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Doc: ECM-ZEIU-20171205 *ARINC812 supplement 2 change proposal review*	***Customer Models:*** *N/A*
Part Number: *N/A*	***Applications:*** *Galley Equipment*
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RECORD OF REVISION

Issue	Effect on		Change Description	Date	Approval
	Page	Section			
1	All	All	Initial Release		

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1 BACKGROUND

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: o Identify and incorporate changes necessitated by production implementation of digital Galley Equipment.
o Update messages based on changes introduced by Supplement 3 to ARINC 825.
o Consider the effect of the new CAN FD protocol on ARINC 812A-compliant components.
o Address data security and provide guidance as needed.
o 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.

2 OBJECTIVES

Objective of this document is to answer the action list items of the last ARINC 812 meeting held in November 2017

Section 3 defines the applicable documents list.

Section 4 incorporates the result of the GAIN_Action_items_11417 allocated to Zodiac.

3 APPLICABLE DOCUMENTS

Reference	Title	Source	Iss/Rev
Section 6.6	Extract of the new draft ARINC 812 standard chapter 6.6	ARINC	-
GAIN_Action_items_11417	GAIN_Action_items_11417	ARINC	1
ARINC 812 Change proposal	ARINC 812 Change proposal	B/E BOEING	1

4 Review

4.1 Review of GAIN remote operation (Section 6.6)

1) ***Command ("CMD") and Change_State (CSTA) could be merged into one message:***
The CMD message allows the GAINs to start/stop/pause catering and others options, meaning the CMD message will change/affect the ARINC state of the equipment.
On the other hand, the CSTA message purpose is to reset and change the ARINC state or mode of a GAIN.
Currently, the CSTA message only uses "8 bits", all the others bits are reserved. The purpose of both message types seems to be redundant. It might be better to consider merging the two message types into one unique CMD message with CSTA features included in the CMD command options.

2) ***Centralized powered mode flow chart need to be updated:***
If more messages are implemented and can be sent anytime, interaction between these messages needs to be documented. The management of priorities will become complex especially if the message affects the ARINC_State of a GAIN. For example: MGCU/GAIN behavior needs to be defined for a scenario with a PBM(0,0), CSTA and CMD message.

3) ***GAIN_CLASS data is already in datablock #5***
- *The content of the GAIN_CLASS data is already implemented in the datablock #5 (device CLASS byte 3, and device GROUP byte 4). The system could use the existing DTS protocol to get even more data. The need of a new message should be discussed.*
- *It is written that a GAIN should answer on DIAG_CMD request and a CMD with the option "send GAIN_CLASS msg". It means there will be three different ways (including datablock 5) to request the information.*
  Note: did the DIAG_CMD message change in the new draft?

4) ***Minimize the number of message to reduce the bus load and reduce complexity:***
Today, there are several CAN messages with a few commands integrated and a lot of room for improvement. For example, The DIAG command message has only one command implemented "self-test request" and 7 bytes available, this message could be reworked to incorporate needed features.
Moreover the list of messages being able to affect the ARINC_STATE of a GAIN is increasing in centralized mode: SES_MGCU, STA_MGCU, PBM, CSTA, CMD, DIAG_CMD. If possible, messages shall be factorized to reduce complexity and avoid retro-compatibility issue.

4.2 Review of the ARINC 812 Change proposal document

4.2.1 Additional Galley Insert Usage Tracking data in datablock #6

Block 6 is used for generic maintenance data. It would be wise to save specific data of all suppliers in another datablock. All supplier data shall be reviewed to see if it can be factorized and fit in one block.

Below,in green, is what Zodiac considers generic data, and in red, specific data .

- *Lifetime failure count: OK*
- *Hours since last filter change (specific)*
- *Life Heating time (specific oven /water heater)*
- *Lifetime water pump hours (specific)*
- *Lifetime Fan hours (specific)*
- *Lifetime hours compressor (beverage chiller / specific)*
- *Lifetime Hours evaporator fan (specific)*
- *Lifetime Hours condenser run (specific)*
- *Lifetime defrost count (specific)*
- *Lifetime self-protection counts for each fault (OK)*
- *Lifetime in catering cycle (OK)*
- *Duration of each heat up, cool down or brew cycle (specific).*

4.2.2 Review of New Galley Insert Status Message

Depending on the implementation, these event-driven messages may flood the can BUS (for example valve on/off, or a CMD event to start all gain would definitely flood the bus). If necessary, it could be implemented upon request of a specific DIAG_CMD message as it is for diagnostic purpose.

4.2.3 Review of additional aircraft data

Aircraft data shall be managed by the MGCU. The MGCU could define the conditions if a GAIN shall pause / or turn off to whatever condition happening in the aircraft.

GAIN should avoid taking in consideration such information, implementation would be too complex.

4.3 Specific Trash compactor signals

The following trash compactor signals could be useful for the crew or the maintenance team:

- *Trash Box sensor (present/ not present . to see if there is a need to load trash box).*
- *Trolley Interlock (to verify the trolley is properly engaged with the back stand of the trash compactor)*
- *Door switch #1 (open/ close ,to verify the trash door is properly closed)*
- *Door switch #2 (open/ close ,to verify the main door is properly closed)*
- *Fluid level (could be used to notify ground maintenance)*

Other signals can be used for troubleshooting, but the information might not be relevant for the crew or the maintenance team:

- *Motor RPM*
- *Piston sensor*
- *Solenoid valve (open/close)*
- *Operation mode (Extraction/Retraction/Standby Off/ No Catering)*
- *Power supply board temp*
- *Control board temp*

4.4 Additional Improvements (lessons learned)

- *Adding a chapter to describe how the MGCU shall handle failures from GAINs based on the lessons learned from the A350 could be useful (CPC on a feeder with GAIN disappearing on the bus, wrong GAIN behavior and other scenarios).*
- *Software update, shall the ARINC812 support a protocol to upload software on simultaneous PN on the BUS.*