

# Helicopter Hoist

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## ICAR 2019, Zakopane

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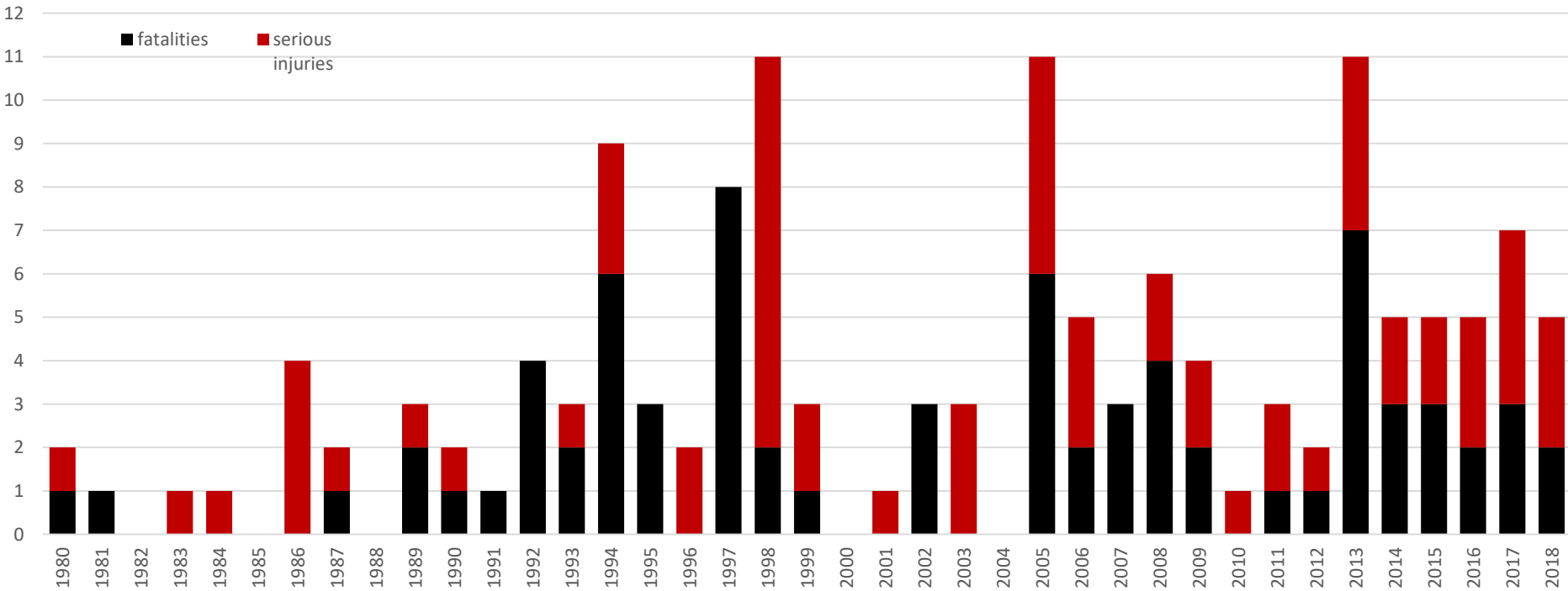
# Starting Point: Occurrence in February 2013

