AIRWORK
& Heliseilerei GmbH

A&H Engineering

A&H Equipment

A&H Services

A&H Expert

Design – Production – Maintenance

EC machinery directive 2006/42/EC
EC directive on PPE 89/686/EEC
EASA CS 27./29.865 on external loads
Annex II

- Lifting accessories and slinging devices
- Special equipment for annex II aircrafts
- PPE against falls from a height
- Personnel-carrying device systems PCDS

Expert assistance

- Damage expertise
- Training of qualified persons (in accordance with BGG 906)
- R&D in collaboration with official authorities (BGV, BFH)
- Consulting (BG Verkehr, Chemnitz TU and others)

- www.luftfahrt-sv.de

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These are our clients....





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Human external cargo (HEC), fixed rope systems

EASA CS-27.865 / CS-29.865 on external loads

- Human external cargo (HEC)

EASA CM-CS-005 Certification Memorandum

- Personnel-carrying device systems (PCDS)
  - simple PCDS
  - complex PCDS

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EN 1498

Personnel-carrying device systems (PCDS)

- Simple PCDS
  - certified in accordance with EC dir. 89/686/EEC
  - certified in accordance with a harmonised EN standard
  - listed in EASA CM-CS-005
  - designed to transport maximum 2 persons
  - safety factor 7 [-] for steel, 14 [-] for textiles
  - CE conformity approved by EC type examination
    - (STC > EASA FORM 1)

Note: only minor change approval required

> Part SPO AMC1 SPO.SPEC.HEC

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1 – 2 persons

Simple PCDS …

EN 354 - EN 358

EN 538 - EN 361

EN 813 - EN 12277

EN 358

EN 362 – EN 12275

EN 1891 A (kernmantel ropes with low elongation, aka static ropes)

Examples

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... and devices which are not listed in EASA CM-CS-005

EN 341 A

EN 12278

EN 567 – 12841

EN 892 (dynamic alpine ropes)

Examples

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Full-scale test

Personnel-carrying device systems (PCDS)

- Complex PCDS
  - EASA CS-27./29.865 major change approval (STC)
  - Part 21 J DO + Part 21 G PO (DO-PO arrangement)
  - no EC type examination required
  - no compliance with EN standards required
  - from 1 person (currently up to 10 persons)
  - calculation based on CS-27./29.865, .303, .619, etc.
    - design load limit HEC 3.5 g (as for LufABw)
  - proof of CS-27./29.305 compliance regarding strength and deformation

Complex PCDS …

> 2 persons

Redundancy system AS332L

GSG9 – WLL 800 kg

Horizontal net – WLL 1 person

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Comparison: EN 1891 vs. Dyneema (HMPE) ropes used for rescue

Properties

EN 1891, ∅ 12.5 mm		Dyneema SK 78, ∅ 8 mm + cover
	UL up to 37 kN	 UL min. 52 kN
	max. WLL 270 kg/2.64 kN 14 [-]	min. WLL 380 kg/3.7 kN
	Bearing parts: core and cover	Bearing part: core only
	Load-bearing share of cover ≥ 30.5%	0.0%
	Load-bearing share of core ≥ 33.3%	100.0%
	Rope∅ min. 8.5, max 16 mm	no limit values
	Elongation ≤ 5% (100 kg)	< 0.3% at WLL
	HEC – shock absorber required: no	HEC: yes

Examples

Comparison: EN 1891 ropes vs. Dyneema ropes

Consequences of cover damage (cut caused by a sharp edge)

EN 1891: cover bears > 30%	Dyneema: non-bearing cover
Loss of cover = min. 30% loss of UL	Loss of cover = no consequences Core reaction to cutting
Video 1: EN 1891 A, 11 mm	Test_EN1891_11.MOV
Video 2: EN 1891 A, 12.5 mm	Test_EN1891_12.MOV
Video 3: Dyneema, 6 x 5 mm	Test DY-6-5_MA.MOV

Examples

Commentary on the videos

Empirical test during which it was attempted to sever ropes by means of a carpet cutter. The test was held on 3rd of July, 2017. Load 50 kg, rope length approximately 1.20 m. Standard rope cutter, manually operated. No force measurements taken.

