

**MINUTES OF THE TWENTY-SIXTH SC-223 PLENARY**  
**MEETING**  
**“Internet Protocol Suite (IPS) and AeroMACS”**

**DATE:** March 5-9, 2018

**TIME:** March 5-8, 2018 9:00 a.m. – 5:00 p.m.  
March 9, 2019 9:00 a.m. – 12:00 p.m.

**PLACE:** Hosted by Rockwell Collins, Inc at  
Hilton Melbourne Rialto Place  
200 Rialto Place  
Melbourne, FL, 32901

**CONTACT:** Rebecca Morrison, Program Director  
(202) 330-0654 or [rmorrison@rtca.org](mailto:rmorrison@rtca.org)

Attendees:

Name	Role	Affiliation	Note
Aloke Roy	Chairman	Honeywell International, Inc.	
Brent Phillips	DFO	Federal Aviation Administration	
Rebecca Morrison	Program Director	RTCA, Inc.	
Dongsong Zeng	Secretary	The MITRE Corporation	
Francois d’Humieres	Member	Frequentis	
Stephane Pelleschi	Member	Rockwell Collins, Inc.	
Kristen Mineck	Member	INMARSAT	
David Robinson	Member	Federal Aviation Administration	
Madhu Niraula	Member	Rockwell Collins, Inc.	
Antonio Correias	Member	Skymantics	Via WebEx
Philippe Sacre,	Member	EUROCONTROL	Via WebEx
Michael Vanguardia	Member	The Boeing Company	
Stephen Van Trees	Member	Federal Aviation Administration	Via WebEx
Vaughn Maiolla	Member	International Civil Aviation Organization	Via WebEx
Chris Wargo	Member	Mosaic ATM, Inc.	Via WebEx
Rafael Apaza	Member	NASA	Via WebEx
Ron Dlouhy	Guest	Rockwell Collins, Inc.	Via WebEx
Bruce Eckstein	Member	Firebird SE LLC	Via WebEx
Victor Flores Gomez	Member	EUROCONTROL	Via WebEx
Bernhard Haindl	Guest	Frequentis	Via WebEx
Jerry Hancock	Guest	Inmarsat	Via WebEx
Paul Mettus	Member	AirNav Solutions, LLC	Via WebEx

Peter Muraca	Member	Federal Aviation Administration	Via WebEx
Alistair Muro	Guest	IEEE	Via WebEx
Thomas Mustach	Member	Federal Aviation Administration	Via WebEx
Robert Segers	Member	Federal Aviation Administration	Via WebEx
Stephen Tamelet	Member	Airbus	Via WebEx
Giulio Vivaldi	Guest	Leonard Company	Via WebEx

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In accordance with the Federal Advisory Committee Act, Brent Phillips, Federal Aviation Administration (FAA), was the Designated Federal Official for this meeting.

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### AGENDA

1. Welcome, Introductions, Administrative Remarks
2. Review of previous meeting notes and action items
3. Review of Current State of Industry Standards
  - a. ICAO WG-I
  - b. AEEC IPS Sub Committee
  - c. EUROCAE WG status
4. Current State of Industry Activities
  - a. SESAR Program
  - b. ESA IRIS IOC
  - c. Any Other Activities
5. IPS Technical Discussions
  - a. Review of IPS high-level profile (working papers)
  - b. Review of IPS RFC detail Profiles
  - c. Prioritization of additional IETF RFCs for Profiling
6. Discussion of potential joint work with EUROCAE WG-108
  - a. RTCA SC-223 Technical Approach for the IPS Profiles
  - b. EUROCAE WG-108 plans and deliverables
  - c. Scope, Intent & Expected Use of the Certification Guidance Document
  - d. RTCA SC-223 intended scope of the IPS MOPS
  - e. EUROCAE WG-108 comments on draft IPS Profiles
  - f. Schedule & approach for harmonized Profiles document
  - g. Joint work plan and action items
7. Any Other Topics of Interest
  - a. ISRA
  - b. FAA paper on IPS implementation
8. Plans for Next Meetings
9. Review of Action Items and Meeting Summary
10. Adjourn when plenary business is complete

#### **Agenda Items 1. Welcome, Introductions, Administrative Remarks**

Aloke Roy, Honeywell, welcomed the participants and reviewed the agenda.

In accordance with RTCA policy, Brent Phillips, the designated FAA representative, opened the meeting by reading the following text: “In accordance with the Federal Advisory Committee Act, this Advisory Committee meeting is OPEN TO THE PUBLIC. Notice of the meeting was published in the Federal Register on January 28, 2018. Attendance is open to the interested public. With the approval of the Chairman, members of public may present oral or written statements at the meeting. Persons wishing to present or obtain information should coordinate with RTCA Program Director – Rebecca Morrison and the Chair – Aloke Roy”

Rebecca Morrison presented the RTCA Proprietary References Policy and Membership Policy.

### **Agenda Item 2. Review of previous meeting notes and action items**

The working group reviewed and approved the of SC-223 P25 meeting minutes without changes, and updated the status of previous action items.

### **Agenda Item 3. Review of Current State of Industry Standards**

#### **3a. ICAO WG-I**

Aloke Roy updated the group on the ICAO WG-I/25 meeting, Bangkok, Thailand, November 13-17, 2017.

For IPS security, three ICAO documents, i.e., Doc10090 Manual of Security for aeronautical communications, Doc10094 Manual of the Aeronautical Telecommunication Network (ATN) Secure Dialogue Service, and Doc10095 Manual of Public Key Infrastructure (PKI) Policy for Aeronautical Communications, are planned to be completed by November 2018.

For IPS global mobility, there exist three candidate solutions, i.e., AERO, LISP and Mobile IPv6. The Mobility group developed a set of criteria to select the best global mobility solution.

#### **3b. AEEC IPS Sub Committee**

The AEEC IPS Sub Committee plans to develop AEEC IPS standards in two steps:

Step 1: 18-month planning activity with five 2-day meetings, potentially involving ICAO, RTCA, EUROCAE, etc. (2015 to 2017, deliverable ARINC 658); and

Step 2: Standards writing (2017 to 2019, deliverable ARINC 858).

The ARINC Project Paper 658: Internet Protocol Suite (IPS) for Aeronautical Safety Services – Roadmap Document was approved for publication in 2017. The AEEC IPS Sub Committee is working on ARINC 858 development.

