SAFETY PROMOTION NOTICE

SUBJECT: GENERAL

ESPN-R Hoist Task Force recommendations

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Introduction:

This document and the following information are the result of the ESPN-R hoist task force study and analysis.

History of hoist use in the rotorcraft industry:

At its inception (from approx. 1950), the rescue hoist system was designed and used to save people (on the ground and on the sea) out of distress situations in SAR / MEDEVAC type missions. The operators were mainly military.

From the 1970s on, the hoist became more robust and popular on lighter helicopters; non-military, governmental and non-governmental organizations started to adopt its use to save lives.
From approximately the early 1990s, helicopter hoists started to be used as transportation means for harbor pilot transfers off-shore, when vessels were not able to perform the transfer - this was the first use of rescue equipment as a personal transport device.

From the mid-2000s, the off-shore wind turbine industry grew and the helicopter with its hoist was a safe vehicle system to transfer maintenance staff to the wind turbines.

Along with the continuous development of renewable energies, the helicopter industry expects a significant growth in this last sector. To ensure a safe and efficient operation, EASA has established together with the helicopter industry a working group to publish best practices, safety recommendations, training standards and review certification requirements.
Lessons learnt in operations: Equipment

PCDS / PSE & PAX

PCDS - Personnel Carrying Device System

Risk to be prevented: use of unapproved/unairworthy/expired/non-standard equipment by ground forces.
Risk prevention & mitigation strategies:
- standardization of PCDS for persons transported on the hoist hook,
- no textile interfaces / loops allowed in hoist hook in compliance with CM CS 005 issue 1 / CS27 Amd.5 & CS29 Amd.5 (link [here](#)).
PSE - Personal Safety Equipment for Hoist Operators, Rescuers, Hoist passengers

Appropriate head & eye protection,
Flight or survival suit
Rescue / emergency knife
Shoes

Protection against environmental conditions, wind, rain, dust, particles, water, etc.
PCDS with quick disconnect link

Appropriate head and eye protection
Flight or survival suit
Radio equipment
Rescue / emergency knife
Shoes

Protection against environmental conditions, wind, rain, dust, particles, water, etc.
PCDS

Depending on the mission: backpack with specific mission equipment...

Risk to be prevented: injuries to the hoist operator, rescuer or hoist passenger.
Risk prevention & mitigation strategies:
- standardized PSE for hoist operators and extended to other crew, including hoisting gloves,
- standardized PSE & PCDS for rescuers and hoist passengers; extended to other crew, including hoisting gloves,
- the Hoist Operator, Rescuer, Hoist Passenger harnesses should be provided generally with a quick release system to be able to detach and escape the cabin even under load conditions on the harness, for instance by being equipped with a rescue knife.

Appropriate head & eye protection, Flight or survival suit, Rescue / emergency knife, Shoes

Protection against environmental conditions, wind, rain, dust, particles, water, etc.
PCDS with quick disconnect link

Depending on the mission: backpack with specific mission equipment...
PSE - Personal Safety Equipment for the victim

Risk to be prevented: additional victim injuries.
Risk prevention & mitigation strategies:
- standardization of rescue equipment for victims within organizations, to ensure safe, quick and easy application to the person being hoisted,
- no untrained (or incapacitated / unconscious) persons to be hoisted unattended.

Off-shore Passenger Emergency Equipment Configuration

Risk to be prevented: use of equipment designed for ship-side use and not for helicopter operations/transfer.
Risk prevention & mitigation strategies:
- Use equipment designed for use with helicopters (life vests, survival suits, life rafts…) which take into account the specific context (non-automatic deployment, release system, lift & boost issues…).
Off-shore hoisting - cabin securing devices shall be releasable under load

Risk to be prevented: crew or passengers unable to release cabin securing devices after ditching.
Risk prevention & mitigation strategies:
- cabin securing devices shall be releasable under load,
- this may also be considered in OPS regulations,
- alternatively, a rescue knife / belt cutter may be used.
Adaptation / Compatibility

Helicopter attached to the ground

Risk to be prevented: an entanglement where the helicopter is attached to the ground through the rescuer.
Risk prevention & mitigation strategies:
- There exists specific devices like the Norwegian ARS or the Petzl Lezard → Video link

