RTCA Paper No. 143-20/SC-223-092

EUR 133-20 / WG108-24

Washington D.C. & Saint Denis, 18 May 2020

MINUTES OF JOINT RTCA SC-223 (PLENARY #36) / EUROCAE WG-108 (MEETING #13) / ICAO WG-I (MEETING #30) / AEEC IPS MEETING

"Internet Protocol Suite (IPS) and AeroMACS"

Date	**March 9-13, 2020**
Time	**9:30am – 2:30pm, Monday – Friday**
Venue	**Virtual Meeting**
Contact	**Liviu POPESCU** Email: liviu.popescu@eurocontrol.int Tel: +32 (0)2 729 3757 **Rebecca Morrison, Program Director, RTCA** (202) 330-0654 or rmorrison@rtca.org **Adrian Cioranu, Director Training and Communications, Technical Program Manager, EUROCAE** +33 1 49 46 19 72 or adrian.cioranu@eurocae.net

Attendees:

Name	Role	Affiliation
Avery, David	Guest	United
Bauge, Tim	Guest	Thales Group
Bharj, Danny	Member	INMARSAT
de Frutos, Olga	Guest	ICAO
d'Humires, Francois	Member	FREQUENTIS A.G.
Dlouhy, Ron	Member	Collins Aerospace

Drasil, Pavel	Member	Honeywell International, Inc.
Emberger, Luc	Guest	Airbus
Garofalo, Giovanni	Guest	ESA
Goodfellow, Mike	Guest	ICAO
Graefe, Jonathan	Member	Collins Aerospace
Haindl, Bernhard	Member	FREQUENTIS A.G.
Henzl, Martin	Member	Honeywell
Holtzman, Bill	Member	MOSAIC ATM
Hooper, Michael	Member	Iridium
Hyland, Neil	Guest	ICAO
Jain, Rovi	Guest	Federal Aviation Administration (FAA)
Jasiukajc, Zbig	Guest	SITAONAIR
Juergens, Tyler	Guest	
Ledjiar, Abderrahmane	Guest	SITAONAIR
Leonardon, Laurant	Guest	Collins Aerospace
Maiolla, Vaughn	Member	ICAO
McParland, Tom	Guest	Basic Commerce and Industries, Inc
Mineck, Kristen	Member	INMARSAT
Mirsayar, Ana	Guest	INMARSAT
Mohr, Manfred	Guest	IATA
Morrison, Rebecca	Manager	RTCA, Inc.
Muraca, Peter	Member	Federal Aviation Administration (FAA)
Niraula, Madhu	Member	Collins Aerospace
Nisbet, David	Member	Thales Group
Olive, Mike	Guest	Honeywell
Patel, Vic	Guest	Federal Aviation Administration (FAA)
Pelleschi, Stephane	Member	Collins Aerospace
Phillips, Brent	Government Authorized Representative	Federal Aviation Administration (FAA)
Popescu, Liviu	Member	EUROCONTROL
Pouzet, Jacky	Guest	EUROCONTROL
Pringvanich, Noppadol	Guest	IATA
Prisaznuk, Paul	Guest	SAE ITC, ARINC IA
Pufahl, Alexander	Guest	ICAO
Roy, Aloke	SC-223 Chair	Honeywell International, Inc.
Saccone, Greg	Member	The Boeing Company
Segers, Robert	Member	Federal Aviation Administration (FAA)
Skorepa, Michal	Guest	Honeywell
Solery, Michel	Guest	DSNA
Tamalet, Stephane	Member	Airbus

Templin, Fred	Member	Boeing
Tran, Hoang	Guest	Federal Aviation Administration (FAA)
Vacher, Jean-Marc	Guest	DSNA
Vanguardia, Michael	Member	The Boeing Company
Vyncke, Eric	Guest	CISCO
Warns, Timo	Guest	Airbus
Whyman, Tony	Guest	McCallum Whyman
Wrobel, Fryderyk	Guest	Airtel-ATN
Xu, Xiangyu	Guest	Thales Group
Zeng, Dongsong	SC-223 Secretary	The MITRE Corporation

AGENDA

1. Welcome and meeting organisational announcements
2. Approval of the agenda
3. Administrative aspects
4. Standards documents overview (purpose and scope)
    a. ICAO DOCS and SARPS (ICAO Annex 10, DOC 9896 ed 3, ICAO DOC 10090, ICAO DOC 10094, ICAO DOC 10095, ICAO DOC 100XX – Security Risk Assessment)
    b. RTCA – EUROCAE IPS MASPS
    c. AEEC A858
5. Airlines specific IPS requirements (AOC, Security, QoS, etc)
6. Standards gap analysis
7. Terminology and architectures
8. Detailed analysis on requirements and implementation guidance status (Dedicated sessions on specific functional area, i.e.: Security and mobility/multilink)
    a. Security Risk Assessment and Key Management
    b. Multilink and Mobility Management
    c. IPv6 addressing scheme
    d. Naming and Address Resolution
    e. Quality of Service
    f. Performance
    g. Transition and deployment
    h. On-going Management and Support
9. Roadmaps and schedules (All three Groups)
10. Review of joint meeting actions

11. Any Other Business
12. Next meetings (Plans for all groups)

Agenda Items 1. Welcome, Introductions, EUROCAE and RTCA Policy Statements, Administrative Remarks

Due to the pandemic situation, the joint meeting was conducted through virtual telecons. Aloke Roy, Chair of SC-223, Stephane Pelleschi, Chair of WG-108, Vaughn Maiolla, Secretary of ICAO WG-I, ICAO, Liviu Popescu, rapporteur of ICAO WG-I, Greg Saccone, Co-chair of AEEC IPS SC, and Luc Emberger, Co-chair of AEEC IPS SC welcomed the participants.

Rebecca Morrison, Program Director, RTCA, presented the RTCA/EUROCAE policy statements.

Agenda Item 2. Review and approve the Agenda

The group reviewed and approved the meeting agenda.

Agenda Item 3. Administrative aspects

In order to save time in WG-I/30 meeting, the SC-223 previous action items were reviewed and updated during a separate group telecon on February 26, 2020. New action items generated during the joint WG-I/30 / SC-223 / WG-108 / AEEC IPS meeting were kept in WG-I/30 meeting summary and therefore excluded in the SC-223 List of Action Items.

Agenda Item 4 – 12.

ICAO WG-I meting summary, recorded by Vaughn Maiolla and contained in Attachment 1, provides a detailed description of the group discussions.

List of Action Items

Action Item #	Action Content	Responsible	Due Date	Status
P23-7	Investigate the CRCs of ROHC at system level.	Aloke Roy	October 23, 2017	10/23/2017 – In progress 12/4/17 – Keep open 3/5/18 – keep open 6/4/18 – keep open 8/13/18 – keep open. 9/24/18 – keep open. 12/10/2018 – postponed to MASP discussion 3/25/2019 – keep it open 6/17/2019 – keep open 9/30/2019 – keep open 12/9/2019 – Review Pavel's paper 2/26/2020 – keep open
P29-2	Reach out to SC-228 to verify whether IPS will be used by C2 link	Aloke Roy	Dec. 3, 2018	12/10/2018 – done. The dependency is still to be defined. 3/25/2019 – keep it open. 6/17/2019 – keep open 9/30/2019 – Closed. Yes. IPS is recommended by SC-228 for C2 Link BLOS use cases. Any potential extensions by WG-105 will be on case on case basis.
P32-1	Update the Profile to include all FRAC/OC resolutions and Rebecca to distribute the file to the group	Dongsong Zeng	April 8, 2019	4/24/2019 – Done and closed
P32-2	Work out a consented resolution on row reduction in Appendix B-6 RFC 2597 detailed profile	Aloke Roy and Stephane Tamalet	April 1, 2019	4/24/2019 – Done and closed
P32-3	Review the updated Profile to make sure all FRAC/OC resolutions are correctly executed	All members	April 1, 2019	4/24/2019 – Done and closed
P32-4	Update the MASPS schedule and draft corresponding TOR revision	Stephane Pelleschi and Aloke Roy	June 17, 2019	6/17/2019 – keep open 9/30/2019 – Done. The TOR has been approved by PMC and TAC.
P32-5	Put SC-223/WG-108 TOR approval on the agenda of next meeting	Dongsong Zeng	June 17, 2019	6/17/2019 – Done and closed.
P32-6	Resolve Alistair's comment	Aloke Roy	April 1, 2019	4/24/2019 – Done and closed
P32-7	Members who were assigned to work on specific MASPS sessions will start to develop the corresponding MASPS annexes	Assigned Members	June 17, 2019	6/17/2019 – keep open 12/9/2019 – keep open 2/26/2020 – keep open
P33-1	Update IPS MASPS development schedule.	Dongsong Zeng	Sept. 30, 2019	7/17/2019 – Done.
P33-2	Schedule a telecon to advance IPS security risk assessment.	Madhu Niraula	Sept. 30, 2019	9/30/2019 – Closed. Vic Patel will lead this activity. A telecon with ICAO WG-I SSG is planned on Nov 8, 10AM EST.

P33-3	Coordinate with EASA for participation in SC-223/WG-108 P39 December 2020 meeting for FRAC/OC resolution.	Stephane Pelleschi and Adrian Cioranu	Sept. 30, 2019	9/30/2019 – keep open. 12/9/2019 – keep open 2/26/2020 – keep open
P33-4	Present DNS concept to ICAO WG-I.	Madhu Niraula	Sept. 30, 2019	9/30/2019 – keep open. In progress. 12/9/2019 – keep open 2/26/2020 – keep open
P33-5	Consolidate inputs to the MASPS moving work-in-progress materials into annexes	Stephane Pelleschi	Sept. 30, 2019	9/30/2019 – Done.
P33-6	Present Collins' multilink concept to the next ICAO WG-I in September 2019.	Madhu Niraula and Dongsong Zeng	Sept. 30, 2019	9/30/2019 – keep open. 12/9/2019 – keep open 2/26/2020 – Closed
P34-1	Provide an initial MASPS authors list based on SC-223 roster and the group will review and determine the final authors list at the end of the work.	Rebecca Morrison	Dec. 9, 2019	12/9/2019 – Closed and subject to review.
P34-2	Provide instructions of change proposals on the Profile standard.	Rebecca Morrison	Dec. 9, 2019	12/9/2019 – Closed and subject to review.
P34-3	Initiate ISRA between SC-222 and SC-223.	Aloke Roy and David Robinson	Dec. 9, 2019	12/9/2019 – Closed. ISRA drafted by SC-223, but rejected by SC-222. SC-222 will not be able to do anything until August.
P34-4	Coordinate with SC-214 on ISRA between SC-214 and SC-223.	Aloke Roy	Dec. 9, 2019	12/9/2019 – Closed. SC-214 is working to support IPS and no ISRA is needed right now.
P34-5	Coordinate with RTCA WAIC on aviation IPv6 address.	Rebecca Morrison and Aloke Roy	Dec. 9, 2019	12/9/2019 – keep open. 2/26/2020 – keep open
P34-6	Update IPv6 address format paper, changing platform type to type, changing type bits from 2 to 4, changing subnet ID to 10 bits.	Aloke Roy	Dec. 9, 2019	12/9/2019 – Closed and subject to review.
P34-7	Identify the process of administration and maintenance of IPv6 addresses.	Aloke Roy	Dec. 9, 2019	12/9/2019 – keep open. Also within the purview of ICAO TFSG/GRAIN. 2/26/2020 – keep open
P34-8	Work with PMC to create a special workspace for security information papers storage.	Aloke Roy	Dec. 9, 2019	12/9/2019 – Closed. Security information repository has been decided to move to ICAO.
P34-9	Complete the assigned MASPS sections by next meeting, as assigned in the MASPS progress spreadsheet.	All members	Dec. 9, 2019	12/9/2019 – keep open. 2/26/2020 – keep open
P34-10	Bring IPS transition and deployment strategy to ICAO DCIWG and request feedbacks from stakeholders of member states.	Aloke Roy and Liviu Popescu	Dec. 9, 2019	12/9/2019 – Closed. Waiting for ICAO action for feedbacks from member states.
P35-1	Talk to Isidore Venetos on IPS SRA by Q2 2020.	Mike Vanguardia	March 9, 2020	2/26/2020 – keep open. Expect an initial draft SRA from Isidore by June 2020
P35-2	Present MASPS multilink material to ICAO WG-I MSG in February 2020.	Aloke Roy	March 9, 2020	2/26/2020 – keep open

P35-3	Prepare slides for convergence of diagrams from different standards and present it to ICAO WG-I.	Stephane Pelleschi	March 9, 2020	2/26/2020 – keep open
P35-4	Prepare a one-page summary of MASPS structure.	Dongsong Zeng	March 9, 2020	2/26/2020 – Closed. Subject to review
P35-5	Present a multilink paper to ICAO WG-I MSG.	Madhu Niraula and Dongsong Zeng	March 9, 2020	2/26/2020 – keep open
P35-6	Present DSCP QoS mapping to ICAO.	Madhu Niraula and Aloke Roy	March 9, 2020	2/26/2020 – keep open
P35-7	Coordinate with Vaughn Maiolla on how ICAO standards should reference AEEC documents.	Liviu Popescu	March 9, 2020	2/26/2020 – keep open
P35-8	Present AEEC A/G management message section to ICAO.	Luc Emberger	March 9, 2020	2/26/2020 – keep open
P35-9	Provide the group feedbacks to SESAR Wave 2 validation recommending align SESAR performance measurements to the architecture that the standard groups are developing.	Francois d'Humieres	March 9, 2020	2/26/2020 – Closed. Action completed.

