AEEC SAI Timely Recovery of Flight Data (TRFD) Teleconference #28

Date: 5 August 2020

Please send any corrections or additions to Greg Moran.

Agenda:

1. Continue work on section 4 definition of TFD interfaces

Discussion:

Organization

TRFD deliverables and schedule are as discussed in APIM 17-005 section 5.1.

Activity	Start Date	Completion Date
Phase 1: document the end-to-end system requirements	June, 2018	December, 2018
i. Define TRFD requirement source documents (ICAO SARP, industry standard, regulation) COMPLETE 13 June 2018		
ii. Define TRFD functional block diagram COMPLETE 13 June 2018		
iii. Capture requirements and recommendations from source documents COMPLETE 15 January 2019		
iv. Identify any additional requirements and recommendations COMPLETE 18 December 2018		
v. Allocate requirements and recommendation to functional blocks COMPLETE 15 January 2019		
vi. Develop section 2 of the report IN WORK June 2019		
Phase 2: develop candidate architectures and select architecture(s)	January, 2019	December, 2019
i. Develop candidate architectures for ADFR and TFD COMPLETE 24 August 2018		
ii. Develop section 3 of the report COMPLETE February 2020		
Phase 3: develop detailed equipment interface, and aircraft installation requirements, as well as ground system requirements	January, 2020 February 2020	September, 2020 February 2021
Schedule re-evaluated at the February, 2020 face-to-face meeting and a six month extension requested. Target to complete by February, 2021 to support the 2021 general session.		

Completion of phase 1 December, 2018 and phase 2 December, 2019 supports requirements & architecture report (phase 1 and 2) March, 2020. Phase 3 completion September, 2020 may need to be adjusted based on characteristic and/or specifications recommended in requirements and architectures report. TRFD team preference to extend due date as TRFD is a new type certification mandate rather than the ADT forward-fit mandate, and ADT phase 3 took longer than 9 months.

SharePoint

- Meeting and teleconference minutes at *681 Input\7.) Meetings and Teleconferences*
- References at *681 Input\2.) References*
- Requirements at *681 Input\3.) Requirements*
- 681 report drafts and revision process at *681 Input\8.) TRFD Requirements and Architectures Report*
- 680 reports for reference / comparison at *680 Input\04.) ADT Requirements and Architectures Report*

Technical

1. Continue work on section 4 definition of TFD interfaces

   TFD –
   - Detect start condition – Miro.
   - Data Transport – Ruben

   The group reviewed content on these sections and completed section 4, save for editorial review / changes.

2. Section 5 conclusions and recommendations

   After the patent disclosure discussion the group will turn our attention to completing the conclusions and recommendations which comprise section 5.

   Teleconferences will be held approximately every three weeks until section 5 is completed, then a longer pause to allow the group to completely review the document prior to group review of comments at a virtual meeting (e.g. 4 hours each for 2 days) to finalize the document.

Up-coming schedule:

Teleconferences to be scheduled approximately every 3 weeks:

- Patent Disclosure 2 September 11a- 1p Eastern
- #29 Wednesday 23 September 11am- 1p Eastern

Actions:

Open -

ID	Action	Assigned	ECD
190617-I	Develop requirements/recommendations Pivot table as an aid to readers in filtering requirements/recommendations by technology and functional block.	Blake	~~10 July 2019~~ ~~13 Nov 2019~~ TBD

Closed –

ID	Action	Assigned	Closed
180411-A	Compile requirements source documents	Hannes / Greg Moran	17 May 2018

180411-B	Compile requirements from source documents into spreadsheet.
	    "shall" = minimum requirements
	    "should" = recommendations
		Greg Moran	17 May 2018

