



European Union Aviation Safety Agency
Comment-Response Document 2019-12

RELATED NPA: 2019-12— RMT.0249 — 22.12.2020

Table of contents

1. Summary of the outcome of the consultation	2
2. Individual comments and responses	4



1. Summary of the outcome of the consultation

93 comments were received from 17 users.

The commentators represented the industry (Airbus Helicopters, Airbus Commercial Aircraft, ATR, Boeing, Bombardier, British Airways, Embraer, European Helicopter Association, GAMA, IATA, Lufthansa, Textron Aviation, VR²C Engineering), national aviation authorities (DGAC (France), FAA (USA), CAA (United Kingdom)), and one union (European Cockpit Association).

The comments are distributed as follows:

S	Page	Description	Comments
0	-	(General Comments)	5
1	3	1.2. How to comment on this NPA	1
2	4	2.1. Why we need to change the rules — issue/rationale	1
3	5	2.1.4. The quality of recording of cockpit voice recorders	2
4	8-10	3. Proposed amendments in detail - 3.1. Rationale - 3.1.1. Data link recording	1
5	10-11	3.1.2. The serviceability of flight recorders - 3.1.2.1 Maintenance instructions	2
6	11	3.1.2. The serviceability of flight recorders - 3.1.2.2 The conversion of FDR raw data into flight parameters expressed in engineering units	2
7	11-12	3.1.3. The quality of recording of cockpit voice recorders	4
8	12-13	3.2. Draft CS-25 - 3.2.1. Data link recording - CS 25.1460	6
9	13-14	3.2. Draft CS-25 - 3.2.1. Data link recording - AMC 25.1460	2
10	14	3.2. Draft CS-25 - 3.2.2. The serviceability of flight recorders - AMC 25.1457	4
11	14-16	3.2. Draft CS-25 - 3.2.2. The serviceability of flight recorders - AMC 25.1459	7
12	16-17	3.2. Draft CS-25 - 3.2.2. The serviceability of flight recorders - AMC 25.1460	4
13	17	3.2. Draft CS-25 - 3.2.3. The quality of recording of cockpit voice recorders - CS 25.1457	2
14	17-20	3.2. Draft CS-25 - 3.2.3. The quality of recording of cockpit voice recorders - AMC 25.1457	21
15	20-21	3.3. Draft CS-29 - 3.3.1. Data link recording - CS 29.1460	2
16	21	3.3. Draft CS-29 - 3.3.1. Data link recording - AMC 29.1460	2
17	22	3.3. Draft CS-29 - 3.3.2. The serviceability of flight recorders - AMC 29.1457	2
18	22-24	3.3. Draft CS-29 - 3.3.2. The serviceability of flight recorders - AMC 29.1459	2
19	24	3.3. Draft CS-29 - 3.3.2. The serviceability of flight recorders - AMC 29.1460	2
20	24-25	3.3. Draft CS-29 - 3.3.3. The quality of recording of cockpit voice recorders - CS 29.1457	1
21	25-28	3.3. Draft CS-29 - 3.3.3. The quality of recording of cockpit voice recorders - AMC 29.1457	5

S	Page	Description	Comments
22	30-31	4. IA - 4.1 What is the issue - 4.1.4. The serviceability of flight recorders - 4.1.4.1 Maintenance instructions	5
23	32-33	4. IA - 4.1 What is the issue - 4.1.5. The quality of recording of cockpit voice recorders - 4.1.5.3 Overview of existing EASA regulations and GM	2
24	34	4. IA - 4.1 What is the issue - 4.1.5. The quality of recording of cockpit voice recorders - 4.1.5.5 Documents published by BEA France	1
25	39-40	4. IA - 4.3. How it could be achieved — options - 4.3.3. The serviceability of flight recorders - 4.3.3.2 Conversion FDR raw data into flight parameters expressed in engineering units	1
26	43	4. IA - 4.4. What are the impacts - 4.4.4. Economic impact - 4.4.4.3 The serviceability of flight recorders	2
27	44-45	4. IA - 4.4. What are the impacts - 4.4.5. ICAO and third-country references relevant to the content of this RMT	1
28	51	8. Quality of the document	1



2. Individual comments and responses

In responding to the comments, the following terminology has been applied to attest EASA's position:

- (a) **Accepted** — EASA agrees with the comment and any proposed amendment is wholly transferred to the revised text.
- (b) **Partially accepted** — EASA either partially agrees with the comment, or agrees with it but the proposed amendment is only partially transferred to the revised text.
- (c) **Noted** — EASA acknowledges the comment, but no change to the existing text is considered to be necessary.
- (d) **Not accepted** — The comment or proposed amendment is not agreed by EASA.

(General Comments)	-
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comment	17	comment by: <i>British Airways</i>
		What is the intended implementation date for the new rules? There are no dates given in the NPA apart from the date of the Decision in Q3 2020. Type Certificates are to CS25 revisions so presumably this is a forward fit requirement only from the Decision date?
response		Noted. The changes that will be introduced in CS-25 and CS-29 will be applicable to products that have the corresponding amendments in their certification basis. This will be the case for new aircraft types but also for certain changes to already certified aircraft types (when these changes must comply with the last certification specifications after application of the Changed Product Rules).
comment	21	comment by: <i>UK CAA</i>
		Thank you for the opportunity to comment on NPA 2019-12, installation and maintenance of recorders – certification aspects . Please be advised that there are no comments from the UK Civil Aviation Authority and that we are in support of the proposal.
response		Noted.
comment	43	comment by: <i>GAMA</i>
		The cost implications for the acquisition of FDR data, servicing, and calibration have not been properly assessed. For example, proprietary software would be required to read FDR data, additional equipment and training would be required for maintainers to assess data, and additional manpower would be required to perform additional servicing and calibration. Similarly for the CVR maintenance costs related to software, the implications of training and additional manpower have not been considered.
response		Not accepted.

This NPA proposed changes to the AMCs in CS-25 and CS-29 with the aim to ensure that operators are supported by the aircraft manufacturers (in terms of maintenance instructions) in order to comply with the ICAO Annex 6 standards and EU Air Operations rules that require operators to make regular operational checks and evaluations of recordings. Refer to point (b) of CAT.GEN.MPA.195, point (b) of NCC.GEN.145 and point (b) of SPO.GEN.145 and to their associated AMC. The AMC changes proposed in this NPA reflect the state of the art in this domain and do not create design requirements for aircraft manufacturers or suppliers of recording systems. In terms of economic impact, it has been assessed that operators should benefit from improved Instructions for Continued Airworthiness.

comment	58	comment by: <i>European Cockpit Association</i>
	ECA welcomes the proposals of NPA 2019-12 and agrees that the suggested amendments will lead to improvements in the availability and quality of the data recorded by flight recorders. Ultimately this will positively affect the safety of aircraft.	
response	Noted.	

comment	73	comment by: <i>European Helicopter Association (EHA)</i>
	<p>The NPA proposes changing CS-29 and AMC to require TC/STC holders to provide better information for maintenance and servicing of CVRs and FDRs. The changes will require ICAs to include requirements for periodic verification of the system performance above what is typically required today.</p> <p>The changes will potentially require maintainers obtain software licenses from equipment suppliers to analyze FDR and CVR data, additional test equipment and training of technicians for the required testing. All of these would have a financial and resource impact on maintenance organizations.</p>	
response	<p>Not accepted.</p> <p>NPA 2019-12 proposed changes to AMCs in CS-25 and CS-29 with the aim to ensure that operators are supported by the aircraft manufacturers (in terms of maintenance instructions) in order to comply with the ICAO Annex 6 standards and EU Air Operations rules (that require operators to make regular operational checks and evaluations of recordings). Refer to point (b) of CAT.GEN.MPA.195, point (b) of NCC.GEN.145 and point (b) of SPO.GEN.145 and to their associated AMC.</p> <p>More specifically, AMC1 CAT.GEN.MPA.195(b), AMC1 NCC.GEN.145(b) and AMC1 SPO.GEN.145(b) specify periodic inspections of the FDR recording, CVR recording and DLR recording, as well as other regular checks. Standards in ICAO Annex 6 Part III, Appendix 4, Section 6 prescribe such regular checks.</p> <p>CAT.GEN.MPA.195 and its AMC have been applicable in all EASA Member States since 2014. NCC.GEN.145, SPO.GEN.145 and their AMC have been applicable since 2016. The investment necessary for complying with these provisions should have been made years ago by operators based in EASA Member States.</p>	

comment	23	comment by: <i>Airbus-Regulations-SRG</i>
	Airbus Commercial Aircraft is pleased to provide comments on NPA 2019-12. We have carefully checked this proposal. Our comments are allocated to the dedicated section OR indicates all affected sections.	
response	Noted.	

2.1. Why we need to change the rules — issue/rationale

p. 4

comment	75	comment by: <i>IATA</i>
	<ol style="list-style-type: none"> General – IATA welcomes the regulatory provisions clearly establishing the TCH obligation to produce ICAs for Flight Recorders. The proposed new sections AMC 25.1457 CVR 8. ICA; AMC 25.1459 FDR 7.ICA and AMC 25.1460 DLR 5.ICA, as well as the corresponding CS 29 equivalents, should ensure a solid basis for the individual maintenance programs of the operators (i.e. AMP). 	
response	Noted.	

2.1.4. The quality of recording of cockpit voice recorders

p. 5

comment	1	comment by: <i>VR²C</i>
	<p>During the application of AIR-OPS for CVR inspection, the following issues have been identified:</p> <ul style="list-style-type: none"> - boomset fitted not compliant with CS 25 and with very bad performances, - boomset with ANR with bad performance, just plug and play without CVR analysis during the certification process, - clipping of the signals on the channels of flight crew members when coming from the boomsets with a very high level setting, - excessive electrical interferences, - degradation of CAM channel performance due to aging. <p>Moreover, some tools used to download the CVR can corrupt the data. No tool (GSE) is formally defined, specified and certified. ED-112 should be updated to consider this topic.</p>	
response	<p>Noted.</p> <p>EUROCAE established Working Group 118, tasked to prepare a revision of the ED-112A standard. The commentator was informed early June 2020 of the start of the project and invited to send a proposal to the EUROCAE project manager.</p>	
comment	63	comment by: <i>Bombardier</i>
	<p><u>Reference:</u></p>	

Section “2.1.4. The quality of recording of cockpit voice recorders” states “ [...] These issues seem to be recurrent because of the lack of a framework for demonstrating the audio quality of a CVR system installation. Indeed, many factors potentially affecting the quality of the recorded audio cannot be addressed at the equipment level, such as the effects of components of the audio system (e.g. headsets), the air circulation in the vicinity of microphones (due to air conditioning systems), vibrations during the flight, electromagnetic interference, etc.”.

Comment:

While BA agrees that accident/incident investigation authorities have indeed found that some CVR system installations do not provide the quality expected, BA disagrees that there is no framework for demonstrating the audio quality of a CVR system installation during original certification.

Many Certification Specifications, such as 2x.1301, 2x.1309, and 2x.1457, require that the applicants for a CVR system installation demonstrate that the CVR system installation performs its intended function and records audio suitable for accident/incident investigation purposes under all foreseeable operating conditions.

A clear framework exists in Part 21 for CVR system installation applicants to submit certification plans which propose means and methods of compliance to demonstrate compliance to these existing CSes. Typically, EASA has insisted on such demonstrations of compliance to be performed by ground and flight tests.

Proposal:

BA proposes EASA delete this text or amend the preamble of the corresponding CRD to state that the existing Part 21 certification framework used to demonstrate compliance to existing Certification Specifications is adequate to ensure CVR systems perform their intended function when installed, under all foreseeable operating conditions with the exception of some severe environmental conditions (heavy rain or hail strikes which create loud noises in cockpit and drown out CAM, EMC disturbances or solar flares, etc), and clarify however that operators have a role to play to ensure the CVR system record quality remains adequate

response

Not accepted.

Although it is agreed that certification rules already exist, the fact is that some certified aircraft have faced various issues affecting the quality of the CVR recording system in such a way that the utilisation of the recording by accident investigation authorities is substantially degraded. Such concern has been encountered on recently certified new aircraft types, showing that the demonstration of compliance with the mentioned rules needs to be improved. Therefore, EASA issued Certification Memorandum CM-AS-001 in 2012. Similarly, the FAA issued Advisory Circular 20-186 in 2016. One objective of this NPA is to transfer the content of CM-AS-001 into the AMCs to CS 25.1457 and CS 29.1457.

