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Saint Denis, 7 Apr 2022
Washington, 7 Apr 2022

**EUROCAE WG-119 Plenary Meeting #6 “Radar Altimeter” /
RTCA SC-239 Plenary Meeting #6 “Low Range Radar Altimeter”**

DATE: 28 Feb – 2 Mar 2022

TIME: 9 AM – 1 PM EDT

PLACE: Virtual

CONTACTS:

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AGENDA

1. Welcome, Introduction and Agenda - Jean-Luc
3. EUROCAE/RTCA presentations and policy - Rebecca, Karan, Anna
4. Round table and detailed agenda for SG – Jean-Luc
5. Current Context, Status of the MOPS and Presentation of the proposed way forward
6. Guided Workshop on ITM convergence, Data and simulations
7. Decision on the ToR
8. SG2 Status and Update: Kim
9. Guided Workshop: ITM, PFD and STAND OFF distances as part of SG-5
10. Scope, technical input and technical output of the Interim Delivery
11. Identification of the next Plenary Date
12. Telcos/Aviation meeting status and Waveform discussions
13. Scope, technical input and technical output of the Interim Delivery
14. Other business, action item review
15. Adjourn

PARTICIPANTS

Name	Organization
Andrew Roy	Aviation Spectrum Resources, Inc.
Angela Roth	Airbus
Anna GUEGAN	EUROCAE
Anne Vaske	TU Braunschweig - Institute for EMC
Asif Gandhi	Verizon
Barbara Clark	Federal Aviation Administration
Barry Miller	Federal Aviation Administration
Bart van den EINDEN	EUROCONTROL
Behlul Poonawalla	FreeFlight Systems
Bryan Dorbert	Verizon
Chad Archer	AT&T
Charisse Green	Federal Aviation Administration
Charles Glass	NTIA
Christine Torres	Sensor Systems, Inc.
Dave Redman	AVSI
David Wolter	AT&T
Deepa Devaraj	AT&T
Ed Drocella	NTIA
Ed Hahn	ALPA
Eddie Straub	Garmin
Gerlof Osinga	The Boeing Company
Hannes Griebel	CGI IT UK Ltd
Hussain Al-Sadi	The Boeing Company
Italo Aguiar	Embraer
James Lee	The Boeing Company
Janet Young	Federal Communications Commission
Jorge Gomez	L3Harris
Jean-Luc Robin	Airbus
Jignesh Panchal	Verizon
John Micallef	EUROCONTROL
Josep Giné	ATR Radio f(X)
Julius Fodje	AT&T
Kajetan Litwin	Transport Canada
Kalaivani Purushothaman	Honeywell
Kim Kolb	The Boeing Company
Martin McDaniel	U.S. Army
Matt Harris	The Boeing Company
Mauro Pagliarini	EASA
Miles Bellman	Federal Aviation Administration

Natalie Wong	Transport Canada
Nataly Magallanes	Sensor Systems, Inc.
Navid Motamed	AT&T
Neeti Tandon	AT&T
Nicholas Shrout	Aviation Spectrum Resources, Inc.
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Rajah Castillo	Sensor Systems, Inc.
Raquel Noriega	AT&T
Rebecca Morrison	RTCA Inc.
Richard Amy	DGAC
Rodrigo Machado	ANAC
Sai Kalyanaraman	Collins Aerospace
Samh Menshawy	Thales
Sergio Machado	ANAC
Seth Frick	Honeywell
Seyed Rastaghi	NAV CANADA
Shunichi Futatsumori	ENRI
Ted Peterson	Collins Aerospace
Thomas Sharpeed	L3Harris
Tim Murphy	The Boeing Company
Timo Warns	Airbus
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 Robin and Seth Frick along with Rebecca Morrison from RTCA and Anna Guégan from EUROCAE welcomed the participants. Anna and Rebecca presented the RTCA and EUROCAE IPR and other relevant policies.

There were some questions from the FCC and NTIA on process and what can be discussed. The feedback clarified that focus was on the technical discussion. This forum was not looking to formulate or drive policy re: the 5G spectrum compatibility item. Barbara Clark clarified that the group could talk about adjacent band power levels.

