

ESPN-R

Sling Load Operations

Safety Promotion

June 2026 Edition

Agenda



Agenda

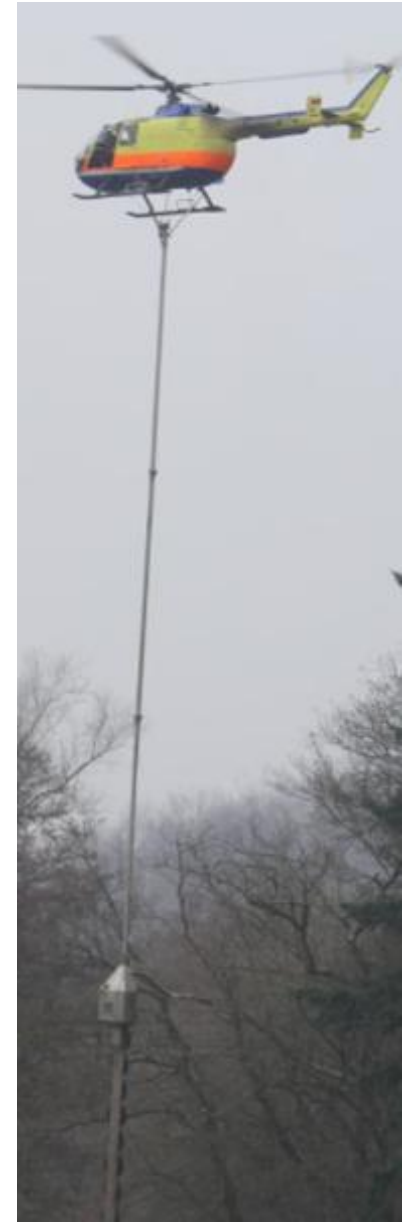
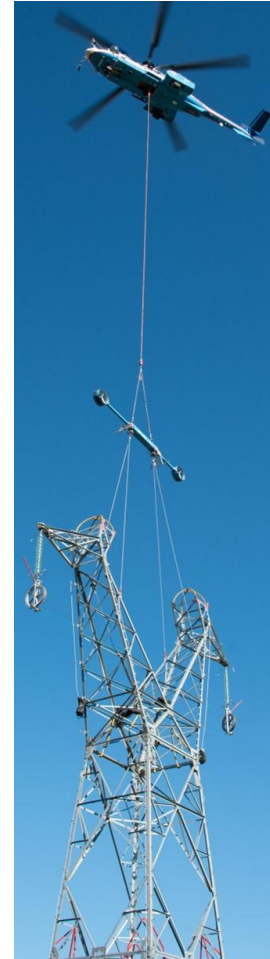
- Aerial Work External Load Overview
- ESPN-R Sling Load Operations Safety Promotion Introduction
- HESLO & HEC Requirements
- General HEC-System overview
- Pre flight check means for a cargo hook
- Simple and Complex Personal Carrying Device System (PCDS)
- Best practices guidelines
- Firefighting

Aerial Work External Load Overview



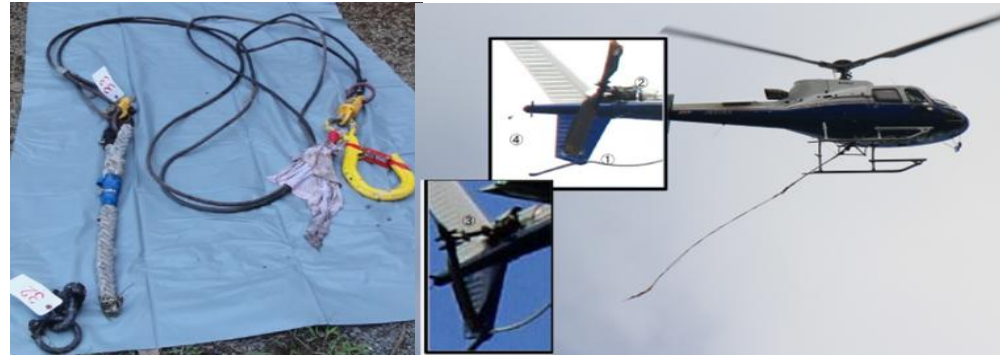
Aerial Work

What is Helicopter External Sling Load Operation ?



Aerial Work

Issues related to Sling Load Operation Overview



Source: BEA;
Number 2019-0023

Source: NTSB; Number
WPR20LA244

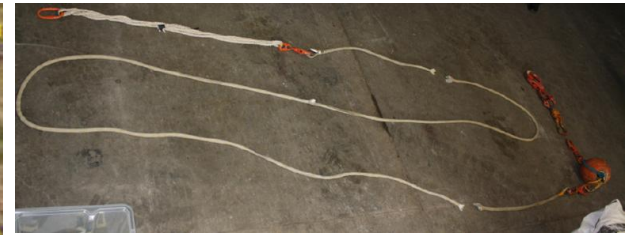
Source: NTSB;
Number WPR13FA006

Aerial Work

Issues related to Sling Load Operation Overview

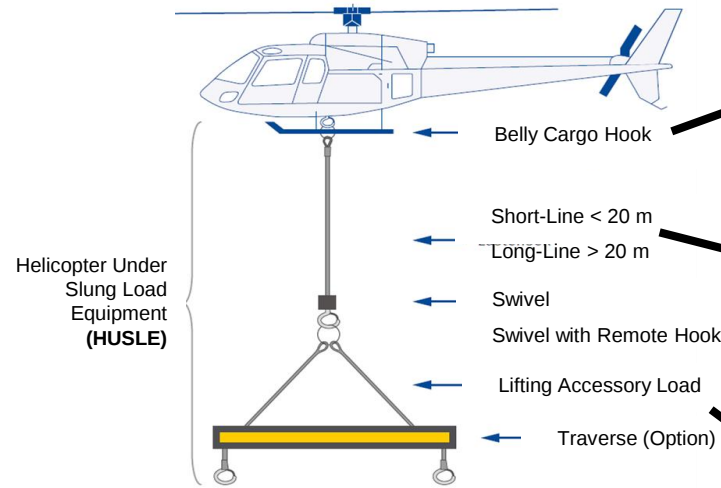


Source: Statens Havarikommisjon
for Transport: SL 2008/02

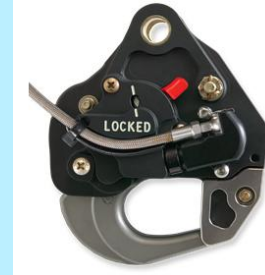


Source: BFU; Number
BFU CX012-10

Aerial Work



Keeperless Design



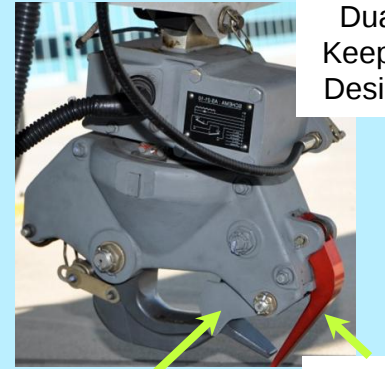
Source Onboard System

Keeper Design



Keeper

Dual Keeper Design



Keeper

Dual Keeper

Steel Ropes



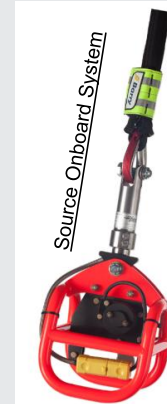
Textile Ropes < 20 m



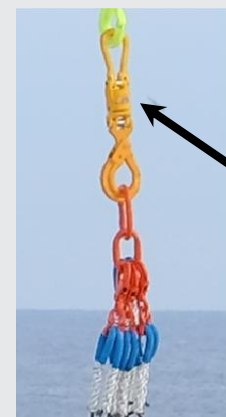
Textile Ropes > 20 m



Source Helihook



Source Onboard System



Swivel

Aerial Work

Overview

- **Definition**
 - **Helicopter External Sling Load Operation (HESLO) or called Rotorcraft Load Combination (RLC) B**
 - is the transport of cargo external to a rotorcraft
 - a high precision of manoeuvring to a lift and place the load
 - continuous coordination between the flight crew and the ground crew / task specialist
 - **Human External Cargo (HEC) or called Rotorcraft Load Combination (RLC) D**
 - is the transport of individuals external to a rotorcraft using a **Personnel Carrying Device System (PCDS)**. This can be done via a hoist or a cargo hook.
 - a person (or persons) who, at some point in the operation, is (are) carried **external to the rotorcraft**.
- *More and more H/Cs have the capability to perform HESLO (RLC B) and/or HEC (RLC D).*