-S-
Dongsong Zeng
Secretary

CERTIFIED as a true and accurate summary of the meeting.

- S-
Aloke Roy
SC-223 Chairman

- S-
Stephane Pelleschi
WG-108 Chairman

Attachment 1. WG-I/30 Meeting Summary

International Civil Aviation Organization

WG-I/30

March 9-13, 2020

REPORT

COMMUNICATIONS PANEL (CP)

DATA COMMUNICATIONS INFRASTRUCTURE WORKING GROUP (DCIWG)

THIRTIETH MEETING OF THE WORKING GROUP I (Internetworking),

JOINT MEETING with AEEC IPS Subcommittee, RTCA SC-223 and EUROCAE WG-108

March 9-13, 2020

Prepared by the Secretary

Summary

This document is a brief summary of the

Thirtieth meeting of CP-DCIWG WG-Internetworking

held Jointly with the

AEEC IPS Sub-Committee, RTCA SC-223 and WUROCAE WG-108

Table of Contents

MEETING SUMMARY – WG-I/30

1.0 Welcome Address and Meeting Organizational Issues:

1.1 The meeting was opened by the Chairs of WG-I, RTCA, EUROCAE and AEEC and the administrative secretary, Rebecca Morrison was introduced to the meeting. This along with IP02, Meeting Plan, were explained to the meeting.

1.2 Meeting arrangements as previously discussed were confirmed, ie:

a) Meeting hours will be 9:30 – 11:30 am (EST) and 12:30 – 14:30 (EST).
    a. (WST) 6:30 – 8:30 am and 9:30 – 11:30 am
    b. (CET) 14:30 – 17:30 and 17:30 – 19:30
b) Meeting chairs and secretaries will hold a teleconference for planning purposes each day at 9:00 am.
c) Meeting chairs will rotate, typically on a session by session basis.
d) Interjections and questions will be indicated by was of the "raise hands" capability in WEBEX. These will be monitored by the admin. Secretary who will advise the meeting chair when the current speaker has finished presenting.
e) A meeting summary will be posted on the web-site at the end of each day. This will give participants from the Asia/Pac Region who will not be able to participate in the full day's proceedings to raise questions or comments. Time will be made available for this at the beginning of each day.

2.0 Approval of Agenda

2.1 The proposed agenda v0.5 was accepted by the meeting.

3.0 Administrative Aspects

3.1 Covered under Agenda Item 1.

4.0 Standards Documents Overview

4.1 ICAO DOCS and SARPS (ICAO Annex 10, DOC 9896 ed 3, ICAO DOC 10090, ICAO DOC 10094, ICAO DOC 10095, ICAO DOC 100XX – Security Risk Assessment)

4.1.1 Liviu Popescu presented WP02, the WP provided some background to the work of WG-I, and then proceeded to give an explanation on the key document deliverables and the Job Cards to which they were related.

4.1.2 One key point was made and that was that updated technology agnostic SARPS were approved at DCIWG/2 in 2018.

4.1.3 Document 10095 – Manual of Public Key Infrastructure (PKI) Policy for Aeronautical Communication, generated some discussion as the (ICAO) Trust Framework Study Group (TFSG) had also generated a Certificate Policy document. The meeting was advised that a copy of this was available on the ICAO WG-I/30 web-site as WP11.

4.1.4 Much of the discussion revolved around the question of which document would take precedence. There was a general understanding that the TFSG document would be general in nature covering many user groups, while Doc 10095 would be specific to the ATN/IPS. It was agreed that this should be resolved through the DCIWG and that an item dealing with governance should be included on the agenda of the DCIWG/4. This lead to the following action items:

ACTION ITEM WG-I/30-1: Secretary to ensure that an item dealing with governance be included on the agenda for DCIWG/4 during which the PKI policy and especially the relationship between Doc 10095 and the (TFSG) Certificate Policy is discussed. This issue would first be reviewed by WG-I and a recommendation brought to the DCIWG.

4.1.5 It was also pointed out that that ICAO SSGC and WGTR (related to the AVSECP) were working on a risk assessment. This lead to the following action item:

ACTION ITEM WG-I/30-2: Secretary to coordinate with AVSECP to ensure that WG-I Doc 100XX and the WGTR Risk Assessment are complementary.

4.2 RTCA – EUROCAE IPS MASPS

4.2.1 SC223-084, *MASPS Structure for Discussion*, was presented. This document outlined the basic structure of the upcoming MASPS, which were expected to be mature in October 2020.

4.2.2 Boeing commented that the structure differed from that of typical MASPS. Boeing agreed to document their views in this regard, this lead to the following action item:

ACTION ITEM WG-I/30-3: Boeing to provide comments to Dongsong Zeng/Stephan Pelleschi on the format/structure of the MASPS.

4.2.3 Also mentioned under this subject was the possibility of the schedule slipping by a quarter (of a year). This however was simply understood to be a caution.

4.3 ARINC A858

4.3.1 Greg Saccone provided a verbal briefing on the status of ARINC Project Paper 858. The salient point from this was that the document was expected to be finished at the end of this year and its availability would coincide with that of DO-262/ED3979 on IPS Profiles.

5.0 Roadmaps and Schedules:

5.1 WG-I IPS Timeline Q1 2020 is available on the repositories. This document is the latest version of the timeline document presented at each WG-I meeting. An explanation of this document was given which highlighted the work that needs to be done to achieve a (SARPS) applicability date of Nov 2022.

6.0 Airlines Specific IP Requirements (AOC, Security, QoS, etc.)

6.1 Luc Emberger presented SC223-089, *ATN-IPS for AOC, March, 2020.* This WP raised important issues related to the support for AOC traffic, among them:

a) The expected level of customisation/configuration, ie: choices of media, mobility providers, etc.
b) DSP-hosted or airline-hosted (or both)???
c) Airline needs for security and how this will be done, ie: airline-hosted or DSP-hosted (or both)??

6.2 This lead to the following action item:

Action Item WG-I/30-4: Ganesh Pasupathy (American Airlines) to obtain initial feedback on the above issues from American Airlines to allow the group to assess the scope of the task.

7.0 Standards Gap Analysis

7.1 Mike Olive presented the latest versions of the IPS Roadmap and IPS Gap Analysis, dated 9/3/2020. Some of the salient points from the following discussion were as follows:

a) Work on the documents to support VDL Mode-2 connectionless mode, was progressing with DO-224E (MASPS) and DO-281D/ED-82D expected to be completed by December 2022.
b) Connectionless mode would also require amendments to ARINC 631-9 and possible ICAO Doc 9776.
c) In addition to this, ARINC 631-9 and ICAO Doc 9776 would need to be amended to provide support for IPS Packets.
d) Regarding Doc 9776 it was agreed that a job card would be needed. Regarding the actual assignment of the work it was agreed that this would proceed as per the last amendment with the RTCA/EUROCAE and AEEC produced a draft to be provided to ICAO. ICAO would them form a Doc 9776 CCB similar to that used for Doc 9880, who would produce the final ICAO version.

7.2 Mike Olive also explained that the "allocation of topics" contained in the Gap Analysis should be re-visited. This item described work areas, sub-work areas plus notes accumulated over successive discussion.

7.3 The meeting then proceeded with a detailed review of the Gap Analysis. Some of the salient issues from this were as follows:

a) On Mobility:
    a. The question was raised about the multiple systems that will be used during the transition period, ie; ATN/IPS, FANS/ACARS and IPS, ATN/OSI. No clear solution was found to this question however there was agreement that it needs to be resolved.
    b. The validation of the mobility/multilink solution was raised as it was potentially a high risk area due to unforeseen problems that could be encountered in an operational environment.
        i. Effective validation however is hard to achieve as it is difficult to replicate realistic conditions that will be encountered in an operational environment.

ii. A number of meeting participants concurred and it was pointed out by the FAA that, mobility management was providing challenges and that this was compounded by the need to support multiple systems.
iii. SITA also concurred and explained that differences between avionics contributed to many of the observed problems. They then explained that one solution that they had effectively employed, was to make a network simulator available to the avionics manufacturers.

b) On Naming:
   a. It was agreed that simple name lookup would be adequate for ATM applications such as CPDLC and ADS-C.
   b. A standard mechanism would be needed for ground-ground name lookup. It was pointed out that in Europe this was not adopted for VOIP as there were security considerations.
   c. As there was a need to consider this for future apps such as SWIM and native-IP apps, this aspect would need further consideration.
   d. In addition solutions would be needed for non-nominal conditions such as name-resolution failure on both the ground and in the air.

c) On Transition, it was pointed out that there was a need to interconnect the existing regional aviation IP Networks, ie: PENS, CRV and REDDIG and that they would look to ICAO for guidance, hence work was needed on this.

d) On security:
   a. As many have assumed that effective security will be a certification requirement, Doc 10090 should point to EASA and FAA Special Conditions as a starting point. The MASPS can provide guidance as to how these can be demonstrated.
   b. Doc 9896 should specify application layer security (ie; DTLS) and point to IPS profiles.
   c. Doc 10095 would provide certification profile consistent with the IATF-CP, as well as an overall PKI architecture.
   d. Doc 10090 would deal with general governance and the security information management system (ISMS).
   e. MASPS would serve multiple purposes:
      i. Indicate DTLS RFCs.
      ii. Provide guidance on the use of security proxies and the impact on the number of DLTS sessions and the impact of performance, while considering overall risk.
      iii. Describe the roles/responsibilities of service providers supporting PKI management.
      iv. Provide guidance on logging, monitoring security events.

e) On performance:

a. MASPS would deal with the RCTP for each traffic type and how traffic would be aggregated and prioritized over each sub-network (this would also consider requirements beyond B2)
b. Doc 9896 would deal with multi-link requirements and especially any elements that are required from the sub-networks to support interop. It was noted by some in the group that this should be independent of any specific sub-network.

f) On ground systems:
   a. AEEC Project Paper 858 would be referenced back to MASPS for the deployment options. This item could become an attachment rather than an appendix
   b. MASPS would also consider the performance of gateways.

7.4 It was agreed that there was a need to continue updating the scope of allocations by the Standards Making Organisations and that in doing so, each group should also review the work of the other groups. This lead to the following action item:

Action Item WG-I/30-5: Each group to continue reviewing and updating the scope of allocations given in the gap analysis and also to review the work of other groups.

7.5 The amended Gap Analysis following the WG/30 Joint Meeting is given in Appendix E.

8.0 Terminology and Architectures

8.1 Liviu Popescu presented WP03, *IPS terminology following Web-Meeting no. 2*. This WP provided a compendium of terms so far identified in the IPS standards. It provided a very useful function in that it showed where terms had been duplicated or applied to different items by different groups. It also showed the status of the terms used, ie: had agreement been reached on the correct use of a term of was it still under consideration.