Dynamic rollout phenomena on hoist hooks

Risk to be prevented: dynamic disengagement of hoist hook, link of D-LOK hook disengagement/rollout.
Risk prevention & mitigation:
- all crew members involved in hoist and/or external sling load operations shall be trained and attentive to the dynamic rollout (ring reversal) phenomenon,
- hook and equipment shall be checked for compatibility prior to flight.
Lessons learnt in operations: Briefing Practices

Mission briefing on the ground & in flight

Risk to be prevented: incoherent actions by the crew.
Risk prevention & mitigation strategies:
- create a clear briefing concept,
- if unavailable, mitigation can be simple questioning of crew members, such as: “are we really going to location XYZ?” to motivate communication between crew members & create situational awareness.

Hoist Passenger training and briefing

Risk to be prevented: untrained / un-briefed personnel to be transported on the hoist hook.
Risk prevention & mitigation strategies:
- Hoist Passenger training and briefing based on:
- Passenger check list for hoist operations, including clear instructions on cable handling (too much slack of cable to be avoided, “Danger of static electricity“..) and basics of the helicopter safety, performance, etc.
Voice and visual commands for the rescuer on the ground

**Normal**

- OK!
- Helicopter tied to the ground
- Cable free to reel in
- XX meters to the ground
- Helicopter tied to the ground
- Ready to hoist up

**Emergency/abnormal**

- Abort hoist operation
- Disconnect from Hook
- Loss of radio com
- Pay attention
Risk to be prevented: lack of clarity in communication.
Risk prevention & mitigation strategies:
- voice and visual commands for all involved in the hoist operation must be clear, limited and standardized to provide essential and minimum information,
- this standard must be part of an intensive initial and recurrent training,
- revise CRM concept (created for a cockpit of 2 or more crew members: pilots, Flight Engineer and Navigator) as it did not take into account specific mission and crew involved in rescue, law enforcement and other missions. Not only must the hoist operator be involved but also other crew members such as HEC.
Lessons learnt in operations: Safety Actions

Ground boarding with rotor turning

Motion sequence while embarking / disembarking

Risk to be prevented: entanglement, loss of load.
Risk prevention & mitigation strategies:
- Standardization in SOP of motion sequence during boarding and disembarking.
- Equipment (backpack, ski, dog, etc.) stowage and loading sequence must be standardized and briefed in advance.

Managing untrained persons (by-standers) approaching a helicopter

Risk to be prevented: lack of situation awareness of untrained persons.
Risk prevention & mitigation strategies:
- Guard/escort hoist passengers when possible - (similar to operations at public heliports).
Cabin Safety / Hoist Operator

Hoist operator securing in the cabin

Risk to be prevented: hoist operator not secured in cabin.
Risk prevention & mitigation strategies:
- request “confirm secured” question by PIC standardization / checklist “before hoist operation / opening of door”,
- leverage four eye principle / perform buddy check as performed by scuba divers.

Cabin Safety 1/3

Risk to be prevented: non-secured jacket / backpack / loose equipment
Risk prevention & mitigation strategies:
- all objects stowed & secured,
- seats to be taken by all passengers / crew members during take-off, landing and flight,
- sliding door shall be closed whenever possible.
Risk to be prevented: unnecessary items brought in flight (loose objects & potential impact on performance).
Risk prevention & mitigation strategies:
- Bring the minimum of additional mission equipment for the flight crew, reduce to what is really essential / required to perform the mission.
Cabin Safety 3/3

Risk to be prevented: more than 1 harness connected to a hard point (safety point).
Risk prevention & mitigation strategies:
- in flight, prior to opening the door, the cabin shall be secured and the Hoist Operator harness attached on one hard point and cross-checked by the other crew members,
- ONE HARD POINT (SAFETY POINT) = ONE HARNESS ONLY.
Recommendations & Checklist before hoisting

Reconnaissance fly-over

Risk to be prevented: Vortex Ring State, main or tail rotor impact, entanglement, FOD by any loose ground object.
Risk prevention & mitigation strategies:
- mandate in SOP 2 reconnaissance fly-overs before initiation of hoist operation to evaluate terrain, wind, visibility, briefing of hoist operation, e.g. power setting, emergencies and escape path, alternate, etc.,
  - A high pass in order to understand the operating zone (wind, main obstacles as powerlines, high trees, animals or crowd on the ground etc., Way in, way out/ Escape route, clearance to descend).
  - Low pass to understand the hoisting area and confirmed A/C performance, winching height, escape route.
- no hoist ops should be performed without a situation assessment before commitment to hover.
Situation assessment by persons on the ground

Risk to be prevented: lack of experience/training of persons on the ground.
Risk prevention & mitigation strategies:
- do not rely exclusively on situation & site assessment by persons on the ground,
- all information provided is to be confirmed by the crew during fly-over.

