

RTCA- 228
Summary of Plenary #27 RTCA Paper No. 025-21/SC228-081
VIRTUAL
11:00 AM EST, January 28, 2021

The twenty-seventh plenary of RTCA Special Committee 228 was called to order by SC-228 Co-Chair, Brandon Suarez at 11:00AM (EST) on January 28, 2021 using WebEx audio and web conferencing only due to COVID-19 restrictions.

1. Agenda Item #1- Call to Order: Welcome
 - 1.1. Brandon Suarez, co-chair called the meeting to order and stated the purpose for today's plenary through a review of the agenda.
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. Brandon stated there are currently 151 unique organizations and 710 registered members.
 - 3.2. Mack Horton, LS Technologies, was welcomed as the new WG3 secretary.
 - 3.3. Andrew Videmsek, GA-ASI, was welcomed as the new WG4 secretary.
 - 3.4. The list of session participants is listed in Appendix A
4. Agenda Item #4- Approve meeting minutes from Plenary Meeting #26
 - 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. Christina called for a motion to approve the minutes. Jim Williams moved to approve the minutes, Will Johnson seconded.
 - 4.3. There we no objections noted, minutes approved.

5. Agenda Item #5- WG2: Update
 - 5.1. Jim Williams, co-chair presented
 - 5.2. Progress on C2 Link System MASPS
 - 5.2.1. All Sections and Appendices reviewed during this week's WebEx Sessions
 - 5.2.2. Almost all new content is complete and remaining sections should be complete in the next 2 weeks
 - 5.2.3. WG-2 Review and Comment period will take place for ~4 weeks in February-March
 - 5.2.4. April Quarterly sessions will finalize draft for Final Review and Comment (FRAC)
 - 5.2.5. April Plenary will request to approve for FRAC entry
 - 5.2.6. FRAC for 30 days in May-June with Exit FRAC planned for July Plenary
 - 5.3. First Phase 3 Task- C2 Link System MOPS for LTE Networks
 - 5.3.1. Current TOR for SC-228 requires standard for use of LTE commercial networks for C2 Link Systems used for type certificated UAS
 - 5.3.2. FRAC Completion Due Date - January 2023
 - 5.3.3. NOTE: Still seeking a document leader to coordinate with EUROCAE and manage RTCA input to standard
 - 5.3.4. Request to RTCA and EUROCAE to consider a joint document (scope, content and schedule)
 - 5.4. EUROCAE Plan for LTE MOPS
 - 5.4.1. EUROCAE will kick off their LTE activity during the first week of February
 - 5.4.2. Co-leads Lionel Clarisse from Thales and Boris Resnick from GLONAS Union
 - 5.4.3. 1st meeting they will confirm an intent to produce joint document with RTCA
 - 5.4.3.1. Will Johnson asked if a document editor is needed, Jim responded that this is more of a coordination role rather than a lead.
 - 5.4.4. Plan for Open Consultation mid-summer 2022 (FRAC equivalent)
 - 5.5. Plenary Action Requested
 - 5.5.1. Approve TOR change request to PMC approval to change LTE MOPS to joint document worked with EUROCAE WG-105. Agreement with EUROCAE WG-105 will be negotiated regarding the scope of the work and deliverable specifics
 - 5.5.2. Only this document will be jointly developed
 - 5.5.3. DO-377B will contain additional material to reflect lessons learned from developing the LTE MOPS
 - 5.5.4. Jim requested approval to go to PMC to jointly work this document. Ravi Jain is concerned there is not enough information to make a decision with technical and operational issues. Jim shared the work going on across industry organizations (telecom and aviation) and desire for an International LTE standard. Brandon shared that the 228 and 105 WG leads have been

meeting. This is intended to be a one document only joint effort, not an ongoing/recurring plan. Al reminded everyone this a request to take to PMC. Andy Thurling made a motion to approve joint EUROCAE/RTCA LTE MOPS. Jim Williams seconded, motion carries.

