

ARINC Project Initiation/Modification (APIM)

1.0 Name of Proposed Project **APIM 16-001**
Airplane Software Quality Metric and Reporting Interface Definition

Name of Originator and/or Organization

Reinhard Andreae, Lufthansa Airlines

2.0 Subcommittee Assignment and Project Support

Suggested AEEC Group and Chairman

Software Quality Working Group of SAI Subcommittee

Reinhard Andreae, Lufthansa

Support for the activity (as verified)

Airlines: Alaska, American, Delta, FedEx, KLM, Lufthansa, TAP Portugal, United, UPS

Airframe Manufacturers: Airbus, Boeing

Suppliers: Honeywell, Panasonic, Rockwell Collins, Thales Avionics

Commitment for Drafting and Meeting Participation (as verified)

Airlines: FedEx, Lufthansa, FedEx, + TBD

Airframe Manufacturers: Boeing, + TBD

Suppliers: Esterline, Rockwell Collins, + TBD

Others:

Recommended Coordination with other groups

SAI Subcommittee

Avionics Maintenance Conference (AMC)

3.0 Project Scope

Description

Software functions are replacing hardware more and more in new aircraft projects. In addition, more and increasingly complex and integrated functions are included, most of which are realized in software. Because of this, the ability of software to reliably perform its function is a dominant factor in an airlines ability to operate and maintain an airplane in an efficient and effective manner.

For hardware parts technical performance measures clearly exist (e.g., MTBF or MTBUR). For software those measures are not defined, standardized or monitored. Hardware performance measures take advantage of the inherent property that hardware obeys the laws of physics, and can be reliably modeled statistically. Software functions do not necessarily obey the laws of physics, therefore standard and accepted quality and performance measures are hard to define.

For enabling a type of quality control loop for airplane systems with software functionality the first step is to define categories of software failures,

incompleteness, and other operational deficiencies for operators to monitor. This will lead to an effort to standardize a set of technical quality metrics. This will include software used in Aircraft Control (AC), Airline Information System (AIS) and Passenger Information and Entertainment System (PIES) domains. This is the main scope of this effort.

The technical measures defined by the proposed standard could be used to exchange data pertinent to software performance among industry participants.

In order to develop good material for guidance on technical performance and quality standards a stepped approach is suggested.

Phase 1: Investigate categories of software failures to monitor, define potential software quality metrics, and agree to the scope of the proposed standard. The output of the Phase 1 will be a report of the proposed metrics and recommendations as to how they might be captured.

Phase 2: The output of the Phase 2 will be an ARINC Report as recommended by Phase 1.

Planned usage of the envisioned specification

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

Use the following symbol to check yes or no below.

New aircraft developments planned to use this specification yes no

Airbus: (any new aircraft program TBA)

Boeing: (any new aircraft program TBA)

Other: (TBA)

Modification/retrofit requirement yes no

Specify: (TBA)

Needed for airframe manufacturer or airline project yes no

Specify: (TBA)

Mandate/regulatory requirement yes no

Program and date: (N/A)

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

Specify: (TBD)

When is the ARINC Standard required? Phase 1 target: Dec 2017
Phase 2 target: Dec 2019

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

If YES please describe, identify patent holder:

Not that we are aware of.

Issues to be worked

Phase 1: Define the problem space.

- a) Research existing standards and review applicability to airline industry.
- b) Define types of in-service issues that should be measured against software-related quality.
- c) Define the criteria for classification of software-related errors, such as:
 1. Criticality of a function (safety)
 2. Availability of a specified function
 3. Operational Impact
 4. Impact to economic aircraft operation
 5. Possible effect of combinations of failures
 6. Impact to maintenance
- d) Determine if additional operational/contextual information is required to be reported through the review of actual in-service issues.
- e) Propose the measurement technique (airline reporting processes or data collection features in onboard software).

Phase 2: Proposal for standard technical measures

- a) Define software-related quality metrics.
- b) Propose standard operational / contextual information to assist in root cause determination of in-service issues.

4.0

Benefits

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: Any airborne software product

Specific project benefits (Describe overall project benefits.)

4.1.1

Benefits for Airlines

Airlines have parameters to measure the actual performance of software against committed values. Consequently, airlines have a foundation to claim functional

corrections of identified non-conforming software parts. The goal is to have software updates available to the airlines on an agreed timely basis.

4.1.2 Benefits for Airframe Manufacturers

Outcome of this proposal has the potential to provide more relevant and focused information to assist in prioritization and investigation of software-related in-service problems.

4.1.3 Benefits for Avionics Equipment Suppliers

Suppliers get a framework of technical measures and software quality definitions that would enable internal targets for compliance and external predictability of quality efforts.

5.0 Documents to be Produced and Date of Expected Result

- ARINC Report – Guidance (Dec 2019)

Meetings and Expected Document Completion

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

Product/Activity	Mtgs	Mtg-Days (Total)	Expected Start Date	Expected Completion Date
Phase 1 kickoff / work plan	Three 2-day meetings	6	Jan 2017	Dec 2017
Phase 2 (TBD) as determined by Phase 1	TBD			
Activity Summary	TBD			

6.0 Comments

This APIM will be updated to describe Phase 2 scope and schedule.

6.1 Expiration Date for this APIM

December 2018

Submit completed form to the AEEC Executive Secretary.