

Helicopter hybridization

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Airbus Helicopters

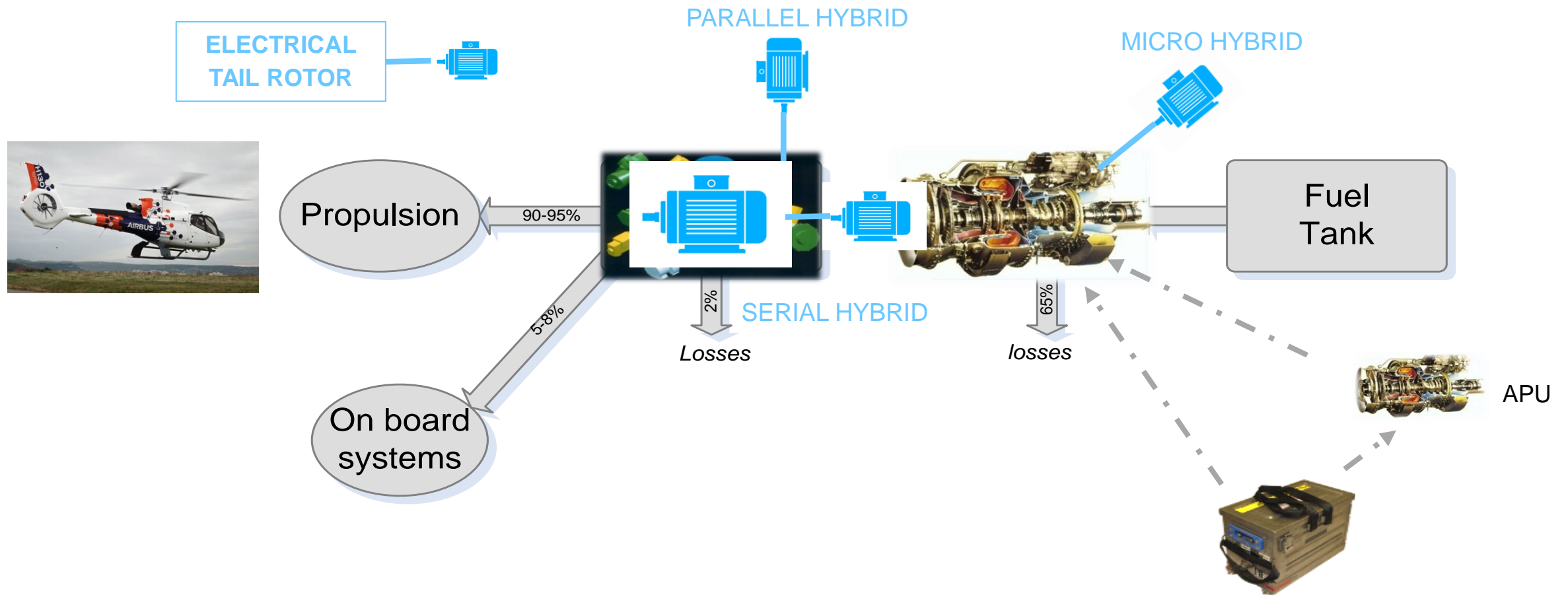


Summary

- ✓ What does hybridization mean on Helicopters ?
- ✓ Different levels of hybridization: applications, functions, power levels
- ✓ Three examples of hybridization projects at Airbus Helicopters
- ✓ Challenges for Electric Hybrid Propulsion System