6. Agenda Item # 6- DO-387 Exit FRAC and WG 1 Update
 - 6.1. DO-387A Overview provided by Don Walker, co-chair.
 - 6.1.1. Worked through FRAC comments on EO/IR MOPS and resolved all Non-Concur, High, and Medium. Low and Editorial left to editorial group to finish
 - 6.2. DO-387 EO/IR MOPS FRAC Summary
 - 6.2.1. Non-Concurs- Accuracy requirements do not have a bias term which can cause issues. Simulations in Appendix E showed that bias terms did not create significant errors, but did not show that any value is OK. Also correlating tracks with other sensors will be problematic. It also renders table 2-3, the 95 percentile table as incorrect because the table assumes zero bias error
 - 6.2.2. Proposed Resolution: Remove standard deviation numbers in Table 2-3 and just use 95%, as bias and error are included; include a note in section 2.2.7.1 to better explain the bias.
 - 6.3. DO-387 EO/IR MOPS FRAC Schedule
 - 6.3.1. 5 February- Comment resolutions to Shelly
 - 6.3.2. 16 February- Draft to PMC
 - 6.3.3. 18 March- PMC Meeting
 - 6.4. DO-387 EO/IR Approval
 - 6.4.1. WG requests plenary approval to publish DO-387 pending incorporation of all resolutions agreed to this week. Don asked for a motion to approve. Shelly O'Leary made a motion to approve, Jim Williams made a motion to second. No one opposed. Motion passes.
 - 6.4.2. Special thanks to Julien Farjon for his diligent efforts to complete this document.
 - 6.5. WG 1 Status
 - 6.5.1. Received an update on simulation work in progress at MIT Lincoln Labs on omni-directional active surveillance; includes work to simulate a validation only interrogation pattern
 - 6.5.2. Miles Bellman asked if further updates will be made to Working Group. Don replied yes. Don Nellis, asked if anyone is looking at capacity issues, Mr. Walker replied Yes.
 - 6.5.3. Leadership met with NASA and received POC information for programs with scope to support phase 3 work. Can summarize as targeted support. Will Johnson stated NASA still wants to support 228.
 - 6.5.4. Phase 3 Scope
 - 6.5.4.1. Addition of an omni-directional active surveillance sensor MOPS
 - 6.5.4.2. Rev A of GBSS MOPS to add enroute class of performance

- 6.5.4.3. Rev C of DAA MOPS to accommodate EO/IR and new sensor classes
 - 6.5.4.4. Split Appendix A OSED into stand-alone document
 - 6.5.4.5. Investigation of operational concept without ATC coordination
 - 6.5.4.6. Investigation of using EO/IR 2D tracks for ADS-B validation
 - 6.5.4.7. Support of ACAS sXu OSED work in SC-147
 - 6.5.4.8. Modification of Class 8 to support HAPS use case
 - 6.5.4.9. Integration of multi-threat guidance (TAWS, Wxr)
 - 6.5.4.10. Walkthrough of Class B takeoff/land use case, identify technical gaps
- 6.5.5. Gilbert Wu asked why nothing was directly related to UAM operations. Don replied ACAS-Xr is tackling this with a 2024 MOPs from Wes Olson. SC-147 TOR has not been updated yet. May just be a delta to current OSED work.
7. Agenda Item # 7- WG 3 (Lost Link) Update
- 7.1. Randy Willis, co-chair, provided an update.
 - 7.2. Randy and James Foster, co-chair, are still gathering data on lost link and establishing direction. Expect to start in Q2/April.
 - 7.3. Brandon ask for an update on ICAO work. Joint task force will create SARPs and PANs on lost link. Interaction between ATC and aircraft is the focus which will go to RPAS panel in March. Applicability, ECD Nov/Dec 2026.
8. Agenda Item # 8- WG 4 (Navigation) Update
- 8.1. Joel Wichgers, co-chair, stated Andrew Videmsek, GA-ASI selected as secretary
 - 8.2. Anticipate launch after DO-304A revision is completed in Q2.
9. Agenda Item # 9- Ad Hoc WG Update
- 9.1. Fabrice Kunzi presented
 - 9.2. Reason for Ad Hoc
 - 9.2.1. Develop UAS scenarios to identify gaps
 - 9.2.2. Develop standards to address those gaps
 - 9.2.3. Support routine, revenue generating operations

