



**European Aviation Safety Agency – Rulemaking Directorate**  
**Notice of Proposed Amendment 2013-18**

**Rotorcraft AMC revision (Group 2)**

RMT.0134 (27&29.029) – 11/09/2013

**EXECUTIVE SUMMARY**

This Notice of Proposed Amendment (NPA) addresses regulatory coordination issues related to rotorcraft AMC material.

Task RMT.0134 (27&29.029) proposed a joint task with the Federal Aviation Administration (FAA) to revise rotorcraft AMC material contained in Book 2 of CS-VLR, CS-27 and CS-29 together with the adopted FAA AC.

Due to the large number of changes proposed, the task was split into two groups to aid processing, avoid unnecessary delays, and to facilitate public review and commenting. This NPA relates to Group 2 material. Group 1 material was contained in NPA 2013-04, published on 14 March 2013.

The specific objective of this NPA is to update AC/AMC in light of recent certification experience, to provide cost-effective means of compliance, and to retain a high level of harmonisation.

Proposed changes to clarify AC 27&29.865B on external loads has resulted in some ambiguity with the rule text and definitions. The opportunity of this NPA has therefore been taken to amend CS-Definitions and CS 27&29.865 to clarify the rule’s intent, provide consistent and clear safety objectives, and to reflect current certification practice. Furthermore, AMC 27.865 (which is specific to operations in Europe) has been amended to reflect the proposed changes.

This NPA proposes the following changes:

- CS-Definitions: Change to definition of ‘external load attaching means’
- CS 27&29.865: Minor changes to clarify the rule
- AC 27&29.865B: Extensive revision of external loads
- AC 29.1303: Clarification of ‘useable’ ADI
- AC 27&29.1321: Further guidance on instrument installation, arrangement and visibility
- AC 27&29 Appendix B: Various changes to Appendix B
- AC 27&29 MG 1: Extension to include GPS, SBAS and WAAS
- AC 27&29 MG16: Update on NVIS cockpit lighting compliance
- AC 27&29 MG19: New MG on Electronic Display Systems
- AC 27&29 MG20: New MG on Human Factors
- AC 27&29 MG21: New MG on system level FHA
- AMC 27.865: Update to reflect changes to AC 27.865

<b>Applicability</b>		<b>Process map</b>	
Affected regulations and decisions:	CS-VLR, CS-27, CS-29	Concept Paper:	No
Affected stakeholders:	Rotorcraft TC/RTC/STC	Terms of Reference:	20/10/2010
Driver/origin:	Level playing field	Rulemaking group:	Yes
Reference:	n/a	RIA type:	Light
		Technical consultation during NPA drafting:	No
		Duration of NPA consultation:	3 months
		Review group:	TBD
		Focussed consultation:	TBD
		Publication date of the Decision:	2014/Q1

## Table of contents

<b>1. Procedural information .....</b>	<b>3</b>
1.1. The rule development procedure .....	3
1.2. The structure of this NPA and related documents .....	3
1.3. How to comment on this NPA.....	3
1.4. The next steps in the procedure .....	3
<b>2. Explanatory Note .....</b>	<b>4</b>
2.1. Overview of the issues to be addressed.....	4
2.2. Objectives .....	6
2.3. Summary of the Regulatory Impact Assessment (RIA) .....	6
2.4. Overview of the proposed amendments .....	6
<b>3. Proposed amendments .....</b>	<b>8</b>
3.1. Draft Certification Specifications (draft Decision on CS-Definitions).....	8
3.2. Draft Certification Specifications (draft Decision on CS-27) .....	8
3.3. Draft Certification Specifications (draft Decision on CS-29).....	13

## 1. Procedural information

### 1.1. The rule development procedure

This NPA, and NPA 2013-04, have been developed under a special procedure with FAA which allows for the joint development and agreement of proposed changes to the FAA AC material. This permits agreed changes to be readily adopted by EASA as AMC in Book 2 of the relevant Certification Specifications, thereby ensuring that the greatest extent of harmonisation is achieved for the benefit of both EASA and industry. FAA is identified as the lead authority for this task.

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this NPA in line with Regulation (EC) No 216/2008<sup>1</sup> (hereinafter referred to as the 'Basic Regulation').

This rulemaking activity is included in the Agency's Rulemaking Programme for 2014–2017 under RMT.0134 (former task number 27&29.029).