Helicopter Power Chain

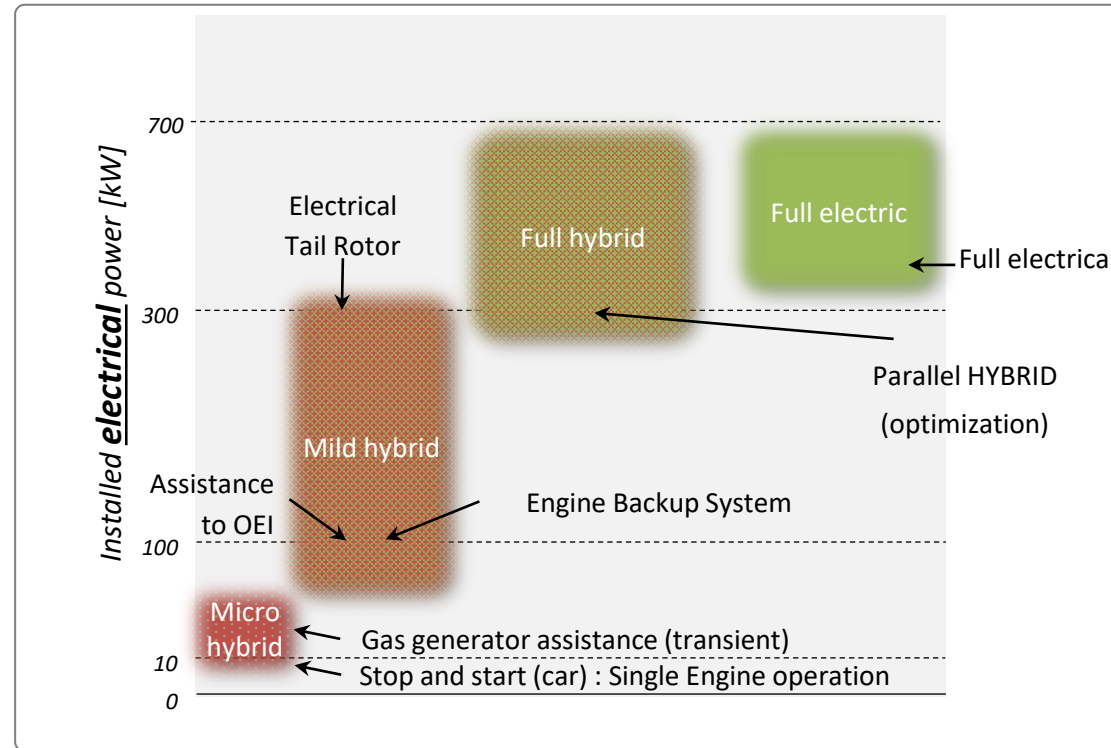
HYBRIDIZATION ?



Electrical propulsion mapping

Hybridization:

Use of electrical energy to complement or replace thermal energy for propulsion

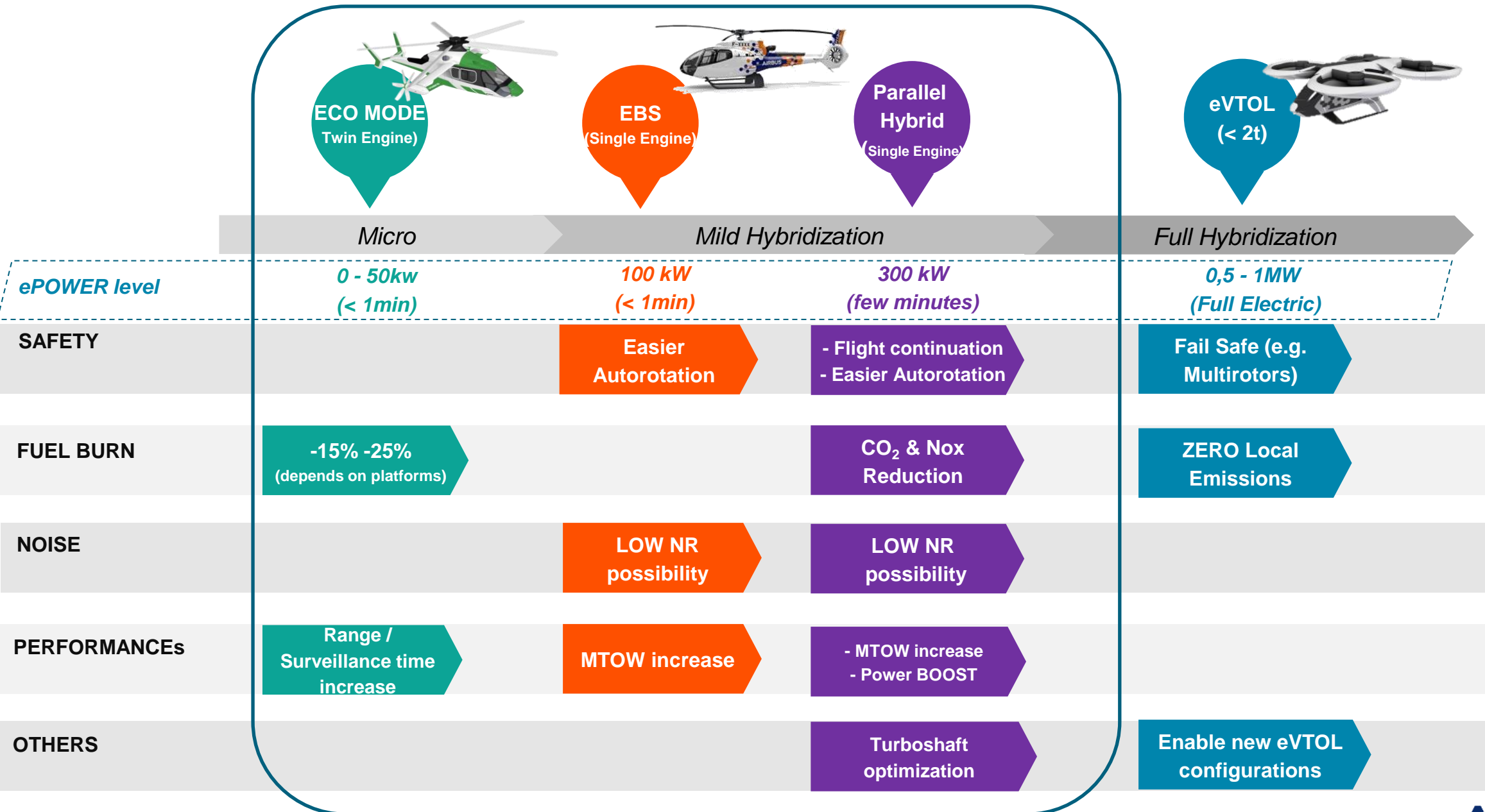


Similar concept to automotive but no possibility for energy recovery on Helicopters