9.3. Known gaps to date- more to be identified

Gap	Cargo	Survey	HAPS	UAM
Automated Contingency Mgmt (incl. Lost Link)	X	X	X	X
Automatic Take-Off and Landing	X	X	X	X
Cybersecurity (?)	X	X		X
Airport Surface Ops	X	X		
UAS Remote Pilot Certification	X	X	X	
Hazard Detection (WX, Terrain, etc.)	X	X		X
Runway-Independent Operations				X
Local Area Operations while under IFR		X	X	
GCS Standards	X			
LowSWAP DAA (sX_u)		(X)		
UAS Flight Rules (“UFR”, “VFR-Like”, etc.)	X	X	X	X
Class B Airport Operations	X			
New Airspace Construct				X
DAA for Rotorcraft (X_r)		(X)		X

9.4. Part 135 Cargo Scenario

9.4.1. Anna Dietrich presented.

9.4.2. Description: Part 23 certified aircraft flying under IFR, routinely transporting cargo from point A to point B and back. Analogous to piloted operation: Small cargo feeder operation with a C208 Grand Caravan

9.4.3. DAA System: DO-365A Class 2/5 or DO-365B Class 3 & GBSS in Terminal

9.4.4. Data Link: DO-362 CNPC and DO-TBD SATCOM

9.4.5. External Alignment to NASA ATM-X PAAV

9.4.6. Desired Demonstration Timeline is demos starting in 2023

9.5. Survey Scenario

9.5.1. Presented by Andrew Videmsek.

9.5.2. Description: Part 23 certified UAS flying under IFR, spending extended time at or below 10kft. Analogous to piloted operation of a Cessna 182, on-board LiDAR scanner

9.5.2.1. Reference Scenario: SC-228 Phase 2, “Extended Operations”

9.5.3. DAA System: DO-365B Class 2 with A3 radar; Alternatively: DO-365B Class 3, potentially with GBSS

9.5.4. Data Link: DO-362 CNPC, TBD SATCOM MOPS

9.5.5. External Alignment

9.5.5.1. Controlled Airspace ARC

9.5.5.2. NASA SWS Project

9.5.6. Desired Demonstration Timeline is in 1 to 2 years (~2022)

9.5.7. No specific mission, sensor, aircraft, or geographic location called out

- 9.5.8. Fixed wing UAS certified under 14 CFR Part 23. Representative aircraft: Cessna 172 Skyhawk, GA-ASI MQ-9A, & Beechcraft King Air 360ER
- 9.5.9. Generic aerial survey data acquisition mission
 - 9.5.9.1. Linear Surveys: inspections of railroads, aqueducts/canals, power lines, and pipelines
 - 9.5.9.2. Non-Linear Surveys: topographical land surveys, health assessments of agricultural fields, and mapping of urban infrastructure
- 9.6. Appendix A: 'Tweener' UAS CONOPS
 - 9.6.1. Smaller UAS performing similar but shorter surveying missions at or below 8kft. Class of UAS between the small UAS operating under 14 CFR 107 and larger UAS operating under 14 CFR 23. Representative UAS: NAVMAR Tigershark, AATI AiRanger, & Textron Systems Shadow
 - 9.6.2. Non-Conventional launch and recovery of UA. Launched from on- or off-airfield vehicle launcher or rolling takeoff
 - 9.6.3. Does not have the SWaP-C to carry the required CNS equipment
 - 9.6.4. May require a NOTAM
 - 9.6.5. Ravi Jain identified gap- radio station needs to move/change with the movement of the UAS; how does this align to C2? Should align with Rose and Appendix A.
- 9.7. HAPS Scenario
 - 9.7.1. Presented by Andy Thurling
 - 9.7.2. Description: Transit through controlled airspace to/from FL600; launch and recovery from a company-owned launch site. Operations above FL600 out of scope. Scenario: "Phase 2 – like", modified for slow moving aircraft
 - 9.7.3. DAA System:
 - 9.7.3.1. DO-365B Class 3 with GBSS in Terminal, or
 - 9.7.3.2. Segregated airspace
 - 9.7.3.3. Timeline or DWC definition requires adjustment for slow forward speed
 - 9.7.4. Data Link: DO-362 CNPC, TBD SATCOM MOPS
 - 9.7.5. External Alignment:
 - 9.7.5.1. "ETM" Subproject within NASA ATM-X
 - 9.7.5.2. FAA "ETM" CONOP
 - 9.7.6. Desired Demonstration Timeline is in 2023
- 9.8. UAM Scenario
 - 9.8.1. Presented by Fabrice Kunzi
 - 9.8.2. Description- Part 23 certified aircraft carrying passengers from A to B
 - 9.8.2.1. ~30 NM route length; 1000-3000ft AGL cruise altitude
 - 9.8.2.2. Close proximity to Class B Airspace (inside or under shelf, within Mode C Veil). Analogous piloted operation: helicopter transport from JFK to Manhattan
 - 9.8.3. DAA System: ACAS Xr
 - 9.8.4. Data Link: TBD

