



EUR 179-18 / WG82-058
RTCA Paper No. 193-18/SC222-059

St Denis, 16 July 2018
Washington, 16 July 2018

**Minutes of
Working Group of the whole meeting of RTCA SC-222 (Meeting #29) and EUROCAE WORKING GROUP 82 (Meeting #31)
“New Air-Ground Data Link Technologies”
related to
SATCOM**

Date	Tuesday 26th June to Thursday 28th June
Place	Cologne, Germany
Venue	European Aviation Safety Agency Konrad-Adenauer-Ufer 3, D-50668 Cologne, Germany
Hosted by	EASA

Participants:

Name	Company	26 th	27 th	28 th
Lorena Albiol	INDRA		X	X
Darrell Andregg	Rockwell Collins	X	X	X
Martin Arndt	Cobham	X	X	X
John Bard	Thales	X	X	X
Cristian Bertoldi	Airbus	X	X	
Chew Keng Boon*	CAAS	X	X	X
Laurent Cadiet	Airbus	X	X	X
Cristian Bertoldi	Airbus	X	X	X
Kevan Bracken *	INMARSAT	X	X	X
Alan Schuster Bruce	INMARSAT	X	X	X
Andrew Ives*	INMARSAT	X	X	X
Sachin Chhibber	Ligado	X	X	
Adrian Cioranu	EUROCAE		X	X
Tan Ye Eugene	CAAS	X	X	X
Anna Guegan	EUROCAE		X	X
Friedhelm Runge	EASA	X	X	X
Daniel Mihoci	EASA	X		
Nikos Fistas	EUROCONTROL		X	
Johan Gericke	COBHAM SATCOM	X	X	X
David Green*	Rockwell Collins	X	X	
Karan Hofmann*	RTCA	X	X	

Rainer Koll	Stellar Aerospace	X	X	
Stefano La Barbera	Thales Alenia Space - Italy	X	X	X
Sean McGinnis	Honeywell	X	X	X
Alessia Miglietta	Thales Alenia Space - Italy	X	X	X
Chuck LaBerge*	LaBerge Engineering (Chair SC-222)	X	X	
Gonzalo Pietro*	ENAIRE	X	X	X
Dave Robinson	FAA (SC-222 GAR)	X	X	X
Armin Schlereth	DFS (Chair WG-82)	X	X	X
Nigel Silverthorn	Honeywell	X	X	X
Stephane Tamalet	Airbus		X	
Richard Tapp	Honeywell	X	X	X
Glenn Torgerson	The Boeing Co	X	X	X
Sam Weich*	Ligado	X	X	
Radek Zaruba	Honeywell	X	X	X

* WebEx Attendee

DOCUMENTS

Agenda Item	Title	File name
1	WG-82 Calling notice	SC-222 and WG-82 Draft Calling notice Meeting 31.doc
2	Minutes of last meeting	222_28_82_Meeting_30_minutes_final version.doc
3	PT-S SARPs development activities; Communication to other SATCOM interested groups	WP03 PT-S W10 communication to other groups v10.docx

All documents are available on the EUROCAE WG-82 workspace.

PRESENTATIONS

Agenda Item	Title	File name
0	Independent Standards Development Organization Briefing	Independent SDO Briefing to Committees – 222.pptx
4	MASPS Update <i>Remark: including SEC REQ from AIRBUS</i>	- ED-242A part 1 draft 3.docx - DO-343B MASPS Comment table – all(2018-06-15).xlsx
4	MOPS update	- ED-243 (2018-06-27).docx - ED-243 Appendix F – LRCS (2018-06-27).docx - ED-243 MOPS Comment table – all(2018-06-27).xlsx
4	Dual Satcom for LRCS – MASPS/MOPS; Suggested way forward	Eurocae WG-82 June 2018 – Dual Satcom for LRCS. Inmarsat and Honeywell.pptx
5 and 8	TSO/ETSO C-159d Harmonization Discussion	FAA Cologne TSO Briefing_06 2118b.pptx
6	ATN over SATCOM	ATN over SATCOM.pptx