3. Proposed amendments in detail - 3.1. Rationale - 3.1.1. Data link recording

p. 8-10

comment 24

comment by: *Airbus-Regulations-SRg*



	<p>Related Section: Page 8 / Chapter 3.1.1 Data link recording</p> <p>PROPOSED TEXT: Add reference to CS & AMC 29.1460 to read as follows:</p> <p>It is proposed to create new provisions (CS and AMC 25.1460 / CS and AMC 29.1560) to address the installation of data link recorders. The following topics have been reviewed in relation to the content of these new provisions. [...]</p> <p>RATIONALE: The NPA is intended to introduce data link requirements to CS-25 and CS-29.</p>
response	<p>Noted. Your comment is correct. But please note that the explanatory note of the NPA will not be re-published.</p>

3.1.2. The serviceability of flight recorders - 3.1.2.1 Maintenance instructions

p. 10-11

comment	<p>44 comment by: GAMA</p> <p>The need for maintainers to check “that the dedicated flight parameters are recorded within the calibration tolerances” implies that maintainers have a means to read data. The costs of software licenses to read the FDR vendors' proprietary format data files may make the ability to perform this check cost prohibitive.</p>
response	<p>Noted. This concern related to commercial considerations does not appear to be created by the proposed changes to CS-25 and CS-29. This NPA does not create new Air Operations requirements. It aims at supporting operators in complying with the ICAO Annex 6 standards and EU Air Operations rules. Please refer also to the response to comment 43.</p>
comment	<p>89 comment by: Airbus-Regulations-SRg</p> <p>Related section: Page 10 / section 3.1.2.1 / Maintenance instructions</p> <p>Airbus request Airbus request to amend the first sentence in the section “Content of the maintenance instructions” to read as follows: The above-mentioned ICAO Annex 6 standards and the ED-112A standard provide the recommended tasks and intervals which should be addressed by the TC or STC Holder when determining the ICA.</p> <p>Rationale:</p>



response

The ICA itself may not need to address the tasks and intervals recommended in ICAO Annex 6 and the EUROCAE ED-112A.

This will depend on the design. The NPA requirement, as correctly written below this sentence, is for the TC or

STC Holder to determine whether this task, or another equivalent task, is needed. In some cases no task will be needed and this

will thus not be addressed in the ICA delivered to the end user.

Noted.

Please note that the explanatory note of the NPA will not be re-published. Regarding the issue raised in the rationale of this comment, please refer to the response to comment No 88.

3.1.2. The serviceability of flight recorders - 3.1.2.2 The conversion of FDR raw data into flight parameters expressed in engineering units

p. 11

comment

84

comment by: Airbus-Regulations-SRg

Related sections:

Page 11 / **Section 3.1.2.2** / The objective for FDR decoding documentation AND

Page 39 / **Section 4.3.3.2** / Conversion of FDR raw data into flight parameters expressed in engineering units AND

AND

Page 47 / **Section 4.6** / Monitoring and evaluation

Airbus request:

Airbus proposes to clarify the applicability of the proposed AMC 25.1459(7)(f) :

The wording “for every new FDR system installation and updated for every change to an FDR system installation”

is used in sections 3.1.2.2 and 4.3.3.2 while section 4.6 states that the proposed changes to CS25 and CS29

will apply to new aeroplane type designs. This is inconsistent and creates confusion regarding the applicability

date to provide the decoding information as part of the ICA, in particular the decoding information in electronic format.

Therefore we would like to encourage EASA to clarify that the proposed changes to AMC 25.1459 (7)(f) are applicable

to new aeroplane type designs.

Rationale:

The proposed AMC 25.1459 (7) is not directly linked to a new amendment of CS 25.1459 rule, therefore it is difficult as an

applicant to identify the applicability of the new AMC. The wording of the initial NPA in section sections 3.1.2.2 and 4.3.3.2

can be understood as a request to provide electronic decoding information as part of the FDR ICA for all changes

on the FDR system, even in case that the applicable certification basis will not cover the amendment of the proposed AMC.



response	<p>In this case it could be interpreted as a retroactive requirement which is out of the scope of CS 25 and would create a significant burden on the applicants for changes to TC / STCs for FDR alterations in case where the electronic decoding information was not provided as part of the FDR system certification of the aircraft before.</p> <p>Also for the economic impact assessment as per section 4.4.4.3 Airbus can agree on the acceptable cost impact on design organizations for new system developments only.</p> <p>The preparation, validation and release of ARINC 647A files for the already flying fleet would have a significant economic impact.</p> <p>Noted.</p> <p>The new AMC provision would apply to certification projects which have the corresponding new CS-25 or CS-29 amendment in the identified certification basis (i.e. new aircraft types, and new FDR systems if applicable per point 21.A.101 of Part-21 (in most of the cases, the change should not be classified as significant, though)). It is therefore not retroactive.</p> <p>Note: The meaning of 'FDR decoding documentation to be prepared for every new FDR system installation and updated for every change to an FDR system installation' is that the already issued decoding documentation should be updated when the FDR system installation concerned is modified.</p>
comment	<p>85 comment by: Airbus-Regulations-SRG</p> <p>Related sections: Page 11 / Section 3.1.2.2 / The objective for FDR decoding documentation AND Page 39 / Section 4.3.3.2 / Conversion of FDR raw data into flight parameters expressed in engineering units</p> <p>Airbus proposal: To add "...affecting the decoding documentation..." to read as follows:</p> <p>[...] The objective is for FDR decoding documentation to be prepared for every new FDR system installation and updated for every change to a FDR system installation affecting the decoding documentation, and that this documentation should be made available to aircraft operators so that they can fulfil their responsibilities with regard to FDR decoding documentation and FDR serviceability. Guidance should also be provided on the content and format of the FDR decoding documentation.</p> <p>Rationale: The term "change to a FDR system installation" would also include mechanical and electrical changes to the FDR system which have no impact on the way how the information is stored on the FDR. The update of the decoding information</p>

	documentation should be limited to those cases where the change affected the decoding information.
response	Noted. Your comment is correct. But please note that the explanatory note of the NPA will not be re-published.

3.1.3. The quality of recording of cockpit voice recorders

p. 11-12

comment	2	comment by: VR ² C
	The BEA document (Study on Detection of Audio Anomalies on CVR recordings) or its content should be included in ED-112 A in Annex I-A to become more formal.	
response	Noted. The content of this document has been taken into account when drafting the proposed AMCs. EUROCAE established Working Group 118, tasked to prepare a revision of the ED-112A standard. The commentator was informed in early June 2020 of the start of the project and invited to send a proposal to the EUROCAE project manager.	
comment	3	comment by: VR ² C
	The ED-112 A mentions the following: "means shall be provided to stop the recorder automatically as soon as possible at the completion of the flight but no later than ten minutes". Some A/C stop the recording a few seconds after the last engine shut down and so the post flight checklist is not recorded.	
response	Noted. Today, conditions on the start-and-stop logic of the CVR are already set in the EU Air Operations rules. When considering aeroplanes operated for CAT, CAT.IDE.A.185 contains conditions that depend on the date of first issuance of the individual certificate of airworthiness: refer to points (f) and (g) of CAT.IDE.A.185. For aeroplanes that only have to meet point (f) of CAT.IDE.A.185, it is not expected that the CVR will continue to record after the time when the aeroplane is not capable of moving under its own power. For aeroplanes that must meet points (f) and (g) of CAT.IDE.A.185, the CVR shall record pre- and post-flight checks 'depending on the availability of electrical power'. Regarding new CVR system installations: point (c)(iv) of paragraph 9 of AMC 25.1457, as proposed in NPA 2019-12, specifies that the evaluation of the CVR recording should include 'checking, that the CVR begins to operate no later than the start of the pre-flight checklist and continues to operate until the completion of the final post-flight checklist'. The point (c)(iv) of the proposed paragraph 7 of AMC 29.1457 contains the same recommendation. However, for consistency with the conditions on the automatic means to stop the recording after a crash impact, the points (c)(iv) of the proposed paragraph 9 of AMC 25.1457 and (c)(iv) of the proposed paragraph 7 of AMC 29.1457 have been amended: please refer to comment No 64.	



comment	<p>4 comment by: VR²C</p> <p>In some CVRs, failures code are not identified in CMM (and so cannot be decoded). Moreover, most major failures are not reported or do not lead to a test fault at cockpit level (CAM inop for instance).</p>
response	<p>First comment (related to the CMM): Noted. This comment is not specific and not substantiated. In addition, the CMM belongs to the documentation to be provided by the equipment manufacturer, while the equipment approval is not in the scope of RMT.0249.</p> <p>Second comment (related to the reporting of CVR failures to the cockpit): Accepted. While subparagraph (d)(3) of CS 25.1457 and subparagraph (a)(4) of CS 25.1459 both require an aural or visual means for pre-flight checking of the recorder for proper operation, only AMC 25.1459 specify the types of failures that should be detected and indicated as a minimum by this means (refer to paragraph 3 of AMC 25.1459). On the other hand, ED-112A provides a list of failures to be monitored, regardless of the type of flight recorder (refer to Section 2-1.4.2). Therefore, for consistency, the same paragraph is created in AMC 25.1457 (as paragraph 4).</p>
comment	<p>27 comment by: Lufthansa German Airlines</p> <p>i) The referenced paragraph of ED-112A is good as far as it is used to provide a first time release to service recorders. It is part of the document mentioned in Paragraph 3.1.3.c)1)ii).</p> <p>iv) Impossible for LR and XLR aircraft with the actual technology. Actual recording time 120 min. LR and XLR flights are longer than 120 min.</p> <p>v) a) CVR is set to record on-wing. The download of of voice data is prohibited by hardware. Therefore the BITE should also be prohibited from downloading on-wing. b) No AMM Procedure available. c) No decoding tool available for many operators. d) Old ED-56 Recorders have an empty memory. ED-112 and ED-112A Recorders often show non-fatal errors which can be ignored for the operation (mostly power up).</p>
response	<p>Comment on 3.1.3c)i): Noted. Comment on 3.1.3.c)iv): Not accepted. Paragraph 9 of the proposed AMC 25.1457 (Evaluation of the CVR recording) is applicable to the evaluation of the CVR recording to be performed by the TC or STC applicant to demonstrate an adequate performance of the installed CVR system, and not to the regular CVR recording inspection to be performed by the aircraft operator. Point b of the proposed paragraph 9 of AMC 25.1457 specifies the following: 'b. To ensure that the CVR system is properly installed [...], the applicant should conduct a flight test. The recording obtained should be evaluated to confirm that the quality is acceptable during all the normal phases of flight (including taxi-out, take-off, climb, cruise, descent, approach, landing, and taxi-in).'</p> <p>Comment on 3.1.3c)v): Not accepted The proposed paragraph 9 of AMC 25.1457 is applicable to the evaluation of the CVR recording to be performed by the TC or STC applicant to demonstrate adequate performance of the installed CVR system, and not to the regular CVR recording inspection to be performed by the aircraft operator.</p>

3.2. Draft CS-25 - 3.2.1. Data link recording - CS 25.1460

p. 12-13

comment

25

comment by: Airbus-Regulations-SRg

Related section
Page 13, para. **CS 25.1460 (c)**

PROPOSED TEXT *and* COMMENT:

Airbus suggests to modify the proposed CS 25.1450(c) to read as follows:

(c) The container of the recorder must be located and mounted so as to minimise the probability of the recorder container rupturing, the recording medium being destroyed, or the recorder locating device failing as a result of **any possible combinations of**:

- its deployment, if applicable;
- an impact with the Earth's surface; ~~or~~
- the heat damage caused by a post-impact fire; **and**
- **immersion in water**

Alternatively, replace CS 25.1460(c) wording by a reference to CS 25.1457 (e) / 25.1459 (b).

