

RTCA- 228
Summary of Plenary #22- RTCA Paper No. 021-20/SC228-067
Washington, DC
1:03 PM EST, January 30, 2020

The twenty-second plenary of RTCA Special Committee 228 was called to order by SC-228 Co-Chair, John Moore at 1:03 PM (EST) on January 30, 2020, using WebEx audio and web conferencing.

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 meeting was to approve two documents to the PMC and review status of working groups
2. Agenda Item #2- Review RTCA meeting guidelines
 - 2.1. Rebecca Morrison reviewed the Anti-Trust Policy, the Proprietary Policy and the RTCA Committee Participation Membership Policy
 - 2.2. Rebecca also briefed safety and room logistics
 - 2.3. Self-rostering feature online at <https://workspace.rtca.org/kws>
3. Agenda Item #3- Opening remarks
 - 3.1. Note new self-rostering feature online at <https://workspace.rtca.org/kws>
 - 3.2. Roll Call- the complete list of session participants is listed in Appendix A
 - 3.3. SC-228 Leadership
 - 3.3.1. Open position for Co-chair. [Thanks to Paul McDuffie for his service, may you have a wonderful retirement!](#)
 - 3.3.2. Working Group 1 has a new Co-Chair, Fabrice Kunzi with General Atomics, and Don Walker is now employed by Airbus, SV. [Thanks to Ted Lester for his service as co-chair.](#)
 - 3.3.3. No changes for Working Group 2
4. Agenda Item #4- Approve meeting minutes from Plenary Meeting #21
 - 4.1. Reviewed the key points of plenary #21 Minutes as documented
 - 4.2. Acceptance of plenary #21 minutes; motion by Jim Williams seconded by Jim Davis. Unanimously approved.
5. DO-365A DAA MOPS FRAC -- Approval to Submit to PMC
 - 5.1. Ted Lester provided overview of FRAC 2
 - 5.2. Second FRAC had 371 comments from 19 commenters
 - 5.3. DO-365A FRAC 2 Resolution
 - 5.3.1. 100% of comments resolved this week
 - 5.3.2. 75% of changes ready for document merging this week
 - 5.3.3. All changes ready for incorporation by 2/9/20

- 5.3.4. PDF copy for internal checks on 2/18/20
- 5.3.5. Send to RTCA for PMC formatting/distribution on 2/21/20
- 5.3.6. PMC Approval 3/26/20
- 5.4. John Moore called for clarification of major updates for PMC with a summary slide to include: on ground based radar, terminal environment, Class, C, E G extended operations, updates to guidance in Phase 2, enroute. **Action to WG1.**
- 5.5. Ted Lester made a motion for approval, Lisa Fern seconded.
- 5.6. John Moore asked for anyone with reservations to speak now; no dissenters. Approved to PMC.

6. DO-XXX Ground Radar MOPS FRAC -- Approval to Submit to PMC
 - 6.1. DO-GBSS FRAC
 - 6.2. All 361 comments resolved
 - 6.3. DO-GBSS FRAC Resolution
 - 6.3.1. 100% of comments resolved this week
 - 6.3.2. 50% of changes ready for document merging this week
 - 6.3.3. All changes ready for incorporation by 2/6/20
 - 6.3.4. PDF copy for internal checks on 2/13/20
 - 6.3.5. Send to RTCA for PMC formatting/distribution on 2/21/20
 - 6.3.6. PMC Approval 3/26/20
 - 6.4. Bruce Eckstein asked how much schedule slide can there be and still meet dates. Answer: significantly smaller document to meet dates, as there is very little room for schedule slide.
 - 6.5. John Moore request a summary slide to provide an overview to PMC. **Action to WG1.**
 - 6.6. Jonas Trego made a motion for approval, Naiel Askar from General Atomics, seconded.
 - 6.7. This document may provide guidance for certification compliance for TSO'd equipment as well as the aircraft system, FAR 14 CFR Part 177
 - 6.8. John Moore asked for anyone with reservations to speak now; no dissenters. Approved to PMC
 - 6.9. [Special thanks to Michael Dubois and Jonas Trego for all their hard work!](#)

