The Future of Flight with Swappable Energy

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SPECS	120 kt / 222 km/h	160 kW	400 NM (750 km)	4 Seats	1400 kg	4 hours
	Cruise Speed	Take-off-Power	Max. Range	Space	Take off Mass	Endurance

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topics:

- the challenges of Aviation 3.0
- smartflyer: design for electric propulsion
- the hybrid-electric powertrain in operation
- from proof-of-concept to type certification
- our market: training aircraft for commercial pilots

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the challenge of aviation 3.0

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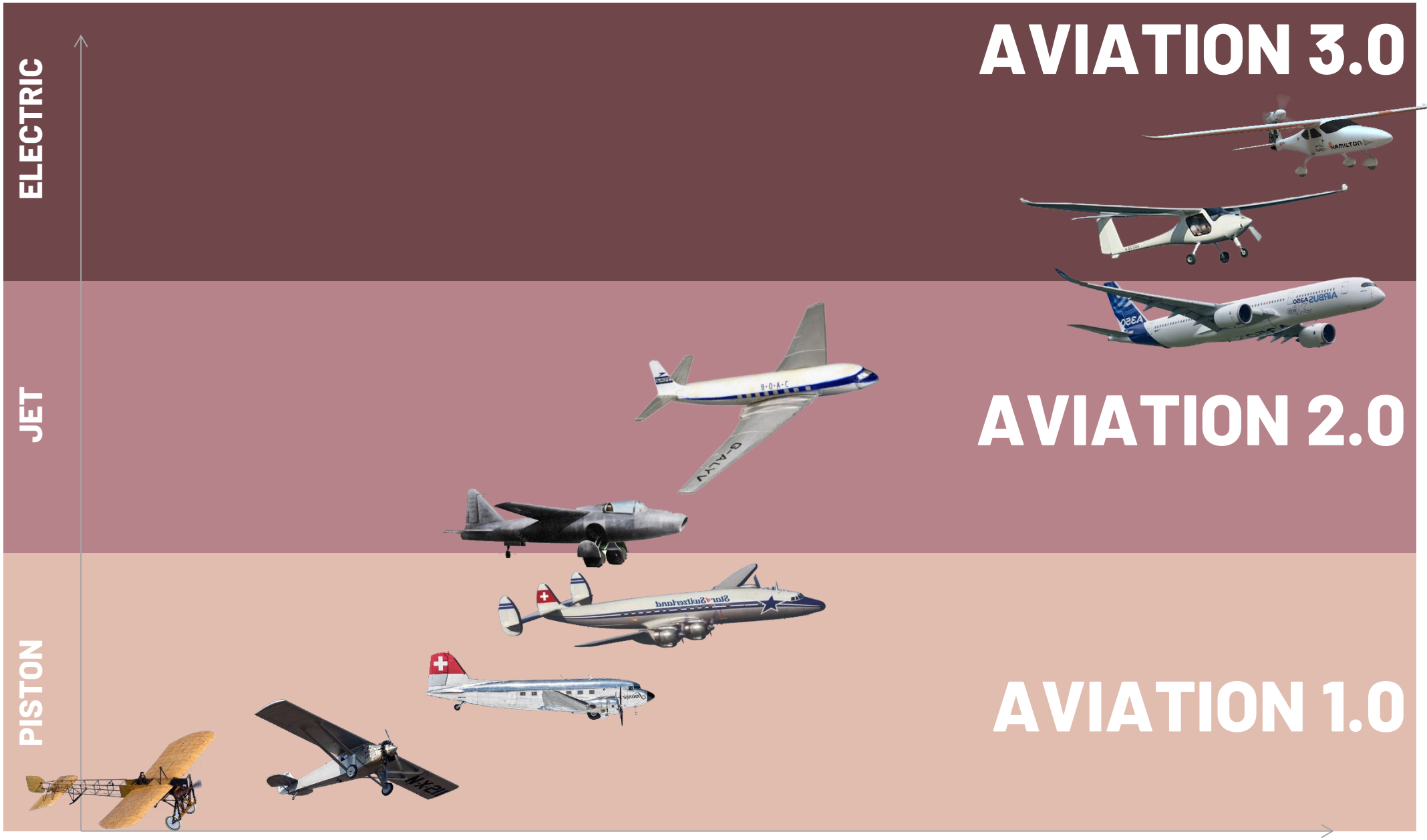