RATIONALE:

The crash protection considerations for a data link recording system should be harmonized with the requirements for CVR/FDR as per CS 25.1457 (e) and CS 25.1459 (b). Also for data link recording system a possible combination of the factors should be considered as well as the possible immersion in water.

response

Accepted.

comment

66

comment by: DGAC France

Since FDR/CVR recording duration requirements are specified both in EU 965/2012 and CS-25 (through the criteria for an automatic means to stop the recording), the same logic should apply to the Data link recorders. Therefore, the proposed CS25.1460 should state that the data-link recording duration should at least be equal to the CVR recording duration?

response

Not accepted.
CS 25.1457 (CVR) does not specify recording duration requirements. However, CS 25.1457(d)(2) requires an automatic means to stop the recording within 10 minutes after crash impact for recorders having a recording duration of less than 25 hours. The intent is to avoid overwriting of a part of the CVR recording after a crash. The minimum recording duration of an FDR, a CVR or data link recorder are set in the applicable Air Operations regulations, not in the certification specifications. The EU Air Operations Regulation No 965/2012, point (c) of CAT.IDE.A.195 (data link recording on board CAT aeroplanes) and point (c) of CAT.IDE.H.195 (data link recording on board CAT helicopters) already require the recorder to be capable of



retaining data recorded for at least the same duration as the one required for the CVR.

comment 67 comment by: DGAC France

The proposed CS 25.1460 and its AMC do not seem to provide details on the equipment approval requirements. Shouldn't a reference to TSO C177 be included for that purpose?

response Accepted.
CS 25.1460(a) specifies, with similar wording to CS 25.1457(a), that the recorder must be 'approved'. This means that the recorder must be approved, either through an ETSO (or an accepted foreign TSO e.g. from the FAA) approval or as part of the aircraft type.
This has been clarified by a statement referring to the ETSO in AMC 25.1460. An equivalent statement is also added in the AMC 25.1457, AMC 25.1459, AMC 29.1457, and AMC 29.1459.

comment 68 comment by: DGAC France

For the sake of consistency between operational and certification requirements, it is proposed that the additional guidance provided in AMC1 CAT.IDE.A.195(f) be included in the proposed CS 25.1460 (a) or its AMC.

response Not accepted.
It is not appropriate to duplicate the content of AMC1 CAT.IDE.A.195 that deals with the data link messages to be recorded, because aeroplanes falling outside the scope of applicability of Regulation (EU) No 965/2012 have to comply with the Air Operations regulation applicable in the State of the operator.

comment 69 comment by: DGAC France

A requirement similar to 25.1459(b)(3) and 25.1457(e)(3) should be added to (c) to deal with failures that could result from immersion in water.

response Accepted.

comment 97 comment by: Textron Aviation

Many CVR's have the ability to record data-link, is it necessary to provide a separate indication for whether or not the CVR has failed vs. a data-link failure or is it acceptable to have one failure indication regardless of which function has failed, i.e. a device failure?

If the recorder performs several recording functions (i.e. it is a combination recorder), the means for pre-flight checking the recorder for proper operation should indicate which device (if any) recordings have failed. For example a CVR, which is also capable of recording data-link messages should indicate CVR fail if either the voice recording or the data-link recording portion of the recorder has failed.

response Partially accepted.



This question is addressed in paragraph 2 of the proposed AMC 25.1460 in the NPA. This paragraph specifies that ‘the means for pre-flight checking the recorder for proper operation should indicate which (if any) recording functions (e.g. FDR, CVR, data-link recorder, etc.) have failed.’.

Paragraph 2 of AMC 25.1457 contains the same provision, since Amendment 23 of CS-25, and paragraph 5 of AMC 25.1459 refer to paragraph 2 of AMC 25.1457. Therefore, for the sake of consistency, the text of paragraph 2 of the proposed AMC 25.1460 is replaced by a reference to the paragraph of AMC 25.1457 titled ‘Combination recorder’.

The same change is made to paragraph 2 of the proposed AMC 29.1460.

3.2. Draft CS-25 - 3.2.1. Data link recording - AMC 25.1460

p. 13-14

comment	28	comment by: <i>Lufthansa German Airlines</i>
	3b) Important for forward fit aircraft.	
response	Noted.	

comment	59	comment by: <i>European Cockpit Association</i>
	Given the options listed in this section, ECA is concerned that, depending on the type of recorder and/or the recording method used, (a part of) the digital content of a recorder used for data link purposes may also contain privacy sensitive information.	
	In that context we suggest to include inspection procedures and provisions in line with what is detailed in Reg (EU) 965/2012CAT.GEN.MPA.195 (f) in order to protect the privacy of (eg CVR) recordings both during the certification process as well as during regular maintenance.	
response	Not accepted. The protection of the privacy of recordings is not regulated by CS-25 or CS-29.	

3.2. Draft CS-25 - 3.2.2. The serviceability of flight recorders - AMC 25.1457

p. 14

comment	29	comment by: <i>Lufthansa German Airlines</i>
	b) e. g. 4 Channel test is not appropriate to check the quality of the recording. Which functional checks will provide information about the quality of the recording?	
	d)iv) From a component point of view further on-wing tests. Are the actual performed operational checks are still enough to fulfill the requirements?	
response	First comment: Noted. As specified in paragraph 8 of the proposed AMC 25.1457 in the NPA, the ICA should include ‘Inspections of in-flight recording, to detect problems with the audio quality of the recording’. Point (a) of AMC1 CAT.GEN.MPA.195(b) already recommends that the operator performs an inspection of the CVR recording at regular time intervals	



(every two years for a solid-state CVR fitted with continuous monitoring for proper operation).

Second comment: Noted

Any type of beacon used to help to locate the memory medium after an accident (underwater locating device or emergency locator transmitter) should be operative. For instance, the state of charge of the beacon battery should be checked at regular time intervals to ensure that, after an accident, it is sufficient for the beacon to transmit during at least the minimum duration specified by the applicable industry standards (30 days for an ULD, 150 hours for an ELT). However, paragraph 8 of the proposed AMC 25.1457 is only applicable to certification projects which have the corresponding new CS-25 or CS-29 amendment in the identified certification basis (i.e. new aircraft types, and new FDR systems if applicable per point 21.A.101 of Part-21).

comment

76

comment by: IATA

1. Point 3.2.2 of the NPA (page 14 of 51)

- Section AMC 25.1457 CVR (...) 8. ICA
 - Existing text:

“a. Inspections of in-flight recording, to detect problems with the audio quality of the recording;

b. Other functional checks needed to ensure that the quality of the recordings is acceptable, when appropriate;”

- Proposed text:
-

“a. Inspections of in-flight recording, to detect problems with the audio quality of the recording; the content of such inspections for the audio quality of the recording should be consistent with the in-service status of the CVR and should not be driven by the extent of recommendations in section “9. Evaluation of the CVR recording” of this AMC;

b. Other functional checks needed to ensure that the quality of the recordings is acceptable, when appropriate; the content of such functional checks to ensure that the quality of the recordings is acceptable should be consistent with the in-service status of the CVR and should not be driven by the extent of recommendations in section “9. Evaluation of the CVR recording” of this AMC;

- Rationale: The extent and granularity of the steps which a TC applicant should go through by following “AMC 25.1457 9. Evaluation of the CVR recording” during certification, in order to show compliance with CS 25.1457(b), is not proportional to what an operator’s AMP should include.



	<p>The present text could leave room to interpretation and unnecessary level of ICA provisions which an operator would have to address at a high cost and with no real benefits to the safety of operation.</p>
response	<p>Partially accepted.</p> <p>Paragraph 9 of the proposed AMC 25.1457 of the NPA ('Evaluation of the CVR recording') is not intended for an operator, but for aeroplane certification projects that include the installation of a CVR system.</p> <p>In order to address this comment as well as comment No 6, the first paragraph of paragraph 9 of the proposed AMC 25.1457 is amended as follows: 'The following acceptable means of compliance with CS 25.1457(b) is provided to demonstrate that the performance of the a new or modified CVR system is acceptable and that the quality of the CVR recording is acceptable. Inspections of the CVR recording that are part of the Instructions for Continued Airworthiness are not in the scope of this paragraph.'</p> <p>The paragraph 7 of the proposed AMC 29.1457 is amended in the same manner.</p>
comment	<p>88 comment by: Airbus-Regulations-SRg</p> <p>Related sections: Pages 14-17 / section 3.2.2 / Serviceability of flight recorders</p> <p>Airbus general comment: A Type Certificate Holder (TCH) will publish all scheduled maintenance tasks declared as ICAs in either the Airworthiness Limitations Section or the Maintenance Review Board Report (or equivalent document / repository if the Maintenance Review Board (MRB) Process is not used). There are no other options. If MRB Process is used, a means must be found to generate the required tasks out of MSG-3 logic. The MSG-3 logic used to develop the content of the MRB Report is capable of identifying all applicable and effective tasks to address the concerns raised in this NPA. It is acknowledged that guidance on what functions and functional failures need to be considered is beneficial to ensure a rigorous application of the MSG-3 logic. Furthermore, clarification of the importance of the availability and validity of recorder functions will guide applicants to address hidden failures / faults according to a logic that requires the selection of a scheduled task. This selection may not always be secured in current applications of MSG-3.</p> <p>Airbus request: Airbus request that the NPA is reworded (as detailed in specific Airbus comments) to require the applicant to assess specific functions and functional failures rather than being prescriptive in terms of identifying the need</p>



for particular scheduled tasks. Technology advances have led, or will lead, to designs that signal failures and faults through continuous monitoring indication and/or by BITE thus allowing visibility to flight crew. Scheduled tasks may thus not be necessary and should not be forced out of the MSG-3 logic simply to meet the NPA requirements. Neither MRBs nor TCHs support inclusion of tasks in MRB Reports that are not resulting from the logic application.

EASA should be aware of the FAA Flight Standards decision to require TCHs to include FDR and CVR download tasks in all MRB Reports. Industry has asked FAA to revisit this prescriptive requirement since the tasks may not be necessary in some design solutions.

Rationale:

Airbus would like to see an international agreement on the measures that need to be taken to assure the availability and validity of DFDR and CVR recordings. The NPA proposes a realistic approach that would cause TCH applicants to address the functions and functional failures of the designs in a robust way. Provided that applicants understand that degraded recording shall be considered in the same way as degraded safety or emergency systems, the MSG-3 logic will determine appropriate maintenance tasks for all failures / faults that would not become visible to the crew flight deck indications. Such tasks will be identified as ICAs by virtue of the fact that they are published in the MRB Report (or equivalent if the MRB Process is not used).

response

Partially accepted.

Regarding the 'international agreement' requested by this comment, standard 7.2 in Section 7 of Appendix 8 to ICAO Annex 6 Part I prescribes that operators perform an inspection of the CVR recording at regular time intervals. This ICAO standard was adopted with Amendment 38 of ICAO Annex 6 Part I, which has been effective since 2014. In addition, standard 7.2 already accounts for more reliable technologies, by permitting, when the CVR system has demonstrated 'a high integrity of serviceability and self-monitoring', that the inspection of the CVR recording is performed every two years instead of every year.

Regarding the MSG-3 methodology, it cannot capture tasks that ensure adequate quality of the CVR audio recording. The reason is that, according to the MSG-3 methodology, safety shall be considered to be adversely affected if the consequences of the failure condition would prevent the continued safe flight and landing of the aircraft and/or might cause serious or fatal injury to human occupants. Therefore, insufficient performance of the CVR or even loss of recording of the CVR are not considered as having an adverse effect on safety, which usually results in the selection of a Failure Effect Category (FEC) 9 – Hidden non safety for such failures.



According to the MSG-3 methodology, the selection of FEC 9 means that the selection of the task is only based on operational and economic criteria, not on safety criteria. Further to that, following the MSG-3 methodology, inspecting the audio quality of the CVR recording does not fulfil the applicability and effectiveness criteria set by this methodology.

Hence, no task to ensure the continued performance of the CVR and in particular minimum audio recording quality results from implementing the MSG-3 methodology.

Nevertheless, EASA accepts the revision of the proposed paragraph on ICA of AMC 25.1457 such that it does not specify the ICA tasks to be included, but instead states that ICA address the failures that may affect the correct functioning of the CVR system or the quality of the recorded audio signals. Examples of failures are also provided. The same approach is applied in AMC 25.1459, AMC 25.1460, and also to the equivalent AMCs in CS-29.

comment 90

comment by: Airbus-Regulations-SRg

Related sections:

Page 14 / **AMC 25.1457 (8)** / Instructions for continued airworthiness (ICA)
AND

Page 14 / **AMC 25.1459 (7)** / Instructions for continued airworthiness (ICA)
AND

Page 16 / **AMC 25.1460 (5)** / Instructions for continued airworthiness (ICA)

Airbus request:

Airbus request to modify the first sentence (each) as follows:

The ICA for the [...] recorder, required by CS 25.1529 and Appendix H, should **be established following evaluation of the need for** ~~include the following items:~~

or as an alternative wording proposal:

The ICA for the [...] recorder, required by CS 25.1529 and Appendix H, should include the following items **unless demonstrated as unnecessary due to the specific design precluding hidden discrepancies:**

Rationale:

The bullets 'a' to 'd' / 'e' / 'f' respectively provide a useful reminder to the analyst to ensure that all functions and functional failures are addressed in the application of the MSG-3 logic. The applicability of the task will be determined by the specific design. A task will be identified for inclusion in the ICAs only if discrepancies may be hidden during normal operations. The NPA should not drive unjustified tasks into the



	ICA documentation.
response	Please refer to the response to comment No 88.

