

Certification Memorandum

Application of Standard Fasteners (nuts and bolts) within the scope of CS-VLA, CS-VLR, CS-23, CS-25, CS-27, CS-29, CS-P and CS-E to be used in Critical Installations

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Log of issues

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1. Introduction

1.1. Purpose and scope

This Certification Memorandum provides guidance and is applicable to fastener installations using Standard Fasteners in Critical Installations in aeroplanes, rotorcraft, engines propeller attachments and appliances.

1.2. References

It is intended that the following reference materials be used in conjunction with this Certification Memorandum:

Reference	Title	Code	Issue	Date
CS LSA.---	Design and Construction – General	CS-LSA		
CS VLR.601		CS-VLR		
CS VLA.601		CS-VLA		
CS 23.601		CS-23		
CS 25.601		CS-25	-	-
CS 27.601		CS-27		
CS 29.601		CS-29		
CS E.---		CS-E		
CS P.---		CS-P		
CS LSA.---		Design and Construction – Critical parts	CS-LSA	
CS VLR.602	CS-VLR			
CS VLA.---	CS-VLA			
CS 23.---	CS-23			
CS 25.---	CS-25		-	-
CS 27.602	CS-27			
CS 29.602	CS-29			
CS E.515	CS-E			
CS P.160	CS-P			



Reference	Title	Code	Issue	Date
CS LSA.---	Design and Construction – Materials	CS-LSA		
CS VLR.603		CS-VLR		
CS VLA.603		CS-VLA		
CS 23.603		CS-23		
CS 25.603		CS-25		
CS 27.603		CS-27	-	-
CS 29.603		CS-29		
CS E.70		CS-E		
CS P.170		CS-P		
CS LSA.---		Design and Construction – Fasteners	CS-LSA	
CS VLR.607	CS-VLR			
CS VLA.607	CS-VLA			
CS 23.607	CS-23			
CS 25.607	CS-25		-	-
CS 27.607	CS-27			
CS 29.607	CS-29			
CS E.---	CS-E			
CS P.---	CS-P			
21A.805	Subpart Q - Identification of critical parts	Part 21		29.09.2003
FAA AC 20-71	Dual Locking Devices on Fasteners	-	-	08.12.1970
-	Commission Regulation (EU) No 748/2012	-	-	-
-	Annex 1 Part 21 to Commission Regulation (EU) No 748/2012 and related AMC	-	-	-

1.3. Abbreviations

AC	Advisory Circular (FAA)
AD	Airworthiness Directive
AMC	Acceptable Means of Compliance (EASA)
CARI	Continued Airworthiness Review Item
CAW	Continued Airworthiness
CM	Certification Memorandum



CS	Certification Specification
DAH	Design Approval Holder
EASA	European Aviation Safety Agency
FAA	Federal Aviation Agency
GM	Guidance Material
ICA	Instructions for Continued Airworthiness
LSA	Light Sports Aircraft
MOA	Maintenance Organisation Approval
POA	Production Organisation Approval
TCH	Type Certificate Holder
VLA	Very Light Aircraft
VLR	Very Light Rotorcraft

1.4. Definitions

Standard Fastener	A fastener that is a Standard Part. Fasteners (nuts and bolts) being produced according to a certain standard which is not directly approved by the agency. They fall within the category of Standard Parts as defined in Commission Regulation (EU) No 748/2012 21.A.303(c).
Qualified Standard Fastener	A Standard Fastener that requires additional verification of compliance to specification and/or control of their source, by methods defined by the DAH.
Critical Installation	A structural/mechanical assembly, which may include fasteners the failure of which (single or multiple due to common cause) is classified as hazardous or catastrophic.
.---	Requirement not available.
XXX	Placeholder for the regulatory requirements listed in the CM header (see first page above)



2. Background

Standard Fasteners are widely used on fixed wing aircraft, rotorcraft, engines, propeller attachments and appliances certified by the Agency. Within the last few years an accumulation of failed Standard Fasteners (nuts and bolts) in aviation has been observed (refer to EASA Safety Information Bulletin 2012-06). The assumptions made during certification rely on adherence to the certified standard. If Standard Fasteners are used in Critical Installations, deviations from the standard, such as manufacturing flaws and errors, may result in unexpected failure of the fastener with undesirable consequences at the aircraft level. The overall quality system applicable to standard parts and the degree of industry oversight of the parts producers is currently the subject of wide ranging discussions and initiatives for improvement. Significant numbers of defective batches of fasteners continue to be identified.