During maintenance flight a dummy load (552lb/250kg) was lost

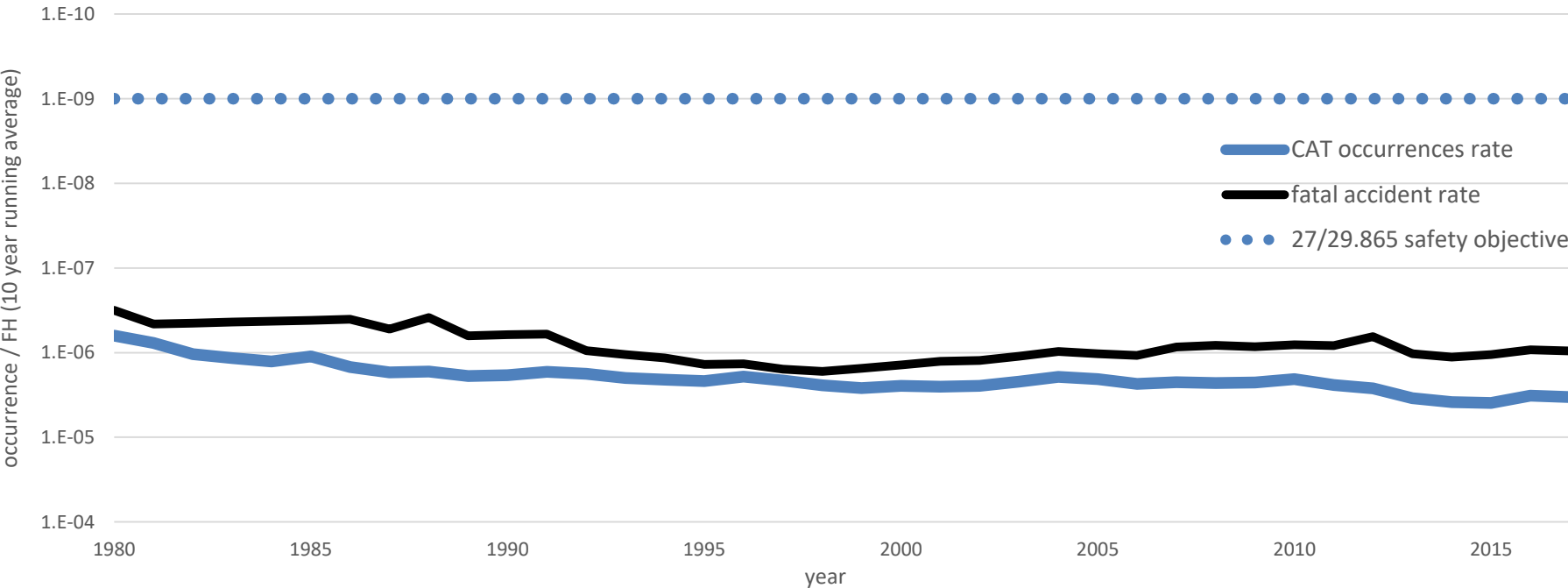
- Root cause: overload clutch failed
- Further investigation revealed several issues with some hoists