the challenge of aviation 3.0

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ELECTRIC

JET

PISTON

AVIATION 3.0

AVIATION 2.0

AVIATION 1.0

power density

1900 1925 1950 1975 2000 2025

the challenge of aviation 3.0

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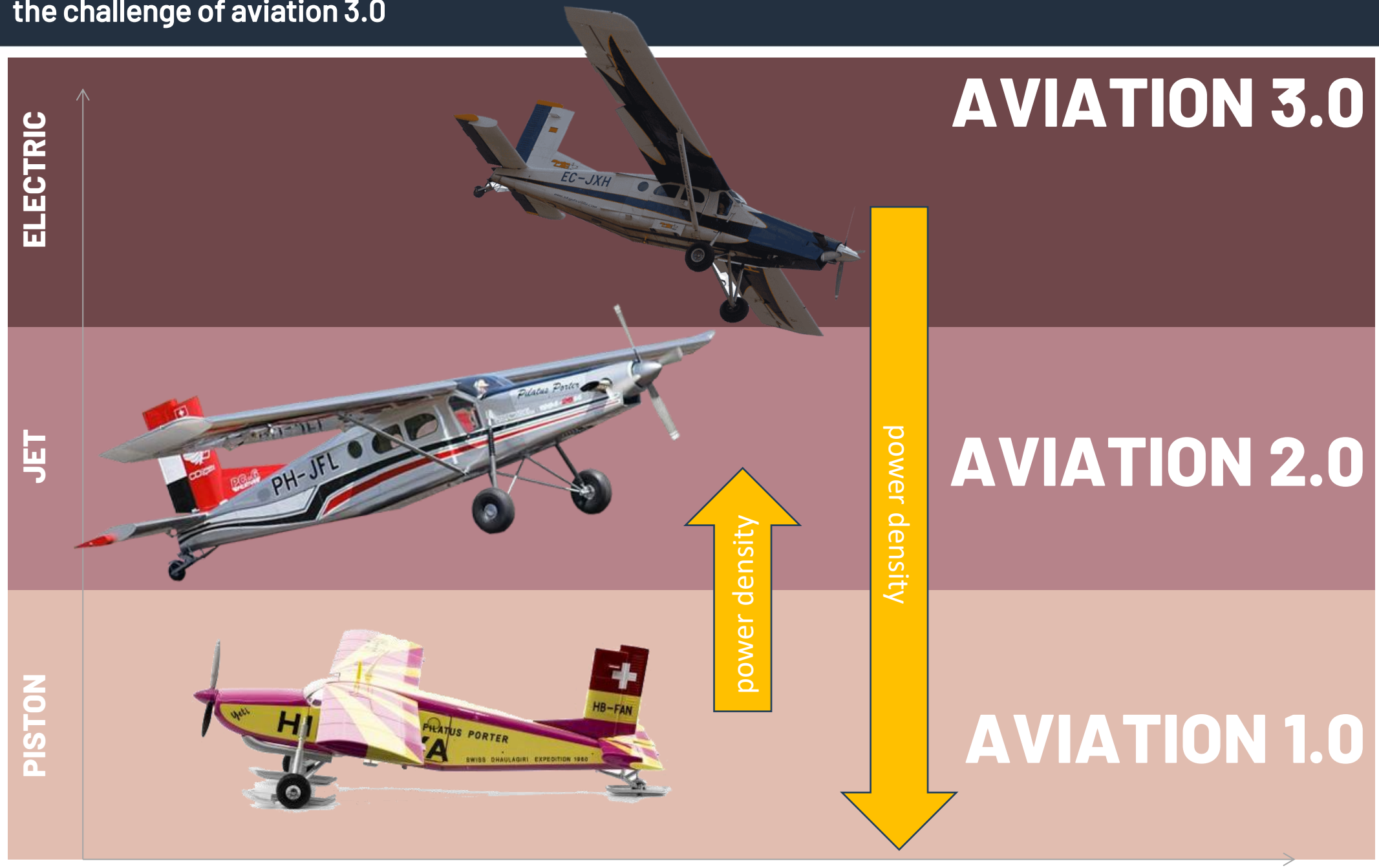

propeller on the vertical tail - why?

