



EUR 44-21/WG119-06  
RTCA Paper No. 117-21/SC239-013

Saint Denis, 5 May 2021  
Washington, 5 May 2021

**EUROCAE WG-119 Plenary Meeting #3 “Radar Altimeter” /  
RTCA SC-239 Plenary Meeting #3 “Low Range Radar Altimeter”**

**DATE:** February 10-11, 2021

**TIME:** 8 AM – 1 PM EDT

**PLACE:** Virtual

**CONTACTS:**

Karan Hofmann ([khofmann@rtca.org](mailto:khofmann@rtca.org); 202-330-0680)  
Jean-Luc Robin ([Jean-Luc.robin@airbus.com](mailto:Jean-Luc.robin@airbus.com))  
Seth Frick ([Seth.Frick@honeywell.com](mailto:Seth.Frick@honeywell.com))  
Sai Kalyanaraman ([Sai.Kalyanaraman@collins.com](mailto:Sai.Kalyanaraman@collins.com))  
Samh Menshaway ([Samh.Menshaway@thalesgroup.com](mailto:Samh.Menshaway@thalesgroup.com))

**AGENDA**

1. Welcome, Introduction and Agenda - Jean-Luc
3. Review of Minutes from the previous plenary – Sai
4. Leadership Organization Status - Jean-Luc
5. EUROCAE/RTCA presentations: Administrative Reminders and Presentation of the MOPS template document - Rebecca, Karan, Anna
6. Overview of sub-groups with deliverable and dependencies - Jean-Luc
7. Antenna, LRU discussion (in the context of TSO approach) - Seth
8. Scope presented by each sub-group leader (Kim (SG2), Ore/Hamza (SG1), Samh (SG4), Miles (SG3), Timo/Lee (SG6), Dave R (SG5)) and validated in plenary.
9. Discussion on the content, methodology, requirements of each sub-group - Kim, Ore, Samh, Hamza, Miles, Timo, Lee, Dave.
10. Planning and content of the 1st draft MOPS and Milestones definitions
11. Identification of the next plenary session date, Other Business and review of Action Items.
12. Adjourn

## PARTICIPANTS

<b>Name</b>	<b>Affiliation</b>
Andrew Roy	ASRI
Angela Roth	Airbus
Anna Guegan	EUROCAE
Anne Vaske	TU Braunschweig - Institute for EMC
Charisse Green	Federal Aviation Administration
Cindy Freud	The MITRE Corporation
Clay Barber	Garmin, Ltd
Craig Brandt	The Boeing Company
David Redman	AVSI
Donny Morrow	Air Lines Pilots Association
Ed Hahn	Air Lines Pilots Association
Eddie Straub	Garmin, Ltd
Fred Fisher	AVSI
Gerhard Berz	EUROCONTROL
Gerlof Osinga	The Boeing Company
Hamza Abduselam	Federal Aviation Administration
Herve Dutruc	Airbus
Hussain Al-Sadi	The Boeing Company
Ivan Martin	Thales Group
Jean Luc Robin	Airbus
John Mettrop	UK Civil Aviation Authority
Karan Hofmann	RTCA, Inc.
Kim Kolb	The Boeing Company
Lee Nguyen	Federal Aviation Administration
Max Fenkell	Joby

Miles Bellman	Federal Aviation Administration
Oreoluwa Ajayi	NeuralVol Inc
Rebecca Morrison	RTCA, Inc.
Richard Amy	DGAC (La Direction generale de l'Aviation Civile
Robert Geise	TU Braunschweig - Institute for EMC
Sai Kalyanaraman	Collins Aerospace
Samh Menshawy	Thales Group
Seth Frick	Honeywell International, Inc
Shane Happs	Collins Aerospace
Shunichi Futatsumori	ENRI
Stephane Tallet	Thales Group
Ted Peterson	Collins Aerospace
Terry McVenes	RTCA, Inc.
Wes Googe	American Airlines
Zhimin Li	Collins Aerospace

### **1. Welcome, Introductions and Administrative Remarks**

After a round-table of introductions, the co-chairs Jean-Luc and Seth Frick along with Karan Hofmann and Rebecca Morrison from RTCA and Anna Guegan from EUROCAE welcomed the participants.

### **2. Agenda Review**

The group reviewed and approved the meeting agenda

### **3. Plenary Discussions**

Sai provided a review of the minutes of the previous plenary. This was accepted with some minor mods as indicated during the review.

Rebecca presented the MOPS drafting approach. Group will use the RTCA numbering at this time and upon completion EUROCAE will map to its chapter nos. Discussion ensued on test requirements and the Interference mask. The plan was to keep the requirements in Scn. 2.2 and the group can reference info in the other appendices as needed. Each req. in 2.2 should be

mappable to a relevant test in Scn. 2.4 (try to keep the link within the same sub chapters across 2.2 and 2.4 as much as possible; for e.g., link 2.2.10 to 2.4.10). Document to explore adopting an approach similar to Scn 2.5 for test cross ref matrix in DO-229D and potentially adopt the Env cross ref table similar to different classes of equipment seen in the DO-229 MOPS.

Jean luc presented the slides on how the SG's will interact with each other and listed the SG deliverables and dependencies for the Out of band (OOB) interference, In band interference and performance chain. This drove additional detailed discussions on these three chains (see slides 13-16 in Jean Luc's plenary presentation). There were additional discussions on which requirements we need to have in place for the RA Tx portion. Proposal on the table is to have these requirements driven by SG4 and to help reference the regulatory information that SG3 will compile to this end.