Conventional helicopter

Innovation through electrical power

Hybrid Helicopters | Hybridization functions and power levels



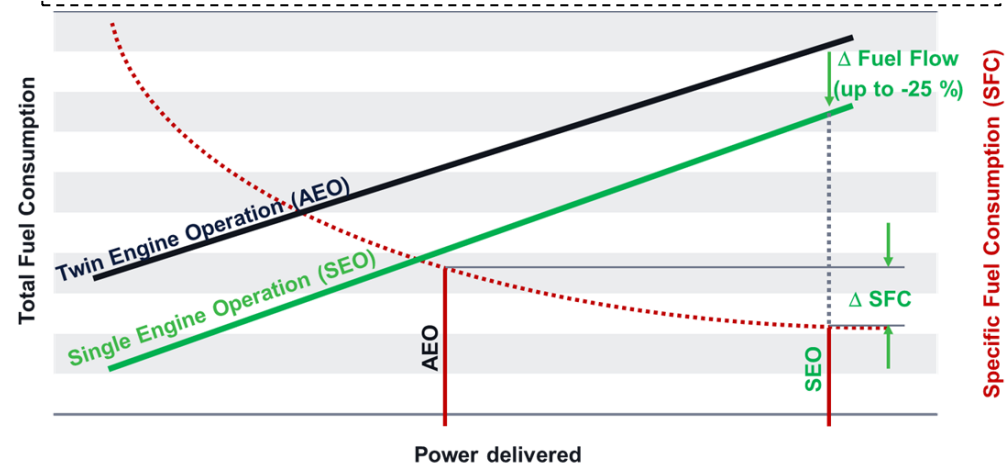
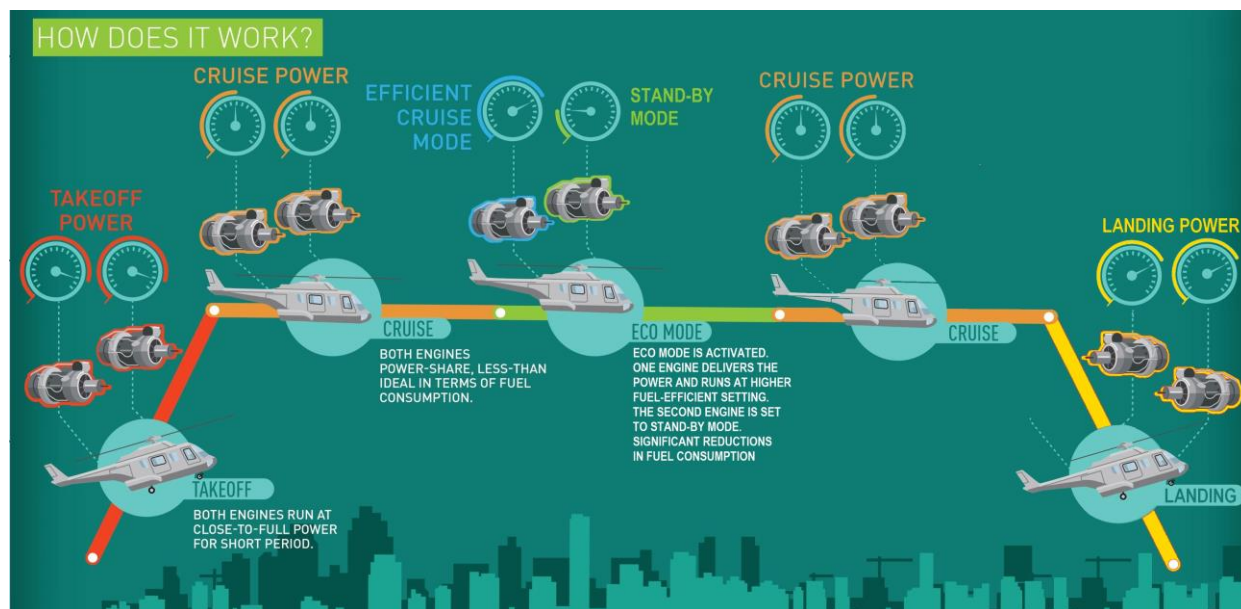
MICRO HYBRID : ECO MODE for TWIN ENGINES

ECO MODE = possibility to use only one engine at high power setting in cruise to optimize its efficiency (SFC), reducing Emissions and increasing surveillance mission time.

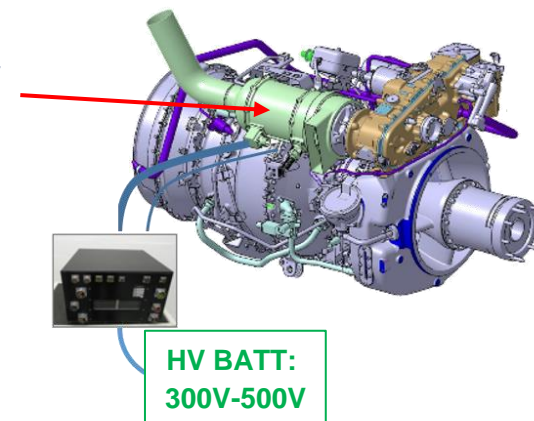
The other engine is in “Sleep Mode” (keeps turning but no combustion) and can be restarted very quickly (few seconds) if the main engine fails, thanks to the micro-hybridization (50-100kW eMotor on the Gas Generator stage).

NB: SFC gains depend on the platform (engine, gearbox torque limits, etc).