The text of this NPA has been developed by the Agency based on input from individual experts and small teams. In addition, two rulemaking subgroups were formed to propose extensive revisions related to 'flight' and 'external loads'. It is hereby submitted for consultation of all interested parties<sup>2</sup>.

The process map on the title page contains the major milestones of this rulemaking activity to date and provides an outlook of the timescale of the next steps.

### 1.2. The structure of this NPA and related documents

Chapter 1 of this NPA contains the procedural information related to this task. Chapter 2 (Explanatory Note) explains the core technical content. Chapter 3 contains the proposed text for the new requirements.

### 1.3. How to comment on this NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at <http://hub.easa.europa.eu/crt/><sup>3</sup>.

The deadline for submission of comments is **9 December 2013**.

### 1.4. The next steps in the procedure

Following the closing of the NPA public consultation period, the Agency will review all comments together with those received during the FAA public consultation process. The outcome of the NPA public consultation will be reflected in the respective Comment-Response Document (CRD).

The Agency will publish the CRD with the Decision.

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<sup>1</sup> Regulation (EC) No 216/2008 of the European Parliament and the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1), as last amended by Commission Regulation (EU) No 6/2013 of 8 January 2013 (OJ L 4, 9.1.2013, p. 34).

<sup>2</sup> In accordance with Article 52 of the Basic Regulation and Articles 5(3) and 6 of the Rulemaking Procedure.

<sup>3</sup> In case of technical problems, please contact the CRT webmaster ([crt@easa.europa.eu](mailto:crt@easa.europa.eu)).

## 2. Explanatory Note

As part of the update to FAA AC 27-1B and AC 29-2C, public consultation of proposed changes has been undertaken in two groups. NPA 2013-04, published on 14 March 2013, contained Group 1 material. This NPA is complementary to NPA 2013-04 and contains the remaining Group 2 material. Together they will form the future Change 4 to the FAA ACs.

The AC/AMC changes forming part of EASA rulemaking task RMT.0134 (27&29.029) were initiated at the request of the Agency, FAA, and both USA and European industry, following a call for proposals. The changed text has been developed jointly using one of the three working methods (individual, small team, or group) depending on task complexity and likely impact on stakeholders. Where a group was used, specific terms of reference of that group were developed and published on the Agency's website.

### 2.1. Overview of the issues to be addressed

To facilitate the review of the proposed AC material, the affected ACs together with a description of the major changes is provided in the table below.

<b>Section</b>	<b>Title of section</b>	<b>Description of revisions</b>
<b>AC 27/29 .865B</b>	External Loads	Guidance is revised to introduce a new format. Technical modifications include redefinition of Personnel-Carrying Device System (PCDS) and Human External Cargo (HEC), deleting references where applicable to operational rules, new reliability figures, and the possibility to have the PCDS as a post-approval item.
<b>AC 29.1303</b>	Flight and navigation instruments	Provides additional guidance on usable ADIs.  The EFIS guidance material is not directly related to demonstration of compliance with CS 29.1303 and is moved to new MG19.
<b>AC 27/29 .1321</b>	Instrument installation - Arrangement and Visibility	Includes descriptions and diagrams for primary and secondary field of view.
<b>AC 27/29 Appendix B</b>	Airworthiness guidance for rotorcraft instrument flight	New AC material is introduced into paragraph (6) 'Automatic Flight Control System'. This clarifies terminology and includes pilot recognition and response times based on the phase of flight and the pilot's involvement and attentiveness. The terminology and values are based on UK DefStan 00-970.  The requirements for SAS no longer reflect the increasing complexity of systems being offered for certification. Modern multilane systems need careful consideration, notably when considering testing of failures. Furthermore, multilane systems, e.g. quadruplex or dual duplex systems, have considerable redundancy and performance monitoring capabilities. This proposed revision intends to give applicants credit for the use of multiredundant monitored systems.  Existing guidance on acceptable pitch/roll attitudes following actuator hard-overs is removed. There is a