ESPN-R Sling Load Operations Safety Promotion Introduction



Introduction

- **Task Force** team has been established with a mixed committee from

- Authority

- EASA



- BAZL (FOCA)



- Industry

- H/C Manufacturer

- Airbus Helicopters



- Bell Textron



- Original Equipment Manufacturer (OEM)

- Onboard Systems International



- Airwork & Heliseilerei



www.air-work.swiss

- Trainer and Operator

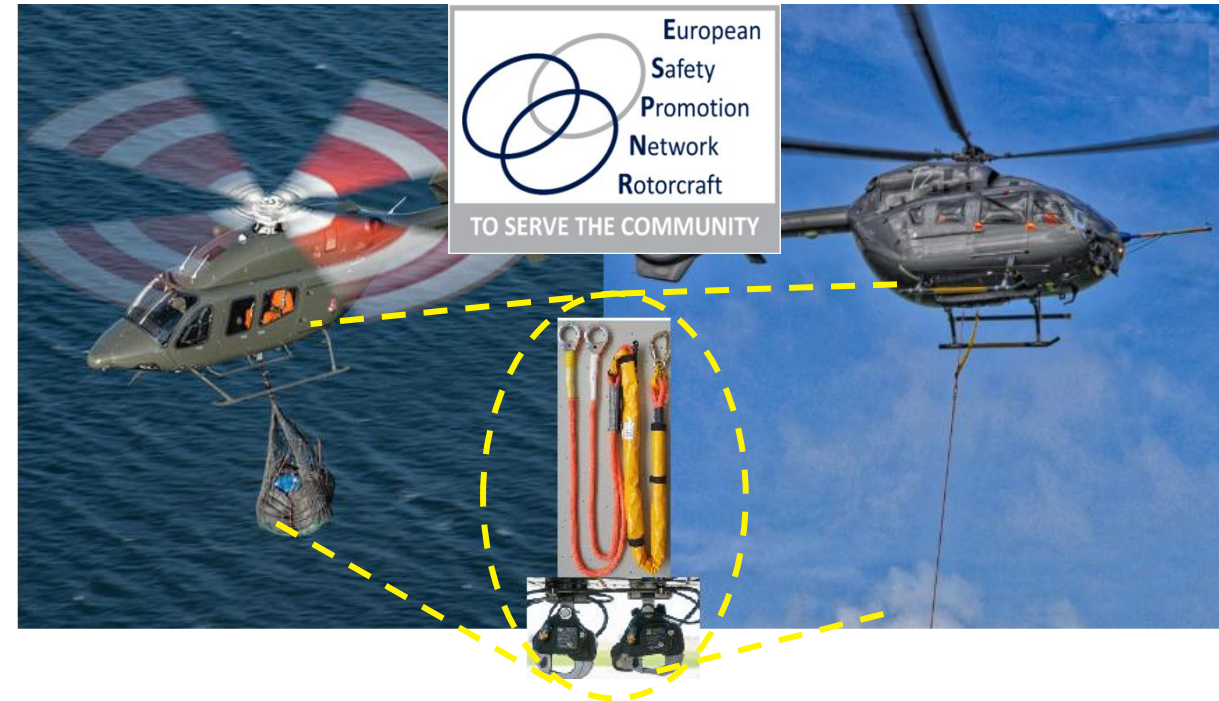
- Training for Aerial-Work - "D-HOPF"



- Volo Mission Andre and Kimberly Hutchings



- David McColI HEC Pilot



External-sling-load-operations-related issues (SI-8038)



Introduction

- ESPN-R Sling Load Operations Safety Promotion LinkedIn Group has been established
- The task force achieved a big leap forward in membership and is very pleased to see that the LinkedIn Group now

➤ counts ~350 members

- **Feel free to join**
- We value all contributions and feedback!

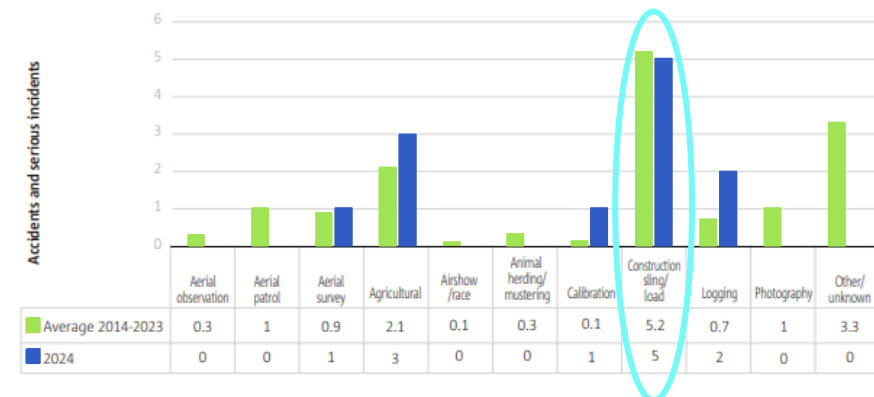
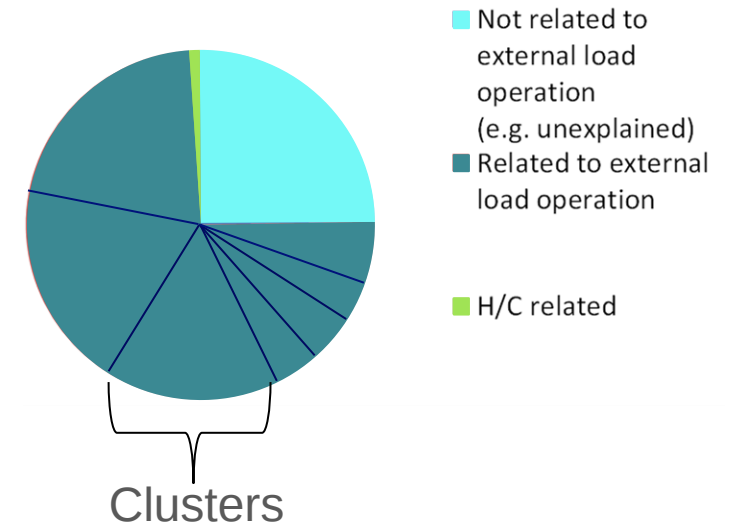


Introduction

Need for an ESPN-R Sling Load Operations Safety Promotion

- Whilst the robust design and certification of sling load components and systems remains important, the service evidence shows a considerable bias towards operational-related events. **Approximately 400 related to operations 2018 to 2025.**
- While a legal reporting obligation exists for all safety-relevant incidents, the actual reporting rate and transparency depend heavily on the **safety culture**
- The captured events are **grouped into clusters** to allow more efficient analyses.
- Each identified **cluster** is assessed carefully by the team. Experience and **guidance is provided**.
- **Guidance** tends to be published as a **sketch with a few words**, so as to make it clear and memorable.

External Load Incidents/Accidents



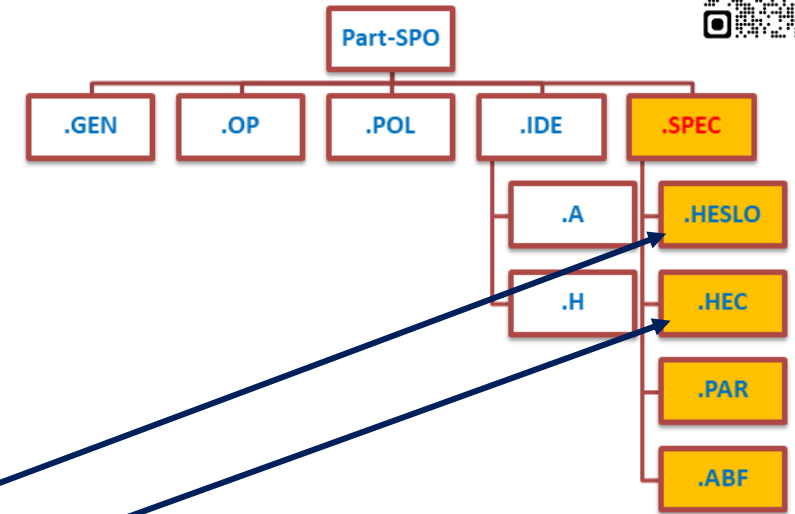
HESLO & HEC Requirements



HESLO & HEC Requirements

Operational requirements

- EASA model (EU)
 - Regulation Air Operation
 - Annex VIII Part-SPO (Special Operations = Aerial work)
 - Subpart E (Specific requirements)
 - **Section 1 HESLO (Helicopter External Sling Load Operations)**
 - **Section 2 HEC (Human External Cargo)**
- FAA model (USA)
 - Part 133 (Rotorcraft External Load Operations)



