EASA	NOTIFICATION OF A PROPOSAL TO ISSUE A CERTIFICATION MEMORANDUM
	**EASA Proposed CM No.:** **EASA Proposed CM – CS – 005 Issue: 01** **Issue Date: 03rd of December 2013** **Issued by: Rotorcraft, Balloons and Airships section** **Approved by: Head of Products Certification Department** **Regulatory Requirement(s): CS 27/29.865**

In accordance with the EASA Certification Memorandum procedural guideline, the European Aviation Safety Agency proposes to issue an EASA Certification Memorandum (CM) on the subject identified below.

All interested persons may send their comments, referencing the EASA Proposed CM Number above, to the e-mail address specified in the "Remarks" section, prior to the indicated closing date for consultation.

EASA Certification Memoranda clarify the European Aviation Safety Agency's general course of action on specific certification items. They are intended to provide guidance on a particular subject and, as non-binding material, may provide complementary information and guidance for compliance demonstration with current standards. Certification Memoranda are provided for information purposes only and must not be misconstrued as formally adopted Acceptable Means of Compliance (AMC) or as Guidance Material (GM). Certification Memoranda are not intended to introduce new certification requirements or to modify existing certification requirements and do not constitute any legal obligation.

EASA Certification Memoranda are living documents into which either additional criteria or additional issues can be incorporated as soon as a need is identified by EASA.

Subject

Helicopter External Loads Personnel Carrying Device System

Log of Issues

Issue	Issue date	Change description
01	03.12.2013	First issue.

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1. INTRODUCTION

1.1. PURPOSE AND SCOPE

The purpose of this Certification Memorandum is to provide specific clarification and additional guidance for certification of equipment and devices intended for carriage of human external cargo on helicopters by means of cargo hook or hoist.

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 27/29.865	External loads	---	---	---
AMC 27/29.865	Human External Cargo for Operations within Europe	---	---	---
AC 27 1B/ 29 2C.865B	§ 27.865 (Amendment 27-36) EXTERNAL LOAD ATTACHING MEANS.	---	---	---
AC 29.865B	§ 29.865 (Amendment 29-43) EXTERNAL LOAD ATTACHING MEANS.	---	---	---
EC Directive 89/686/EEC	COUNCIL DIRECTIVE on the approximation of the laws of the Member States relating to personal protective equipment and harmonised EN-standards	---	---	---
EN 358	Personal protective equipment for work positioning and prevention of falls from a height – Belts for work positioning and restraint and work positioning lanyards	---	---	---
EN 361	Personal protective equipment against falls from a height – Full body harnesses	---	---	---
EN 362	Personal protective equipment against falls from a height – Connectors	---	---	---
EN 364	Personal protective equipment against falls from a height – Test methods	---	---	---
EN 813	Personal fall protection equipment – Sit harnesses	---	---	---
EN 1497	Personal protective equipment against falls from a height – Rescue harnesses	---	---	---
EN 1498	Personal protective equipment against falls from a height – Rescue loops	---	---	---
EN 12275	Mountaineering equipment – Connectors – Safety requirements and test methods	---	---	---
EN 12277	Mountaineering equipment – Harnesses – Safety requirements and test methods	---	---	---

Reference	Title	Code	Issue	Date
EN 354	Lanyards	---	---	---
EN 363	Test methods	---	---	---
EN 365	Marking/packaging/instructions to use	---	---	---
Directive 2006/42/EC	DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on machinery, and harmonised EN-standards	---	---	---
TSO C167	Technical Standard Order Personnel Carrying Device Systems (PCDS), also known as Human Harnesses	---	---	---

1.3. ABBREVIATIONS

The following abbreviations are used in this Certification Memorandum:

Abbreviation	Meaning
HEC	**H**uman **E**xternal **C**argo (definition in AC 27/29.865)
PCDS	**P**ersonal **C**arrying **D**evice **S**ystem For the purpose of this Certification Memorandum the PCDS is a device or system that has the structural capability and features needed to transport occupants external to the rotorcraft during HEC operations. The PCDS does not include elements (such as ropes) connecting it to the cargo hook/hoist. A PCDS includes, but is not limited to, life safety harnesses, rigid baskets and cages that are either attached to a hoist or cargo hook or mounted to the rotorcraft airframe..
a/c	**A**ircraft

1.4. DEFINITIONS

The following definitions are used in this Certification Memorandum:

Definition	Meaning
Personal **C**arrying **D**evice **S**ystem	For the purpose of this Certification Memorandum the PCDS is a device or system that has the structural capability and features needed to transport occupants external to the rotorcraft during HEC operations. The PCDS does not include elements (such as ropes) connecting it to the cargo hook/hoist. A PCDS includes, but is not limited to, life safety harnesses, rigid baskets and cages that are either attached to a hoist or cargo hook or mounted to the rotorcraft airframe.

2. BACKGROUND

When humans are transported under helicopter cargo hooks or hoists, the certification rules require approval of the Personal Carrying Device Systems (PCDS). However, the approval process for a PCDS using the current airworthiness requirements that constitute the a/c certification basis has been questioned by European operators as being non cost effective, in particular when the PCDS is of a simple design. In these cases and when the PCDS complies with the European Standards that have to be complied with for the same devices when used to protect humans in non-flying activities, EASA consider that a simplified approach will provide equivalent safety, under the conditions described in this certification memorandum.

This approach is in line with what has previously been done by various national Aviation Authorities, prior to EASA, in particular the Swiss National Aviation Authority FOCA.

3. EASA CERTIFICATION POLICY

3.1. APPLICABILITY

This Certification Memorandum provides additional guidance for the EASA airworthiness approval of Personnel Carrying Device Systems of simple design (also referenced as 'simple PCDS') and the elements connecting it to a cargo hook or hoist as part of the external loads of the rotorcraft.

Approval of external load not human (cargo only) and of the systems connecting it below the cargo hook is deemed to be covered under operational approval.

3.2. CLASSIFICATION OF PERSONNEL CARRYING DEVICE SYSTEM (PCDS)

For the purpose of this CM a PCDS could be classified as simple or complex. An example of simple design is a safety harness conforming to the harmonised EN-Standard (e.g. EN 361 for Body Harnesses, EN 358 for restraint systems [straps], EN 362 for Karabiners/fasteners). A complex design could be a cage which hosts one or more individuals.

3.3. CLASSIFICATION OF CHANGE

An approval that follows the guidance of this certification memorandum may be conducted according to a minor change classification for the following example cases:

- PCDS of simple design (such as a safety rescue harness), to be attached directly to the hoist hook,
- PCDS of simple design (such as a safety rescue harness), with a simple rope system connecting up to maximum 5 simple PCDS to the cargo hook.

Approval of a PCDS of complex design - such as a cage containing persons or a rope connecting more than 5 simple PCDS - should be conducted according to a major change classification.

In case of a simple PCDS having new or novel features which are not proven by satisfactory service experience, or in case of any doubt in the classification please contact EASA.

3.4. REGULATORY REFERENCES

CS/FAR 27/29.865(c)(2) dealing with external loads requires that for rotorcraft-load combinations to be used for human external cargo (HEC) applications, the rotorcraft must have a reliable, approved, Personnel-Carrying Device System (PCDS).

The previously applicable guidance material (MG12) of AC 27-1B and 29-2C was replaced in 2006 by the new AC 27/29.865B which provides acceptable means of compliance with CS 27/29.865 and FAR 27/29.865 at amendment 27-36 and 29-43 respectively.

CS 29.865(f) requires that for HEC, the fatigue evaluation of CS 29.571 applies to the entire quick-release and personnel-carrying device structural systems and their attachments to the rotorcraft (e.g. including ropes or cables to the approved hoist or hook).