ECO Mode is a smart solution to the oversizing of twin engines due to OEI regimes, which induces lower efficiency and higher consumption.



eMotor



With ECO MODE, Fuel consumption can be reduced by 15-25%

Engine Backup System (EBS)

HELICOPTERS

ePower / Energy:
100 kW for 30s
in case of Engine failure



Flight Test campaign
Q3 2021

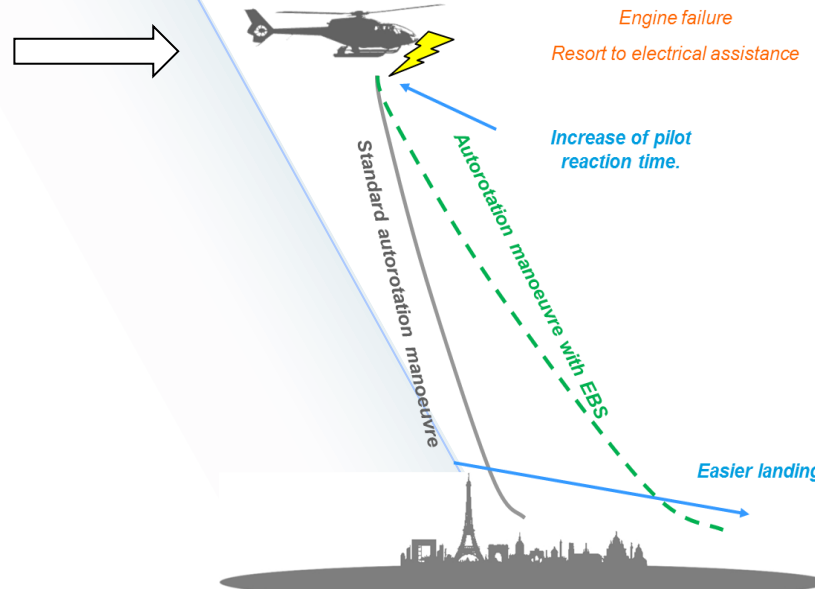
Q4 2021: TRL6

TARGETS:

- ❑ **PERFO:**
MTOW and Payload increase
vs H130
- ❑ **SAFETY:**
SAFER AUTOROTATION in
case of engine failure
- ❑ **NOISE REDUCTION (Rotor)**



H130 MTOW is limited by the capability to land safely in case of engine failure **at take-off**.
→ *The prompt electrical power input in case of engine failure allows heavier take off, still being able to land with comparable level of safety.*



MTOW increase

« accessible » MTOW
increase

NEW
PAYLOAD

EBS System
Weight

Additional
Useful Load
(pax/Fuel)

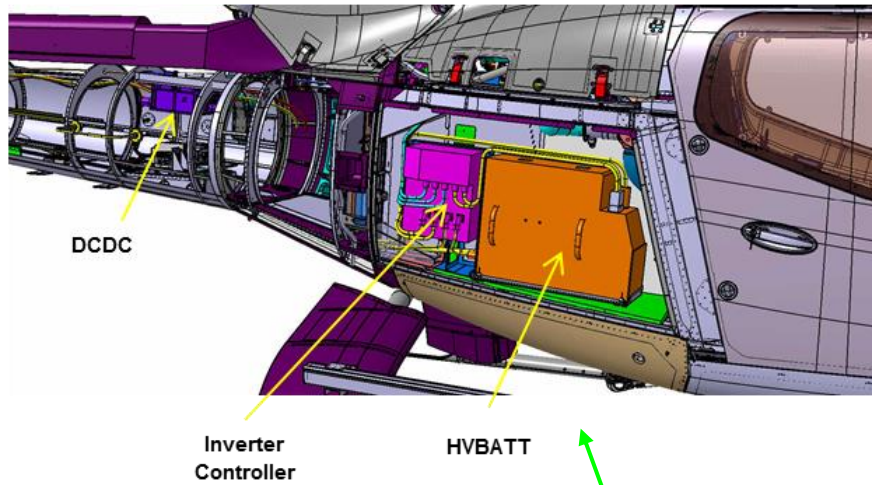
Safer autorotation in case of engine failure:

- ✓ Increased pilot reaction time
- ✓ Less NR drop at engine failure
- ✓ Wider autorotation cone if required
- ✓ Easier final flare and softer emergency landing

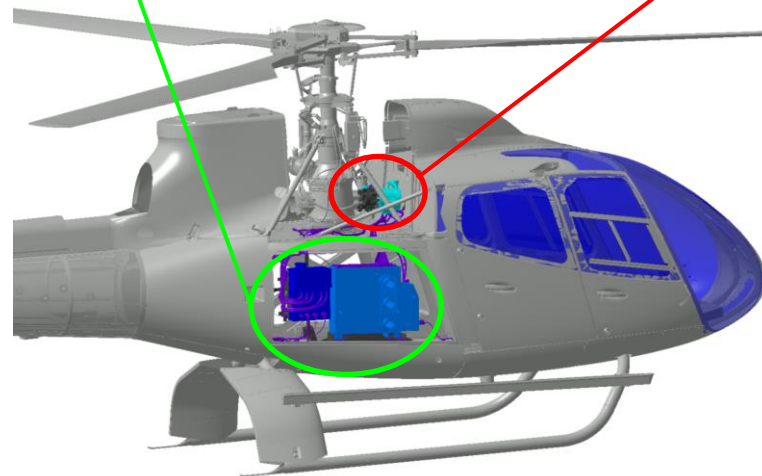
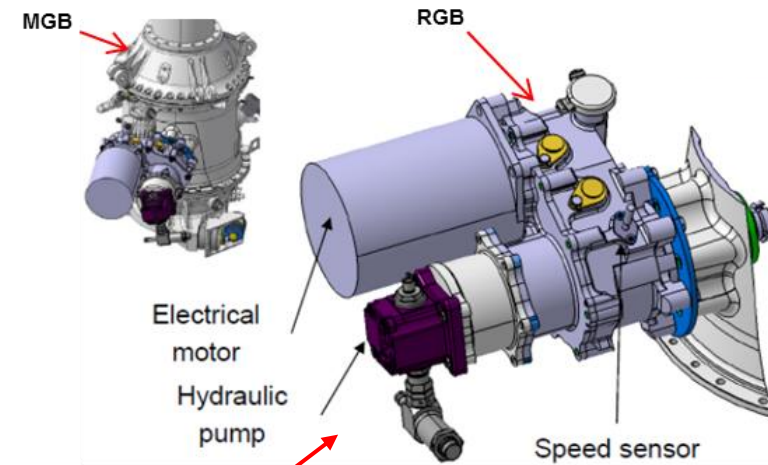
EBS 100 kW / 30s: system description

