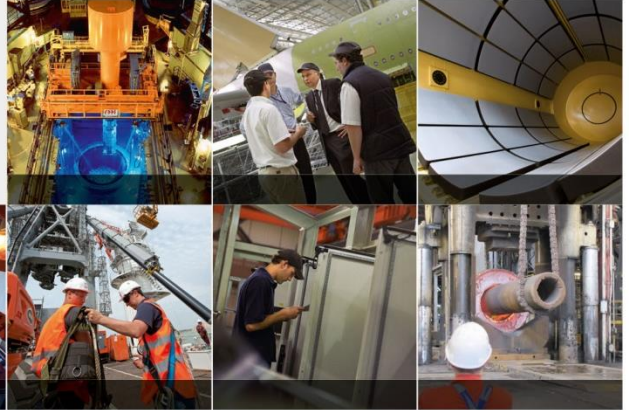




HANDLING AND LIFTING SYSTEMS



Rotorcraft External Loads Seminary



70 years of expertise

in critical lifting and handling equipment :



Industries



Nuclear



Aeronautics



Defence



Aluminum



Offshore



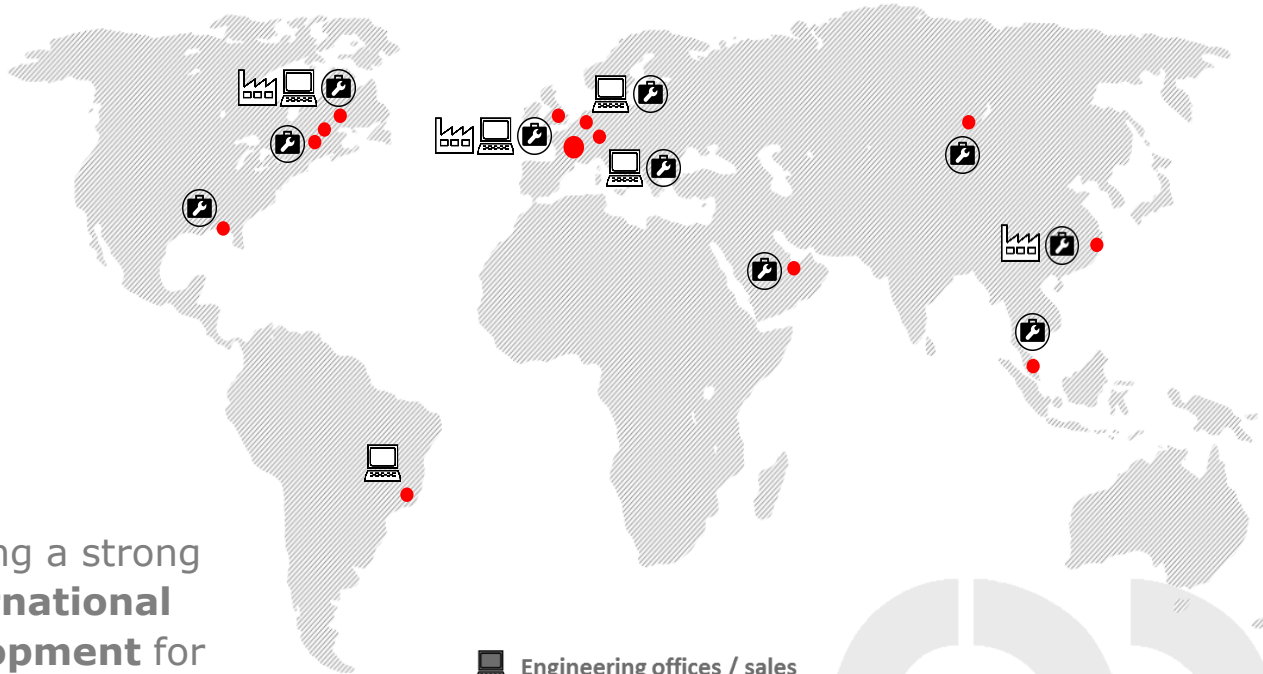
Hydropower






Industries



REEL, an independent company employing more than 2100 people



Enjoying a strong
**international
development** for
the last 30 years.