Checklists

Risk to be prevented: operational & situational awareness.
Risk prevention & mitigation strategies:
- establish short and pragmatic checklists.
- create & use standardized wording / commands for external loads.
Safety check prior to hoisting up

Risk to be prevented:
- entanglement or hooking of harness,
- unintended detachment during initial lift off.

Risk prevention & mitigation strategies: the goal is to ensure that the rigging and equipment have been checked and that the load is clear of obstructions.
- a safety check should be performed prior to the extraction of HEC (human external cargo),
- once the pilot is satisfied and considers the check complete, he is clear to depart the scene.
Hoisting

Shock Load on hoist cable and/or hoist passenger

Risk to be prevented: shock load on the cable.
Risk prevention & mitigation strategies:
- position the HEC in order to avoid “falling into” the rope or cable,
- prepare a controlled progressive tensioning of the cable and departure.

Helicopter attached/tied to the ground, normal and emergency

Risk to be prevented: aircraft-side crew unaware that the helicopter is attached to the ground.
Risk prevention & mitigation strategies:
- setup and use clear hand-signals to the hoist operator / flight crew when no radio communication available or possible,
- always maintain visual contact.
Hoist Operator positioning in the helicopter (with wheel landing gear)

Risk to be prevented: unstable position of the hoist operator.
Risk prevention & mitigation strategies, related to hoist operator positioning for helicopters with retractable landing gear (and no articulating boom):
- the HO shall not have the full body outside the cabin with the two feet on the footstep,
- the best positions are: one knee (or foot) on the cabin floor and one foot on the step; or two knees (or feet) on the cabin floor.
- the lanyard length of the hoist operator harness must be set to prevent the HO from falling outside the cabin.

Hoist Operator positioning outside the helicopter (with skid landing gear)

Risk to be prevented: unstable position of the hoist operator.
Risk prevention & mitigation strategies, for aircraft with skids (and an articulating boom):
- It is possible to have the two feet outside the cabin using a step designed for these types of operation.
Pilot loss of visual reference

Risk to be prevented: PIC loss of visual reference; HMD (helmet mounted display) information overload; focus on specific phase of flight relevant information by PIC (chime or gong).
Risk prevention & mitigation strategies:
- reduction of radio communication (temporary on hoist mission - info to ATC),
- crew Resource Management; example for off-shore harbor pilot transfer: during vessel hoist maneuver, PF only Intercom and hoist commands while PNF ATC and vessel communications.

Hoist maneuvers at night on shore

Risk to be prevented: disorientation of the pilot, unstable positioning.
Risk prevention & mitigation strategies in an environment with limited visual reference for the flight crew (e.g. mountainous terrain with no light pollution - extreme darkness, snowing weather conditions, etc.):
- Configure helicopter autopilot in automatic mode of flight director position, hold/auto hover, where available.
Hoist maneuvers at night off shore

Risk to be prevented: disorientation of the pilot, unstable positioning.
Risk prevention & mitigation in extreme dark environment with limited visual reference for the flight crew (as off shore and only illumination of the vessel):
- Highly skilled and trained flight crew necessary, as helicopter autopilot in automatic mode of flight director position, attitude and altitude hold/auto hover is not able to use the ship as reference due to relative track & motion.

Night Hoist operations white light vs. NVG

Risk to be prevented: insufficient ground scene illumination, rescuer on hoist is unable to see hand signals from the Hoist Operator due to the light beam under the fuselage.
Risk prevention & mitigation:
- most on-board search lights are not sufficient to illuminate the hoist mission area. Potentially a tactical high intensity light such as Trakka may be used to increase visibility for the helicopter crew,
- standardization of lighting signals to be introduced / developed for normal, abnormal and emergency procedures for hoist operations in case of loss of radio communication,
- hoist operations under NVG conditions - special training necessary and proficiency has to be demonstrated to remain current / mission ready
Lessons learnt in operations: Problem management

**Hoist not possible to reel in with HEC attached**

Risk to be prevented: hoist technical failure preventing reel-in of the HEC & crew not prepared/briefed for this incident.
Risk prevention & mitigation strategies:
- Crew briefing to address this type of emergency to be prepared in case of hoist failure / alternate plan / missed approach.