9	SATCOM Class B MOPS – Interference with GNSS/other L-band SATCOM	SC222_WG82_Airbus_contribution_interference_v04.pptx
15	EUROCAE-WG 82; SESAT 2020 COM Solution Overview	EUROCAE-WG82(June2018)-SESAR-Presentation-v2.pdf
17	Iris Service Evolution	Eurocae WG-82 June 2018 – Iris Service Evolution presentation – Inmarsat.pptx
17	ATN-IPS	Eurocae WG-82 June 2018 – ATN-IPS presentation – Inmarsat.pptx
17	SBB and Iris Performance validation activities	Eurocae WG-82 June 2018 – SBB Performance validation - Inmarsat.pptx
17	QoS monitoring and reporting for IPS multilink	QoS monitoring for IPS.PPTX

All presentations are available on the EUROCAE WG-82 workspace.

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

The meeting was split into 2 parts. The afternoon session on the first and second days were run as Plenary meeting of EUROCAE WG-82 and RTCA SC-222, whereas the morning session on the second and third days were WG-82 only meetings.

Chuck LaBerge and Armin Schlereth welcomed the group. Main items were related to INMARSAT SBB update of MASPS and MOPS material. This time no presentation/contributions have been given by IRIDIUM and LIGADO.

Before starting the meeting Karan Hofmann from RTCA secretariat explained the new relation between FAA and RTCA. RTCA now became an independent standards development organization. In that context the role of a Designated Federal Official (DFO) no longer exists. Current DFO will change the role to become a Government Authorized Representative (GAR). Plenary session will no longer be announced in the Federal Registry. Plenary session can be run without physical presence of the GAR.

After that the IPR and participation statement from RTCA and EUROCAE side were given.

2 **APPROVAL OF THE AGENDA**

The final agenda of the RTCA SC-222 and/or EUROCAE WG-82 only meeting looked as follows:

First day: 26th June 2018 (2:00 pm – 6:00pm)

Afternoon Session (2:00 pm to 6:00 pm) (Joint Session with RTCA SC-222)

Welcome, Introductions, Administrative Remarks by Special Committee Leadership

- Government Authorized Representative (GAR): Mr. David Robinson
- Chair RTCA-SC222: Dr. Chuck LaBerge, LaBerge Engineering
- Chair EUROCAE WG-82: Dr. Armin Schlereth, DFS

The following agenda is for both days of the joint sessions:

1. Agenda Overview
2. Review/Approve prior Plenary Meeting Summary – (action item status)
3. Coordination with other GROUPs (EUROCAE, RTCA, SESAR, AEEC)
 - a. ICAO: Status of PT-S work (ECTL) → second meeting day
4. Updates on DO-343B/ED-242A and DO-262D/ED-243A
5. TSO items discussion
6. ATN over SATCOM – Transition Aspects (Honeywell)
7. EASA RMT.0524 aspects
8. Discussion of SATCOM Performance Structure (FAA-GAR)
9. Industry Presentations
 - a. SATCOM Co-site interference (AIRBUS)
 - i. SATCOM Performance Class B interference with GNSS
 - ii. SATCOM interference between INM and Iridium
 - b. HF replacement (Honeywell)
10. SC-228 IRSA Discussion

11. Detailed Work Plan for SC-222 and WG-82
12. Establish Agenda, Date and Place for next meeting
13. Review of Action Items
14. Adjourn – Plenary meeting

Second day: 27th June 2018 (9:00 am – 6:00 pm)

Morning Session (9:00 am – 1:00 pm) (WG-82 only)

15. Presentation of SATCOM Performance Class A material
 - a. Presentation by THALES on SESAR activities

Afternoon Session (2:00 pm to 6:00pm) (Joint Session with RTCA)

16. Joint session with RTCA SC-222 → Continuation of agenda according work progress

Third day: 28th June 2018 (9:00 am – 1:00 pm)

