AEEC

Together "We Set the Standard."

To	Aviation Industry	**Date**	May 26, 2021
From	P. J. Prisaznuk AEEC Executive Secretary & Program Director pjp@sae-itc.org tel +1 443-254-0528	**Reference**	21-055/AXX-235 lth

Subject **AEEC's Work Program for 2021-2022**
AEEC General Session
May 11 and May 13, 2021

Summary The AEEC Executive Committee approved 10 additional project proposals during the AEEC General Session:

APIM Number	AEEC Sub-Committee	APIM Description
21-001	NIS	Supplement 3 to ARINC Report 842: Guidance for Usage of Digital Certificates
21-002	EFB	ARINC Project Paper 8XX: Guidance for Wireless Use of COTS Crew Devices
21-003	SDL	ARINC Project Paper 8XX: System Level Guidance for Data Loading Aircraft Components
21-004	SDL	Supplement 4 to ARINC Report 615A: Airborne Computer High Speed Data Loader
21-005	CSS	Supplement 8 to ARINC Specification 628 Part 1: Cabin Equipment Interfaces (combines scope of five APIMs)
19-004A	CSS	ARINC Project Paper 8XX: Cabin Systems Secure Media Independent Messaging (revised schedule)
18-001A	CSS	ARINC Project Paper 8XX: Fifth Generation Cabin Network (5GCN) (revised schedule)
17-007A	GAIN	Supplement 1 to ARINC Specification 812A Part 2: Standard Data Interfaces for Galley Inserts (GAIN)
16-006A	KSAT	Supplement 2 to ARINC Characteristic 791 Part 2, Ku/Ka Band Satcom
15-004B	IPS	Supplement 1 to ARINC Specification 858: Internet Protocol Suite (IPS) Part 1 and Part 2 Supplement 1 to ARINC Report 658: Internet Protocol Suite Roadmap Document

The statement of work for each project is attached to this document in the form of an APIM (ARINC Proposal to Initiate/Modify an ARINC Standard).

As of the date of this letter, the AEEC has 29 APIMs presently open, calling for 12 new ARINC Standards and 29 Supplements to existing ARINC Standards, all presently in work.

Thank you for your support of these initiatives.

Summary The purpose of this letter is twofold:

1. Actions of the Airlines Electronic Engineering Committee (AEEC) are hereby announced.
2. ARINC Industry Activities invites its Members and all interested parties to participate in ARINC Standards development activities.

For additional information on AEEC's Work Program, contact the AEEC Executive Secretary & Program Director or visit the AEEC website: *www.aviation-ia.com/activities/aeec*.

cc AEEC Executive Committee, CSS, EFB, GAIN, IPS, KSAT, NIS, SAI, SDL

Attachment 1

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project — APIM 21-001

ARINC 842 Online Certificate Provisioning

1.1 Name of Originator and/or Organization

Ndrianina Randrianasolo – Airbus

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

ARINC NIS Subcommittee, Jeffrey Rae – United Airlines

2.2 Support for the Activity (as verified)

Airlines: United Airlines, American Airlines (TBD)

Airframe Manufacturers: Airbus

Suppliers: Honeywell, Collins Aerospace, Panasonic (TBD), Astronautics Corp of America (TBD)

Others:

2.3 Commitment for Drafting and Meeting Participation (as verified)

Airlines: United Airlines (TBD), American Airlines (TBD)

Airframe Manufacturers: Airbus

Suppliers: Collins Aerospace, Panasonic (TBD), Astronautics Corp of America (TBD)

Others:

2.4 Recommended Coordination with other groups

ATA Digital Security Working Group (DSWG) for the ATA DSWG Spec. 42

AEEC Software Distribution and Loading (SDL) Subcommittee

3.0 Project Scope (why and when standard is needed)

3.1 Description

The rise of e-Enabled aircraft has brought the challenge to securely and reliably connecting aircraft systems to ground infrastructure as well as connecting multiple external or internal devices to aircraft systems.

This connectivity need mainly relies on digital certificate for secure authentication between all these systems (e.g., Wi-Fi, VPN, HTTPS, etc.)

The need to ensure a coherent security approach and interoperability between systems from multiple suppliers was enforced through standardization (e.g., ARINC 822, ARINC 842, ARINC 848, etc.)

However, the current state of certificate management for aircraft systems is lacking an efficient way to manage the certificates embedded on those systems. Indeed, while basic certificate policy usually requires one certificate per device, for a device installed in an aircraft, it would mean:

- One Field Loadable Software (FLS) part per aircraft for this system
- To be installed manually on each aircraft every 1 to 3 years
- For a fleet with 60 aircraft, it means at least 1 installation every week

This leads to a very complex aircraft configuration management as well as to a very costly maintenance action on aircraft. Some airlines are also choosing to implement alternate, less secure ways to manage certificates.

To solve this issue, suppliers are starting to implement Online or Remote Certificate Provisioning solutions, allowing to ease the management of aircraft device certificates. In addition, ATA DSWG Spec 42 – 2020 now includes the high-level description of such functionality. This is a key feature as it finally allows proper and operable certificate management on aircraft.

The objective of this APIM is to update ARINC 842 to provide implementation guidance specifically for Online Certificate Provisioning of aircraft systems. The scope includes both the onboard part (aircraft system) as well as the ground part (PKI provider and Ground Infrastructure). Interoperability between systems is a major objective. To achieve such interoperability while limiting the implementation cost, the interface is to be based on the EST protocol (Enrollment over Secure Transport) which has been standardized as RFC 7030.

Due to this feature being key for aircraft device certificate management and due to multiple suppliers starting to develop such feature, an agreed standard for the aeronautical industry is needed within 2 years to promote the development of interoperable solutions.

3.2 Planned usage of the ARINC Standard

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

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

Airbus: (aircraft & date)

Boeing: (aircraft & date)

Other: (manufacturer, aircraft & date)

Modification/retrofit requirement yes ☒ no ☐

Specify: A320-2021

Needed for airframe manufacturer or airline project yes ☒ no ☐

Specify: A320-2021

Mandate/regulatory requirement yes ☐ no ☒

Program and date: (program & date)

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

Specify ARINC 842

When is the ARINC standard required? ________________

What is driving this date? ___________________________

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

The main issues to be worked as part of this APIM are:

- Allow Certificate provisioning for a large fleet of aircraft devices in a way easily operable by airlines.
- Use a standard protocol (EST) that can be implemented on aircraft devices to ease implementation, adoption, and interoperability.

Provide choices for secure process implementation depending on risk level.

3.4 Security Scope

Is Cyber Security Impacted (if yes, check box(es) below) yes ☒ no ☐

Aircraft Control Domain - *To be investigated* yes ☐ no ☐

Airline Information Services Domain yes ☒ no ☐

PAX Information and Entertainment Systems yes ☒ no ☐

Other _________________________________ yes ☐ no ☐

The objective of this APIM is to update ARINC 842 to provide implementation guidance specifically for Online Certificate Provisioning of aircraft systems. The scope includes both the onboard part (aircraft system) as well as the ground part (PKI provider and Ground Infrastructure). Interoperability between systems is a major objective. To achieve such interoperability while limiting the implementation cost, the interface is to be based on the EST protocol (Enrollment over Secure Transport) which has been standardized as RFC 7030.

4.0 Benefits

4.1 Basic Benefits

Operation 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: _Digital Certificate delivered online_

Product offered by more than one supplier yes ☒ no ☐

Identify: Airbus, Collins Aerospace

4.1.1 Benefits for Airlines

- Enables Secure and Operable Certificate Management for aircraft systems

- Lower Ground Infrastructure cost by using common PKI infrastructure and standards for multiple systems

4.1.2 Benefits for Airframe Manufacturers

- Reduce development effort

4.1.3 Benefits for Avionics Equipment Suppliers

- Better market opportunities through enhanced interoperability between products.

5.0 Documents to be Produced and Date of Expected Result

Update of ARINC 842 by May 2023.

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
ARINC 842-3	*7**	*7*	*May 2021*	*May 2023*

* Meetings are proposed to be held monthly, online in 2021, two hours each. 2022 schedule is TBD, adjusted to meet industry needs.