		<p>safety concern that recovery from unusual attitudes could be difficult in IMC close to the ground and stipulating values of 55° pitch/80° roll may give a false impression of what is acceptable.</p> <p>Paragraph 15 is expanded to provide more guidance on flight below V<sub>mini</sub> to allow certain approaches. Since V<sub>mini</sub> is defined as a limitation in 27/29.1503, any IFR flight below V<sub>mini</sub> will still require a special condition.</p>
<b>AC 27/29 MG1</b>	Certification procedure for rotorcraft avionics equipment	Expanded to include guidance on Global Positioning Systems (GPS), Satellite-Based Augmentation System (SBAS) and Wide Area Augmentation System (WAAS).
<b>AC 27/29 MG16</b>	Certification guidance for rotorcraft Night Vision Imaging System (NVIS) aircraft lighting systems	Harmonises the approach for NVIS lighting system compliance adopted by FAA, EASA and TCCA.
<b>AC 27/29 MG19</b>	Guidance on Electronic Display Systems (EDS) for Rotorcraft installations	Guidance on Electronic Display Systems (EDS) for rotorcraft installations.
<b>AC 27/29 MG20</b>	Human Factors (HF)	New guidance material addressing Human Factors (HF) and human performance.
<b>AC 27/29 MG21</b>	Guidance on creating a system level Functional Hazard Assessment (FHA)	Provides guidance for developing a system level Functional Hazard Assessment (FHA) and is derived from the Society of Automotive Engineers (SAE) Aerospace Recommended Practices (ARP) 4761, <i>Guidelines and Methods for Conducting the Safety Assessment Process in Civil Airborne Systems and Equipment</i> .

## 2.2. Objectives

The overall objectives of the Agency are defined in Article 2 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issues outlined in Chapter 2 of this NPA.

The specific objective of this proposal is to facilitate the free movement of goods, persons and services and to promote cost-efficiency in the regulation and certification processes.

## 2.3. Summary of the Regulatory Impact Assessment (RIA)

This NPA addresses AMC and will have no significant impact. Adoption of the FAA AC will provide greater harmonisation in the acceptable means of compliance required by FAA and the Agency. Where existing differences in FAA/EASA policy/rules/interpretation are present, additional AMC in Book 2 of the CSs aims to highlight these differences and to provide prior knowledge to applicants which is clear and transparent so that they can plan accordingly.

The proposed changes to CS 27/29.865 and CS-Definitions are aimed at clarifying the intended safety objectives and to better align with the revised AC. While a difference with FAA will be created, this is considered to be minor, and as the proposals reflect current certification practice there will be no impact on stakeholders.

## 2.4. Overview of the proposed amendments

The detailed changes to the FAA AC have been made available for public consultation on the FAA website. Stakeholders are specifically invited to review and comment on this material. Comments received by the Agency in response to this NPA will undergo a joint disposition process with the FAA with the aim of maintaining harmonisation.

Proposed changes to the FAA AC can be viewed on the FAA website:  
[http://www.faa.gov/aircraft/draft\\_docs/ac/](http://www.faa.gov/aircraft/draft_docs/ac/)

**NOTE: When making comments on the FAA AC material, please insert your comments into the appropriate section of the table in Section 2.1 to facilitate future processing by the Agency.**

In addition to changes to the FAA AC, the Agency's specific AMC 27.865 addressing human external cargo for operations within Europe is amended as proposed in paragraph 3 below. This Agency specific AMC reflects a difference in operational rules between Europe and the USA, as European operating rules permit small rotorcraft to perform helicopter hoist operations as part of a commercial air transport operation, provided the small rotorcraft is CAT A certified. (See EU 965/2012<sup>4</sup> SPA.HHO.125)

The proposed changes to AC 27/29.865B are intended to clarify the split between operational and airworthiness aspects of external loads. To this end, references to FAA

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<sup>4</sup> Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1).

operational terms that are not used in Europe are removed. This has provided an opportunity to further clarify the associated CS-27/CS-29 Book 1 requirement that still refers to these FAA operational terms and which has added to the confusion over the safety objectives. In the past the rule has been unclear regarding its scope and which parts of the external load system fall within the scope of airworthiness. The revised text makes use of the term 'external load system' defined in the AC to clarify the scope, which can be summarised as follows:

- For all HEC operations, the entire external load system must be type certified. This includes the external load attaching means (hoist and/or hook), the quick release system, the Personnel-Carrying Device System (PCDS) and all attachments.
- For non-HEC operations, type certification is limited only to the external load attaching means, as redefined in CS-Definitions. This excludes ropes and netting used to attach the external cargo to the cargo hook or hoist, which are subject to an operational approval.