2. Agenda Review

The group reviewed and approved the meeting agenda (which Jean Luc presented). Group added the definition of the PFD as an item to address under the guided workshop on ITM discussion. Jean Luc went through the different SG's that have updates to share and confirmed that the SG leads can present as required. Sai mentioned that he will provide an update on the telecom/aviation meeting status and waveforms.

The group approved the previous Plenary (September 8-9, 2021) summary.

Sai asked for clarification on what will be covered under the fixed wing and helo operations and whether the goal is to discuss the aviation volumes for these platforms and what that means for the ITM.

Charles Glass asked whether the fixed wing implies operations that cover (user) category 2 or higher. Jean Luc stated that it covers air transport and general aviation. Barbara clarified that all aircraft with a rad alt should be addressed. Jean Luc mentioned that we may not include UAS. Barbara clarified that we may not discuss it during this meeting but all A/C with a rad alt are addressed.

3. Plenary Discussions

Jean Luc presented the outline of a few MOPS document sections in a table with columns to indicate what the workload is estimated to be for the remaining scope of work. He provided a slide on SC-239 / WG-119 planning towards compiling the MOPS document.

Jean Luc presented a slide that outlined a proposal to have an RTCA delivery to determine the long-term solution. It depicted how to come up with the final MOPS and who the stakeholders are. Seth and Sai referred to the plans that were looking to drive an interim drop of the MOPS. The group asked for the ToR to be shared so that people can look at this and provide feedback. Given the state of the discussions (and the ground that needed to be covered), the group decided to have plenary meetings on 5-7 April.

Jean Luc displayed the ToR update slide. Barbara asked Jean Luc to talk to the details of the spectrum compatibility before the group offered up options on how to address the ToR update. The RTCA PM clarified that RTCA and EUROCAE can only deliver docs to the PMC/TAC. There was further discussion on cleaning up the slide on convergence and Rebecca expressed further concerns with this slide (Barbara and others had further inputs to this slide). It was determined that this slide needed further updates. Rebecca highlighted the fact that RTCA doesn't have formal relations with the other groups and that these arrows in the slide where there are interfaces on the side are not supported by the RTCA process (Pls see presentation from JLR).

Jean Luc stated that we need to make sure that we are not diverging. Dave Wolter recommended that we should title the slide "Info flow". Charisse chimed in and added that we should work this slide offline.

The group went back to the ToR slide. There was further discussion on what the near-term deliverable will be. Seth's plan was to have a full DO-155A release, and all sections will be marked reserved other than the Appendix. Appendix A will have the ITM info. Barbara and Sai asked the group to consider a separate doc vs. an Appendix A for this item.

Charles added that filtering should be considered for system level requirements. Seth said that this near-term deliverable will not have requirements. It is an assessment of the RF Signal Operating Environment (and will be captured in an appendix). There will be no explicit filtering requirements. Sensor Filtering is one potential implementation to achieve the necessary tolerance but not the only one to help meet the operational needs in the updated Interference environment.

Discussion ensues on RF env and requirements. Charles Glass had additional questions on this. Barbara wanted a clear definition of how the ITM and the antenna information are given. Seth stated that the details on decomposition of the ITM into what needs to be done to test at the RA will be addressed in the new Apex A (or the other independent document). An Interference tolerance mask

is what the group is looking at. Charles asked for item 2 on this slide (re: RF Interference requirements) to be updated.

Eddie brought up the concern re: realizable implementations especially targeting current space of fielded designs. There was discussion on reference design and Seth mentioned that Honeywell has been thinking about this. He stated that there are multiple solutions (for Honeywell) that had differing S21 characteristics but similar performance in the presence of near band RFI and that points to selectivity not being the only criteria for compatibility.

The ToR update draft sent out by Rebecca Morrison the week before the plenary. Discussion ensues on whether we needed a new DO (rev) or a different DO document that stands alone. Eddie brought the concern on what the TSO reference to the existing DO's will do (even if the TSO does not ref DO-155, it does have a call out for Loop loss that calls out an appendix in the DO).

Discussion ensues on the document planning for delivery with the timelines. Concerns on what the timeline should be and what the risks of running too early or too late were reflected in the discussion. Seth mentioned that the alternative to not move fast is not acceptable.

