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|  <p>European Aviation Safety Agency</p> | <p>General Aviation (GA) Section</p> <p>Guidelines to Project Managers, Experts and Applicants (DOAs).</p> | <p>Doc. No. : GA/G/001</p> <p>Nature : Guidance</p> <p>Release : 2</p> |
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Installations of ETSO'ed High Integrated Primary Electronic Flight Displays on Board CS-23 Aircraft

General

This guidance clarifies general aspects and applicability of Software related Certification Memos (CM) (former Software CRIs) as part of a STC application where ETSO'ed High Integrated Primary Electronic Flight Displays on board CS-23 aircraft are involved. This Guidance may be amended based on other new systems offering similar technology and functionality ready for installation in GA aircraft.

1. Classification of Change

In line with EU Regulation (EC) No 1702/2003 Annex Part 21 Paragraph 21A.101 particularly sub paras (c) and the Guidance material (AMC/GM) from 21A.101 the change is to be classified as “**Non-Significant Major Change**” as long as no further functionalities are directly integrated and the original flight instruments are retained in the aircraft, irrespective of operational approval.

If the aircraft's principles of avionics installation are not retained (e.g. complete glass cockpits, including display engine parameters or steering of NAV/COMM/GPS) and the removal of Original Equipment Manufacturers (OEM) instrumentation then the AMC/GM to 21A101 defines this as a “**Significant Major Change**”

If Project Certification Manager (PCM), Experts or Applicants (DOAs) are involved in installations outside these broad definitions including other new systems offering similar technology and functionality then EASA advice should be sought.

2. Specific Applicable Guidance material.

2.1 For all applicants for the change

- Part 21A.91, 21A101 and AMC/GM thereto
- Certification Specification (CS) 23.1301, 23.1309, 23.1311 and other applicable (CS) 23 paragraphs..
- Federal Aviation Administration (FAA) Advisory Circulars (AC) AC23.1309-1D, AC 23-23 (GAMA 12), AC 23.1311-1B
- EASA Acceptable Means of Compliance (AMC) AMC 20-115B
- High Intensity Radiated Fields (HIRF) and Lightning Certification Review Items (CRI) F-52, F-53, and F-54 (JAA Interim Policies INT/POL/23/1,2,3)
- Human Factors CRI B-52

2.2 Additional for the first time installation.

EASA Certification Memo (CM) (former Software CRI) concerning Software (S/W) and Complex Electronic Hardware (CEH) development (embedded in this document (see Appendix)):

CM SWCEH_01 (CRI F-70): Software Aspects of Certification

CM SWCEH_02 (CRI F-71): Electronic Hardware Development Assurance


CM SWCEH_03 (CRI F-72): Management of Open Problem Reports

CM SWCEH_04 (CRI F-73): Embedded Software Configuration Files

CM SWCEH_05 (CRI F-74): Aeronautical Databases

CM SWCEH_08 (CRI F-75): S/W formalized and model-based requirements validation and verification

CM SWCEH_09 (CRI F-76): Use of Object Oriented Techniques at Design or Source Code levels

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CM SWCEH_11 (CRI F-78): Databases
CM SWCEH_12 (CRI F-79): Use of COTS Graphical Processors (CGP)

Unless considered during the ETSO approval process by the equipment manufacturer (ETSO holder) on an elect-to-comply basis, the STC applicant will require support from the ETSO Holder in the showing of compliance with the following CMs (CRIs):

SWCEH_02 (CRI F-71); SWCEH_04 (CRI F-73); SWCEH_05 (CRI F-74); SWCEH_08 (CRI F-75); SWCEH_09 (CRI F-76).

The “other” CMs (CRIs):

(SWCEH_01 (CRI F-70); (SWCEH_03 (CRI F-72); SWCEH_11 (CRI F-78) and SWCEH_12 (CRI F-79)).

are considered as part of the installation approval and for which STC holder need to provide compliance data, provided the issue addressed in a CM (CRI) is applicable within the STC project. Additional support by the ETSO Holder might be necessary to sufficiently address the CM (CRI) aspects.

In relation to the “other” CMs (CRIs) above the following should be noted:

SWCEH 01 (CRI F-70): This CM (CRI) provides additional guidelines to the STC applicant on different aspects complementary to ED-12B/DO-178B. This CM (CRI) need to be considered during the installation process by the STC applicant.


If the FAA Notice 8110.49 has taken into account during the ETSO/TSO approval process CM SWCEH_01 need NOT to be considered during the STC process.

SWCEH 03 (CRI F-72): As open problem report may have an impact at installation level, the requirements and guidance of SWCEH_03 (CRI F-72) need to be considered for all installations either under the CM (CRI) or as part of the STC project Certification Plan and Compliance Checklist.