Furthermore, recent investigations have shown that designers do not always select the most appropriate Standard Fasteners for use in their designs. Standard Fasteners manufactured in accordance with the applicable standard offer a level of quality and reliability that may not meet the critical demands for reliability required for some designs. As with design and production of any part, the reliability of a fastener in the service environment that can be achieved through the standard depends on a number of factors and includes the sensitivity and variability of the manufacturing processes and the details and extent of the associated quality controls contained in that standard. It has also been observed that the successful use of some Standard Fasteners in Critical Installations in the past may have resulted, in part, from additional checks and controls being performed above and beyond the minima associated to the standard.

Designers should consistently take into account the limitations of the standards, including the applicable fastener manufacturing processes and quality controls, to ensure that when a standard part or qualified standard part is selected its properties and associated level of reliability will meet the applicable certification requirements for the design.

The intent of this CM is to further inform DAHs and applicants for design approvals of the issue and provide guidance to help ensure that appropriate measures are considered for initial certification, including associated continued airworthiness aspects, to minimise the risk that the use of Standard Fasteners might compromise the intended level of safety.

[Note: To assess and address the potential risk for existing designs, EASA may issue a Continued Airworthiness Review Item (CARI) to TCHs and in the case of an immediately apparent unsafe condition, issue an Airworthiness Directive.]



2.1. Existing requirements

There are existing requirements in Part 21 and the CSs related to critical parts, fasteners and materials which may be relevant within the context of this CM.

2.1.1. 21.A.805 Identification of critical parts

“In addition to the requirement of 21.A.804, each manufacturer of a part to be fitted on a type-certificated product which has been identified as a critical part shall permanently and legibly mark that part with a part number and a serial number.”

2.1.2. CS 25.601 General

“The aeroplane may not have design features or details that experience has shown to be hazardous or unreliable. The suitability of each questionable design detail and part must be established by tests.”

2.1.3. CS VLR/27/29.602 Critical parts (this requirement is available for rotorcraft only)

“(a) Critical parts - A critical part is a part, the failure of which could have a catastrophic effect upon the rotorcraft, and for which critical characteristics have been identified which must be controlled to ensure the required level of integrity.

(b) If the type design includes critical parts, a critical parts list shall be established. Procedures shall be established to define the critical design characteristics, identify processes that affect those characteristics, and identify the design change and process change controls necessary for showing compliance with the quality assurance requirements of Part-21.”

2.1.4. CS 25.603 Materials (For Composite Materials see AMC 20-29)

“The suitability and durability of materials used for parts, the failure of which could adversely affect safety, must –

(a) Be established on the basis of experience or tests;

(b) Conform to approved specifications, that ensure their having the strength and other properties assumed in the design data (See AMC 25.603(b));”

2.1.5. CS XXX.607 Fasteners (relates to locking and retention of fasteners, although the text varies between the CS, so the text here is taken from the rotorcraft requirement as an example)

“(a) Each removable bolt, screw, nut, pin or other fastener whose loss could jeopardise the safe operation of the rotorcraft must incorporate two separate locking devices. The fastener and its locking devices may not be adversely affected by the environmental conditions associated with the particular installation.

(b) No self-locking nut may be used on any bolt subject to rotation in operation unless a non-friction locking device is used in addition to the self-locking device.”

3. EASA Certification Policy

3.1. EASA Policy

Failures of Standard Fasteners may have severe consequences at the aircraft level when used in Critical Installations. Although industry and authorities are seeking to address the production quality issues affecting Standard Fasteners by all means available, the eventual improvement of the quality and



conformance of Standard Fasteners by responsible parties does not address (remove or control) existing defective parts in the supply chain.

Once demonstrated, conformance to a standard provides a certain level of reliability under known loading and environmental conditions. The reliability of a standard part or any other part specified in the design needs to be assessed and shown to be compatible with the design objectives to be met. Designers should take care to ensure that they select appropriate fasteners to meet the certification objectives for continued function and reliability, taking into account the limitations of the applicable standards including the associated manufacturing processes and applicable quality controls.

This CM is therefore addressed to DAHs, to provide them with guidance on appropriate actions to ensure appropriate utilisation of Standard Fasteners in their designs, to help them to instruct POAs and MOAs as necessary to ensure CAW and to provide means by which unsafe conditions related to the use in design of Standard Fasteners can be prevented. For the information of affected parties and to ensure consistency, the obligations of the POA with respect to standard parts are recalled in the Appendix to the CM.

