ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM 15-004

ARINC Project Paper xxx: *Internet Protocol Suite (IPS) for Aeronautical Safety Services - Development Plan (working title)*

1.1 Name of Originator and/or Organization

Boeing

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

Group: Internet Protocol Suite (IPS) for Aeronautical Safety Services Subcommittee

Chairman: For step 1, Airbus and Boeing have agreed to co-chair.

2.2 Support for the activity

Airlines: AAL, DLH, HAL, SWA, UAL, UPS, USAF

Airframe Manufacturers: Boeing, Airbus

Suppliers: Airtel ATN GE Aviation, Honeywell, Rockwell Collins, Thales

Others: ARINC (RC-IMS), EUROCONTROL, FAA, SITA, Inmarsat, Iridium, Panasonic

2.3 Commitment for Drafting and Meeting Participation

Airlines:

Airframe Manufacturers: Boeing, Airbus

Suppliers: Airtel ATN, GE Aviation, Honeywell, Rockwell Collins, Thales

Others: ARINC (RC-IMS), FAA, SITA, Inmarsat, Panasonic

2.4 Recommended Coordination with other groups

DLUF, DLK, NIS, SAI

3.0 Project Scope

3.1 Description

The Existing ACARS network and Aeronautical Telecommunication Network (ATN) infrastructure for aeronautical safety services is aviation-unique. Modern, off-the-shelf, efficient, and robust network infrastructure common to both air traffic services (ATS) and aeronautical operational communications (AOC) safety service applications is needed.

Note: The ITU Radio Regulations define “safety service” as any “radiocommunication service used… for the safeguarding of human life and property” and ICAO Annex 10 refines that

definition to a “service reserved for communications relating to safety and regularity of flights”, specifically ATS and AOC “safety communications” as defined in ICAO Doc 9718.

New network infrastructure for safety services based on the modern Internet Protocol Suite (IPS) will meet this need. Accordingly, it is proposed that a new AEEC subcommittee prepare a detailed technical definition of IPS for aeronautical safety services in a new ARINC Standard. This subcommittee will base the specification on the ICAO Doc 9896 IPS definition and on prevalent commercial IP network technology (e.g., IETF RFC 2460 for IPv6) with the modifications necessary to support aeronautical safety services. It is anticipated that IPS will use multiple line-of-sight and beyond-line-of-sight subnetworks that operate in ‘protected’ spectrum allocated by ITU and ICAO for safety services, including Inmarsat SwiftBroadband, Iridium Certus, AeroMACS, future Satcom and LDACS systems, and possibly VDL Mode 2. It is targeted that IPS will also provide backward compatibility with traditional ACARS ATS (e.g., FANS) and AOC (e.g., ARINC 702A flight plans) as well as LINK2000+ (ATN B1) and ATN B2 applications, so the applications will remain unchanged.

The activity of the new subcommittee is proposed in two steps:

Step 1: Roadmap for standardization and main architecture impacts of IPS introduction

The subcommittee will define the perimeter which needs to be standardized for IPS (air-to-ground and end-to-end) and in which timeframe each part shall be standardized (ICAO, RTCA, EUROCAE, ARINC). This will include an identification of IPS requirements (performance, data security) and a description of the main avionics architecture impacts.

The output of the new subcommittee for Step 1 will be an ARINC Report.

Step 2: Development of an ARINC Standard for IPS

The output of the new subcommittee will be an ARINC Standard containing the specification of avionics architecture, functions, and an IPS profile which specifies implementation options and constraints as well as higher level details regarding the accommodation of different applications. The scope of this standard will possibly correspond to the CMU (or equivalent avionics) by defining its ability to act as an IP router. The subcommittee will also make a performance assessment regarding the usage of different potential IPS subnetworks.

3.2 Planned usage of the envisioned specification

New aircraft developments planned to use this specification yes ☒ no ☐

Specify: TBD

Modification/retrofit requirement yes ☒ no ☐

Specify: If airlines want to take advantage of IPS for aeronautical safety services, then they must retrofit the capability via CMU (or equivalent) avionics

Needed for airframe manufacturer or airline project yes ☒ no ☐

Specify: Boeing TBD airplane programs

Mandate/regulatory requirement yes ☐ no ☒

Program and date: No mandate

Is the activity defining/changing an infrastructure standard? yes ☒ no ☐

Specify: IPS is envisioned to eventually replace ACARS and ATN in the long term

When is the ARINC Standard required? 2019

What is driving this date? Pull from airlines due to their needs/wants to prepare for the future with modern, efficient, and robust data communications network infrastructure for safety services that leverages the increasing availability of IP links to their airplanes (e.g., Inmarsat SwiftBroadband, Iridium Certus, AeroMACS). Additionally, the normal long lead time for development of aviation specifications means that key areas need to start being investigated and developed now to meet longer term targets in the mid-2020s.

