



RTCA Paper No. No. 312-20/SC222-084  
 EUR Reference No EUR 330-20 / WG82-82

Washington, 16 November 2020  
 St Denis, 16 November 2020

**Minutes of EUROCAE  
 WORKING GROUP 82 (WG-82) (Meeting #42) and RTCA SPECIAL COMMITTEE 222  
 (SC-222) (Meeting #39)  
 “New Air-Ground Data Link Technologies”  
 related to SATCOM**

<b>Date</b>	<b>10<sup>th</sup> and 12<sup>th</sup> November 2020</b>
<b>Place</b>	<b>Virtual Meeting</b>
<b>Venue</b>	<b>EUROCAE – Webex</b>
<b>Hosted by</b>	<b>EUROCAE</b>

**Participants:**

Name	Company	10 <sup>th</sup>	12 <sup>th</sup>
Adam Sarhage	GARMIN	X	
Alan Schuster-Bruce	INMARSAT	X	X
Andrew Morin	IRIDIUM	X	X
Angelo Rossi	MITRE	X	
Ann Heinke	Stellar Solutions	X	X
Anna Guegan	EUROCAE	X	X
Aristides Cintra	EMBRAER	X	X
Armin Schlereth (chair WG-82)	DFS	X	X
Ayaz NEMAT	THALES	X	X
Ben Huang	IRIDIUM	X	X
Brandon Hinton	WILEY	X	X
Chuck LaBerge (chair SC-222)	LaBerge Engineering	X	X
Cindy Freud	MITRE	X	
Darrell Andregg	COLLINS	X	X
David Green	Rockwell Collins	X	X
Gonzalo Prieto	ESSP		X
Hans Trautenberg	EASA	X	X
Hiroshi OKOCHI, JRANSA	JRANSA	X	X

Jeffrey Bull	IRIDIUM	X	X
Jila Rainer Koll	Stellar Solutions	X	X
Johan Gericke	COBHAM	X	X
Karan Hofmann	RTCA	X	X
Luke Sienkiewicz	IRIDIUM	X	X
Maqbool Aliani	LIGADO	X	
Mark Insley	LATITUDE-TECH	X	X
Martina Angelone	ESA	X	X
Michael Gertsman	SQUAREPEG	X	
Michael Hooper	IRIDIUM		X
Nick Hendrickson	FLYHT		X
Nikolaos Fistas	EUROCONTROL	X	X
Ravi Jain	FAA	X	X
Richard Tapp	HONEYWELL	X	X
Sachin Chhibber	LIGADO	X	X
Sam Weich	LIGADO	X	X
Stephen Van Trees (GAR)	FAA	X	X

#### DOCUMENTS

Agenda Item	Title	File name
1	Calling Notice and Agenda	SC-222 (39) and WG-82 (42) Calling Notice.pdf
2	Meeting Minutes of last Meeting	222_38_WG-82_Meeting_41_Minutes_Finalv2_WP321
4a	SC-222 Working Paper 317B: Proposal to SC-159 on GLONASS L1 Operations	WP317B Coordination letter on GLONASS-FINAL 101910.docx
4d	GPS antenna isolation	222WP326 GPS Isolation Spreadsheet.xls
5	Iridium MASPS	WP319C Iridium DO343C MASPS_201007.pdf
5	Updated Schedule	222WP316D Updated SC222 Schedule for Iridium Docs.xls
7	Iridium MOPS	WP320C Iridium DO262F MOPS_201009.pdf
7	EXCEL Pre-Frac Comments Sheet	222WP327 Pre FRAC Comments on Iridium Documents.xls

Documents related to IRIDIUM are available on the RTCA SC-222 Workspace.

#### PRESENTATIONS

Agenda Item	Title	File name
3	ICAO PT-S (SATCOM) Update	WG82 PT SAT update November 2020.pptx

## **Welcome, Introductions, Administrative Remarks by Special Committee Leadership**

Chuck LaBerge (chair SC-222) welcomed the group.

Karan Hofmann and Anna Guégan informed about the anti-trust policy, IPR policy, and call and participation membership policies for RTCA Special Committees (SC) and EUROCAE Working Groups.