8.2 The ensuing discussion focussed on the management of this approach since three groups were actively involved. The first related to the document hierarchy and therefore which documents should take precedence. This was especially important when these documents were being used as references. The conclusion was that since ICAO annexes are at the apex of the hierarchy, they would take precedence over other documents. In the case of other documents at a similar level in the hierarchy, then the reference used should be to the document most relevant to the task.

8.3 There was also discussion on new terms. As a result, it was agreed that the term, “gateway” and “mobility end-point” would be added.

8.4 It was agreed that the terminology should be applied uniformly across all groups. If problems were encountered, the rapporteur of WG-I should be advised. Finally all members were requested to review the document and provide feedback however this should be limited to the agreed terms indicated with green shading. This lead to the following action item:

Action Item WG-I/30-6: Meeting participants to review the agreed terms in WP03 (shaded in green) and provide feedback to Liviu Popescu.

8.5 Mike Olive presented *PP858 Key Terminology with comments*, this paper explained that much of the terminology was consistent between the two documents but provided three classes of term requiring further consideration:

a) Those that appear in the IPS Profiles but have not been used in PP858
b) Those that appear in PP858 but not in the WG-I WP03 and
c) Those that appear in both documents but are used differently.

8.6 It was further explained that two gateway definitions existed. One, being a transition gateway. A comment was made that gateways would only be used for transition as they would not be needed at the end-state. Also the need for a ground-ground gateway was considered without conclusion.

8.7 Another point was made and that was that where there was a difference between ITU definitions and those used for IPS. The latter should prevail.

8.8 The question was asked about the use of the term ATN in conjunction with IPS, which was suggested as being superfluous. It was generally agreed that the term ATN had been overused as it could also apply to numerous phases of the ATN development.

8.8 Discussion also focused on the use of the terms node or host versus end-system. It was finally agreed to use end-system when referring to OSI networks/systems, as the precedent for this had been long established and then to use node/host or router as appropriate as these terms were generally used for IPS networks/systems. This convention will need to be carried over to the master glossary. This lead to the following action item:

Action Item WG-I/30-7: reflect convention to use end-system for OSI networks/systems and node/host/router for IPS networks/systems.

9.0 Detailed Analysis on Requirements and Implementation Status Guidance

9.1 Security Risk Assessment and Key management.

9.1.1 WP04, Methodology for Risk Assessment was presented by Vic Patel and Isidore Venetos. This paper outlined a four-stage risk assessment process based on the work of the FAA Aircraft System Information Security/Protection (ASISP) research project. This methodology based on the following steps:

a) Scoping
b) System Definition
c) Attack Analysis
d) Risk Assessment.

9.1.2 The salient points of each were as follows:

a) Scoping begins with a review of "unacceptable losses" and "aircraft-level hazards. These are followed by a system function statement, dealing with the vulnerable systems. Part of this involves a review of the system "control structures", as they can represent the attack surface.
b) System Definition begins with a review of the system functions followed by an analysis of the control actions. This takes the form of a matrix between the system functions and the control elements.

c) Attack Analysis begins with considerations of the control context (ie; what is appropriate and what is not). This is followed by the Subject-Level Hazard Identification. This leads to the identification of Hazardous Control Actions and then attack scenarios and their impact. If necessary they are grouped to develop an attack tree.

d) The final step is the risk assessment, which is done in a way to minimize subjective elements. The result of the assessment are presented in a "Risk Chart", which compares the safety impact with the capability level of the adversary. The capability is based on a combination of sophistication of the tools, resources and time needed to affect an attack.

9.1.3 The meeting was also advised that a full document on the subject would be available in April.

9.1.4 WP18, *IPS Use Case Presentation*, was presented by Isidore Venetos, Vic Patel and Mike Vanguardia. This WP provided an explanation of the IPS use cases being evaluated by the Cyber Safety Commercial Aviation Technical Team (CS-CAT), which is a US-based group made up of various commercial aviation stakeholders. The salient points of this WP are given in the following paragraphs.

9.1.5 The Safety Risk Assessment (SRA) for both ATS and AOC operations is based on the following steps.

a) Use Case(s)
b) Associated Operational Scenarios
c) Explanatory Vignettes.

Each of the above considers the relevant actors and symptoms.

9.1.6 The identified vignettes are as follows:

a) The pre-departure phase
b) ATS using IPS
c) En-route AOC
d) Effects of different architectures deployed.

For each of the above a flow and sequence diagramme is produced.

9.1.7 The effects at each "layer" will also be considered. For completeness, the layers will consider both human elements as well as the technical elements.

9.1.8 The paper ended by asking for comments from WG-I. The meeting was also advised that initial results will be available in June with the final report expected by the end of the year.

9.1.9 Timo Warns presented WP12, *Clarification on ATN/IPS End-End Security Protocol*. This WP pointed out differences in the end-end security protocol adopted by WG-I and AEEC Project Team 858 with the former adopting DTLS and the latter a custom security protocol for air-ground communication using DTLS for the initial authenticated key exchange and the custom Message Integrity Check (MIC) function for securing application traffic.

9.1.10 The aim of this WP was to have all parties adopt the approach chosen by WG-I. To achieve this the paper pointed out the advantages of using DTLS as opposed to the custom security protocol and the MIC while also stressing that failure to do so would result in a lack of interoperability across administrative domains:

a) the custom protocol (i) was not subject to security evaluations by a larger security community and (ii) is unlikely to be part of off-the-shelf cryptographic implementations.
b) The MIC function uses a lower number of bits for functions such as the hash function with a subsequently lower level of security provided.

9.1.11 The paper then proposed how the different industry (standards-making) groups could incorporate DTLS into their documentation suites. Namely;

a) The RTCA/EUROCAE IPS Profiles could be modified to address the DTLS RFCs and their application.
b) AEEC (project paper 858) could add implementation-specific requirements on the end-to-end security protocol. Examples include dimensioning memory, computing and network resources for the on-board ATN/IPS router to support DTLS (e.g. driven by a minimum number of parallel DTLS sessions to support).
c) ICAO documents could address aspects of security risk management, certificate polices and PKI governance. Doc 9896 would need to unequivocally specify DLTS as the chosen end-end solution.
d) In each case Doc. 9896 would take precedence.

9.1.12 The working paper asked WG-I to consider dealing with the above while also considering that should DTLS not be considered a suitable protocol for end-end security, to find a suitable alternative.

9.1.13 In conclusion the group agreed that WG-I (IPS Security SG) should have primacy in determining the solution for end-end security and that now, DTLS would the solution if technically feasible. The above discussion resulted in the following action item:

Action Item WG-I/30-8: WG-I members who are also members of the RTCA/EUROCAE and AEEC groups to promote the acceptance of DTLS for end-end security based on its adoption by WG-I. They are to also allocation roles for the various standards documents according to WP12.

9.1.14 Mike Goodfellow (TFSG/DIWG) presented WP11, *IATF Certificate Policy*. This WP provided a certificate policy for review by WG-I. It was further explained that the policy was based on a number of industry-standard and State and proprietary certificate policies. At this time further work was needed on Section 9, Other Business and Legal Matters. WG-I was asked to comment on the document by March 31, which lead to the following action item:

Action Item WG-I/30-9: Meeting participants to comment on the draft CP contained in WP11 by March 31, 2020.

9.1.15 Dongsong Zeng, MITRE, presented SC223-088, *Preliminary Airworthiness Security Risk Assessment of Internet Protocol Suite (IPS)*. This working paper points out that IPS security risk assessment is mandated by aviation regulations for aircraft certification and provides preliminary IPS SRA results following the FAA/EASA recommended means of compliance, i.e., DO-326A, DO-356A and DO-355. During the discussion, a point was raised that ground security requirements should be considered in the airworthiness SRA to ensure the end-to-end security of IPS system. A revised version with more assessment details is expected to come out in the next WG-I meeting.

9.2 Multilink and Mobility Management

9.2.1 Danny Bharj presented WP20, *WG-I IPS Mobility Sub-Group Conclusion Slides*. The WP presented the conclusions arising from the 10th meeting of the IPS Mobility SG, held in mid-February.

9.2.2 The salient points from this meeting are summarized below:

a) The work of the group is driven by the following high-level requirements to be placed in the next edition of Doc 9896, which are governed by the following assumption; Airlines and ATSP need to have a set of policy rules to ensure connectivity. Any regional variation will be defined by the IPS MASPS;

    a. An aircraft shall implement a Policy Table for selecting the A/G Network used for downlinking a message.
    b. Access Network Provider shall propagate aircraft reachability, provider and preference "if available" information to relevant stakeholders. Assume that there is a trust framework between CSPs, for the provision of information relating to connectivity of aircraft.
    c. Aircraft may announce its supported Air to Ground list of links.
    d. Aircraft shall include the provider identifier/information related to access network in the Link Establishment message. (MN to provide a paper with justification)
    e. Aircraft should specify its preference order for use of Air to ground links (option tbc) – (ST to provide a paper to highlight the Airbus concerns to this requirement/recommendation)
    f. Aircraft shall announce its link state when a link is lost. The announcement shall be transmitted over at least one active A/G network. It may be transmitted over all active A/G networks. Assume that aircraft authenticity has been established.
    g. Design Goal: minimum no. of messages and overhead
    h. Ground to implement a mobility management solution. Note: a different mobility solution may be implemented by each administrative domain.
    i. It shall be possible for Mobility Service Providers to interconnect with each other

j. An Access Network Provider shall provide the capability to an aircraft to communicate with any ATN/IPS ground user (May need to address regional restrictions on network use by traffic type).

b) Each mobile node shall have a globally unique unicast address prefix which shall be fixed (during the course of a flight).
c) Mobility shall be seamless.
d) Two plans exist for global mobility:
    a. Plan A – OMNI → RS (+ OMNI options) /RA
    b. Plan B → Link Status encapsulated in UDP message
e) Aircraft shall implement RS/RA functionality, to cover all possible ground implements options leading for implementation of Plan A.

f) The above High Level requirements resulted in the following "Multilink" requirements:

    a. For Downlinks:
        i. An aircraft shall implement a Policy Table for selecting the A/G Network used for downlinking a message.
        ii. The table shall select from the set of active A/G Networks by at least message type and aircraft location (local implementation)
        iii. The policy for AOC Messages shall be specified by the aircraft operator.
        iv. The a/g link selection policy for ATS Messages shall be specified by the destination ANSP (Airframer will act as proxy) for downlink messages.
        v. Provisions shall exist for the update of the policy table by an authorised party while the aircraft is at rest (Wheels on gnd).
        vi. Provision shall exist for the limited update of the policy table while in flight. Change of CSP state – will cause a frequent change of state. WP to be submitted to MSG May 2020 meeting with pros/cons.
        vii. Aircraft shall send its link status to the ground.
        viii. The ground networks shall provide aircraft link status to the ANSPs, aircraft operator and their proxies.
        Note : so that ANSPs can apply their own policy for selection of the air/ground uplink to use for uplink messages.

    b. For Uplinks:
        i. An aircraft shall implement a Policy Table for selecting the A/G Network used for downlinking a message.
        ii. The table shall select from the set of active A/G Networks by at least message type and aircraft location (local implementation)
        iii. The policy for AOC Messages shall be specified by the aircraft operator.
        iv. The a/g link selection policy for ATS Messages shall be specified by the destination ANSP (Airframer will act as proxy) for downlink messages.
        v. Provisions shall exist for the update of the policy table by an authorised party while the aircraft is at rest (Wheels on gnd).

vi. Provision shall exist for the limited update of the policy table while in flight. Change of CSP state – will cause a frequent change of state. WP to be submitted to MSG May 2020 meeting with pros/cons.
vii. Aircraft shall send its link status to the ground.
viii. The ground networks shall provide aircraft link status to the ANSPs, aircraft operator and their proxies.
ix. Note : so that ANSPs can apply their own policy for selection of the air/ground uplink to use for uplink messages.