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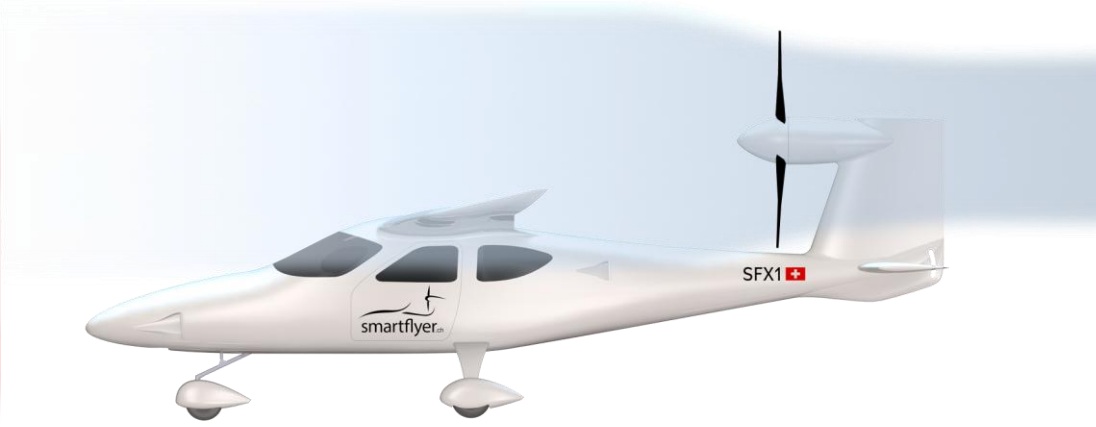

Blockage Propeller:

- blockage effect of fuselage
- no laminar airflow
- only small prop

Free Stream Propeller:

- laminar flow to prop
- laminar flow on fuselage
- big prop diameter
- good ground clearance

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... the solution

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Pöschel P 300
1971

eGenius Uni Stuttgart
2011

Embraer Energia Electric
future concept aircraft

system overview

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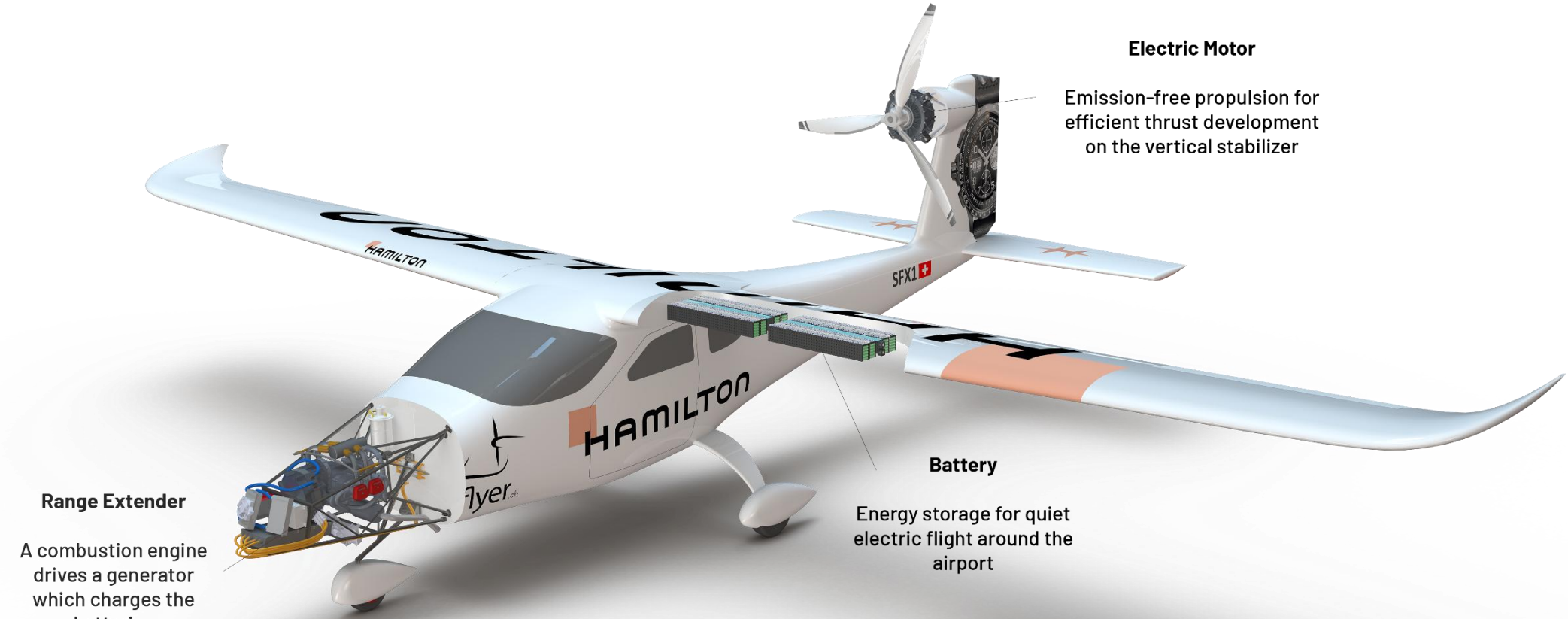