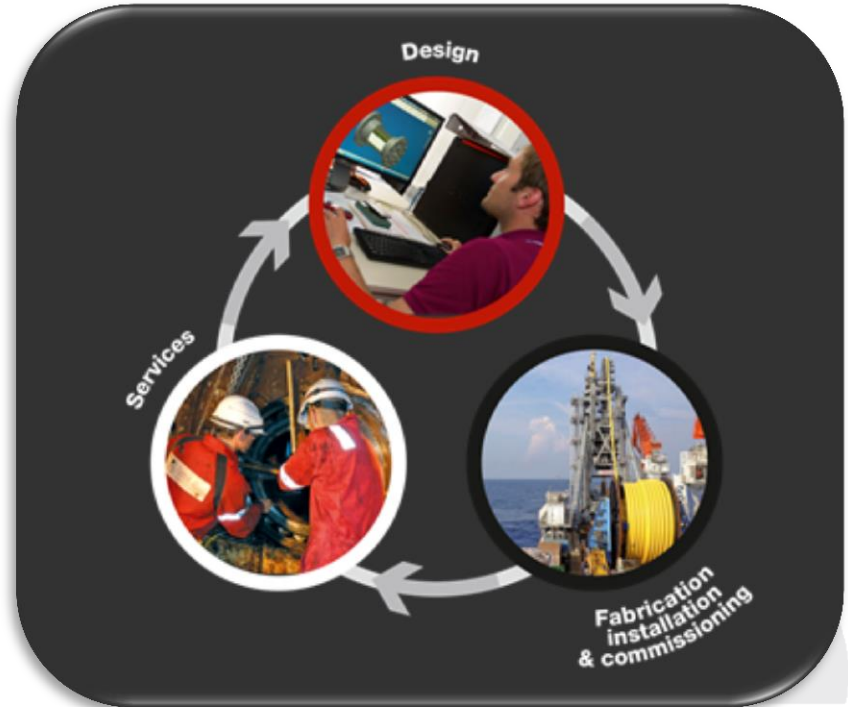
-  Engineering offices / sales
-  Services base
-  Manufacturing plant

REEL, a completely integrated company



With a strong Experience sharing with the users

Amongst our maintenance teams, our design offices and users for constant improvement of our equipment.





REEL, has decided to develop a Business Line :

“Airborne Equipment”

With a development into
human external cargo
hoist under the
trademark :



New regulation recommendation



□ There is a process to define new standards :

- AS6342 - Minimum Operation Performance Standard for Helicopter Hoist. With support of EASA, FAA and hoisting specialists (Helicopter and hoist manufacturers + Operators)
- TSO and ETSO for hoist will be published by regulation authorities.



Our actions :

- Contribute to this regulation
- Take into account these new requirements in our design



REEL methodology, place users at the heart of development

- ❑ Exchange with users to understand operational constraints and expectations in both civilian and military environments
- ❑ Transcription of REEL's 70 years design expertise for safety into airborne context
- ❑ Participate and Satisfy to the regulation objectives in progress in order to integrate by design solutions for safety



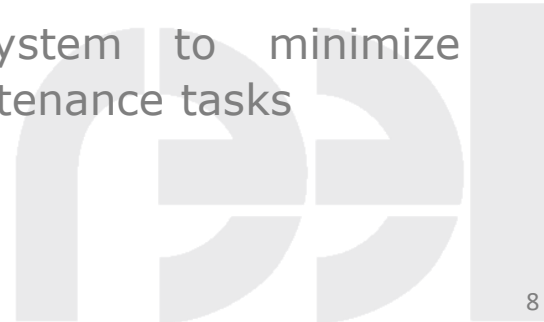
Design topics addressed in the presentation



- ❑ Avoid risks of overload and entanglement during hoisting operation
- ❑ Ensure Backlash protection in the event of a sudden cable break



- ❑ Design a system to minimize complex maintenance tasks



Condition of a potential overload events



- In order to anticipate and to design an overload protection system we have to address several condition :
 - Event to be managed to ensure H/C protection :
 - Entanglement of cable to ground or infinite load
 - Event to be managed to ensure human external load protection :
 - Detection of a load higher than nominal payload
 - Load acceleration due to hoist speed variation
 - Load acceleration due to helicopter flying envelope
 - Shock load due to reel in at high speed with cable slack
 - Shock load due to events of sudden drop of load with slack

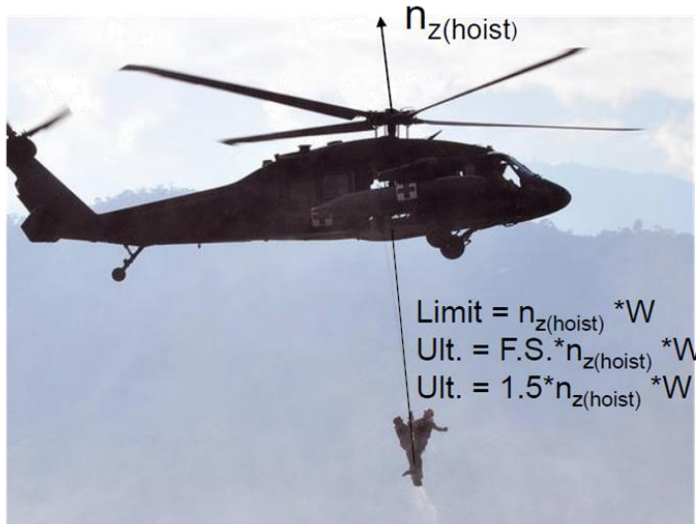
Condition of a potential overload events



How does an overload protection system achieve both?