#### **3c. EUROCAE Working Group**

Stephane Pelleschi, Rockwell Collins, Chair of WG-108, provided an update on the WG-108 status. The EUROCAE TAC tasked WG-108, in WG-108 Terms of Reference (TOR), to prepare a guidance document to ensure that the ATN/IPS deployment satisfies the IPS safety, security and performance needs. A new certification framework may be needed to assure IPS end-to-end interoperability. WG-108 is willing to cooperate with SC-223 on the IPS profile development.

### **Agenda Item 4. Current State of Industry Activities**

**4a. SESAR Programs**

Francois d'Humieres, Frequentis, provided an update on SESAR2020 P14.2.4 (FCI) initial concept study. Voice over IPS capability is still in discussion, due to its lack of compelling use cases. Nevertheless, it is part of FCI requirements and considered along with the other types of data, similarly to the approach followed by RTCA. Multilink and Mobility are also addressed in the initial concept study.

**4b. ESA IRIS IOC**

Kristen Mineck, Inmarsat, provided an Iris IOC Overview. The Iris program consists of Precursor (roughly 2016-2018), IOC (Initial Operational Capabilities, roughly 2018-2020) and FOC (Final Operational Capabilities, roughly 2020-2025) phases. The Precursor phase performed technical validation of Iris technology on ground/airborne test infrastructure. The IOC phase takes Precursor activities forward into certification and operational service deployment. The FOC phase expands the IOC capabilities to include final operational capabilities.

Operations to be supported by **IOC**:

- Safety related data communications in support of short and mid-term ATM in UK, Europe and Oceanic regions;
- Continental ATM Initial Trajectory Based operation in line with SESAR's 4D Operational Concept improving safety and efficiency of flight;
- Commercial services such as Airline Operational Communications improving efficiency and punctuality;
- Aircraft surveillance, including position and intent Information collected through Data Communications;
- Controller Pilot Data Link Communications;
- Oceanic ATM long range communications which require beyond line of sight.

Operations to be supported by **FOC**:

- All the Iris with IOC enabled operations (backwards compatibility)
- Safety related data communications in support of long term ATM in UK, Europe and Oceanic regions;
- Continental ATM Full Trajectory Based operation in line with SESAR's 4D Operational Concept improving safety and efficiency of flight;
- New commercial services (to be defined during programme execution)
- Operations with Remotely Piloted Aircraft System (RPAS), Helicopters and military transport;
- Emerging new domains such as polar communications;
- Operations in geographical locations that are out of coverage or have not been equipped with Terrestrial based communications infrastructure.

**4c. Any Other Activities**

No other activities were reported.

**Agenda Item 5. IPS Technical Discussions****5a. Review of IPS high-level profile**

The group discussed and resolved the review comments received from WG-108 on the IPS high-level profile. The WG-108 comments and corresponding SC-223 resolutions are contained in Table 1.

Table 1. WG-108 Comments on IPS Profile and Corresponding SC-223 Resolutions

No.	Company	Section	WG-108 Comment Description	SC-223 Resolution
1		Figure 2.1-1	This figure, in line with ICAO general diagram, shows that the OSI-IPS convergence is done between the end-systems whereas it may be different in the case of the accommodation on the ground side. Indeed, the inter-domain router could also manage the accommodation. In addition, avionics or ground systems can also operate as pure OSI systems.	Change "OSI/IPS convergence" to "ATN PKT adaptation", add another box to support native IP. Stephane and Madhu will draft a new diagram.
2		Figure 2.1-2	Is TCP recommended or optional?	Change recommended to optional. On page 17, TCP is optional on the air side and mandatory on the ground side.
3		§2.3.1.2	Is DNS confirmed by ICAO?	DNS is still under consideration and has not been finalized by any group.
4		§2.4	VoIP is not part of the AEEC IPS baseline. Discussion to harmonize between groups on this topic needed?	Add a VoIP clarification that VoIP is only treated as data flow over IPS, no additional design considerations are provided in this profile.
5		Figure 2.4-1	UAS ATS link managed on ground? Seems not to be in line with WG-105 feedback during the WG-108 kick-off meeting	Subject to SC-228 and WG-105 decision.
6		§3.3.1	Is SCTP needed even for ADS-C? if yes, this should be mandatory otherwise we could remove it	No need for SCTP.
7		p19	1981: Why is it kept as optional if the note explains that it should not be needed?	Air side is not required.
8		p20	If 5225 supersedes the definition of 5795, why do we keep 5795	5795 is a framework
9		p21	RFC 3843/4362: why not mandatory if we want to go that path?	Need further analysis on the benefits of requiring these RFCs. Identify benefits to justify mandatory requirements.
10		§3.3.3 p24	8. the "IPS system"	Editorial
11		§3.3.3 p25	Regarding Multicast Listener, does the "O" means that this is not fully decided yet and could become a "Y" or a "N" in a future version?	Same resolution as in Row 2.
12		p33	DNS servers replication: is this the scope of this document?	Replication requirement will be removed
13		§3.3.10.1 to §3.3.10.4	Is it part of the scope for profiles? This does not drive any interop behaviors between IPS systems	SNMP will not be required. High-level requirements will likely to move to SARPS.
14	FRQ	chapter 2.3	Why is here only DNS mentioned?	See resolutions of other DNS comments.
15	FRQ	Table 1.5.3	The devices classes shall be discussed. In the FCI architecture used by Sesar the A/G router is the interface between the IPS Ground Internetwork and the different A/G access networks and the access router is the router interfacing with the ground radios	In the context of IPS profile, the routing relationship is between airborne router and air/ground router.