6.0 Comments

6.1 Expiration Date for the APIM

October 2023

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

Attachment 2

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM 21-002

ARINC Project Paper 8xx: Guidance for Wireless Use of COTS Crew Devices

1.1 Name of Originator and/or Organization

Electronic Flight Bag (EFB) Subcommittee

2.0 Subcommittee Assignment and Project Support

Electronic Flight Bag (EFB) Subcommittee

2.1 Suggested AEEC Group and Chairman

Electronic Flight Bag (EFB) Subcommittee - Dave Jones, Astronautics

2.2 Support for the Activity (as verified)

Airlines: Air France, American Airlines, Austrian Airlines, Delta Air Lines, FedEx, Lufthansa Airlines, Southwest Airlines, United, UPS

Airframe Manufacturers: Airbus

Suppliers: APiJet, Astronautics, Astronics Ballard Technology, Avionica, Collins, GE Aviation, Honeywell, Jeppesen, Lextech, Lufthansa Systems, Navblue, SatAuth, SITA, Teledyne

Others: [TBD]

2.3 Commitment for Drafting and Meeting Participation (as verified)

Airlines: American Airlines, Delta Air Lines, FedEx, Lufthansa Airlines, Southwest Airlines, UPS

Airframe Manufacturers: Airbus

Suppliers: APiJet, Astronautics, Astronics Ballard Technology, Avionica, Collins GE Aviation, Honeywell, Jeppesen, Lextech, Lufthansa Systems, Navblue, SITA, Teledyne

Others: [TBD]

2.4 Recommended Coordination with other Groups

The EFB Subcommittee will coordinate this activity with the AEEC's Network Infrastructure and Security (NIS) Subcommittee and other AEEC Subcommittees as required with co-located teleconferences.

The following are relevant to this topic:

- ARINC Specification 664 Part 5
- ARINC Project Paper 679
- ARINC Project Paper 687
- ARINC Characteristic 759
- ARINC Specification 834
- ARINC Project Paper 834A
- ATA Spec 42
- IEEE 802.11

- IETF RFC 5216

3.0 Project Scope (why and when standard is needed)

The transition from traditional installed EFBs to portable tablet EFB devices has brought the challenge of securely and reliably connecting these tablets to an Aircraft Interface Device (AID) and/or local area networks.

No ARINC guidance currently exists regarding wirelessly connecting tablet EFBs. Therefore, installations are designed by suppliers without the benefit of agreed upon industry standards, interfaces, or security measures.

Existing tablet based EFB installations are using Wi-Fi connected via:

- Dedicated Wireless Access Points (WAP) specifically installed for this purpose,
- WAP that are part of an AID,
- Using IFE provided WAPs or,
- Bluetooth connection.

The need for an ARINC standard to guarantee secure connectivity is increasing as airlines seek to obtain aircraft data for use on increasingly sophisticated EFB applications that require weather, winds aloft, atmospheric conditions, aircraft weight and balance, flight plan information etc.

3.1 Description

The objective of this APIM is to obtain authorization to prepare guidance specifically relating to installation and operation of wireless crew devices (e.g., EFB) to address areas including and not limited to:

1. Wireless technology used, e.g. type of IEEE 802.11, Bluetooth, or other
2. Device authentication methods, e.g., Pre-Shared Key versus RADIUS authentication, SSID policies etc.
3. Certificate management for both AID as well as tablet devices
4. Operating as part of a larger aircraft network
5. Network protection aspects, especially protecting unintended access by passengers (domain protection)
6. Failure mode scenarios

This work is planned to leverage of the work being performed on ARINC PP 687 as appropriate, which in turn references ARINC 842. The goal is to apply guidance provided by PP 687 specifically to the use of wireless EFB installations. The work requested by this APIM may also affect the formulation of PP 687.

The material being established through this work is not only envisioned to apply to EFB and AID suppliers but is also intended to provide guidance in other areas such as cabin crew devices, maintenance devices, and IFE providers to establish secure networks for use by EFB.

Details are to be established through the ensuing work authorized through this APIM.

3.2 Planned usage of the ARINC Standard

The vast majority of EFBs today are portable tablet devices. Connectivity for these devices is overwhelmingly wireless. The use cases will typically require additional data for specialized EFB applications. Planned usage will be industry-wide.

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

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

Airbus: (aircraft & date)

Boeing (aircraft & date) yes ☐ no ☒

Other: (manufacturer, aircraft & date) yes ☐ no ☒

Modification/retrofit requirement yes ☐ no ☒

Specify: (aircraft & date)

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? 5/2023

What is driving this date? Increasing use of wireless EFB connectivity

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

The main issues/aspects to be worked as authorized by this APIM include:

- Guidance on wireless technology used for EFBs and portable devices,
- Assure adequate security is provided, minimizing creation of attack vectors,
- Define an acceptable security certificate management process,
- Guidance for cost effective implementations for airlines.

3.4 Security Scope

Is Cyber Security Impacted (if YES, check box(es) below) yes ☒ no ☐

Aircraft Control Domain yes ☒ no ☐

Airline Information Services Domain yes ☒ no ☐

PAX Information and Entertainment Systems yes ☒ no ☐

Other: ______________________________ yes ☐ no ☒

The goal of this proposal is to establish specific guidance for the use of wireless COTS crew devices within aircraft. It is anticipated that no higher than Authentication Assurance Level 2 will be required.

The security effort will be guided by:

ARINC Specification 664P5: *Aircraft Data Network Part 5 Network Domain Characteristics and Interconnection*

ARINC Project Paper 687: *Onboard Secure Wi-Fi Network Profile Standard*

ARINC Report 842: *Guidance for Use of Digital Certificates*

ATA Spec 42: *Aviation Industry Standards for Digital Information Security*

IETF RFC 5216: *Extensible Authentication Protocol (EAP)-Transport Layer Security (TLS)*

IEEE 802.11: *Wireless Local Area Networks (WLAN) Standards.*

4.0 Benefits

4.1 Basic Benefits

Operation 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: Wireless interface between portable electronic devices and aircraft data systems and/or AID.

Product offered by more than one supplier yes ☒ no ☐

This proposed project will establish an open standard that can be implemented by any supplier.

4.2 Specific Project Benefits

This proposed project will establish an open standard that can be implemented by any supplier to provide secure wireless connectivity at competitive prices.

4.2.1 Benefits for Airlines:

- Standardize implementations by offering suggested architectures,
- Facilitate certification through use of agreed industry standards, reduce STC costs,
- Facilitate certificate management to IT, remove uncertainty still existing today,
- Manage airline expectations regarding implementation requirements.

4.2.2 Benefits for Airframe Manufacturers

- Reduce development effort and certification costs.

4.2.3 Benefits for Avionics Equipment Suppliers

- Better market opportunities through enhanced interoperability between installations.

5.0 Documents to be Produced and Date of Expected Result

New ARINC Project Paper 8xx by April 2023.

5.1 Meetings an Expected Document Completion

The following table identifies the meetings needed to produce the document described above.

Activity	Mtgs	Mtg-Days (Total)	Expected Start Date	Expected Completion Date
ARINC PP 8xx	*Monthly teleconferences*	*Semi-annual 3-day meetings online*	*June 2021*	*April 2023*

No in-person meetings are planned.

Monthly teleconferences will be held between semi-annual online meetings to maintain progress.

6.0 Comments

None

6.1 Expiration Date for the APIM

October 2023

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

Attachment 3

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM #: 21-003

ARINC Report 8XX: System Level Guidance for Data Loading Aircraft Components

New standard defining LRU dataloading targets with a focus on behavior, robustness and performance and common challenges

1.1 Name of Originator and/or Organization

Carsten Schweigert, TechSAT GmbH

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

Software Distribution and Loading (SDL) Subcommittee

Ted Patmore / Chris Kuske

2.2 Support for the Activity (to be expanded)

Airlines: Delta Air Lines, KLM

Airframe Manufacturers: Boeing, Airbus

Suppliers: TechSAT GmbH, Teledyne Controls, AIT, MBS, Collins Aerospace, GE Aviation, Astronics, Honeywell, Safran, Aero Instruments

Others: TBD

2.3 Commitment for Drafting and Meeting Participation (to be expanded)

Airlines: Delta Air Lines, KLM

Airframe Manufacturers: Boeing, Airbus

Suppliers: TechSAT GmbH, Teledyne Controls, AIT, MBS, Collins Aerospace, GE Aviation, Astronics, Honeywell, Safran, Aero Instruments

Others: TBD

2.4 Recommended Coordination with Other Groups

Liaise and interface with ARINC groups concerned with functional needs/constraints for

- databases,
- complex platforms as required.

