

Major/Minor Classification, Cert Memos, Master CRIs and SEI List

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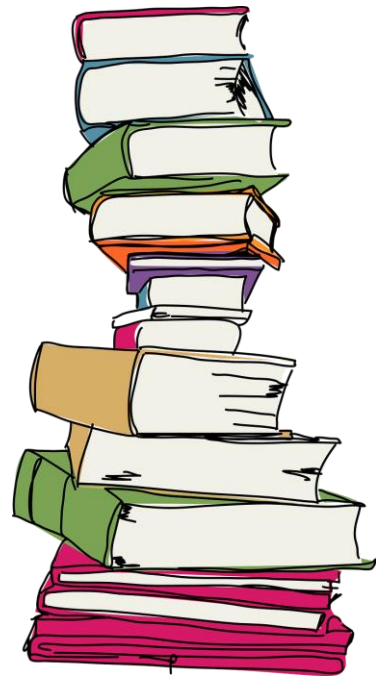
Rotorcraft Structures Workshop 18-19 February 2025

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 - Cert Memos applicable to Rotorcraft (structural topics)
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- Master CRIs
 - What is a Master CRI?
 - Rotorcraft Structures Master CRIs
- Validation with FAA: SEI/SSD



Major / Minor Classification

(Structural topics)



Major / Minor Classification

Appendix A to GM 21.A.91 Examples of Major Changes per discipline

1. Structures

Current GM

- (i) changes such as a cargo door cut-out, fuselage plugs, change of dihedral, **addition of floats**;
- (ii) changes to **materials, processes or methods of manufacture** of **primary structural elements**, such as spars, frames and **critical parts**;
- (iii) changes that **adversely affect fatigue or damage tolerance or life limit characteristics**;
- (iv) changes that **adversely affect aeroelastic characteristics**

! NPA 2024-04: CRD under review !

- (ii) changes to **materials, processes or methods of manufacture** of **critical parts that impact the critical characteristics**;
- (iii) changes to **materials, processes or methods of manufacture** of **primary structural elements that impact mechanical properties or characteristics**, such as strength, fatigue, corrosion resistance and stiffness;
- (iv) changes that **adversely affect fatigue or damage tolerance characteristics or that are beneficial for fatigue and damage tolerance and for which credit is sought**, such as extension of an approved life limit or inspection interval.

7. Rotors and drive systems

Current GM

Changes that:

- (i) **adversely affect fatigue evaluation** unless the service life or inspection interval are unchanged. This includes changes to **materials, processes or methods of manufacture of parts**, such as:
rotor blades, rotor hubs including dampers and controls, gears, drive shafts, couplings
- (ii) affect **systems the failure of which may have hazardous or catastrophic effects**. The design assessment will include:
cooling system, lubrication system, rotor controls
- (iii) **adversely affect the results of the rotor drive system endurance test**, the rotor drive system being defined in CS 27/29.917.
- (iv) **adversely affect the results of the shafting critical speed analysis** required by CS 27/29.931.

Major / Minor Classification

Appendix A to GM 21.A.91 Examples of Major Changes per discipline

! NPA 2024-04: CRD under review !

Rotors and drive systems

- (i) **changes to structural parts of the rotors** (e.g. blades, hub, control mechanism, hinges, elastomeric bearings) and **drive systems** (e.g. gears, shafts, bearings and housings), in accordance with the guidance in **Section 1 'Structure'**
- (ii) **changes that affect equipment/systems associated with the rotors and rotor drive systems** (e.g. cooling and lubrication systems with their associated monitoring means, chip detection systems, rotor brake actuation and monitoring systems, VHM systems), **the failure of which may have hazardous or catastrophic effects.**
- (iii) changes that **adversely affect the results of the rotor drive system endurance test**, the rotor drive system being defined in CS 27/29.917.
- (iv) changes that **adversely affect the results of the shafting critical speed analysis** required by CS 27/29.931.

Cert Memos

(Structural topics)



What is a Cert Memo?