- EASA AD was issued to ensure continued safe operation of the hoist
- Initiated a service history review

# Service History

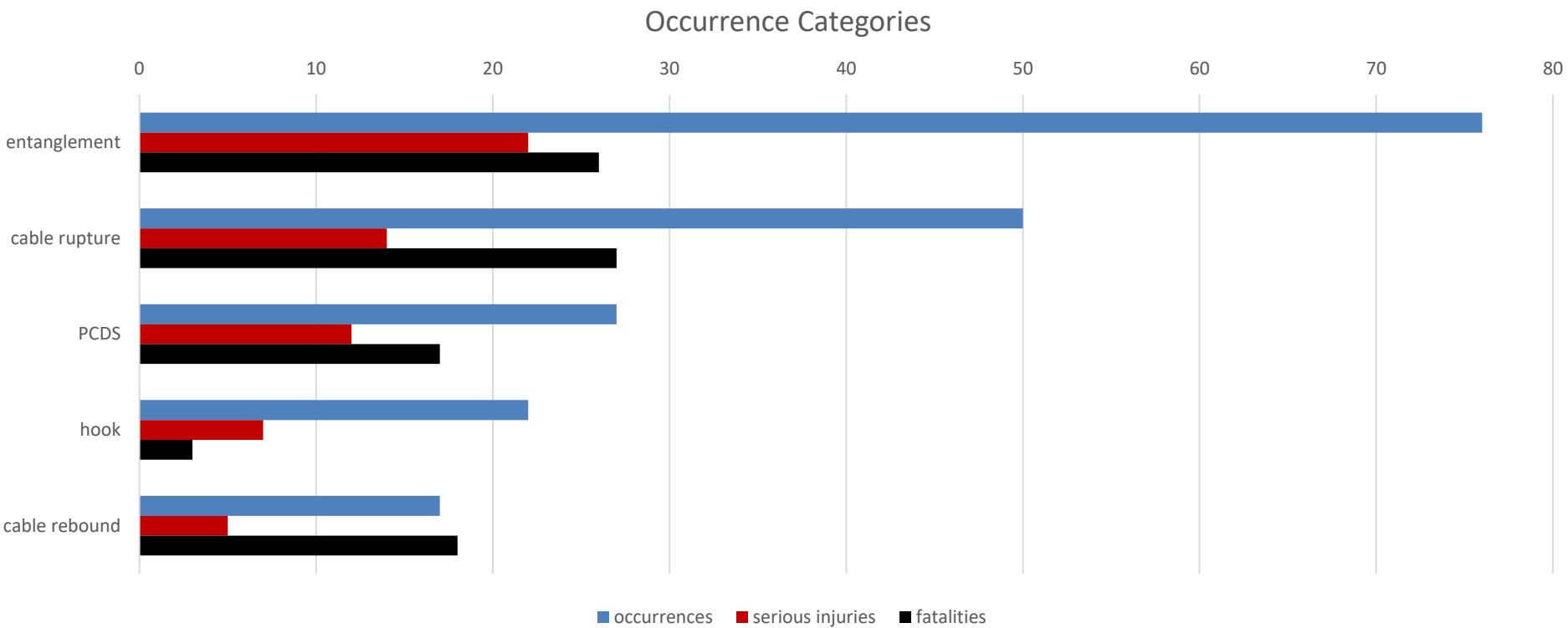
Fatalities and serious injuries potentially linked to hoist design