INTEGRATION

❑ Electrical components: H130 RH cargo bay and tail boom



❑ eMOTOR and reduction gearbox (RGB): H130 upper deck

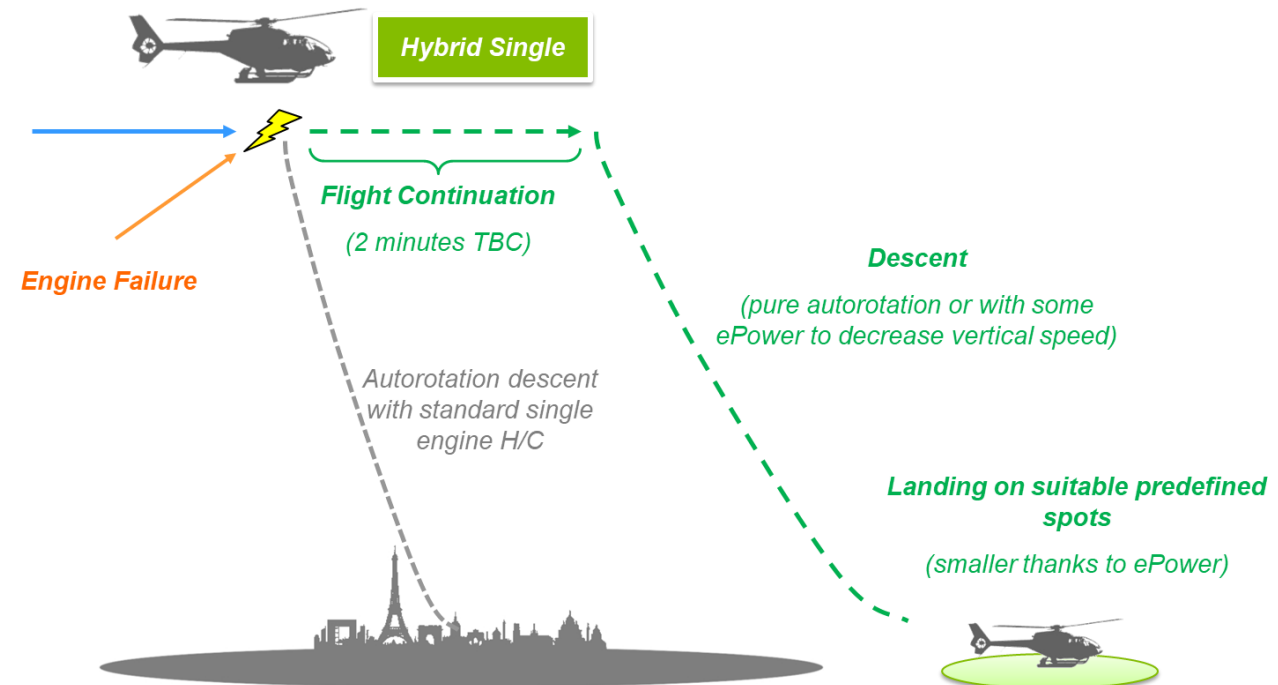
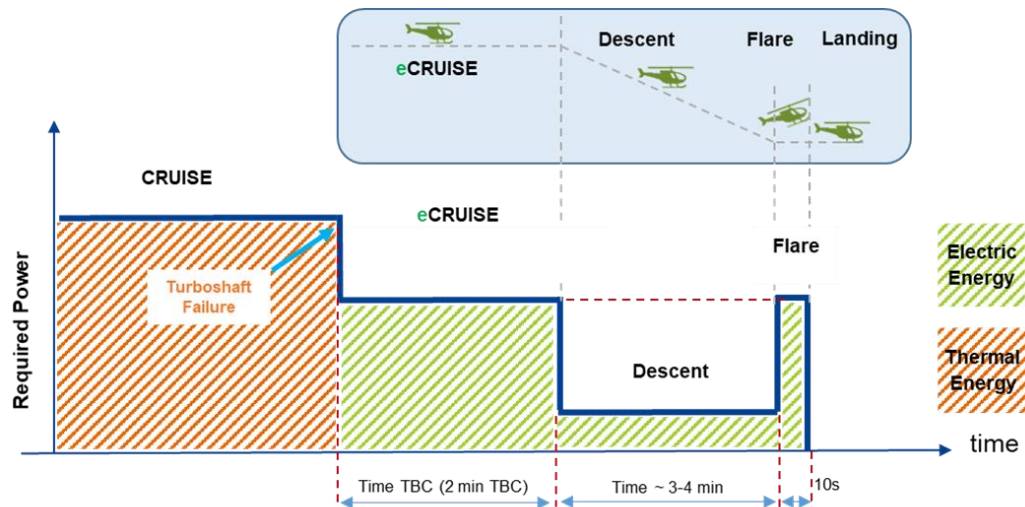