- ✓ Clarify EASA's general position on specific initial airworthiness, validation, continuing airworthiness or organisational items.
- ✓ Provide guidance and interpretative material on a particular subject
- ✓ Provide complementary information and/or MOC for compliance demonstration
- ✓ Can be used by applicants in their Cert Plan
- ✗ Do not introduce new certification requirements
- ✗ Do not modify any existing certification requirements
- ✗ Do not constitute any legal obligation



<https://www.easa.europa.eu/en/downloads/139634/en>



Comprehensive internal reviews and public consultation
(Feedback is highly encouraged and appreciated)

EASA Level of Involvement in product certification

CM-21.A/21.B-001 Issue 02, 20 September 2019

Guidance for proposing and determining the EASA involvement in product cert.

Attachment 3 – Additional guidance for Structures

Attachment 13 – Additional guidance for Rotorcraft Transmission

→ (Non exhaustive) list of examples

- Novelty
- Complexity
- Criticality

		Risk Class		
Non-Critical consequences of a non-compliance	The CDI has no novel aspects, no complex aspects	Class 1	Class 1	Class 2
	The CDI has no novel aspects, but has complex ones; or has novel aspects, but no complex ones	Class 1	Class 2	Class 3
	The CDI has both novel and complex aspects	Class 2	Class 3	Class 3
Critical consequences of a non-compliance	The CDI has no novel aspects, no complex aspects	Class 1	Class 2	Class 3
	The CDI has no novel aspects, but has complex ones; or novel aspects, but no complex ones	Class 2	Class 3	Class 4
	The CDI has both novel and complex aspects	Class 3	Class 4	Class 4
		performance high	performance Medium	performance low or unknown



Mature

Cert Memos applicable to Rotorcraft

(Structural topics)



External Installations on Helicopters

CM-21.A-D-002 Issue 01, 27 September 2019

Guidance for certification of external devices, e.g.

- External equipment boxes with fixed equipment
- Cameras
- Searchlights
- Loudspeaker

Covers Structural and Flight Aspects only

[see presentation: Guide for STCs: Internal and External Installations]



Due to be up-issued 2025
(Minor technical updates)

Application of Standard Fasteners (nuts and bolts)

CM-S-003 Issue 01, 26 Feb 2015

Application of Standard Fasteners (nuts and bolts) to be used in Critical Installations

- Content now published in AMC1 29/27.607
- Critical Installations: *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.*

[see presentation: Standard Fasteners]



MATURE

Content in CS 27/29 AMC

Composite – Shared Databases

CM-S-004 Issue 01, 14 Jan 2014

Acceptance of Composite Specifications and Design Values Developed using the NCAMP Process

- Provides an interim EASA position regarding acceptance of composite material data developed specifically using the NCAMP shared database process
- EASA accepts data developed through the process described in the Cert Memo, to **demonstrate equivalency.**



[see presentation: Composite Materials]

Composite – Bonded Repair Size Limits

CM-S-005 Issue 01, 11 Sept 2015

Determination of Bonded Repair Size Limits for critical structures

- Composite or metallic structures, monolithic or sandwich.
- Bonded repair size limits may be restrictive for critical structures addressed by this policy.



[see presentation: Composite Materials]

Post Certification Actions to Verify the Continued Integrity of Rotorcraft Critical Parts

CM-S-007 Issue 01, 19 Aug 2015

Supplement existing guidance for compliance to CS 27/29.602 Critical Parts

- Applicant should develop a Continued Integrity Verification Programme (CIVP)
- CIVP supports the continued validity of assumptions made during certification that could affect the integrity of critical parts.