3.0 Project Scope (why and when standard is needed)

This project intends to provide guidance for the implementation of dataloading functions on LRU targets.

Existing, certified targets will not require updates by this standard. The document is focused on improving new target development, as well as design refreshes where commercially and technically appropriate.

Lack of common guidance and commonly formulated design considerations for dealing with typical challenges such as implementing short loading, parallel loading, cross-loading or loading of more complex platforms often create challenges resulting in

- unexpected operational behavior,
- not fully realized performance and violation of expected load times,
- corrupted or inconsistent states of installation,
- as well as inability to reload/recover LRUs after upload failures.

As this function resides within the target LRUs subject to airborne certification processes, incorrect behavior is very costly to correct, and timelines for correction are long, as compared to errata within a dataloader which can be often corrected swiftly.

As an additional opportunity, relevant guidance on target design considerations for integrity check target data security recommendations can be integrated as required.

Scope Targets
- Cost-savings: Common patterns - Description of expected characteristic for commonly encountered performance, robustness and predictability goals intends to enable significant cost-savings for next-generation LRU target loader designs and implementations.
- Reducing incorrect failure behaviors: system-level behavior for common load failures – allowing checklists during design process.
- Performance: optimized load times due to commonly known design tradeoffs.

3.1 Description

ARINC dataloading standards have been implemented and matured well at protocol level between LRUs and airborne and portable data loading systems.

But the behavior as well as performance is largely driven by the conceptual design of the LRU target. Recommended and expected methods for performance/load time enhancements include implementation
- Short loading
- Cross loading
- Parallel loading/cross-loading
- Semantic behavior for software location IDs for software upgrades or replacement and subsequent LSAP config reporting
- Security enhancements
-

This project aims to provide system-level guidance for recommended behavior, tradeoffs and pitfalls to consider when implementing target loaders implementing ARINC protocols for loading ARINC 665 (and ARINC 615) LSAPs.

As a more detailed example, guidance and expected behavior is intended to enable robust design decisions for short loads with regards to

- structuring of the loads,
- and installation/update behavior within the target platform
- ability to replace partially corrupted loads during short loads by subsequent short or full loads as applicable and adequate LRU config management and reporting
- … for distinctly different loads types such as operating software loads, simple LRU applications, complex LRU applications as well as databases and other loads.

For large software loads, respective design considerations for packaging/partitioning and transfer mechanisms such as parallel loads and crossload are to be included.

Regarding robustness, recommended techniques and behaviors for dealing with load failures (compatibility, memory space, integrity) will be described for design consideration.

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: (aircraft & date)

Boeing: (aircraft & date)

Other: (manufacturer, aircraft & date)

Modification/retrofit requirement yes ☐ no ☒

Specify: (aircraft & date)

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

The considered topics for design guidance include

- Choosing/bundling the right software types – operating systems, databases, system applications, user applications, third-party applications, etc
- Tradeoff considerations – field loadable vs. not
- Short loads
- Dealing with unexpected behavior
- Interruptions, wire-cuts, power-cuts and recovery
- Parallel loading, multi-channel, multi-LRUs, etc
- Cross-loading
- Dealing with load corruptions/inconsistencies and design options for recovery
- Configuration reporting for complex platforms
- Compatibility checks for complex platforms
- Load proxy/forwarding/gateway functions
- Partitioning for onboard vs. shop loading
- Shop loading
- Boot loading considerations for LSAPS – partitioned OS, bare-metal, COTS, etc.
- Partitioning for boot vs loadable LSAPs
- Considerations for security checks – loader vs. target
- Etc.

3.4 Security Scope

Is Cyber Security Impacted (if yes, check box(es) below) yes ☐ no ☒

Aircraft Control Domain yes ☐ no ☒

Airline Information Services Domain yes ☐ no ☒

PAX Information and Entertainment Systems yes ☐ no ☒

Other ________________________________ yes ☐ no ☒

(Discuss the level of cyber security guidance needed, the specific topics to be covered, and whether these topics are covered elsewhere by reference, e.g., ICAO Documents, RTCA/EUROCAE Standards, existing ARINC Standards, or if they need to be defined by a new or revised ARINC Standard.)

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: applies to LRU manufacturers

4.2 Specific Project Benefits (Describe overall project benefits.)

4.2.1 Benefits for Airlines

- Optimized LRU load times via well-defined short load/parallel load concepts
- Avoiding situations when LRUs cannot be loaded after upload failure

4.2.2 Benefits for Airframe Manufacturers

- Reduced LRU development/sourcing cost during development
- Optimize SW LSAP partitioning for new airframes by predictable design tradeoffs

4.2.3 Benefits for Avionics Equipment Suppliers

- Reduced risk and cost through standardized loader behavior for common cases

5.0 Documents to be Produced and Date of Expected Result

ARINC Report 8XX: *Target Loader Design Guidance*

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
ARINC Report 8XX	*24*	*2 hours per meeting (48 hours total)*	*June 2021*	*April 2023*

6.0 Comments

The SDL Subcommittee has other APIMs in-work. Work on all projects are done in parallel. The SDL will have monthly web conferences to discuss and modify their assigned projects.

In May 2021, the SDL will have one APIM open (16-015A).

6.1 Expiration Date for the APIM

April 2024

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

Attachment 4

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM: 21-004

This APIM proposes development of the following document:

Supplement 4 to ARINC Report 615A: *Software Data Loader Using Ethernet Interface*

Developing guidance and clarification for methods of concurrent software data loading to multiple targets.

1.1 Name of Originator and/or Organization

Ted Patmore, Delta Air Lines

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

Software Distribution and Loading (SDL) Subcommittee

Co-Chairman: Chris Kuske, Teledyne Controls

Co-Chairman: Ted Patmore, Delta Air Lines

2.2 Support for the Activity (as verified)

Airlines: Delta, KLM, FedEx

Airframe Manufacturers: Airbus, Boeing

Suppliers: Honeywell, TechSAT, Safran, Teledyne Controls, mbs Electronics, AIT, Collins Aerospace, Safran, Aero Instruments, Honeywell, GE Aviation

Others:

2.3 Commitment for Drafting and Meeting Participation

Airlines: Delta, KLM, FedEx

Airframe Manufacturers: Airbus, Boeing

Suppliers: Honeywell, TechSAT, Safran, Teledyne Controls, mbs Electronics, AIT, Collins Aerospace, Safran, Aero Instruments, Honeywell, GE Aviation

Others:

2.4 Recommended Coordination with Other Groups

TBD

3.0 Project Scope (why and when standard is needed)

3.1 Description

ARINC 615A defines the standard protocol for loading software to aircraft systems and components. Software loading is performed by communication to specific components (IP load targets).

Many modern system components are organized within an Integrated Modular Avionics (IMA) architecture, where several functions, are contained within one cage or cabinet of computing modules, capable of supporting numerous applications. In many cases, each application is a separate load target, with its independent ARINC 615A IP address, which may require that all applications must be loaded sequentially, one at a time.

This APIM proposes to standardize parallel loading capability to ARINC 615A, thus decreasing the time needed to load a complete IMA cabinet, other LRUs that contain multiple load targets, or systems that have multiple ARINC 615A load targets accessible by one common ARINC 615A ethernet bus or ARINC 615A over AFDX bus.

Typically, within ARINC 615A, multiple loads to targets that each have unique IP addresses may be implemented using concurrent threads. The loader may keep track of each occurring load event by mapping each target IP within the Trivial File Transfer Protocol (TFTP) software.

Another option possible in ARINC 615A is to use the Port Option which allows the load Target Hardware to have unique IDs by initiating communication with unique target control port numbers. This can be used for multiple load targets where each target has the same IP address, but different port numbers.

An additional option known as multicast may be considered by the SDL WG. This would be used in cases where many software load targets are required to be loaded with the same software.

In summary two, or possibly three types of concurrent software data loading should be clarified:

- Multiple software load targets where each target has a unique IP address.
- Multiple software load targets where each target has the same IP address, but uses a different port number.
- Optional addition of multicast loading method for multiple targets all requiring the same software loaded. (This will be investigated by the WG to form a vision of future use cases).