# Service History



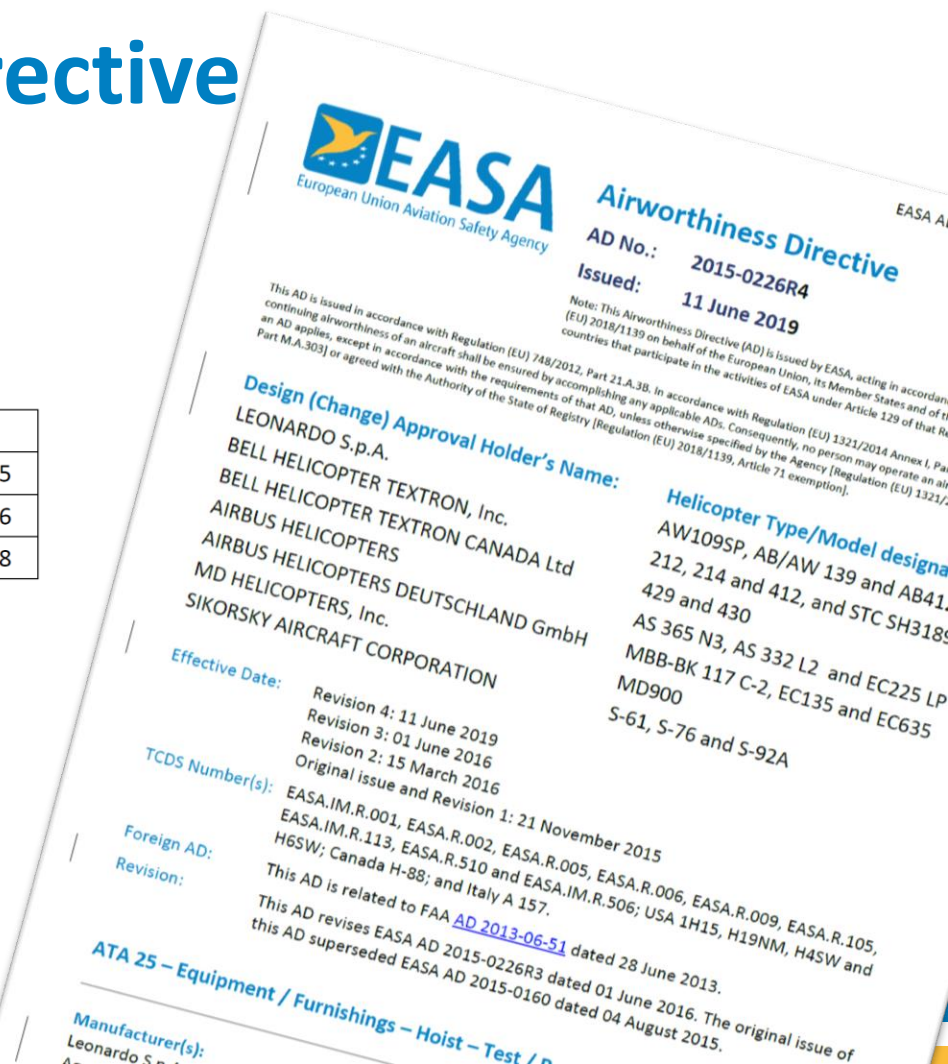
# Service History



# EASA Airworthiness Directive

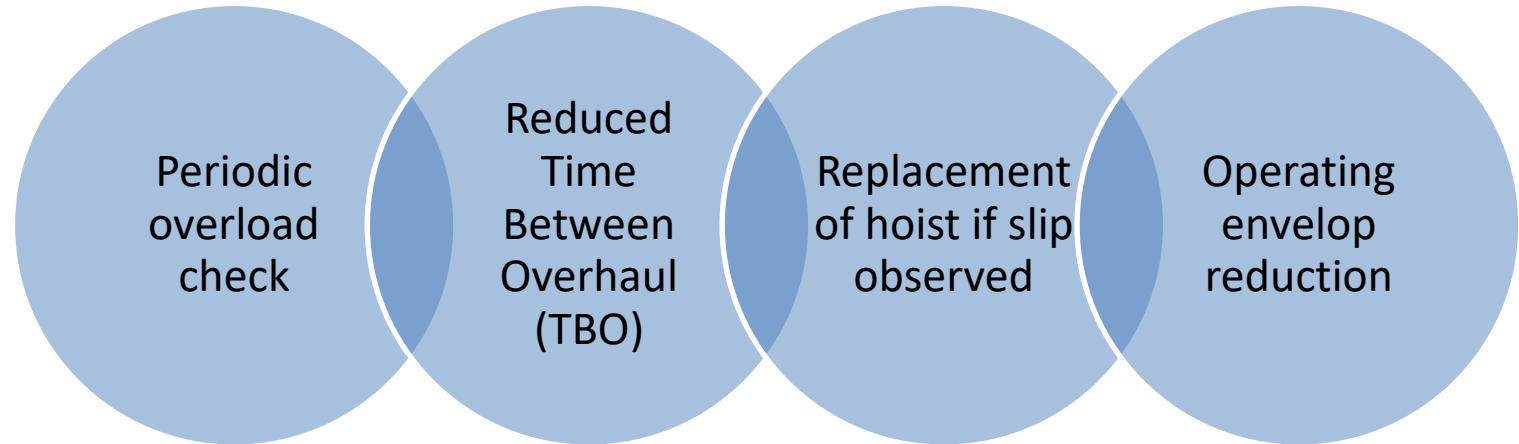
Table 1 – Affected Goodrich Hoists P/N

| (all suffixes, unless specified) |            |            |             |       |       |
|----------------------------------|------------|------------|-------------|-------|-------|
| 42315                            | 44301-10-2 | 44301-10-6 | 44301-10-9  | 44311 | 44315 |
| 42325                            | 44301-10-4 | 44301-10-7 | 44301-10-10 | 44312 | 44316 |
| 44301-10-1                       | 44301-10-5 | 44301-10-8 | 44301-10-11 | 44314 | 44318 |