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- **plug-and-fly within 15 minutes**
- one aircraft with different types of energy sources
- replacable without maintenance action

Battery Electric
- zero emissions
- 2,5 hours endurance
- quiet performer

Range Extender
- 800 km range
- 4 hours endurance
- fast turnaround
- low CO2 taxes

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Battery Electric
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Range Extender
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Fuel Cell
- sustainable
- 4 hours endurance

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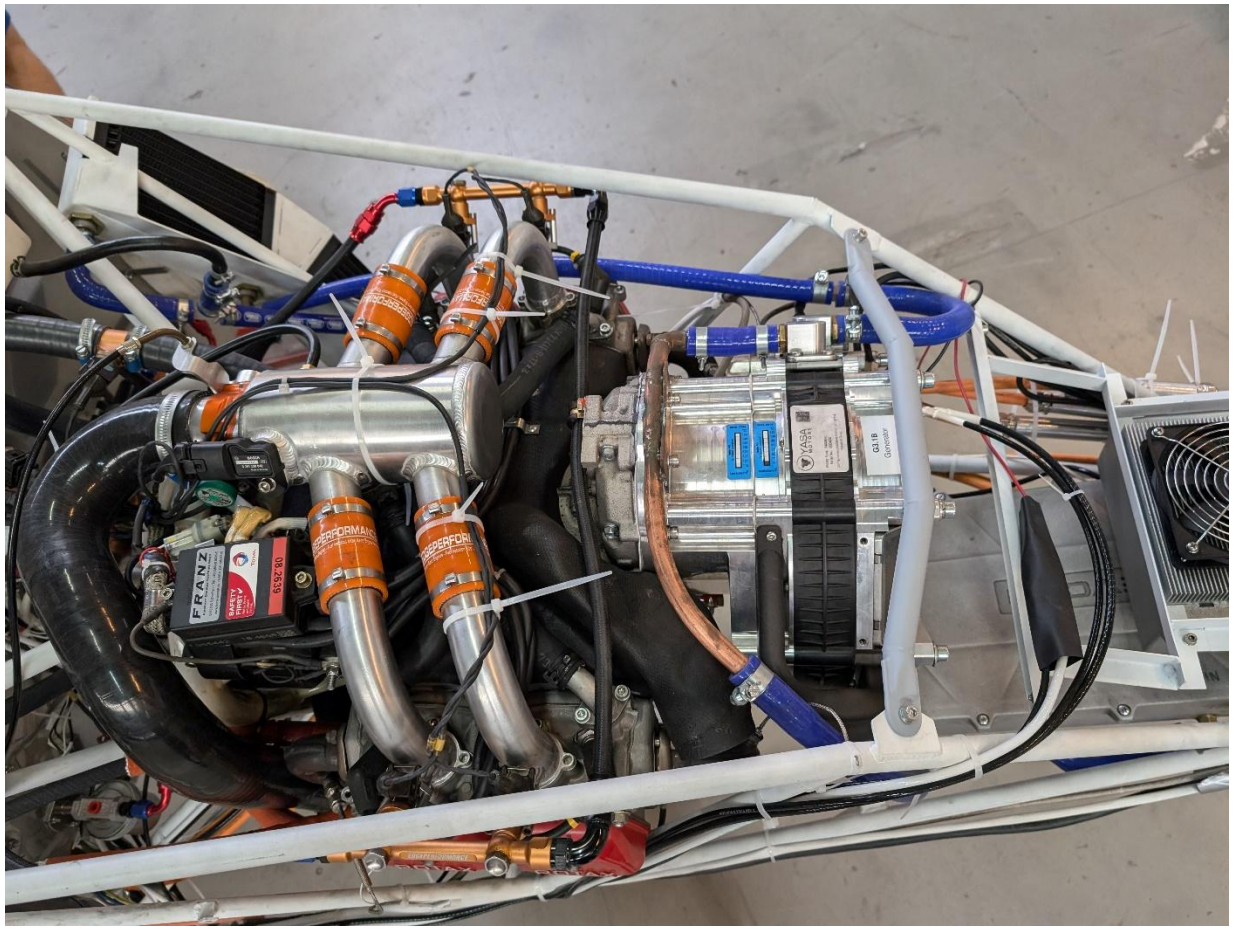