9.2.3 It was further explained that Plan A is the preferred option as it provide more information on the link status and will result in better mobility/multilink performance however it is not available as a COTS product yet and has yet to be recognised by the IETF, which would incidentally lead to its acceptance by manufacturers.

9.2.4 Given the lack of certainty of Plan A, Plan B was developed as it is a COTS product and can be used if attempts to pursue Plan A are either too protracted of at worst fail.

9.2.5 The plan to garner acceptance of Plan A is as follows. Plan A code will be ready to turn over to router vendors by the time we meet again in May for WG-I/31. Two router verndors have been tracking the progress, and the code is light enough to be taken up into commercial products quickly. The progress of the code maturity will roughly correspond to the progression of the IETF draft toward RFC publication according to the liaison statement schedule. So, both the standard and commercial adoption of the code are planned to happen by the end of 2020 and not years and years from now.

9.2.6 As both plans rely on the use of RS/RA message, the question was asked whether there would be a security risk through the carriage of RS/RA messages across multiple networks. The response to this was that the RS/RA would be sent from the Mobile Node (MN) over a secure Access Network where they would be intercepted by the Proxy. The Proxy would then coordinate with the Mobility Service in a secured manner – for AERO, this entails forwarding the RS/RA to an AERO Server over secured paths; for other types of mobility services it would be done in the manner specific to that service. This is specific to the way the OMNI interface lays down over the ATN/IPS (and other such networks). A MN using an OMNI interface on the open global Internet would instead do the RS/RA exchange with a Server via SEcure Neighbor Discovery (SEND) so that both ends will know the messages are authentic. This is a different security profile that what we have for the ATN/IPS, but still the RS/RA messaging would only be between trusted parties and not spread widely across the open network.

9.2.7 Fred Templin presented WP05, *ICAO IETF Liaison Statement*. This WP contained a draft request to the Internet Engineering Task Force (IETF) to enter the proposal for the Overlay Multilink Network Interface (OMNI) into the (IETF) RFC publication process. The meeting agreed with the general intent, especially as it would lead to early resolution of the Plan A vs Plan B

question. Meeting participants were asked to review this item and comment at the earliest opportunity. This lead to the following action item:

Action Item WG-I/30-10: Meeting participants to review the IETF Liaison Statement and provide comments at the earliest opportunity.

9.2.8 It should be noted that OMNI is the new name for what was previously known as the AERO interface. A name change was appropriate as the latest proposal differed significantly from the first version of AERO presented to WG-I.

9.2.9 Fred Templin presented WP06, *Draft IPV6 Maintenance (6Man) OMNI interface*. This WP which accompanies WP05, provided the group with details of the actual proposal to the IETF to enter OMNI onto the "standards track" towards publication.

9.2.10 Michal Skorepa present WP17, *Air-Ground Interface – Plan B*. This WP presented a number of options should Plan B be implemented. It also raised some questions regarding the treatment of Plan A and Plan B, namely:

a) Do we pursue only the preferred solution, Plan A in the standards??
b) If so, what happens if this approach is not adopted by the IETF or vendors?
c) Which do we validate??

9.2.11 These questions were referred to the Mobility SG, who were asked to have a web-meeting dedicated to these issues. This lead to the following action item:

Action Item WG/30-11: IPS Mobility SG and Sec. to arrange a dedicated web-meeting (of the IPS Mob SG) to dal with the issues raised in 9.2.10.

9.2.12 Stephane Tamalet presented WP16, *ATN/IPS Media Advisory Parameters Content*. This WP raised the point that the need for the transfer of "media advisory" information from the aircraft to the ground had been recognized by the IPS Mob SG but the actual format and content of this information had not been agreed. It was further pointed out that any such agreement should also include the needs of aircraft operators.

9.2.13 The paper described two levels of information that could be exchanged, ie:

a) Status of active links (as is done today with ACARS)
b) Dynamic contextual data on the links to be used. This would be based on parameters such as aircraft location, phase of flight, link quality.

9.2.14 In the case of dynamic contextual data, which the IPS Mob SG had seen as having merit, there were two possibilities. That is the output can be calculated by the aircraft or the ground router. In the latter case the aircraft could for example transmit data such as, i) phase of flight, ii) next data authority or iii) a continental/oceanic indicator.

9.2.15 The meeting was asked to consider the parameters that need to be included, while taking the needs of aircraft operators into account and to consider tasking the IPS Mob SG with the work of developing this concept based on the contents of this WP.

Action Item WG/30-12: WG-I members to consider the parameters to be included in the media advisory message taking into account the needs of aircraft operators (and ATS).

9.3 IPv6 Addressing Scheme

9.3.1 Rob Segers presented WP19, *International Aviation Trust Framework (IATF) Address Allocation for IPv6.* The addressing plan described by the WP was similar to that proposed by Aloke Roy in WP07 to TFSG GRAIN 1. There were the following differences:

a) The ICAO 24-bit address is not embedded in the IPv6 address.
b) QoS/CoS is handled in a different manner.

9.3.2 The need for the 24-bit address generated a fair amount of discussion, the salient points of which are as follows:

a) It may be difficult to correlate the 24-bit address with the IPv6 address.
    a. This is complicated by the fact that duplicate codes exist.
    b. The aircraft personality module may change and with it the 24-bit code.
b) Ground end-systems are tied to the 24-bit address.
    a. Communications and Surveillance.
c) Aircraft operators' systems are also tied to it.

Given b) and c) above it was felt that the introduction of another "unique" means of identifying the aircraft would add unnecessary complexity.

9.3.3 This discussion on this item ended without conclusion with WG-I, AEEC and RTCA/EUROCAE supporting the inclusion of the 24-bit address and the participating members of the TFSG questioning it.

Appendix A - Agenda

Appendix B – List of Participants.

Session 1 – March 9 – 10, 2020 (Mon/Tues)		
Participant Name	**E-Mail**	**State/Organisation**
Rebecca Morrison (Sec.)	rmorrison@rtca.org	RTCA
Manfred Mohr	mohrm@iata.org	IATA
Luc Emberger	luc.emberger@airbus.com	AIRBUS
Rob Segers	Robert.Segers@faa.gov	US
Laurent Leonardon	laurent.leonardon@rockwellcollins.com	Collins Aerospace
Stéphane Tamalet	stephane.tamalet@airbus.com	AIRBUS
Pelleschi, Stephane	stephane.pelleschi@rockwellcollins.com	Collins Aerospace
Timo Warns	timo.warns@airbus.com	AIRBUS
Ron Dlouhy	ron.dlouhy@collins.com	Collins Aerospace
Danny Bharj	danny.bharj@inmarsat.com	INMARSAT
Fred Templin	fred.l.templin@boeing.com	Boeing
Fryderyk Wrobel	fryderyk.wrobel@airtel-atn.com	AIRTEL-ATN
Pete Muraca	peter.muraca@faa.gov	US
Tyler Juergens	t@j.com	
Noppadol Pringvanich	pringvanin@iata.org	IATA
Greg Saccone	gregory.t.saccone@boeing.com	Boeing
Jean-Marc Vacher	jean-marc.vacher@regis-dgac.net	France
Xiangyu XU	xiangyu.xu@thalesgroup.com	Thales Group
Dongsong Zeng	dzeng@mitre.org	Mitre
Mike Goodfellow	mgoodfellow@icao.int	ICAO
Madhu Niraula	kadfjdasfl@aol.com	Collins Aerospace
Tony Whyman	tony.whyman@mccallumwhyman.com	McCallum/Whyman
Michal Skorepa	michal.skorepa@honeywell.com	Honeywel
Jonathan Graefe	Jonathan.Graefe@collins.com	Collins Aerospace
Hoang Tran	hoang.tran@faa.gov	US
Paul Prisaznuk	paul.prisaznuk@sae-itc.org	SAE-ITC
Aloke Roy	aloke.roy@honeywell.com	Honeywell
Pavel Drášil	pavel.drasil@honeywell.com	Honeywell
Giovanni Garofalo	giovanni.garofalo@esa.int	ESA
Bernhard Haindl	bhaindl@frequentis.com	Frequentis
Vaughn Maiolla (Sec.)	vmaiolla@icao.int	ICAO
Tim Baugé	timothy.bauge@uk.thalesgroup.com	Thales Group
Michael Vanguardia	michael.r.vanguardia@boeing.com	Boeing
Eric Vyncke	evyncke@cisco.com	Cisco
Mike Olive	mike.olive@honeywell.com	Honeywell
Vic Patel	vidyut.patel@faa.gov	US

Ganesh Pasupathy	gp@aa.com	American Airlines
Michael Hooper	michael.hooper@iridium.com	Iridium
Zbig Jasiukajc.	zbig.jasiukajc@sitaonair.aer	SITAONAIR
Abderrahmane Ledjiar	abderrahmane.ledjiar@sitaonair.aero	SITAONAIR
Liviu Popescu	liviu.popescu@eurocontrol.int	EUROCONTROL
David Nisbet	david.nisbet@uk.thalesgroup.com	Thales Group
Neil Hyland	nhyland@icao.int	ICAO
Michel Soléry	michel.solery@aviation-civile.gouv.fr	DSNA
Ana Mirsayar	ana.mirsayar@inmarsat.com	INMARSAT
Francois d'Humieres	francois.dhumieres@frequentis.com	Frequentis
Alex and Olga	ddddsdd@dddd.com	ICAO
Bill Holtzman	bholtzman@mosaicatm.com	MOSAIC ATM
Thomas CTR McParland	tmcparland@bcisse.com	BCISSE
Ron Dlouhy	ron.dlouhy@collins.com	Collins Aerospace
Martin Henzl	martin.henzl@honeywell.com	Honeywell
David Avery	dvid.avery@united.com	United Airlines
Session 2 – March 11, 2020 (Weds)		
Participant Name	**E-Mail**	**State/Organisation**
Rebecca Morrison	rmorrison@rtca.org	
Kanaan Abdo (Altys)	kanaan.abdo@altys-tech.net	
David Avery	dvid.avery@united.com	
Tyler Juergens	t@j.com	
Vaughn Maiolla	vmaiolla@icao.int	
Paul Prisaznuk	paul.prisaznuk@sae-itc.org	
Luc Emberger	luc.emberger@airbus.com	
Pelleschi, Stephane	stephane.pelleschi@rockwellcollins.com	
Greg Saccone	gregory.t.saccone@boeing.com	
Aloke Roy	aloke.roy@honeywell.com	
Dongsong Zeng	dzeng@mitre.org	
Liviu Popescu	liviu.popescu@eurocontrol.int	
David Avery	dvid.avery@united.com	
Jonathan Graefe	jgraefe@arinc.com	
Timo Warns	timo.warns@airbus.com	
Fryderyk Wrobel	fryderyk.wrobel@airtel-atn.com	
Tony Whyman	tony.whyman@mccallumwhyman.com	
Rob Segers	Robert.Segers@faa.gov	
Madhu Niraula	kadfjdasfl@aol.com	
Stéphane Tamalet	stephane.tamalet@airbus.com	
Laurent Leonardon	laurent.leonardon@rockwellcollins.com	
Giovanni Garofalo	giovanni.garofalo@esa.int	
Tim Baugé	timothy.bauge@uk.thalesgroup.com	