3.2. Draft CS-25 - 3.2.2. The serviceability of flight recorders - AMC 25.1459

p. 14-16

comment	30	comment by: <i>Lufthansa German Airlines</i>
	7b) How is the quality of Flight Data recording defined? Either the specified digital data is recorded or not? What does quality means here?	
response	<p>Noted.</p> <p>EUROCAE Document ED-112A (referenced in paragraph 1 of AMC 25.1457), paragraph II-B.1.7 specifies: 'Flight data recorder systems should be considered unserviceable if the recording duration is less than required, if there is a significant period of poor quality data or if one or more of the mandatory parameters is not recorded correctly.' When considering a given flight parameter, it may not be recorded correctly if the recorded values are stale, not consistent with the normal operating range of that parameter or with the evolution of other parameters, or if the recorded values reveal a problem of accuracy, a constant offset, noise, a large number of outliers or data dropouts. Appendix B of Advisory Circular AC 21-24 of Australia CASA may be consulted for examples related to the quality of an FDR recording.</p>	
comment	42	comment by: <i>Francois GERBAULT (ATR)</i>
	<p>AMC 25.1459 (7)(b)(iii). Format of the FDR decoding documentation -> Is a .xls file comply with the requirement of the AMC 25.1459 (7)(f)(iii)? Rational : an .xml file complies with the need, but is not so obvious to read. A table file (using a row/column display) is more convenient to read. (not to mention that it takes less paper when printing)</p>	
response	<p>Not accepted.</p> <p>ARINC Specification 647A is recommended, as this industry standard covers all the information that FDR decoding documentation should contain, and because it allows the fast transfer of FDR decoding documentation between different flight data processing software. ARINC Specification 647A provides the format that meets the needs of aircraft operators and of the safety investigation authorities. Decoding documentation provided in other formats is often incomplete.</p> <p>This comment also reveals that there is an overlap between points (f)(iii) and (f)(iv) of paragraph 7 of the proposed AMC 25.1459. Indeed, if the FDR decoding documentation complies with ARINC Standard 647A, then it is readily displayable and it allows editing. Therefore, points (f)(iii) and (f)(iv) of paragraph 7 are merged as follows:</p> <p>'iii. Format of the FDR decoding documentation FDR decoding documentation should:</p> <ul style="list-style-type: none"> — be provided in an electronic format; — contain all the information described in paragraph f.ii; and — comply with ARINC Specification 647A or a later equivalent industry standard.' 	



Similarly, points (f)(iii) and (f)(iv) of paragraph 4 of the proposed AMC 29.1457 are merged.

comment

45

comment by: GAMA

Clarification needed for AMC 25.1459 7.a and b.: The inspections of in-flight recording to ensure that data quality is acceptable is levied on flight software?

Clarification needed for AMC 25.1459 7.f.iii., "Format of the FDR decoding documentation . . . it allows editing": Does this imply that the decoding documentation should be retrieved from storage in the FDR, edited in-flight by flight crew, and afterwards updated in the FDR recording medium?

response

First comment: Noted.

The inspection of an in-flight recording of the FDR is described in point GM1 CAT.GEN.MPA.195(b) of AMC & GM to Part-CAT of Air Operations Regulation (EU) No 965/2012. Readout equipment and flight data processing software are needed to retrieve the FDR recording files, extract and plot the FDR parameters.

Second comment: Noted

Point (f)(iii) of paragraph 7 of the proposed AMC 25.1459 neither specifies that the FDR decoding documentation file should be stored on the FDR, nor that this file should be made available to the flight crew members.

comment

82

comment by: Yaborã S.A.

The FDR decoding documentation should not be editable. Otherwise, the operator may change its contents in a way that a user unaware of such a change may not be able to read the FDR file or may read it incorrectly.

We suggest removing the editing requirement for the FDR decoding documentation.

To change the text from:

iii. Format of the FDR decoding documentation

The FDR decoding documentation should be provided in an electronic format such that:

- *it contains all the information described in paragraph f.ii. above;*
- *it is readily displayable (i.e. it can be presented on an output device, like a printer or display screen, using any readily available ASCII text editor); and*
- *it allows editing.*

To:

The FDR decoding documentation should be provided in an electronic format such that:

- *it contains all the information described in paragraph f.ii. above;*
- *it is readily displayable (i.e. it can be presented on an output device, like a printer or display screen, using any readily available ASCII text editor); and*
- ~~*it allows editing.*~~



response Not accepted.
According to paragraph (d) of point CAT.GEN.MPA.195 of Part-CAT of Air Operations Regulation (EU) No 965/2012, 'The operator shall keep and maintain up to date documentation that presents the necessary information to convert raw flight data into flight parameters expressed in engineering units.' In order to help the operator to comply with this requirement, the TC or STC holder should provide this documentation in an editable format together with each delivered aircraft. It should be noted that this requirement has been applicable to operators based in EU Member States under Commission Regulation (EC) No 859/2008 (EU-OPS) that was published in 2008.

comment 86 comment by: Airbus-Regulations-SRg

Related section:
Page 16, **AMC 25.1459/ Chapter 7. (f) (iii)** Format of the FDR decoding documentation

Airbus comment:
If the decoding information in an electronic format is provided as ICA the completeness and accuracy of this electronic information needs to be validated and accepted. Currently there is no process agreed between EASA and the applicant covering such validation of electronic decoding information as part of the ICA package.

response Noted.
Per Part-21, point 21.A.61, the aircraft TC holder is responsible for providing a complete set of ICAs to each owner of an aircraft. This will therefore apply to the FDR decoding information. The process used to validate the ICAs, whatever the format used, falls also under the responsibility of the aircraft TC holder. For a DOA holder, this should be done under an EASA auditable process in accordance with GM No 1 to 21.A.239(a) and GM 21.A.265(h) GM.
Furthermore, EASA may request to be involved during future certification projects for this novel aspect. The TC holder may nevertheless consult EASA on the adequacy of the validation process during a certification project.

comment 87 comment by: Airbus-Regulations-SRg

Related section:
Page 16/ **AMC 25.1459 / Chapter 7 (f) (iv)** Electronic documentation format

Airbus request:
Airbus proposes to amend AMC 25.1459, Chapter 7 (f) (iv) Electronic documentation format.
The sole reference to ARINC 647A as the accepted means of compliance is too prescriptive.
Therefore the use of electronic decoding information in other formats, meeting the criteria listed in AMC 25.1459, Chapter 7 (f) ii and Chapter 7 (f) iii, should be mentioned as acceptable means, too.



	<p>Rationale: Airbus supports the idea that airworthiness requirements should be written as performance based requirements. Even if the proposed AMC 24.1459 is not a regulation by itself, this approach should be followed here, too. Airbus is indeed concerned by the fact that the DFDR decoding documentation has been published in electronic format before the issuance of ARINC 647A standard, and the introduction of AARINC 647A would break the compatibility of different tools used today to decode the data.</p>
response	<p>Partially accepted. ARINC Specification 647A is recommended in paragraph 7 of the proposed AMC 25.1459 (and in paragraph 4 of the proposed AMC 29.1459) because this industry standard covers all the information that FDR decoding documentation should contain, and because it allows the fast transfer of FDR decoding documentation between different flight data processing software. ARINC Specification 647A provides the format that meets the needs of aircraft operators and of the safety investigation authorities. Decoding documentation provided in other formats is often incomplete. In addition, adding an import and export function (from and to the ARINC 647A format) to existing flight data processing software does not require significant software development. In order to make the wording used in paragraph 7 of the proposed AMC 25.1459 less prescriptive, the words 'or a later equivalent standard' have been added. The same change has been made in AMC 29.1459 Please refer also to the response to comment No 42.</p>
comment	<p>91 comment by: Airbus-Regulations-SRg</p> <p>Related sections: Page 15 / AMC 25.1459 (7)(c) / Operational checks</p> <p>Airbus request: Airbus requests to amend AMC 25.1459 (7)(c) to read as follows: [...] c. Operational checks of the recorder not addressed in the pre-flight check described in the Aircraft Flight Manual [...]</p> <p>Rationale: NPA discussion, sub-section 3.1.2.1 line (a) [at the bottom of pdf-page 10] requires the flight recorder installer to assess 'the use of the pre-flight check means for monitoring the proper operation of the flight recorder system'. If this means is selected and the crew action is included in the AFM then there is no justification to include the same check as a maintenance task as part of ICAs.</p>
response	Noted.

This paragraph of the AMC has been revised such that it does not specify any more a list of tasks to be included in the ICA, thereby making this comment no longer applicable.

3.2. Draft CS-25 - 3.2.2. The serviceability of flight recorders - AMC 25.1460

p. 16-17

comment	<p>31 comment by: <i>Lufthansa German Airlines</i></p> <p>a) There has to be a specific guideline to identify possible problems during operation. This is not available now. Furthermore it can only be analyzed that datalink (CPDLC) has recorded information and that it is decodable. But there is no reference or comparable data available for the operators. The comparable data would be in the hand of e. g. Eurocontrol which are only recording CPDLC communication above FL 280. Therefore the task can nor be accomplished.</p> <p>b) Please define functional checks that ensures quality of datalink recording on. Also please define the term "quality" for a CPDLC communication.</p> <p>e)i) The data can be decoded but depending on the OEM of the recorder the documentation for ICA purposes differs significantly. One provides the information in clear text, the other provide only a storable HEX-/Ascii-File which has to be decode a clear text file again.</p>
response	<p>First comment: Not accepted. GM1 CAT.GEN.MPA.195(b) of AMC & GM to Part-CAT of Air Operations Regulation (EU) No 965/2012 provides guidance on how to perform an inspection of the data link recording: 'Checking the consistency of the data link recording with other recordings for example, during a designated flight, the flight crew speaks out a few data link messages sent and received. After the flight, the data link recording and the CVR recording are compared for consistency.'</p> <p>Second comment: Not accepted. EUROCAE Document ED-112A (reference in paragraph 1 of the proposed AMC 25.1460), paragraph IV-B.2 specifies: 'Data link recorder systems should be considered unserviceable if the recording duration is less than required, if one or more messages are corrupted or not recorded.' EASA is not responsible for defining functional checks, which is the responsibility of the TC or STC holder which performs the data link recording system installation. This is why point b. of paragraph 5 of the proposed AMC 25.1460 specifies 'when appropriate'.</p> <p>In addition, data link applications other than CPDLC are in the scope of data link recording, as listed in Part-CAT, point CAT.IDE.A.195: data link initiation, addressed surveillance, flight information, aircraft broadcast surveillance, aeronautical operational control data, and graphics. A description of these applications is provided in AMC1 CAT.IDE.A.195.</p> <p>Third comment: Noted. There is no industry standard that specifies in which format the decoding documentation of data link recording should be provided.</p>
comment	<p>47 comment by: <i>GAMA</i></p>



response	<p>Clarification needed for AMC 25.1460 5.a. and b.: The inspections of in-flight recording to ensure that data quality is acceptable is levied on flight software?</p> <p>Noted. The inspection of an in-flight recording of the data link recording is described in GM1 CAT.GEN.MPA.195(b) of AMC & GM to Part-CAT of Air Operations Regulation (EU) No 965/2012. Readout equipment is needed to retrieve the datalink recording files.</p>
comment	<p>70 comment by: DGAC France</p> <p>The paragraph ICA should be "4" instead of "5"</p>
response	<p>Accepted.</p>
comment	<p>93 comment by: Airbus-Regulations-SRg</p> <p>Related sections: Page 16 / AMC 25.1460 (5)(c) / Operational checks</p> <p>Airbus request: Airbus requests to amend AMC 25.1460 (5)(c) to read as follows: [...] c. Operational checks of the recorder not addressed in the pre-flight check described in the Aircraft Flight Manual [...]</p> <p>Rationale: If the pre-flight check detailed in the Aircraft Flight Manual includes crew actions that verify availability of some aspects of the recorder system then there is no justification to include the same check as a maintenance task in the ICAs.</p>
response	<p>Noted. This paragraph of the AMC has been revised such that it does not specify any more a list of tasks to be included in the ICA, thereby making this comment no longer applicable.</p>

3.2. Draft CS-25 - 3.2.3. The quality of recording of cockpit voice recorders - CS 25.1457 p. 17

comment	<p>32 comment by: Lufthansa German Airlines</p> <p>2) Recording during normal flight operations does not provide information which mike is used. Normally mask mike are not used and will therefore not be quality checked during analysis.</p> <p>4)i) Not used during normal flight operations, due to no occupation.</p>
response	<p>Not accepted. CS 25.1457(c) specifies which sources must be recorded on separate channels. It does not deal with quality check instructions. In addition, paragraph 9 of the proposed</p>



AMC 25.1457 is applicable to the evaluation of the CVR recording to be performed by the TC or the STC holder for demonstrating adequate performance of the installed CVR system, and not to the regular CVR recording inspection to be performed by the aircraft operator.

comment	71	comment by: DGAC France
	The new paragraph added does not take into account item (c)(4)(i) of CS 25.1457. It shall do it.	
response	<p>Not accepted</p> <p>The proposed new paragraph in point (c) of CS 25.1457 states the following: 'No channel shall record communication or audio signals from more than one of the following sources: the first pilot station, second pilot station, cockpit-mounted area microphone, or additional crew member stations.'</p> <p>This new paragraph does not forbid the mixing of audio signals between crew member stations other than the first pilot station and the second pilot station. Therefore, it does not contradict (c)(4)(i).</p>	