Federal Aviation Regulations

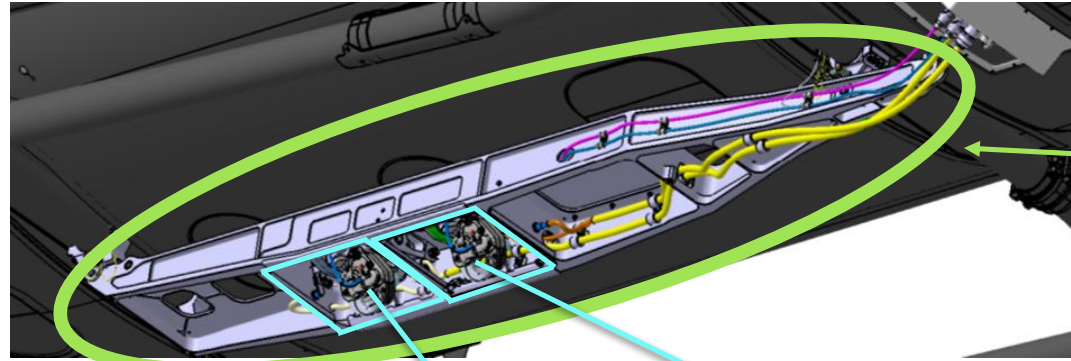
- SUBPART A - Applicability
 - [FAR 133.1 - Applicability](#)
- SUBPART B - Certification Rules
 - [FAR 133.11 - Certificate required](#)
 - [FAR 133.13 - Duration of certificate](#)
 - [FAR 133.14 - Carriage of narcotic drugs, marijuana, and depressant or stimulant drugs or substances](#)
 - [FAR 133.15 - Application for certificate issuance or renewal](#)
 - [FAR 133.17 - Requirements for issuance of a rotorcraft external-load operator certificate](#)
 - [FAR 133.19 - Rotorcraft](#)
 - [FAR 133.21 - Personnel](#)
 - [FAR 133.23 - Knowledge and skill](#)
 - [FAR 133.25 - Amendment of certificate](#)
 - [FAR 133.27 - Availability, transfer, and surrender of certificate](#)
- SUBPART C - Operating Rules and Related Requirements
 - [FAR 133.31 - Emergency operations](#)
 - [FAR 133.33 - Operating rules](#)
 - [FAR 133.35 - Carriage of persons](#)
 - [FAR 133.37 - Crewmember training, currency, and testing requirements](#)
 - [FAR 133.39 - Inspection authority](#)
- SUBPART D - Airworthiness Requirements
 - [FAR 133.41 - Flight characteristics requirements](#)
 - [FAR 133.43 - Structures and design](#)
 - [FAR 133.45 - Operating limitations](#)
 - [FAR 133.47 - Rotorcraft-load combination flight manual](#)
 - [FAR 133.49 - Markings and placards](#)
 - [FAR 133.51 - Airworthiness certification](#)

General HEC-System overview



General HEC System

Overview



Cargo hook system
underneath the
fuselage

Dual hook
installation

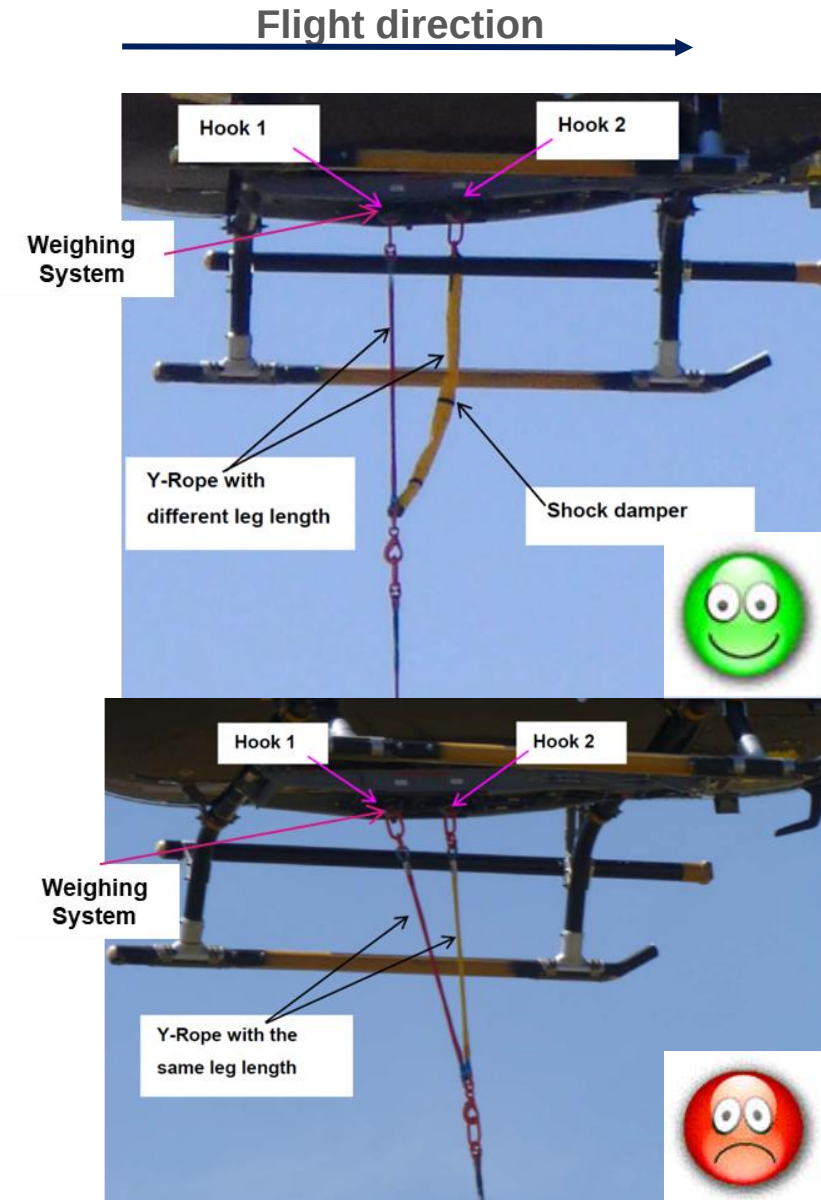


Personnel Carrying
Device System
(PCDS)