180411-C	Draft TRFD functional block diagram	Greg Smith	18 May 2018
180522-A	Circulate EASA document (HKCAD and CAAS regulatory material)	Hannes / Greg Moran	31 May 2018
180522-B	Update TRFD functional block diagram	Greg Smith / Miro	13 June 2018
180522-C	Update requirements table for ADFR	Blake	6 June 2018
180522-D	Provided requirements table numbering scheme	Greg Moran	31 May 2018
180613-A	Add EASA location of an aircraft in distress to requirements map.	Greg Moran	13 June 2018
180710-B	Review Distress Events MASPS ED-237 and add applicable requirements & recommendations to TRFD table.	John	31 July 2018
180710-C	Identify location of EASA AIR OPS regulations.	Greg	10 July 2018
180710-E	Develop document for TFD candidate architecture	Miro	31 July 2018
180710-F	Review TFRD requirements/recommendations table to a) confirm functional block allocation and b) identify any missing requirements/recommendations	All	31 July 2018
180710-D	Develop document for ADFR candidate architecture	Blake	~~31 July 2018~~ 6 Aug 2018
180613-B	Add combination recorder and FDR & DLR duration requirements (only CVR duration was added) in TRFD Minimum Requirements.	Blake	31 July 2018
180710-A	Review ELT MOPS ED-62B and add applicable requirements & recommendations to TRFD table.	Tom/Blake	31 July 2018
180731-A	Provide descriptive text for functional block diagram for inclusion into requirements section 2.	Greg Smith	21 Aug 2018
181026-A	Follow up with expected changes to ICAO Annex 13 for data protection and access issues.	Greg Smith	4 Dec 2018
181026-B	Should lithium battery references as listed in ADT also be listed for TRFD?	Blake	4 Dec 2018
181026-C	Review requirements/recommendations table to determine any changes or any which are missing.	All	18 Dec 2018
180731-B	Review ICAO Annex 13 and possibly also Doc9756 for applicable requirements/recommendations & create verbiage for how this is interpreted in section 2	Hannes	15 Jan 2019
181218-B	Review ED-62B requirements and recommendation for functional block assignment	Blake	15 Jan 2019
180918-A	Update section 2 from ADT requirements & architecture study for TRFD.		19 Feb 2019
	• Update Figure 5 for TRFD.	John	
	• Update Figures 4 & 11 and text after Figure 7 for TRFD; add subsections regarding HKCAD, CAAS and NPA 2018-03 (section 2.3.7)	Greg Moran	
	• Update Figure 11 for TRFD	Miro	

		Confirm deletion of EU regulation section copied from ADT report	Blake	
		Add subsection regarding ED-112A (similar to ED-237, section 2.3.9)	Greg Smith	
		Add subsections for ED-62B (section 2.3.10), EASA CPOs and NPA TBD (section 2.3.7).	Blake	
180918-B	Update section 3 for ADFR architecture		Blake, Claude, Bill	19 Feb 2019
190206-A	Finalize requirements / recommendations table – remove items marked for deletion, etc.		Robin	12 Feb 2019
190206-B	Provide section 2.4.2 input for TRFD key terms: applicable requirements document(s), requirement(s) quote(s) if necessary and identification of items needing further analysis/discussion in later sections. Refer to ADT ARINC 680 draft for example(s).			4 Apr 2019
	Distress		Greg Smith -> Greg Moran	
	Flight data, Timely		Greg Moran	
	Location of the point of end of flight		Blake	
	Recovery, Timely recovery of flight data		Hannes -> Greg Moran	
190226-A	Update Figure 2 & related discussion to be TRFD specific		John Fisher	2 Apr 2019
190226-B	Add TRFD description in Table 1		John Fisher	2 Apr 2019
190226-D	Add ADFR & TFD architecture study to section 3 of straw-man draft.		~~Greg Moran~~ -> John Fisher	2 Apr 2019
190404-A	Reformat key term discussion to table format rather than quoting directly from requirements source document.		Greg Moran	23 April 2019
190404-B	Add ICAO Annex 13 5.14 to requirements map MS Excel file and associated table.		Greg Moran	23 April 2019
190404-D	Provide ARINC report document template		Peter Grau	4 Apr 2019
190404-C	Update TFD architecture study based on feedback provided to date.		Miro and John	15 May 2019
180918-C	Update section 3 for TFD architecture (draft 4 available for review at GAT SharePoint 681 Input / 6.) Architecture for Continuous Data Transmission)		Miro	15 May 2019
180918-D	Provide feedback for ADFR & TFD architectures to Blake & Miro, respectively		All	18 June 2019
181218-A	Review ED-112A requirements and recommendations for technology and functional block assignment, or further discussion to be added to requirements section 2 (e.g. mandatory parameter list).		Greg Smith	18 June 2019
190617-A	Add general note in requirements and recommendations tables regarding the applicability of ED-112A to TRFD, where appropriate.		Greg Smith	10 July 2019
190617-B	Review ED-112A for specific elements that apply to TFD e.g. start/stop logic, data handling, CVR audio quality, derive bandwidth, data compression, documentation.		Greg Moran	10 July 2019