7. Agenda Item #5 WG1 (DAA) Status Report
 - 7.1. 2020 WG-1 Plenary Document Plan
 - 7.1.1. 23 April- 23rd Plenary, Enter FRAC for Air-to-Air Radar MOPS, DO-366A, add 2 new classes: LSNC and ACAS X
 - 7.1.2. 23 July- 24th Plenary, Exit FRAC for Air-to-Air Radar MOPS, DO-366A and Enter FRAC for DO-365B
 - 7.1.3. 16 October- 25th Plenary, Exit FRAC for DO-365B and Enter FRAC for EO/IR MOPS
 - 7.1.4. DO-365B Major Changes include: ACAS Xu, LSNC Radar, Automation Appendix, CAVS display features

7.2. Consider adding Terminal and En-Route criteria to GBSS MOPS, discussion moved to New Business, Phase 3 TOR revisions discussion

7.3. [Special Thanks to Ted Lester for all his hard work!](#)

8. Agenda Item #6- WG2 (C2) Status Report

8.1. DO-362A C-Band Link System MOPS

8.1.1. Extensive analysis completed and reviewed on two possible resolutions to the near/far problem with existing MOPS

8.1.2. Consensus reached on adopting a modified version of the original MOPS approach with the following changes:

8.1.2.1. One-slot solution preferred for spectral efficiency, however operational limitations may require use of two-slot solution

8.1.2.2. Frequency management risk @ airports and operational limitations, remain to be resolved

8.1.2.3. Improved transmit mask, fading margins, antenna characteristics

8.1.2.4. Increased range and density of UAs supported

8.1.2.5. Many questions remain to be answered to validate one-slot solution is acceptable

8.1.3. **RISK:** The unanticipated length of time required to complete the analysis has created a schedule risk to complete the document on the current schedule

8.1.4. John Moore called for questions, no questions asked

8.2. DO-377A C2 Link System MASPS

8.2.1. RAC #5 Complete

8.2.2. Consensus reached on approach to address all Non-concur and High comments (all have status of "in process" within comment matrix)

8.2.3. Schedule: All comments to be resolved within 4 weeks from F2F.

8.2.4. Significant issues to be resolved: Major changes need in Terrestrial (Backhaul) Network, Appendix K

8.2.5. John Moore called for questions, no questions asked

8.3. ICAO RPAS Panel C2 WG Update

8.3.1. First package of C2 Link SARPs have Preliminary Approval by the ANC and are now in the State comment period, which closes on February 21 2020

8.3.1.1. SARPs cover C2 Link procedures, frequency bands, and high level system requirements

8.3.1.2. Effectivity Date planned for Q3 2021

8.3.2. Second package of, technology specific, SARPS now being developed with planned Effectivity Dates between 2023 and 2025

8.3.2.1. C2 Links using satellite, terrestrial and high altitude airborne relay systems operating in C Band spectrum allocated to airborne safety of flight operations

- 8.3.2.2. C2 Links using the Fixed Satellite Service (FSS) that operate in Ku/Ka Band spectrum which is not allocated to safety of flight operations
- 8.3.3. C Band System SARPs
 - 8.3.3.1. Use EUROCAE ED-265 MOPS (satellite) and RTCA DO-362(A) MOPS (terrestrial and airborne relay)
 - 8.3.3.1.1. Compatibility analysis and interference mitigation (if needed)
 - 8.3.3.1.2. C Band frequency management planning
 - 8.3.4. Ku/Ka Band System SARPs
 - 8.3.4.1. Use safety analysis from RTCA DO-377(A) to set required C2 Link System performance
 - 8.3.4.2. Use satellite link FSS characteristics from ITU-R to determine achieved link performance
 - 8.3.4.3. If achieved performance does not meet required performance then develop mitigations and/or limitations
- 8.4. NASA C2 Link System Flight Testing
 - 8.4.1. NASA Glenn Research Center delivered a complete set of CNPC flight test data to the RTCA SC-228 WG2 on 1/22/20. The data set is over 60 MB in size, and included ground-to-air and air-to-ground signal propagation data for:
 - 8.4.1.1. Three independent terrain settings; flat land, open fresh water, and hilly terrain
 - 8.4.1.2. Ascent and descent flight tracks at 1°, 1.5°, 2°, and 3° elevation (glide slope) angles
 - 8.4.1.3. Bi-directional cross tracks at 15, 30, 45, and 60 nmi ranges from the ground station.
 - 8.4.2. Data from over 127 individual flight segments was delivered in both plotted and tabular form, representing over 22 hours of flight time in the NASA S-3B research aircraft.
 - 8.4.2.1. All data was synchronized at 1-second resolution and was fully corrected for all thermal conditions and system noise.
 - 8.4.2.2. NASA not only provided the path loss calculations, but also provided all constituent “raw” data in the data tables, allowing independent analysis.
 - 8.4.2.3. This data is critical to the validation of the UAS C2 Terrestrial MOPS D0-362 Rev A document under development.
 - 8.4.3. NASA Glenn Research Center technical Lead Kurt Shalkhauser delivered a detailed presentation to WG2 on 1/29/20 describing the flight test equipment, test approach and arrangements, flight plans, data processing steps, and data formatting.
 - 8.4.4. [John Moore provided a special thank you to NASA for all their hard work and flight test results.](#) Without NASA, the completion of this research would not be possible. Jim Williams, reminded the committee that this NASA