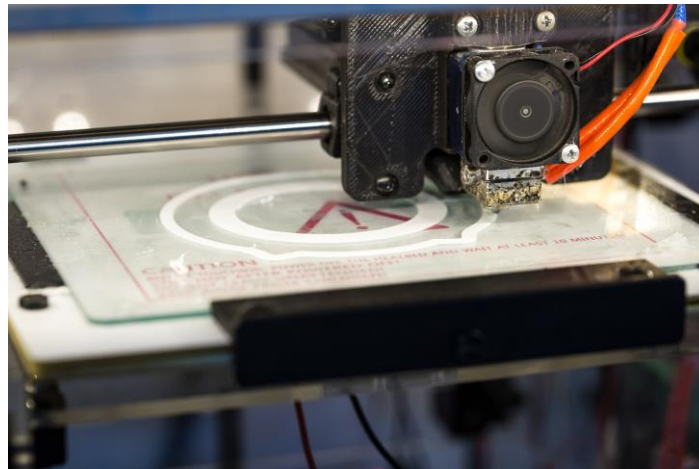
[see presentations: CIVP]

Additive Manufacturing

CM-S-008 Issue 03, 30 April 2021

Guidance regarding the introduction and use of Additive Manufacturing (AM) technologies

- Issue 4 addresses:
 - Criticality classification
 - Emphasis upon completing an appropriate design safety assessment
 - Certification effort being proportionate to criticality
 - AM parts of no or low criticality (including examples)



[see presentation: Additive Manufacturing]

Composite Materials – Sandwich Structures

CM-S-010 Issue 01, 29 Nov 2018

Guidance Regarding The Safe Design and Use of Monocoque Sandwich Structures in Principal Structural Element Applications

- Qualification of the manufacturing process
- Process Specifications
- Material Strength and determination of design allowables
- Damage tolerance and residual strength
- Safety Management System (SMS)
- Instructions for Continued Airworthiness (ICA)

[see presentation: Composite Materials]



MATURE
Content in CS 27/29 AMC

CS 27/29.952a for Helicopter External Installations

CM-S-011 Issue 03, 14 July 2022

Guidance regarding fuel tank crash resistance (drop test requirement) when external installations are installed in the vicinity of the tank

- External installations in the vicinity of the tank and are part of the surrounding structure.
- These may be a contributing hazard to the fuel tank in the event of a crash.



[see presentation: Guide for STCs: Internal and External Installations]



Certification of Vibration Health Monitoring (VHM)

CM-S-012 Issue 01, 30 Apr 2018

Certification of VHM capability for helicopter offshore operations

- To ensure that VHM capability is subject to a design approval in accordance with CS 29.1465 when this is to be used to show compliance with the operating requirement SPA.HOFO.155.



MATURE

Fireproof/Fire-resistance compliance

proposed CM-S-015 Issue 01, 7 Jul 2021

Required material properties and structural residual strength for Fireproof / Fire-resistance compliance demonstration

- Loaded and non-loaded structure
- Materials accepted as fireproof
- Loading conditions to consider in the event of a fire

[see presentation: Fireproof / Fire-resistance Compliance Demonstration]



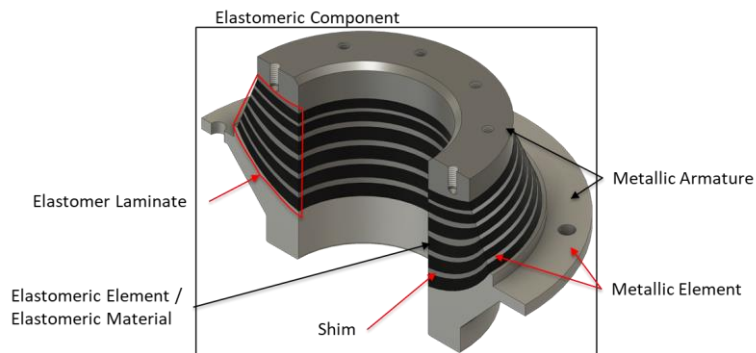
Issue 1:
Public Consultation complete
CRD under review

Certification of Elastomeric Components

CM-S-016 Issue 01, 31 Jan 2025

Guidance and good practice for certification of elastomeric components for rotorcraft

- General principles for classification and criticality
- Requirements commonly used
- Usually accepted certification approach including the parameters influencing elastomeric component performances