Morning Session (9:00 am – 1:00 pm) (WG-82 only)

17. Presentations from Inmarsat not been able to be given at the Plenary
 - a. IRIS Service Evolution conclusions (INMARSAT)
 - b. ATN/IPS (INMARSAT)
 - c. SBB performance (INMARSAT)
18. Presentation of SATCOM Performance Class A material con't
 - d. QoS monitoring (Honeywell)
19. Minutes of the meeting and action item list
20. AOB
21. Summary & Next Meeting(s)

3 Minutes of last meeting

The minutes of the last meeting were approved after taking into account comments from the group. The action item list has been reviewed. The updated action item list is outlined at the end of the present minutes.

4 Coordination with other GROUPs

EUROCAE

No input provided at the meeting.

ICAO

Nikos Fistas, Rapporteur of CP PT-S of ICAO, presented a paper at the second day of the meeting, which outlines the decisions and directions which the ICAO COM Panel SATCOM group (PT-S) is taking in developing the update of the SATCOM SARPs to include the requirements for Class B SATCOM systems. He explained the agreements so far, as well as

identified the items that the group is currently working on and discussing. PT-S aims to complete the development of the updated Draft SARPS by October 2018. Therefore, PT-S is inviting the comments and feedback of other groups interested in SATCOM. In this paper a detailed discussion of the Performance Class B and A takes place. Especially it is proposed to only use one-way technical delay requirements. It is proposed to use the 95 % and 99 % values for round trip delay divided by 2 as one-way delay values. But this is mathematically not correct. In order to inform the group Chuck La Berge volunteered provide a white paper explaining the exact mathematical outline on this item. Further on Nikos explained that one-way delay values have been selected as two-way values are difficult to measure. Alan from Inmarsat explained that they are doing it currently in their system and it should not be problem to measure. More clarification how Inmarsat is measuring it will be provided by Alan asap.

RTCA

See item on coordination with RTCA SC-228 (action item A30-09). Chuck will provide a feedback on the outlined expected performance values asap.

AEEC

No input provided at the meeting.

SEAR

A comprehensive presentation has been given under agenda item 15 by Alessia Miglietta and Stephane la Barbera on the actual status of work within SEAR PJ 14.2.2 and 14.2.4.

5 SATCOM MOPS (DO-262D/ED-243A) development

Draft Annex E changes

Radek went through the comments received so far. All the items have been discussed. The actual status is outlined in the according Excel-Sheet, which is available on the WGs internet workspace. A few items require further update of the document before final review is started.

“HF-replacement” discussion/Dual SATCOM installation

A long discussion on this matter took place and the following important items needs to be mentioned:

- The need for an independent long-range communication system (LRCS) as HF is defined by the region, in which the aircraft is flying. This means that it is not up to a standard like MOPS to explain, that a DUAL SATCOM system can be used instead.
- The meaning of “independent” was not clear to the group. It might also mean a second SATCOM installation (Dual SATCOM). But due to the fact that each region defines the equipment required this discussion becomes obsolete.
- Finally, the group agreed that it would be best to discuss this item within the MASPS and provide the necessary technical means in the MOPS to allow for a Dual SATCOM installation. If it will be used and installed like that is up to the regional regulations in place. But at least the technical feasibility will be outlined. Alan and Radek outlined in a short slide presentation the way forward to organize the work. It is planned to have the updates of MASPS and MOPS ready end of August 2018. This allows for a 2-week review process by the group and final Plenary discussion of the material on the 13th September (WEBEX).

6 SATCOM MASPS (DO-343B/ED-242A) development

Alan Schuster-Bruce (INMARSAT) presented an update of the SATCOM MASPS material for DO.343B Att1 (INMARSAT SBB) covering security requirements as prepared by AIRBUS and

discussed in the March WEBEX of WG-82. The group discussed the text and updates have been included accordingly. The text with changes have been finally accepted by the meeting.