### **1. APPROVAL OF THE AGENDA**

After a round table, Chuck LaBerge introduced the proposed agenda of the RTCA SC-222/ EUROCAE WG-82 Plenary meeting. The final agreed agenda looked as follows:

#### **AGENDA**

**10, 12 November 2020 (9:00 am – 5:00 pm ET) – (15:00 – 23:00 pm CEST)**

Welcome, Introductions, Administrative Remarks by Special Committee Leadership

- Government Authorized Representative (GAR): Stephen Van Trees
- Chair RTCA SC-222: Dr. Chuck LaBerge, LaBerge Engineering
- Chair EUROCAE WG-82: Dr. Armin Schlereth, DFS

1. Review Agenda
2. Review Minutes and Actions
3. Review of activities in related groups (ICAO, ARINC, etc.)
4. Review of Working Papers & Outstanding Issues
  - a. Iridium vs. GLONASS (WP317A): per September 14 meeting
  - b. Voice Specification and Environment, per September 28 meeting
  - c. Ligado vs. Iridium
  - d. Iridium vs. GPS Isolation Same Aircraft (added at request of Ravi Jain, FAA)
5. Review of updates to DO-343D/ED-242C Iridium-specific MASPS (formal comment tracking required)
6. Approve release of DO-343D/ED-242C for Final Review and Comment / Open Consultation (FRAC/OC)
7. Review of updates to DO-262F/ED-243C Iridium-specific MOPS (formal comment tracking required)
8. Approve release of DO-262F/ED-243C for FRAC/OC
9. ISRA Discussion – from SC-228
10. Other Discussion as needed
11. Agreement on Actions
12. Agreement on Meeting Schedule (ref. 222WP316C)
13. Adjourn

### **2. Review Minutes and Actions**

The minutes of the last meeting have been reviewed and approved. The action item list has been reviewed focusing on the open actions and their status has been updated. The updated action item list is outlined at the end of the present minutes.

### **3. Review of activities in related groups (ICAO, ARINC, etc.)**

#### **ICAO**

Nikos FISTAS presented the status of the PT-SAT, recalling the scope (performance definition for the short term ATS B2 -SATCOM class B - and for future ATS B3 -SATCOM class A -) and

presenting some topics: SARPS (especially RCTP and RSTP), key parameters for voice, notification and outage requirements draft SARPS including also considerations on availability requirements and multilink requirements.

Also, CPDLC and ADS-C Measurement points are being identified, which will be used to apportion the SARPS, differentiating them from the ones defined in the PBCS which may not be always available.

Concerning Class B, it was mentioned that the group will consider also new satcom constellations and simultaneous operations of different SATCOM systems on the A/C.

Text for the Draft SARPS is expected to be finalized by end of 2020. SSP confirmed intention to provide validation material by Q1 2021. Targets are to have the SARPS by Q1 2022 and the Manual by Q3 2022

#### **4. Review of Working Papers & Outstanding Issues**

The set of open working papers has been reviewed and related issues discussed. It was not possible to resolve all the outstanding issues.

##### **a. Iridium vs. GLONASS (WP317A): per September 14 meeting**

Luke presented the latest version of the paper. It summarizes GLONASS HSN Transmit Power Limits and updates on the paper 317B addressing the Out of Band emissions noise requirements to protect the GLONASS receivers on nearby aircraft.

Chuck LaBerge reported that the SC222/WP317B had been forwarded to Dr. Chris Hegarty and Dr. George Ligler, co-chairs of SC159 for distribution and comment by SC159 members. No comments have yet been received. Darrell Andregg of Collin reported that Sai K. of Collins, who is the Chair of SC159/WG-6 on spectrum and frequency issues was heavily involved in the revised version of WP317B. Chuck LaBerge reminded all SC-222 participants that FRAC/OC comments should be solicited from GNSS experts in their organizations.

##### **b. Voice Specification and Environment, per September 28 meeting**

Discussion on the type of test that the DRT would undergo. Concerns are raised about how to harmonize the machine testing and voice perception//human testing.