3.2. Draft CS-25 - 3.2.3. The quality of recording of cockpit voice recorders - AMC 25.1457

p. 17-20

comment	5	comment by: VR ² C
	<p>CVR system definition is in ED-112.</p> <p>AIR-OPS refers to CVR dedicated equipment for the same perimetre of items belonging to the recording function.</p> <p>Harmonisation would be welcome for the definitions.</p>	
response	<p>Partially accepted.</p> <p>A sentence has been added at the beginning of paragraph 1 of AMC 25.1457 and of paragraph 1 of AMC 29.1457 to explain the meaning of the term 'CVR system'. Similar sentences have been added regarding the FDR system and the DLR system in the corresponding AMCs.</p> <p>Note: the term 'CVR system' is not used in CS 25.1457, in CAT.IDE.A.185 or in AMC and GM to CAT.IDE.A.185.</p>	
comment	6	comment by: VR ² C
	<p>As the CVR system includes the following as per the ED-112 (Audio interface equipment, including microphone/telephone signal summing amplifiers,), does it mean that a boomset or audio management unit P/N change implies to perform a flight test to check the CVR recording?</p> <p>Is the flight test duration supposed to cover the complete CVR duration (2 or 25 hours)?</p>	
response	<p>First comment: Accepted.</p> <p>The beginning of paragraph 9 of the proposed AMC 25.1457 has been amended to clarify this aspect: please refer to the response to comment No 76.</p>	



	<p>Second comment: Not accepted; Performing a flight test of the duration of the CVR is not necessary to demonstrate the CVR recording duration. The correct recording of data by the CVR is an equipment-level requirement and it is already addressed by point (a) of CS 25.1457, which requires the CVR to be approved.</p>	
comment	7	comment by: VR ² C
	<p>ED-112A provides tool description which is totally oldfashioned. As the audio file from a CVR is a wav format, the use of an oscilloscope do not provide any added value. This chapter in ED-112 should be revised to reflect the updated tools.</p>	
response	<p>Noted. It is agreed that the use of an oscilloscope has been replaced by better tools. Nevertheless, the ED-112A standard does not mandate the use of an oscilloscope.</p>	
comment	8	comment by: VR ² C
	<p>Replay center: Unlike the other A/C domains, recorders evaluation can be performed by anybody without any specific approval (as Part 21J, G, 145 or 66 is not relevant) and nobody is able to evaluate the adequate knowledge of the replay centers. A working group with investigators and AA should be created to evaluate the replay centers.</p>	
response	<p>Noted. EUROCAE established Working Group 118, tasked to prepare a revision of the ED-112A standard. The commentator was informed in early June 2020 of the start of the project and invited to send a proposal to the EUROCAE project manager.</p>	
comment	9	comment by: VR ² C
	<p>The BEA document "Study on Detection of Audio Anomalies on CVR recordings " should be included in the ED-112 so that the evaluation can refer to the criteria identified in BEA document.</p>	
response	<p>Noted. EUROCAE established Working Group 118, tasked to prepare a revision of the ED-112A standard. The commentator was informed in early June 2020 of the start of the project and invited to send a proposal to the EUROCAE project manager.</p>	
comment	10	comment by: VR ² C
	<p>9. Evaluation of the CVR recording The following acceptable means of compliance: As the CVR performances level are degraded during the time, the CVR certified with a "Fair" comment will become "Poor" very rapidly without any solution as the aging effect is not managed from a maintenance stand-point.</p>	
response	<p>Partially accepted.</p>	

This comment does not specify what ‘aging effect’ would make the audio recording quality of a signal source become poor.

This comment also points to the fact that each time this is practicable at reasonable cost, the applicant should strive for audio recording quality that is rated ‘good’, and not only ‘fair’. When a CVR recording system installation is modified, or when a new CVR system is installed on an aircraft type with an already approved audio communication system, it could be challenging to achieve a ‘good’ audio recording quality for some CVR channels, and in that case, ‘fair’ could be acceptable. However, when the CVR system installation is part of a new TC, there is no reason to accept less than ‘good’ audio recording quality.

Therefore, point (e) of paragraph 9 of the proposed AMC 25.1457 is amended to state that the performance of the CVR system should be considered acceptable by the applicant only if, for none of the signal sources required by CS 25.1457(c) or by the applicable operating rules, the quality of the audio recording was rated as ‘poor’. In addition, if a the CVR system is part of a new aeroplane type, the performance of the CVR system should be considered acceptable by the applicant only if for all of the signal sources required by CS 25.1457(c) and by the applicable operating rules, the quality of the audio recording was rated as ‘good’.

The same change is made to point (e) of paragraph 7 of the proposed AMC 29.1457.

comment	11	comment by: VR ² C
response	<p>Table 1: Examples of issues affecting a signal source and of the associated severity. Is a loss of CAM channel for ten minutes acceptable over 120 minutes as this is not a quasi-permanent defect?</p> <p>Today, the loss of CAM channel for 10 minutes is very frequent (detected during CVR inspection).</p> <p>Noted.</p> <p>This case is already part of the examples of issues rated as ‘MAJOR’ in Table 1 of paragraph 9 of the proposed AMC 25.1457: ‘— Uncommanded interruption of the CAM signal’</p>	
comment	12	comment by: VR ² C
response	<p>Table 1: Examples of issues affecting a signal source and of the associated severity. Phasing anomaly between CVR tracks</p> <p>There is no clear requirement in ED-112 which prevents from having such behaviour. How to manage it?</p> <p>ED-112 should be updated to include such a requirement.</p> <p>Noted.</p> <p>EUROCAE established Working Group 118, tasked to prepare a revision of the ED-112A standard. The commentator was informed in early June 2020 of the start of the project and invited to send a proposal to the EUROCAE project manager.</p>	
comment	18	comment by: British Airways
	<p>It's not clear if this AMC is part of instructions for continued airworthiness (ICA). Are prospective Type Certificate holders expected to implement AMC 25.1457 as part of their type design continued airworthiness?</p>	

response Noted.
Paragraph 9 of the proposed AMC 25.1457 is not intended for an operator, but for certification projects that include the installation of a CVR system.
It is provided to support the evaluation of a new CVR system recording in view of its CS-25 certification. The aim is to ensure that new CVR systems are installed with acceptable quality CVR recording. Please refer also to the response to comment No 76.

comment 33 comment by: *Lufthansa German Airlines*

9) Each non-ejectable record container must be located and mounted so as to minimise the probability of container rupture resulting from crash impact and subsequent damage to the record from fire. In meeting this requirement the record container must be located as far after as practicable, but need not be after the pressurised compartment, and may not be where after-mounded engines may crush the container upon impact (See AMC 25.1459(b)).

9)a) Aircraft type certification includes position, system requirements and design specifications. The chapter defines the requirements for evaluation. If this specification is not met the aircraft should not have TC acc. CS25.

9)b) Each operator has to conduct a flight test in order to be compliant with the CVR regulation requirement? Does this mean that operators have to conduct a flight test every day in a year? a) Heavy impact on operation, b) Impact on environmental targets, c) Commercial impact, d) Is this part compliant with EU Directive 2008/101/EC and EU Regulation 224/2014?

c)ii) Complaint by checking issues such as described in the BEA documents titled "Study on Detection of Audio Anomalies on CVR recordings" (published in September 2015) and "Guidance on CVR recording inspection (published in October 2018).

c)iv) Impossible for LR and XLR aircraft with the actual technology. Actual recording time 120 min. LR and XLR flights are longer than 120 min.

c)v) a) CVR is set to record on-wing. The download of of voice data is prohibited by hardware. Therefore the BITE should also be prohibited from downloading on-wing. b) No AMM Procedure available. c) No decoding tool available for many operators. d) Old ED-56 Recorders have an empty memory. ED-112 and ED-112A Recorders often show non-fatal errors which can be ignored for the operation (mostly power up).

response Noted.
Paragraph 9 of the proposed AMC 25.1457 is not intended for an operator, but for certification projects that include the installation of a CVR system.
It is provided to support the evaluation of a new CVR system recording in view of its CS-25 certification. The aim is to ensure that new CVR systems are installed with acceptable quality CVR recording. Please refer also to the response to comment No 76.

comment 34 comment by: *Lufthansa German Airlines*



	<p>e) Wording includes each signal source including masks and 3rd occupant in cockpit which are not in use during normal operation. There fore each readout with 2 pilots in normal operation will fail the requirement.</p> <p>Table 1) "One or more warning or callout is not recorded": How to identify except with an special test flight providing the replay and evaluation center the exact time and kind of warning or callout? During normal operation callouts are recorded. A problem here could only be identified if one channel records the callout and further one not.</p>
response	<p>Noted.</p> <p>Paragraph 9 of the proposed AMC 25.1457 is not intended for an operator, but for certification projects that include the installation of a CVR system.</p> <p>It is provided to support the evaluation of a new CVR system recording in view of its CS-25 certification. The aim is to ensure that new CVR systems are installed with acceptable quality CVR recording. Please refer also to the response to comment 76.</p>
comment	<p>35 comment by: <i>Lufthansa German Airlines</i></p> <p>Table 1) "One required signal source is missing from the recording (e. g. one microphone signal not recorded)" and "Bad intelligibility of one microphone source (e. g. speech through oxygen mask mic)": Not all sources are in use during normal operation.</p>
response	<p>Noted.</p> <p>Paragraph 9 of the proposed AMC 25.1457 is not intended for an operator, but for certification projects that include the installation of a CVR system.</p> <p>It is provided to support the evaluation of a new CVR system recording in view of its CS-25 certification. The aim is to ensure that new CVR systems are installed with acceptable quality CVR recording. Please refer also to the response to comment 76.</p>
comment	<p>36 comment by: <i>The Boeing Company</i></p>



	<p>Page: 18 Paragraph: AMC 25.1457 9. Evaluation of the CVR recording</p> <p>THE PROPOSED TEXT STATES: <i>Multiple locations, as an example:</i> the tasks described in ED-112A, Annex I-A, Chapter I-A.3;</p> <p>REQUESTED CHANGE: the tasks described in ED-112A (<i>or later revision</i>), Annex I-A, Chapter I-A.3;</p> <p>JUSTIFICATION: Boeing understands that EASA has recently proposed to reconvene a working group to update ED-112A. Boeing supports this proposal as ED-112A Annex I-A, Chapter 1-A.3 includes subjective statements for evaluating CVR audio quality such as “excessive clipping”, “adequate signal to noise ratios” and “signal levels are reasonably balanced” without providing definitions for “excessive”, “adequate” or “reasonably”. As an update to ED-112A appears likely, EASA is requested to consider referencing revisions to ED-112A within the proposed AMC.</p>
response	<p>Accepted.</p> <p>In paragraph 1 of the proposed AMC 25.1457, the reference to ED-112A is amended to read at the end: ‘or a later revision’. The same change is made to AMC 25.1459, AMC 25.1460, and the equivalent AMCs of CS-29.</p>
comment	<p>37</p> <p>comment by: <i>The Boeing Company</i></p>



Page: 20, 27

Paragraph: AMC 25.1457 9. Evaluation of the CVR recording

THE PROPOSED TEXT STATES:

MAJOR –

- Bad intelligibility of one microphone source (e.g. speech through oxygen mask mic)
- Quasi-permanent physical saturation of a microphone cell
- Mechanical and/or electrical interference providing useful data suppression
- Default of CAM sensitivity
- Default in the start/stop sequence

REQUESTED CHANGE:

MAJOR-

- ~~Bad~~ **Poor** intelligibility of one microphone source (e.g. speech through oxygen mask **microphone**)
- Quasi-permanent physical saturation of a microphone ~~cell~~ **channel**
- Mechanical and/or electrical interference providing useful data suppression
- ~~Default of~~ **Fault in** CAM sensitivity
- ~~Default~~ **Fault** in the start/stop sequence

JUSTIFICATION:

The MAJOR criteria are understood to be copied from the BEA report ‘guidance on CVR inspection’ dated 8 October 2018, but some are not entirely understood as described.

- It is suggested to replace ‘bad’ with the term ‘poor’, which is defined in AMC as ‘being considered ... not intelligible’
- It is suggested to replace the abbreviation ‘mic’ with ‘microphone’ for clarity.
- Revision is requested for ‘interference providing useful data suppression’ as ‘useful data suppression’ is not understood.
- The term ‘microphone cell’ is understood to mean ‘microphone channel’.
- It is suggested to rephrase to ‘Fault in CAM sensitivity’ and ‘Fault in the start/stop sequence’ as ‘default’ is not understood in this context.

response

Partially accepted.