Range Extender:

- Rotax drives generator
- inverter
- 60 kW DC power
- fully automatic

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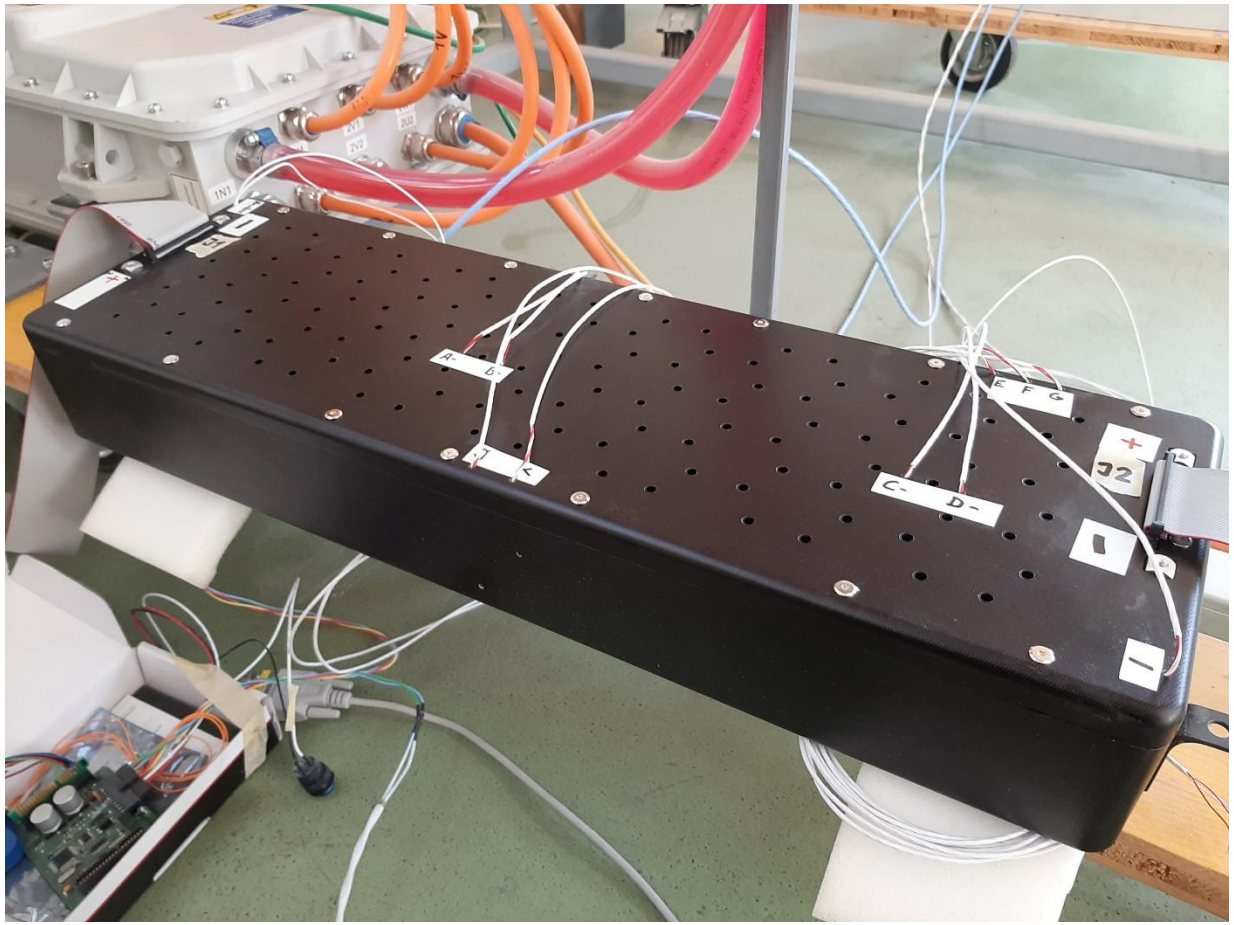

