TERMS OF REFERENCE

Special Committee (SC) 223

Internet Protocol Suite (IPS) and Aeronautical Mobile Airport Communication System (AeroMACS) (Version 4)

REQUESTOR:

Organization	Person
FAA ANG-B	ANG-B/Michelle Merkle

SC LEADERSHIP:

Position	Name	Affiliation	Telephone	email	Change
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BACKGROUND:

As Internet Protocol (IP) standards mature and current communication technologies are upgraded or new systems are developed, a move to IP-based communication becomes a more viable and attractive alternative to existing technologies. Enterprises can begin to leverage the benefits stemming from a unified IP based communications strategy including greater network flexibility due to better scalability and ultimately better performance.

The Aviation Industry's planned end-state has recently been identified as one based on Aeronautical Telecommunications Network – Internet Protocol (ATN/IPS) standards. ICAO has planned to adopt the IPS standards for future aeronautical datalink communications to enable seamless, broadband, end-to-end communications.

A variety of safety-critical services and applications will be supported by the proposed IPS network. These include, for example, Controller-Pilot Datalink communications (CPDLC), Network-centric Mission Services, Support Services, and SWIM-Oriented Architecture (SOA) Core Services envisioned in the NAS Enterprise Architecture SV-4 Framework. Services will enable full 4D Trajectory-based Operations

(TBOs) through all phases of flight including the airport surface. Additionally, various Aeronautical Information (AIM) and metrological (MET) data products can be provisioned via the IPS network.

Aircraft-to-vehicle, vehicle-to-vehicle, and aircraft-to-aircraft data exchanges may also be supported by this new communications network for a variety of situational awareness applications. Finally, the same AeroMACS/IPS network may be utilized for communications with and among fixed assets on the airport surface, such as surveillance, lighting, and telecommunications infrastructure.

FAA Management has directed that the existing ICAO Doc 9896 be updated to complete the air-ground IPS requirements and to develop the corresponding A-G IPS MOPS document in RTCA. All future FAA Aviation systems can then be designed and developed leveraging these new communication standards to enable more effective and efficient sharing of data.

Since the future A-G IPS Systems will be operating in Commercial Aircraft, it will be necessary to develop form and fit standards to support their development and implementation. Based on Boeing's request, AEEC SAI Committee initiated the development of ARINC Standards for ATN/IPS. This activity is expected to leverage documentation developed from the ICAO ATN/IPS SARPS and RTCA MOPS activities.

DELIVERABLES:

Product	Description	Due Date	Change
Aviation Profiles for Internet Protocol Suite	**Certification profiles for TCP / UDP / IP / DHCP / Routing / Mobility / Multilink protocols based on IETF RFCs**	**Dec. 2018**	**Dec. 2017**
Minimum Aviation System Performance Standard (MASPS) for the Internet Protocol Suite used in Aviation A-G Communication System	**MASPS for the Internet Protocol Suite for avionics certification.**	**Dec. 2019**	**Dec. 2018**

SCOPE:

The proposed standards would be used to support future mobile and fixed data communication applications and services for both air/ground and ground/ground communications services supporting the aviation industry. Examples include information exchanges to support CPDLC, Collaborative Decision Making (CDM); Surveillance Broadcast System (SBS) applications, and System Wide Information Management (SWIM) data exchanges, and its extension to aircraft ("Aircraft Access to SWIM"), such as aeronautical and metrological data link services. Development of technical standards for products that support both the airborne and ground segments would make extensive use of the IETF RFC standards (and its updates).

AeroMACS is expected to be the first aeronautical broadband datalink to operate under the native IPS. However, the IPS networking, routing, mobility and multilink management, transport, and security

functions will be equally applicable for future air/ground datalinks such as INMARSAT and IRIDIUM broadband SATCOM, L-DACS, etc. The IPS standard will also integrate the air/ground communications with the planned migration of ground/ground infrastructure to IP networks. It should be noted that major telecommunication network providers have established a sunset date for circuit-switched TDMA services. As such, FAA ground network infrastructure have to migrate to IP networks in the 2020 timeframe.

The RTCA Standards development activities identified represent a major step necessary to support the FAA's plan to transition to end-to-end IP infrastructure. The standards, when complete will provide the requirements and guidance material necessary for the manufactures to support the FAA's needs and to help achieve system interoperability.

The development of the IPS MASPS will provide the necessary standards to support the successful design, development and implementation of future IPS based Aviation Communications Systems.

SC-223 completed the AeroMACS Profiles (DO-345) and AeroMACS MOPS (DO-346). If any defects to these standards are identified as part of AeroMACS validation and implementation activities, this committee will evaluate the defect reports and update the standards as applicable.

ENVISIONED USE OF DELIVERABLE(S)

1. The IPS MASPS derived from IETF RFCs and developed in SC-223 will be used by regulators to base FAA's Advisory Circular/s (AC) for enabling communication avionics equipment and for airworthiness certification.
2. The IPS Profile developed in SC-223 will be used to provide useful guidance to the designers, manufacturers, installers and users of the ground network infrastructures using IP communications.
3. The IPS Profiles and MASPS will be used to develop the ICAO IPS Guidance and Technical Manual documents. Also, the IPS MASPS will be used to define the airborne equipment interface specifications by AEEC.