It was agreed that DRT testing will be carried out at system level and that MASPS AND MOPS will not refer to PESQ. This is because PESQ does not provide voice intelligibility values, which is required. For this real listener tests a required. In order to avoid a requirement that each AES manufacturer repeat such tests, it was agreed that the MOPS approach would be to test the signal quality at the input to the modem and test the Codec by means of Iridium-provided test vectors. The signal quality test assures that the signal to the modem will produce acceptable output quality (as established by the system level tests). The test vectors assure that the Codec algorithms have been correctly implemented. This eliminates the need for extensive and expensive DRT testing at the AES level.

##### **c. Ligado vs. Iridium**

Discussion focused on what happens to an Iridium terminal if several Ligado transmitters are in the proximity of the Iridium terminal. Sachin Chibber replies that they do not expect any interference issue. Armin Schlereth pointed out that section 3.4. 3 MASPS needs rewording, and the meeting attempted some real-time editing. This discussion concluded that more

detailed numbers and technical details would be needed to provide users and regulators with the scope of any potential problem. Armin also pointed out that without additional material providing such analytical predictions, he will not concur on the MASPS material during FRAC/OC.

One concern is that at the gate an Iridium receiver might be overloaded by emissions from a few Ligado handsets. Since this could interrupt the dispatch of an aircraft, it is potentially a safety issue and therefore not acceptable. John Gericke even pointed out, that his simplified preliminary analysis indicates a significant potential for severe interference during AMS(R)S En-Route Continental Operations due to a large multiplicity of Ligado handsets. The meeting could not debate the analysis, because no papers have been submitted for review.

Ligado pointed out its concern on the limited time available to provide such expected detailed material. In response, Armin commented that this item has been open for more than one year (September 2019 meeting SC-222 meeting) and that no additional material has been presented so far.

#### **d. Iridium Related GPS Isolation Issues**

Ravi Jain from FAA brought up an issue related to the required isolation required for GPS onboard the aircraft.

In particular, a discussion was opened on the requirement for antenna-port-to-antenna-port isolation requirement between Iridium and a GPS on the same aircraft of nearly 70 dB. This contrasted with the normal assumption – used for more than 20 years in the SATCOM community and represented many specifications, of around 40 dB.

Discussion on this continued on the second day of the meeting when Iridium presented new calculations in the context of the MOPS review. It seems that the issue comes from the fact whether peak or average power values are considered. Current practice on all other such systems, including Iridium Block 1, Inmarsat Classic Aero, and Inmarsat Swift Broadband has been to use average power. There are no widespread reports of interference from these systems to GPS.

More details are outlined in the section on MOPS discussion in Agenda Item 7, below.

#### **5. Review of updates to DO-343D/ED-242C Iridium-specific MASPS (formal comment tracking required)**

In the absence of Michael Hooper due to a health issue, Luke Sienkiewicz from Iridium led the meeting through a discussion of comment on MASPS material. As noted earlier, a significant item of concern was related on the section addressing the potential for interference from Ligado handsets to the reception of Iridium Certus from the satellite.

The group agreed to delete references to SC222/WP321, as that paper has been withdrawn.

For the outcome of the discussion see the updated EXCEL Comments Sheet.

#### **6. Approve release of DO-343D/ED-242C for Final Review and Comment / Open Consultation (FRAC/OC)**

The Committee approved the updated draft of DO-343D/ED-242C Minimum Aviation System Performance Standard for AMS(R)S Data and Voice Communications Supporting Required Communications Performance (RCP) and Required Surveillance Performance (RSP) for the FRAC/OC. The Committee asked Iridium to make the final edits and scheduled a meeting (optional attendance) to review those final edits before sending the document(s) to RTCA.

This concluded the business for November 10.

**7. Review of updates to DO-262F/ED-243C Iridium-specific MOPS (formal comment tracking required)**

The Committee reconvened on Thursday, November 12.

The Committee resumed a more detailed discussion on required GPS isolation (Agenda Item 4d, above). Updated calculations show that isolation required from Satcom to GNSS antenna connectors ranges between 42 and 48 dB depending on the AES class, based on the average power. Discussion took place on whether the peak power should be taken into account instead. Based on the precedent established for Classic Aero, Swift Broadband, and Iridium Block 1, and the lack of evidence of interference issues related to GPS on thousands of operational aircraft, the Committee decided to specify average power for this item.