16	FRQ	Figure 2.1.2	The IPS context diagram should be discussed.	See resolutions of Figure 2-1.2 above.
17	FRQ	2.3.1.2.1	Please justify why the DNS service has to support name resolution for mobile systems.	See resolutions of other DNS comments.
18	FRQ	chapter 3.3.1	Shall the reliable UDP be only used over bandwidth limited A/G channels. What is meant with reliable UDP? The DS over UDP used to make the communication reliable for the application?	A: No. B: Please see Doc9896 for reliable UDP. C: Yes, it is intended to make communication reliable.
19	FRQ	Table 3.3.1-1	Why is UDP mandatory for the routers? Please have a look at Figure 2.1.1	Add a note in the table to indicate that UDP is needed to support some of the routing, management and security functions in the router.
20	FRQ	Table 3.3.2-2	The mapping of ATN applications to DSCP values should be discussed.	This table is aligned with Doc 9896, 10044, and WG-82.
21	FRQ	Table 3.3.2-2	Is EF required in the aircraft?	Yes.
22	FRQ	Table 3.3.2-2	What does ROHC means for the multlink concept in terms of handover performance.	ROHC is needed for communication efficiency and may be independent of multilink.
23	FRQ	Table 3.3.2-2 / RFC 2998	Is this RFC really needed in the aircraft	Yes, to support end-to-end QoS signaling. Implementation details of the scheduler is out of the scope.
24	FRQ	chapter 3.3.3 / 2	Why do we need a stand-alone routing domain in the aircraft	Aircraft is a stand-alone domain, separate from air/ground domain.
25	FRQ	chapter 3.3.3 / 6	The following statement: "the IPS router shall update its routing information base using reachability data received from its neighboring routers and hosts" should be extended with radio devices.	Please clarify.
26	FRQ	chapter 3.3.3 / 8	Please explain what is meant with "The IPS shall provide capability to discover its neighbors."	High-level requirement.
27	FRQ	Table 3.3.3-1	Why is RFC 4861 (Neighbor Discovery) needed on the Air Router and why is it not needed on the Ground Host?	Only RS and RA messages are supported over air/ground. It is required for Ground host.
28	FRQ	Table 3.3.3-1 page 25	All the multicast RFCs are optional. Does this mean that there is no need for Multicast support? Is this in line with the discussion in the ICAO mobility SG?	Multicast is optional because there is no high priority use case in the near term and it is very difficult to specify considering security and dynamic aircraft situations. It is expected to be covered in the future standards update.
29	FRQ	Table 3.3.3-1 page 25	Why is the Ipv6 Router Advertisement Flags Option (RFC 5175) required in the aircraft?	This is an expedited mechanism to signal link preference. Additional extension of RA flag option is desired for quick network convergence.
30	FRQ	chapter 3.3.4	The functionality that the same IPv6 unicast address shall be assigned to multiple interfaces of different subnetworks shall be discussed	This is standard IPv6 capability, therefore, it is continually required for IP mobility.
31	FRQ	chapter 3.3.4 / page 27	Is the described address format compliant to the address format defined in ICAO 9896.	Yes, but subject to INNOVA task force resolution.

32	FRQ	chapter 3.3.4 / page 28	Is the IEEE EUI-64 guideline required for interfaces in the aircraft and / or on ground?	Recommended but need a common mechanism for the lower 64-bit configuration.
33	FRQ	chapter 3.3.4.4/3	Why is IEEE EUI-64 rules are required?	This is recommended.
34	FRQ	Table 3.3.4-1/page 31	Why is the IPV6 Stateless Address Autoconfiguration required for the aircraft. Isn't that a static address configuration.	SLAAC is needed to configure interface address specific to access network reached by that interface.
35	FRQ	Table 3.3.5-1/page 34	The LISP functionality is not required at the Ground Host and also not on the A/G router. Note that the architecture used in SESAR is different than the one used here and therefore the A/G route is defined differently. (see comment 15)	Wait for MSG resolution in May
36	FRQ	Table 3.3.7-1/page 42	Why is RFC 4941 required in the aircraft?	See resolution in row 35
37	FRQ	page 77	Why is RFC3246 (EF) required at the air router?	See resolution in row 30
38	AIRBUS	§ 2.3.1.2	DNS should not be made mandatory in a minimum profile for the Airborne systems. The current Airborne D/B could continue to be used, at least while it is considered that it will be more cost effective than certifying an Airborne DNS application coupled with an Airborne Database of ground DNS servers addresses.	Still being worked. From Airbus and DSN perspective, DNS is not urgent in the near future.
39	AIRBUS	§3.3.2	Not sure DiffServ complex scheduler should be made mandatory for Airborne routers. Current Airborne routers are handling very few infrequent messages (typically less than one per minute) and the need of a complex scheduler can therefore be challenged, especially while Voice over ATN/IPS is not implemented	Signaling of QoS of DiffServ is required
40	AIRBUS	§3.3.3	The Airborne router profile should be "subject to ICAO WG-I Mobility subgroup"	Being coordinated with WG-I and MSG.
41	AIRBUS	§3.3.10.5	SNMPv3 should not be mandatory on Airborne systems side, because specific BITE protocol are generally used for onboard systems management, and also because use of SNMP over the A/G link must be precluded over the A/G link for security reason.	On the air side, the SNMP should be optional.
42	ALTYS	§2.3.1.2	Air router could be challenged to maintain a local DNS cache with sufficient size / expiry period (TTL) to avoid DNS update during flight and to privilege DNS update on ground? Any recommendation on the DNS size and TTL?	Resolved above for DNS comment
43	ALTYS	§3.3.1	The SCTP protocol supports multihoming, is there any impact/simplification on the mobility protocol choice if this feature is used?	SCTP requirement is removed. No plan to support SCTP.
44	ALTYS	Table 3.3.2	when used for A/G and Air routers, is there any required modification or adaptation for the ICMPv6 to optimize the A/G ground bandwidth usage? e.g. for Router Solicitation / Advertisement messages, use a high RA retransmission timer? etc.	RS and RA are only used at startup as well as to notify connectivity status changes. Other ICMP messages are not sent over A/G subnetwork. The timer and performance specification will be

				addressed during MOPS development.
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Note: The yellow highlighted items may need further discussion in the next meeting.

**Decision 3:** TCP is optional on the air side and mandatory on the ground side.

**Action Item P26-5:** Stephane Pelleschi to initiate IETF coordination.

**Action Item P26-6:** Madhu Niraula and Michael Vangardia to update Figure 2.1-2 in the IPS profile and create a new IPS data flow diagram.

**Action Item P26-7:** Stephane Pelleschi to review the functional profile and identify which ground options should be changed to mandatory

**Action Item P26-10:** Alope Roy to provide an architecture diagram/s with focus on expanding the architecture to include mobility, transition, access subnetworks

## 5b. Review of IPS RFC detail Profiles

### IPS Security

Robert Segers, FAA, provided a draft IPS security requirements document. The group reviewed and modified the requirements. The results are contained in SC-223 security requirements\_P26.docx file.

**Decision 1:** The IPS security requirements proposal from Rob Segers has been reviewed and approved to be baselined by the group subject to resolution of end-to-end integrity requirement.

**Action Item P26-1:** Madhu Niraula to resolve the end-to-end security requirement issue.

**Action Item P26-2:** Alope Roy and Dongsong Zeng to coordinate the SC-223 approved IPS security requirements with AEEC IPS subcommittee and ICAO WG-I.

### Domain Name System (DNS) and Simple Name Lookup

Madhu Niraula, Rockwell Collins, presented slides on simple name lookup proposal.

**Action Item P26-9:** Madhu Niraula to provide a writeup describing simple name lookup for incorporation into the Profile.

