ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM 21-005

Supplement 8 to ARINC Specification 628: *Cabin Equipment Interfaces (CEI), Part 1, Cabin Management and Entertainment Systems – Peripherals*

This APIM is a compilation of five (5) APIMs from 2015-2017 to reconfirm industry support, to reschedule deliverables, and to simplify project management.

- APIM 15-006: Global CWAP Operational Management
- APIM 16-005: Landscape Camera and 4K UHD Video Standards
- APIM 17-009: Cabin Wireless Access Point (CWAP) 100 Gbps+
- APIM 17-011: Cabin and Cargo Surveillance
- APIM 17-013: Cabin IFE Modem Standardization

Additionally, an update to **Supplement 5 to ARINC Specification 628:** *Cabin Equipment Interfaces (CEI), Part 0, Cabin Management and Entertainment Systems – Overview* may result as work progresses through these projects.

1.1 Name of Originator and/or Organization

Scott Smith, AEEC Staff, ARINC
CSS Subcommittee Secretariat

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

Cabin Systems Subcommittee (CSS)

2.2 Support for the activity (as verified)

Airlines: Delta Air Lines

Airframe Manufacturers: Airbus, Boeing

Suppliers: KIDDE, VT Miltope, LH-Technik, Thales, Panasonic, Collins, Lumexis, Zodiac ZII, Zodiac Seats France, Astronics, Amphenol, TE Connectivity, Esterline Souriau, ITT Cannon, W. L. Gore, Molex, Latecoere

Others:

2.3 Commitment for Drafting and Meeting Participation (as verified)

Airlines: Delta Air Lines

Airframe Manufacturers: Airbus, Boeing

Suppliers: KIDDE, VT Miltope, LH-Technik, Thales, Panasonic, Collins, Lumexis, Zodiac ZII, Zodiac Seats France, Astronics, Amphenol, TE Connectivity, Esterline Souriau, ITT Cannon, W. L. Gore, Molex, Latecoere

Others:

2.4 Recommended Coordination with other groups

As needed.

3.0 Project Scope (why and when standard is needed)

3.1 Description

ARINC Specification 628 defines civil air transport cabin systems to include: audio, video, communication, power, and wireless connectivity.

ARINC Specification 628 include the following parts:

THE CABIN EQUIPMENT INTERFACES SET	
628P0	Cabin Equipment Interfaces (CEI) Part 0, Cabin Management and Entertainment System – Overview
628P1	Cabin Equipment Interfaces (CEI) Part 1, Cabin Management and Entertainment System – Peripherals
628P2	Cabin Equipment Interfaces (CEI) Part 2, Cabin Management and Entertainment System – Seat Interfaces
629P3	Cabin Equipment Interfaces (CEI) Part 3, In-Flight Entertainment System (IFES) to Aircraft System Interfaces
628P4A	Cabin Equipment Interfaces (CEI) Part 4A, Cabin Management and Entertainment System – Cabin Distribution System – Daisy Chain
628P4B	Cabin Equipment Interfaces (CEI) Part 4B, Cabin Management and Entertainment System – Cabin Distribution System – Star Wiring
628P4C	Cabin Equipment Interfaces (CEI) Part 4C, Cabin Management and Entertainment System – Cabin Distribution System (2nd Gen.) – Daisy Chain
628P5	Cabin Equipment Interfaces (CEI) Part 5, Parts Selection, Wire Design and Installation Guidelines
628P6	Cabin Equipment Interfaces (CEI) Part 6, Fiber Optic Cable Assembly General Specification
628P7	Cabin Equipment Interfaces (CEI) Part 7, Cabin Equipment Cooling General Specification
628P8	Cabin Equipment Interfaces (CEI) Part 8, In-Flight Entertainment (IFE) Standard Availability Measurement Guidelines
628P9	Cabin Equipment Interfaces (CEI) Part 9, Cabin Information Network

This APIM focuses solely on updates to system peripheral components and systems found in ARINC Specification 628, Part 1.

Subsequent to the results of the CSS actions, the overview material in ARINC Specification 628, Part 0 may be updated.

3.2 Planned usage of the envisioned specification

The majority of implementation of the definitions and guidance in this APIM are intended for <u>future designs, or retrofit designs,</u> where appropriate resources and needs exist.