The Excel sheet with calculations will be included in the MOPS as working paper and will be separately recorded as WP-326.

Committee members are urged to consult with the GPS experts in their organizations as part of the FRAC/OC process for this MOPS document, so that comments will be received on the approach adopted by this committee.

Document wording was changed to permit declaration of isolations of up to 60 dB.

The Committee resumed a more detailed discussion on voice latency, focusing on the voice latency measurement described in section 2.2.3.6.2.7. It was agreed to increase the latency value from 100 ms to 150 ms taking also into account link layer framing. Several manufacturers agreed to make measurements and comment on this value during FRAC.

For the outcome of the discussion see the updated EXCEL Comments Sheet, Working Paper 327.

**8. Approve release of DO-262F/ED-243C for FRAC/OC**

The Committee approved the updated draft of DO-262F/ED-243C Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS) for the FRAC/OC. The Committee asked Iridium to make the final edits and scheduled a meeting (optional attendance) to review those final edits before sending the document(s) to RTCA.

This concluded the business for November 12.

Subsequent to the approval and conclusion of the November 12 meeting, the editorial review meeting was held on November 17. This meeting had additional comments about the wording of the Ligado interference section in the MASPS, but no changes were made to the text approved on November 10. Mike Hooper and Luke S. led the attendees through the agreed changes to verify that the changes had been properly implemented. The attendees agreed, with only very minor word changes.

Iridium agreed to submit the documents to RTCA by the morning of November 18, so that the drafts could be prepared for the FRAC/OC process.

**9. ISRA Discussion – from SC-228**

SC-228 briefed the leadership of SC-222 about the UAS requirements. Thus far, a lack of response has not impacted SC-228 process, and SC-228 (Steve Van Trees) acknowledged that it was reasonable for them to wait until our documents entered FRAC/OC. Therefore, this item continues to be open.

**10. Other Discussion as needed**

No other subjects have been discussed at the meeting.

**11. Agreement on Actions**

Armin Schlereth went through the action items of the meeting. The final version is attached to the minutes.

**12. Agreement on Meeting Schedule (ref. 222WP316C)**

It has been agreed to have another meeting of a small subgroup to do the required editorial work on the IRIDIUM MOPS before issuing the FRAC/OC. This meeting is scheduled for 17th November 2021 from 9am to 5pm. Working Paper 222WP316 was updated to rev D. The remaining tasks listed in that WP are included below:

Action or Meeting		Content For Review
<b>PMC Mtg (Changed)</b>	<b>Thursday, March 18, 2021</b>	<b>Post FRAC/OC Iridium MOPS/MASPS, interference model plus WG-82 material on Class A Airspace.</b>
Documents to PMC	Thursday, February 11, 2021	Documents for Approval (see above)
Documents to RTCA	Monday, February 1, 2021	Documents for Approval (see above)
FRAC Resolution Plenary	Wed Thur January 13-14, 2021	Documents for Approval (see above)
FRAC Complete	Wednesday January 7, 2021	Documents for Approval (see above)
FRAC Released	Monday November 23, 2020	Documents for Approval (see above)
Plenary (continued)	Tuesday November 17	
Documents to RTCA	Tuesday November 17	
Plenary Approval	Thursday, November 12, 2020	(If needed?)
Plenary Approval	Tuesday, November 10, 2020	Documents for Approval (see above)

The November 17 meeting has been reported on under Item 8, above.

**13. Adjourn**

Chuck thanked the group for the discussion and congratulated Iridium on the amount of work done in advance to complete documentation so far. Despite the approval for FRAC, issues on item 4a, 4c, and 4d are expected to create comments. Iridium, its partners, and Ligado are urged to use the intervening time to progress these issues, so that the FRAC resolution meeting scheduled for mid January 2021 will go smoothly. Some items were open (GPS interference, GLONASS interference, LIGADO interference, Voice Quality) when starting the meeting.

**14. Establish Agenda, Date and Place for next meeting**

For RTCA SC-222 and EUROCAE WG-82 the planning of next steps have been discussed. The plan for FRAC resolution is shown in the schedule above. Beyond that schedule, the following next meetings have been agreed on.