General HEC System

Overview

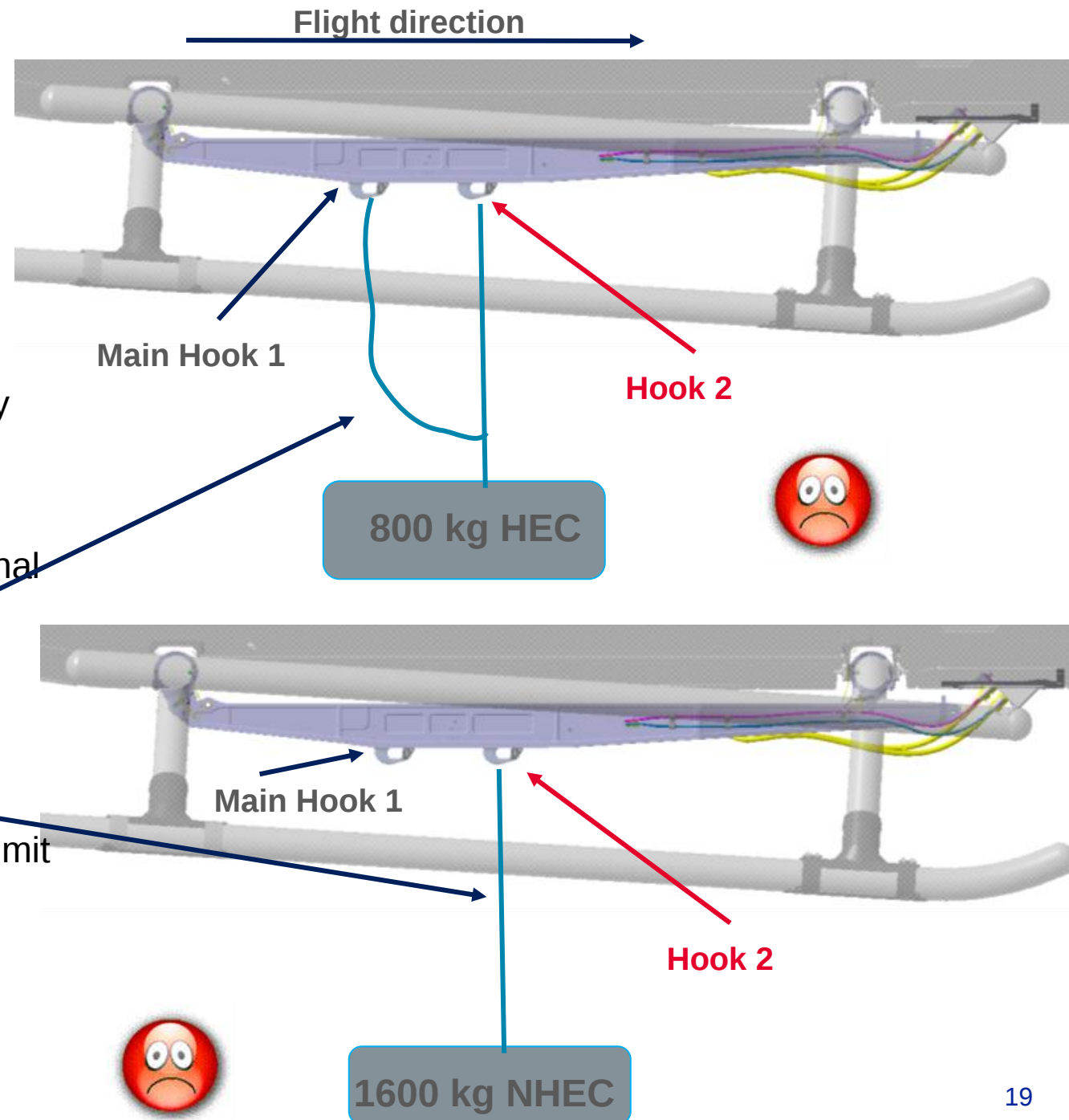
- A complex PCDS (Covered by an EASA approval) is recommended.
- The PCDS shall be compatible with the to be used H/C.
- A common installation is:
 - Two independent cargo hooks are used (for safety reason)
 - **The shorter rope leg of the asymmetric rope (A-Rope) needs to be connected on the Main Hook 1.**
 - The longer rope leg needs to be connected to the Hook 2 and therefore Main Hook 1 bears the full load.
- A **symmetric rope** (Y-Rope) is not recommended because
 - The external load mass would be distributed on both Cargo Hooks in a static flight.
 - However the **weighing system** is only **installed in Hook 1** (rear one).
 - There would be a difference between the actual load mass attached and the indicated load mass on the MFD (Multi-Functional Display)



General HEC System

Overview

- Special care must be given by attaching the Asymmetric Rope (A-Rope) onto the cargo hook.
- The designation of the cargo hook is mentioned by placards.
 - e.g. Main **Hook 1** and **Hook 2**
- The maximum rated load is different between Non Human External Cargo (NHEC) and Human External Cargo (HEC).
 - e.g. **1600 kg NHEC** and **800 kg HEC**
- **False Scenarios**
 - Do not mix the A-Rope legs
 - Do not attach 1600 kg on the Hook 2,
 - the center of gravity could be out of the limit
 - the structural limit may be reached
 - Do not use the Hook 2 for NHEC operation
 - Do not use the Hook 2 for an additional load



General HEC System

Overview

- Special care must be given by attaching the Asymmetric Rope (A-Rope) onto the cargo hook.
- **Do not twist** the Hook 2 A-Rope leg around the Main Hook 1 leg.



Flight direction →

Main Hook 1

Hook 2





Helicopter External Sling Load

Pre flight check means for a cargo hook



HESLO

Pre flight check means for a cargo hook

- Pre flight check.
 - The following release modes need to be checked prior to the first flight of the day with external loads (Correct operation (open / closed) of the respective cargo hook
 - Primary Quick Release System => electrically
 - first choice
 - Back Up Quick Release => mechanically
 - in case of a failure of the Primary Quick Release System

Electrical releases



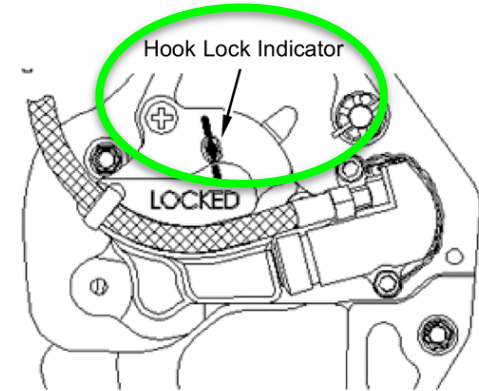
Safety guard

Green mark

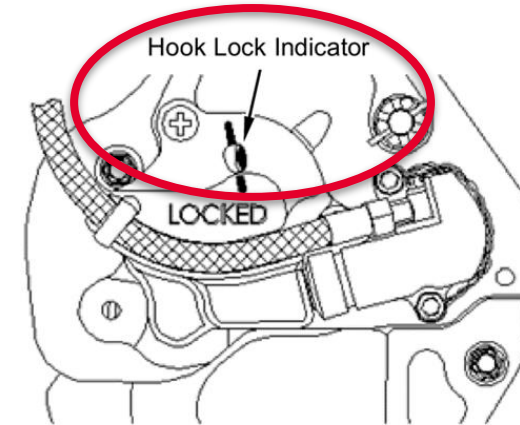
HESL

Pre flight check means for a cargo hook

- Pre flight check.
 - Verify that the **hook lock indicator** (if installed) on the side of the hook returns to the **fully locked position**.
 - In the fully locked position the hook lock indicator should align with the lines on the manual release cover.
 - **If the hook does not release (e.g. during pre-flight check), re-latch or have an aligned hook lock diamond**
 - **Do not use the unit until the problem is resolved.**



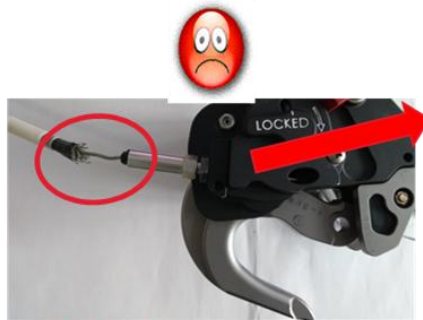
ACCEPTABLE
LOCK INDICATOR DIAMOND IS
ALIGNED WITH ENGRAVED
LINES ON THE COVER.



NOT ACCEPTABLE
LOCK INDICATOR DIAMOND IS VISIBLE
BUT IS NOT ALIGNED WITH ENGRAVED
LINES ON THE COVER.

Pre flight check means for a cargo hook

- Pre flight check for Bowden cable
 - At least prior the first flight of the day with external load or change of any part, the cargo hook Bowden cable* must be inspected for :
 - broken or kinked conduit/inner cable
 - correct rigging, with proper free play
 - cable routing to avoid strain on the cable (within the complete cargo hook swing envelope and collective lever travel)
 - Further details are defined within the appropriate flight manual



Strained Bowden Cable



Play between Ground Release Lever and Bowden Cable End

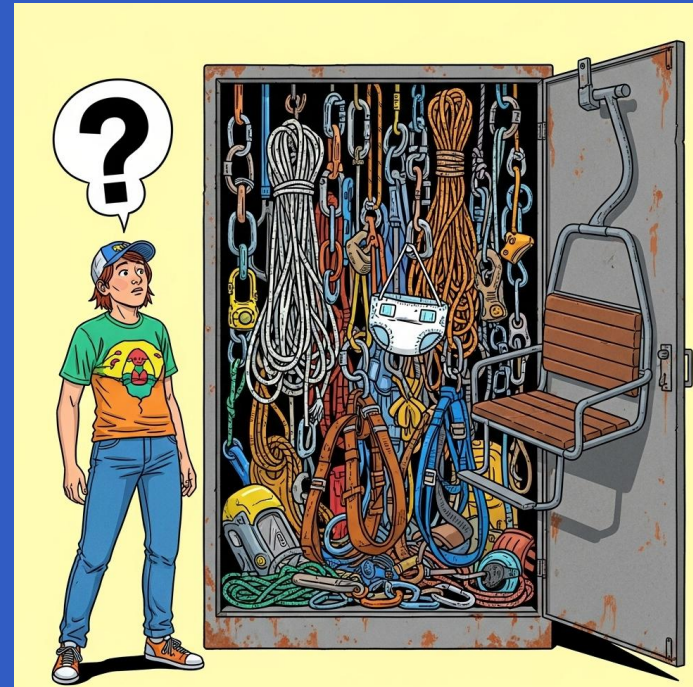


No Play between Ground Release Lever and Bowden Cable End



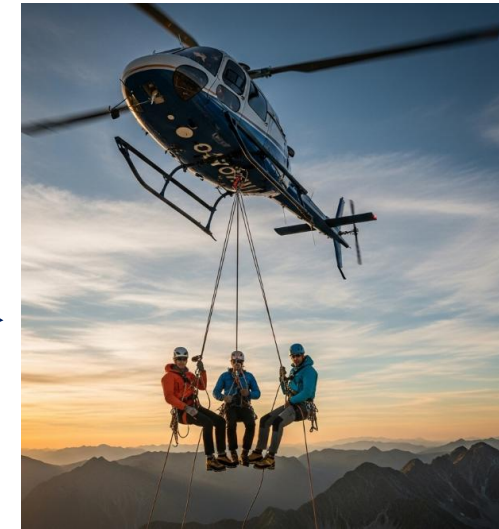
Broken or kinked conduit

Personal Carrying Device System (PCDS)