Maintain “Up & Away” Loads

& Allow Overload protection to protect aircraft



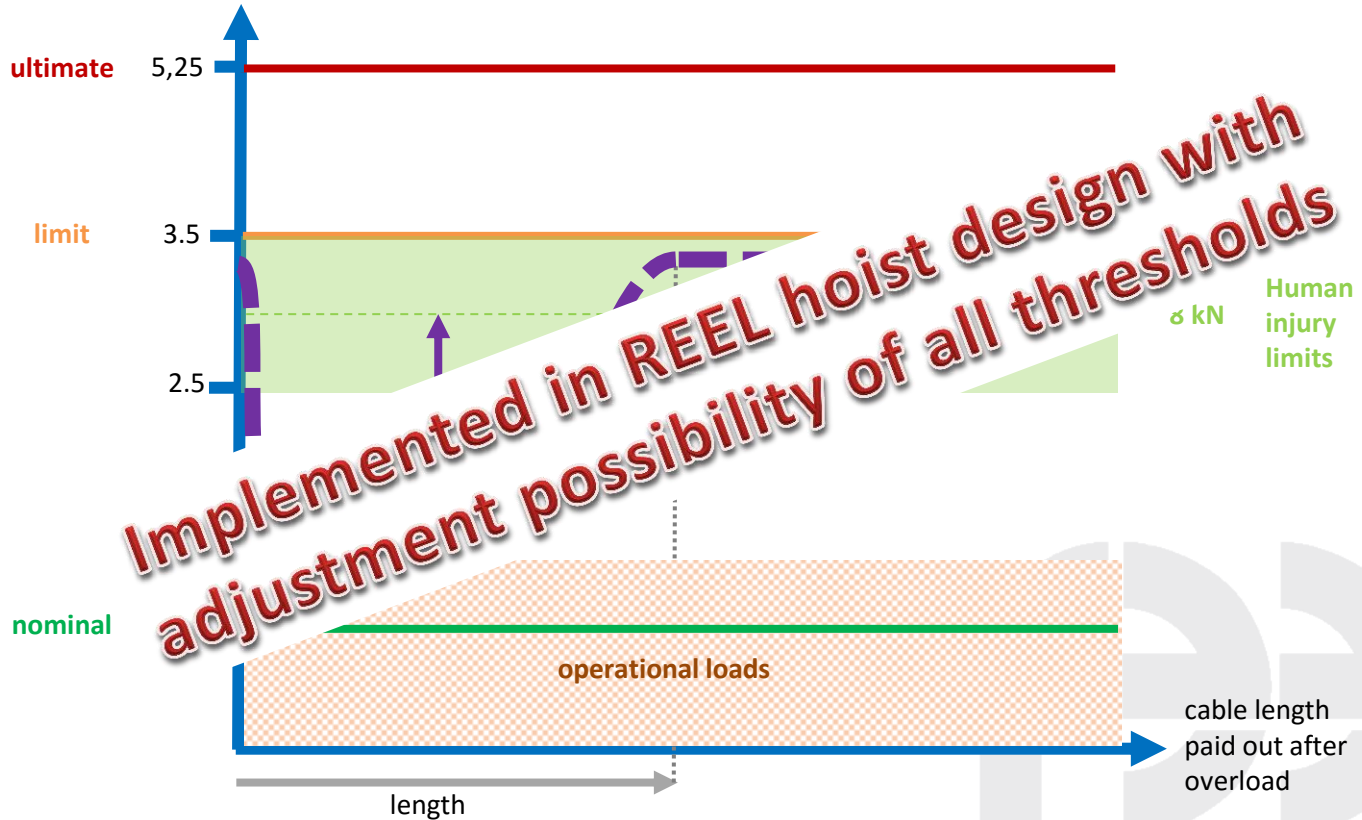
&



REEL Solution to reach this target :