**Grounding cable lost in operation 1/2**

Risk to be prevented: Grounding cable lost in operation due to incorrect sequence of attached hardware.
Risk prevention & mitigation strategies:
- the combination of used hardware and hook must match,
- appropriate hardware for this type of hook must be used.
Grounding cable lost in operation 2/2

Risk to be prevented: Grounding cable lost in operation due to entanglement with ground structure.
Risk prevention & mitigation strategies:
- use of appropriate equipment (anti-static line without weight) to prevent entanglement,
- a predetermined breaking point shall exist.

Uncontrolled rotation of HEC (video link1) 1/2

Risk to be prevented: Uncontrolled rotation of passenger during hoisting up leading to vertigo and even falling from height due to dizziness when set down in mountainous terrain (video link2).
Risk prevention & mitigation strategies:
- briefing & check of equipment: mostly vertical position, preferably put in front and not on back, with no heavy or large backpacks,
- increase of forward speed of HC as the critical cable length between 15 to 22 meters is to be avoided,
- brief on use of personal position (“Scheißhocke” or toilet position),
- finally, with faster hoist cable speeds, critical cable length can be passed faster/safer 6 hydraulic (slower 0,9 m/s) vs. electric (1,25 m/s) (faster).
Uncontrolled rotation of HEC 2/2

Risk to be prevented: Uncontrolled rotation of HEC during hoisting.
Risk prevention & mitigation strategies:
- In the situation where a stretcher procedure is needed, an anti-rotation line system should be used, or alternatively an aerodynamic type rudder (video link).

Background Wind Noise in Intercom

Risk to be prevented: strong winds making hot mic of hoist operator and communication/commands hard to understand.
Risk prevention & mitigation:
- standard wording for commands,
- wind deflector or full face mask for intercom microphone.
Testimony

SAR-Training  “Training for the unexpected”
“In the rescue-business it is important to note, that no matter how long a course, we can never train for every eventuality.
The training philosophy shouldn’t be to give students a quick and shallow look at numerous scenarios, but to instill them into the basic skills which, combined with experience, can be used to solve every challenge they will encounter.”
Testimony of Klaus Hopf, Bavarian Police Helicopter Sqd.

Lessons learnt in operations: Training

Night hoist Operations Training

Risk to be prevented: inadequate skills, insufficient ground scene lighting.
Risk prevention & mitigation for night hoist operations:
- pilots and crew members need to be trained to constantly use manual techniques (hands on flying) and automatic mode (helicopter autopilot in automatic mode of flight director hold/auto hover),
- radio communication between hoist operator/flight crew and hoist passenger/ground crew is mandatory, as hoist passenger/ground crew may not be able to see hoist operator when searchlights from helicopter illuminate the scene 6 may be different for off-shore harbor pilot transfers, when vessel is illuminated.
Training - theoretical and operational 1/2

Risk to be prevented: training insufficiently documented.
Risk prevention & mitigation:
- hoist operator basic requirements / assessment / qualification / certification → AOC to reflect qualification procedure / syllabus.
- initial, Proficiency / recurrent check concept NORM & EMERG procedures → informational briefing of FLM, regulations, organizational, equipment, etc. changes (classroom & operational tasks).

Training - theoretical and operational 2/2

Risk to be prevented: loss over time of skills & procedure knowledge.
Risk prevention & mitigation:
- Annual proficiency / recurrent check concept NORM & EMERG procedures → informational briefing of FLM, regulations, organizational, equipment, etc. changes (classroom & operational tasks).
Emergency training concept

Risk to be prevented: insufficient emergency procedures knowledge or coordination.
Risk prevention & mitigation:
- emergency training concept, all EMERGENCY scenarios to be trained under real conditions, e.g. OEI training → awareness of potential risks such as height loss, pendulum, loss of intercom & radio etc. and to be performed under “safe” conditions,
- training objectives should include A/C performance (OEI consideration), action in case of fly away, etc.,
- operators with multiple platforms and potential risk of lack of knowledge or familiarity of control panel location in cabin,
- training concept of pilot and hoist operator training / combined (at the same time) not ideal, as two newcomers are trained at the same time → mitigation by splitting the trainings.