Rafael Apaza, NASA, provided a draft detailed profile of RFC1035 Domain Names Implementation and Specification. The group reviewed the detailed profile of RFC1035.

**Decision 5:** Name lookup is needed because ATS is not the only application that IPS will support, other applications such as SWIM, AOC, weather services, need a general name lookup service. The solution, data base vs simple lookup, has not been finalized yet.

**Action Item P26-11:** Rafael Apaza to change all mandatory requirements to conditional requirements depending on DNS support (IO-DNS). Also re-assess air requirements because DNS is not supported over A/G.

**Action Item P26-12:** Rafael Apaza to add an introduction to define the scope of RFC 1035.



**Action Item P26-14:** Michael Vangardia to look into the database-driven name lookup option.

The detailed profiles of DNS security-related RFCs 4033, 4034 and 4035, provided by Robert Segers, were reviewed and approved by the group to be incorporated into the IPS Profile.

**Decision 4:** Approved incorporation the detail profiles of RFC4033, 4034, and 4035 into the Profile.

**Action Item P26-4:** Robert Segers to investigate RFC 4035 Section 3.1.5 about the security concerns over zone transfer.

### **5c. Prioritization of additional IETF RFCs for Profiling**

The group discussed the VDL2 subnetwork security enhancement proposal from Madhu Niraula, Rockwell Collins. This proposal involves several IPsec RFCs. Whether to put these RFCs in the IPS standard or in the VDL2 standard need further thoughts and discussion.

**Action Item P26-15:** Kristen Mineck to provide a list of IPsec RFCs implemented for Iris precursor

## **Agenda Item 6. Discussion of potential joint work with EUROCAE WG-108**

### **6a. RTCA SC-223 Technical Approach for the IPS Profiles**

Aloke Roy, Honeywell, presented slides titled “SC-223 Scope and Technical Approach.”, in which SC-223 has two tasks: (1) Develop IPS profiles, and (2) develop IPS MOPS.

The planned completion date of IPS Profiles was December 2017. However, to support the late start of EUROCAE WG-108, the completion date remains flexible, with the goal to finalize IPS Profiles jointly with WG-108 by mid-2018.

FAA requires IPS MOPS to be completed by December 2019. The intent of the MOPS is to provide tools to (1) facilitate certification of airborne IPS implementations suitable for safety services while reducing the certification costs for vendors and OEMs, and (2) to validate performance of airborne IPS systems uniformly and equitably regardless of aircraft architectures.

At the macro level, the cost of TSO/AC of avionics is lower than that of TC/STC across all platforms.

### **6b. EUROCAE WG-108 plans and deliverables**

According to the current WG-108 TOR (December 22, 2017), WG-108 plans to develop a guidance document that will be used as a reference for certification authorities by 2020. The guidance document will address IPS performance, transition, Quality of Service (reliability and availability), security, responsibilities and accountabilities of IPS stakeholders.

Meanwhile, WG-108 is also willing to develop and publish the IPS Profiles jointly with SC-223. As this IPS Profiling is not currently in WG-108 TOR, WG-108 plans to expand its TOR to include IPS Profiling in the next EUROCAE TAC meeting.

### **6c. Scope, Intent & Expected Use of the Certification Guidance Document**

The group discussed the scope, intent and expected use of the certification guidance document. During the discussion, a question whether ground equipment certification is need or not was raised. To answer this question, coordination with regulators, e.g., FAA and EASA, is necessary.

**Action Item P26-3:** Aloke Roy, Stephane Pelleschi, and Dave Robinson to work with regulators to investigate the potential IPS certification criteria.

**6d. RTCA SC-223 intended scope of the IPS MOPS**

The initial SC-223 intended scope of IPS MOPS include but not limited to:

- Define specific functional boundaries and interfaces for each device class per Profiles.
- Devices classes are functional blocks regardless of allocation of these functional blocks to specific LRUs – so it does not constrain aircraft implementation architecture.
- Allocate performance & security requirements to each of the device classes (defined by functional Profiles).
- Define standard test procedures to validate performance by device class, regardless of implementation architecture.
- As IPS is based on commercial Internet Standards, protocol functional compliance can be verified by commercially available tools. As such, MOPS will not specify functional test procedures (unless IPS defines aviation-specific, custom requirements).

**6e. EUROCAE WG-108 comments on draft IPS Profiles**

See Agenda Item 5c.

**6f. Schedule & approach for harmonized Profiles document**

**Action Item P26-8:** Robert Segers to take to the INNOVA the CONOPs and frame work of naming convention and ground DNS server responsibility, then provide requirements to SC-223/WG-108.

**6g. Joint work plan and action items**

The group listed and compared the objectives of SC-223 IPS MOPS and WG-108 Guidance document as shown in Table 2, and found that there exists significant commonality between the two documents. The two committees working jointly will benefit the development of both documents.

Table 2. Comparison of Objectives of SC-223 IPS MOPS and WG-108 Guidance Document

<b>Objective Number</b>	<b>SC-223 IPS MOPS</b>	<b>WG-108 Guidance Document</b>
1	The tools to enable FAA to certify airborne IPS implementations	Yes
2	Enable TSO/AC of avionics at lower certification cost	TBD - continuous operational safety
3	Allocate security requirements (CAI)	Yes
4	Allocate performance requirements (QoS, availability, reliability)	Yes
5	Establish a well-defined process for security	Yes
6	Do not reinvent wheels	Yes
7	Out of scope	Assure end-to-end interoperability (MASPS like)
8	Out of scope	Transition (application and network, MASPS-like)

9	Out of scope	European addressing scheme
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**Action Item P26-13:** Stephane Pelleschi to draft an initial 2-year meeting schedule.

**Action Item P26-16:** Alope Roy to initiate a strawman outline of the MOPS document.

### **Agenda Item 7. Any Other Topics of Interest**

#### **7a. ISRA between SC-228 and SC-223**

SC-228 Phase 2 activities are focused on expanding C2 radio-line-of-sight operation to include beyond-radio-line-of-sight (BRLoS) applications over both Satellite Communication (SATCOM) architectures and terrestrial communication subnetwork. Internet Protocol Suite (IPS) Command and Control (C2) Data Link Profile and MOPS requirements are needed for UAS C2 BLOS applications.

SC-228 is developing CONOPS and preliminary safety/security assessment such that the functional and performance requirements for UAS network applications and network systems can be determined.

SC-223 requests participation of SC-228 members in the development of UAS-related IPS CONOPS, use cases, and requirements, that will be included in the IPS Profiles.