SWCEH 11 (CRI F-78): External Databases: This CM (CRI) should only be considered by the STC applicant for external databases other than the already well-proven point-to-point databases A429, RS-232 and RS-485. The STC applicant should identify all external databases being used in the Certification Plan.

Internal Databases: Issues regarding internal databases should be addressed by the ETSO holder, and may be answered during the ETSO approval process.

SWCEH 12 (CRI F-79): If a COTS graphical processor is used, failure or malfunction in the display has to be assessed. If this failure or malfunction is not mitigated at system level by other equipment installed then SWCEH_12 (CRI F-79) needs to be

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considered by the ETSO holder. If it is mitigated at system level then SWCEH_12 (CRI F-79) needs to be considered by the STC applicant.

3. Alleviations for very small aircraft, MTOW < 2720 kg (6000 lb)

The following is general guidance for alleviation for Type I and II (MTOW<2720kg (6000lb) with Single or multiple Reciprocating or Turbine engines installed) as defined in AC 23.1309-1D.

If the PCM is uncertain about a particular change then EASA guidance should be sought.

- a) If the installation to be certified is for an aircraft designated Type I or Type II in FAA AC 23.1309-1D Figure 2, and the original instruments are retained, **and**
- b) The equipment is ETSO approved demonstrating that the guidance of EUROCAE ED-12B/RTCA DO-178B has been followed, **and**
- c) If Complex Electronic Hardware is present, an assessment against EUROCAE ED-80/RTCA DO-254 has been demonstrated during the ETSO process,

then in these cases it can be assumed, that the objectives of the EASA basic CMs (CRIs) (Section 2.2 above) are not applicable.

The Human Factors CRI B-52 can be replaced by appropriate explanation provided in the Project Certification Plan and/or Compliance Checklist by a reference to AC 23-23 (GAMA Publication No.12) and FAA AC 23.1311-1B.

The “other” above mentioned CM’s (CRI’s) addressed in Section 2 can be replaced by appropriate references in the Certification Plan and/or Compliance Checklist.

It is expected, that questions concerning HIRF and Lightning can be answered with the help of general engineering assessments based on FHA and reference to results from equipment tests according to DO-160D.

4. Further Alleviations for VFR aircraft

If the aircraft is restricted to VFR day operations, and

- a) All functionalities with a hazard classification of Major or above are supported by the retained OEM instruments, **and**
- b) Assigned Software and CEH development assurance level (DAL) is not higher than D,,

then the CM (CRI) material referenced in Section 2 above need not be applied.

This restriction to VFR shall be in the **limitations section of the Technical Visa (TV)**.

Note: *Installations for VFR Night operations should be handled like installations for IFR operations.*

Appendix:

Glossary:

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| AC | Advisory Circular |
| AMC | Acceptable Means of Compliance |

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| CEH | Complex Electronic Hardware |
| CGP | COTS Graphical Processor |



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|------|-----------------------------------|
| CM | Certification Memo |
| COMM | Communication |
| COTS | Commercial Off The Shelf |
| CRI | Certification Review Item |
| DAL | Development Assurance Level |
| DOA | Approved Design Organisation |
| EASA | European Aviation Safety Agency |
| EC | European Commission |
| ED | EUROCAE Document |
| ETSO | European Technical Standard Order |
| EU | European Union |
| FAA | Federal Aviation Administration |
| FHA | Functional Hazard Assessment |
| GA | General Aviation |

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| GAMA | General Aviation Manufacturer Association |
| GM | Guidance Material |
| GPS | Global Positioning System |
| HIRF | High Intensity Radiated Fields |
| INT/POL | Interim Policy |
| MTOW | Maximum Take-Off Weight |
| NAV | Navigation |
| OEM | Original Equipment Manufacturer |
| PCM | Project Certification Manager |
| RTCA | Radio Technical Commission for Aeronautiques |
| STC | Supplemental Type Certificate |
| SW | Software |
| TSO | Technical Standard Order |

Referenced Software Memo's:



SWCEH_01



SWCEH_02



SWCEH_03



SWCEH_04



SWCEH_05



SWCEH_08



SWCEH_09



SWCEH_11



SWCEH_12

Note:

Today the Certification Memos (CM) have been issued, harmonised and approved internally EASA but there are not official GM material. That's why they are usually embedded inside CRI's as annexes and consequently the CRI is only a cover sheet which introduces the Certification Memo. It means that the Certification Memo cannot be used or referred directly and they should be included in CRIs until EASA will have published Certification Memos.