Video 1: EN 1891 A, 11 mm

Rope compliant with EN 1891 A, 11 mm, made by Gleistein. Both cover and core are bearing elements and stressed in tension. A carpet cutter was placed onto the rope to remove the cover. Duration: 3 seconds. Total rope failure.

Video 2: EN 1891 A, 12.5 mm

Rope compliant with EN 1891 A, 12.5 mm, made by Mammut AG. Both cover and core are bearing elements and stressed in tension. A carpet cutter was carefully placed on the cover to remove it with a circular cut. A neat separation of the cover from the core was not possible. Duration: 39 seconds. Total rope failure.

Video 3: Dyneema, 6 x 5 mm

6 x 5 mm DynaOne HS rope with PES cover. Rope cover not load-bearing and not in tension. The cover could be separated from the core. Duration: 28 seconds.

Subsequently, a 5 mm DynaOne HS strand was severed by violent cutting movements while applying pressure. Duration: 16 seconds. Accidentally, 2 further strands were partly cut. Nevertheless, no rope failure occurred since the remaining strands could bear the load.

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Synopsis

A system's safety is not simply the sum
of the strength of its single elements (statics),
complete certification (CVE),
compliance with standards (references by the authorities)
and appropriate costs (commerce).

A most important aspect is the SUITABILITY
of the material used with regard to its intended application.

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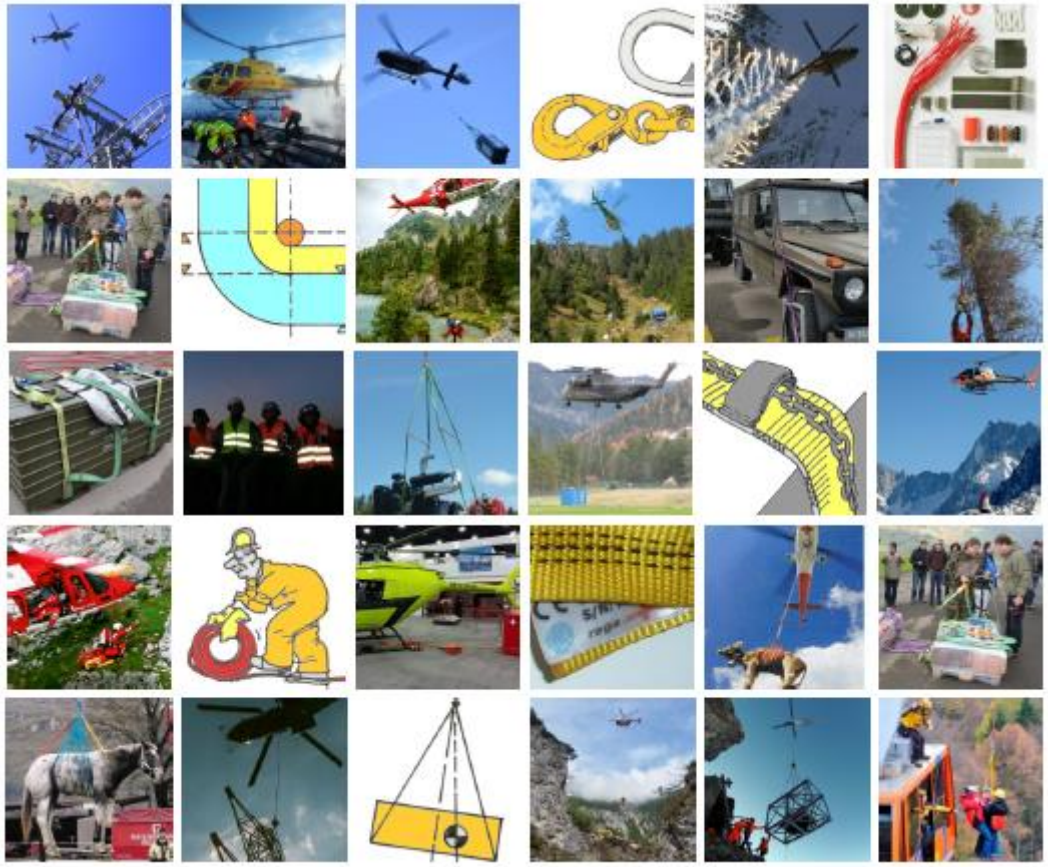

Thank you very much for your attention!

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