**WEBEX's:**

- **13.01.2021 and 14.01.2021 WG-82/RTCA SC-222: Plenary WEBEX from 3pm to 11pm CET** (WEBEX will be organized by RTCA)

*Note: This WEBEX is intended as resolution meeting of the fore-mentioned FRAC/Review process. It is intended to hand over the final material to Anna Guegan and Karan Hofmann on the 01 February 2021.*

**Physical Meetings:**

- **No physical meeting(s) are planned.**

**12. Adjourn – Plenary meeting**



## Action items

### RTCA-SC222 / EUROCAE WG-82 30<sup>th</sup> meeting: 6.02.2018 and 7.02.2018

Action#	Content	Responsible	Deadline	Status
A30-09	<p>Review of SC-228 slides and material (ITU M.2127) to provide feedback on the following items:</p> <ol style="list-style-type: none"> <li>1) Support of 2000 UA</li> <li>2) 10 – 100 kbps per UA (Peak!)</li> <li>3) Voice latency of 390 millisecond maximum</li> <li>4) Use of protected spectrum (L-Band)</li> </ol> <p><b>Discussion at WG-82#31:</b> Chuck LaBerge will provide a response on it asap.</p> <p><b>Discussion at WG-82/#32:</b> Values might change in the MASPS for UAS. MASPS are available end of the year. So no activities required by WG-82/SC-222 until availability of MASPS.</p> <p><b>Discussion at WG-82/#33:</b> MASPS on C2 link support by SATCOM expected Q1/2019.</p> <p><b>Discussion at WG-82/#34:</b> Status unchanged.</p> <p><b>Discussion at Plenary June 2019:</b> Status unchanged.</p> <p><b>Discussion at Plenary July 2019:</b> Current priority on MASPS and MOPS actual documents. Status unchanged.</p> <p><b>Status Plenary Sept 2019:</b> Status unchanged. Current publication schedule has higher approval.</p> <p><b>Status Plenary Nov 2019/Jan 2020:</b> Status unchanged. Current publication schedule has higher approval</p> <p><b>Discussion at Plenary June 2020:</b> Status unchanged.</p> <p><b>Discussion at Plenary Nov 2020:</b> Early 2021 SC-228 finishing RPAS MASPS. Restart coordination then.</p>	Chuck LaBerge	asap	<b>Open</b>

**RTCA-SC222 / EUROCAE WG-82 31<sup>st</sup> meeting: 26.06.2018 and 28.06.2018**

<b>Action#</b>	<b>Content</b>	<b>Responsible</b>	<b>Deadline</b>	<b>Status</b>
A31-03	<p>Contact EUROCAE WG-105 (RPAS) to ask for requirements on SATCOM Performance Class A</p> <p><b>Discussion at WG-82/#34:</b> Still open. Armin Schlereth to take care of it soon.</p> <p><b>Discussion at WG-82/#35:</b> Still open.</p> <p><b>Discussion at Plenary June 2019:</b> Status unchanged.</p> <p><b>Discussion at Plenary July 2019:</b> Current priority on MASPS and MOPS actual documents. Status unchanged.</p> <p><b>Status Plenary Sept 2019:</b> Status unchanged.</p> <p><b>Status Plenary Sept 2019/Jan 2020:</b> Status unchanged. Current publication schedule has higher approval.</p> <p><b>Discussion at Plenary June 2020:</b> Status unchanged.</p> <p><b>Discussion at Plenary Nov 2020:</b> Early 2021 SC-228 finishing RPAS MASPS. Restart coordination then.</p>	Armin Schlereth	asap	<b>Open</b>

**RTCA SC-222/EUROCAE WG-82 meeting: 12.06. and 13.06.2019**

<b>Action#</b>	<b>Content</b>	<b>Responsible</b>	<b>Deadline</b>	<b>Status</b>
A36-04	<p>Distribute Draft ICAO SATCOM SARPS to Armin Schlereth and Chuck LaBerge for further distribution within SC-222 and WG-82. Review by both groups appreciated.</p> <p><b>Status Plenary July 2019:</b> Armin Schlereth to ask Nikos on this matter.</p> <p><b>Status Plenary Sept 2019:</b> ICAO PT-S plans to provide the draft SARPs for EUROCAE/RTCA review and comments in January 2020.</p> <p><b>Discussion at Plenary Nov 2020:</b> See presentation and information from Nikos.</p>	Nikos Fistas	End January 2021	<b>Open</b>