Are 18 months (min) available for standardization work? yes ☒ no ☐

If NO, please specify solution: Not applicable

Are Patent(s) involved? yes ☐ no ☒

If YES please describe, identify patent holder: Not applicable

3.3 Issues to be worked

Issues to be worked in Step 1 include an assessment and the definition of a plan to develop standards (ICAO, EUROCAE, RTCA, ARINC) addressing the following:

- Definition of long-term needs for IPS for aeronautical safety services
- Transition phase during which ACARS, ATN/OSI, and IPS will co-exist
- Accommodation of legacy aircraft equipped with ACARS, ATN/OSI, and new production aircraft with IPS
- General Air/Ground end to end architecture
- Ground Gateway to accommodate Legacy and New Production aircraft
- Airborne architecture including security
- Support of AOC and ATS applications
- Technical definition:
    - IPS Profile
    - Security studies and coordination with other relevant groups (network or application level, technology choices, etc.)
    - Addressing schemes and address allocations
    - Technology investigation (e.g., IPv4, IPv6, compression, etc.)
    - Handling interfaces that have embedded IP (e.g., ARINC 781) versus interfaces that do not have embedded IP (e.g., VDL Mode 2)

- Mobility and routing trade studies and selection (AERO, Mobile IP, etc.)
- Performance investigation
- Transport layer protocol choices (TCP and/or UDP)
- Functionality allocation
- Dialog service interfaces
- System management requirements

Step 2 includes the definition of the appropriate ARINC Standards as identified by Step 1.

4.0 Benefits

4.1 Basic benefits

Operational enhancements? yes ☒ no ☐

For equipment standards:

a. Is this a hardware characteristic? yes ☐ no ☒

b. Is this a software characteristic? yes ☒ no ☐

c. Interchangeable interface definition? yes ☒ no ☐

d. Interchangeable function definition? yes ☒ no ☐

If not fully interchangeable, please explain: Not applicable

Is this a software interface and protocol standard? yes ☒ no ☐

Specify: IPS will provide a third set of network protocols (in addition to ACARS and ATN)

Product offered by more than one supplier yes ☒ no ☐

Identify: TBD

4.2 Specific project benefits (Describe overall project benefits.)

4.2.1 Benefits for Airlines

Airline benefits are expected to accrue in the form of greater data communications performance compared to ACARS and ATN. IPS will be designed to support both ATS and AOC applications, provide backward compatibility with traditional ACARS ATS (e.g., FANS) and AOC (e.g., ARINC 702A flight plans) applications, and use both line-of-sight and beyond-line-of-sight subnetworks, all of which will further increase its effectiveness and applicability. IPS will support a wide range of future applications and enable a transition to high-speed links for safety services.

4.2.2 Benefits for Airframe Manufacturers

It is expected that airframe manufacturers' benefits will accrue in the form of moving towards future datalink technologies providing more bandwidth and

capabilities. IPS protocols (IP, TCP, and UDP) have been exhaustively tested in the commercial domain and are widely available for adaptation for aeronautical use.

4.2.3 Benefits for Avionics Equipment Suppliers

Avionics equipment supplier benefits will accrue in the form of moving towards future datalink technologies providing more bandwidth and capabilities. IPS protocols (IP, TCP, and UDP) have been exhaustively tested in the commercial domain and are widely available for adaptation for aeronautical use.

5.0 Documents to be Produced and Date of Expected Result

ARINC Report “Standardization Roadmap for IPS Aeronautical Safety Services”, in April 2017.

ARINC Project Paper 8XX, *IPS for Aeronautical Safety Services (working title)*, in late 2018 or early 2019.

5.1 Meetings and Expected Document Completion

The following table identifies the number of meetings and proposed meeting days needed to produce the documents described above.

Activity	Mtgs	Mtg-Days (Total)	Expected Start Date	Expected Completion Date
Step 1: ARINC Report Standardization Roadmap for IPS, (Develop plan and work program, identify deliverables pertaining to IPS)	5	10	Sept 2015	April 2017
Step 2: ARINC Project Paper 8XX, Internet Protocol Suite (IPS) for Aeronautical Safety Services	TBD	TBD	April 2017	April 2019

6.0 Comments

6.1 Authorization for Step 1

When voted, the APIM will authorize the activity proposed for Step 1. A revision to this APIM shall be prepared to authorize the activities of Step 2, considering the results of Step 1.

6.2 Expiration Date for the APIM

April 2017