Fred Templin	fred.l.templin@boeing.com	
Vic Patel	vidyut.patel@faa.gov	
Mike Olive	mike.olive@honeywell.com	
Ganesh Pasupathy	gp@aa.com	
Pavel Drášil	pavel.drasil@honeywell.com	
Michal Skorepa	michal.skorepa@honeywell.com	
Hoang Tran	hoang.tran@faa.gov	
Michael Vanguardia	michael.r.vanguardia@boeing.com	
Danny Bharj	danny.bharj@inmarsat.com	
Noppadol Pringvanich	pringvanin@iata.org	
David Nisbet	david.nisbet@uk.thalesgroup.com	
Thomas CTR McParland	tmcparland@bcisse.com	
Xiangyu XU	xiangyu.xu@thalesgroup.com	
Ron Dlouhy	ron.dlouhy@collins.com	
Jean-Marc Vacher	jean-marc.vacher@regis-dgac.net	
Zbigniew Jasiukajc	zbig.jasiukajc@sitaonair.aer	
Michel Soléry	michel.solery@aviation-civile.gouv.fr	
Pete Muraca	peter.muraca@faa.gov	
Mike Goodfellow	mgoodfellow@icao.int	
Bernhard Haindl	bhaindl@frequentis.com	
Francois d'Humieres	francois.dhumieres@frequentis.com	
Danny Bharj	danny.bharj@inmarsat.com	
Isidore Venetos	isidore.venetos@faa.gov	
Vaughn Maiolla (Sec.)	vmaiolla@icao.int	
Neil Hyland	nhyland@icao.int	
Martin Henzl	martin.henzl@honeywell.com	
Alex and Olga	ddddsdd@dddd.com	
Session 3 – March 12, 2020 (Thurs)		
Participant Name	**E-Mail**	**State/Organisation**
Rebecca Morrison	rmorrison@rtca.org	
Tyler Juergens	t@j.com	
Vaughn Maiolla	vmaiolla@icao.int	
Luc Emberger	luc.emberger@airbus.com	
Greg Saccone	gregory.t.saccone@boeing.com	
Dongsong Zeng	dzeng@mitre.org	
Paul Prisaznuk	paul.prisaznuk@sae-itc.org	
Aloke Roy	aloke.roy@honeywell.com	
Pelleschi, Stephane	stephane.pelleschi@rockwellcollins.com	
Liviu Popescu	liviu.popescu@eurocontrol.int	
David Avery	dvid.avery@united.com	
Vic Patel	vidyut.patel@faa.gov	

Fryderyk Wrobel	fryderyk.wrobel@airtel-atn.com	
Timo Warns	timo.warns@airbus.com	
Pete Muraca	peter.muraca@faa.gov	
Ron Dlouhy	ron.dlouhy@collins.com	
Neil Hyland	nhyland@icao.int	
Rob Segers	Robert.Segers@faa.gov	
Stéphane Tamalet	stephane.tamalet@airbus.com	
Hoang Tran	hoang.tran@faa.gov	
Fred Templin	fred.l.templin@boeing.com	
Madhu Niraula	kadfjdasfl@aol.com	
Tim Baugé	timothy.bauge@uk.thalesgroup.com	
Michael Vanguardia	michael.r.vanguardia@boeing.com	
Mike Olive	mike.olive@honeywell.com	
Michal Skorepa	michal.skorepa@honeywell.com	
Mike Goodfellow	mgoodfellow@icao.int	
Bernhard Haindl	bhaindl@frequentis.com	
Giovanni Garofalo	giovanni.garofalo@esa.int	
Laurent Leonardon	laurent.leonardon@rockwellcollins.com	
Pavel Drášil	pavel.drasil@honeywell.com	
Steve Giles	sgiles@mitre.org	
Jean-Marc Vacher	jean-marc.vacher@regis-dgac.net	
Jonathan Graefe	jgraefe@arinc.com	
Ganesh Pasupathy	gp@aa.com	
Noppadol Pringvanich	pringvanin@iata.org	
Martin Henzl	martin.henzl@honeywell.com	
Michel Soléry	michel.solery@aviation-civile.gouv.fr	
Danny Bharj	danny.bharj@inmarsat.com	
Xiangyu XU	xiangyu.xu@thalesgroup.com	
Thomas CTR McParland	tmcparland@bcisse.com	
Tony Whyman	tony.whyman@mccallumwhyman.com	
David Nisbet	david.nisbet@uk.thalesgroup.com	
Danny Bharj	danny.bharj@inmarsat.com	
Francois d'Humieres	francois.dhumieres@frequentis.com	
Zbigniew Jasiukajc	zbig.jasiukajc@sitaonair.aer	
Xiangyu XU	xiangyu.xu@thalesgroup.com	
David Nisbet	david.nisbet@uk.thalesgroup.com	
Luc Emberger	luc.emberger@airbus.com	
Neil Hyland	nhyland@icao.int	
Alex and Olga	ddddsdd@dddd.com	
Michel Soléry	michel.solery@aviation-civile.gouv.fr	
Saulo da Silva	sdasilva@icao.int	

Session 4 – March 13, 2020 (Fri)		
Participant Name	**E-Mail**	**State/Organisation**
Rebecca Morrison	rmorrison@rtca.org	
Paul Prisaznuk	paul.prisaznuk@sae-itc.org	
Dongsong Zeng	dzeng@mitre.org	
Vic Patel	vidyut.patel@faa.gov	
Zbigniew Jasukiajc	zbig.jasiukajc@sitaonair.aer	
Fred Templin	fred.l.templin@boeing.com	
Danny Bharj	danny.bharj@inmarsat.com	
Ron Dlouhy	ron.dlouhy@collins.com	
Timo Warns	timo.warns@airbus.com	
Giovanni Garofalo	giovanni.garofalo@esa.int	
Jonathan Graefe	jgraefe@arinc.com	
Tim Baugé	timothy.bauge@uk.thalesgroup.com	
Rob Segers	Robert.Segers@faa.gov	
Tony Whyman	tony.whyman@mccallumwhyman.com	
Mike Goodfellow	mgoodfellow@icao.int	
Fryderyk Wrobel	fryderyk.wrobel@airtel-atn.com	
Madhu Niraula	kadfjdasfl@aol.com	
Michel Soléry	michel.solery@aviation-civile.gouv.fr	
Laurent Leonardon	laurent.leonardon@rockwellcollins.com	
Michael Vanguardia	michael.r.vanguardia@boeing.com	
Aloke Roy	aloke.roy@honeywell.com	
Luc Emberger	luc.emberger@airbus.com	
Greg Saccone	gregory.t.saccone@boeing.com	
Pavel Drášil	pavel.drasil@honeywell.com	
Mike Olive	mike.olive@honeywell.com	
Pete Muraca	peter.muraca@faa.gov	
Michal Skorepa	michal.skorepa@honeywell.com	
Liviu Popescu	liviu.popescu@eurocontrol.int	
TAMALET, STEPHANE	stephane.tamalet@airbus.com	
Neil Hyland	nhyland@icao.int	
Jean-Marc Vacher	jean-marc.vacher@regis-dgac.net	
Noppadol Pringvanich	pringvanin@iata.org	
Pelleschi, Stephane	stephane.pelleschi@rockwellcollins.com	
Francois d'Humieres	francois.dhumieres@frequentis.com	
Pelleschi, Stephane	stephane.pelleschi@rockwellcollins.com	
Saulo da Silva	sdasilva@icao.int	
Bernhard Haindl	bhaindl@frequentis.com	
Ganesh Pasupathy	gp@aa.com	

Vaughn Maiolla	vmaiolla@icao.int	
Xiangyu XU	xiangyu.xu@thalesgroup.com	
Brent Phillips	brent.phillips@faa.gov	
David Avery (UAL)	david.avery@united.com	
Hoang Tran	hoang.tran@faa.gov	
Alex and Olga	ddddsdd@dddd.com	
Vaughn Maiolla	vmaiolla@icao.int	
Luc Emberger	luc.emberger@airbus.com	
Pete Muraca	peter.muraca@faa.gov	

Appendix C – List of Action Items as at end of First Joint Meeting (WG-I/30)

Action Item	Description	Status
30-1	Secretary to ensure that an item dealing with governance be included on the agenda for DCIWG/4 during which the PKI policy and especially the relationship between Doc 10095 and the (TFSG) Certificate Policy is discussed. This issue would first be reviewed by WG-I and a recommendation brought to the DCIWG.	OPEN
30-2	Secretary to coordinate with AVSECP to ensure that WG-I Doc 100XX and the WGTR Risk Assessment are complementary.	OPEN
30-3	Boeing to provide comments to Dongsong Zeng/Stephan Pelleschi on the format/structure of the MASPS.	
30-4	Ganesh Pasupathy (American Airlines) to obtain initial feedback on the above issues from American Airlines to allow the group to assess the scope of the task. The issues related to AOC traffic and were as follows: a) The expected level of customisation / configuration, ie: choices of media, mobility providers, etc. b) DSP-hosted or airline-hosted (or both)??? c) Airline needs for security and how this will be done, ie: airline-hosted or DSP-hosted (or both)??	
30-5	Each group (RTCA/EUROCAE; ICAO or AEEC) to continue reviewing and updating the scope of allocations given in the gap analysis and also to review the work of other groups.	
30-6	Meeting participants to review the agreed terms in WP03 (shaded in green) and provide feedback to Liviu Popescu.	
30-7	Reflect convention to use end-system for OSI networks/systems and node/host/router for IPS networks/systems.	
30-8	WG-I members who are also members of the RTCA/EUROCAE and AEEC groups to promote the acceptance of DTLS for end-end security based on its	

	adoption by WG-I. They are to also allocation roles for the various standards documents according to WP12.	
30-9	Meeting participants to comment on the draft Certificate Policy contained in WP11 by March 31, 2020.	
30-10	Meeting participants to review the IETF Liaison Statement and provide comments at the earliest opportunity.	
30-11	IPS Mobility SG and Sec. to arrange a dedicated web-meeting (of the IPS Mob SG) to dal with the issues raised in 9.2.10. These are: Regarding the treatment of Plan A and Plan B: a) Do we pursue only the preferred solution, Plan A in the standards?? b) If so, what happens if this approach is not adopted by the IETF or vendors? c) Which do we validate??	
30-12	WG-I members to consider the parameters to be included in the media advisory message taking into account the needs of aircraft operators (and ATS).	

Appendix D – List of Working Papers, Information Papers and Flimsies.

ICAO

WP/IP	Title	Source
WP01	Proposed Agenda for WG-I/28 V0.5	Rapporteur
WP02	ICAO WG-I documents overview v0.1	Rapporteur
WP03	IPS terminology following web-meeting 2	Rapporteur
WP04	Methodology for Risk Assessment	FAA
WP05	ICAO-IETF-Liaison-Statememt-2.0	Fred Templin (Boeing)
WP06	Draft 6Man OMNI Interface-03	Fred Templin (Boeing)
WP07	Update for Editors version of Doc 9896	Greg Saccone (Boeing)
WP08	Doc 9896 Amendment Proposal Discussion	Greg Saccone (Boeing)
WP09	Nil	
WP10	IANA Port Registration Updade	ICCAIA
WP11	(TFSG) IATF Certificate Policy	Mike Goodfellow (TFSG)
WP12	Clarification on ATN/IPS End-End Security Protocol	Timo Warns (AIRBUS)
WP13	Onboard IP-level Prioritization	Honeywell
WP14	ICAO WG-I (Integrated) Timeline Q1 2020	Rapporteur
WP15	Comments on TFSG Proposal for an ATN-IPS Addressing Plan	Tony Whyman (INMARSAT)
WP16	ATN/IPS Media Advisory Parameters Content	Stephane Tamalet (AIRBUS)
WP17	Air-Ground Interface Plan B	
WP18	IPS Use Case Presentation	FAA
WP19	TFSG AITF Address Allocation for IPv6	
WP20	IPS Mobility Sub-Group - Conclusions	Rapporteur, IPS Mob SG
IP01	RTCA/EUROCAE Welcome – Meeting Kick-off Slides	RTCA/EUROCAE
IP02	Plan for meeting of Week March 9, 2020 v3	Various

RTCA/EUROCAE

WP/IP	Title	Source
82	Draft MASPS as of March 6, 2020	
83	AIRBUS input to MASPS, 2020	
84	IPS MASPS Structure for Discussion	
85	MITRE Performance Verification Method	
86	Robust Header Compression for IPS	
87	On-board IPS Level Prioritization	
88	Preliminary IPS Security Risk Assessment	

WP/IP	Title	Source
89	ATN-IPS IPS for AOC	

AEEC

WP/IP	Title	Source
	Project Paper 858 as of March 2, 2020	
	AEEC 658 IPS Gap Analysis Update March, 2020	
	AEEC IPS 858 IPS Roadmap as of March 10, 2020	
	AEEC 658 IPS Gap Analysis Update at end of Day Two	

Editor's Note: Unless specifically mentioned in the body of the report WPs/IPs were not presented due to a lack of time.