Jean Luc Began discussing the BS antenna mask (slide 10 in the presentation). Charles glass asks about the definition of the ITM. Dave Wolter had a question on what the reference for the dotted black line was. Same type of question from Janet young at the FCC. Needed more clarity on this trace. There was agreement on removing the 6 dB safety margin from this slide.

Discussion focused on leveraging measurements from the antenna vs. the sim for antenna pattern info - Janet Young wanted to know if we can use the latest info as against waiting for this to be updated through ITU-R.M.2101. Telecom stakeholders stated that 3GPP has patterns that are similar to what was shared in ITU-R.M.2101 and relevant ITU-R WP discussions. Seth added that we need to know what the pattern from the antenna will be at zenith.

Ed Hahn wanted to ensure that whatever is built in the future for the rad alt will be able to operate in all future env (as these solutions fly worldwide). If the group states that the BS equipment here is better than its spec, we are now committing to specs that are anticipated to be met worldwide. He added that we need to have a standard for worldwide usage. Eddie Straub chimed in and added that co-existence will be a multi-dimensional problem with a multi-dimensional solution.

Additional questions on distance vs power vs pointing angles were posed and discussed. Neeti from AT&T had a question on what could be done at the diff frequency offsets (from the rad alt) as well.

Discussion ensued on what the interim MOPS deliverable will be and how the antenna requirements will be decomposed. Goal is to have system level requirements and a "standard" antenna definition that will allow the rad alt manufacturers to determine what requirements they need to meet at the sensor input. TSO can be obtained at system level by rad alt manufacturer, or a two-part TSO can be obtained with one at the sensor level and another by the antenna manufacturer at the antenna level. Both options are allowable at this time.

Discussion on SC-239 / WG-119 ToR proposal: A separate doc or two rev's of DO-155? Poll took place (inconclusive results observed). The group was trending towards having the adjacent band resiliency characterization material in a standalone DO.

Dave Wolter (ATT) stated that we should be prepared for changes to the RF env (Asif from Vz agreed with dave) in the long term.

Kim Kolb –lead of SG2 provided a status update on global 5G emissions limits and plans. Added in the Japan info re: 60.8 dBm/ MHz max EIRP (sum across all three sectors) up to 4100 and above 4500 (based on input from Shunichi). Questions on TRP vs EIRP came up, questions arose on what spurious limits are seen in the UK.

Jean Luc presented the ITM, PFD, 5G mask and the standoff distance slide (slide 13 in the final presentation). He asked if rad alt manufacturers can meet the more stressful case of the plots that are seen in the bottom of the slide. Sai and Seth said that we can meet the bottom right but in a new end state solution.

Eddie and Matt Harris asked, “What is the deliverable per the RTCA process?” Jean Luc replied that the PFD is the deliverable (i.e.) PFD as a function of altitude.

Discussion ensued on how we address this, ground up – with what we can do (best we can do from rad alt design) and then bounce against what the worst 5G env might be. There will likely be a gap here based on what cannot be met and then this will advise the next steps on what further details will need to be agreed upon/codified from a 5G SiS (signal in space) perspective.

Discussion on scope #2 slide (tentative) – discussion on what inputs and outputs are of this interim document. Lots of discussions on how we adjudicate the best possible performance. Substantive discussions ensued on this chart and Jean Luc updated this in real time. Jean Luc provided an overview of aircraft operational volumes with the help of a relevant pictorial (slide 15) to help decouple volume as a whole from what could be considered as aircraft operational areas that would have different safety level impacts. He also presented details on some stand-off distance examples (slides 17-19).

Sai and Eddie provided the group with a succinct update on the status of aviation discussions with Telecom.

4. Future Meetings

- a. Next joint plenary with EUROCAE WG-119 will be between 5-7 Apr 2022. It is anticipated that this will be a hybrid meeting.
- b. Other Actions –
 - i. present a draft Updated ToR for review at the next SC-239 plenary
 - ii. compile material to present at the next PMC meeting to help advise leadership on the path forward.

5. Adjourn

The meeting adjourned around 1 PM ET.

Certified

Sai Kalyanaraman, Secretary SC-239

Samh Menshawy, Secretary WG-119

Seth Frick, Chairman SC-239

Jean Luc Robin, Chairman WG-119