Simple versus Complex Personal Carrying Device System PCDS

- Regulation
 - These are the applicable requirements for a PCDS
 - REGULATION (EU) 2016/425 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2016 on personal protective equipment and repealing Council Directive 89/686/EEC
 - [Easy Access Rules for Air Operations \(Regulation \(EU\) No 965/2012\)](#)
 - GM17 Annex I Definitions ED Decision 2019/019/R
- Key Infos
 - **Simple PCDS** is for **no more than two persons** outside the cabin
 - Designed to an EN standard under an EU regulation/ directive : Machinery / Personal Protection Equipment
 - As soon as there are **more than two persons** attached, it means **complex PCDS**
 - A complex PCDS needs to be certified via a Supplement Type Certification (STC) or modification to the Type Certification (TC)



Simple versus Complex Personal Carrying Device System PCDS

Examples

Simple PCDS



Complex PCDS



Source: AIRWORK & Heliseilerei GmbH



Source: Klaus Hopf



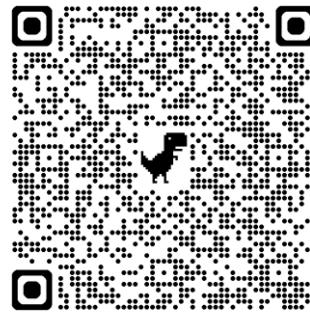
Personal Carrying Device System PCDS

Common static climbing ropes

- It has been reported to operate with **common static industry/climbing rope** as connection between the person on the rope and Helicopter.
- Especially in an environment close to “sharp” objects and with the movement of the Helicopter these ropes are not appropriate.



Source: AIRWORK & Heliseilerei GmbH

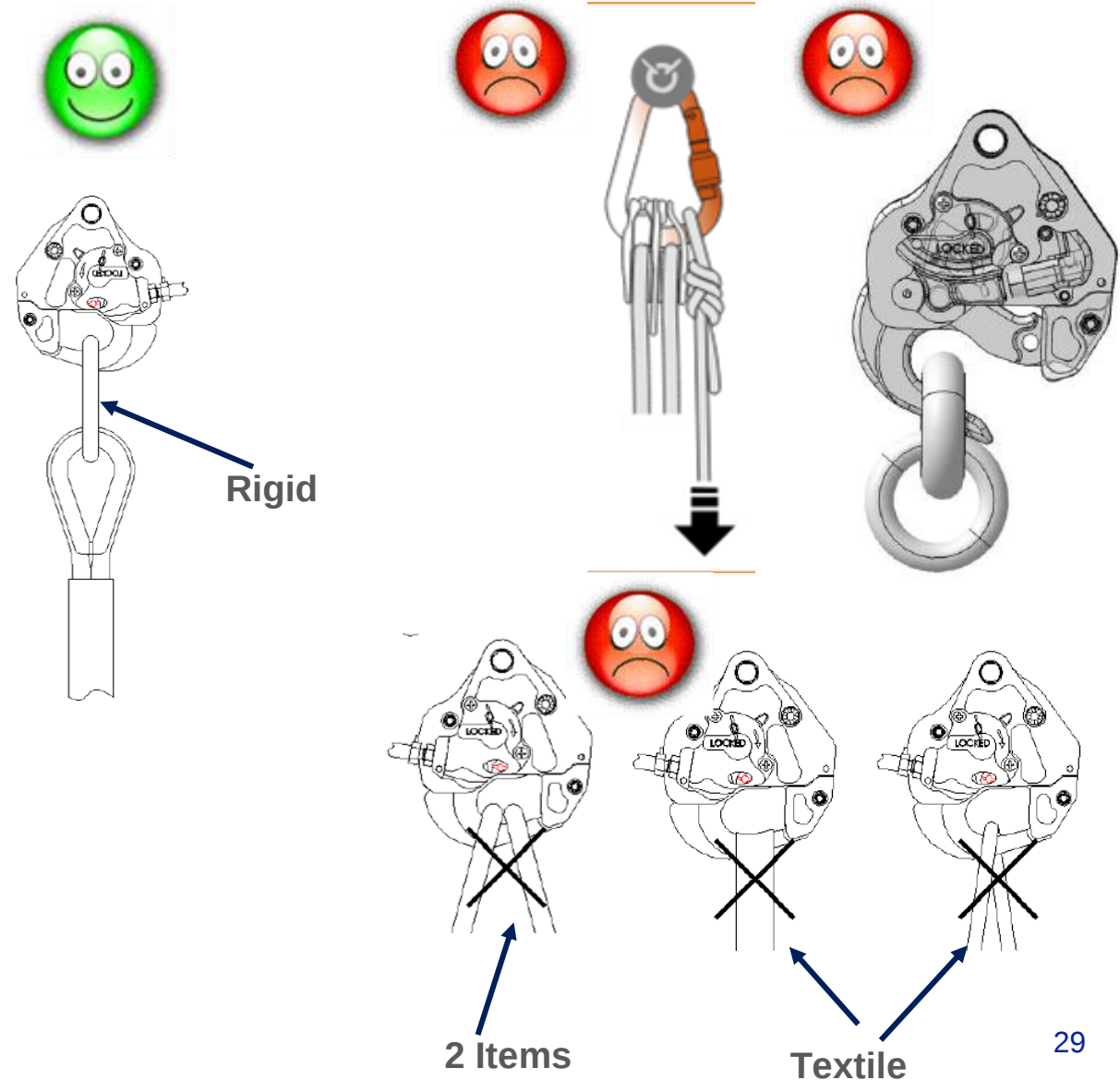


Personal Carrying Device System PCDS

Also applicable for Non Human Cargo

Primary Cargo Hook Interface

- PCDS /Helicopter compatibility
 - Compatibility and relevance of PCDSs and operation equipment should ensure proper interactions to properly work together.
- For the compatibility check, the following points needs to be considered:
 - Jamming situations
 - Wrong load apply area
 - Only rigid rigging devices in direct contact with the cargo hook load beam are recommended.
 - Only one item to be used inside the cargo hook throat area.

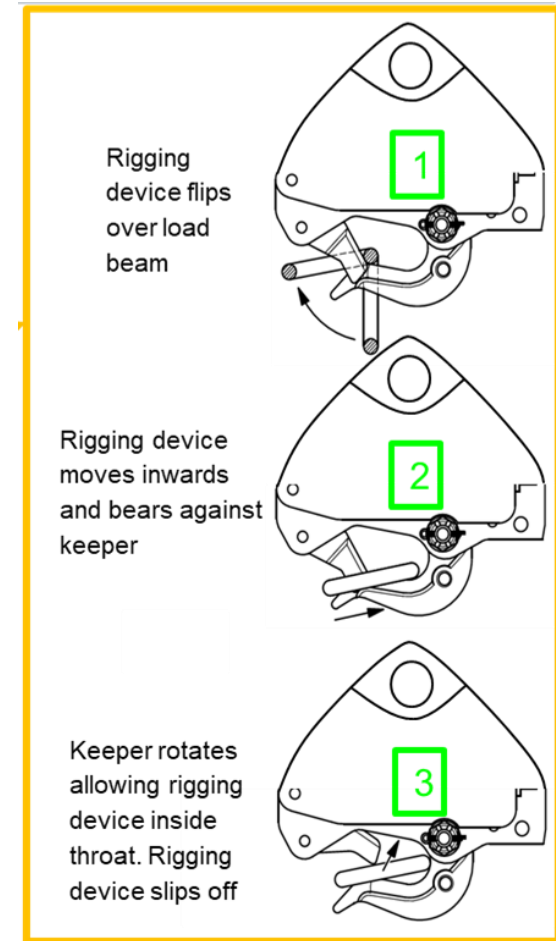


Personal Carrying Device System PCDS

Also applicable for Non Human Cargo

Dynamic Roll-Out

- Unintended release (dynamic roll-out) of the rope typically occurs when either the sling or harness is not properly attached to the hook, is blown by downdraft, is dragged along the ground or through water, or is otherwise placed into a dangerous hook-to-eye configuration.