Appendix E – IPS Gap Analysis

A copy can be found at the following link: https://portal.icao.int/CP-DCIWG/ACPWGF/Forms/AllItems.aspx?web=1&RootFolder=%2fCP%2dDCIWG%2fACPWGF%2fCP%20WG%2dI%2030%2fAEEC&FolderCTID=0x0120004556C8902AF4AC4895A0593F44E559C900836C40735815874A9BBC9CC8095BF4A9

A658 Appendix D - Updates	
IPS Standardization Gap Analysis	
Last Update:	13-Mar-2020

Note: ✓ indicates a pull-down menu selection

A	B	C	D	E	F	G	H	I	J	L	M	N	O	P	Q	R	S	T	U	V
		IPS-related Standardization Activities								Dependencies							Topic Scope Allocation			
								Artifact		Activity/Artifact has a Dependency on (needs input from)			There is a Dependency on the Activity/Artifact (is an output to)							
Work Area	Sub-work Area	Work Type	Work Status	A658 Section where Gap is Addressed	Standards Organization	Working Group / Sub-group	Activity Description / *Gap Description*	Document No.	Planned Completion Date (MMM-YYYY)	Input Dependency FROM	Input Need Date	Input Availability Date	Output Dependency TO	Output Need Date	Output Availability Date	Additional Comments	ICAO Doc. xxxx	RTCA/EUROCAE IPS Profiles / MASPS	AEEC PPBSB	Topic Scope General Comments
Application Interfaces	DSI (legacy)		In-Progress		ICAO	WG-I	ATNPKT definition for backward compatibility with existing dialog service-based OSI applications	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)	Doc. 9880		Available Now	ICAO WG-I internal		Available Now	Job Card: CP-DCIWG.006.02 *NOTE: Unedited version is an ICAO DOC publication supported by the Panels and approved, in principle, by the Secretary General, which is rendered available to the public for convenience. The final edited version may still undergo alterations in the process of editing.*	Doc. 9880: Specified in 9880; may need an update for IPS addressing (e.g., use of a different VER as presented previously by Boeing-Greg). Doc. 9896: One option is to make the change in 9896, but that may still require a note in 9880 to refer to 9896.	None	None	
		STD	In-Progress	5.4.4	ICAO	WG-I	Mapping between OSI addresses and IPS address (see comment) Updates to DSI -- application level (CM), overall format, dependence on mobility	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)	ICAO WG-I MSG (IPS addressing and mobility solution)			RTCA/EUROCAE AEEC IPS	3Q-2019	In-progress (Boeing action to submit port reservation requests to IANA)	1. Consider multi-phased approach, where initial deployments use address mapping from OSI to IPS, but future deployments may be IPS addresses only. 2. May start in ICAO and move to RTCA/EUROCAE (SC-214/WG-78)				
	ACARS (legacy)	STD	In-Progress	5.4.1.1, 5.4.4	ICAO	WG-I	Encapsulation of FANS (e.g., A618) for IPS (e.g., mapping of FANS to IPS DS), including what parts of the ACARS message are included (e.g., SMI)	Doc. 9896 GM	Nov-2020 (Adv) 1Q-2022 (unEd)	Collins, HON, Boeing		Available Now	RTCA/EUROCAE		Available Now	Current thinking is that this topic is covered under existing job card; pending output of DCIWG Oct 2018 meeting	Doc. 9896: Points to 858 for ACARS-based app adaptation details (AP has been agreed, changes to be incorporated in 9896).	MASPS: Use DO-350A and 9896/858 info for Safety and Perf assessment. Impact of AOC accommodation to be addressed.	ACARS-to-IPSDS Convergence Function detailed specification (Att3)	
		STD	*TBD/TBS*	5.4.1.2.7	AEEC	DLK	*Standardization of air-ground messaging layer for AOC (A620 non-safety) applications using MIAM over IPS.*	ARINC 841	TBD	A858; Doc. 9896 ATNPKT format	TBD (future APIM, see comment)		None			The need date for updating the ARINC 841 MIAM Standard is TBD				
	Native IP (future, e.g., SWIM Safety)	STD	In-Progress	5.4.4	AEEC	IPS	Support for native IP applications	ARINC 858	TBD (future suppl.)	Doc. 9896 ATNPKT format	TBD (future APIM, see comment)	TBD (future APIM, see comment)	None			Note that this may be addressed in a future supplement to A858 and not the initial release	Future	Future	Future	ALL: Airline input desired
Mobility & Multilink	Inter-subnetwork	ANA	In-Progress		ICAO	WG-I / MSG	Mobility sub-group to analyze Multi-link mobility options (e.g.,MIPv6, AERO, LISP) and recommend a candidate	Working Papers		LISP - SESAR 15.2.4 AERO - IETF RFC							Doc. 9896: Mobility management provisions RS/RA air-ground signaling with extensions. Plan A and B approaches being considered by ICAO WG-I MSG	MASPS: Performance and Safety specification and tests covering mobility. Guidance for deployment. Profiles: Update as necessary for consistency with ICAO mobility approach, including any addition mobility-related RFC	Review IPS Management messages (Att4) with respect to which document is appropriate (98967) -- revisit. Potential need to address how to configure preferences that are communicated to the ground.	ALL: Need to think thru how to validate and stress test solution in a comprehensive, representative environment that includes entire protocol stack. (IRIS and SESAR programs are addressing some of this.) May need to introduce activity to capture operational scenarios to be used as basis for validation exercises. ALL: A decision on Plan A vs. B impacts all of the documents -- i.e., should they deal with both Plan A and Plan B; just Plan A if that's the target end state, but then what happens if Plan A is not adopted by
		STD	In-Progress		ICAO	WG-I / MSG	Mobility technical provisions	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)				RTCA/EUROCAE MASPS	4Q-2019		Job Card: CP-DCIWG.006.01				
	Inter-region	STD	In-Progress		ICAO	WG-I / MSG	Mobility technical provisions	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)								Doc. 9896: Part of the mobility solution			
Upper Layers	Transport Options	ANA	In-Progress		ICAO	WG-I	Further refinement of transport options, whether UDP/TCP/etc. should both be supported, and including reliability extensions	Working Papers								During WG-I/27, Airbus presented proposal to specify UDP for DS-based apps (i.e., use ATNPKT). Group agreed; Airbus to prepare AP	Requirements	Profiles	Airborne IPS System implications	
		STD	In-Progress		ICAO	WG-I	Document IPS transport provisions	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)											
	Supporting Services Identification	STD	In-Progress		ICAO	WG-I WG-I / MSG	Identify additional services necessary to support IPS, e.g. ICMP, local BGP, etc.	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)				RTCA/EUROCAE Profiles	2Q-2020 (A/R)	OK for now		Doc. 9896: Requirements	Profiles	Airborne IPS System implications	
	Profile	STD	In-Progress		EUROCAE +RTCA	WG-108 / SC-223	IPS profiles	ED-262 / DO-379	Sep-2019 (Jun-2021 A/R)				ICAO Doc. 9896		Pre-pub version Available now		Doc. 9896: Requirements Add AP to reference the Profiles	Profiles	Airborne IPS System implications	
	Application Level Guidance	GM	In-Progress		EUROCAE +RTCA	WG-108 / SC-223	IPS End-to-End interop guidance (MASPS)	ED-TBD DO-TBD	Mar-2021	Doc. 9896 inputs for upper layers	3Q-2019	Available now				Upper layers only -- see other sections (e.g., security, perf., etc.)	Doc. 9896: Process AP's based on prior working papers (e.g., ATNPKT, DTLS)	MASPS: Safety and Perf assessment Impact of AOC accommodation to be addressed	App-level considerations (Sections 6 and 3)	

Lower Layer Interfaces	AeroMACS	STD	Complete		ICAO	WG-S	AeroMACS SARPS	Annex 10	Complete										
		STD	Complete		ICAO	WG-S	AeroMACS Technical Manual and Guidance	Doc. 10044	Complete							Potential for future update			
		STD	Complete		RTCA	SC-223	AeroMACS Profile	DO-345	Complete							Potential for future update			
		STD	Complete		RTCA	SC-223	AeroMACS MOPS	DO-346	Complete							Potential for future update			
		STD	Complete		AEEC	AeroMACS	AeroMACS Transceiver and Installation	ARINC 766	Complete							Potential for future update			
		STD	*TBD/TBS*	5.4.1.2.4	AEEC	AeroMACS	*AeroMACS architecture concepts (for segregation) to support IPS may not be defined adequately for developers*	ARINC 766	TBD	A858 (I/F with IPS Core functions, multi-link) Doc. 9896 (multi-link technical provisions TBC)	TBD (future APIM, see comment)	End-2020	EUROCAE/RTCA MASPS?	?	TBD (future APIM, see comment)	AEEC is monitoring AeroMACS ground station development, installation, and critical mass. The need date for updating the ARINC 766 Standard is TBD if dual connectivity with ACD and AISD is required in the radio for IPS.	Doc. 9896: General level requirements for subnetwork interface.	MASPS: Additional requirements for consistent subnetwork interface (e.g., join/leave event other key input parameters) and performance. Subnetwork-agnostic (then individual specs would include detail for how to meet the requirements).	Pointers to subnetwork specs. 858 should be consistent with what is stated in the MASPS. Further detail to document the logical description of the interface. Anything else??	ICAO: Recommendation for WG-I to ask PT-SAT and PT-T to take a look at these documents.
	LDACS	STD	In-Progress		ICAO	WG-T	LDACS SARPS	Annex 10, Vol III	Dec-2022							Job Card: CP-DCIWG.010.01	Same as above	Same as above	Same as above	Same as above
		STD	In-Progress		ICAO	WG-T	LDACS Technical Manual	Doc. TBD	Dec-2022							Job Card: CP-DCIWG.010.01				
		GM	In-Progress		ICAO	WG-T	LDACS Guidance Material	Doc. TBD	Dec-2022							Job Card: CP-DCIWG.010.01				
		STD	In-Progress		EUROCAE	WG-82	Development of MOPS/MASPS	Doc. TBD	TBD											
		STD	*TBD/TBS*	5.4.1.2.5	AEEC	TBD	*LDACS transceiver and interfaces*	ARINC TBD	TBD	A858 (I/F with IPS Core functions, multi-link) Doc. 9896 (multi-link technical provisions TBC)	TBD (future APIM, see comment)	End-2020	EUROCAE/RTCA MASPS?	?	TBD (future APIM, see comment)	AEEC member airlines have yet to discuss the LDACS concept, potential benefits, timing, and other factors that might drive the need for standardization.				
	SATCOM (current) - Performance Class B	STD	Planned		ICAO	WG-T	Update SARPs (generic) and Technical Manual, including technology-specific parts (e.g., INMARSAT and Iridium)	Doc. 9925 (new part) Annex 10 Vol 3 Ch4	TBD								Same as above	Same as above	Same as above	Same as above
		STD	Planned		EUROCAE	WG-82	MOPS / MASPS updates for IPS	ED-TBD	TBD											
		STD	Planned		RTCA	SC-222	MOPS / MASPS updates for IPS	DO-343x	TBD											
		STD	In-Progress		AEEC	AGCS	MK3 Aviation SATCOM Systems Form/Fit/Function - additional work currently in progress to focus on ACARS (which may support accommodation)	ARINC 771 ARINC 781	TBD	None									
		STD	*GAP*	5.4.1.2.6	AEEC	AGCS	*Updates (as necessary) and architecture concepts to support IPS*	ARINC 771 ARINC 781	TBD	A858 (I/F with IPS Core functions, multi-link) Doc. 9896 (multi-link technical provisions TBC)	TBD (future APIM, see comment)	End-2020	EUROCAE/RTCA MASPS?	?	TBD (future APIM, see comment)	Some initial placeholder text in planned next versions (2018), but future update expected to fully address IPS.				
	SATCOM (future) - Performance Class A	STD	Proposed		ICAO	WG-T	SATCOM Class A Technical Manual and Guidance and SARPS	Doc. TBD	TBD							Proposal presented by Eurocontrol during ICAO CP/2 in October 2016. Draft Job Card presented during ICAO CP/2 in WP02.	Same as above	Same as above	Same as above	Same as above
		STD	In-Progress		EUROCAE	WG-82	MOPS / MASPS updates for IPS	ED-TBD	TBD											
		STD	*TBD/TBS*	5.4.2	RTCA	SC-222	*Extension of current MOPS/MASPS to accommodate future SATCOM and IPS*	DO-TBD	TBD											
		STD	*TBD/TBS*	5.4.1.2.6	AEEC	AGCS	*Updates (as necessary) and architecture concepts to support IPS*	ARINC TBD	TBD	A858 (I/F with IPS Core functions, multi-link) Doc. 9896 (multi-link technical provisions TBC)	TBD (future APIM, see comment)	End-2020	EUROCAE/RTCA MASPS?	?	TBD (future APIM, see comment)	See SATCOM Performance Class B. Current SATCOM Performance Class B will evolve and are expected to serve airline needs for the foreseeable future.				
	Non-safety SATCOM	STD	Complete		AEEC	KSAT	Track non-safety SATCOM activities to ascertain whether there are concepts/techniques that can be leveraged for IPS	ARINC 791 ARINC 792	Complete											ICAO: No work here currently at ICAO
	HF Next	STD	Planned					TBD	TBD								Same as above	Same as above	Same as above	Same as above
	VDLm2	STD	Planned	5.4.1.2.3	AEEC	Joint VDL Group	Updates for VDLm2 support of IPS, e.g., modifications to VDL Tech Manual to address connectionless VDLm2 exchange, and accommodate IP packets in VDLm2 as a result of analyses including e.g., reliability mechanisms, access network security, etc.	ARINC 631-9 Doc. 9776 input	Dec-2022	WG-I SSG Security Risk Analysis	2Q-2020					Current APIM 17-002A (in progress to extend date to Dec-2020), addressing near-term Broadcast-VDLm2 for OSI. Need new/modified APIM for IPS CL-VDLm2.	Same as above	Same as above	Same as above	Same as above
										A858 (I/F with IPS core functions, multi-link)	2Q-2020	End-2020								
		STD	Planned	5.4.4	ICAO	WG-M	Updates for VDLm2 support of IPS, e.g., modifications to VDL Tech Manual to address connectionless VDLm2 exchange, and address IP packets in VDLm2.	Doc. 9776	Dec-2022	WG-I SSG Security Risk Analysis	2Q-2020					Expected 6 months after MASPS/MOPS updates				
										A858 (I/F with IPS core functions, multi-link)	2Q-2020	End-2020								
		STD	Planned	5.4.2	RTCA	SC-214 / VDLSG	Updates for VDLm2 support of IPS, e.g., modifications to VDL Tech Manual to address connectionless VDLm2 exchange, and address IP packets in VDLm2.	DO-224E (MASPS) DO-281D (MOPS)	Dec-2022	WG-I SSG Security Risk Analysis	2Q-2020					SC-214 TOR Rev 11 (13-Dec-2018)				
										A858 (I/F with IPS core functions, multi-link)	2Q-2020	End-2020								
		STD	Planned	5.4.2	EUROCAE	WG-92	Updates for VDLm2 support of IPS, e.g., modifications to VDL Tech Manual to address connectionless VDLm2 exchange, and address IP packets in VDLm2.	ED-92D (MOPS)	Dec-2022	Doc9896 for security	2Q-2020					SC-214 TOR Rev 11 (13-Dec-2018)				
										A858 (I/F with IPS core functions, multi-link)	2Q-2020	End-2020								
	Distributed Radio Architecture	STD	In-Progress	New M07	AEEC	SAI	Focus is mainly hardware, but there may be impact on the overall architecture and interfaces with respect to IPS (e.g., radios on a network)	ARINC TBD	Apr-2020	A858 (I/F with IPS Core functions, multi-link) Doc. 9896 (multi-link technical provisions TBC)	End-2019 (Assuming that radio is not a network node)	End-2020	EUROCAE/RTCA MASPS?	?	?	APIM 18-003 The initial activity in AEEC SAI will produce hardware architecture recommendations. Any GAP is TBD pending that recommendation. Need to ascertain any impact of new radio architecture on security.				ICAO: Trying to initiate a Task Force activity in this area to identify the issues and roadmap. AEEC: Current work is just an evaluation of DRA viability, but no standards in process yet.