In order to reduce the risk of Critical Installations failing, through the inadvertent use of defective Standard Fasteners or due to the inappropriate selection of standards, the Agency recommends that all applicants for type certificates and design changes perform a design review to ensure the risk posed by the use of standard parts is mitigated by:

- Ensuring that fasteners (nuts and bolts) used in the design will meet the certification requirements, taking into account any limitations of the selected standards, the associated fastener manufacturing processes and quality controls, and relevant service experience. [Note: The degree to which the standard ensures relevant characteristics such as locking functions, static strength and fatigue strength should be evaluated as far as is necessary based on the criticality of the parts intended use and operating environment. Consideration should be given to stress levels arising from manufacture, installation requirements, external loading and temperature effects. Particular attention should be paid to standard parts that utilise high strength alloys in combination with plating or other processes that may increase the risk of hydrogen embrittlement or deformation processes that are not closely specified.]
- Ensuring the design standard and associated procedures met for production of the aircraft is maintained throughout the operational life of the aircraft, e.g. through the use of the ICA controlling maintenance of Critical Installations.
- Creating, when Standard Fasteners (nuts and bolts) are selected, a list of Critical Installations where only Qualified Standard Fasteners (nuts and bolts) may be used. Redundancy of fasteners alone may not negate the need to qualify the fasteners as all the fasteners on a joint could originate from a common defective batch. Similarly, required double locking functions on fasteners may also need consideration of Qualified Standard Fasteners to ensure the fail safe design philosophy is maintained when common cause failure of both locking functions is possible.
- Defining how the Standard Fastener is qualified wherever necessary.
- Clearly defining any necessary additional conformity checks as part of the type design standard, specifying requirements for approved suppliers and any other criteria necessary for acceptance, storage and installation of Standard Fasteners that are appropriate for their use in the design.
- Ensuring through Maintenance Instructions that Qualified Standard Fasteners are only replaced by other Qualified Standard Fasteners.
- Considering introducing a DAH part numbering system for Qualified Standard Fasteners, at which point they would become aviation parts. (Note: If such part numbering is implemented and further part marking is not feasible due to the part's size or for other reasons, other means such as regular appropriate batch controls should be established and documentation provided according to Part 21.A.804(b).)



In addition, DAHs are reminded that certain existing Certification Specifications and regulations specifically address critical parts. Typically Standard Parts are not appropriate for use as critical parts and all critical parts are subject to a critical parts plan that controls their critical characteristics during production and service.

3.2. Who this Certification Memorandum Affects

This Certification Memorandum affects applicants who need to show compliance with CS-LSA, CS-VLR, CS-VLA, CS-23, CS-25, CS-27, CS-29, CS-E, CS-P or Part 21. The extent of EASA's investigation into this subject during certifications will depend on the level of risk presented by the use of standard parts in the specific design, considering service experience, the applicable certification basis and the safety objectives for the product.

As a first step, following the publication of this CM, EASA will continue to employ CRIs on CS-27 and CS-29 type certification projects and will now also systematically raise CRIs on new TC applications for CS-E, CS-P, CS-25 and CS-23 commuter category products.

4. Remarks

1. Suggestions for amendment(s) to this EASA Certification Memorandum should be referred to the Certification Policy and Safety Information Department, Certification Directorate, EASA. E-mail CM@easa.europa.eu or fax +49 (0)221 89990 4459.
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5. Appendix

GM No. 2 to 21.A.139(a) Quality System – Conformity of supplied parts or appliances, is applicable to POA holders and provides guidance on ensuring the conformity of all supplied parts. The applicability of this POA holder responsibility to standard parts is indicated by the GM to 21.A.133(a) Eligibility – Approval appropriate for showing conformity.

GM to 21.A.133(a) states:

“Where standard parts, materials, processes or services are included in the applicable design data (see guidance on applicable design data in GM 21.A.131) their standards should be controlled by the POA holder in a manner which is satisfactory for the final use of the item on the product, part or appliance.”

This may entail following instructions issued by the design approval holder regarding the control and use of the standard part. E.g., specific inspections in addition to those required in production and manufacture of the part may be called up in the assembly procedures and maintenance instructions.

Refer to GM No. 2 to 21.A.139(a) for the detailed guidance related to conformity of supplied parts.