Personal Carrying Device System PCDS

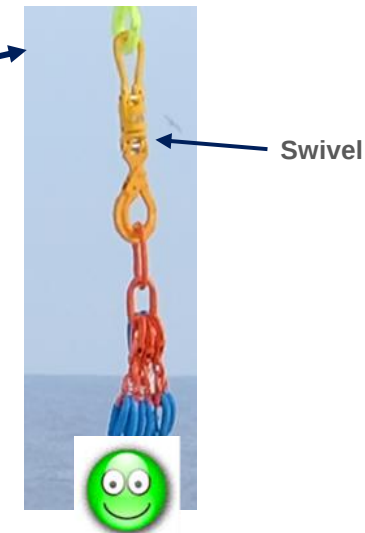
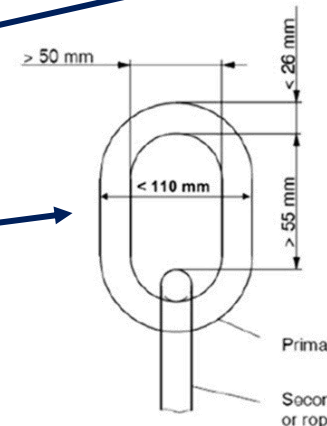
Also applicable for Non Human Cargo

GENERAL HEC-System Overview

- Only **rigid rigging devices** in **direct contact** with the cargo hook **load beam** are recommended
 - Any sharp notch could damage a non rigid rigging device.
 - Sharp notches are not uncommon especially if the H/C is operated under NHEC for logging operation
- **The release capability is reduced for non rigid rigging devices.**
- **A swivel shall be used as any load is prone to rotation**
- The **rigging dimensions** are defined within the Aircraft Flight Manual



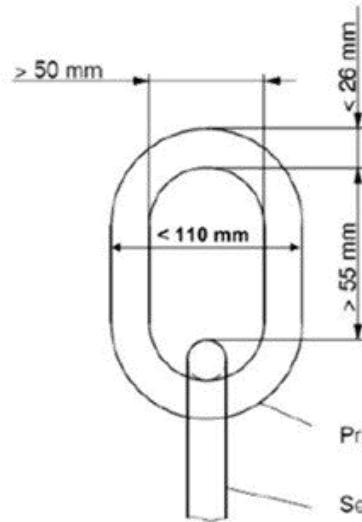
Source: Continuing Airworthiness Notice – 05-006



Personal Carrying Device System PCDS

Also applicable for Non Human Cargo

Primary Cargo Hook Interface



Rigid



Textile

Best Practices Guidelines

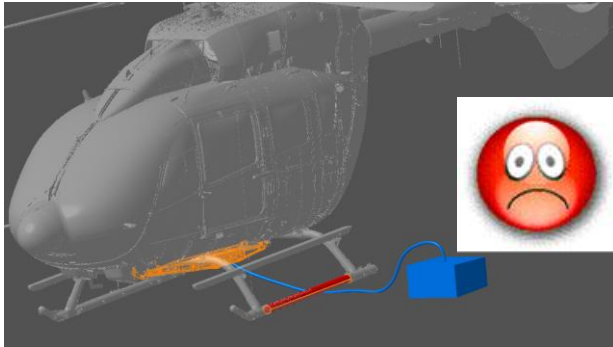


Hazards during lifting off

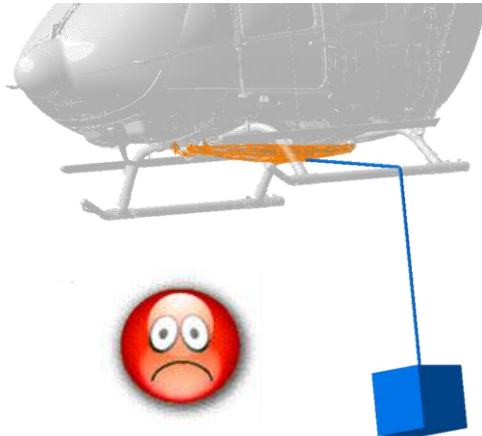
WARNING

The following conditions could lead to a hazard :

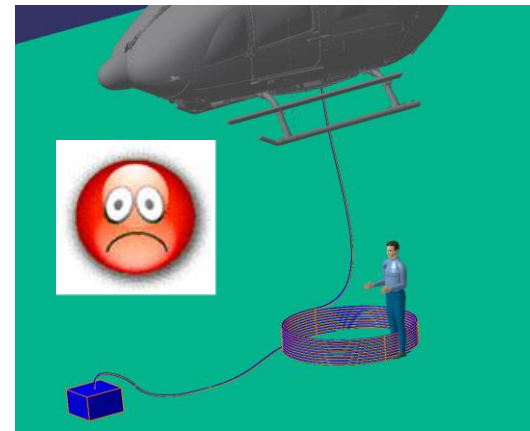
- The task specialist standing on the rope coil during lifting the load.
- Landing on the rope with the skid landing gear.
- Lifting the load while the rope is routed over the skid landing gear.



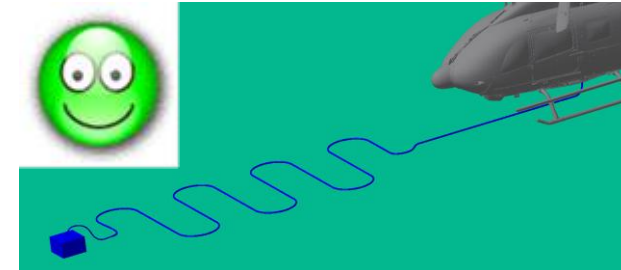
Landing on the rope



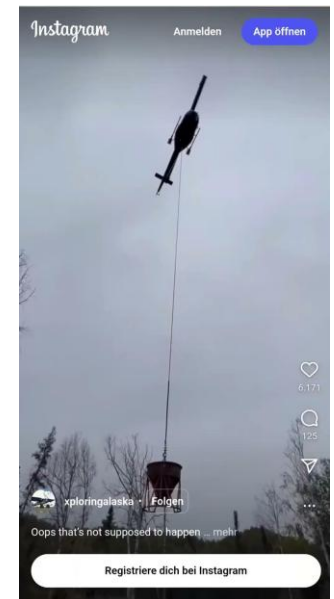
Rope over skid landing gear



Task specialist standing on rope coil



Rope properly spread out



Hazards during Operation

Rope Condition



Source: AIRWORK & Heliseilerei GmbH

- Special care needs to be given of the rope condition.
 - Ropes have a **service life limit** (most of them **5 Years**)
 - Do not pull or move the rope over a rough surface, high risk for damage.
 - Each rope supplier provides a detailed check procedure with pass/fail criteria
 - Do not expose the rope to overheated surfaces for a long time, such as tarmac or concrete surfaces heated by the sun.
 - CMM rope check



MELTING OR GLAZING:

Rope showing melting or glazing caused by excessive heat, which can be the result of intensive abrasion, must be retired from service.