3.5. COMPLIANCE PROCEDURES

The existing paragraph of FAA AC 27/29.865 regarding PCDS states that TSO C167 is an approved minimum performance specification for HEC body harnesses. Currently EASA has no ETSO corresponding to the FAA TSO C-167. The approval process for a PCDS in the absence of an ETSO and the application of the fatigue requirements using the normally accepted means of compliance (detailed fatigue analysis supported by test) as provided in AC 27/29 MG 8 and MG 11 has been called into question when the PCDS is of a simple design and complies with applicable European standards for such devices used to protect the occupant in the workplace. EASA therefore offers an alternative means of compliance for the static and fatigue strength of a simple PCDS and attaching means to the hook, providing safety factors and consideration of calendar life replacement limits in lieu of dedicated fatigue analysis and test.

The EC Directive 89/686/EEC and corresponding EN-Standards are an acceptable basis for means of compliance for the fatigue and static strength of a PCDS to EASA requirements provided that:

- The PCDS is of a simple design. An example of simple design is a safety harness build based on the harmonised EN-Standard (e.g. EN 361 for Body Harnesses, EN 358 for restraint systems [straps], EN 362 for Karabiners/fasteners). An example of complex design could be a cage which hosts one or more individuals.
- The applicable EC Directive 89/686/EEC and corresponding EN standards for the respective components are complied with (EC Type Examination Certificate)
- The applicant for the minor change has obtained from the manufacturer and keeps on record the applicable EC Conformity Certificate(s)
- The EC certified components are appropriately qualified for the intended use and environmental conditions

  Note: A simple PCDS has an EC Type Examination Certificate (similar to an STC), issued by a Notified Certification Body and, for the production and marketing, an EC Conformity Certificate (similar to an EASA Form1) issued by the Manufacturer
- The maximum load applied to each component between the HEC and the hook is conservatively estimated. This is particularly important when more than one person is attached by a single system to the cargo hook/ hoist. Annex 1 defines the appropriate minimum ultimate load (ULmin). If ULmin is above the static strength currently declared by the supplier of the PCDS or of a component of the attachments, through compliance with an EN, then proof of sufficient strength for compliance with CS/FAR 27/29 is to be provided by static tests. All possible service load cases (including asymmetric load distribution) are to be considered. In this case the PCDS and/or the attachment means (e.g. rope/ carabineer /shackles etc.) must be capable of supporting ULmin for a minimum of three minutes without failure. There should be no permanent deformation of components. Components and details added to the EN approved equipment (such as splicing, knots, stitching, seams, press fits, etc.) or the materials used (textiles, composites etc.) that might reduce the strength of a product or could (in combination) have other detrimental effects have been investigated by the applicant and accounted for in the substantiation.
- Effects of ageing (due to sunlight, temperature, water immersion etc.) and other operational factors that may affect strength are accounted for through appropriate inspections and application of a calendar life limit as appropriate. A logbook should be established personalized per serial number.

- The PCDS and the related attachment elements are limited to the carriage of HEC
- The risk of fatigue failure is minimised. See Annex 1 for further details.
- Instructions for continued airworthiness (ICA) should be provided. Typically the ICA would comprise of an inspection programme and maintenance instructions based on the applicable manufacturer's data. The ICA should ensure that the specific operational uses of the system that may affect its strength are accounted for. A calendar life limit is applied when appropriate.
- When the harness is not designed to transport a incapacitated or untrained person, a specific limitation of use is included in the Rotorcraft Flight Manual.

3.6. PCDS/HELICOPTER COMPATIBILITY

The usability of the PCDS should be verified on the specific helicopter by means of test.

3.7. MANUFACTURING AND IDENTIFICATION

PCDS of simple design that comply with the applicable EC Directive 89/686/EEC and corresponding EN standards for the respective components are considered standard parts in accordance with Part 21.A.303(c).

All PCDS should be marked as follows:

- Manufacturing date
- Life limit date (If applicable)
- Manufacturer's address
- Part Number
- Serial Number
- STC / minor change approval number
- Authorised load in kg
- Authorised number of persons

3.8. WHO THIS CERTIFICATION MEMORANDUM AFFECTS

Applicants for minor changes, STCs and Major changes concerning certification of helicopter external loads.