**Decision 2:** The draft ISRA from SC-228 has been reviewed and agreed upon by the group.

#### **7b. FAA position paper on IPS implementation**

Brent Phillips, FAA, presented a position paper titled “Update on the Planned Timeline for U.S. Implementation and Operational Use of IPS to Support Aeronautical Operations in the NAS.”

The Federal Aviation Administration (FAA) would like to reaffirm its commitment to the use of the Internet Protocol Suite (IPS) as the network of choice to support the National Airspace System’s future communication needs. Recent discussions in public forums have introduced uncertainty with some in the aviation community about the IPS direction and timeline the FAA intends to pursue. As any perceived uncertainty has the potential to negatively impact the continued progress towards a more modern, cost-effective, secure, efficient and robust network protocol, it is important to reemphasize FAA’s commitment to IPS.

The current roadmap, as shown in Figure 1, created as part of the Joint US/European Communication Harmonization Strategy document identifies the beginning of the implementation of IPS based Ground Infrastructure and Aircraft Avionics in the US beginning in the 2024 timeframe. For the US, this is necessarily prior to the US Data Comm Program Segment 2, as it allows for the gradual introduction of air and ground assets with the advantage of allowing the start of transition with existing ATS technologies (FANS-1/A applications) to ATN/ IPS prior to introducing the planned new application technologies (B2) for Segment 2. The Strategy Document Roadmap identifies 2028 as the point which there will be a sufficient number of ATN/IPS equipped aircraft to begin to recognize full operational benefits and thus the earliest date which IPS Operations will be in the U.S. Finally, it should also be noted that IPS is the agreed-upon harmonization goal for the US and Europe.

Industry and the FAA support this schedule for the introduction of ATN/IPS, as evidenced by the multiple standards development activities that have recently started in AEEC and RTCA specifically for IPS.

Additionally, ICAO is in the process of updating its ATN/IPS-related standards in order to account for the latest developments and inputs in coordination with AEEC and RTCA. There are also multiple activities, funded by the FAA and SJU as well as from various industry members' internal research and development projects, that are investigating the implementation of ATN/IPS on the air, ground and RF/space segments. These efforts underscore the importance of moving to IPS technology within industry, and also recognize the long lead time of standards and systems development required to be ready for the dates identified in ATN/IPS roadmaps.

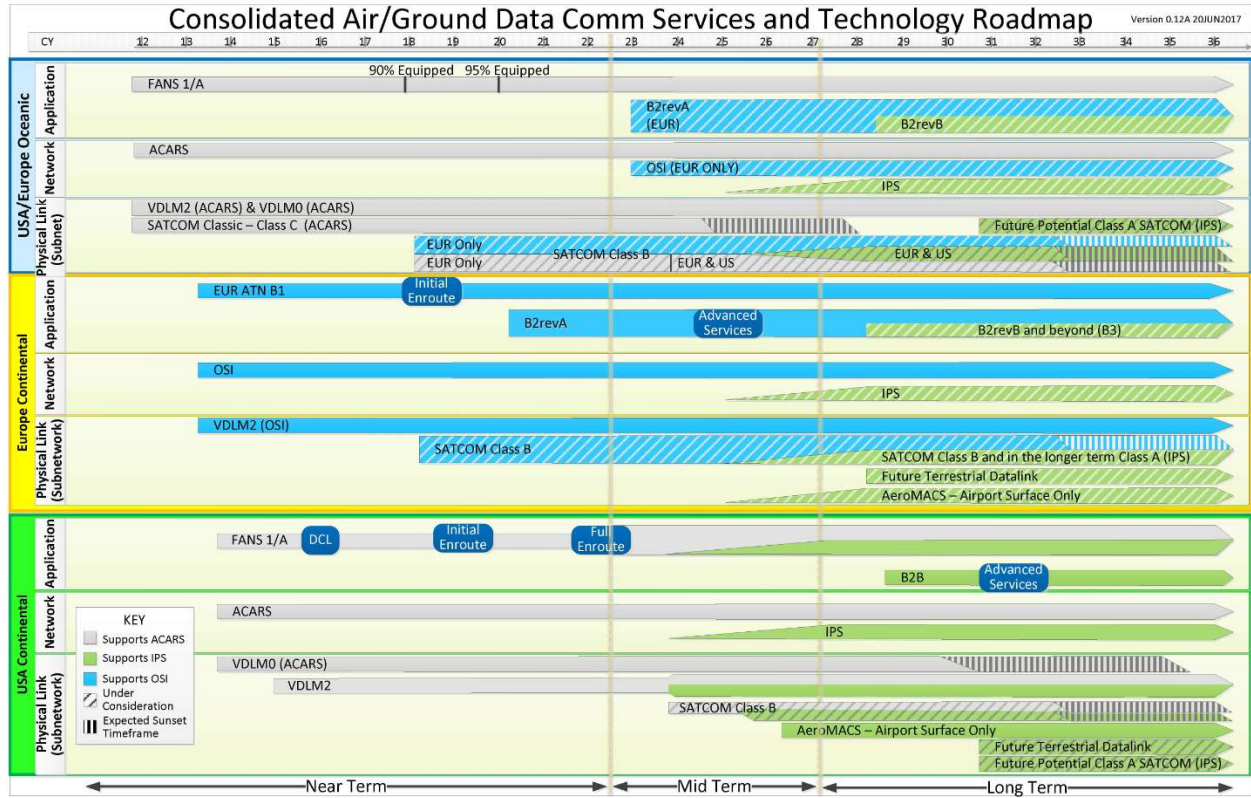


Figure 1 US and EU Coordinated Air/Ground Data Comm Services and Technology Roadmap

**Agenda Item 8. Plans for Next Meetings**

**Decision 6:** Future meetings:

- Monthly joint telecons
- Joint SC-223/WG-108 P27 meeting, June 4-8, 2018, EUROCAE, in Paris
- SC-223 SG meeting, August 13 – 17, 2018, Inmarsat, Washington, D.C.
- Joint P28 meeting (Profile FRAC Release), September 24 - 28, 2018, RTCA

**Agenda Item 9. Review of Action Items and Meeting Summary**

Dongsong Zeng, MITRE, presented the out-briefing (SC-223 IPS Meeting OutBriefing\_March\_2018.pptx) which summarizes all the decisions and action items that were made during this meeting. The work group reviewed and agreed on the out-briefing.

**Agenda Item 10. Adjourn**

The meeting adjourned around 11:30 AM, Friday, March 9, 2017.

