AEEC

Together "We Set the Standard."

To	SDL Subcommittee	**Date**	July 11, 2022
From	Mark E. Magee Mark.Magee@sae-itc.org tel +1 240.906.3674	**Reference**	22-999/SMA-282 lth

Subject **Meeting Announcement**
Software Distribution and Loading (SDL) Subcommittee

Co-Chairs Ted Patmore, Delta Air Lines
Chris Kuske, Teledyne Controls

When **July 26, 2022**

Meeting Times	US Pacific	US Eastern	Central European
Start	0700	1000	1600
Adjourn	0900	1200	1800

Host This meeting will be 100% virtual. Details to be provided to those who register.

Instruction Please notify ARINC Industry Activities of your intention to attend by registering online at: *http://www.aviation-ia.com/events/.*

The meeting is open to all interested parties. Individuals requesting time on the agenda should contact Mark Magee. Any material to be circulated prior to the meeting should be submitted via e-mail to Mark Magee by **July 24, 2022.**

A detailed agenda will be provided prior to the meeting.

Activity Scope The SDL Subcommittee's objective is to develop standards for software distribution and loading. This includes the continued development of high-speed data loaders with high-density storage media, and loading protocols. The SDL Subcommittee prepares and updates standards with definitions for file format, media type, part numbering, distribution, and terminology.

This subcommittee also defines the interfaces between the software data loader and the target hardware. The SDL Subcommittee sets standard formats for Loadable Software Parts (LSPs) so the requirements of configuration management of LSPs may be accomplished.

Meeting Objectives

APIM 22-004: Aircraft Ground System Software Reception

The SDL will begin the development of a new AEEC Project Paper intended to provide guidance to airlines and MROs to build and maintain a safe, secure process to receive, authenticate, and manage aircraft software. See Attachment 1 for more information about APIM 22-004.

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

The SDL will continue work to add guidance material to ARINC 615A to define best practices about concurrent (parallel) loading to one or more aircraft component targets. See Attachment 2 for more information about APIM 21-004.

ARINC Project Paper 8XX: *Aircraft Ground System Software Reception*

The SDL will continue the development of a new AEEC Project Paper intended to provide guidance to airlines and MROs to build and maintain a safe, secure process to receive, authenticate, and manage aircraft software. See Attachment 3 for more information about APIM 21-003.

Any other SDL related inputs, comments, or questions should be sent to Mark Magee at *Mark.Magee@sae-itc.org*.

cc SAI Subcommittee

Attachment 1

Attachment 1

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project APIM 22-004

Aircraft Ground System Software Reception

(This APIM is a replacement for APIM 16-015A on eEnablement)

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-Chairs:

Chris Kuske, Teledyne Controls

Ted Patmore, Delta Air Lines

2.2 Support for the Activity (as verified)

Airlines: American, Delta, FedEx, KLM, Lufthansa, United

Airframe Manufacturers: Airbus, Boeing

Suppliers: Teledyne, Collins, Safran, Aero Instruments, TechSAT, AIT, GE Aviation

Others:

2.3 Commitment for Drafting and Meeting Participation (as verified)

Airlines: Delta, FedEx, KLM, Lufthansa, United

Airframe Manufacturers: Airbus, Boeing

Suppliers: Teledyne, Collins, Safran, Aero Instruments, TechSAT, AIT, GE Aviation, MBS electronics

Others:

2.4 Recommended Coordination with other groups

AEEC NIS Subcommittee

AEEC SAI Subcommittee

RTCA SC-216

EASA WG-72

3.0 Project Scope (why and when standard is needed)

3.1 Description

There is currently a proliferation of formats and protocols used to distribute aircraft software to airlines.

Airlines that operate aircraft from more than one airframer are faced with building and maintaining more than one ground system to receive software.

Standardization of software delivery process and method is greatly needed to avoid the growing proliferation of multiple reception scenarios, requiring the airlines to purchase, learn and maintain multiple tools and processes.

The left side of Figure 1 shows the external and internal functions concerned with airline software receiving. There can be many external sources of software each of which must be received by the airline receiving process. It is becoming increasingly important to have one common airline software receiving process. This will save much time and expense associated with using diverse software receiving systems and methods.