7 TSO items discussion

Dave Robinson (FAA-GAR) gave a slide presentation on this subject. This slide presentation also includes STACOM Performance Structure aspects. Specifically, the high availability values of 0,999995 caused concern within the group, as this would lead to a quite expensive SATCOM system. On the other side it is not understood where this high value is coming from. It might also include a multilink implementation including other links like VLD 2. No final conclusion could be given on this matter. The group finally came to the conclusion that RTCA SC-222 and EUROCAE WG-82 should communicate to the appropriate bodies dealing with the definition of such requirements the technical feasibility.

8 ATN over SATCOM

Radek Zaruba (Honeywell) gave a slide presentation on this subject. Especially the subject of certification on European side has been discussed in more details.

Due to the importance of the transition to ATN/IPS (EUROCAE MOPS/MASPS Revision B) it has been agreed to make it a regular agenda item for WG-82. The group agreed to communicate this material to other bodies to make clear that SATCOM might be an ideal candidate to support transition from ATN/OSI to ATN/IPS.

9 EASA RMT.0524 aspects

This item has not been specifically discussed but it should be pointed out here that RMT.0524 is mainly dedicated to VDL Mode 2 implementation and not to SATCOM. Complementary Technologies like SATCOM are not really treated within this Rule Making Task.

10 Industry Presentations

a. SATCOM Co-site interference

Laurent from AIRBUS gave presentation on this matter especially outlining the more stringent GNSS interference problem related to IRIDIUM due to its frequency band being closer to the GNSS band. Unfortunately, up to now no new technical material of IRIDIUM Next (CERTUS) is available to the group to allow for furthermore deep discussion on this matter.

b. HF replacement/Dual SATCOM installation

Radek provided a slide presentation on this item. Final agreement within the group was to discuss this within MASPS and provide the technical means for DUAL SATCOM installation within MOPS. See also section related to MOPS update of the present minutes.

11 THALES presentation on SESAR activities for Performance Class A system

Alessia and Stefano from Thales gave a very comprehensive presentation on the actual status of SESAR work within PJ14.2.2 on SATCOM Services and PJ14.2.4 on Future Communication Infrastructure and Multi-link.

PJ14.2.2 "Future Satellite Communication data link" project objectives are:

- Compliance with ATN baseline 2 requirement (especially Real time sharing of 4D trajectories)

- Development of technical specifications and validation procedures for Long Term SATCOM for ATM/Iris (class A SatCom) integrated in the FCI (IPv6 and ATN/IPS with multilink policy) taking into account a seamless transition from SESAR baseline and considering the intermediate step of the i4D based on ESA Iris Precursor solution (Class B).
- Technical validation of satellite Air-Ground Datalink for Long Term SATCOM integrated in the FCI (ATN Baseline 3, ATN/IPS, multilink)
- Standardization at global level (ICAO, EUROCAE) of proposed solution for Long Term SATCOM; validation to V2 in wave 1 followed by V3 validation in wave 2. There will be strong coordination with ESA Iris Program and the reuse and consolidation of the ESA Iris program prototypes where possible.

This project is planned to be finalized October 2019.

Achieved Maturity Level:

➔ **SATCOM Class B - TRL 6**

- **Successful flight trials.** On Feb 23, 2016, the Iris Precursor operated a first test flight between Toulouse and the Balearic Islands passing above Madrid, performing initial 4D flight path control and controller–pilot data link exchanges with the Maastricht Upper Area Control Center

➔ **SATCOM Class A - TRL 4**

- **Successful in-lab verification including prototypes**

First set of SATCOM Performance Class A documents (SPR, TW-IRS, INTEROP) expected end of July 2018. Final versions are planned for end 2019. Armin asked whether these documents can be made available at an early stage for WG-82. This is confirmed. Friedhelm Runge from EASA asked why VFR flights are excluded. Response was that project focuses on IFR flights, but VFR is not excluded. It might be simply due to high costs for equipment. Alan Schuster Bruce from INMARSAT asked why a common standard is required for SATCOM Performance Class A as INMARSAT and IRIDIUM have their own standards. Nikos Fistas from ECTL responded, that a common standard would allow for having a single box in the aircraft rather than several ones, which is an advantage to airspace users.