**List of Action Items**

<b>Action Item #</b>	<b>Action Content</b>	<b>Responsible</b>	<b>Due Date</b>	<b>Status</b>
P18-1	Add ARINC658, DO-350a, DO-351a, DO-352a, and DO-353a to the initial documents in TOR	Aloke Roy	August 17, 2016	Closed - 11/2016 8/2016 - Draft done, need to present to next PMC
P18-2	Inform us about SESAR IPS related projects	Antonio Correas	August 17, 2016	Closed - 11/2016
P18-3	Check with FAA about GA participation in IPS data communication and FAA data communication safety and security assessment and requirements	Brent Phillips	August 17, 2016	Open 8/2016 - AeroMACS security was just completed, IPS security will leverage that later. 2/2017 – Keep open 5/2/2017 – Keep open, SC-216 draft document says single layer security may be adequate. 8/21/2017 – Keep open. 10/23/2017 – Closed. IPS can be used by GA if it provides business benefits, same as air transport aircraft.
P18-4	Provide communication related system level safety analyses	Bruce Eckstein	August 17, 2016	Closed 8/2016 - Reference to DO-350a for operational safety analysis will satisfy the intent of this action item. SSA-lite was a limited report, not to be used as system safety analysis.
P18-5	Conduct the safety analysis (IPS use for safety and regularity of flight domain) for IPS and provide the Design Assurance Level (DAL) for IPS	David Robinson, Brent Phillips, FAA	August 17, 2016	Open 8/2016 - Start with safety assessment, then decide DAL. 2/2017 – Open. 5/2/2017 – Not aircraft certification office responsibility, David to check with UAS. 8/21/2017 – keep open. 10/23/2017 – Keep open. Data Comm Seg 2 requires security provisions. UAS C2 will require security (mutual authentication and integrity are required, encryption is optional). See action item P24-4 12/4/17 – Closed. Refer to RPAS (SC-228) safety assessment and network availability requirement to derive the IPS safety requirements because RPAS C2 would be the most stringent use case for IPS. SC-228 will

				provide safety/security inputs in the next SC-223 March meeting.
P18-6	Inform ICAO WG-I about ICAO Doc9896 Section 2.2 Link Layer Requirements, in which interface requirements should not be local issues	Aloke Roy	Next WG-I meeting in May 2016	Open 8/2016 - Will be presented at December meeting 2/2017 - Closed
P18-7	Generate a work sheet of RFC list	Dongsong Zeng	August 17, 2016	Closed - 8/2016
P18-8	Check with SC-206 for the needs of IP services like FTP, Telnet, SNMP, etc.	Aloke Roy	August 17, 2016	Open 8/2016 - Will start a new ISRA with SC-206 2/2017 – the formal ISRA should be developed by SC-206 if this is needed. 5/2/2017 – CLOSED. Checked with A/G SWIM, no IP service needs.
P18-9	Check whether RFC 2488 Enhancing TCP over Satellite Channels is needed by IPS	Danny Bharj and David Robinson	August 17, 2016	Open 2/2017 - Inmarsat is looking at the draft from David. Boeing is proposing an updated UDP to ICAO WG-I. 5/2/2017 - CLOSED
P18-10	Continue coordinating with EUROCAE about global harmonization and EUROCAE participation in IPS standardization	Aloke Roy and Brent Phillips	August 17, 2016	Open 8/2016 - On going 11/2016 - On going 2/2017 – EUROCAE is waiting for AEEC IPS roadmap completed. 5/2/2017 – CLOSED. AEEC road will not complete until Oct 2017, we decided to proceed with SC-223 plan.
P18-11	Bring the TOR schedule modification request to next PMC for approval	Aloke Roy	Next PMC meeting in June 2016	Closed – 11/2016 8/2016 – Will present to September meeting
P18-12	Reach out to NIST for the latest version of USGv6 on the profile for IPv6 in US Government	Brent Phillips	August 17, 2016	Open 8/2016 - On going 2/2017 – Closed.
P18-13	Identify any other profiles that can be shared in the group	All SC-223 members	August 17, 2016	Open 11/2016 - On going 2/2017 – Closed. Company profiles are not releasable.
P18-14	Draft a working paper for ICAO WG-I on the scope and function of IPS based on USGv6_v1 structure	Aloke Roy	August 17, 2016	Open 8/2016 - next WG-I meeting in December 2/2017 – Closed.
P18-15	Coordinate with SC-222 about SATCOM providers' participation	Aloke Roy and David Robinson	August 17, 2016	Closed 8/2016 - Ann Heinke will participate SC-223
P18-16	Members are invited to develop profiles for RFCs that are within the scope and bring to the next meeting as a strawman proposal	All SC-223 members	August 17, 2016	Closed - 8/2016
P18-17	Develop initial draft profile for RFC 768 User Datagram Protocol, August 1980	Dongsong Zeng	August 17, 2016	Closed - 8/2016

P18-18	Develop initial draft profile for RFC 791 Internet Protocol	Paul Mettus and Alope Roy	August 17, 2016	Closed - 8/2016
P18-19	Develop initial draft profile for RFC 793 Transmission Control Protocol (TCP), September 1981	Bruce Eckstein and Antonio Correias	August 17, 2016	Closed - 8/2016
P19-1	Review the draft RFC profiles and provide comments before next meeting	All members	November 8, 2016	11/2016 - On going 2/2017 – on going 5/2/2017 – CLOSED.
P19-2	Identify IPv6 functions and corresponding RFCs, on the basis of the Appendix C: Requirements Summary Table in the file <code>disr_ipv6_profile_version_6_july_2011.pdf</code> , with consideration of NIST USGv6_v1 document and RFC6434. Task group reports findings from DoD IPv6 Profile at the next telecon.	Paul Mettus, Antonio Correias, Madhu Niraula, and Dongsong Zeng	November 8, 2016	Closed – 11/2016
P19-3	Restructure the workspace to set up working folder and final folder	Dongsong Zeng and Rebecca Morrison	November 8, 2016	Closed – 11/2016
P19-4	Explore FTI documents on IPv6 profiles and test procedures	FAA, David Robinson and Brent Phillips	November 8, 2016	On going 2/2017 – David is working on the NDA with FTI. On-going. 5/2/2017 – on going. 8/21/2017 – new FTI manager selected. Brent reached out to Andy. Material received, working on approval to release. Keep open. 10/23/2017 – Closed.
P19-5	From SC-223 perspective, there is no need to develop ISRA with SC-222. SC-223 TOR requires definition of the subnet user interface and generic subnetwork performance requirements. It is not the responsibility of SC-223 to allocate RCTP to each specific subnetwork.	Alope Roy	November 8, 2016	Closed – 11/2016
P20-1	Investigate Cisco RFC implementation for IP over SATCOM	Rafael Apaza and David Robinson	Feb 28, 2017	2/2017 – on going. 5/2/2017 – Nothing special identified in current SATCOM trials. Ongoing. 8/21/2017 – keep open 10/23/2017 – Closed. IPS will define a standard interface.
P20-2	Check with FAA infrastructure people about how to use A/G capabilities of IPS. Would FAA use the IPS Profiles in the infrastructure procurement?	Alope Roy and Brent Phillips (Andy Isaksen)	Feb 28, 2017	2/2017 – Open 5/2/2017 – Keep open. Would FTI 2 refer to IPS Profiles? 8/21/2017 – keep open 10/23/2017 – Closed. They can use the same IPS profiles if necessary, additional RFCs can be specified for G/G.
P20-3	Draft initial high-level diagram of a generic network architecture for IPS	Madhu Niraula	Feb 28, 2017	2/2017 – Closed.