Another current issue to be worked with the current ARINC 615A document is that there are errata to be incorporated in Section 5 identified that need to be corrected.

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: (aircraft & date)

Boeing: (aircraft & date)

Other: (manufacturer, aircraft & date)

Modification/retrofit requirement yes ☐ no ☒

Specify: (aircraft & date)

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? ______________

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

(Describe the major issues to be addressed.)

- Research known load targets that can benefit from parallel loading
  - (IMA Cabinets and other systems)
- Research and consolidate known probable use cases to determine a unified solution.
- Choose best approach to implement concurrent multiple data path communications based on unified solution requirements.
- Define and outline software protocol modifications required to utilize ARINC 615A
- Maintain backwards compatibility with current ARINC 615A functions.
- Determine if there are two or more methods of concurrent target loading currently in use.
- Review and incorporate errata and editorial into document

3.4 Security Scope

Is Cyber Security Impacted (if yes, check box(es) below) yes ☐ no ☒

Aircraft Control Domain yes ☐ no ☒

Airline Information Services Domain yes ☐ no ☒

PAX Information and Entertainment Systems yes ☐ no ☒

Other ___________________________________ yes ☐ no ☒

(Discuss the level of cyber security guidance needed, the specific topics to be covered, and whether these topics are covered elsewhere by reference, e.g., ICAO Documents, RTCA/EUROCAE Standards, existing ARINC Standards, or if they need to be defined by a new or revised ARINC Standard.)

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: ___Backwards Compatible to Single Path of ARINC 615A_

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

Specify: __Software Loading Protocol__

Product offered by more than one supplier yes ☒ no ☐

Identify: Data Loading Equipment Suppliers

4.2 Specific project benefits (Describe overall project benefits)

4.2.1 Benefits for Airlines

Significant Reduction in ground time required to load software to multiple targets

4.2.2 Benefits for Airframe Manufacturers

Increased efficiency in maintainability in terms of reduced aircraft ground maintenance time.

4.2.3 Benefits for Avionics Equipment Suppliers

Improved software loading time requirements of product.

5.0 Documents to be Produced and Date of Expected Result

The document produced will be Supplement 4 to ARINC Report 615A: *Software Data Loader Using Ethernet Interface*

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
ARINC 615A-4	*24*	*2 hours per mtg (48 hours total)*	*June 2021*	*April 2023*

Please note the number of meetings, the number of meeting days, and the frequency of web conferences to be supported by the IA Staff.

6.0 Comments

The SDL Subcommittee has other APIMs in-work. Work on all projects are done in parallel.

The SDL has monthly web conferences to discuss and modify their assigned projects.

6.1 Expiration Date for the APIM

April 2024

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

Attachment 5

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 future designs, or retrofit designs, 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.

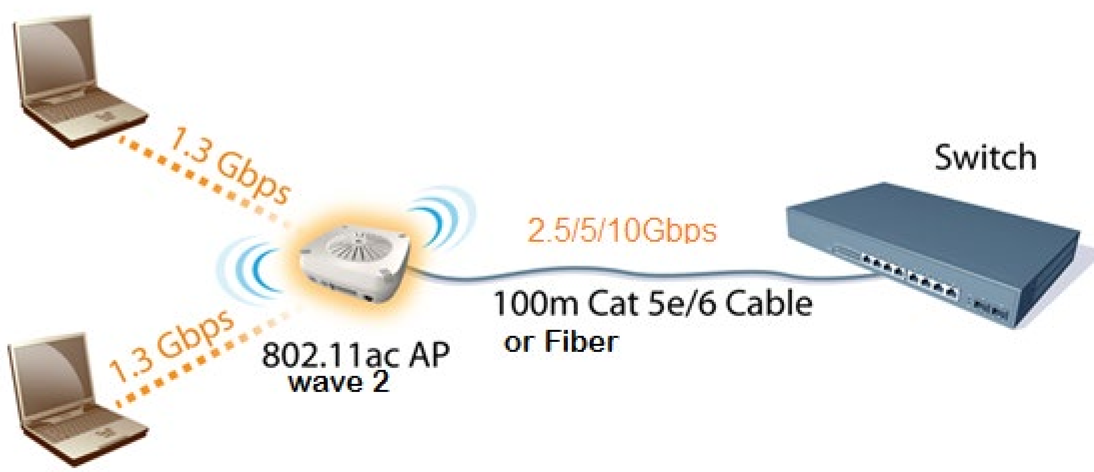
See Attachment 2 for the original project charter.

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

Attachment 6

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM 19-004*A*

New ARINC Project Paper xxx: Cabin Secure Media Independent Messaging

1.1 Name of Originator and/or Organization

Safran Aerospace

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

Cabin Systems Subcommittee (CSS)
Jecelin Peterson, Boeing / Fritz Urban, Airbus

2.2 Support for the activity (as verified)

Airlines: Delta, Etihad

Airframe Manufacturers: Boeing, Airbus

Suppliers: Safran Passenger Systems, Panasonic, Thales, Crane, Lufthansa Technik, Astronics, Zodiac Seats UK, KID Systeme, Recaro, BAE Systems, Diehl

Others:

2.3 Commitment for Drafting and Meeting Participation (as verified)

Airlines: Delta, Etihad

Airframe Manufacturers: Boeing, Airbus

Suppliers: Safran Passenger Systems, Panasonic, Thales, Crane, Lufthansa Technik, KID Systeme, Astronics, Recaro, BAE Systems, Diehl

Others:

2.4 Recommended Coordination with other groups

Network Infrastructure and Security (NIS) Subcommittee

EFB Subcommittee

SAI Subcommittee

3.0 Project Scope (why and when standard is needed)

3.1 Description

Refer to attached White Paper

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: (aircraft & date)

Boeing: (aircraft & date)

Other: (manufacturer, aircraft & date)

Modification/retrofit requirement yes ☒ no ☐

Specify: (aircraft & date)

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

When is the ARINC standard required? ______(ASAP) __________

What is driving this date? Many existing integrations between different suppliers of IFE & IFC

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

Define the following:

- M2M messaging infrastructure services necessary to communicate with networked components based on selected IoT services and protocols (REST, CoAP or MQTT, DTLS, CBOR, etc.);
- Rules for URI mapping of device attributes and services for access by applications executing on other networked devices;
- Machine readable schema (e.g., JSON Hyper-schema) that will be used by suppliers and integrators to describe device interfaces, device interaction and path to source data;
- Common device attributes and services necessary to enable network integration, security, installation and management;
- Aircraft systems semantic ontology used to document device interfaces;
- Semantic ontological repository to allow open access for supplier contributions, configuration managed to support application developers and integrators;
- Subsystem and system verification testing approach based on declared component functionality and integrator defined components and information paths;
- Limited exposure of some component attributes and services and the manner in which they are made available for access by non-avionics data analytic maintenance applications.

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)

Panasonic Avionics Corporation
Thales InFlyt Experience

Safran Aerospace

Crane

Astronics

Recaro

4.2 Specific project benefits (Describe overall project benefits.)

4.2.1 Benefits for Airlines

Common messaging infrastructure across aircraft wired and wireless networks allows simplified system integration for aircraft functional expansion including new sensors, new applications and shared information across dissimilar networks to achieve improved operations and maintenance.

4.2.2 Benefits for Airframe Manufacturers

Similar to airline benefits

4.2.3 Benefits for Avionics Equipment Suppliers

Similar to airline benefits

5.0 Documents to be Produced and Date of Expected Result

ARINC 8xx new document, +18 months

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
Develop ARINC Project Paper xxx	4	4 (using 1 of 3 SC meeting days)	Oct 2019	May 2025

This effort is part of the larger Cabin Systems Subcommittee effort. The draft document will be discussed in web conferences as needed.

The APIM update in 2021 moved expected completion dates forward 48 months due to world economic pressures, as well as internal corporate priorities.

Comments

none

5.2 Expiration Date for the APIM

October 2025

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

Background Information

APIM 19-004
Cabin Secure Media Independent Messaging

1.0 Introduction

A typical aircraft hosts many networked systems from different suppliers. In most cases, these systems operate independently and, with limited exceptions, are unable to benefit from equipment commonality, integrated maintenance or centralized management.