190617-E	Editorial: update figures to latest available from contributors.	John Fisher	10 July 2019
190617-F	Add EASA RMT.0400 to GAT SharePoint	Greg Moran	10 July 2019
190617-G	Remove requirements/recommendations from draft NPAs (without number assigned & not publically available). CPOs can remain but flagged as requiring an update when NPA is released (expected October, 2019).	Greg Moran	10 July 2019
190617-H	Add requirements/recommendations with functional block assignments specific to ADFR and TFD in respective architecture study sub-sections. Renumber identity code for requirements/recommendations tables to sequential rather than follow ADT numbering convention.	Greg Moran	10 July 2019
190617-K	Develop content for TFD architecture study, off aircraft storage functional block discussion (section 3.2.3.4).	Janine Roux	07 Aug 2019
190710-A	Define ARINC standard for terms 'must', 'will', 'shall', 'should', etc. so that we are consistent within the ARINC 681 report. *Terms defined in ARINC 647.*	Peter	07 Aug 2019
190617-C	Editorial: add introductory sub-section in section 2 for an organization when that organization has two or more applicable documents.	John Fisher	09 Oct 2019
190617-L	Review ICAO or other guidance regarding guidance for SAR recovering the ADFR, which could be added to our requirements/recommendations tables. **Only Doc10054 section 3.5 discusses recovering the ADFR.**	Blake	09 Oct 2019
190807-A	Add discussion explaining "REQ" and "REC" identity codes to section 2.	Greg Moran	09 Oct 2019
190918-A	Update ADFR architecture figure and/or text to indicate that ADFR DT implementation is not meant to suggest the only means to satisfy the ADT requirement.	Blake	09 Oct 2019
190807-B	Is there an applicable ARINC standard regarding data storage protection? **There is no ARINC standard presently, nor is this in work.**	Peter	13 Nov 2019
190617-D	Editorial: ARINC 681 key term is 'location of end of flight', to be used throughout this report. Our terms equates to EASA term 'location of the point of end of flight'.	John Fisher	3 Dec 2019
190617-J	Develop content for TFD architecture study, data transport functional block discussion (section 3.2.3.3)	Ruben	8 Jan 2020
200108-A	Revise 3.2.7 Key Airplane Infrastructure Support and Required Changes to be similar in structure to 3.2.8.	Greg Moran	29 Jan 2020
191113-A	Customize figure 10 TFD functional block diagram.	Miro	1 Apr 2020
191113-F	Develop content for 3.2.8 Key Network Infrastructure and Ground Segment Support	Hannes & Miro	1 Apr 2020

191113-H	Verify if data protection requirements exist for transmitted CVR & AIR/FCMIR data not part of an incident/accident investigation (Annex 13), a system management system/criminal investigation purposes (Annex 19), nor maintenance inspection (Annex 6). If not, request from ICAO. Figure available from ICAO Doc10101 draft – included in 3.2.3.5 Data Recovery	John Fisher	22 Apr 2020
200211-A	Compare draft to 1st edition ICAO Doc10054 to identify any impact to our requirements & recommendations tables.	John & Greg Moran	22 Apr 2020
200211-B	Add new derived recommendation for the TFD system to be reconfigurable with regard to trigger logic definition and operation mode (trigger, continuous, hybrid).	Greg Moran	22 Apr 2020

Attachment 1

ARINC 681 Report Revision Process

John Fisher, Technical Editor

- Trust but verify – I make changes and mistakes, I am not the best guy for the job but the best one we have, please help me by pointing out typos, mistakes etc. and please be patient.

- Configuration control – if you fail to provide comments to a version and we start a new version, you will need to incorporate your comments into the newer version.

- If you comment after the due date I'll try to incorporate it, but you may have to wait until the next version to provide comments.

"Bad" comments will be noted, for example:

Text	Comment	Response
"The FDR must data when turned on"	Need to improve language.	Noted, no change.

"Good" comments will be addressed, for example:

Text	Comment	Response
"The FDR must data when turned on."	The FDR must **record** data when turned on.	Agreed, text changed.
"The FDR must data when turned on."	Add 'record' after the word mus.t	Agreed, text changed.

- If you submit a comment, please verify it was incorporated into the document, (if it is not done in front of you on the spot at a meeting etc.). I try not to make errors of omission but may do anyway. Please perform quality control on my work!

Attachment 2

Clarification requested from ICAO regarding Doc10054

The following areas of improvement for ICAO Doc10054 have been identified with regard to timely recovery of flight data guidance material for Annex 6 Part I 6.3.6 SARP as industry works to examine the potential to develop associated industry standards.

1. ICAO Doc10054 references Annex 6 Part I 6.3.5 flight data recovery in multiple locations, but the section has been revised to 6.3.6 in the latest Annex 6 Part I amendment.

2. ICAO Annex 6 Part I 6.3.6.1 requires "a means … to recover flight recorder data". This has been construed by some as all flight recorder data from each fixed recorder (FDR, CVR, DLR, AIR/FCMIR).

> a. Doc10054 3.3.3 Definition of flight recorder data discusses "any type of recorder…" but then section 3.3.4 describes the 'set of data to recover' which is a subset of all flight recorder data. Sections 3.3.3 and 3.3.4 do not describe that the set of flight recorder data to recover differs depending on the technology (transmission of flight data is a subset whereas automatic deployable flight recorder would be the same as fixed recorders). Some incident investigator are interpreting the SARP and Doc10054 to require all flight recorder data to be transmitted, which is not technically feasible with existing technology. Sections 3.3.3 and 3.3.4 appear to conflict with the TFD sections later in the document whereby a subset of flight recorder data is described as the minimum requirement.