				Feb 28 review, and will be available on the workspace.
P20-4	Add notes to elaborate the required RFCs	Tiger team	Feb 28, 2017	2/2017 – Closed.
P20-5	Expand the high-level profile for IPS	Tiger Team	Feb 28, 2017	2/2017 – Closed.
P20-6	Present the updated TOR to PMC	Brent Phillips	Feb 28, 2017	2/2017 – Closed.
P20-7	Present a working paper to WG-I with RFC recommendations and profile for RFC2460 and RFC2474	Aloke Roy and Dongsong Zeng	Feb 28, 2017	2/2017 – Closed.
P20-8	Present Gap analysis comments to AEEC IPS	Brent Phillips and Dongsong Zeng	Feb 28, 2017	2/2017 – Closed.
P20-9	Develop use case based on existing vulnerability analysis for FTI and AeroMACS	David Robinson	Feb 28, 2017	2/2017 – On going. 5/2/2017 – keep open. 8/21/2017 – keep open. 10/23/2017 – Closed. See action item P24-4.
P21-1	Add RFC 7296, 7427, 7670 1034, 1035, 1123, 2181 to high-level profile.	Dongsong Zeng	May 2, 2018	5/2/2017 – CLOSED
P21-2	Draft detail profiles for RFC 2460, 5795, 6846, 5225, 3095, and 4815.	Paul Mettus	May 2, 2018	5/2/2017 – Keep open 8/21/2017 – in progress 10/23/2017 - Keep open 12/4/17 – Keep open 3/5/18 – Keep open
P21-3	Draft detail profiles for RFC 4443, and 4861.	Madhu Niraula	May 2, 2018	5/2/2017 – CLOSED.
P21-4	Draft detail profiles for RFC 4862, 4429, 4291, 2474, 2475, 2597, and 3246.	Aloke Roy	May 2, 2018	5/2/2017 – keep open 8/21/2017 – In progress. 10/23/2017 – In progress 12/4/17 – Keep open 3/5/18 – Keep open until Aloke put them on the workspace
P21-5	Refine detail profiles for RFC 2464, 5175, and 768.	Dongsong Zeng	May 2, 2018	5/2/2017 – CLOSED.
P21-6	RFC 3411, 3412, 3413 (SNMP low priority) to be assigned.	All members	May 2, 2018	5/2/2017 – keep open 8/21/2017 – keep open 10/23/2017 – In progress 12/4/17 – Keep open, low priority
P21-7	Draft detail profiles for RFC 1151 (RDP), and 7542 (NAI).	Antonio Correias	May 2, 2018	5/2/2017 – CLOSED
P21-8	Initiate the IPS system overview and use cases	Aloke Roy, Rafael Apaza, Antonio Correias and Dongsong Zeng	May 2, 2018	5/2/2017 – in progress 8/21/2017 – in progress 10/23/2017 – Closed and subject to review.
P21-9	Merge the two high-level profiles and draft the working paper for next WG-I meeting	Dongsong Zeng	May 2, 2018	5/2/2017 – CLOSED
P21-10	Investigate the tradeoffs of SCTP, RDP, UDP and TCP.	Dongsong Zeng and	May 2, 2018	5/2/2017 – CLOSED



		Antonio Correas		
P21-11	Identify DNS related RFCs and develop use cases.	Rafael Apaza	May 2, 2018	5/2/2017 – keep open. 8/21/2017 – Closed
P22-1	Develop DNS use case	Rafael Apaza	August 21, 2017	8/21/2017 – Closed, subject to group review.
P22-2	Develop general connection establishment, data flow and mobility use case	Madhu Niraula	August 21, 2017	8/21/2017 – keep open 10/23/2017 – In progress 12/4/17 – Closed.
P22-3	Develop general security use case	Madhu Niraula	August 21, 2017	8/21/2017 – keep open 10/23/2017 – In progress 12/4/17 – Keep open 3/5/18 – Madhu provided initial draft, the group needs to discuss it.
P22-4	Develop multi-link use case	Antonio Correas and Dongsong Zeng	August 21, 2017	8/21/2017 – Closed, subject to group review.
P22-5	Generate mapping table between WG-I requirements and derive requirements to identify gaps	Aloke Roy	August 21, 2017	8/21/2017 – Closed, overtaken by events. We will address it through use cases development
P22-6	Develop initial Profile and MOPS outline	Aloke Roy	August 21, 2017	8/21/2017 – Closed. Profile draft is done, MOPS outline can be deferred to later time.
P22-7	Place/organize the approved profiles on the work space	Dongsong Zeng	August 21, 2017	8/21/2017 – Closed.
P23-1	Explore subnetwork point of attachment (SNPA) addresses for aircraft.	Aloke Roy	October 23, 2017	10/23/2017 – Closed.
P23-2	Explore how many subnets typical DSPs have.	Madhu Niraula	October 23, 2017	10/23/2017 – Closed.
P23-3	Explore how many subnets FAA enterprise has.	Brent Phillips	October 23, 2017	10/23/2017 – In progress 12/4/17 – Closed. Rob Segers - for aviation interop only certain element of FAA network will be exposed. For those elements, 64 subnets will be more than adequate. This strategy might be applicable to other ANSPs.
P23-4	Explore how many subnets PAN European enterprise has.	Danny Bharj	October 23, 2017	10/23/2017 – In progress 12/4/17 – Closed. Refer to ECDL WP3 form CP WG-I/25.
P23-5	Review what is available in the IETF for multilink.	Antonio Correas, Madhu Niraula, Dongsong Zeng	October 23, 2017	10/23/2017 – Closed
P23-6	Flesh out the IPS CONOPS text.	Dongsong Zeng	October 23, 2017	10/23/2017 – Closed
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