For clarity, the following corrections have been made in Table 1 of paragraph 9 of the proposed AMC 25.1457 and in Table 1 of paragraph 7 of the proposed AMC 29.1457:

- ~~Bad~~ **Poor** intelligibility of one microphone source (e.g. speech through oxygen mask **microphone**)
- Quasi-permanent physical saturation of **the CAM due to its excessive sensitivity a microphone-cell**
- Quasi-permanent electrical saturation of a CVR channel
- Mechanical and/or electrical interference **making the transcription of signals difficult or impossible providing useful data suppression**
- ~~Default of~~ **Insufficient** CAM sensitivity
- ~~Default~~ **Fault** in the start/stop sequence’

comment

38

comment by: *The Boeing Company*



Page: 20, 27-28

Paragraph: AMC 25.1457 9. Evaluation of the CVR recording

THE PROPOSED TEXT STATES:

MEDIUM-

- Audio pollution generated by either the aircraft or the recorder power supply
- Oversensitivity of the CAM line* to hyper frequency activity (Wi-Fi, GSM, etc.)
- Phasing anomaly between CVR tracks
- Transitional saturation

REQUESTED CHANGE:

MEDIUM-

- Audio pollution generated by either the aircraft or the recorder power supply
- Oversensitivity of the CAM line* to **hyper high**-frequency activity (Wi-Fi, GSM, etc.)
- Phasing anomaly between CVR **tracks channels**
- Transitional saturation

JUSTIFICATION:

The MEDIUM criteria are understood to be copied from the BEA report 'guidance on CVR inspection' dated 8 October 2018, but some are not entirely understood as described.

- How is 'audio pollution' distinct from mechanical/electrical interference? It is suggested to use one term for the same issue.
- Suggested to use the term "high-frequency" rather than "hyper-frequency". GSM 850 MHz and 1900 MHz and Wi-Fi 900 MHz, 2.4 GHz, 3.6 GHz, 4.9 GHz, 5 GHz, 5.9 GHz and 60 GHz. Ultra high-frequency (UHF) per IEEE is 300MHz – 3GHz and extremely high frequency (EHF) 30 – 300GHz.
- The term 'channel' is typically used rather than 'track'.
- Revision is requested to clarify the meaning of 'transitional saturation'.

response

Partially accepted.

The proposed changes are accepted, except that in order to cater for new and future wireless communication technologies (such as 5G), the UHF and the EHF frequencies are included.

For clarity, the following corrections have been made in Table 1 of paragraph 9 of the proposed AMC 25.1457 and in Table 1 of paragraph 7 of the proposed AMC 29.1457:

- ~~Imbalance of audio events~~ Inappropriate level balance between signal sources on a CVR channel, that results in a signal source masking other signals sources
- ~~Audio pollution generated by~~ Electrical interference caused by either the aircraft or the recorder power supply
- Low dynamic range of the recording on a CVR channel
- Low recording level of alert and or callout
- ~~Oversensitivity of the CAM line* to hyper frequency activity~~ electromagnetic interference in the HF, UHF or EHF domain (Wi-Fi, GSM, 5G, etc.)
- Oversensitivity of the CAM line* to electrostatic discharge (ESD) phenomena
- Oversensitivity of the CAM to air flow or conditioning noise (bleed air)
- Phasing anomaly between CVR ~~channels~~ tracks



- Side tone recorded with low level
- ~~Transitional~~ Transitory saturation'

comment	<p>41 comment by: <i>Francois GERBAULT (ATR)</i></p> <p>AMC 25.1457 (9)(d)(ii)</p> <p>The replay and evaluation of CVR recordings should be performed by personnel who have adequate knowledge of CVR systems and aircraft operations, and who have appropriate experience of the techniques used to evaluate recordings;</p> <p>-> Is there a reference to an official documentation describing the recording evaluation techniques?</p>
response	<p>Noted.</p> <p>The commentator may want to consult the document titled 'Guidance on CVR recording inspection' published on the website of Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile.</p>
comment	<p>49 comment by: <i>GAMA</i></p> <p>Clarification needed for AMC 25.1457 9.a.: Should all microphones at each flight crew station be recorded on the same channel, or stored separately? If separate, what is the maximum number of channels required so that memory allocation can be accurately determined?</p> <p>Additionally, for 9.d., is the evaluation of CVR audio recordings to be performed prior to STC?</p>
response	<p>First question: Noted.</p> <p>Regarding the number of CVR channels: the conventional four-channel organisation can deliver satisfactory results when it is correctly implemented, but it also has some intrinsic limitations. In particular, mixing several signal sources on the same CVR channel requires adjustment of the relative volume between the signal sources so that they are all easily audible and no signal source masks another one, which can be challenging. With new technologies, CVRs with more than four channels can be designed. For example, if there is one CVR channel allocated per signal source, mixing signal sources is no longer necessary.</p> <p>Therefore, the text of point (c) of CS 25.1457 was amended in order to allow more than four channels for the CVR. No maximum number of channels is prescribed. This amendment includes a requirement that no CVR channel records communication or audio signals from more than one of the following sources: the first pilot station,</p>



second pilot station, cockpit-mounted area microphone, or additional crew member stations.
 Second question: Noted.
 The purpose of the evaluation is to demonstrate the performance of a new or modified CVR installation as part of the TC or STC approval. Please refer also to the response to comment No 76.

comment 61 comment by: *European Cockpit Association*

ECA suggests to include provisions in line with what is detailed in Reg (EU) 965/2012CAT.GEN.MPA.195 (f) in order to protect the privacy of CVR recordings not only during regular maintenance but also during the certification process.

response Please refer to the response to comment No 59.

comment 64 comment by: *Bombardier*

Reference:

Section “3.1.3 The quality of recording of cockpit voice recorders” proposes to “b) Transfer the content of CM-AS-001 (version of 2012) to AMC 25.1457 and AMC 29.1457;
 c) Also add the following in these AMCs:
 1) Indicate that the evaluation of the CVR recording should include:
 iv) checking that the CVR begins to operate no later than the start of the pre-flight checklist and continues to operate until the completion of the final post-flight checklist; and”

Section “3.2.3. The quality of recording of cockpit voice recorders” proposes to “[...] Amend AMC 25.1457 as follows:
 9. Evaluation of the CVR recording
 [...] c. The evaluation of the CVR recording should include:[...] iv. checking that the CVR begins to operate no later than the start of the pre-flight checklist and continues to operate until the completion of the final post-flight checklist; and”

Comment:

Not all EASA-approved CVR system installations (especially those without RIPS) will record the final post-flight checklist if normal sources of electrical power are interrupted (e.g. engine shutdown at the gate) and the post-flight checklist calls for reconfiguring or turning off certain electrical system buses prior to full power shutdown.

Typically, these alternate recording start/stop conditions have been accepted by the certifying authority (and recorded in a CRI or Issue Paper).

Proposal:

BA proposes that EASA amend AMC 2x.1457 9. c. iv. to add “[...] unless the CVR system installation is designed to start the recording or stop the recording when



response	<p>specific alternate conditions are met and this is acceptable to the certifying authority, in which case the check should be performed against those alternate conditions.”</p> <p>Partially accepted.</p> <p>Point (c)(iv) of paragraph 9 of the proposed AMC 25.1457 should be consistent with paragraph 3 of the existing AMC 25.1457 (Automatic means to stop the recording after a crash impact) and it should also take into account the alternate power source required by CS 25.1457(d)(6). Therefore, the text of point (c)(iv) of paragraph 9 of the proposed AMC 25.1457 has been reworded as follows:</p> <p>-‘iv. checking the start-and-stop logic of the CVR. The CVR should begin to operate no later than when power from other sources than from the alternate power source is available and the pre-flight checklist is started. The CVR should continue to operate until either the completion of the final post-flight checklist or until 10 minutes after power is lost on all engines (and, when applicable the APU) and the aeroplane is on the ground.’</p> <p>For consistency with paragraph 2 of AMC 29.1457 (Automatic means to stop the recording after a crash impact), point (c)(iv) of paragraph 7 of the proposed AMC 29.1457 has been amended to read:</p> <p>‘iv. checking the start-and-stop logic of the CVR. The CVR should begin to operate no later than when power from other sources than from the alternate power source is available and the pre-flight checklist is started. The CVR should continue to operate either until the completion of the final post-flight checklist or until 10 minutes after power is lost on all engines.’</p>
comment	<p>65 comment by: <i>Bombardier</i></p> <p><u>Reference:</u></p> <p>Section “3.1.3 The quality of recording of cockpit voice recorders” proposes to “[...] b) Transfer the content of CM-AS-001 (version of 2012) to AMC 25.1457 and AMC 29.1457;</p> <p>c) Also add the following in these AMCs:</p> <p>3) Add a reference to ED-112A, Annex I-A, with regard to examples of CVR replay and an evaluation report.</p> <p>[...]</p> <p>6) Specify that the CVR system installer should provide the CVR evaluation report performed by the replay and evaluation centre as part of the compliance demonstration.</p> <p>7) Specify that the CVR system installer should provide to the operator a summary of the CVR quality report detailing the assessed quality of each of the required signal sources of the approved CVR installation design.”</p> <p>Section “3.2.3. The quality of recording of cockpit voice recorders” proposes to “[...] Amend AMC 25.1457 as follows:</p> <p>9. Evaluation of the CVR recording</p> <p>[...]</p> <p>d. It is recommended that the evaluation of the CVR recording should be performed by a replay and evaluation centre. An acceptable replay and evaluation centre should fulfil all of the conditions below: [...]</p>

f. As part of the compliance demonstration, the applicant should provide a statement with regard to the acceptability of the replay and evaluation centre and the CVR evaluation report performed by the replay and evaluation centre. However, the replay and evaluation centre need not be a separate organisation from the applicant's."

Comment:

While the proposed AMC 2x1457 9. d. states that the evaluation of the CVR recording is recommended to be performed by a replay and evaluation centre, f. implies it is required.

Traditionally, one acceptable means of compliance used by applicants was to produce a dedicated CVR design compliance report (DCR) which contains adequate compliance statements to the requirements using the agreed means and methods of compliance in the certification plan.

These DCRs typically reference a ground and flight test plan and associated test results report, and would also clearly document all pass/fail criteria for an acceptable audio signal. For example, CAM saturation due to transient low-frequency vibration could have been acceptable for certain operating conditions where such vibrations are unavoidable (e.g. landing gear or flap extension or retraction).

Proposal:

BA proposes that EASA move the proposed AMC 2x.1457 9. f. as a sub-bullet of d.

response

Partially accepted.

The content of point (f) of paragraph 9 of the proposed AMC 25.1457 has been deleted. Point (d) has been re-worded without reference to the term 'replay and evaluation centre', focusing only on providing the conditions which should be fulfilled by the evaluation of the recording.

The same correction is applied to paragraph 7 of the proposed AMC 29.1457.

comment

83

comment by: *Yaborã S.A.*

The personnel who will assess the CVR recording are not required to be knowledgeable in aircraft operations.

Aircraft operations are a broad concept. The professional who will assess the audio quality should be knowledgeable in audio quality and not aircraft operation. This requirement extrapolates the criteria necessary to assess the CVR system.

We suggest changing the text from:

d. It is recommended that the evaluation of the CVR recording should be performed by a replay and evaluation centre. An acceptable replay and evaluation centre should fulfil all of the conditions below:

(...)



ii. The replay and evaluation of CVR recordings should be performed by personnel who have adequate knowledge of CVR systems and aircraft operations, and who have appropriate experience of the techniques used to evaluate recordings;

To:

d. It is recommended that the evaluation of the CVR recording should be performed by a replay and evaluation centre. An acceptable replay and evaluation centre should fulfil all of the conditions below:

(...)

ii. The replay and evaluation of CVR recordings should be performed by personnel who have adequate knowledge of CVR systems ~~and aircraft operations~~, and who have appropriate experience of the techniques used to evaluate recordings;

response

Not accepted.

EUROCAE ED-112A Paragraph I-A.3.2 states that ‘Signal quality may be confirmed during subjective listening checks’. Because assessment of the CVR audio quality does not only rely on objective criteria, it requires ‘personnel with adequate knowledge of CVR systems and aircraft operations, and who have appropriate experience of the techniques used to evaluate recordings’ (see ED-112A, paragraph I-A.1.4). In effect, the persons needed for assessment of the audio quality of a new CVR system installation should include an ‘operational expert’. This person should be capable of quickly and accurately associating the communications and sounds heard with the actual operation of the aircraft. His/her role should be to confirm that the quality of the recording is sufficient to understand the communications in all the phases of a flight, recognise the sounds which are expected to be heard during normal operation and make an accurate transcript of the recording. This operational expert may be a flight test pilot, or a pilot qualified on the aircraft type (depending on whether the CVR system installation is approved under a TC or an STC).