SPECIFIC GUIDANCE:

The proposed IPS Profiles derived from IETF RFCs and related standards needed to provide the desired safety and regularity of flight functions, including operational goals for the airport surface wireless system. These profiles would be consistent with the broader IETF and NIST standards. In particular, the special committee should:

1. Describe air/ground data communication network environment encompassing multiple air/ground connectivity options having dissimilar performance characteristics
2. Identify overall network reliability, availability, security, integrity and continuity of service requirements based on references to the ICAO PBCS Manual, Safety and Performance Requirements (SPR) and Interoperability (INTEROP) documents developed by RTCA SC-214 Data Communications, SC-206 Aeronautical Information Services (AIS) Data Link, SC-186 Automatic Dependent Surveillance-Broadcast, SC-222 next generation satellite system MASPS, SC-217 (Airport mapping, terrain and obstacles) and others standards groups, as appropriate, to support future airport surface and end-to-end data communication operations.
3. Define characteristics such as network resource allocation scheme, network security, routing, mobility, priority, quality of service and firewall partitions for the system to be used across the full range of aviation data networks and services;
4. Specify any other system characteristics that may be needed by designers, installers, manufacturers, service providers, and users of the networks;

5. Develop IPS Profiles for the development of MASPS in conformance with IETF RFCs to support networking, routing, mobility and multilink management, transport, and security functions enabling end-to-end aeronautical safety services over data networks;

6. Develop MASPS for airborne IPS router and IPS Host functions based on the IPS Profiles developed under Item 5 above. The IPS MASPS will define the performance requirements of airborne IPS functional configurations regardless of the aircraft implementation architecture. Definition of these functional configurations as IPS subsystems with clearly identified interfaces and performance standards will facilitate subsequent development of the AC/s for certification of these IPS airborne subsystems.

- **EUROCAE Coordination** –
  - o The EUROCAE Council has been consulted. The intent is that the RTCA SC-223 and EUROCAE committees will work together as a joint committee to develop a globally harmonized aviation standard for IPS. The EUROCAE Working Group 108 was established in 4Q2017 and held their initial kickoff meeting in February 2018. WG-108 desires to develop the IPS Profiles document jointly with SC-223 and is requesting additional time for review and coordination before the Profiles document is finalized. In consideration on the proposed joint publication of the Profiles document, Profiles FRAC is proposed after the joint Plenary meeting on September 2018.
  - o WG-108 and SC-223 have aligned their deliverables to produce the second document as a MASPS.
  - o Deliverable schedule for SC-223 and WG-108 have been aligned for both the profiles document and the MASPS to enable joint publication of technically equivalent documents.

- **Additional Coordination** –

  - o The Special Committee will coordinate with other organizations as necessary, such as:

    FAA   Federal Aviation Administration

    ICAO   International Civil Aviation Organization

    EUROCONTROL   European Organization for the Safety of Air Navigation

    - ➢ The FAA and EUROCONTROL developed a Future Communication Strategy and Roadmap for future work and harmonization of activities. As a part of the proposed Agreement, both organizations would provide periodic updates to the international community through the ICAO Aeronautical Communications Panel on the status of this technology and standards development work. The completed standards would be brought to ICAO for technical review and possible adoption. Additional coordination will be conducted with the Internet Engineering Task Force (IETF) which is responsible for updates to the Internet Protocol RFC documents.

    IEEE   Institute of Electrical and Electronics Engineers

    EUROCAE   European Organization for Civil Aviation Equipment

    ISO   International Organization for Standard

    IETF   Internet Engineering Task Force

    AEEC   Airlines Electronic Engineering Committee

- **Initial Documentation** -

Documents	Intended Use
ITU Directive	**Support Recommendation for SC**
ICAO Commission Approval of FCS Recommendations	**Support Recommendation for SC**
ARINC 821 and 822	**Background Guidance**
DO-272	**Background guidance on D-Taxi and D-Traffic applications**
DO-308	**Background guidance on AIS and MET Data Link Services**
Various SC-186, SC-206, SC-214 and SC-217 working documents.	**To provide background guidance for the DRNP, A-IM, 4DTRAD, D-Taxi, and other relevant services.**
ICAO Document 9896	**Background ICAO Technical Manual and Guidance document for IPS. This document is currently being updated by ICAO WG-I.**
ARINC Standard 658	**Background on aircraft architecture, roadmap and gap analysis**
DO-350A	**Safety and Performance Requirements Standard for Baseline 2 ATS Data Communications (Baseline 2 SPR Standard)**
DO-351A	**Interoperability Requirements Standard for Baseline 2 ATS Data Communications (Baseline 2 Interop Standard)**
ICAO Doc 9869	**Performance Based Communication and Surveillance (PBCS) Manual**

TERMINATION*:*

This Special Committee will terminate its activities when the Program Management Committee (PMC) approves the committee's final document. Any change/extension of the committee's work program requires prior PMC approval.