- 9.8.5. External Alignment
 - 9.8.5.1. NASA AAM Mission Integration Office
- 9.9. Other CONOP Efforts
 - 9.9.1. FAA NextGen UAM CONOP, v1.0 Published June 26, 2020
 - 9.9.2. NASA UAM Vision CONOP at UML-4; Published December 2, 2020
 - 9.9.3. RTCA CONOPs will focus on UAM at a mature state.
- 9.10. UAM Alignment Discussion Needed
 - 9.10.1. CONOP describes both UAS integration challenges and UAM operational challenges. In general, the UAM operational challenges are not within scope for SC-228
 - 9.10.2. Discussion required to determine appropriate scope; ACAS Xr and transponder equipage most applicable
 - 9.10.3. A separate effort will be required for addressing UAM operational challenges
 - 9.10.3.1. Navigation performance for UAM Aircraft
 - 9.10.3.2. Airspace structure
 - 9.10.3.3. Integration with PSUs and existing ATC services
 - 9.10.3.4. Appropriate flight rules
 - 9.11. **Special thank you to all who worked on the various CONOP scenarios!**
- 10. Agenda Item # 10- New Business
 - 10.1. SC-135 SME Request, presented by Al Secen
 - 10.1.1. EUROCAE WG 14 /RTCA disconnect on structure of DO-380 structure; this is being worked.
 - 10.1.2. **Help Needed:**
 - 10.1.2.1. SC-135 working on revision of DO-380.
 - 10.1.2.2. Looking for expertise for ground station environmental testing specifically for direct effects lightening and earthquake.
 - 10.1.2.3. It would be extremely helpful to have anyone in your organization with these skills in SC-135
 - 10.2. SC-240 SME Request, also presented by Al
 - 10.2.1. **Help Needed:**
 - 10.2.1.1. SC-240 is continuing to develop the document that will be used for lower risk operations.
 - 10.2.1.2. The group would benefit from participation from UAS manufacturers in crafting the new standard so it reflects the right guidance to develop process for software development which will be independent from DO-178C/ED-12C. SC-228 has expertise in this area.
 - 10.2.1.3. Please consider if your company/organization is willing to help craft this new standard.
 - 10.2.2. Will Johnson stated NASA has an entire branch working emerging V&V standards with the FAA.
 - 10.3. Upcoming Plenaries, shared by Brandon.

- 10.3.1. 25 February- 28th Plenary
 - 10.3.1.1. DO-304A Enter FRAC (First document of Phase 3)
- 10.3.2. 15 April 2021 - 29th Plenary
 - 10.3.2.1. DO-377A Enter FRAC
 - 10.3.2.2. DO-304A Exit FRAC; approval to PMC
- 10.3.3. 16 July 2021 - 30th Plenary
 - 10.3.3.1. DO-377A Exit FRAC; approval to PMC
- 10.3.4. 14 October 2021 - 31th Plenary
- 10.4. Leadership team is working to develop a MS Project schedule. Christina Westover will request support from each WG secretary.

11. Agenda Item #11- Adjourn

- 11.1. Brandon called for any final questions/comments, there were none. Andy Thurling made a motion to adjourn.
- 11.2. Still waiting for a quorum on when we can assemble together again.
- 11.3. Meeting adjourned at 3:29 PM EST.