Regarding the **PJ14.2.4**, which deals with the future ATN/IPS implementation, it was stated:

The Future Communications Infrastructure (the FCI) is a “network of networks” whose definition began within the SESAR1 P15.02.04.

The flexible use of the three Data Links (SATCOM, LDACS, AeroMACS) requires the definition and specification of the multilink function, as well as of IP Mobility management solution and support for specific security features.

The Functional Requirements Document continues and improves the definition of the FCI System Architecture, especially detailing critical aspects, like:

- IP Mobility;
- Multilink strategies;
- Interface between the FCI Constituents;
- FCI Security

12 IRIS Service Evolution conclusions

Alan Schuster Bruce from INMARSAT gave a slide presentation on this subject. After providing an overview of the whole IRIS program he discussed the following system tradeoffs:

- Trade Off #1: Coverage Extension to Polar Region
- Trade Off #2: High Availability
- Trade Off #3: Dedicated Ground Segment
- Trade Off #4: Satcom delivery of ATN/IPS
- Trade Off #5: HF Replacement
- Trade Off #6: Waveform improvements (➔ meaning link layer issues)

- Trade Off #7: Non-level flight (→meaning aircraft is banking)

In his overall conclusions he outlined that some trade-offs are taken forward for further study in Iris IOC (Initial Operational Capability). These are:

- Trade-off #2: High Availability
- Trade-off #4: ATN/IPS
- Trade-off #6: Waveform improvements
- Trade-off #7: Non-level flight

Other trade-offs require external input to move forward, which are:

- Trade-off #1: Extended coverage – identification of possible third-party missions, e.g. for hosted payload
- Trade-off #3: Dedicated ground segment – feedback from regulator
- Trade-off #5: HF replacement – feedback from regulator / aviation community

13 ATN/IPS

Alan at first provided an overview of standardization activities and forums involved. These are ICAO WG-I, RTCA SC-223/EUROCAE WG-108, AEEC ATN/IPS Subcommittee (ARINC standard 858). Regarding the impact of work within WG-82 he outlined the following:

→ICAO WG-I aims to create standardised model for A/G networks:

- Define service requirements to be support on A/G link
- Standardize on ground network and aircraft interfaces, independent of technology used

→ATN/IPS will be included as extension to Class B Satcom as well as future Class A

→First draft update to MASPS and MOPS proposed start of 2020

14 SBB performance

Alan gave an overview of activities related INMARSAT SBB and the achievements reached so far. One of the main findings were that IRIS Precursor based on SBB could fulfil the required technical performance values of RCP130 and RSP160.

Finally, he also gave an overview of the next step covering the so-called IRIS IOC program. The planned validation activities within IRIS IOC are:

Objectives

The objectives of the “IOC Pilot” phase are to transition the system developed in Iris Precursor to initial operations and equip commercial aircraft with certified avionics to support flight trials within European airspace

The importance of end-to-end validation has been demonstrated by the difficulties encountered with the Data Link services over VDL2 implementation in Europe

Validation means

→Test Platform

Development of an end-to-end validation platform (similar to the Link2000+ one)

“Pilot” Flight trials

→ Organisation and execution of a campaign of validation using commercial flights equipped with Iris capability (≈ 20 aircraft)

→Preparation of the certification of the Iris Service Provider and system verification

→ Will capture required artefacts for the IPS certification and system validation

IRIS IOC program started in February 2018 and will last 3 years. It includes the design work for FOC.

15 QoS monitoring

Radek gave a slide presentation about the item of QoS monitoring in a future IPS network. Up to now it is not clear how such a QoS monitoring and link selection will be implemented. He presented several concepts for further discussion.