funded research is ending and will need to be funded by industry, going forward.

9. Agenda Item #7- New Business

9.1. Discussion on Phase 3 Scope and Terms of Reference Revisions

9.2. Scope- WG1 DAA

9.2.1. GBSS MOPS Rev A for en route

9.2.2. OSEDs: low-altitude DAA operations without ATC separation services; terrain/obstacle avoidance incorporation into DAA logic; weather avoidance incorporation into DAA logic; single pilot operation use of DAA

9.2.3. SPRs: Solar HALE; UAM/Helicopter

9.3. Scope- WG1 C2

9.3.1. MOPS: SATCOM harmonization, L band updates, LTE commercial networks

9.3.2. MASPS: Class E above A, UAM

9.3.3. Other: UAS navigation performance; lost link procedures and performance; Urban Air Mobility (UAM) standards

9.3.3.1. These may require a new special committee and/or working groups to be formed, as they are not DAA or C2, but required for unmanned aviation

9.4. Proposed Schedule for TOR Revisions

9.4.1. SC-228 Steering Committee stakeholder meeting in February or March to review and prioritize

9.4.2. April 23, 2020- Plenary Approval

9.4.3. June 11, 2020 RTCA PMC Approval

9.5. NASA requests multiple NASA stakeholders be invited to scoping meetings.

9.6. Fabrice Kunzi hopes Phase 3 will enable routine operations and other industry engagements through RTCA to identify special gaps and applications

9.7. Some of these documents may not be driven by the FAA, but by industry

9.8. **Action:** Contact Don Walker to be added to the meeting series to discuss Phase 3 DAA

9.9. Proposed Future Plenary Meetings

9.9.1. **23 April- 23rd Plenary**

9.9.1.1. C2 Link MOPS (Terrestrial) Rev A Enter FRAC

9.9.1.2. Air-to-Air Radar MOPS, DO-366A Enter FRAC

9.9.1.3. Phase 3 TOR Proposal Approval

9.9.2. **23 July- 24th Plenary**

9.9.2.1. Air-to-Air Radar MOPS, DO-366A Exit FRAC

9.9.2.2. C2 Link MOPS (Terrestrial) DO-362A Exit FRAC

9.9.2.3. DO-365B Enter FRAC

9.9.2.4. DO-377A Enter FRAC

9.9.3. **16 October- 25th Plenary**

9.9.3.1. DO-365B Exit FRAC

- 9.9.3.2. DO-377A Exit FRAC
- 9.9.3.3. EO/IR MOPS Enter FRAC
- 9.9.3.4. The date of the 25th plenary to revised to October 16th
- 9.10. FAA requested Safety Management System (SMS) panel support from RTCA. Based on history, RTCA leadership does not support providing industry resources. NASA proposed utilizing the UAST. Jonas Trego does not expect utilization of standard publication of SRM at this point. Industry OEM will need to do this during the certification process.
- 9.11. Call for new business, no respondents

Page 1 of 1 1/31/2020

	2019				2020				2021			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PMC		3/21	9/12	12/19	3/26	6/11	9/10	TBD				
Plenary	1/25	4/17	7/25	10/25	1/31	4/23	7/23	10/16	TBD			
Phase 3 TOR					TOR Proposal 4/23							
FRAC												
WG1 TOR Deliverables												
WG2 TOR Deliverables												

10. Agenda Item #8- Adjourn

- 10.1. Jim Williams called a motion to adjourn and Jim Davis seconded.
- 10.2. John Moore adjourned the plenary at 3:02 PM EST.