Naming and Addressing	Naming	STD	In-Progress		ICAO	WG-I	Define naming convention and DNS requirements	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)	INNOVA TF (prefix size) and Coordination with RTCA/EUROCAE	2Q-2019	2Q-2020	RTCA/EUROCAE MASPS	2Q-2020		Job Card: CP-DCIWG.006.02	Doc. 9896: Naming strategy and protocol (e.g., simple name lookup for existing apps). Need a standard mechanism for ground-ground name lookup, and security implications. Need hooks for future apps (e.g., SWIM, Native IP apps).	MASPS: Consider impact on deployment and safety, including impact on non-nominal conditions	Aircraft side responses to non-nominal conditions (e.g., name resolution failure)	
	Addressing	STD	In-Progress		ICAO	WG-I	Define addressing	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)	WG-I in Coordination with RTCA /EUROCAE	1Q-2020		RTCA/EUROCAE MASPS	1Q-2020		Job Card: CP-DCIWG.006.02	Doc. 9896: Addressing scheme and port numbers	MASPS: Consider impact on deployment and safety, including impact on non-nominal conditions	Address configuration and storage	
	IPv6 Transition Ph1	ANA	In-Progress		AEEC	NIS	Roadmap for IPv6 transition in aviation	ARINC 686	May-2020	None						APIM 17-001 (AEEC NIS activity is for information only)	Doc. 9896: Interconnection of heterogeneous regional ground systems. Regions will be looking to ICAO for guidance.			ALL: Recommendation to read the 686 document for potential applicability to IPS.
	IPv6 Transition Ph2	STD	Proposed		AEEC	NIS	Updates to standards for IPv6 transition as identified during the roadmap activity	ARINC 664pX(other parts and/or new part)	TBD	A858	TBD (future APIM)	End-2019	None			APIM 17-001 - proposed Phase 2 (AEEC NIS activity is for information only)				
										RTCA/EUROCAE Profiles	TBD (future APIM)	End-2020								
	Administration	OPR	*GAP*	5.4.4	ICAO	INNOVA (?)	*Processes for on-going administration of IP names and addresses* *IP database management/translations*	TBD	TBD				Name/Address Management Entities	4Q-2020	4Q-2020	This will need to be determined for mobility	Doc. 9896: TBD - Potential implementation and deployment guidance in 9896, IF naming is needed	MASPS: Regional-specific naming/addressing guidance		
		OPR	*GAP*	5.4.5	OTHER	IATA	*Same as above but for AOC*	TBD	TBD				Name/Address Management Entities	4Q-2020	4Q-2020	This isn't really WG-I but does need to be done consistently with ICAO or else AOC applications may end up with completely different routing logic				