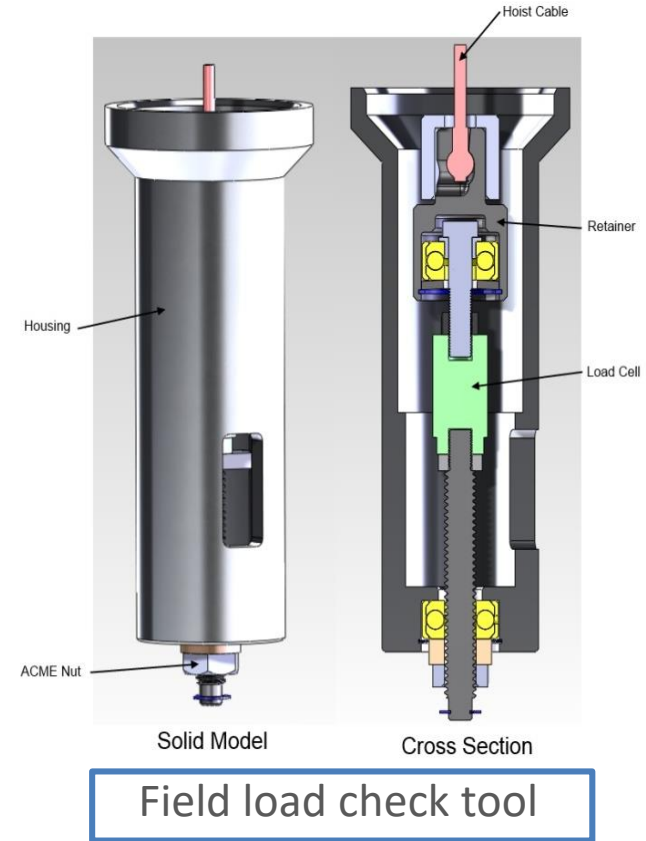
# EASA Airworthiness Directive

→ The AD introduces 4 elements:



# 1. Periodic overload check

- Catch degraded clutch before it fails
- Frequency calculated i.a.w. GM 21.A.3B(d)(4)
- Test every 6 months / 300 cycles
- Verify if slip point is within (2-2.7g) activation band





## 2. Reduced Time Between Overhaul

- New TBO time is 2 years / 1200 cycles
- Using improved Acceptance Test Procedure (ATP)
- Promote better controlled disks / oil (Population 2)



### 3. Replace if slip observed



## 4. Operating envelope reduction

### Placard 1 – Operational Limitations

**Operation with extended cable and load on the hook:**

- Maximum permissible bank angle in turn is 20°
- Warning: exceeding 15° of lateral pendulum angle/helicopter vertical axis can lead to clutch slippage

**Caution:** overload clutch is unlikely to function in case of overload

### Placard 2 – For 600-lb [272 kg] rated hoists

OAT above 0°C : Maximum hoist load 550 lb [249 kg]

OAT at or below 0°C : Maximum hoist load 500 lb [227 kg]

# Goodrich Hoist Clutch evolution

## → Population 1 (Pop 1)

- Clutch in a non controlled configuration
- Replacement is mandatory through AD or life limit
- Not allowed to be installed
- Limitations
  - TBO 24 months
  - Field load check tool (FLCT) checks
  - Payload reduction
  - Operational limitations

# Goodrich Hoist Clutch evolution

- Population 2 (Pop 2: No design change to Pop 1)
  - Configuration is controlled and certified
  - Same limitations as for Pop 1
  - TBO extended to 36 + 4 months
- Population 3 (Pop 3: Improved clutch design)
  - Less temperature dependent
  - Currently 1 project in progress for certification

Pop 3 clutch will not likely bring the Goodrich hoist back to all original limitations (payload / TBO / temperature / operational envelope)

# Hoist European Technical Standard Order (ETSO)

- SAE Working Group G-26 „Helicopter Hoists“
  - Develops a standard for hoists with overload protection (AS6342)
  - Consists of hoist manufacturers, OEMs, operators and authorities
  - The draft standard represents the minimum acceptable level of safety
  - Widely harmonized between the FAA and EASA
  - Includes provisions for new technologies
  - Latest ballot was not accepted by the majority
- EASA continues the effort of introducing a hoist ETSO

# ETSO Schedule

- To enable a timely publication, EASA is currently drafting an ETSO not referring to SAE AS6342
- EASA Rulemaking Task has started
  - Improvement of the current CS-27/29 rule on external loads (CS-27/29.865)
  - Creating an ETSO based on SAE AS6342
- Terms of reference for rulemaking task expected by October 2019
- Publication of ETSO by mid 2020
- Until publication, draft SAE standard is useable for hoist certification

# Important safety improvements in ETSO

- Rebound of cable:
  - Rebound of the cable should have no catastrophic effect on the rotorcraft
- ETSO Hoists will have a mandatory overload protection system
  - Increases the reaction time for the pilot in case of entanglement
  - Limits the energy in the cable in case of cable rebound
- Hoist System will meet latest system safety requirements (redundancy / limited nb of single load paths with CAT effects)
- Full fatigue and damage tolerance of the hoist structure
- Enables introduction of synthetic cables



# Next Generation Hoists

- EASA has been supporting the development of new hoists
- Currently several hoist certification projects are under investigation by EASA (STC or Major Changes)
- Next Gen hoists could enter the market by end of 2020



Vincorion Skyhoist



Collins (Goodrich)  
Pegasus



Reel Class Alpha Hoist

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