Normal procedure training with HEC

Risk to be prevented: normal operations training not relevant.
Risk prevention & mitigation:
- normal procedures must also be trained with trained human cargo (personnel) to ensure situational awareness of the hoist operator,
- pilots must experience being hoisted (not as a pilot) to improve many aspects of the hoist operations including crew coordination,
- rescue dogs shall wear a muzzle or dog biting protection.
Training of cable slack management

Risk to be prevented: helicopter pulling on hoist cable attached to ground.
Risk prevention & mitigation:
- Promote the management of cable slack during training. The Hoist Operator must be trained on how to manage the quantity of cable reeling out/in when load may be attached to the ground or the hook lowered to a rolling / unsteady target / ship.

Training cooperation of various hoist operators /organizations

Risk to be prevented: inefficient interaction with third parties.
Risk prevention & mitigation:
- Training cooperation of various hoist operators/organizations with rescuers/ground forces with the hoist to work together and apply standardized procedures.
Recurrence training on synthetic flight trainer

Risk to be prevented: incidents during training on real conditions.
Risk prevention & mitigation:
- Annual recurrence training: crew to receive training in simulator or similar device to reproduce various kinds of emergencies.

Dry Ground PCDS / PSE Training

Risk to be prevented: lack of currency.
Risk prevention & mitigation:
- Perform frequent ground training refreshment and brief for hoist operators and rescuers.
Lessons learnt in operations: IT & Maintenance

The following lessons learnt come from actual events analyzed by the ESPN-R task force.

**Tracking of helicopter configuration in IT system**

Risk to be prevented: incorrect helicopter configuration in IT system, inappropriate planning or cancellation of mission.

Risk prevention & mitigation strategies:
- Deploy robust processes for helicopter configuration tracking.
Cable damages during hoist operation

Risk to be prevented: damage to hoist cable during operations, damage non-detection by maintenance technician.
Risk prevention & mitigation:
- training of hoist operators for hoist cable damages during hoist operation to avoid a potential loss of load and substantial damage to the equipment,
- sharing information with maintenance technicians on damage typologies.
Maintenance Procedures not applied as per documentation

Risk to be prevented: Maintenance procedures not correctly applied (for instance pyrotechnic cartridge not installed).
Risk prevention & mitigation strategies:
- dual inspection to be performed,
- apply the same safety, quality, training, tools, etc. to hoist maintenance as when working on similarly critical components (main rotor blades, engines, etc.).

Critical tasks / maintenance procedures in the hoist load path

Risk to be prevented: Maintenance procedures not correctly applied.
Risk prevention & mitigation strategies:
- Critical tasks during servicing / maintenance / repair to be performed with four eye principle, e.g. hoist cable change, micro-switch setting, etc.
**Hoist usage (hrs / cycles) information not correctly tracked**

Risk to be prevented: Hoist usage (hrs / cycles) information not well monitored by flight crew, maintenance staff and not correctly tracked in the IT system leading to maintenance procedures not correctly applied, unairworthy hoist.

Risk prevention & mitigation strategies:
- Stick to procedures & processes for hoist usage monitoring.

**Hoist maintenance training**

Risk to be prevented: Lack of currency on maintenance & operation procedures.
Risk prevention & mitigation strategies:
- Recommendation to National Aeronautic Authorities to make the recurring training mandatory.
Awareness of approved configuration of sub systems

Risk to be prevented: In Flight use of unapproved hoist configuration.
Risk prevention & mitigation strategies:
- If unsure ask your Techrep or OEM for clarification.

Hoist Tools and Ground Support Equipment

Risk to be prevented: Incorrect maintenance procedure application.
Risk prevention & mitigation strategies:
- Dedicated ground support equipment shall be available by the OEM to ensure correct application of maintenance procedures.
Risk to be prevented: Hoist equipment unserviceable. 
Risk prevention & mitigation strategies, OEMs shall have an outstanding AOG spares service:
- Technical & logistical single point of contact,
- high industry quality standard,
- reliable / fixed turnaround times,
- rental / exchange units pool,
- for operators starting the hoist operation, OEMs shall make a minimum spares kit available.