Respectfully Submitted by,
 Christina Westover
 Secretary, RTCA SC-228
 January 31, 2020

CERTIFIED as a true and accurate summary of the meeting by,

Appendix A- List of SC-228 Plenary Participants

John Moore	SC-228 Co-Chair	Collins Aerospace
Unfilled	SC 228 Co-Chair	
Don Walker	SC-228 WG1 for DAA, Co-Group Lead	Airbus, SV
Fabrice Kunzi	SC-228 WG1 for DAA, Co-Group Lead	General Atomics Aeronautical Systems, Inc.
Jonas Trego	SC-228 WG1 for DAA, Secretary	General Atomics Aeronautical Systems, Inc
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
Rebecca Morrison, delegate for AI Secen	SC-228 Program Director	RTCA
Christina Westover	SC-228 Secretary	Boeing

ATTENDEES

Company	Name
A3 by Airbus	Don Walker
ACES, Inc.	Alfonso Malaga
Adaptive Aerospace Group	Keith Hoffler Devin Jack
ALPA	
Aircraft Owners & Pilots Association (AOPA)	
ARCON Corporation	Siva Sivananthan
BAE Systems	
Bihrl Applied Research, Inc.	Jacob Kay
The Boeing Company	Lisa Fern Cesar Suarez Christina Westover Don Wilkins Amelia Wilson Steve Yun
Calhoun Systems Inc.	Barry Jackson
Cavan Solutions	Sean Ghazavi

Cobham Aerospace Communications	Jeff Knickelbein
Collins Aerospace	Tyler Barney Randy Jacobson John Moore
Electronics & Telecommunications Research Institute (ETRI)	Hee Wook Kim
FAA	Paul Campbell Keith Carver Larry Cowles Tom Farrier Peter Georgiou Summer Guerrero Art Hinaman Ruth Hirt Ravi Jain Tony Long Shelia Mariano Rose Merchant- Bennett Rodney Murphy Don Nellis Lee Nguyen Neal Suchy Chris Swider Gerald Van Hook Steve Van Trees Kevin Williams
FirebirdSe LLC	Bruce Eckstein
Garmin LTD.	Ben Peetz
GE Aviation	Ted Lester
General Atomics Aeronautical Systems, Inc	Naiel Askar Tim Grebe Jose Fuentes Fabrice Kunzi JJ Lu Jonas Trego
Honeywell International, Inc.	Sara Bauman
Iridium	
Japan Radio Air Navigation Systems Association	
JHW Unmanned Solutions, LLC.	Jim Williams
Johns Hopkins University	Walter Bender Charles Leeper Sam Smearcheck
Korea Advanced Institute of Science	Hyunchul Shim
L3 Technologies	Kevin Diamond

	Michael Nathanson
Ligado Networks	Samuel Weich
MIT	Maria Kuffner Matt Edwards
MITRE Corporation	Frank Box Joe Boyd Greg Thibeault
Mitsubishi Research Institute	Takeshi Tomoda
Mosaic ATM, Inc	Todd Kilbourne
NASA	Summer Brandt Donna Clements Jack Connolly Peggy Cornell Ty Hoang Seung Man Lee Elliot Lewis Michael Jarrell William Johnson Mohamad Refai Maurico Revas Jay Shivley Clint St. John Doug Wada
Northeast UAS Airspace Integration Research Alliance (NUAIR)	
Northern Plains UAS Test Site	Erin Roesler
Northrup Grumman Corp	Yi-Liang Chen Robert Hughes Lance King Robert Stamm
Raytheon	Michael Dubois Joseph Dunagan
Regulus Group	Shelly O'Leary
Reliable Robotics	Michael Sherback
RTCA	Al Secen Rebecca Morrison
Sagem Avionics, Inc.	Julien Farjon
San Jose State University Foundation	Alan Hobbs
Square Peg	
S-Tec	
Thales Group	Liu Huan
Technology Providers, Inc.	Marvin Hammond
Transport Canada	
uAvionx	Jim Davis

US Air Force	Jack Brendlinger
US Navy	Roger Burton Scott McLellan Matthew Ray
Washington Cord	Sean Chappell