DISCOLORATION:

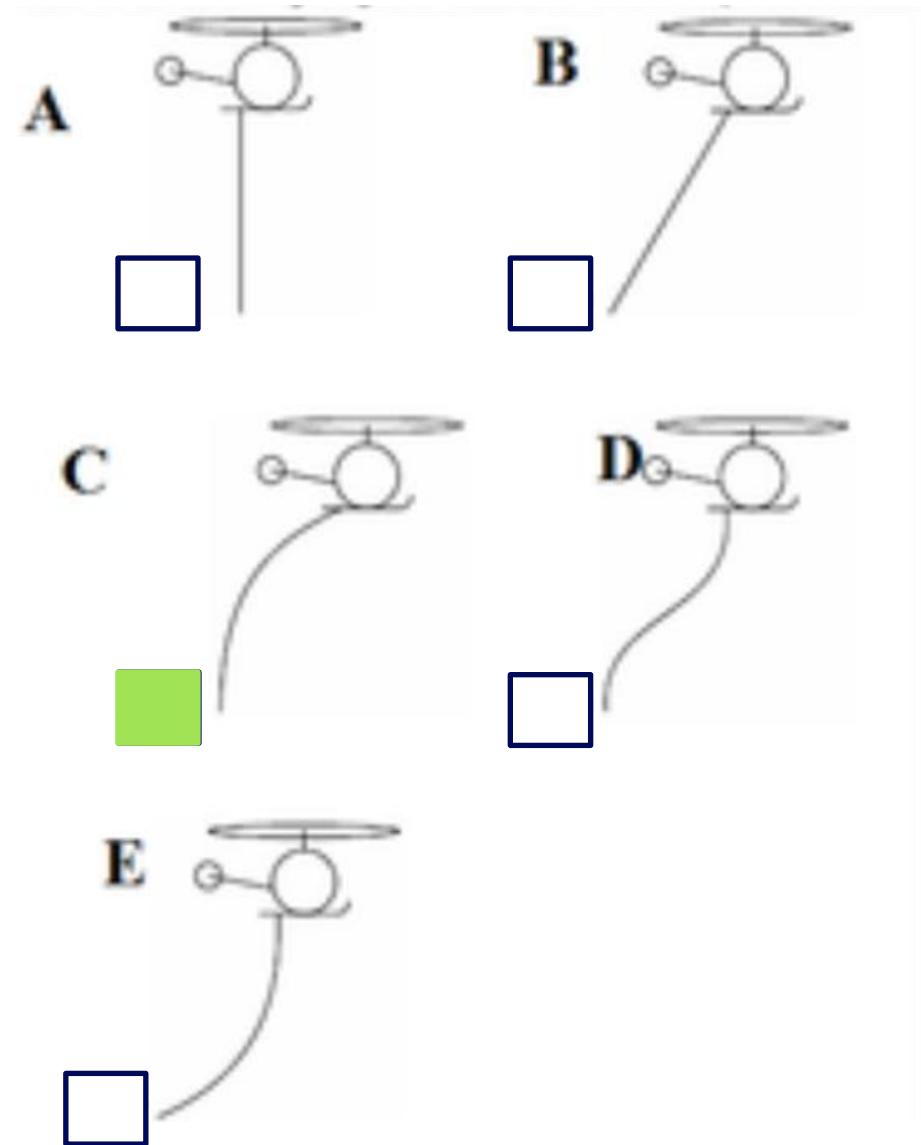
A change in the color of the fibers may be caused by exposure to chemicals or heat. Determine the source and if the longline has been in contact with damaging chemicals or heat, remove it from service.

Source: Cordages Barry Ltd.

Hazards during long line operation

Long Line Behaviour in Forward Flight

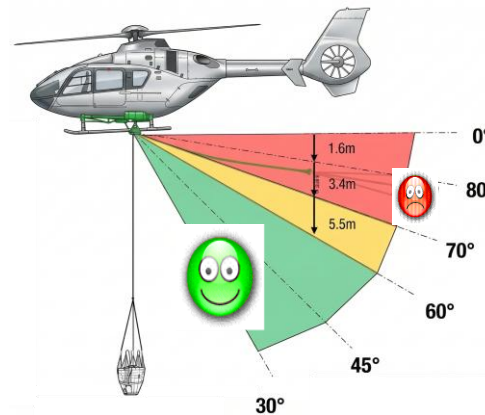
- A H/C is flying horizontally at constant speed (e.g. 80 kts). A flexible sling with a low weight at the end (e.g. 10 kg) is suspended underneath the H/C.
- Which of the following diagrams best shows the shape of the cable as the helicopter flies through the air to the right?



Hazards during long line operation

Risk for tail rotor strike with short or long line

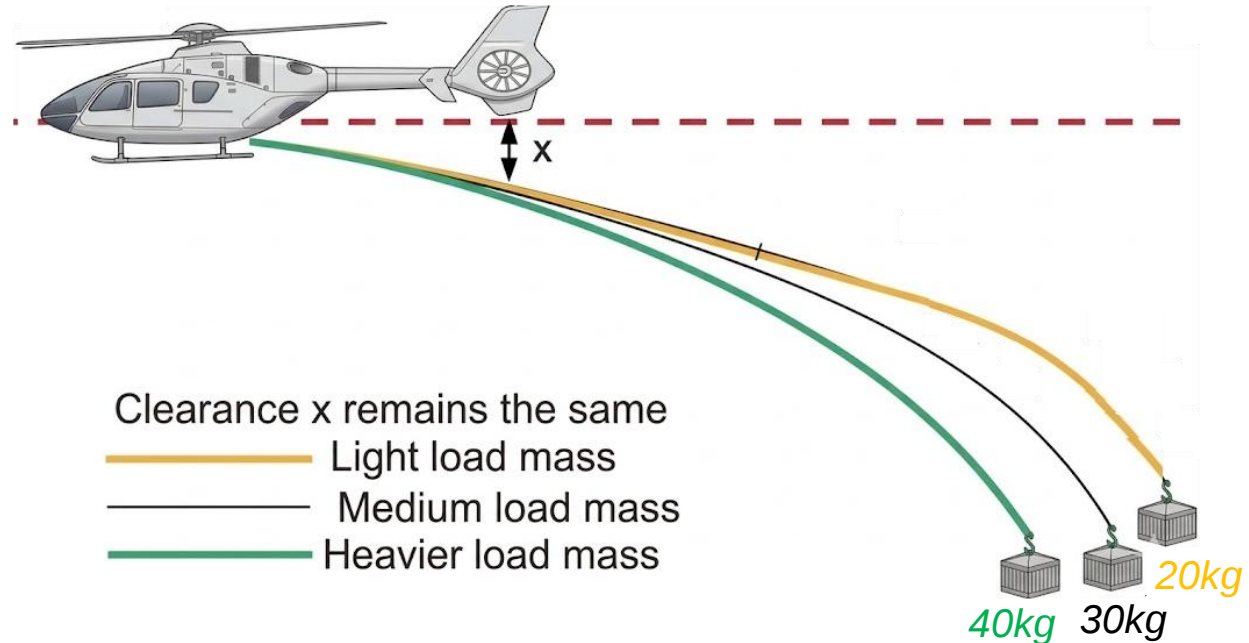
- The risk is associated, it is impact to the rotorcraft especially the tail rotor.
- The tail rotor clearance depends:
 - Ballast weight in combination
 - Sling load Vne
 - Length of the rope
 - Shape of the rope cross section => resulting drag
 - RoD
- A comprehensive risk assessment should be conducted for all such operations.



Hazards during long line operation

Risk for tail rotor strike with short or long line

- When changing or removing the ballast weight potential hazard exist to strike the tail rotor
- The ballast weight is less efficient for longer lines.
- Specially for a long line the clearance to the H/C becomes less dependent on the ballast weight. Other factors e.g. forward speed become dominant. Hence less reliance can be placed on the ballast weight of the long line.
- *If the ballast weight has been changed from a short line to a long line a potential hazard exist to strike the tail rotor.*



SIN No. 3170-S-00

Hazards during lifting off

Working underneath a Helicopter

- Ground operator should, where possible, leave the lifting area before the load is airborne (tension on rope).
- Limit the persons in affected area to those strictly necessary to perform the operation
- Perform a risk assessment before the operation
- Briefing and De-Briefing including third parties
- Avoid populated areas along the flight route





Firefighting



Firefighting

Water Container

- A helicopter is an established means to extinguish the fire in remote areas.
- Based on the operational occurrence distribution, a focus should be made on the fire fighting with the H/C.
- Due to the climate change more and more wildfires are happening
- More and more H/Cs are equipped with this capability.
- **The operation with the Fire Fighting Water Container is more prone to make mishaps, by its fundamental nature.**
- Based on this, the different cases have been identified and presented on the following pages.



Firefighting

Water Container

- The Fire Fighting Water Container is one possibility for fire fighting with the H/C.
- FFWC are available with a capacity of 270 to 9800 liters.
- The FFWC may consist of :
 - Control Head with interface to the cargo hook
 - Suspension lines to hold the Container
 - Container with the water release valve



Firefighting

Water Container “Forward flight”

- The critical flight situation is with the empty Fire Fighting Water Container because
 - It has a high drag
 - It has a low mass
 - This leads to a high aft sling load angle
- Limitations:
 - Operational speed shall be in accordance with the applicable manuals, not exceeding the V_{ne} .