SC-228 Leadership

John Moore	SC-228 Co-Chair Ad Hoc Co-Chair	Collins Aerospace
Brandon Suarez	SC 228 Co-Chair Ad Hoc 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 Ad Hoc 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
Mack Horton	SC-228 WG3 for Lost Link, Secretary	LS Technologies
Joel Wichgers	SC-228 WG4 for Navigation, Co-Group Lead	Collins Aerospace
Matt Harris	SC-228 WG4 for Navigation, Co-Group Lead	Boeing
Andrew Videmsek	SC-228 WG4 for Navigation, Secretary	General Atomics Aeronautical Systems, Inc.

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	Devin Jack Keith Hoffler
ALPA	
Aircraft Owners & Pilots Association (AOPA)	Chris Cooper
Amazon Prime Air	Amelia Mahan
Archangel Aero	
ARCON Corporation	
Avionics International	
Bihrl Applied Research, Inc.	
The Boeing Company	Cesar Suarez Christina Westover John Vian Martin Kearney-Fischer Matt Moser
Calhoun Analytics	
Capital Sciences, LLC	
Cavan Solutions	
Civil Aviation Authority of New Zealand	Charlie Morris
Cobham Aerospace Communications	Jeffrey Knickelbein
Collins Aerospace	Joel Wichgers John Moore Randy Jacobsen
COMAC	Mingwei Wang
Constellation Aviation Solutions, LLC	
Esterline CMC Electronics	Jean-Pascal Joary
Electronics & Navigation Research Institute (ENRI)	
Federal Aviation Administration (FAA)	Art Hinaman Chris Nassif Chris Swider Don Nellis James Foster Jennifer Ledford Kevin Aurandt Miles Bellman Paul Campbell Peter Georgiou Ravi Jain Ray Mei Rose Merchant- Bennett

Company	Name
	Ruth Hirt Shelia Mariano Steve Van Trees Talwyn Haley Tony Long Vic Patel
Federal Communications Commission (FCC)	
FedEx	
FirebirdSe LLC	
Garmin LTD.	Ben Peetz
GE Aviation	
General Atomics Aeronautical Systems, Inc	Andrew Videmesk Brandon Suarez Fabrice Kunzi JJ Lu Naiel Askar Tim Grebe TojumiOluwa Adegbyega Xaviar Aloysius Redondo
Honeywell International, Inc.	David Counts Sara Bauman
Information Systems Delft	Erik Theunissen
INMARSAT	Kristen Mineck
Iridium	Joseph Darden
Japan Radio Air Navigation Systems Association	
JHW Unmanned Solutions, LLC.	Jim Williams
The Johns Hopkins University	Charles Leeper Ben Zintak
Korea Advanced Institute of Science	
L3Harris	
Ligado Networks	Sam Weich
LS Technologies	Mack Horton
MIT Lincoln Laboratory	Wes Olson
The MITRE Corporation	Rob Strain
Mitsubishi Research Institute	Takeshi Tomoda
Mosaic ATM, Inc	Todd Kilbourne
NASA	Aaron Dutle Bryan Barmore Donna Clements Elliot Lewis Gilbert Wu Jack Connolly Jay Shivley Jeffrey Homola

Company	Name
	Jeffery Maddalon Kurt Shalkhauser Mohamad Refai Summer Brandt William Johnson
Near Earth Autonomy, Inc	
NextNav	Ashu Pande
National Oceanic and Atmospheric Administration (NOAA)	
Northeast UAS Airspace Integration Research Alliance (NUAIR)	Andrew Thurling
Northern Plains UAS Test Site	Erin Roesler
Northrup Grumman Corp	Randy Willis Robert Hughes
Raytheon	Michael Dubois
RDRTec, Inc.	
Regulus Group	Bill Benner Shelly O'Leary
Reliable Robotics	Juerg Frefel
RTCA	Al Secen
Sagem Avionics, Inc.	
SAIC	Kolie Lombard
San Jose State University Foundation	
Sematica Aerospace Limited	Carl Thibault Siu O'Young
Square Peg	
S-Tec	
Thales Group	
Technology Providers, Inc.	
Transport Canada	Matthew Spanos Tom Hastie
uAvionx	
Uber Elevate	
US Air Force	
US Navy	
Washington Cord	
Wisk	Garv Stephenson
Xwing, Inc	Anna Dietrich
Unknown Affiliation/ Not Active	Steve Wiler Mack Horton- LS Technologies Chad Kirk Tom Gramaglia