Security	Risk Analysis	ANA	In-Progress		ICAO	WG-I SSG	Notional end-to-end risk analysis for IPS	Doc. 100xx	2Q-2020 (preliminary) 4Q-2021	IPS Deployment Scenarios (from WG-I, and detail in ABSB)		Available Now	AEEC IPS/ AEEC Joint VDL	2Q-2020 (preliminary version)	TBD	I think this would be necessary in final determination of use of network-level security (or not)	Doc. 100xx: High-level, E2E risk assessment; 9896: security requirements and assumptions	MASPS: Air-ground security perspective with respect to deployment options, traced to high-level	Airborne IPS System security requirements and guidance, traced to high-level	
	Certification Guidance	GM	In-Progress		EUROCAE + RTCA	WG-108 / SC-223	Further decompose ICAO security requirements (e.g., regional constraints) on IPS as part of MASPS	ED-TBD DO-TBD	Mar-2021	ICAO WG-I Doc. 100xx	2Q-2020 (preliminary version)						MASPS: May point to Doc. 10090, which points to EASA and FAA Special Conditions (as a starting point) and existing cert guidance. Also some description of security implications. MASPS should provide guidance that can be invoked by EASA/FAA for how to demonstrate the appropriate level of security for a secured IPS System. (NOTE: Airbus and Boeing are assuming that security cert will be mandatory for IPS, driven from risk assessment.)		
	End-to-End - Dialogue Service	~~STD~~	~~Complete~~		~~ICAO~~	~~WG-I / SSG~~	~~Secure Dialog Service (SDS), end-to-end Dialogue Service application layer security applicable to both OSI and IPS~~ ~~Secure Dialog Service (SDS) Concept of Operations~~	~~Doc. 10084, Part I~~	~~Complete~~						~~sDS no longer applicable for IPS~~					
		~~GM~~	~~In-Progress~~		~~ICAO~~	~~WG-I / SSG~~	~~Secure Dialog Service (SDS) guidance material~~	~~Doc. 10084, Part II~~	~~Dec-2018~~						~~sDS no longer applicable for IPS~~					
		~~GM~~	~~In-Progress~~		~~ICAO~~	~~WG-I / SSG~~	~~Secure Dialog Service (SDS) guidance material~~	~~Doc. 10084, Part III~~	~~Jun-2019~~						~~sDS no longer applicable for IPS~~					
		~~VAL~~	~~In-Progress~~		~~FAA~~	~~WJHTC~~	~~SDE validation~~	~~Validation Report~~	~~Dec-2018~~						~~sDS no longer applicable for IPS~~					
		~~ANA~~		~~NEW M08~~	~~ICAO~~	~~WG-I / SSG~~	~~sDS certificate caching options to minimize bits over the air (e.g., aircraft caches ground cert and indicates cert to ground, which uplinks cert only when there is a change).~~	~~Working Papers~~	~~TBD~~						~~sDS no longer applicable for IPS~~					
		~~ANA~~		~~NEW M08~~	~~ICAO~~	~~WG-I / SSG~~	~~sDS Certificate revocation options, which may be in band (i.e., impacts sDS ASN.1) or out of band (i.e., need to be specified, possibly in ASSB). Options include: short-lived certs, CRL, OCSP stapling.~~	~~Working Papers~~	~~TBD~~						~~sDS no longer applicable for IPS~~					
	Application Security Options	ANA	Complete	NEW M08	ICAO	WG-I / SSG	sDS vs. DTLS	Working Papers	Complete				AEEC IPS		Available Now		Doc. 9896: App-layer security provisions specifying DTLS, pointing to IPS Profiles. Address legacy and future applications. Interoperability aspects and required crypto strengths / cipher suites. Pointer to Doc. 10095 for certificate profiles / PKI (IATF CP) to ensure global consistency.	Profiles: Specify the DTLS RFCs MASPS: Recommendations/ guidance on multiple DTLS sessions, and impact on performance (need to specify the scope of the performance work in MASPS). Implications of using the IPS Gateway as a security proxy. Guidance on which profiles should be selected wrt the applications and the results of the security risk analysis.	Specification of filtering (e.g., packet, DPI) Dimensioning (i.e., how many simultaneous DTLS sessions) Specification of DTLS+MIC (is 858 the right place? Move requirement to 9896 and how-to implementation details 858)	ICAO: For VoIP, Liviu will present a paper on the evolution in EU deployment. ALL: Need to discuss overall architecture; is this missing in the gap analysis OR is it part of "Ground Systems" work area. WG-I SSG: As an action from Timo's presentation, general agreement that App-level security needs to be discussed and decided in ICAO WG-I SSG, to include: DTLS vs DTLS+MIC, DTLS v1.2 vs v1.3. Then revisit scope allocation.
	Security Framework	GM	In-Progress		ICAO	WG-I / SSG	Overall security framework	Doc. 10090	TBD-2021	Doc. 10044		Available Now	RTCA/EUROCAE MASPS	TBD		Job Card: CP-DCIWG.007.03 Airbus/Boeing preliminary risk assessment may be an initial input to Doc 10090	Doc. 10090: Aero Comm Security Services	MASPS: May point to Doc. 10090, which points to EASA and FAA Special Conditions (as a starting point) and existing cert guidance.		
	Ground-Ground	STD	In-Progress		ICAO	WG-I / SSG	Ground-ground IPS security	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)	Doc. 10044		Available Now	RTCA/EUROCAE MASPS	TBD			Doc. 9896: Requirements (common crypto requirements) Ground-ground app security (e.g., VoIP, AMHS, etc.)	Profiles: Ground needs to support IPS Profiles to interact with airborne systems. But, ground-ground may use functionality beyond what's specified for Air-ground. MASPS: Guidance and considerations for ground-ground		
	PKI	STD	Complete		ICAO	WG-S	AeroMACS PKI Certificate Policy, which includes certificate/CRL profiles. Expected to be reusable for SDS.	Doc. 10044	Complete	ATA Spec 42 WMF Certificate Profile & Certificate Policy		Available Now					Doc. 10095: -- Pointer to IATF CP, Certificate profiles/formats, and add more specificity where needed for interop. (e.g., ATN-specific policy OIDs) -- High-level key management requirements (may also point to the IATF CP) -- Overall global PKI architecture (relevant material available in IATF CP) Need further analysis of how to reference IATF CP and the scope of Doc. 10095 (i.e.	MASPS: Deployment considerations with respect to PKI. Definition of roles and responsibilities for service providers that provide key management services (e.g., air-ground key management protocol per Att4).	Detailed key management messages (Att4) -- need to be considered as part of risk assessment.	
		VAL	Complete		WMF	AWG	AeroMACS test certificates	N/A	Complete											
		STD	In-Progress	5.4.4	ICAO	WG-I / SSG	PKI Policy for Aeronautical Communications	Doc. 10095	Nov-2020 (Adv) 4Q-2021 (unEd)				AEEC IPS	4Q-2019	Preliminary available now	Does some of this have an impact on IPS security?				
		VAL	Planned	5.4.4	ICAO	WG-I / SSG	Public Key Infrastructure Validation	Doc. 10095	Nov-2020 (Adv) 4Q-2021 (unEd)											
		GM	*GAP*	5.4.1.2.8	AEEC	TBD	*Key loading and key management necessary for LRU installation and maintenance (e.g., key replacement) -- updates necessary for IPS (all systems)*	ARINC TBD	TBD	A858 ICAO tech manual	TBD (future APIM, see comment)	?	EUROCAE/RTCA MASPS (ground) & Profiles (new RFCs for PKI?)	?	?	A Security Concept of Operation is expected to provide focus in terms of standards, scope, and timing.				
	Network Layer Security	STD	In-Progress		ICAO	WG-I	Definition of the security solution for the network level, including for AOC traffic	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)	RTCA / EUROCAE Profiles	4Q-2018 (Initial RFCs provided)	Available Now				Airbus analysis suggests that network level security may not be required. Need to protect control plane data. To-be-confirmed by risk analysis in progress.	Doc. 9896: Technical provisions and guidance for protecting control plane traffic. Consider approaches for protecting ground-based networks on output of risk analysis	MASPS: Recommendations and requirements to ensure appropriate security measures for protecting ingress points (assuming aviation overlay network) -- both data plane and control plane.	Packet firewall (mandatory) and DPI (optional) for Airborne IPS System.	
	Aircraft Security Reliance on Ground Security	GM	In-Progress		EUROCAE + RTCA	WG-72 / SC-216	Airworthiness Security Methods and Considerations - Trustworthiness considerations in the security environment	ED-203A / DO-356A (Air) ED-205 (Ground cert)	Available now (updates for IPS)									MASPS: Understand requirements, do allocation between air and ground to provide cert guidance on what ground will provide. (NOTE: Reference to ED-205 for general guidance. Clarification as to whether this applies to airline IPS systems.)	Address the way that IPS is implemented onboard (Section 5)	
		GM	Planned		EUROCAE + RTCA	WG-108 / SC-223	IPS End-to-End guidance supporting certification (MASPS)	ED-TBD DO-TBD	Mar-2021	ICAO WG-I Risk Assessment	2Q-2020									
		GM	*GAP*	5.2 ?	OTHER	ARAC (?)	*Address this topic and provide recommendations to FAA/EASA*	TBD	TBD											
		GM	*GAP*	5.2	FAA		*FAA/EASA regulation update or new process?? Impact on certification if aircraft has reliance on the ground*	TBD	TBD											
		GM	*GAP*	5.2 ?	EASA		*FAA/EASA regulation update or new process?? Impact on certification if aircraft has reliance on the ground*	TBD	TBD											
	Security Management (Technical)	STD	In-Progress		ICAO	WG-I		Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)								Doc. 10090: Security event distribution (ISMS work). Parallel work is being done in ICAO GRAIN that can be leveraged.	MASPS: Guidance on logging, monitoring, event alerts from an end-to-end perspective. Synch with the ISMS work in ICAO.	Airborne IPS System level security event logging, log life cycle management, security configuration and tuning (e.g., firewall rules), crypto agility, continued airworthiness aspects	
		STD	In-Progress		EUROCAE + RTCA	WG-108 / SC-223		ED-TBD DO-TBD	Mar-2021											
		STD	In-Progress	5.4.2	AEEC	IPS		ARINC 858	Dec-2020											
	Security Policy (Governance)	STD	Planned		ICAO	WG-I / SSG	ICAO Overall Security Policy Requirements	Doc. 10090	TBD-2021							Job Card: CP-DCIWG.007.03	Doc. 10090: Governance and framework for aviation network.			

Performance	QoS (IP-level prioritization and packet labeling)	STD	Planned		ICAO	WG-I / MSG	Map ATN QoS to IPS DIFFSERV (should be defined as an end-to-end mechanism)	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)	Doc. 9880 Doc. 10044		Available Now				Doc 9880 is done, so think this is already available?	Doc. 9896: Mapping ATN apps to DSCP codes. Current doc is an example in GM, but should be technical provisions. Consistent QoS signaling in transit (i.e., DSCP may be modified in transit, so alternatives like including traffic type in the address). Capture QoS operation and assumptions in GM (e.g., DSCP values are used consistently at ingress and egress routers)	Profiles - RFCs MASPS: Apportionment of performance requirements (RCTP) for each traffic type. Address how traffic types get aggregated over subnetworks. Appendix in MASPS includes guidance on how to prioritize downlinks -- maybe some box-level material should move to 858. Address whether end-to-end network engineering is	Airborne IPS System level mechanisms (e.g., prioritization)	
		STD	In-Progress	5.4.1.1	AEEC	IPS	Detailed QoS mechanisms for segregating ATS and AOC traffic (part of ATN/IPS router form factor / architecture??)	ARINC 858	Dec-2020	Doc. 9880 Doc. 10044	4Q-2018	Available Now	EUROCAE/RTCA MASPS?	?	?	Doc 9880 is done, so think this is already available?				
	Compression APP = Application HDR = Header	STD	In-Progress		ICAO	WG-I	ATNPKT update to include compression provisions	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)	RC-IMS Proposal						Do we need to move all this to Doc. 9896, or would this stay in A858?	Doc. 9896: APP - Decision not to include compression in ATNPKT during joint meeting. HDR - Technical provision ("may" --> shall) with reference to IPS Profiles		APP: ACARS compression in adaptation function.	
		STD	In-Progress	5.4.1.1	AEEC	IPS	Standardization of proposed compression techniques	ARINC 858	Dec-2020							Assumes compression will be standardized at ICAO level		HDR: IPS Profiles	HDR: Reference IPS Profiles	
	RCTP (B2)	STD	Complete		EUROCAE + RTCA	WG-78 / SC-214	SPR	ED-228A / DO-350A ED-122 / DO-306	Mar-2016 Oct-2007				EUROCAE/RTCA MASPS		Available Now			MASPS: Performance requirements (RCTP, as it contributes to RCP)	Pointer to MASPS	
	RCTP (Beyond B2)	STD	*TBD/TBS*	NEW M06	ICAO	ODLWG	*RCP/RSP updates for beyond B2*	Doc. 9869	TBD									MASPS: Consider provisions for future (high-level)		
		STD	*TBD/TBS*	5.4.3	EUROCAE	WG-78	*SPR update for beyond-B2 services*	ED-TBD	TBD											
		STD	*TBD/TBS*	5.4.3	RTCA	SC-214	*SPR update for beyond-B2 services*	DO-TBD	TBD											
	Multi-link	STD	Planned		ICAO	WG-I / MSG	Multi-link technical provisions	Doc. 9896	Nov-2020 (Adv) 1Q-2022 (unEd)	SESAR PJ14.2.4			EUROCAE/RTCA MASPS?	?	?		Doc. 9896: Definition of "multilink" concept and requirements, including any elements that need to be signaled or made available from the subnetworks as necessary for interop.	MASPS: Performance requirements, and any requirements that must be met by the ground end system.	Describe detailed mechanisms for implementing the multilink concept. (How much is implementation specific?) Preference configuration.	
		STD	In-Progress	5.4.1.1	AEEC	IPS	Detailed definition of multi-link based on ICAO definition.	ARINC 858	Dec-2020	ICAO WG-I MSG	4Q-2019	Preliminary Info Available Now 1Q-2020 (after next MSG)	EUROCAE/RTCA MASPS?	?	?	The CMU standard would need to refer to the IPS router standard for the specification of the multilink functional specification, i.e., the CMU is one instance of an IPS router.				
	MASPS	GM	Planned		EUROCAE + RTCA	WG-108 / SC-223	IPS End-to-End guidance supporting certification (MASPS)	ED-TBD DO-TBD	Mar-2021							Work within current RCP info				
Form / Fit / Interfaces	CMU	STD	*GAP*	5.4.1.2.2	AEEC	DLK	*CMU specification updates to support IPS (e.g., including segregation, new interfaces, data logging, traffic shaping/filtering, etc.)*	ARINC 758	TBD	A858	TBD (future APIM, see comment)	End-2020	None			Although A758 is open, the current APIM 17-003 addresses Ethernet interface but does not include IPS; a future APIM will be necessary	None	Subnetwork-specific MASPS: May need updates to subnetwork-specific MASPS documents (e.g., VDLm2)	Provide guidance/examples, but physical interfaces are defined in other documents	
	IPS Router & Physical Interfaces	STD	In-Progress	5.4.1.1	AEEC	IPS	Specification for an IPS-specific router or router function (e.g., including segregation, new interfaces, etc.)	ARINC 858	Dec-2020	Doc. 9896 RTCA / EUROCAE Profiles	1Q-2019	2Q-2019				AEEC IPS should review A758 document as a reference for structure and content for current CMF				
Ground Systems	OSI/IPS and ACARS/IPS Gateway	GM	In-Progress	5.4.4	ICAO	WG-I	Technical definition of what needs to maintained between OSI and IPS in order to maintain application correlation. (Ground requirements RTCA/EUROCAE involvement?)	Doc. 9896 and/or ARINC 858 (see comment)	Nov-2020 (Adv) 1Q-2022 (unEd)							This could be the gateway definition level, and may be either in A858 or Doc 9896	Doc. 9896: Include cross-reference in GM	MASPS: Deployment options and guidance for deployment. MASPS: Performance considerations for the Gateway	Technical provisions, referenced back to MASPS for the deployment options. (May want to consider making an 858 attachment rather than appendix - discuss in AEEC IPS)	
		STD	In-Progress	5.4.1.1	AEEC	IPS	Definition of ACARS-IPS gateway function	ARINC 858	Dec-2020				ICAO WG-I	2Q-2019	2Q-2019					
		STD	Planned	5.4.4	EUROCAE + RTCA	WG-108 / SC-223	Ground system considerations for IPS end-to-end interoperability and performance as part of MASPS	ED-TBD DO-TBD	Mar-2021	AEEC IPS	2Q-2019	2Q-2019								
	IPS NW Topology	ANA	Planned		ICAO	WG-I	Discuss network topologies and proposals (e.g., DSP-centric solution)	Working papers					EUROCAE/RTCA MASPS?	?	?					
													AEEC IPS	2Q-2019	2Q-2019					
		GM	*GAP*	5.4.5	OTHER	Regional CAAs	*Regional implementation of IPS based on the ICAO standard*	TBD	TBD							A858 "guidance" since that's where the gateway will be?				