New cabin system designs are beginning to integrate cabin functions in aid of overarching functions like data collection and off-load for predictive maintenance and the creation of expanded crew awareness such as display of cabin status including TTL safety checks on portable crew devices.

Expanded cabin functionality and cabin systems integration are expected to touch galleys, lavatories, passenger service units, entertainment services, window controls, lighting and many other systems.

Integration of systems from different suppliers is only possible if communications interfaces and protocols are standardized. Similarly, suppliers require common standards to affordably produce new devices that can communicate with and be easily integrated into a variety of cabin systems.

Wireless system intra-communications is rapidly becoming the preferred system architectural approach to achieve reduced weight, reduced cost and ease of system reconfiguration/expansion.

Onboard networks vary widely in their needs for power, throughput, distance, location, number of clients, etc. From a wireless communications perspective, one size does not necessarily fit all: different aircraft interconnect systems come with different technical problems and benefit from different network architectures and communications mediums, whether wired or wireless.

Ethernet, Bluetooth, WAIC, RFID, Wi-Fi, ZigBee –each technology has unique attributes that make it the most efficient and/or cost-effective solution for a specific onboard task.

A common inter-application communications infrastructure is required to enable onboard sensors, clients and applications to communicate and share information across a variety of task-optimized communications mediums.

2.0 Messaging

Application-to-application communications across dissimilar networks is common in the IP-world and has been further pushed forward in the commercial electronics industry through the development of communications standards for the Internet of Things (IoT), which includes a larger variety of different client platforms and network technologies.

Machine-to-Machine (M2M) communications between applications and IoT devices occur at the presentation and application layer of the OSI stack, thereby abstracting network-specific physical interfaces and protocols. Standards for M2M messaging on the IoT offer a well-defined framework that can be used for aircraft cross-system communications.

The IoT does not depend on fixed addresses or device-specific functions. Rather, IoT applications rely on a “discovery” process. When a new device is discovered on the network, an application can refer to a common Resource Repository to determine device capabilities and determine how to access the attributes and services of the new device. The discovery process allows new devices and new applications to be introduced to networks at will and it works because IoT devices and applications use a common language to describe their capabilities and interfaces. When a new IoT device is attached to a home network its capabilities can be automatically discovered so its features and services can be incorporated by existing

applications. While useful and clever in the home market, device discoverability is not necessarily a positive attribute in network environments with strict configuration management rules.
Aircraft networks employ fixed configurations, established by system integrators. Introducing IoT-type devices and communications into an aircraft environment will require certain standard adaptations to ensure adherence to aircraft certification and configuration management processes.
The overall utility of M2M communications for integration of new aircraft functionality will depend on standard definitions for device attributes and services that can be mapped by system integrators to manage the application interaction necessary to create new functionality.
The definition of a standardized M2M messaging interface for each avionics component enables the development and certification of new aircraft applications which can be introduced without impacting existing certifications.

3.0 Device Interface Definition Format

Traditional avionics suppliers provide an Interface Control Document (ICD) for each aircraft equipment that defines precisely how its attributes and services are accessed. An aircraft system integrator then utilizes equipment ICDs to define the system interconnections to distribute data from sources to destinations. This process works because RTCA/EUROCAE MOPS and ARINC documents exist which specify common interfaces between suppliers. It is also a fixed process that is slow and difficult to change. New sensor and wireless communications technologies are being developed at a rate that existing processes for equipment standardization can no longer support.
Interface definitions for IoT devices are written in a human-readable form. The most popular formats for interface definition are eXtended Markup Language (XML) or JavaScript Object Notation (JSON) schema. The interface definition for a given IoT device fully describes the accessible features of the device. An IoT device's interface schema is the functional equivalent of an aircraft equipment ICD. The structure of the device schema is usable by applications as an extension of the device address to access specific device attributes and services.
An IoT device's interface definition is described by the supplier in an importable schema. This same schema concept is used to describe the interface definitions of a subsystem. A system integrator defines new aircraft functions by linking function-specific applications to the imported attributes and services of member devices.

4.0 Core Device Features

System integrators depend on a common set of attributes and services from each network device to allow that each device to be incorporated and managed in a common manner. The following core services will enable system integrators to build network solutions from compliant avionics components:

- Authentication/authorization
- Remote (Wireless) Data load
- Configuration Management, including access controls
- Security/Cryptographic Key/Certificate Management
- Maintenance Services (BITE, etc.)
- Maintenance Logging and Reporting
- Security Logging and Reporting

5.0 Device Addressing

Aircraft network addressing must accommodate both wired and wireless devices in fixed or mobile operation. In any case, networks will no longer be dependent on fixed hardware adapter physical addresses (e.g. Ethernet). Instead, access to IoT devices will be based on web addressing using Uniform Resource Identifiers (URI). Access to individual device attributes and services will be accomplished by extending a device URI with the name of the attribute or service as defined in the semantic ontology. For example:

Each property or service in the device schema has a reference URI which consists of the device name with a concatenated name of the property or service.

e.g., “readingLight/on”

An integrator embedding a predefined device into passenger seat would import the device’s JSON schema and create an instance of the device schema. The URI to access a property or service of a device instance would be built by concatenating the name of the current container object (“seat”) with the partial URI from the embedded object to form a unique description.

e.g., “seat/readingLight/on”

Continuing with the seat example, one or more instantiations of the seat object can be embedded into a seat group. Each instance of seat is given a unique name. The URI to access any addressable element of an object in the seat group is built by concatenating the seat group name “seatGroup” with the name of an object instance e.g., “seat1” with the name of the device followed by the name of the property or service.

e.g., “seatGroup/seat1/readingLight/on”

This same process occurs as the cabin integrator embeds instances of seatGroup into a Row schema and instances of Row into a cabin schema.

e.g., “Row/MiddleSeatGroup/seat1/readingLight/on”

becomes

“LH748Cabin/Row33/MiddleSeatGroup/seat1/readingLight/on”

The only remaining step for the system integrator is to concatenate the link type and authority address with any URI address chain to derive a fully formed address to a parameter on the network.

e.g.,
“coap://192.168.1.1/LH748Cabin/Row33/MiddleSeatGroup/seat1/readingLight/on”

The above integration process can be highly automated and can be fully verified at every subsystem step to significantly simplify the total aircraft-level integration effort.
Each subsystem can limit how many of its internal attributes and services are accessible by only exposing some attributes and services in its schema that will be imported for integration on other systems.
The nested subsystems in the above example also illustrate how subsystem testing can be accomplished within the IoT metaphor. Every subsystem (e.g., seat) is independently testable since the subsystem schema fully defines the attributes and services available for communications with other systems.

6.0 Semantic Ontology

IoT applications are able to establish communications with new IoT devices on the network because they share a common descriptive language for defining device capabilities, attributes and methods and a common M2M messaging service for communicating between devices. A Semantic Ontology is the common dictionary for a collection of IoT devices.
Semantic ontologies tend to differ from one industry to another and are typically built from modular device ontologies such as the Semantic Sensor Network Ontology on the World Wide Web. Industry-specific semantic ontologies are hosted on W3.org so as to be universally accessible by device developers and system integrators. The medical and automotive industries have semantic ontologies on W3.org. No semantic ontology exists for the aviation industry on W3.org today.
A semantic ontology for the aviation industry must be built based on a common base object that defines all of the standard attributes and services which every other aviation device will inherit. Avionics suppliers define new device interfaces based on the terminology used in the semantic ontology. The semantic ontology will expand as new and unique device capabilities are incorporated into the ontology by equipment suppliers.

7.0 RTCA DO-356A Security Compliance

RTCA SC-236 Wireless Avionics Intra-Communications (WAIC) is currently defining equipment and network requirements for wireless avionics communications devices operating in the 4.2-4.4 GHz band. SC-236 performed an analysis based on DO-356A/ED-203A security guidelines which identified vulnerabilities associated with authentication, data load and configuration of wireless equipment on aircraft. SMIM requirements will address these vulnerabilities to ensure networks that use SMIM are capable of DO-356A/ED-203A compliance when using either wired or wireless media types.