**RTCA SC-222/EUROCAE WG-82 meeting: 19.09. and 20.09.2019**

<b>Action#</b>	<b>Content</b>	<b>Responsible</b>	<b>Deadline</b>	<b>Status</b>
A38-01	<p>Consider Ligado potential interference issue on the Iridium MOPS in the Iridium Working Group session</p> <p>Plenary SC-222 and WG-82 Nov 2019: IRIDIUM wants to have it part of the Plenary discussion.</p> <p>Make a new AI out of it. Closed this one!</p> <p>Plenary June 2020: Decided to keep it for more discussion at next meeting.</p> <p><b>Discussion at Plenary Nov 2020:</b> See discussion during meeting!</p>	Chuck Laberge	October Meeting of SC-222	<b>Open</b>

**RTCA SC-222/EUROCAE WG-82 meeting: 23.06. and 24.06.2020**

<b>Action#</b>	<b>Content</b>	<b>Responsible</b>	<b>Deadline</b>	<b>Status</b>
A41-01	<p>Write a White Paper summarizing the relevant bodies, which may provide requirements input to the work of RTCA SC-222 and EUROCAE WG-82 on Future SATCOM.</p> <p><b>Discussion at Plenary Nov 2020:</b> Ravi and Armin to coordinate offline how to proceed.</p>	Ravi Jain supported by Armin Schlereth (European bodies)	18.July 2020	<b>Open</b>
A41-02	<p>Clarify on future harmonized work program of RTCA SC-222 and EUROCAE WG-82.</p> <p>Organize a meeting with Karan Hofmann, Ann Guégan, Chuck LaBerge and Armin Schlereth</p>	Armin Schlereth	1.July 2020	Closed
A41-03	<p>Write a Paper on justification of C1 low/high gain maximum level of white band noise (-114.6 dBm and -120.5 dBm). Also power loop control management to be covered clarifying not inducing multi aircraft interference.</p>	IRIDIUM (Mike Hooper, Luke Sienkiewicz?)	18.July 2020	Closed
A41-04	<p>Provide a White Paper to Chuck LaBerge on GLONASS interference subject. Chuck LaBerge then to coordinate with RTCA SC-159</p>	Mike Hooper, Chuck LaBerge	11.July 2020	Closed

**RTCA SC-222/EUROCAE WG-82 Plenary meeting: 10.11. and 12.11.2020**

<b>Action#</b>	<b>Content</b>	<b>Responsible</b>	<b>Deadline</b>	<b>Status</b>
A42-01	Ligado/IRIDIUM to provide detailed material about interference between Ligado and IRIDIUM to become part of the MASPS.	Michael/Sachin	1 week ahead of FRAC/OC resolution meeting	<b>Open</b>
A42-02	Clarify on trade mark usage on MASPS/MOPS cover page with Karan	Chuck	12.11.2020	<b>Open</b>
A42-03	Update IRIDIUM MASPS document according discussion and forward it to RTCA program manager for FRAC/preparation	Luke / Michael	17.11.2020	<b>Open</b>
A42-04	Iridium to provide the excel spreadsheet to Chuck for assigning it a working paper number and attaching it to the MOPS	Luke	12.11.2020	<b>Open</b>
A42-05	Manufacturer to clarify calculation proposed in paper from A42-04 is correct during FRAC/OC process	Darrell Andregg/ Richard Tapp / Johan Gericke	FRAC/OC resolution meeting	<b>Open</b>
A42-06	Manufacturer to test 150ms Voice Latency requirement during FRAC. Present results at FRAC resolution meeting	Darrell	FRAC/OC resolution meeting	<b>Open</b>
A42-07	Update IRIDIUM MOPS document according discussion and forward it to RTCA program manager for FRAC/preparation	Luke	17.11.2020	<b>Open</b>
A42-08	Facilitate feedback from GLONASS WP	Chuck	asap	<b>Open</b>