

ARINC Project Initiation/Modification (APIM)

- 1.0 Name of Proposed Project** **APIM 17-003**
Supplement 9 to ARINC Specification 618 - Air/Ground Character-Oriented Protocol Specification
Supplement 4 and Supplement 5 to ARINC Characteristic 758 - Communications Management Unit (CMU) Mark 2, to define CMU with Ethernet interfaces to the SDU and other IP transceivers such as AeroMACS
- 1.1 Name of Originator and/or Organization**
Honeywell and Rockwell Collins
- 2.0 Subcommittee Assignment and Project Support**
- 2.1 Suggested AEEC Group and Chairman**
Group: Data Link Systems Subcommittee (DLK)
Chairman: Bob Slaughter, American Airlines
- 2.2 Support for the activity (as verified)**
Airlines: American Airlines, Lufthansa, Southwest, TAP Portugal, UPS, United
Airframe Manufacturers: Boeing
Suppliers: Honeywell, Rockwell Collins
Others: L2 Aviation, Rockwell Collins IMS
- 2.3 Commitment for Drafting and Meeting Participation (as verified)**
Airlines: American Airlines
Airframe Manufacturers: Boeing
Suppliers: Honeywell, Rockwell Collins
Others: Rockwell Collins IMS
- 2.4 Recommended Coordination with other groups**
Internet Protocol Suite (IPS) for Aeronautical Safety Services Subcommittee
Air-Ground Communications Systems Subcommittee (AGCS)
AeroMACS Working Group
Monitor pertinent activities of RTCA SC-223 and EUROCAE WG-82
- 3.0 Project Scope (why and when standard is needed)**
- 3.1 Description**
With recent activity in the commercial aviation industry, including the publication of the Second Edition of ICAO 9896 (Manual on ATN using IPS) and creation of the AEEC Internet Protocol Suite (IPS) for Aeronautical Safety Services Subcommittee, the industry is moving toward use of IP-based data communication to and from all aircraft domains (passenger, cabin and now cockpit). Avionics standards need to be updated to accommodate these changes.

It is recognized that the CMU will need Ethernet interfaces to communicate with IP-based transceivers and possibly other on-board devices. The provisions in ARINC Characteristic 758-3 for Ethernet interfaces are incomplete. Rear connector pins have been defined, but nothing else. Therefore, it is proposed to investigate whether the defined #22 contacts will pass the emissions requirements as is, or whether the recommendations in ARINC 664 for #22 contacts will pass the emissions. If neither pass, then prepare Supplement 4 to ARINC Characteristic 758 with a CMU connector change to add Quadrax contacts. In either case (use of Quadrax contacts or #22 contacts) add references to ARINC 664 Part 2 to fully define the Ethernet protocol and IP protocol to the CMU. This will be consistent with ARINC 781 describing the Inmarsat SwiftBroadband (SBB) system.

In addition, ARINC 618 will be updated to include a section on simple ACARS messaging over IP using Ethernet interface(s) between the CMU and transceiver(s). The new section would include the ability to transfer ACARS messages to/from the transceiver using one or two "super" blocks, instead of the traditional sized ACARS blocks. (Note that for SBB, this interface will use the SDU's prioritized IP port.)

This simple ACARS messaging over IP may be used in the interim while the ARINC Project Paper 658 IPS roadmap document and subsequent ARINC Standard(s) are being developed. When the IPS Subcommittee has completed its work, ARINC Characteristic 758 may be upgraded, as proposed by a new APIM, to include the ARINC Project Paper 8xx IPS services.

Additions and modifications to ARINC Characteristic 758 will include:

- Prepare Supplement 4 to ARINC Characteristic 758 as needed to include a new connector definition with Quadrax contacts in the rear connector for Ethernet interfaces, and revise the other pinouts to accommodate the Quadrax contacts.
- Additions/changes to Section 2 (Interchangeability Standard) for the added/modified interfaces and references to ARINC 664 Part 2.
- Additions/changes to Section 3 (System Architecture)
- Additions to Section 4 (Functional Capability) for IP subnetworks, security considerations, etc.
- Additions to Section 5 (Interfaces and Protocols)
- Additions/changes to the applicable Attachments, as needed.

Two phases are proposed in this APIM:

1. The first phase includes the necessary physical interface changes (possibly connector and pinout) as determined by testing and analysis, and descriptive material for including the ARINC 664 Part 2 Ethernet protocol.
2. The second phase is the addition of a simple ACARS over IP that will enable operators to take advantage of the benefits of IP. Supplement 9 to ARINC 618 will be prepared in this phase to take advantage of Ethernet and IP. ARINC 758 will be updated to refer to Supplement 9 to ARINC 618.