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

- Airbus: Future designs
- Boeing: Future designs
- Other: Future designs

Modification/retrofit requirement yes ☒ no ☒

- Specify: Not a requirement, but in retrofits

Needed for airframe manufacturer or airline project yes ☐ no ☒

- Specify: (aircraft & date)

Mandate/regulatory requirement yes ☐ no ☒

- Program and date: (program & date)

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

- Specify (e.g., ARINC 429)

When is the ARINC standard required?
_____(month/year)_____

What is driving this date? _____(state reason)_____

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

Global CWAP Operational Management

This project was initiated in 2015. The intent was to create or obtain "radiofrequency maps" in various regions to create profiles for Wi-Fi propagation over specific channels and frequencies. This would mitigate interference from ground-based radars and other interruptions. This enhancement of service would lead to increased passenger satisfaction. Other benefits include reduced design and certification costs (including those specific to multiple regions/nations).

Items to be resolved include:

- Discuss and collect the major compliance requirements from FCC and ECC (ETSI) for CWAP global management.
- Discuss and evaluate technical implementation solutions for Global CWAP Operational Management (Geo-position based intrinsic or external) without service interruption in cooperation with WAP suppliers Cisco, Motorola, Aruba, etc., define aircraft interface and data (API).
- Alignment with FCC and ECC technical compliance.
- Update ARINC 628P1, Section XX, Cabin Wireless Access Point (CWAP)

See Attachment 1 for the original project charter.

Landscape Camera and 4K UHD Video Standards

The objective is to help the airlines cope with the rapid and evolving IFE industry by providing them with the freedom of choice in the installation and modular expansion of cabin equipment. This is necessary since passenger entertainment and infotainment systems are subject to frequent aircraft upgrades. Generating cabin interface protocols, administering and resolving seat integration issues, cabin communications, and connector standardization are also significant parts of the activities.

The following changes will be made in Supplement 8 to ARINC 628 Part 1:

1. Provide interfaces for a High-Definition (HD) Landscape Camera. The interface definition will include new video encoding formats, video resolution, and bandwidth requirements.
2. Provide specifications for UHD Video streams (4K), video encoding requirements and video screen resolutions.

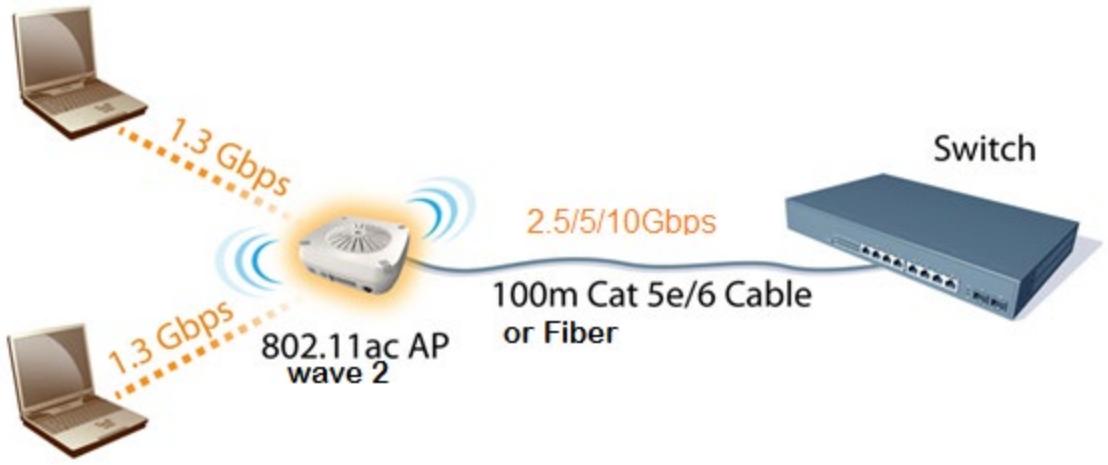
See Attachment 2 for the original project charter.

Cabin Wireless Access Point (CWAP) – Multi-Gigabit, IEEE 802.11ac Wave 2

As cabin networks expand, so does the need for more and more data via wired and wireless networks. The introduction of IEEE 802.11ac Wave 2 CWAPs has finally caught up to the 1-Gigabit Ethernet backbone that feeds them. This project aims to:

- Evaluate, select, and define the Ethernet backbone that will feed the next generation CWAPs. A faster Ethernet backbone throughout the cabin will foster future growth of cabin systems and inflight entertainment.
- Define MultiGigabit CWAP equipment and interface definitions to support IEEE 802.11ac Wave 2 for a wide variety of cabin installations.

The throughput that current IEEE 802.11ac Wave 1 CWAPs can support has already shown that daisy-chaining more than 2 CWAPs together can result in a network bottle neck on the wired Ethernet backbone. Higher quality video streams and other IFE options being considered along with the major increase in cabin management data will require a much faster backbone. The increased throughput required from the wireless clients to the IFE servers is just the start of the throughput bottle neck as seen in the figure below. Currently, aircraft are wired with 100 Mbps (100 BaseT) or 1 Gbps (1000 BaseT) Ethernet lines.