Parallel Hybrid architecture

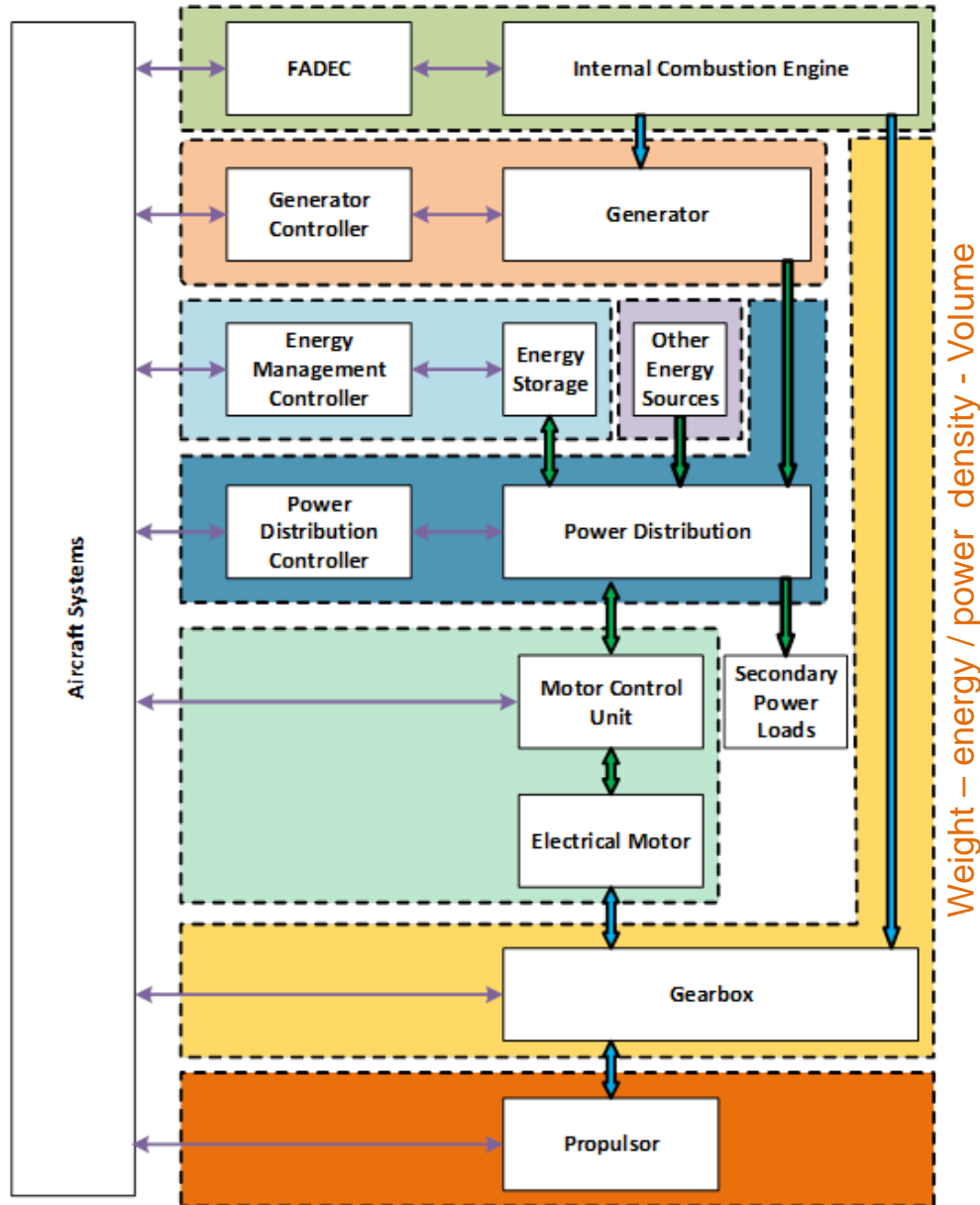
Parallel hybridization on Light Single Engine Helicopters targets the capability of **continuing the level flight for few minutes after engine failure**, thanks to the Electric Propulsion System powered by a rechargeable battery.

OBJECTIVES:

- Investigate **other gains** allowed by Hybridization
- Pave the way to future hybridization solutions



Challenges for Electric Hybrid Propulsion System



EHPS level

Elec system level

Component level