3.3. Draft CS-29 - 3.3.1. Data link recording - CS 29.1460

p. 20-21

comment

52

comment by: *GAMA*

“aeroplane” to be replace with “rotorcraft” in CS 29.1460(b)(ii).

response

Accepted.

comment

77

comment by: *FAA*

Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)



3.3.1	CS 29.1460 (a),(b),(c) or (d)	Creating a new CS for datalink communications is not necessary. These already exist in current 14 CFR 29.1457 (a)(6), (d)(5), (e) and (g) rather than making a separate rule. Further, harmonization between the EASA CS and FAA CFR would be preferred.	Recommend incorporating the previously mentioned sections of 14 CFR 29.1457 into CS 29.1457, in lieu of creating a new CS 29.1460.	Conceptual
3.3.1	AMC 29.1460	Creating a new AMC 29.1460 would not be required if the above proposal was incorporated. Current AC 20-160A provides guidance and references both EUROCAE documents ED-112-A and ED-93.	Incorporate proposed resolution above and refer to AC 20-160A vs creating a new AMC.	Conceptual

response

Not accepted.
The data link recording function does not necessarily need to be performed by a CVR (refer to point CAT.IDE.H.195 and AMC1 CAT.IDE.H.195 of the EU Air Operations Regulation No 965/2012). Therefore, EASA decided to have certification specifications and an AMC dedicated to data link recorders.

3.3. Draft CS-29 - 3.3.1. Data link recording - AMC 29.1460

p. 21

comment

57

comment by: *Airbus Helicopters*

On Paragraph 2. Combination Recorder, we propose to allow flexibility for the indication of which recording function have failed for the rotorcraft product for which datalink is not required by the operational regulations. Having a single failure message (e.g. Recorder fail) to address both datalink and recorder failures is not foreseen as causing a safety concern as the consequence for the dispatch of the rotorcraft will be conservative (restrictions for the failure of the recorder are more stringent than those of the non-required datalink function). This is also not justified to have a dedicated alert message to identify the failure of the datalink because of the low usage of the function on helicopters.
Proposal: To delted paragraph 2 from AMC 29.1460 or at least move this to a guidance material (GM) level.

response

Not accepted.



Paragraph 5 of AMC 29.1457 (published as part of Amendment 7 to CS-29) already specifies that the means for pre-flight checking the recorder for proper operation should indicate which recording functions have failed.

comment 60 comment by: *European Cockpit Association*

Given the options listed in this section, ECA is concerned that, depending on the type of recorder and/or the recording method used, (a part of) the digital content of a recorder used for data link purposes may also contain privacy sensitive information.

In that context we suggest to include inspection procedures and provisions in line with what is detailed in Reg (EU) 965/2012CAT.GEN.MPA.195 (f) in order to protect the privacy of (eg CVR) recordings both during the certification process as well as during regular maintenance.

response Please refer to the response to comment No 59.

3.3. Draft CS-29 - 3.3.2. The serviceability of flight recorders - AMC 29.1457

p. 22

comment 51 comment by: *GAMA*

Clarification needed for AMC 29.1457 6.a. and b.: The inspections of in-flight recording to ensure that data quality is acceptable is levied on flight software?

response Noted.
The main steps expected to be performed during an inspection of a CVR recording are described in point GM1 CAT.GEN.MPA.195(b) of the AMC & GM to Part-CAT of Air Operations Regulation (EU) No 965/2012. Readout equipment and audio analysis software are needed to retrieve the CVR recording files and inspect them.

comment 78 comment by: *FAA*

Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
3.3.2	AMC 29.1457	AC 20-186 addresses these issues and is an existing document.	Consider referencing the FAA AC 20-186 and accept that for ICA of CVRs by applicants.	Conceptual

response Not accepted.



EASA prefers to have its own AMC. This allows EASA to amend the AMC when needed without waiting for the revision of the FAA AC. For instance, when a EUROCAE standard is revised, EASA wants to be able to reflect it promptly in its AMC material. Furthermore, FAA ACs include regulatory references that are not applicable, and sometimes different in content, than in the EU.

3.3. Draft CS-29 - 3.3.2. The serviceability of flight recorders - AMC 29.1459 p. 22-24

comment

46

comment by: GAMA

The inspections of in-flight recording to ensure that data quality is acceptable is levied on flight software? Further, the implication of performing “calibration” checks (AMC 29.1459 d.) of sensors providing data to the FDR does not seem to be full understood. “Calibration” in the case of accelerometers could require the sensor to be removed and sent to a dedicated facility for testing. Recommend clarification of the scope of the calibration.

response

First comment: Noted.
 The main steps expected to be performed during an inspection of an FDR recording are described in point GM1 CAT.GEN.MPA.195(b) of AMC & GM to Part-CAT of Air Operations Regulation (EU) No 965/2012. Readout equipment and flight data processing software are needed to retrieve the FDR recording files, extract and plot the FDR parameters.

Second comment (about calibration): Partially accepted.
 The calibration check is explained in Annex II-B of EUROCAE document ED-112A: ‘Calibration: The process of establishing the relationship between the recorded raw data by the flight data recorder and the actual physical measurements of a parameter for the purpose of converting raw data to engineering units.
 Calibration Check: A check to determine the accuracy of a recorded parameter relative to a standard.’
 Hence ‘calibration check’ does not mean calibration of a standalone sensor, but checking that a flight parameter meets the applicable minimum accuracy requirement (refer to paragraph II-A.9 in Annex II-A of ED-112A). An example of a calibration check is provided in Table II-B.1, in Annex II-B of ED-112A.
 For clarity, sub-paragraph d of paragraph 4 of the proposed AMC 29.1459 is completed as follows:
 ‘Calibration checks of flight parameters from sensors dedicated to the flight data recorder to verify the accuracy of these flight parameters.’
 The same change is made to sub paragraph d of paragraph 7 of the proposed AMC 25.1459.

comment

79

comment by: FAA

Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type



				(Conceptual, Editorial, or Format)
3.3.2	AMC 29.1459	AC 20-141B with Appendix addresses these issue and is an existing document	Consider referencing the FAA AC 20-141B and accept that for ICA of FDRs by applicants.	Conceptual

response Not accepted.
EASA prefers to have its own AMC. This allows EASA to amend the AMC when needed without waiting for the revision of the FAA AC. Furthermore, FAA ACs include regulatory references that are not applicable, and sometimes different in content, than in the EU.

3.3. Draft CS-29 - 3.3.2. The serviceability of flight recorders - AMC 29.1460 p. 24

comment	48	comment by: GAMA
	Clarification needed for AMC 29.1460 5.a. and b.: The inspections of in-flight recording to ensure that data quality is acceptable is levied on flight software?	
response	Noted. The main steps expected to be performed during an inspection of a data link recording are described in point GM1 CAT.GEN.MPA.195(b) of AMC & GM to Part-CAT of Air Operations Regulation (EU) No 965/2012. Readout equipment is needed to retrieve the datalink recording files.	

comment	80	comment by: FAA												
	<table border="1"> <thead> <tr> <th>Paragraph Number</th> <th>Referenced Text</th> <th>Comment/Rationale or Question</th> <th>Proposed Resolution</th> <th>Comment Type (Conceptual, Editorial, or Format)</th> </tr> </thead> <tbody> <tr> <td>3.3.2</td> <td>AMC 29.1460</td> <td>AC 20-160A addresses these issues and is an existing document.</td> <td>Consider referencing FAA AC 20-160A and accept that for ICA of CVRs with data link recording capabilities by applicants.</td> <td>Conceptual</td> </tr> </tbody> </table>				Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)	3.3.2	AMC 29.1460	AC 20-160A addresses these issues and is an existing document.	Consider referencing FAA AC 20-160A and accept that for ICA of CVRs with data link recording capabilities by applicants.	Conceptual
Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)										
3.3.2	AMC 29.1460	AC 20-160A addresses these issues and is an existing document.	Consider referencing FAA AC 20-160A and accept that for ICA of CVRs with data link recording capabilities by applicants.	Conceptual										



response Not accepted.
EASA prefers to have its own AMC. This allows EASA to amend the AMC when needed without waiting for the revision of the FAA AC. Furthermore, FAA ACs include regulatory references that are not applicable, and sometimes different in content, than in the EU.

3.3. Draft CS-29 - 3.3.3. The quality of recording of cockpit voice recorders - CS 29.1457 p. 24-25

comment 53 comment by: GAMA
For CS 29.1457(c), recommend harmonizing the ability to provide more than four channels with 14 CFR 29.1457.

response Noted.
EASA agrees with the intention of this comment and we recommend that it is directed to the FAA for their consideration in the frame of their rulemaking programme.

3.3. Draft CS-29 - 3.3.3. The quality of recording of cockpit voice recorders - AMC 29.1457 p. 25-28

comment 39 comment by: The Boeing Company

Page: 20, 27-28

Paragraph: AMC 25.1457 9. Evaluation of the CVR recording

THE PROPOSED TEXT STATES:

MEDIUM-

- Audio pollution generated by either the aircraft or the recorder power supply
- Oversensitivity of the CAM line* to hyper frequency activity (Wi-Fi, GSM, etc.)
- Phasing anomaly between CVR tracks
- Transitional saturation

REQUESTED CHANGE:

MEDIUM-

- Audio pollution generated by either the aircraft or the recorder power supply
- Oversensitivity of the CAM line* to **hyper high**-frequency activity (Wi-Fi, GSM, etc.)
- Phasing anomaly between CVR **tracks channels**
- Transitional saturation

JUSTIFICATION:

The MEDIUM criteria are understood to be copied from the BEA report 'guidance on CVR inspection' dated 8 October 2018, but some are not entirely understood as described.

- How is 'audio pollution' distinct from mechanical/electrical interference? It is suggested to use one term for the same issue.



	<p>-Suggested to use the term “high-frequency” rather than “hyper-frequency”. GSM 850 MHz and 1900 MHz and Wi-Fi 900 MHz, 2.4 GHz, 3.6 GHz, 4.9 GHz, 5 GHz, 5.9 GHz and 60 GHz. Ultra high-frequency (UHF) per IEEE is 300MHz – 3GHz and extremely high frequency (EHF) 30 – 300GHz. -The term ‘channel’ is typically used rather than ‘track’. -Revision is requested to clarify the meaning of ‘transitional saturation’.</p>
response	Please refer to the response to comment No 38.
comment	<p>40 comment by: <i>The Boeing Company</i></p> <p>Page: 20, 27 Paragraph: <i>AMC 25.1457 9. Evaluation of the CVR recording</i></p> <p><u>THE PROPOSED TEXT STATES:</u> MAJOR – -Bad intelligibility of one microphone source (e.g. speech through oxygen mask mic) -Quasi-permanent physical saturation of a microphone cell -Mechanical and/or electrical interference providing useful data suppression -Default of CAM sensitivity -Default in the start/stop sequence</p> <p><u>REQUESTED CHANGE:</u> MAJOR- -Bad Poor intelligibility of one microphone source (e.g. speech through oxygen mask microphone) -Quasi-permanent physical saturation of a microphone cell channel -Mechanical and/or electrical interference providing useful data suppression -Default of Fault in CAM sensitivity -Default Fault in the start/stop sequence</p> <p><u>JUSTIFICATION:</u> The MAJOR criteria are understood to be copied from the BEA report ‘guidance on CVR inspection’ dated 8 October 2018, but some are not entirely understood as described. -It is suggested to replace ‘bad’ with the term ‘poor’, which is defined in AMC as ‘being considered ... not intelligible’ -It is suggested to replace the abbreviation ‘mic’ with ‘microphone’ for clarity. -Revision is requested for ‘interference providing useful data suppression’ as ‘useful data suppression’ is not understood. -The term ‘microphone cell’ is understood to mean ‘microphone channel’. -It is suggested to rephrase to ‘Fault in CAM sensitivity’ and “Fault in the start/stop sequence” as ‘default’ is not understood in this context.</p>
response	Please refer to the response to comment No 37.



comment 50 comment by: GAMA

Clarification needed for AMC 29.1457 7.a.: Should all microphones at each flight crew station be recorded on the same channel or stored separately? If separate, what is the maximum number of channels required so that memory allocation can be accurately determined? Additionally for 7.d., is the evaluation of CVR audio recordings to be performed prior to STC?

response Please refer to the response to comment No 49.

comment 62 comment by: European Cockpit Association

ECA suggests to include provisions in line with what is detailed in Reg (EU) 965/2012CAT.GEN.MPA.195 (f) in order to protect the privacy of CVR recordings not only during regular maintenance but also during the certification process.

response Please refer to the response to comment No 59.

comment 81 comment by: FAA

Paragraph Number	Referenced Text	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)
3.3.3	AMC 29.1457	AC 20-186 addresses these issues and is an existing document. The added detail for each audio channel and examples with ratings are value added guidance, though not necessary to achieve a compliant system.	Consider referencing the FAA AC 20-186 and accept that for ICA of CVRs by applicants.	Conceptual

response Not accepted.
EASA prefers to have its own AMC. This allows EASA to amend the AMC when needed without waiting for the revision of the FAA AC. Furthermore, FAA ACs include regulatory references that are not applicable, and sometimes different in content, than in the EU.