8.0 Key Tasks

The ARINC Specification must specify:

- M2M messaging infrastructure services necessary to communicate with networked components based on selected IoT services and protocols (REST, CoAP or MQTT, DTLS, CBOR, etc.);
- Rules for URI mapping of device attributes and services for access by applications executing on other networked devices;
- Machine readable schema (e.g., JSON Hyper-schema) that will be used by suppliers and integrators to describe device interfaces, device interaction and path to source data;
- Common device attributes and services necessary to enable network integration, security, installation and management;

- Aircraft systems semantic ontology used to document device interfaces;
- Semantic ontological repository to allow open access for supplier contributions, configuration managed to support application developers and integrators;
- Subsystem and system verification testing approach based on declared component functionality and integrator defined components and information paths;
- Limited exposure of some component attributes and services and the manner in which they are made available for access by non-avionics data analytic maintenance applications.

While the above list of tasks may initially appear daunting for the development of a new ARINC Specification, this activity can pull extensively from existing IoT standards and emulate semantic ontology models developed for the medical and automotive industries to reduce the total project effort.

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Attachment 7

Attachment 7

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project — APIM 18-001*A*

New ARINC Project Paper 8xx: 5th Generation Cabin Network (5GCN)

1.1 Name of Originator and/or Organization

Cabin Systems Subcommittee (CSS)

Rolf Goedecke, Airbus

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

Cabin System Subcommittee (CSS)

Dale Freeman, Delta Air Lines

2.2 Support for the activity (as verified)

Airlines: Delta Air Lines

Airframe Manufacturers: Airbus

Others: Collins, Panasonic, Thales, ZII, Amphenol, Molex, Souriau, Radiall, TEC, Miltope

2.3 Commitment for Drafting and Meeting Participation (as verified)

Airlines: Delta Air Lines

Airframe Manufacturers: Airbus

Others: Collins, Panasonic, Thales, ZII, Amphenol, Molex, Souriau, Radiall, TEC, Miltope

2.4 Recommended Coordination with other groups

Network Infrastructure and Security (NIS), Fiber Optic Subcommittee (FOS)

3.0 Project Scope (why and when standard is needed)

3.1 Context

The scope of this project is to develop the next generation (5th) Cabin Distribution Network as an enhancement of the 4GCN standard. The standardization will combine multiple networks to a distribution network with single backbone. Advantages of the new fiber components (ARINC 846) as well as the next generation cabin network bus (ARINC 854) with a special focus on the topology with consideration of future bandwidth needs, redundancy, reliability and reconfigurability. The standard includes connectors, pin allocation, data bus and the protocol of the interfaces to allow interchangeability. An effort will be made to create a plug-and-play standard for in-seat and cabin peripherals.

3.2 Description

A standardized system answering a set of agreed customer functions and needs with a standardized network topology scalable to aircraft size and customer options with standardized interfaces and provisions in the aircraft to reduce the customization effort to a minimum.

3.3 Planned usage of the envisioned specification

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

Airbus: all new

Boeing:

Modification/retrofit requirement yes ☐ no ☒

Specify: Airlines are retrofitting cabin systems into their existing fleets.

Needed for airframe manufacturer or airline project yes ☒ no ☐

Specify: driven by the need to provide common definitions for the airplane programs and retrofit programs

Mandate/regulatory requirement yes ☐ no ☒

Program and date: No mandate

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

Specify:

When is the ARINC Standard required? Per aircraft program

What is driving this date? Aircraft Development Schedules

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

3.4 Issues to be worked

- Functions
  - Provide high bandwidth to all passenger seats and connected cabin equipment
  - Network security considerations
- Architecture
  - Definition of single cabin backbone and system topology to minimize customization effort and to allow scalability
- Interface
  - Definition of standardized mechanical and electrical interfaces to the aircraft
  - Connectors and cabling and electrical interfaces for cabin devices

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 ☐

Product offered by more than one supplier yes ☒ no ☐

Identify:

4.2 Specific project benefits (Describe overall project benefits.)

The standardization of the 5GCN will increase the bandwidth needed for future and will take advantage of new high-speed network components.

4.2.1 Benefits for Airlines

The standardization of the 5GCN will ease customization and integration of such equipment in commercial aircrafts and allows fleet commonality between suppliers

4.2.2 Benefits for Airframe Manufacturers

It will provide the required bandwidth for future needs and makes use of new highspeed network components in order to simplify the cabin networks. It allows to standardize the provisions on the aircraft and reduces the lead time for the airlines as there is interchangeability of units, using the same mechanical and wiring provisions as well as data bus protocols.

4.2.3 Benefits for Avionics Equipment Suppliers

This standard supports the main goals to provide high bandwidth in conjunction with reliability and easy configurability by a simplified and harmonized topology and using the latest commercial standards to guarantee the quality of service. A single standard among different suppliers allows interchangeability and reduces development cost and therefore cost for the airlines.

5.0 Documents to be Produced and Date of Expected Result

- **New ARINC Project Paper 8xx:** *5GCN Seat Network*
- **Supplement 1 to ARINC Specification 846:** *Fiber Optic Ferrule, Mechanical Termini*
    - Develop new hybrid MT fiber and copper insert, using a new ARINC-defined rectangle MT fiber terminus.
- **Supplement 4 to ARINC Specification 664**: *Aircraft Data Network, Part 2, Ethernet Physical and Data Link Layer Specification*
    - Update Part 2 to include IEEE 802.3 bz Ethernet standard
- **Supplements to ARINC Specification 800**, Part 2 (Connectors), Part 3 (Cables), and Part 4 (Standard Test Methodology)
    - Updates for new revised connector and cable components and testing of the new links
- **Supplement 5 to ARINC Report 803:** *Fiber Optic Design Guidelines*
    - Updates for MT termini use cases
- **Supplement 6 to ARINC Report 805:** *Fiber Optic Test Procedures*
    - – Updates for MT termini use cases

- **Supplement 7 to ARINC Report 806:** *Fiber Optic Installation and Maintenance*
    - – Updates for MT termini use cases
- **Supplement 5 to ARINC Report 807:** *Fiber Optic Training Requirements*
    - – Updates for MT termini use cases
- **Supplement 1 to ARINC Specification 836A:** *Cabin Standard Enclosures*
    - – Updates for new MT fiber connectors use in the Mini-MRP

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
ARINC Project Paper 8XX	***12***	***36***	*6/23*	*6/25*
Supplement 4 to ARINC 664, Part 2			*6/23*	*6/25*
Supplements to ARINC 800, Parts 2,3,4			*6/23*	*6/25*
Supplement 1 to ARINC 803			*6/23*	*6/25*
Supplement 6 to ARINC 805			*6/23*	*6/25*
Supplement 7 to ARINC 806			*6/23*	*6/25*
Supplement 5 to ARINC 807			*6/23*	*6/25*
Supplement 1 to ARINC 836A			*6/23*	*6/25*

* Meeting days reflect CSS meetings responsible for multiple ARINC Standards. In addition to the in-person meetings identified above, web conferences will be called to support specific project goals.

* Updates to ARINC 803, 805, 806, 807, and 846 may require inputs prepared by the Fiber Optic Subcommittee.

The APIM update in 2021 moved expected completion dates forward 48 months due to world economic pressures, as well as internal corporate priorities.

6.0 Comments

none

6.1 Expiration Date for this APIM

October 2025

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

Attachment 8

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM 17-007A

ARINC Specification 812A: Standard Data Interfaces for Galley Inserts (GAIN), Digital Interface Update for Health Management Messages, Functionality, and System Integration

1.1 Name of Originator and/or Organization

Galley Inserts (GAIN) Subcommittee

Airbus/Boeing, Co-Chairman

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Co-Chairmen

Galley Inserts (GAIN) Subcommittee

Adam Cha, Boeing

Christian Auris, Airbus

2.2 Support for the activity (as verified)

Airlines: Lufthansa, United Airlines

Airframe Manufacturers: Airbus, Boeing

Suppliers (TBC): B/E Aerospace, Zodiac, Iacobucci HF Electronics, IPECO, Jamco

Others:

2.3 Commitment for Drafting and Meeting Participation (as verified)

Airlines: TBD

Airframe Manufacturers: Airbus, Boeing

Suppliers (TBC): B/E Aerospace, Zodiac, Iacobucci HF Electronics, IPECO, Jamco

Others:

2.4 Recommended Coordination with other groups

CAN Working Group

3.0 Project Scope (why and when standard is needed)

3.1 Description

ARINC Specification 812A defines interfaces to functional catering components (i.e., beverage makers, ovens, refrigerators, trash compactors, etc.), specifically the Controller Area Network (CAN) data interfaces and data content to be considered between all galley equipment using a Galley Data Bus.