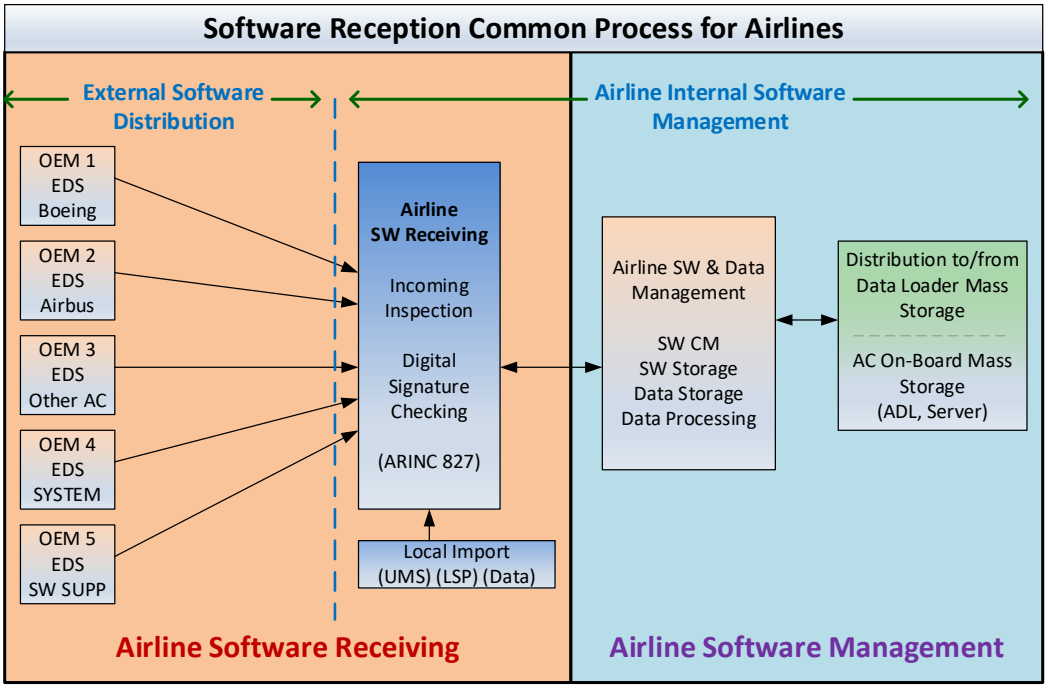

Figure 1 – Software Reception (Airline Perspective)

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: (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

Need to assess all current software receiving requirements currently in use by operators to determine the best common software reception protocol solution. Determine methods for secure transfer and distribution of software must be included to comply with current security requirements. Determine if there are any enhancements required to **ARINC Report 827:** *Electronic Distribution of Software*.

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 - All Software Loaded Using Ground Infrastructure yes ☒ no ☐

This project will define a process for receiving software from multiple sources (i.e., airframers, component suppliers, software updates, etc.).

RTCA DO-355A was recently updated with airborne software protection guidance, but the airlines would like the AEEC to prepare a project paper that provides standardized processes to receive software in a safe, secure, and authenticated manner.

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

This standard will provide one common aircraft software distribution method that can be easily controlled and understood by multiple stakeholders.

4.2.1 Benefits for Airlines

The airlines will realize a savings in the cost, time and personnel required to maintain multiple reception methods from multiple vendors. The current confusion associated with maintaining multiple processes for software reception can be avoided.

4.2.2 Benefits for Airframe Manufacturers

Provide the airframe manufacturer with one method of sending software to recipients, avoiding the need to define multiple tools and processes for securely receiving software. There will be no need to provide multiple tools for operators to learn and use.

4.2.3 Benefits for Avionics Equipment Suppliers

Provide equipment suppliers with one method of sending software to recipients, avoiding the need to define multiple tools and processes for securely receiving software. There will be no need to provide multiple tools for operators to learn and use.

5.0 Documents to be Produced and Date of Expected Result

Identify Project Papers expected to be completed per the table in the following section.

ARINC Project Paper 851: *Aircraft Ground System Software Reception*

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 851	3 mtgs	3 mtg days	04/2022	04/2023

Please note the number of in-person meetings and the number of meeting days to be supported by the ARINC IA Staff.

6.0 Comments

(none)

6.1 Expiration Date for the APIM

April 2024

Completed forms should be submitted to (aeec@sae-itc.org)

Attachment 2

Attachment 2

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 (aeec@sae-itc.org)

Attachment 3

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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 (aeec@sae-itc.org)