Energy Storage System:

- 32 kWh
- air cooled
- Li-ion batteries
- 18650 cell

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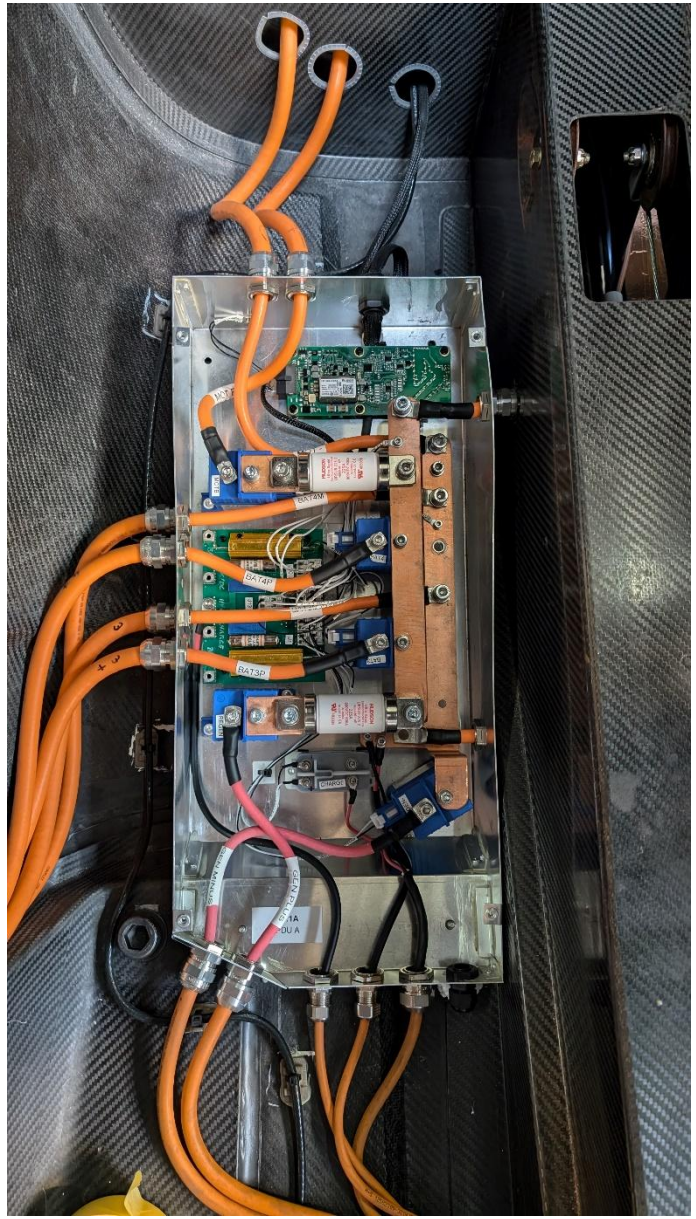

