRE Corporation	Laine D'Augustine
Mitsubishi Research Institute	Takeshi Tomoda
Mosaic ATM, Inc	Todd Kilbourne
NASA	Aaron Dutle Clint St. John Conrad Rorie Donna Clements Doug Wada Elliot Lewis Gilbert Wu Jack Connolly Kurt Shalkhauser Kurt Swieringa Mohamad Refai Summer Brandt William Johnson
Near Earth Autonomy, Inc	Justin Mackay
NextNav	Ashu Pande
National Oceanic and Atmospheric Administration (NOAA)	John Coffey
Northeast UAS Airspace Integration Research Alliance (NUAIR)	Andrew Thurling
Northern Plains UAS Test Site	Erin Roesler
Northrup Grumman Corp	Randy Willis

Raytheon	Robert Stamm
RDRTec, Inc.	
Regulus Group	Bill Benner Shelly O'Leary
Reliable Robotics	
RTCA	Al Secen
Sagem Avionics, Inc.	
SAIC	
San Jose State University Foundation	
Square Peg	
S-Tec	
Thales Group	
Technology Providers, Inc.	Marvin Hammond
Transport Canada	Matthew Spanos Tom Hastie
uAvionx	
Uber Elevate	Greg Belaus
US Air Force	
US Navy	
Washington Cord	
Xwing, Inc	Anna Dietrich
Unknown Affiliation/ Not Active	Steven Bretmerksky