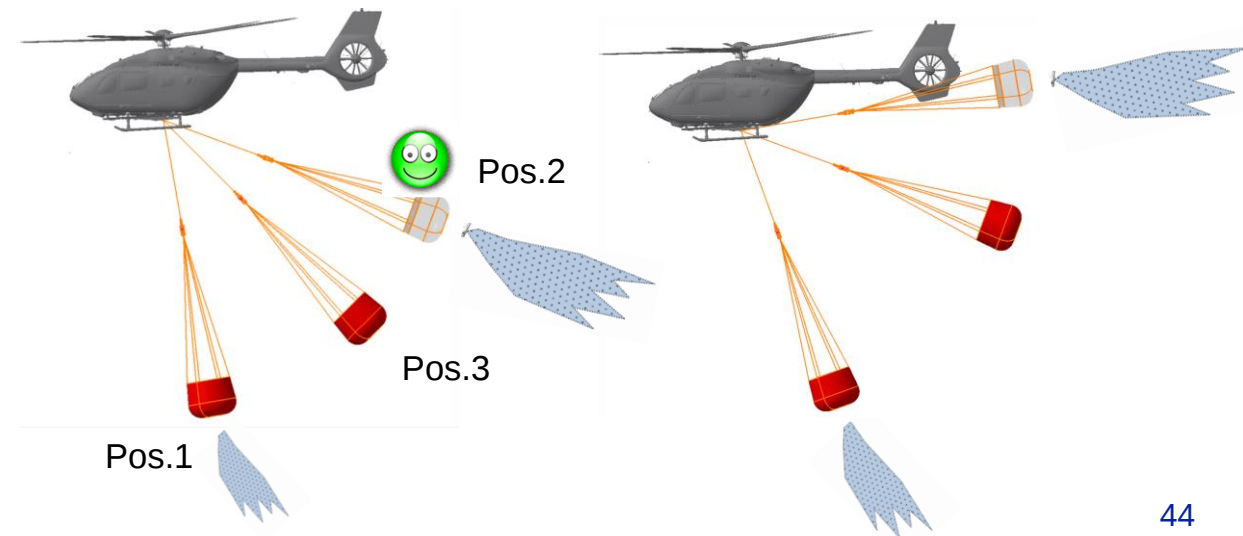
Firefighting

Water Container “Dumping of water”

- Service evidence suggests that there can be an over-swing effect as water is released.
- Some preliminary simulation has been done which suggests the presence of over-swing effect.
- The simulation also suggest that the over-swing effect is more pronounced with a shorter rope length.
- The following scenario needs to be considered especially when using a Fire Fighting Water Container:
 - During forward speed water dumping the Fire Fighting Water Container may move upwards from
 - Pos. 1 => Pos. 2. => Pos. 3
 - The Pos. 2 is higher than the Pos. 3 of the flight with an empty fire fighting water container



SIN 3349-S-25



Cluster: Risk for tail rotor strike with short or long line

Conclusion ESNP-R-2020-39-04

- The following scenario needs to be considered especially with empty FFWC (Fire Fighting Water Container):
 - **FFWC with Long Line**
 - Dangerous situations can occur with a FFWC, which can reach the tail rotor.
 - According to the Operations Manual the overall length of the FFWC should be at least 6" (152.4 mm) smaller than the distance between the hook center and the closest possible point on the tail rotor/fan.

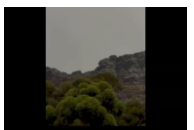
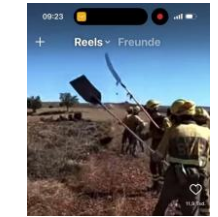
Limitations:

- **If the FFWC is installed and can reach the tail rotor, a Long Line shall be used.**



Firefighting

Water Container - Operational Hazards



Public Release



SHARING EXPERTISE

VERTICAL MAGAZINE FALL MEGA ISSUE 2025

SHARING BEST PRACTICES AND EXPERTISE IS A CRITICAL SAFETY CORNERSTONE FOR EASA'S EUROPEAN SAFETY PROMOTION NETWORK - ROTORCRAFT'S SLING LOADS GROUP IS PLAYING A KEY ROLE.

BY JONATHAN HALL

Even in the civil aerospace industry it is outside it that you would question the need for robust safety regulation, or the vital role that is played by a strong and independent safety regulator. However, it's also worth while thinking about what other means are available to help operators remain both safe and successful — the aim of everyone in our industry. One of the primary methods is through safety promotion, the often overlooked fourth pillar of safety management as outlined in EASA Annex 19.

The sharing of lessons learned and best practices can be particularly powerful for those parts of the industry dominated by a large number of small operators, as they may not have achieved a "critical mass" of experience within their own organisations. More specific to rotorcraft, safety promotion is also well worth considering for activities where issues with the design represent a very small sub-set of the events recorded in service or the operational risks people face.

Rotorcraft sling load operations (i.e. loads — including human — which are carried on a hook under the helicopter, on a line of a fixed length) are a clear example of this. Not only is the European market for such operations dominated by a large number of small operators, but also the design integration in the helicopter is largely optimised. This means that only small incremental gains in safety can be achieved by further design changes. This is borne out by the available data of in-service events, which are dominated by operational causes rather than problems that can be attributed to the design.

The European Union Aviation Safety Agency (EASA) created the European Safety Promotion Network Rotorcraft (ESPN-R) in 2017 with a desire to share best practice within rotary-wing operations. It was based on the experience acquired by its predecessor, the European Helicopter Safety Team (EHST), created in 2007. ESPN-R brings together experienced professionals on an informal and voluntary basis. There are various sub-groups within ESPN-R, one of which is for sling load operations.

For the past six years, I have had the privilege to be the EASA representative in the ESPN-R Sling Load Operations Safety Promotion Task Force, led by Airbus Helicopters. As an engineer of nearly 30 years' experience, this has allowed me to see much more closely how certified designs are operated in-service — and the risks involved in this type of activity. It has also brought me in contact with a group of experienced professionals, including helicopter pilots, engineers, and safety experts.

September:

- If you are not carrying any load, then typically the weight of the hook and swivel at the end of the line is nothing like sufficient to act as a ballast weight.
- When carrying a load, the aerodynamic effect will tend to lift the load. This can have a rapid onset — it might have happened before you even realise it.
- Even within the RPM airspeed limit, if you are, for example, descending rapidly down the side of a mountain, this can also have the effect of "lifting" an empty line.
- Take care! Assess the risks carefully, and stay safe.

(Such as Airbus Helicopters Deutschland, equipment manufacturers (Airwork & Heliwerk, Switzerland), training organisations (D-HOP), Bavaria, which was previously in German Federal Police) and other airworthiness regulators specifically FOCA, the Swiss national regulator, reflecting the over-representation of sling loads operators in the Alpine regions). Despite the fact that the "C" in ESPN-R stands for European, another fantastic step within the last couple of years has been the expansion of our group "across the pond" with colleagues from both Bell Helicopters and Orbital Systems welcomed — bringing different perspectives and a further wealth of experience.

Our basic modus operandi is to begin with databases of reported events from recent years. As with any database, the quality and quantity of what can be extracted is only to the level of the input, but we have found a real wealth of data on which to base our work. We then sub-divide the events into similar root causes — what we call "clusters" — where we perceive a positive benefit could be made through a transfer of knowledge. It does not take long to see these clusters emerge from the data, and each is discussed in turn during our monthly meetings.

Examples of the clusters we have considered include the load striking the tail rotor; mis-rigging of the hook-release cable, leading to inadvertent load release; spinning of the carried load — a particular problem when the "load" is a person; snagging of the load on ground; and all operational risks pertaining to firefighting operations.

Each cluster is discussed within the group and the pertinent advice is then written and promoted. Our main communication outlet is our LinkedIn page.

However, we have begun to increase our outreach by going on tour, presenting our group and outcomes, and delivering demonstrations in the Rotorcraft Safety Zone of European Rotors in Madrid (2023) and Amsterdam (2024), and this year's edition in Cologne. (Please do come and visit us!)

These presentations have been well supported by Airbus Helicopters, who very kindly constructed and transported a full mock-up of a sling load installation with all the associated systems and equipment. This has enhanced our presentations, and allows people to come and view (and play with!) the real systems and equipment.

Things to consider when firefighting with a bucket:

- Filling up the water could be dangerous.
- Visibility can be an issue, with water on the windshield or smoke in the area.
- There can be mid-air conflicts, and obstructions above and below water sources.
- Large and loose items may be stirred up by your aircraft's downwash.
- Twisted suspension lines from the bucket can be an issue.
- A long line can be used to reduce the impact of the downwash.
- Care is also needed when taking water from a moving water course.

are often people fighting the fire down below, so are to avoid hitting them with a water drop.



ESPN-R Sling Load Operations Safety Promotion

Thank you