NOTE: Approval of a simple PCDS

Under CS 27/29.865, approval of a PCDS has only been accepted as part of the external load system during initial type certification, or as a subsequent change or STC. Following a request by operators to provide greater flexibility and cost-effectiveness in certification procedures, particularly when the PCDS is of a simple design, AC 27/29.865 has been amended to introduce the possibility that PCDS can be approved post-type certification. The Agency will prepare in the coming months a Certification Memorandum (CM) that will enable it to grant approval of such devices when the PCDS complies with a recognised European standard used to protect humans in non-flying activities and if designed and approved under the conditions described in the CM. This simplified approach will provide equivalent safety with existing rules and is in line with previous procedures adopted by some national aviation authorities prior to the establishment of the Agency.

### 3. Proposed amendments

The text of the amendment is arranged to show deleted text, new or amended text as shown below:

- (a) deleted text is marked with ~~strike through~~;
- (b) new or amended text is highlighted in **grey**;
- (c) an ellipsis (...) indicates that the remaining text is unchanged in front of or following the reflected amendment.

#### 3.1. Draft Certification Specifications (draft Decision on CS-Definitions)

Proposal 1: Amend CS-Definitions as follows:

##### 1. GENERAL DEFINITIONS

'**External load attaching means**' means the structural components of the rotorcraft used to attach an external load ~~to an aircraft~~, including a hoist and/or cargo hook, external-load containers, the backup structure at the attachment point and any quick-release device used to jettison the external load.

#### 3.2. Draft Certification Specifications (draft Decision on CS-27)

Proposal 2: Amend CS-27 Book 1, CS 27.865, as follows:

##### CS 27.865 External loads

- (a) It must be shown by analysis, test, or both, that the rotorcraft external load attaching means ~~for rotorcraft load combinations~~ to be used for non-human external cargo applications can withstand a limit static load equal to 2.5, or some lower load factor approved under CS 27.337 through 27.341, multiplied by the maximum external load for which authorisation is requested. It must be shown by analysis, test, or both that when used for human external cargo applications the rotorcraft external load system (including the external load attaching means, ~~and corresponding~~ the personnel-carrying device system and all attachments) ~~for rotorcraft load combinations to be used for human external cargo applications~~ can withstand a limit static load equal to 3.5 or some lower load factor, not less than 2.5, approved under CS 27.337 through 27.341, multiplied by the maximum external load for which authorisation is requested. The load ~~for any rotorcraft load combination class~~, for any external cargo type, must be applied in the vertical direction. For jettisonable ~~rotorcraft load combinations~~, for any applicable external cargo type, the load must also be applied in any direction making the maximum angle with the vertical that can be achieved in service but not less than 30°. However, the 30° angle may be reduced to a lesser angle if:
  - (1) An operating limitation is established limiting external load operations to such angles for which compliance with this paragraph has been shown; or
  - (2) It is shown that the lesser angle cannot be exceeded in service.
- (b) The external load attaching means for jettisonable external cargo ~~rotorcraft load combinations~~, must include a quick-release system to enable the pilot to release the external load quickly during flight. The quick-release system must consist of a primary quick-release subsystem and a backup quick-release subsystem that are isolated from one another. The quick-release system, and the means by which it is controlled, must comply with the following:



- (1) A control for the primary quick-release subsystem must be installed either on one of the pilot's primary controls or in an equivalently accessible location and must be designed and located so that it may be operated by either the pilot or a crew member without hazardously limiting the ability to control the rotorcraft during an emergency situation.
- (2) A control for the backup quick-release subsystem, readily accessible to either the pilot or another crew member, must be provided.
- (3) Both the primary and backup quick-release subsystems must:
  - (i) Be reliable, durable, and function properly with all external loads up to and including the maximum external limit load for which authorisation is requested.
  - (ii) Be protected against electromagnetic interference (EMI) from external and internal sources and against lightning to prevent inadvertent load release.
    - (A) The minimum level of protection required for jettisonable ~~rotorcraft load combinations used for~~ non-human external cargo is a radio frequency field strength of 20 volts per metre.
    - (B) The minimum level of protection required for jettisonable ~~rotorcraft load combinations used for~~ human external cargo is a radio frequency field strength of 200 volts per metre.
  - (iii) Be protected against any failure that could be induced by a failure mode of any other electrical or mechanical rotorcraft system.
- (c) For ~~rotorcraft load combinations to be used for~~ human external cargo applications, the rotorcraft must:
  - (1) For jettisonable external loads, have a quick-release system that meets the requirements of subparagraph (b) and that:
    - (i) Provides a dual actuation device for the primary quick-release subsystem, and
    - (ii) Provides a separate dual actuation device for the backup quick-release subsystem.
  - (2) Have a reliable, approved personnel-carrying device system that has the structural capability and personnel safety features essential for external occupant safety,
  - (3) Have placards and markings at all appropriate locations that clearly state the essential system operating instructions and, for the personnel-carrying device system, ingress and egress instructions,
  - (4) Have equipment to allow direct intercommunication among required crew members and external occupants,
  - (5) Have the appropriate limitations and procedures incorporated in the flight manual for conducting human external cargo operations, and
  - (6) For human external cargo applications requiring use of Category A rotorcraft, have one-engine-inoperative hover performance data and procedures in the flight manual for the weights, altitudes, and temperatures for which external load approval is requested.
- (d) The critically configured jettisonable external loads must be shown by a combination of analysis, ground tests, and flight tests to be both transportable and releasable throughout the approved operational envelope without hazard to the rotorcraft during normal flight conditions. In addition, these external loads must be shown to be releasable without hazard to the rotorcraft during emergency flight conditions.
- (e) A placard or marking must be installed next to the external load attaching means clearly stating any operational limitations and the maximum authorised external load as demonstrated under CS 27.25 and this paragraph.

- (f) For non-human external cargo, ~~the fatigue evaluation of CS 27.571 does not apply~~ applies only to those structural elements of the external load attaching means ~~rotorcraft load combinations to be used for non-human external cargo except for the failure of critical structural elements the failure of which that~~ would result in a hazard to the rotorcraft. For ~~rotorcraft load combinations to be used for~~ human external cargo, the fatigue evaluation of CS 27.571 applies to the complete external load system. ~~entire quick release and personnel carrying device structural systems and their attachments.~~

Proposal 3: Amend CS-27 Book 2, AMC 27.865, as follows:

## **AMC 27.865**

### **~~Class D (Human External Cargo) for Operations within Europe~~**

### **Human External Cargo (HEC) operations requiring Category A rotorcraft**

#### 1. Introduction

This ~~Additional~~ EASA AMC, used in conjunction with the FAA guidance<sup>5</sup> on Human External Cargo (HEC), provides an acceptable means of compliance with CS 27.865 for rotorcraft intended for Human External Cargo (HEC) operations requiring a Category A rotorcraft. ~~Class D Rotorcraft/Load Combinations (RLC) for the carriage of Human External Cargo (HEC). For all other RLC classes, reference should be made directly to the adopted FAA AC material.~~

The addition of this AMC has been necessary due to a difference in operational requirements within the USA and Europe and the absence of dedicated material within the FAA AC. ~~This additional EASA guidance is based on AC 29.865B.~~

#### 2. ~~Basic Definition and Intended Use~~

~~A Class D RLC is one where personnel are at some point in the operation transported external to the rotorcraft, and the operator receives compensation from or on behalf of the person(s) being transported. e.g. Transfer of personnel to/from a ship.~~

#### 3. ~~Certification Considerations~~

~~Class D HEC was originally envisaged for Part 29/CS29 rotorcraft only. This additional guidance is applicable to rotorcraft which have been shown to comply with the engine isolation specifications of CS27 Appendix C are also eligible.~~

~~The rotorcraft must be certified for an OEI/OGE hover performance weight, altitude and temperature envelope. This becomes the maximum envelope that can be used for Class D HEC operations.~~

#### 24. Compliance Procedures

~~4.1 The rotorcraft is required to meet the Category A engine isolation specifications of CS27 Appendix C, and have One Engine Inoperative/Out of Ground Effect (OEI/OGE) hover performance capability in its approved, jettisonable HEC weight, altitude, and temperature envelope.~~

24.1 If the operating rules require that the rotorcraft meets the Category A engine isolation requirements of CS-29 and that the rotorcraft has One-Engine-Inoperative/Out-of-Ground Effect (OEI/OGE) hover performance capability in its approved, jettisonable HEC weight, altitude, and temperature envelope, then the following apply:

- (i) In determining OEI hover performance, dynamic engine failures should be considered. Each hover verification test should begin from a stabilised hover at the maximum OEI hover weight, at the requested in ground effect (IGE) or OGE skid or wheel height, and with all engines operating. At this point the critical engine should be failed and the rotorcraft should remain in a stabilised

<sup>5</sup> See reference in *AMC 27 General*.

hover condition without exceeding any rotor limits or engine limits for the operating engine(s). As with all performance testing, engine power should be limited to minimum specification power. Engine failures may be simulated by rapidly moving the throttle to idle provided a 'needle split' is obtained between the rotor and engine RPM.

- (ii) ~~Normal pilot reaction times should be used following the engine failure to maintain the stabilised hover flight condition will depend on the environment in which such operations are planned. For HEC operations planned for day visual meteorological conditions (VMC), normal pilot reaction times are acceptable. Recent certification projects for HEC operations planned to take place over water at night while in VMC or in instrument meteorological conditions (IMC) required greater pilot reaction times. When hovering OGE or IGE at maximum OEI hover weight, an engine failure should not result in an altitude loss of more than 10 percent or four (4) feet, whichever is greater, of the altitude established at the time of engine failure. In either case, sufficient power margin should be available from the operating engine(s) to regain the altitude lost during the dynamic engine failure and then to transition to forward flight.~~
- (iii) Consideration should also be given to the time required to recover (reel in and bring aboard) the HEC ~~or manoeuvre the Class D external load and then to transition into forward flight. For example to winch up and bring aboard personnel in hoisting operations or manoeuvre clear of power lines for fixed strop/basket operations. This time increment necessary to perform such actions may exceed the short duration OEI power ratings. For example, for a helicopter with a 30sec/2 min rating structure that sustains an engine failure at a height of 40 feet, the time required to reestablish them a hover, recover the HEC external load (given the hoist speed limitations), and then transition to forward flight (with minimal altitude loss) would likely exceed 30 seconds and a power reduction into the 2-minute rating would be necessary. In accordance with the intent of OEI power ratings, recovery and transition procedures shall not utilize more than one iteration of either a 30-second/2-minute power combination or a 2½-minute rating.~~
- (iv) The Rotorcraft Flight Manual (RFM) or Supplement (RFMS) should contain information that describes the expected altitude loss, any special recovery techniques, and the time increment used for recovery of the external load when establishing maximum weights and wheel or skid heights. Engine failure procedures that permit safe recovery of the HEC and safe fly-away capability shall be included in the RFM or RFMS. The OEI hover chart should be placed in the performance section of the RFM or RFMS. Allowable altitude extrapolation for the hover data should not exceed 2 000 feet. The following statement (modified appropriately) should be included to indicate to operators which charts are applicable to these HEC operations.

*For external load equipment installations specifically intended for HEC applications requiring the use of Category A rotorcraft, OEI hover performance data and procedures may be found in Figures/Charts/Section XX - YY...*

- 24.2 For helicopters that incorporate engine-driven generators, the hoist should remain operational following an engine or generator failure. A hoist should not be powered from a bus that is automatically shed following the loss of an engine or generator. Maximum two engine generator loads should be established so that when one engine or generator fails, the remaining generator can assume the entire rotorcraft electrical load (including the maximum hoist electrical load) without exceeding approved limitations.

- 4.3 ~~The external load attachment means and the personnel carrying device should be shown to meet the specifications of CS 27.865(a) for the proposed operating envelope.~~
- 4.4 ~~The rotorcraft is required to be equipped for, or otherwise allow, direct intercommunication under any operational conditions among crew members and the HEC. For RCL Class D operations, two way radios or intercoms should be employed.~~

### 3.3. Draft Certification Specifications (draft Decision on CS-29)

Proposal 4: Amend CS-29 Book 1, CS 29.865, as follows:

#### CS 29.865 External loads

- (a) It must be shown by analysis, test, or both, that the rotorcraft external load attaching means ~~for rotorcraft load combinations~~ to be used for non-human external cargo applications can withstand a limit static load equal to 2.5, or some lower load factor approved under CS 29.337 through 29.341, multiplied by the maximum external load for which authorisation is requested. It must be shown by analysis, test, or both that ~~when used for human external cargo applications, the rotorcraft external load system (including the external load attaching means, and corresponding the personnel-carrying device system and all attachments) for rotorcraft load combinations to be used for human external cargo applications~~ can withstand a limit static load equal to 3.5 or some lower load factor, not less than 2.5, approved under CS 29.337 through 29.341, multiplied by the maximum external load for which authorisation is requested. The load ~~for any rotorcraft load combination class, for any external cargo type,~~ must be applied in the vertical direction. For jettisonable ~~rotorcraft load combinations, for any applicable external cargo type,~~ the load must also be applied in any direction making the maximum angle with the vertical that can be achieved in service but not less than 30°. However, the 30° angle may be reduced to a lesser angle if:
- (1) An operating limitation is established limiting external load operations to such angles for which compliance with this paragraph has been shown; or
  - (2) It is shown that the lesser angle cannot be exceeded in service.
- (b) The external load attaching means for jettisonable ~~external cargo rotorcraft load combinations,~~ must include a quick-release system to enable the pilot to release the external load quickly during flight. The quick-release system must consist of a primary quick-release subsystem and a backup quick-release subsystem that are isolated from one another. The quick-release system, and the means by which it is controlled, must comply with the following:
- (1) A control for the primary quick-release subsystem must be installed either on one of the pilot's primary controls or in an equivalently accessible location and must be designed and located so that it may be operated by either the pilot or a crew member without hazardously limiting the ability to control the rotorcraft during an emergency situation.
  - (2) A control for the backup quick-release subsystem, readily accessible to either the pilot or another crew member, must be provided.
  - (3) Both the primary and backup quick-release subsystems must:
    - (i) Be reliable, durable, and function properly with all external loads up to and including the maximum external limit load for which authorisation is requested.

- (ii) Be protected against electromagnetic interference (EMI) from external and internal sources and against lightning to prevent inadvertent load release.
    - (A) The minimum level of protection required for jettisonable ~~rotorcraft load combinations used for non-human~~ external cargo is a radio frequency field strength of 20 volts per metre.
    - (B) The minimum level of protection required for jettisonable ~~rotorcraft load combinations used for human~~ external cargo is a radio frequency field strength of 200 volts per metre.
  - (iii) Be protected against any failure that could be induced by a failure mode of any other electrical or mechanical rotorcraft system.
- (c) For ~~rotorcraft load combinations to be used for human~~ external cargo applications, the rotorcraft must:
- (1) For jettisonable external loads, have a quick-release system that meets the requirements of subparagraph (b) and that:
    - (i) Provides a dual actuation device for the primary quick-release subsystem, and
    - (ii) Provides a separate dual actuation device for the backup quick-release subsystem.
  - (2) Have a reliable, approved personnel-carrying device system that has the structural capability and personnel safety features essential for external occupant safety,
  - (3) Have placards and markings at all appropriate locations that clearly state the essential system operating instructions and, for the personnel-carrying device system, ingress and egress instructions,
  - (4) Have equipment to allow direct intercommunication among required crew members and external occupants,
  - (5) Have the appropriate limitations and procedures incorporated in the flight manual for conducting human external cargo operations, and
  - (6) For human external cargo applications requiring use of Category A rotorcraft, have one-engine-inoperative hover performance data and procedures in the flight manual for the weights, altitudes, and temperatures for which external load approval is requested.
- (d) The critically configured jettisonable external loads must be shown by a combination of analysis, ground tests, and flight tests to be both transportable and releasable throughout the approved operational envelope without hazard to the rotorcraft during normal flight conditions. In addition, these external loads must be shown to be releasable without hazard to the rotorcraft during emergency flight conditions.
- (e) A placard or marking must be installed next to the external load attaching means clearly stating any operational limitations and the maximum authorised external load as demonstrated under CS 29.25 and this paragraph.
- (f) For non-human external cargo, ~~t~~The fatigue evaluation of CS 29.571 ~~does not apply~~ applies only to those structural elements of the external load attaching means ~~rotorcraft load combinations to be used for non-human external cargo except for the failure of critical structural elements~~ the failure of which that would result in a hazard to the rotorcraft. For ~~rotorcraft load combinations to be used for human~~ external cargo, the fatigue evaluation of CS 29.571 applies to the ~~complete external load system~~ ~~entire quick release and personnel carrying device structural systems and their attachments~~.