> b. 3.3.9.1 could be amended to "a) to recover selected flight recorder data…"

3. Annex 6 Part I 6.3.6.2 discusses only "appropriate CVR channels and appropriate FDR data". Doc10054 includes DLR and AIR / FCMIR but does not discuss why these are included, as the SARPs only discuss CVR and FDR.

> a. Doc10054 section 3.6.10.5 requires DLR messages to be transmitted.

4. Doc10054 is not consistent with regard to terminology (AIR and FCMIR are both used). It is suggested to use FCMIR throughout the document, with a short discussion about the relationship between AIR and FCMIR.

5. Doc10054 was written prior to Annex 6 Part I 6.3.4 Flight crew-machine interface recordings. An update to Doc10054 appears appropriate to provide guidance on transmission of FCMIR.

> a. For example, in Doc10054 section 3.6.9 Format of the flight crew-machine interface data which may suggest (and has been construed by some) that transmission of such data is required.

> b. The bandwidth necessary to transmit FDR, CVR and DLR was analyzed but not FCMIR.

     c.   Doc10054 section 3.6.10.x does not include any requirement or recommendation regarding transmission of FCMIR. A separate subsection (e.g. Transmission of FCMIR image data) is requested to clarify.

6.   An incident investigator has suggested that because of the following requirement "The system providing timely recovery of flight recorder data has to provide at a minimum the data from the time the aeroplane enters the distress conditions to the end of the flight." that the equipment must be able to withstand extreme environmental conditions not normally required for recording systems equipment and/or possibly have battery backup. Robustness of the power supply is already addressed in Doc10054 section 3.3.10; however, clarification is requested for the expected environmental qualification test requirements (understood to be no different than the existing recording system).

7.   Doc10054 section 3.6.10.4 the estimate for required parameters in a 1024wps data frame could be better described as a range of 3-5Kbit/second, rather than 3Kbit/second listed.

8.   Doc10054 section 3.6.10.7 has a phrase "As the duration of the event cannot be predicted" but no further context. It is understood that the priority of transmission listed in Table 3-2 is during a non-normal conditions (event) with insufficient bandwidth exists to transmit all defined flight recorder data. Some have construed this table to mean priority to transmit during normal conditions whereby a system could be designed only to comply with priority 1-3 for example.

9.   Doc10054 table 3-2 lists priority for transmission of flight data.

     a.   The table has recommended historical data prioritized over required real-time data. It is requested that the priority be revisited considering required and recommended data to be transmitted.

     b.   The table has priority 7 "Other data (non-required FDR parameters, AIR)" which has been construed by some as a requirement to transmit non-required FDR parameters, AIR). Clarification is requested as to the meaning of "Other data", e.g. "Non-required flight data" with a note that priority 7 is a recommendation, or consists of other flight data an operator voluntarily elects to transmit.

     c.   Relating to item 13 historical data download rate, should industry maximize the historical data download rate for priority 3 **Required FDR parameters – historical** to preclude (stop) transmission of priority 4 **CVR crew microphones audio – real-time** until the minimum twenty (20) minutes of priority 3 **Required FDR parameters – historical** is complete? The real-time download date rate is fixed but the historical download data rate can vary. Doc10054 does not discuss a minimum or maximum data rate to apply to historical data download. How does the available bandwidth (normal versus non-normal) affect the prioritization and historical data download rate?

10. Sections 3.6.10.12 & 3.6.10.13 Transmission of CVR audio data would be more logically located adjacent to the sections 3.6.10.5 & 3.6.10.6 Transmission of flight recorder data. Currently these two sections are separated by Priority of flight recorder data to transmit.

11. A separate section caption is recommended for section 3.6.10.6, e.g. Transmission of FDR parametric data as is the case for transmission of CVR audio data.

12. A separate subsection is requested for transmission of DLR messages (e.g. Transmission of DLR message data), as transmission of DLR messages is required by 3.6.10.5.

13. For transmission of historical flight recorder data, section 3.6.13.7 requires most recent data to be given highest priority, but there is no discussion of the time (e.g. 60s) needed to transmit the minimum twenty (20) minutes (per section 3.4.3.4) of historical flight data. Should guidance be provided for this recommended historical flight data, or is this best effort?

14. Data protection requirements appear to be missing for transmitted CVR & AIR/FCMIR data not part of an incident/accident investigation (Annex 13), a system management system/criminal investigation purposes (Annex 19), nor maintenance inspection (Annex 6).