The intent of the proposed phases is to allow the CMU hardware design and hardware qualification testing to begin (after the Phase 1), while the details of the upper layers are being finalized. This is followed by the definition of simple

ACARS over IP functionality to provide some benefit before the IPS Subcommittee work is fully completed. Note that the Phase 2 work may occur in parallel with the Phase 1 work as time allows.

If the output of the IPS Subcommittee determines that IPS functionality may reside in an ARINC 758 CMU, a new APIM would be initiated to propose ARINC Project Paper 758A.

3.2 **Planned usage of the envisioned specification**

Note: New airplane programs must be confirmed by manufacturer prior to completing this section.

New aircraft developments planned to use this specification yes no

Airbus:

Boeing:

Other:

Modification/retrofit requirement yes no

Specify: To be used on forward fit Boeing 737 MAX and potentially in retrofit applications. Phase 2 (ARINC 618) to be used on Boeing 787 and Boeing 777X.

Needed for airframe manufacturer or airline project yes no

Specify: Boeing (737 MAX, 787, 777X)

Mandate/regulatory requirement yes no

Program and date:

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

Specify:

When is the ARINC Standard required?

Phase 1: December 2018

Phase 2: December 2020

What is driving this date? Need date is flexible, but the new interfaces and functionality are desired as soon as can be reasonably developed in the standards.

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

If NO please specify solution: _____

Are Patent(s) involved? yes no

If YES please describe, identify patent holder: _____

3.3 **Issues to be worked**

- Determine number and type of Ethernet interfaces to include
- Determine rear connector type(s) and pinout
- Determine how much material can be included by reference to other documents (e.g., ARINC 664, ARINC 766, etc.) and what gaps need to be filled.

- Determine need to address security aspects
- Determine ACARS over IP message format

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: _____

Is this a software interface and protocol standard? yes no

Specify: Additions to ARINC Specification 618 as noted above

Product offered by more than one supplier yes no

Identify: Honeywell, Rockwell Collins

4.2 Specific project benefits (Describe overall project benefits.)

4.2.1 Benefits for Airlines

Equipping of aircraft with a CMU designed to an updated ARINC Characteristic (and the necessary IP capable transceivers) will provide the capability to use ACARS over IP. This provides for higher data throughput and use of lower cost links. It also provides standard CMU hardware that can be used for IPS functionality, if needed. An ARINC Characteristic will enable equipment interchangeability (standard form factor, connector, interwiring, etc.)

4.2.2 Benefits for Airframe Manufacturers

Equipping of aircraft with a CMU designed to an updated ARINC Characteristic (and the necessary IP capable transceivers) will provide the capability to use ACARS over IP. This provides for higher data throughput and use of lower cost links. It also provides standard CMU hardware that can be used for IPS functionality. An ARINC Characteristic will enable equipment interchangeability (standard form factor, connector, interwiring, etc.)

4.2.3 Benefits for Avionics Equipment Suppliers

Provides an ARINC Characteristic for an interchangeable federated CMU that includes the necessary interfaces and capabilities to support messaging over IP and potentially IPS, which are recognized by the industry to be the future of aircraft data communications.

5.0 Documents to be Produced and Date of Expected Result

Preparation of Supplement 4 to ARINC Characteristic 758 at end of Phase 1.

Preparation of Supplement 5 to ARINC Characteristic 758 and Supplement 9 to ARINC Specification 618 at end of Phase 2.

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
Phase 1: 1) Prepare Supp 4 to ARINC 758, add physical Ethernet interfaces (physical and datalink layers) and Ethernet protocol (ARINC 664 Part 2)	3	9	June 2017	Dec 2018
Phase 2: 2) Prepare Supp 5 to ARINC 758, add material defining ACARS over IP and basic security 3) Prepare Supp 9 to ARINC 618	4	12	Dec 2018 (may begin earlier)	Dec 2020

6.0 Comments

The DLK Systems Subcommittee will review this APIM prior to start of Phase 2 and make any changes deemed necessary before initiating Phase 2.

This work will be completed as part of the normal meeting schedule (twice annual) and web conference schedule of the DLK Subcommittee. This will depend on the other tasks at hand for the subcommittee over the next several years.

6.1 Expiration Date for the APIM

May 2021

Completed forms should be submitted to the AEEC Executive Secretary.