ARINC 812A includes two parts, Part 1 includes the definition of CAN data interfaces and protocols for digital galley equipment and Part 2 includes the definition of verification test procedures for ARINC 812A Part 1 bus protocol implementation.

Production implementation of the ARINC 812A protocols have led to the identification of changes and corrections that should be updated. This project will resume the important work of the GAIN Subcommittee. Specifically, the work will focus on the following:

- Development of Supplement 2 to ARINC Specification 812A Part 1: *Standard Data Interface for Galley Insert (GAIN) Equipment, CAN Communications*, which will:
  - Identify and incorporate changes necessitated by production implementation of digital Galley Equipment.
  - Update messages based on changes introduced by Supplement 3 to ARINC 825.
  - Consider the effect of the new CAN FD protocol on ARINC 812A-compliant components
  - Address data security and provide guidance as needed.
  - Update the XML and XSD support files as required.
- Development of Supplement 1 to ARINC Specification 812A Part 2: *Standard Data Interface for Galley Insert (GAIN) Equipment, CAN Communications, Verification, and System Test Guidance*, which will update the verification test procedures based on the changes identified in Supplement 2 to ARINC 812A Part 1. **Development of Part 2 will commence upon acceptance of Supplement 2 to ARINC Specification 812A Part 1.**

3.2 Planned usage of the envisioned specification

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

Airbus: all new

Boeing: 777X

Modification/retrofit requirement yes ☐ no ☒

Needed for airframe manufacturer or airline project yes ☒ no ☐

Specify: driven by the need to provide common definitions for the airplane programs and retrofit programs

Mandate/regulatory requirement yes ☐ no ☒

Program and date: No mandate

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

Specify:

When is the ARINC Standard required? Per aircraft program

What is driving this date? Aircraft Development Schedules

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

- Incorporate enhanced health management messaging, functionality, and system integration
- Improve GAIN serial number capability, PBM (0, t) misinterpretation, and CAN-Bus recovery.
- Incorporate remote control messaging as optional feature.

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 ☐
Product offered by more than one supplier	yes ☒ no ☐

Identify: B/E Aerospace, Zodiac, Zodiac Controls, IPECO, Iacobucci HF Electronics, Jamco

4.2 Specific project benefits (Describe overall project benefits.)

GAIN standards provide a common distribution system for Airbus and Boeing multi- and single-aisle aircraft. These standards focus on communications protocols and messaging that are beneficial to the airlines, airframe manufacturers, and suppliers.

4.2.1 Benefits for Airlines

- Equipment interoperability between suppliers
- Reduction in development cost, improved reliability, and therefore reduced cost for the airlines

4.2.2 Benefits for Airframe Manufacturers

- Equipment interoperable between suppliers
- Flexibility and reduced costs by working from the same set of guidelines
- Reduction of time and cost for new developments due to reuse of proven solutions

4.2.3 Benefits for Avionics Equipment Suppliers

- Eliminates the need to design custom provisions for each installation
- Reduction of time and cost for new developments due to reuse of proven solutions

5.0 Documents to be Produced and Date of Expected Result

- Supplement 2 to ARINC 812A Part 1 **(completed May 2021)**
- Supplement 1 to ARINC 812A Part 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
Supplement 2 to ARINC 812A Part 1	1*	3	June 2017	**Completed May 2021**
Supplement 1 to ARINC 812A Part 2	1*	3	**May 2021**	**April 2022**

* In addition to the in-person meetings identified above, monthly web conferences will be used to prepare material for review.

6.0 Comments

None.

6.1 Expiration Date for this APIM

April **2022**

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

Attachment 9

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project — APIM 16-006A

Broadband Satellite System Installation and Equipment Interfaces

1.1 Name of Originator and/or Organization

Ku/Ka Band Satellite Communications (KSAT) Subcommittee

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

Ku/Ka Band Satellite Communications (KSAT) Subcommittee
Chris Schaupmann, Airbus

2.2 Support for the activity (as verified)

Airlines: American Airlines, Delta Air Lines, FedEx, United Airlines
Airframe Manufacturers: Boeing, Airbus, Bombardier (TBC)
Service Providers: Viasat, Panasonic, Intelsat, Inmarsat (TBC), Hughes (TBC)
Suppliers: IDirect, Carlisle, Kontron, SCI Systems
Others: Totaport

2.3 Commitment for Drafting and Meeting Participation (as verified)

Airlines: American Airlines, Delta Air Lines (TBC), FedEx (TBC), United Airlines
Airframe Manufacturers: Boeing, Airbus, Bombardier (TBC)
Service Providers: Viasat, Panasonic, Intelsat, Inmarsat (TBC), Hughes (TBC)
Suppliers: IDirect, Carlisle, Kontron, SCI Systems,
Others: Totaport

2.4 Recommended Coordination with other groups

Air/Ground Communications Systems (AGCS) Subcommittee
Cabin Systems Subcommittee (CSS)
Fiber Optics Subcommittee (FOS)
Internet Protocol Suite (IPS) Subcommittee
Network Infrastructure and Security (NIS) Subcommittee
Systems Architecture and Interfaces (SAI) Subcommittee

3.0 Project Scope (why and when standard is needed)

3.1 Description

ARINC 791, Part 1 and ARINC 791, Part 2 define Ku-Band and Ka-Band satellite communication (satcom) equipment, installation and necessary interfaces to aircraft systems. Airlines, aircraft manufacturers, avionics suppliers, IFE suppliers, cabin communication suppliers and service providers with an interest in providing this equipment and services have participated in these activities.

It is recommended that the following work be performed to maintain these standards:

Supplement 3 to ARINC Characteristic 791 Part 1, including the following:

- Revise fittings to address installation issues identified during installation programs and to accommodate a broader range of antenna options.
- Revise antenna location and blockage maps for selected single aisle configurations
- Clarify labeling of bulkhead penetrations
- Revise form factor length dimension for the KRFU and KANDU enclosures
- Revise and correct RTCA DO-160 section and category references, including updates for DO-160G
- Provide guidance on minimum agility to track satellites in taxi, in approach/departure, and enroute
- Provide guidance for waveguide installation

Supplement 2 to ARINC Characteristic 791 Part 2, including the following:

- Modify the network interface definition to correct port labeling and VLAN trunk definition.
    - **Alignment with ARINC Network Security Standards**
- Revise aircraft geometry/blockage data section to include asymmetric blockage cases
- Update the management information base (MIB) for Ku-band and Ka-band satcom systems
- **Update Quality of Service (QoS) and Class of Service (CoS) definitions**
- **Update Antenna-Modem Interface Protocol (AMIP) Attachment**
- **Remove ARINC 629 interfaces**
- **Clarify that the Introduce virtual Airplane Personality Module (APM)**
- **Introduce the additional modem unit (AMU) and define provisions required to support multiple modem operation**
- **Satellite Antenna Equipment Recommendations for a flexible terminal capable of seamless connection to numerous networks**
- **Add guidance on protecting control and maintenance KSAT interfaces to the Ground Earth Station (GES).**
- **Align network interface definition to support optional connectivity to IPS router/host with alignment with ARINC 858 – Part 1, IPS Technical Requirements. This connectivity will be provided with the assumption that Ka/Ku satcom is a non-guaranteed link, and integrity requirements of using this satcom link for advisory / safety services will be defined in ARINC 858 or other applicable standards.**

Supplement 2 to ARINC Characteristic 791 Part 2 will also include applicability to the interfaces of the KSAT system/s defined in ARINC Characteristic 792.

3.2 Planned usage of the envisioned specification

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

Airbus: Airplane retrofit and forward fit programs

Boeing: 737 Max, 777X, and airplane retrofit programs

Modification/retrofit requirement yes ☒ no ☐

Specify: Airlines are retrofitting connectivity systems into their existing fleets.

