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	s planned to use this s	specification	yes 🗵 no 🗖		
Airbus:	(any new aircraft progr	am TBA)			
Boeing:	(any new aircraft progr	am TBA)			
Other:	(TBA)				
Modification/retrofit requirement			yes 🛛 no 🗵		
Specify:	(TBA)				
Needed for airframe manu	yes 🗵 no 🗖				
Specify:	(TBA)				
Mandate/regulatory requir	ement		yes 🛛 no 🗵		
Program and date:	(N/A)				
Is the activity defining/cha	inging an infrastructu	re standard?	yes 🗵 no 🗖		
Specify:	(TBD)				
When is the ARINC Standard required? Phase 1 targe			t: Dec 2017		
		Phase 2 targe	t: Dec 2019		
What is driving this date?					
Are 18 months (min) availa	able for standardizatic y solution:	on work?	yes 🗵 no 🗖		
Are Patent(s) involved?			yes 🗖		
If YES please describe, identify patent holder:					
Not that we are awar	re 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 softwarerelated 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 inservice 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.