P23-8	Review the existing RFC detail profiles for 5795, 4861, 2597, 3260, 2474, 3246 and provide comments before next telecon.	All member	October 23, 2017	10/23/2017 – In progress 12/4/17 – Closed and will be subject to document walk through.
P23-9	Identify what criteria are needed for link selection.	Antonio Correas	October 23, 2017	10/23/2017 – Closed
P23-10	Generate a whitepaper for the need for airborne router.	Madhu Niraula	October 23, 2017	10/23/2017 – Closed.
P24-1	Draft the simple name lookup provision	Madhu Niraula	December 4, 2017	12/4/17 – Closed and to be discussed.
P24-2	Compare the difference between RFC 8200 and RFC 2460, and recommend profile update	Paul Mettus	December 4, 2017	12/4/17 – Closed and to be discussed.
P24-3	Draft working paper to ICAO WG-I on the use of unique aircraft routing prefix mapped to mobility service provider for route determination. The ground entities use normal routing protocols to propagate the path information. This is an alternate solution to AERO, ground LISP and mobile IPv6	Madhu Niraula	December 4, 2017	12/4/17 – Closed
P24-4	Provide safety/security requirements for both data and control messages	Robert Segers	December 4, 2017	12/4/17 – Keep open 3/5/18 – done and subject to group review.
P24-5	Provide link layer security white paper to Rob	Madhu Niraula	December 4, 2017	12/4/17 – Keep open 3/5/18 – Closed
P24-6	Provide CONOPS and DNS to Rich for incorporation to IPS profile draft	Dongsong Zeng	December 4, 2017	12/4/17 – Keep open 3/5/18 – closed
P24-7	Provide link selection criteria specifying which are optional and which are required	Antonio Correas	December 4, 2017	12/4/17 – Closed and to be discussed
P24-8	Provide a concept scheme showing multilink management of packet queuing and forwarding	Antonio Correas	December 4, 2017	12/4/17 – Closed and to be discussed
P24-9	Analyze IP multicast over multilink for emergency messages	Antonio Correas	December 4, 2017	12/4/17 – Closed and to be discussed
P24-10	Update profile schedule to the PMC	Aloke Roy and Brent Phillips	December 4, 2017	12/4/17 – Keep open. 3/5/18 – to be presented in March PMC
P25-1	Draft simple name lookup use case considerations for FANS over IPS and B2 over IPS in the format ready to be incorporated in the Profile	Madhu Niraula	March 5, 2018	3/5/18 – Done and subject to review.
P25-2	Draft security and mobility use case whitepaper and RFC detail profiles	Madhu Niraula	March 5, 2018	3/5/18 – Done and subject to review.
P25-3	Define security requirements and investigate FAA special conditions and share with SC-223	Robert Segers	March 5, 2018	3/5/18 – Done and subject to review.
P25-4	Analyze the DNS security RFCs and if needed generate the detailed RFC profiles	Robert Segers	March 5, 2018	3/5/18 – Done and subject to review.
P25-5	develop port filtering and firewall rules for TCP/UDP ports	Aloke Roy	March 5, 2018	3/5/18 – Done and subject to review.
P25-6	Investigate additional DNS fields needed for simple name lookup, and RFC detail profiles	Rafael Apaza	March 5, 2018	3/5/18 – keep open
P25-7	Review Section 3 Functional Requirements of the draft Profile	All members	March 5, 2018	3/5/18 – keep open
P25-8	Finish multilink use case and requirements	Antonio Correas	March 5, 2018	3/5/18 – Done and subject to review.

P25-9	work on multicast use case (uplink/downlink) and RFCs	Antonio Correias and Alope Roy	March 5, 2018	3/5/18 – Done and subject to review.
P25-10	Investigate the initial discovery for each subnetwork prefix and default gateway (wait for RC IMS paper)	Dongsong Zeng and Madhu Niraula	March 5, 2018	3/5/18 – keep open.
P25-11	Review the current RFC 8200 detail profile and provide comments to Paul (starting from item 9 in Section 4.6)	All members	March 5, 2018	3/5/18 – Done and subject to review.
P26-1	Resolve the end-to-end security requirement issue.	Madhu Niraula	June 4, 2018	
P26-2	Coordinate the SC-223 approved IPS security requirements with AEEC IPS subcommittee and ICAO WG-I.	Alope Roy and Dongsong Zeng	June 4, 2018	
P26-3	Work with regulators to investigate the potential IPS certification criteria.	Alope Roy, Stephane Pelleschi, and Dave Robinson	June 4, 2018	
P26-4	Investigate RFC 4035 Section 3.1.5 about the security concerns over zone transfer.	Robert Segers	June 4, 2018	
P26-5	Initiate IETF coordination.	Stephane Pelleschi	June 4, 2018	
P26-6	Update Figure 2.1-2 in the IPS profile and create a new IPS data flow diagram.	Madhu Niraula and Michael Vangadia	June 4, 2018	
P26-7	Review the functional profile and identify which ground options should be changed to mandatory	Stephane Pelleschi	June 4, 2018	
P26-8	Take to the INNOVA the CONOPs and frame work of naming convention and ground DNS server responsibility, then provide requirements to SC-223/WG-108.	Rob Segers	June 4, 2018	
P26-9	Provide a writeup describing simple name lookup for incorporation into the Profile.	Madhu Niraula	June 4, 2018	
P26-10	Provide an architecture diagram/s with focus on expanding the architecture to include mobility, transition, access subnetworks	Alope Roy	June 4, 2018	
P26-11	Change all mandatory requirements to conditional on DNS support (IO-DNS). Also re-assess air requirements because DNS is not supported over A/G	Rafael Apaza	June 4, 2018	
P26-12	Add an introduction to define the scope of RFC 1035	Rafael Apaza	June 4, 2018	
P26-13	Draft an initial 2-year meeting schedule	Stephane Pelleschi	June 4, 2018	

P26-14	Look into the data base driven name lookup option	Michael Vangardia	June 4, 2018	
P26-15	Provide a list of IPsec RFCs implemented for Iris precursor	Kristen Mineck	June 4, 2018	
P26-16	Initiate a strawman outline of the MOPS document	Aloke Roy	June 4, 2018	

-S-  
Dongsong Zeng  
Secretary

**CERTIFIED** as a true and accurate summary of the meeting.

- S-  
Aloke Roy  
Chairman