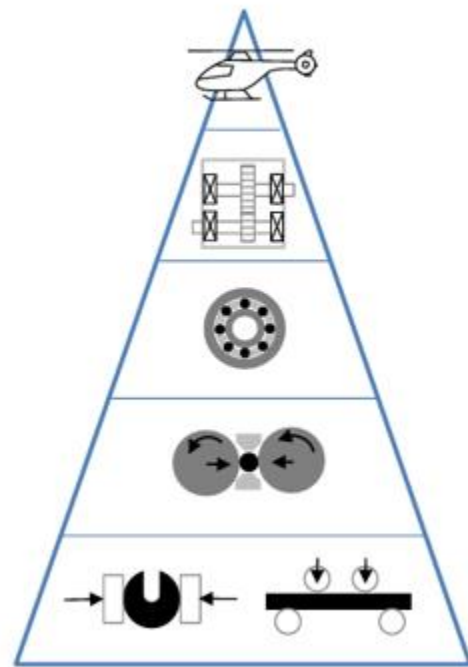
[see presentation: Elastomeric Components]

Hybrid Bearings

proposed CM-RTS-003 Issue 01, 24 Dec 2024

Guidance regarding the certification of hybrid bearings for rotorcraft drive systems and rotor control mechanisms

- Hybrid bearings rolling elements made of Silicon Nitride (Si_3N_4)
 - Level of involvement
 - Design
 - Strength evaluations, materials and fabrication methods
 - In-service monitoring and ICA



[see presentation: Hybrid Bearings]

Cert Memos applicable to other Products

(Structural topics)



Cert Memos Applicable to other products



CM-S-006 Issue 1, 13 July 2017

Certification, Type Design Definition,
Material and Process Qualification
for Composite Light Aircraft



CM-S-002 Issue 1, 14 Jan 2014

1.33 wear and tear factor – frequent
removal of interior structures

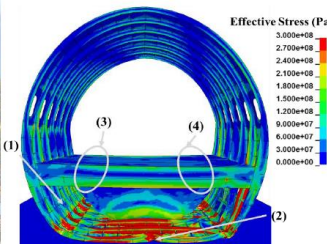


CM-S-009 Issue 1

Loading conditions for Occupant
Safety in Cabin Interiors



(a) Post-impact picture of section drop experiment



(b) Section drop test simulation result

Proposed CM-S-014 Issue 1

Modelling and Simulation

*[see presentation: Modelling and
Simulation]*

MASTER CRIs

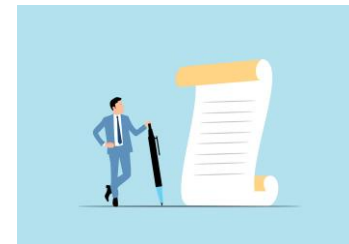
(Structural topics)



What is a Master CRI (Certification Review Item)?

CRI:

- A **formal administrative means** within the certification process
- Provides a **structured means of recording subjects** regarding the certification basis and its interpretation throughout a certification project
- CRI process also establishes a means to formally record the positions for **significant issues** between EASA, the Applicant, and a third country National Aviation Authority **if EASA is acting as validating authority** of a foreign product.



MASTER CRI:

- EASA maintains a **Master CRI repository**, incl. MOC CRIs, Special Conditions, Equivalent Safety Finding (ESF), Deviations
- To ensure **traceability and repeatability** on technical subjects (TS)
- Serves as **source for CRIs on project level**
- If a Master CRI becomes sufficiently mature it may be considered in a **CS 27/29 update**



Work
Instruction

<https://www.easa.europa.eu/en/document-library/certification-procedures/cri-and-cai-writing-and-management>

Master CRIs for Panel 3

Installation of Bear Paws



Photo: LA(Phot) Bernie Henesy/MOD, OGL v1.0OGL v1.0, via Wikimedia Commons

Adaptation of CS27/29.505 load conditions for bear paws and pad installations on skid landing gear and wheeled landing gear

[see presentation: Guide for STCs]

27/29.865



- Structural Provisions for fast roping
- HEC: Non-metallic cable substantiation
- HEC Platform

[see presentation: HEC]