4. REMARKS

1. This EASA Proposed Certification Memorandum will be closed for public consultation on the **14th of January 2014**. Comments received after the indicated closing date for consultation might not be taken into account.
2. Comments regarding this EASA Proposed Certification Memorandum should be referred to the Certification Policy and Planning Department, Certification Directorate, EASA. E-mail CM@easa.europa.eu or fax +49 (0)221 89990 4459.
3. For any question concerning the technical content of this EASA Proposed Certification Memorandum, please contact:

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ANNEX 1

Static strength.

The PCDS should be substantiated for the loading conditions determined under the applicable paragraphs of the FAA AC 27/29.865. For a PCDS to be certificated separately from the hoist using the guidance of this certification memo, the minimum ultimate load (ULmin) to be substantiated is defined as follows:

ULmin = M * n * j * jf * K

Where;

M is the total mass of the PCDS equipment/component and persons restrained by the part being substantiated. (This is equivalent to the working load rating of an EN.) The mass of each person should be assumed to be 100 Kg. Note: If the person(s) or their task requires the personal carriage of heavy items (backpacks, tools, fire extinguishers, etc.), these must be accounted for in the total mass M, in addition to the person's mass of 100kg.

n is the helicopter manoeuvring limit load and must be assumed = 3.5 (CS 27/29.337)

j is the ultimate load factor of safety for all parts = 1.5 (CS 27/29.303)

K is an additional safety factor for textiles = 2.0 (see Note (1)) (CS 27/29.619)

jf is an additional fitting factor = 1.33 applying to all joints, fittings etc. (CS 27/29.619)

The resulting values to ensure compliance with CS 27/29 static strength requirements are:

ULmin for metallic elements with fitting factor (needed for all joints and fittings): = 7M

(Note: see section below on fatigue)

ULmin for textiles (webbing, ropes etc.) with fitting factor: = 14M (see Note(1))

ULmin may be compared to the strength of the PCDS components already substantiated according to EC Directive 89/686/EEC and corresponding EN-Standards or EC Directive 2006/42/EC, Annex I, Art. 6. Where ULmin is greater than the EC directive/EN requirements, a static test to not less than ULmin will be necessary. The test load must be sustained for three minutes without permanent deformation.

Note (1), EC Directive 2006/42/EC, Annex I, Art. 6. recommends a safety factor of 14 (2 * 7) for textiles applied to the working load (equivalent to 14M above) for equipment lifting humans, whereas for a rescue harness EN 1497 requires a static test load of not less than the greater of either 15kN or 10 times the working load. In consideration of this difference, for each textile component within the PCDS certificated to one of the following ENs, the value of K may be reduced, such that ULmin is not less than 10M:

For a full body harness, EN 361, EN 1497 or EN 12277A; for a sit harness, EN 813 or EN 12277C; for a for a belt or strap and for a lanyard, EN 354.

Furthermore, to allow this reduced value ULmin, the ICA must include a life limitation of 5 years (or the life indicated by the PCDS manufacturer if less) and an annual detailed inspection of the general condition of the harness.

Fatigue.

When the PCDS and the related attachment elements are limited to the carriage of HEC only, no further specific fatigue substantiation is necessary for each part of the PCDS that is not new or novel in design and there is satisfactory service experience with such designs in similar operations and that part is either

1) substantiated for static strength as described above with an additional factor of safety of 2 for all metallic joints and fittings. i.e. ULmin = 2* n * j * jf * M = 2 * 3.5 * 1.5 * 1.33 * M = 14M; or

2) loaded by not more than a single person plus their equipment and is certificated in accordance with the following ENs, as applicable:

for a full body harness, EN 361, EN 1497 or EN 12277A; for a sit harness, EN 813 or EN 12277C; for a for a belt or strap, EN 358; for a connector, EN362 or EN 12275 and for a lanyard, EN 354.