Needed for airframe manufacturer or airline project yes ☒ no ☐

Specify: driven by the need to provide common definitions for the airplane programs and retrofit programs

Mandate/regulatory requirement yes ☐ no ☒

Program and date: No mandate

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

Specify:

When is the ARINC Standard required? Per aircraft program

What is driving this date? Aircraft Development Schedules

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

- Take advantage of improvements or corrections identified in the development of ARINC Project Paper 792
- Incorporate items identified in service implementation of ARINC 791 by the suppliers, service providers, airlines, and airframe manufacturers

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 ☒

Product offered by more than one supplier yes ☒ no ☐

Identify:

4.2 Specific project benefits (Describe overall project benefits.)

Simplify and lower the cost of installation and interconnection of these Ku band and Ka band satellite communication systems in new and retrofit airplanes.

4.2.1 Benefits for Airlines

Lowers acquisition cost of these systems for new and retrofit airplanes. Standardized equipment will also lower maintenance and spares costs across the airlines multiple airplane models.

4.2.2 Benefits for Airframe Manufacturers

Simplifies the design for installation of these systems, lowering the cost of installation and interconnection which ultimately lowers the acquisition cost.

4.2.3 Benefits for Avionics Equipment Suppliers

Avionics suppliers are able to design standard equipment applicable to multiple airplane manufacturers and models decreasing their design effort and cost.

5.0 Documents to be Produced and Date of Expected Result

Supplement 3 to ARINC 791 Part 1 and Supplement 2 to ARINC 791 Part 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
Supplement 3 to ARINC 791 Part 1	3	9	July 2016	~~Oct 2017~~ **Completed Sept 2019**
Supplement 2 to ARINC 791 Part 2	**(monthly online)**	**12 to 15 TBC**	July 2016	~~Oct 2017~~ **April 2022**

Reflects necessary Ku-Band and Ka-Band Satcom Subcommittee meetings. In addition to the proposed meetings identified above, the Subcommittee will have approximately 10 online meetings per year to support specific develop goals.

6.0 Comments

None

6.1 Expiration Date for the APIM

~~Oct 2017~~ **October 2022**

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

Attachment 10

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM 15-004B

1) Supplement 1 to ARINC Specification 858: Internet Protocol Suite (IPS) for Aeronautical Safety Services, Part 1, Airborne IPS System Technical Requirements
2) Supplement 1 to ARINC Specification 858: Internet Protocol Suite (IPS) for Aeronautical Safety Services, Part 2, IPS Gateway Air-Ground Interoperability
3) Supplement 1 to ARINC Report 658: Internet Protocol Suite (IPS) for Aeronautical Safety Services - Roadmap Document

1.1 Name of Originator and/or Organization

Boeing / IPS Subcommittee

2.0 Subcommittee Assignment and Project Support

2.1 Suggested AEEC Group and Chairman

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

Co-Chairs: Luc Emberger (Airbus) and Greg Saccone (Boeing)

2.2 Support for the activity

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

Airframe Manufacturers: Boeing, Airbus

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

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

2.3 Commitment for Drafting and Meeting Participation

Airlines: AAL, USAF

Airframe Manufacturers: Boeing, Airbus

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

Others: BCI, Collins IMS, EUROCONTROL, FAA, SITA, Inmarsat, Iridium, 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 an AEEC Subcommittee prepare a detailed technical definition of IPS for aeronautical safety services in a new ARINC Standard. The IPS 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 VDL Mode 2. It is expected that IPS will support ACARS ATS (e.g., FANS) and AOC (e.g., ARINC 702A flight plans) as well as B2 and future applications. This activity represents a planned continuation of IPS Subcommittee work.

The IPS Subcommittee is preparing documents in **several** ~~two~~ steps. Step 1 was a roadmap activity, which defines the perimeter which needs to be standardized for IPS (air-to-ground and end-to-end) as well as the timeframes within respective standardization development organizations (SDOs) such as ICAO, RTCA, EUROCAE and AEEC. The output of Step 1 is ARINC Project Paper 658 (~~to be~~ completed in October 2017).

Step 2 will be an ARINC Standard containing the specification of IPS functions, implementation options, and constraints as well as higher level details regarding the accommodation of different applications.

Step 3 is proposed to ensure alignment with related ICAO, EUROCAE, and RTCA standards presently in development.

The IPS subcommittee will also maintain specific sections of ARINC 658 (e.g., identifying gaps and which SDOs are working which areas) and provide coordination across IPS standardization activities as appropriate.

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? **2022**~~2019~~

What is driving this date? **ICAO WG-I activities are driving the schedule for Supplement 1.** 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 2 include the following **(completed May 2021)**:

- Organize and execute IPS standards development efforts to address the work scope allocated to the IPS Subcommittee, initially outlined as described in Section 5.4.1.1 of ARINC 658.
  - Prepare ARINC Project Paper 858: Internet Protocol Suite (IPS) for Aeronautical Safety Services - Technical Requirements (working title) - (pending approval of the AEEC Executive Committee).

Issues to be worked in Step 3 include the following:

- **Supplement 1 to ARINC 858 Part 1 to align with the related ICAO, EUROCAE, and RTCA standards, in particular security, key management, IPv6 addressing, and mobility.**
- **Supplement 1 to ARINC 858 Part 2 to update IPS Gateway Interface**
- Maintain the IPS standardization roadmap**, Supplement 1 to ARINC Report 658,** (including updates to the gap analysis and standardization activity timing), contained in Section 5 of ARINC 658. If necessary

- Serve as the coordination focal for all AEEC IPS-related activities, including:
    - Coordinate with industry stakeholders and other AEEC subcommittees to ensure that the timing and scope of IPS-related project proposals consider the "need-by" dates of specific industry programs as well as dependencies on other AEEC Subcommittees and/or other standards development organizations.
    - Address questions from other AEEC Subcommittees regarding interpretations of ARINC 658.
    - Monitor AEEC IPS-related developments and standardization work.
- Coordinate with other IPS standardization development organizations, including:
    - Engage AEEC IPS industry participants, particularly those who support multiple SDOs, to develop and present working papers to other SDOs regarding the status of AEEC IPS efforts.
    - Leverage the IPS standardization roadmap as a communication tool for inter-organization coordination, particularly where there may be dependencies.
    - Based on updates to the gap analysis, provide recommendations for potential additional work to be considered by the other SDOs.

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 658: Internet Protocol Suite (IPS) for Aeronautical Safety Services - Roadmap Document (mature document, October 2017)

ARINC 858: Internet Protocol Suite (IPS) for Aeronautical Safety Services - Technical Requirements (**May 2019 due date**)

Supplement 1 to ARINC 658 (October 2022 due date)

Supplement 1 to ARINC 858 (October 2022 due date)

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 658 Standardization Roadmap for IPS, (Develop plan and work program, identify deliverables pertaining to IPS) **- published**	5	15	September 2015	**Completed** October 2017
Step 2: ARINC Project Paper 858: Internet Protocol Suite (IPS) for Aeronautical Safety Services - Technical Requirements	6	18	October 2017	~~December 2019~~ **Completed May 2021**

Activity	Mtgs	Mtg-Days (Total)	Expected Start Date	Expected Completion Date
Step 3 Supplement 1 to ARINC Specification 858: Internet Protocol Suite (IPS) for Aeronautical Safety Services, Part 1, Airborne IPS System Technical Requirements	monthly*	TBD*	May 2021	October 2022
Step 3 Supplement 1 to ARINC Specification 858: Internet Protocol Suite (IPS) for Aeronautical Safety Services, Part 2, IPS Gateway Air-Ground Interoperability	monthly*	TBD*	May 2021	October 2022
Step 3 Supplement 1 to ARINC 658: Internet Protocol Suite (IPS) for Aeronautical Safety Services - Roadmap Document	monthly*	TBD*	May 2021	May 2023

6.0 Comments

The schedule proposed is dependent on several factors, namely ICAO WG-I, and Doc 9896, Doc 10090, Doc 10094, Doc 10095, Doc 10145 development schedules, EUROCAE WG-108 and RTCA SC-223 schedules.

*Monthly check-in meetings online, 3-day online meetings every 4 months, in-person meetings when possible.

6.1 Authorization for Step 3

This APIM authorizes the activity proposed for Step 3.

6.2 Expiration Date for the APIM

December 2023

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