4. IA - 4.1 What is the issue - 4.1.4. The serviceability of flight recorders - 4.1.4.1 Maintenance instructions p. 30-31

comment 13 comment by: VR²C



response	<p>4.1.4.1 Maintenance instructions Based on experience, on several A/C, preflight checking do not report major failure of CAM channel (aging impact on analog components which are not detected).</p> <p>Noted. Poor quality of the audio recording on the CAM channel should be detected at the occasion of a scheduled CVR recording inspection, as specified in AMC1 CAT.GEN.MPA.195(b) of AMC & GM to Part-CAT of Air Operations Regulation (EU) No 965/2012.</p>
comment	<p>19 comment by: <i>British Airways</i></p> <p>The text in this section says that AMC1 CAT.GEN.MPA.195(b) recommends inspections of FDR recordings and CVR recordings every year. The AMC allows other inspection intervals if certain conditions apply, so it's misleading to simply say every year. It should not be inferred that the proposed certification specifications are always an annual requirement.</p>
response	<p>Accepted. The information provided in paragraph 4.1.4.1 of the NPA regarding the inspection of FDR and CVR recordings was indeed not complete. It provides the default 1-year interval but AMC1 CAT.GEN.MPA.195(b) of AMC & GM to Part-CAT of Air Operations Regulation (EU) No 965/2012 indeed foresees other intervals that may be used, depending on the type of recorder installed.</p>
comment	<p>54 comment by: <i>GAMA</i></p> <p>The “in-depth” knowledge of the system in the responsibility of the TC.STC Holder, however the “in-depth” knowledge of the ETSOed item is with the ETSO Holder. The ETSO holder should be required to define the appropriate maintenance program as it relates to the recording device within the ETSO.</p>
response	<p>Noted. Point 21.A.609 of Part-21 (Annex I to Regulation (EU) No 748/2012) (Obligations of holders of ETSO authorisations) already requires the following: ‘The holder of an ETSO authorisation under this Subpart shall: (...) (d) make available to users of the article and to the Agency on request those maintenance, overhaul and repair manuals necessary for the usage and maintenance of the article, and changes to those manuals;’</p>
comment	<p>94 comment by: <i>Airbus-Regulations-SRg</i></p> <p>Related section: Page 30 / Section 4.1.4.1 / Maintenance Instructions</p> <p>Airbus comment: Operational requirements provided in CAT.GEN.MPA.195(b) will continue to apply despite the development of requirements identified as ICAs. This is likely to result in unnecessary duplication and in some cases lead</p>

to performance of tasks that are not justified by the actual design.
 Provided that operators comply with ICAs developed to satisfy revised AMC 25.14xx guidance they should not also be required to follow generic tasking requirements for recorders provided in CAT.GEN.MPA.195(b).

Rationale:

NPA section 4.1.4.1 quotes the current requirements that EU operators comply with. Four bullets identify specific tasks together with their intervals. These tasks and intervals are not ICAs since they are not published by the TC or STC Holder as part of compliance with CS 25.1529 and Appendix H. With the release of the proposed updates to AMC 25.1457, AMC 25.1459 and AMC 25.1460, the TC or STC Holder is required to identify ICAs related to the three types of recorder in accordance with CS 25.1529 and Appendix H. Unless the wording in the CAT.GEN.MPA.195(b) is modified, operators will in future be required to follow both the ICAs and the operational checks and evaluations required to ensure the continued serviceability of the recorders. There is considerable overlap between the two exercises. The ICA determination will take into consideration the detailed design and generate repetitive tasks only where applicable and effective.

Further we would like to highlight the fact that this determination could subsequently be overridden by the national operational requirements that are prescriptive in terms of both the tasks and their frequencies, taking no account of the detail design characteristics of the system.

response

Noted.
 All operators have to take into account both the Air Operations regulations of their State and the ICA provided by the (S)TCH. The maintenance programme is then established in a way to ensure compliance with the two sources of requirements. Point CAT.GEN.MPA.195(b) of Part-CAT of Air Operations Regulation (EU) No 965/2012 requires CAT operators based in EASA Member States to conduct operational checks and evaluations of the recordings to ensure the continued serviceability of the flight recorders. AMC1 CAT.GEN.MPA.195(b) specifies, as part of the acceptable means of compliance with point (b) of CAT.GEN.MPA.195(b), time intervals as a function of the characteristics of the recorder. GM1 CAT.GEN.MPA.195(b) indicates guidelines on how to perform the inspection; these are not mandatory elements. These AMC and GM provisions have been issued to ensure that operators follow minimum inspection standards, because the available ICA are not exhaustive enough or the provided intervals not adequate. The goal of the proposed AMC 25.1457, AMC 25.1459 and AMC 25.1460 is to ensure that in the future, ICA are sufficiently detailed to support the operators in complying with CAT.GEN.MPA.195(b). In that case, an operator subject to Part-CAT of the EU



Air Operations regulations will be able, through the approval of an alternative means of compliance (AltMoC), to deviate from AMC1 CAT.GEN.MPA.195(b). The (S)TCH could take into account the recommended intervals in AMC1 CAT.GEN.MPA.195(b) and possibly align with the interval of a task with the provided value. But a different interval may be justified, and additional tasks may also be required.

In the long term, if the ICA addressing the serviceability of flight recorders are complete and accurate for all new products and STCs (including those approved by certification authorities other than EASA), AMC1 CAT.GEN.MPA.195(b) could be amended.

comment

95

comment by: *Airbus-Regulations-SRg*

Related section:

Page 30 / **Section 4.1.4.1** / Maintenance Instructions

Airbus Comment:

Airbus would like to propose that through the International MRB Policy Board, EASA lead a discussion on whether it is better to reach a harmonized standard through application of ICAs rather than the current situation where each NAA details a prescriptive list of tasks and intervals, these varying between NAAs.

Rationale:

The change to the Part 25.14xx AMCs will lead to the issuance of all necessary ICAs to address the recorder system design. Appropriate tasks will be developed to assure continued serviceability. These will be developed by the TC or STC Holder, it being recognized in the para 4.1.4.1 that only they have access to the necessary information.

Standardization of scheduled maintenance requirements for the recorders in a specific aircraft type would be achieved if operators were required to comply only with the ICAs.

A previous Airbus comment raises concern on the duplication and validity of tasks included in EU operators programs.

This comment extends the concern to the worldwide fleet. National Aviation Authorities in other countries also issue prescriptive requirements. Inconsistent maintenance practices among aircraft operators will continue until there is an international agreement. The last paragraph of 4.1.4.1 highlights EASA concern with this inconsistency among aircraft operators.

response

Noted.

Normally, States transpose the ICAO Annex 6 provisions into their national Air Operations regulations (for the inspections of flight recorder systems, refer to Section 7 of Appendix 8 to ICAO Annex 6 Part I). There may be differences though in the way the transposition is made.

Although EASA does not disagree with the rationale of this comment, the MRB is not used to define the content of ICAO Annex 6 and the related transposition by States. The commentator may want to propose a change to the ICAO standards addressing



the serviceability of flight recorders to the Flight Recorders Specific Working Group (FLIREC-SWG) of the ICAO Flight Operations Panel.

4. IA - 4.1 What is the issue - 4.1.5. The quality of recording of cockpit voice recorders - p. 32-33
4.1.5.3 Overview of existing EASA regulations and GM

comment 14 comment by: VR²C

4.1.5.3 Overview of existing EASA regulations and guidance material
 Based on my experience of replay center applying AIR-OPS rules, around 40% of CVR systems are affected by a major issue which is detected only during the annual inspection.

response Noted.
 Thank you for sharing your experience.

comment 15 comment by: VR²C

The reason is that an ETSO addresses the performance of the stand-alone equipment, not the performance of the installed equipment.
 This statement is true but misleading.
 ED-112 included a chapter dedicated to CVR installation and evaluation after flight tests.
 With a ETSO C-123(b or c), there is no restriction which states that such a chapter is not applicable to the ETSO.

response Noted.

As explained in Section 4.1.5.3 of NPA 2019-12, ETSO-C123c does not require compliance with some chapters and sections of ED-112A, including those chapters and sections addressing the installed performance of the CVR:
 ‘Standards set forth in EUROCAE document ED-112A, MOPS for Crash Protected Airborne Recorder Systems, dated September 2013, that pertain to the CVR type, except Chapters I-1 and I-6, and Sections 2-1.1 , 2-1.5 , 2-1.6 , 2-1.11 , 2-1.12 , 2-3.1 , 2-5 , 3-1.1, 3-1.2, 3-1.3, 3-1.4, 3-1.5 , 3-1.7, Annex I-A, Annex I-C, and other ED-112A requirements related to installation, flight testing, aircraft maintenance’.
 ED-112A Chapter 2-5 contains the general specifications regarding the installation and installed performance of a flight recorder.
 ED-112A Chapter I-6 contains the specifications regarding the installation and installed performance of a CVR.
 Post-flight evaluation of CVR recordings is addressed in Annex I-A, while CVR maintenance practices are addressed in Annex I-C. These chapters and annexes of ED-112A are not required to be complied with by ETSO-C123c.

4. IA - 4.1 What is the issue - 4.1.5. The quality of recording of cockpit voice recorders - p. 34
4.1.5.5 Documents published by BEA France

comment 16 comment by: VR²C



	4.1.5.5 Documents published by BEA France This document or its content should be included in ED-112 A in Annex I-A to become more formal.
response	Noted. EUROCAE established Working Group 118, tasked to prepare a revision of the ED-112A standard. The commentator was informed in early June 2020 of the start of the project and invited to send a proposal to the EUROCAE project manager.

4. IA - 4.3. How it could be achieved — options - 4.3.3. The serviceability of flight recorders - 4.3.3.2 Conversion FDR raw data into flight parameters expressed in engineering units	p. 39-40
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comment	55	comment by: GAMA
	This section ignores the fact that the installer does not typically have the same in-depth knowledge of data recording formats as the FDR manufacturer who have the expertise for their ETSO approved systems. Suggest revising the applicable ETSO (<i>i.e.</i> , ETSO C124c) to include the provision of the required documentation.	
response	Noted. Revision of ETSO-C124c is not in the scope of RMT.0249. EASA NPA 2019-06 (RMT.0457) contains a proposed amendment to ETSO-C124c that includes the following new requirement: 'All the information specified in EUROCAE ED-112A, Section 2-1, 2-1.3.4 excluding item 6, shall be documented in a manual (...)' This information includes: 'Details of the procedures to be followed for retrieval of the recorded information from an undamaged recorder' However, whatever the applicable TSO or ETSO, the FDR system installer has always been responsible for selecting an FDR model for which appropriate support is provided by the equipment manufacturer, including the necessary information regarding FDR downloading and the format of FDR data files.	

4. IA - 4.4. What are the impacts - 4.4.4. Economic impact - 4.4.4.3 The serviceability of flight recorders	p. 43
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comment	56	comment by: GAMA
	The economic impact assessment only addresses the potential for reduced cost related to investigation and equipment serviceability. The assessment does not include the increased cost to installers and maintainers to obtain the required proprietary data from the ETSO equipment manufacturers nor does it include the additional training, equipment and direct maintenance costs. FDRs typically require specific software provided by the FDR equipment manufacturers.	
response	Not accepted. The comment seems to assume that we are starting from a situation where no one is doing proper maintenance of flight recorders. This is not the case, but the goal is to bring everybody to an acceptable level. Installing a flight recorder without offering	

the necessary readout equipment and support is unacceptable, since in that case, the flight recorder cannot be properly maintained by the aircraft operator.

comment 74 comment by: *European Helicopter Association (EHA)*

The recurring cost to operators to support the additional maintenance has not been adequately assessed within the NPA. The economic impact assessment in Section 4.4.4.3 does not address the increased cost to operators to purchase test software from equipment manufacturers, purchase test equipment, conduct training of technicians, and increased recurring maintenance costs.

response Not accepted.
Please see the reply to comment No 73.

4. IA - 4.4. What are the impacts - 4.4.5. ICAO and third-country references relevant to the content of this RMT p. 44-45

comment 72 comment by: *DGAC France*

In paragraph "Data link recording", FAR 25.1457 should be also listed.

response Not accepted.
FAR 25.1457 is not considered relevant in terms of 'references considered for alignment'. FAR 25.1457 is applicable to the CVR. It is not required to implement the data link recording function on the CVR (refer to point CAT.IDE.A.195 of Part-CAT of Air Operations Regulation (EU) No 965/2012 and AMC1 CAT.IDE.A.195).