Validations with FAA SEI/SDD

(Structural topics)



EASA SSD / SEI list – Panel 3



SEI Safety Emphasis Items → Non-Basic classification criteria

SSD Significant Standards Differences → do not qualify as SEI and do not trigger Non-Basic

<https://www.easa.europa.eu/en/document-library/bilateral-agreements/eu-usa/easa-lists-safety-emphasis-items-sei>

#03-02 Control Loads

§395 Rotating controls - jamming

#03-03 Seat Adapter Plate

§561 and §562 compliance

#03-04 Structural Ditching

a §562 up to Amdt.4

b §562 Amdt.4 and later

#03-05 F&DT Metallic

a §571 up to Amdt.4

b §571 RCF

#03-06 Composite Structures

§573 Fatigue and DT

SEI List Part 1

#03-08 Standard Fasteners

§601, §602, §603, §605 and §607

#03-09 CS27 Birdstrike

§27.631

#03-10 Design Limitations

§309 Density Altitude

#03-11 Limit manoeuvring load factor

§337 and §309 <3g

#04-01 External loads

§865 PCDS

#07-01 Fuel Tank Drop Test

§952(a)(4) Surrounding Structure

#07-12 Material Fireproofness

§861, §863 and §1191

SEI List Part 2

#03-01 Yawing Condition

§351

EASA SSD / SEI list – Panel 13



SEI Safety Emphasis Items → Non-Basic classification criteria

SSD Significant Standards Differences → do not qualify as SEI and do not trigger Non-Basic

<https://www.easa.europa.eu/en/document-library/bilateral-agreements/eu-usa/easa-lists-safety-emphasis-items-sei>

SEI List Part 1

#13-01 Bearing assessment and qualification

§547(b), §602, §917(b), §923, §927

#13-02 Endurance test

a §923 Representativeness

b §923, §927 Additional ratings/capabilities

#13-03 Monitoring means

a §547(b), §917(b) Performance

b §1337(e) Chip detection system

#13-05 Loss of lubrication

a §917, §927(c), §1521 CS-29 up to Amdt. 4

b §917(a)(b), §927(c), §1585(h) CS-29 from Amdt. 5

#13-06 TBOs

§1529

#13-07 Processes and CAW

§602 Continued Integrity Verification Program

#13-08 VHM

a §547, §571, §917, §1465, §1529 Credit applications

b §1465 Elect to comply or operational regulation

SEI List Part 2

Nothing has been moved to part 2 but discussions are ongoing with the FAA

FAA SSD / SEI list – Panel 3



SEI Safety Emphasis Items → Non-Basic classification criteria

SSD Significant Standards Differences → do not qualify as SEI and do not trigger Non-Basic

https://www.faa.gov/aircraft/air_cert/design_approvals/rotorcraft/val_dom_cert

27/29.395 Control Loads

Rotating controls - jamming

27/29.562(a) Seat Adapter Plate

(a) Seat Adapter Plate

Test Dummy (ATD) Weight

27/29.563 Structural Ditching

New Regulation

29.571(c) F&DT Metallic

FAA Approval of MOC

27/29.573(b) Composite Structures

FAA Approval of MOC

SEI List Part 1

29.601 29.603

Large glass installations in cabin

27/29.861, 27/29.863, 27/29.1191

Material Fireproofness

27/29.865(f)

Simple PCDS

27/29.952(a)

Fuel Tank Drop Test

Vibration Health Monitoring

CS29.1465 requirement / MG-15

Conclusion

- Major / Minor Classification: Appendix A to GM 21.A.91 has been updated for structures and rotors/drive clarification (NPA 2024-04)
 - CRD currently under review
- Cert Memos:
 - Many Cert Memos applicable to Rotorcraft for structural topics
 - Cert Memos applicable to other products may provide useful guidance
- Master CRIs:
 - Installation of Bear Paws
 - HEC: Fast-roping, HEC-Platform, Non-metallic cables
- FAA/EASA SDD/SEI list is available online → work ongoing to harmonise



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