SG4 will be instrumental to defining the performance classes. Seth mentioned that SG4/5 will have the direct authority to determine the requirements in Scn 2.2 (SG5 RF interference requirements and rad alt performance requirements from SG4).

Further discussion ensued on the FHA, SSA at A/C level. The group discussed the need to address the A/C level safety and continuity requirements and identified the need to have more discussions on how to translate the integrity requirements from A/C level to LRU (as needed)

Seth presented slides on the variety of Rad alt sensor/antenna/ display integrations that could be encountered with different installations. This was presented from the view of looking at the path to TSO for the rad alt and antenna across different platforms. TSO may be obtained at the integrated rad alt/antenna level or the antenna can get a partial TSO that can be used in conjunction with the rad alt sensor to establish the entire TSO basis. Further details can be seen in the slides presented by Seth.

Dave Redman presented a detailed listing of the scope of activities under SG5. He listed time wise dependencies for the work that he has planned to address within his SG.

The next day (11 Feb) we began with a discussion on the framework for the MOPS. The team used an .xls table to identify and capture the requirements that we have today across ED-30 and DO-155 and included the relevant A707 details. This will be used to aid the MOPS requirements capture activity.

Kim Kolb presented updates on SG2 discussions. SG2 will maintain an updated spreadsheet of information on relevant spectrum regulations and details of nation specific 5G rollout plans that Kim will continue to update as the Global 5G plans evolve. This will be useful towards identifying the in, near and adjacent band rad alt spectrum compatibility needs (and the ensuing ITM within SG5). There was further discussion on the Spectrum needs from a Rad alt Tx standpoint. This will be address within the SG's that handle the regulatory aspects.

SG3 (Miles) and SG1 (Ore) provided updates on their planned activities to identify and capture the existing regulatory standards and relevant regulatory co-ordination details respectively. Further details can be found in the material that was presented by SG3 and SG1 leads.

SG4 (Samh) presented the task of identifying the paragraphs to update for the new MOPS and discussed new specs that we would need to consider adding to the MOPS. He used ED 30 as a baseline for the working session. The goal was to leverage ED30, DO155 and go line by line to identify the requirements and determine what was equivalent or inconsistent and to clarify any

ambiguities in the verbiage for the new MOPS. The plan going forward is to pull in additional relevant details reflected by SG's 1, 5, 6 and help compile the requirements, test cases and procedures for the new MOPS. Further discussions ensued on the integrity needs (and how to reflect this within the MOPS performance requirements). Lee had questions on how to show compliance to the availability, continuity and integrity requirements.

Group discussion ensued on how to address the loop loss standard and selection of a worst-case reflection coefficient. Seth stated that rad alt antennas should be installed with a clear field of view and that the RF propagation path should not be impacted by obstructions. Loop loss should consider roll and pitch on the antenna, address the antenna gain, terrain reflection coefficient and RF free space path loss. DO-155 gives 6 dB additional margin to acct for A/C roll maneuvers out to the -3dB beam width of the antenna. One needs to review enough data on reflectivity and other relevant details to validate the loop loss parameters. The plan is to leverage existing industry information and available collected (field) data. Seth to share further information on this with the group.

Discussions ensued around the possibility of exploring additional spectrum for rad alt usage. It was stated that the W band (around 77 GHz) would not be usable for airborne safety of life rad alt use in the US (currently used for automotive radar). That being said, we can explore V, Ku and X bands. One needs to determine the feasibility of using other bands for airborne safety of life rad alt usage. It is to be noted that the 4.2 – 4.4 GHz band will continue to be the default rad alt band and discussion on other bands is exploratory at this point in time. There was a follow-on action for SG3 to explore this for future designs.

From an SG6 perspective the data security focus it to looking at jamming, spoofing and classify the potential threats that the rad alt can be exposed to. This is to be followed up with a whittled down list of relevant jamming and spoofing scenarios that we will need to evaluate for inclusion (under the scope of the new MOPS development).

Further discussion took place on the MOPS document planning. The goal is to deliver a new MOPS document by the end of 2022 with intermediate drops every three months. The plan is to have an initial draft in place by summer of 2021.

#### **4. Future Meetings**

- a. Next joint plenary set for May 5<sup>th</sup> and 6<sup>th</sup> 2021 with EUROCAE WG-119 (9 AM – 1 PM US ET).
- b. A regular meeting cadence for SG's 1 through 6 has been set based on the discussion during this plenary

#### **5. Other Actions**

- 1) Karan: to set up a placeholder for the next plenary - Done.
- 2) Sai to introduce a proposal for integrity evaluation : Sai presented on this item after the last plenary in February – done (Further activities are taking place within SG's to take this representative example that sai presented and translate them into ITM's and rad alt performance requirements).

- 3) Samh and Eddie (Ore can help), and SG-4 team to create a first outline doc format (1<sup>st</sup> draft MOPS) based on RTCA format and the Excel Traceability Matrix (for the next plenary if help is provided). - done
- 4) Karan to ask Anna if we can have an editable format of ED-30 and to provide an editable RTCA format with style.- done
- 5) Seth: flow chart to enhance the understanding the Antenna/LRU document - pending

## **6. Adjourn**

The meeting adjourned around 1 PM ET on the 11<sup>th</sup> of Feb 2021.

Certified

Sai Kalyanaraman, Secretary SC-239

Samh Menshawy, Secretary WG-119

Seth Frick, Chairman SC-239

Jean Luc Robin, Chairman WG-119