Issues to be resolved include:

- Selection of the Ethernet backbone to the CWAPs: 2.5 Gbps, 5 Gbps or 10 Gbps.
- Connectors and pin assignments for best performance and safety of the aircraft.
- 10 Gbps fiber optic implementation (coordinate with FOS).
- Compatibility with current wired dual-quadrax cabling in aircraft. Current cabling will not support 10 Gbps Ethernet but might support 2.5 Gbps or 5 Gbps.
- Consideration of MultiGigabit standard IEEE Std 802.3bz-2016, which was released 23Sept16 and could lend itself to having switch manufacturers being able to support 100/1G/2.5G/5G/10G speeds. Hardware is not readily available as of Q1 2017

- Network security considerations (coordinate with NIS)

See Attachment 3 for the original project charter.

Cabin and Cargo Surveillance Systems

This project will define a standardized video recording and storage system meeting a set of agreed to customer functions and needs with standardized interfaces and provisions in the aircraft to reduce the customization effort to a minimum.

Standardization will preclude wide proliferation of bespoke solutions across disparate fleets of aircraft.

Patents to acknowledge:

- Aircraft surveillance and recording system, US 5742336 A
- Surveillance system for aircraft interior, US 6864805 B1
- Aeronef pourvu d'un systeme de surveillance, EP 2694372 A1
- Record and playback system for aircraft, US 6366311 B1
- Latecoere patent ongoing

Issues to be resolved include:

- Functions
    - Network security considerations
    - Security assurance level
    - Video performance and formats
- Architecture
    - Network throughput requirements
    - Network protocols
- Interface
    - Definition of standardized mechanical and electrical interfaces to the aircraft
    - Connectors and cabling and electrical interfaces for Ethernet networking for devices (e.g., cameras)

Airlines, airframers, and system suppliers will benefit from a standardized network protocol and interfaces of a Cabin and Cargo Surveillance System reduce the customization effort to a minimum. Shorter lead times and reduced design and integration time lower the cost of this highly customized system.

See Attachment 4 for the original project charter.

Cabin IFES Modem Standardization

The airframe manufacturers are increasingly installing cell modems for communication of cabin systems with ground infrastructure (e.g., WLAN, UMTS, LTE). There is a high effort necessary to integrate the cell modems, as all cell modems from various suppliers are different in size, mounting method, interface location and installation location. Standardization of form and fit of the cell modem will enable a particular installation location to be used for cell modems available from different suppliers. This project aims to:

- Define the form factor for a cell modem.

- Define mounting method for a cell modem.

The harmonization of form and fit of cell modems from different suppliers allows the airframe manufacturers to define a dedicated location in each aircraft type for such equipment.

Items to be resolved include:

- Consensus on modem footprint, size, and dimensions
- Mounting methods
- Mechanical and electrical interface standardization
- Provisions for future enhancements

This project is closely coupled with the CWAP efforts of the CSS.

See Attachment 5 for the original project charter.

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: _____

Product offered by more than one supplier yes ☒ no ☐

Identify: (company name)

4.2 Specific project benefits (Describe overall project benefits.)

4.2.1 Benefits for Airlines

The projects contained herein will benefit all stakeholders through lowered costs, increased system reliability, and increased passenger satisfaction.

4.2.2 Benefits for Airframe Manufacturers

The projects contained herein will benefit all stakeholders through lowered costs, increased system reliability, and increased passenger satisfaction.

4.2.3 Benefits for Avionics Equipment Suppliers

The projects contained herein will benefit all stakeholders through lowered costs, increased system reliability, and increased passenger satisfaction.

5.0 Documents to be Produced and Date of Expected Result

New sections to be added via supplements to ARINC Specification 628, Part 1. These include:

- Section 17.0 Cabin Wireless Access Point (CWAP)

- Section 18.0 Global CWAP Operational Management
- Section 19.0 Cabin and Cargo Surveillance Systems
- Section 20.0 Cabin IFES Communication Modem Systems

Note that some section numbers and titles may change editorially.

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
Supplement 5 to ARINC Specification 628, Part 0	*36*	*18*	*June 2021*	*April 2023*
Supplement 8 to ARINC Specification 628, Part 1	*36*	*18*	*June 2021*	*April 2023*

Regular web conference will be conducted.

6.0 Comments

none

6.1 Expiration Date for the APIM

May 2023

Completed forms should be submitted to Paul Prisaznuk (pjp@sae-itc.org)
AEEC Executive Secretary & Program Director