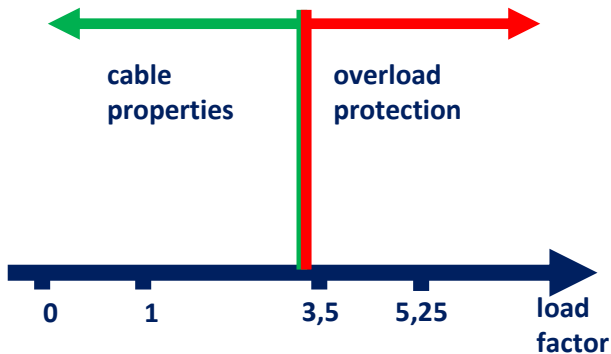
Adjust the overload protection thresholds in two steps with two independent mechanical systems (Detection + Braking)



Hoisting Cable Backlash phenomenon



Even if cable has higher breaking strength than ultimate load, damage of cables has to be considered below overload detection and demonstration has to be done that no cable failure shall have a catastrophic effect onto the H/C



Higher overload detection threshold value leads to higher tension in the cable and thus higher potential of backlash effect in the cable

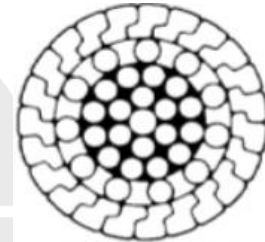
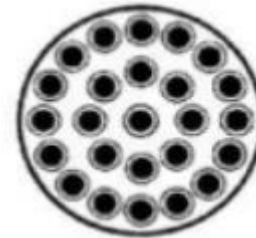
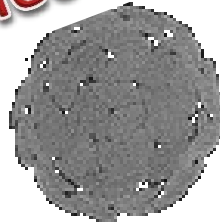
Hoisting Cable Backlash phenomenon



According to these considerations, investigation have been made to determine cable comportment and rebound margin in order to select cable design to qualify for HEC hoisting mission.



**Several types of cable construction
have been selected by REEL in its design**



Maintenance recommendation for safety



- ❑ Define a program to minimize risks of human error during maintenance tasks to ensure safety (No adjustments, easy inspection,...)
- ❑ Provide the ability to retrieve on ground as much information as possible from mission data



Our actions :

- Design a system to minimize complex maintenance tasks
- Ensure a training program dedicated to maintenance operator
- Provide efficient support services to ensure availability for mission

Global Hoist architecture

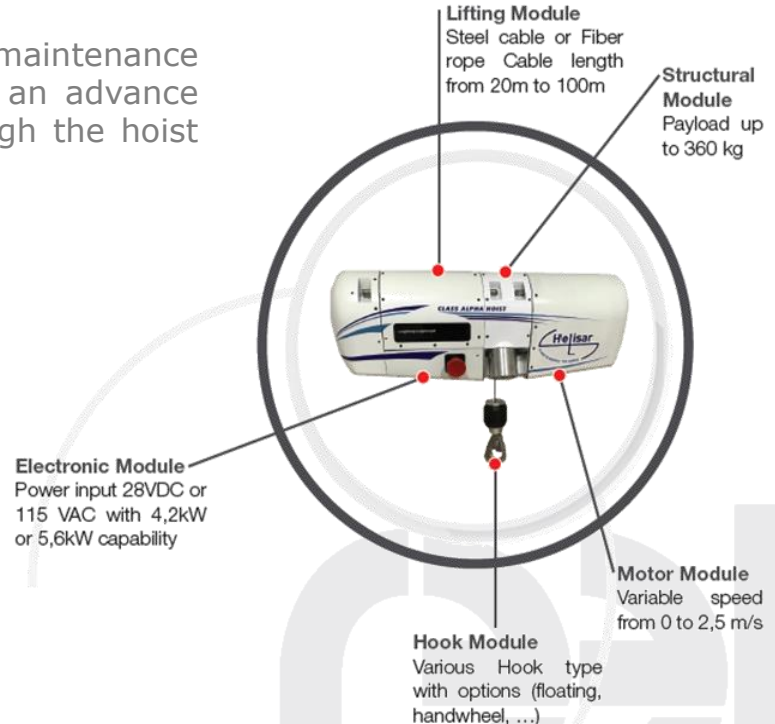


The complete Hoist system is divided into several LRU and SRU to ensure the design modularity

This is designed to secure a low maintenance program adapted to each function with an advance control of hoist usage parameters through the hoist control pendant and the GSE.

Quick exchange directly on helicopter of one of the five modules provides almost a 100% availability and gives the possibility to reconfigure the hoist from one mission to another without changing the complete hoist.

Furthermore, the completely new design features (Overload, Electronic Control, lifting system, brushless motor,...) have been adapted to ensure safety and to be compliant with further regulation.





Questions ?