As the way forward Radek proposed the following:

- We'd like to hear opinions from other members of this group
 - Did we miss something? Are there simpler / more useful methods? Has any detailed design / analysis / validation been done in the past?
- So far, we are in favor of keeping things as simple as possible even for IPS:
 - Stick to Join/Leave (C1) and possibly add "Not guaranteed" state (C6) if benefits are demonstrated.
 - If any future IPS applications have substantially different characteristics (e.g. graphical weather), consider supporting them through a different logical channel such as different PDP context and bypassed AAP layer in SB-Safety (C7)
- If we don't see pushback from this group, we'd like to present and argue this opinion on behalf of this group at the IPS standardization forums.

WG-82 agreed to first discuss his ideas internally before contacting WG-108. Therefore, Radek will setup a subgroup of experts in order to work out a final proposal, which shall be then presented to WG-82 for final review and afterwards being discussed with WG-108.

16 Establish Agenda, Date and Place of next meeting

A discussion within WG-82 took place on the way ahead regarding covering the Performance Class A material development. The TOR of the group requires a review of the status of the activities after MASPS and MOPS Rev A material has been published. Armin therefore proposed to have a WG-82 WEBEX in the Q1/2019 timeframe to discuss the subject in detail. It might happen as concrete material on MASPS and MOPS update for Rev B will not be expected before early 2020 that WG-82 SATCOM will be put from an active to a dormant state.

RTCA SC-222 and EUROCAE WG-82 agreed on the following planning to complete next Revision of MASPS and MOPS:

WEBEX's:

- **13.09.2018 WG-82/RTCA SC-222: WEBEX from 3pm to 6pm CET** (WEBEX will be organized by RTCA)

Note 1: At this WEBEX the final document comments on SATCOM MASPS Rev A and MOPS Rev A update shall be discussed. MASPS Rev A and MOPS Rev A update documents are expected to be available end of August for group's review.

Note 2: This meeting might be extended by RTCA SC-222 only in case material from IRIDIUM Next is available for discussion by the group.

Meetings:

- **No next physical meeting(s) planned**

Action items

RTCA-SC222 / EUROCAE WG-82 30th 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"> 1) Support of 2000 UA 2) 10 – 100 kbps per UA (Peak!) 3) Voice latency of 390 millisecond maximum 4) Use of protected spectrum (L-Band) <p>Discussion at WG-82#31: Chuck will provide a response on it asap.</p> <p>Discussion at WG-82/#32: 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>	Chuck	asap	Open

RTCA-SC222 / EUROCAE WG-82 31st meeting: 26.06.2018 and 28.06.2018

Action#	Content	Responsible	Deadline	Status
A31-01	Coordinate with RTCA SC-159 on GNSS issues (sensitivity level etc.)	Chuck	end of July 2018	Open
A31-02	Coordinate with EUROCAE WG-62 on GNSS issues (sensitivity level etc.)	Armin	end of July 2018	Open
A31-03	Contact EUROCAE WG-105 (RPAS) to ask for requirements on SATCOM Performance Class A	Armin	asap	Open
A31-04	<p>Write a paper to explain performance value split between backward and forward channel with total loop requirement available and distribute it to SC-222 and WG-82.</p> <p><i>Note: This is also input to ICAO PT-S work on requirements definition.</i></p>	Chuck	asap	Closed
A31-05	<p>Is round trip delay be measurable in reality? Alan to check with Garry at INMARSAT.</p> <p>Discussion on WG-82/#32: It is implemented but not fully verified.</p>	Alan	end of July 2018	Open
A31-06	Distribute updated MASPS with new material on DUAL SATCOM for review by the group.	Alan	end of August 2018	Closed
A31-07	Distribute updated MOPS with new material on DUAL SATCOM for review by the group.	Radek	end of August 2018	Closed
A31-08	Radek to setup subgroup working on QoS Monitoring issues.	Radek	end of July 2018	Closed