Power Distirbution Unit:

- in: RE & batteries
- out: EPU

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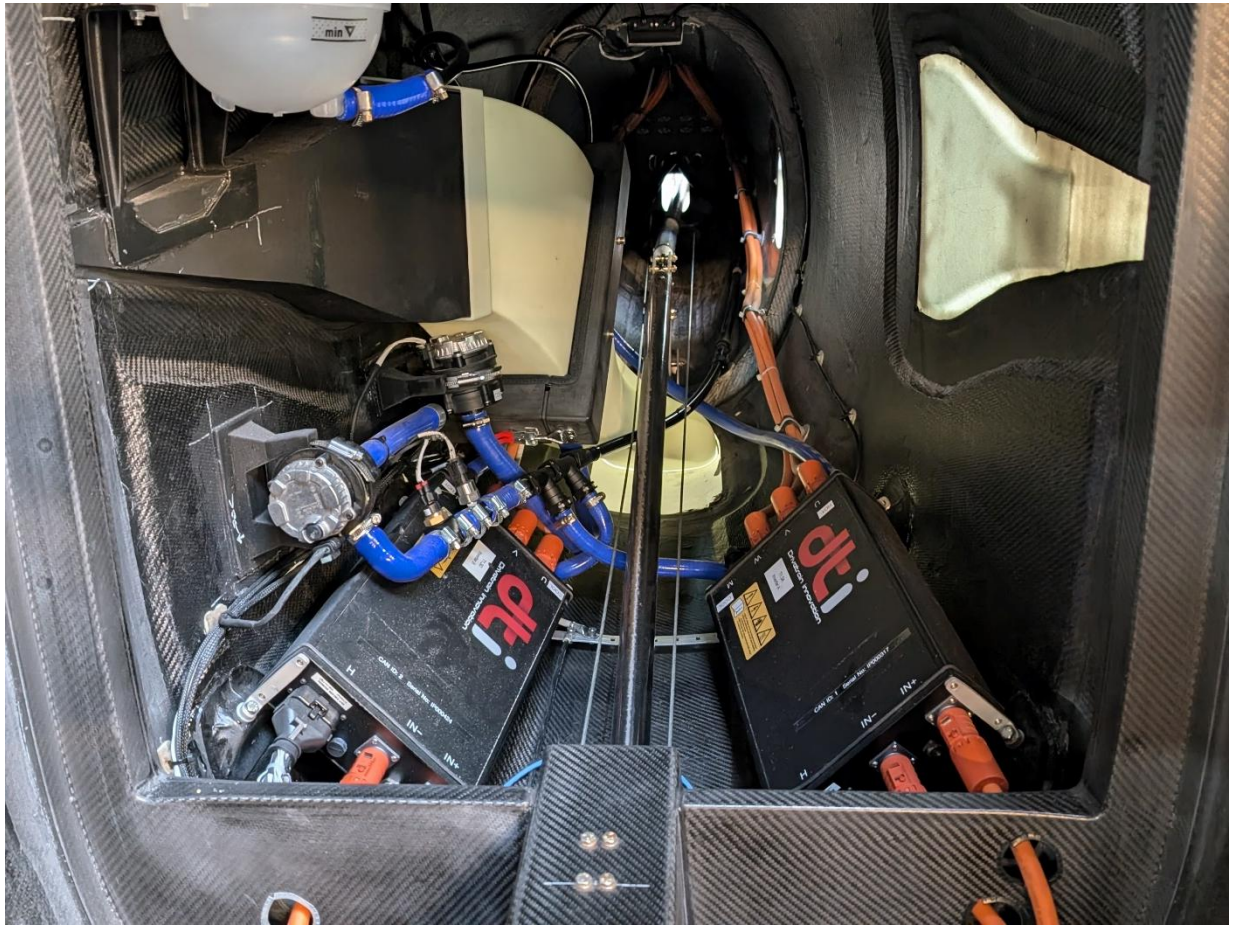

Electric Power Unit:

- DTI inverters (2 units)
- liquid cooled

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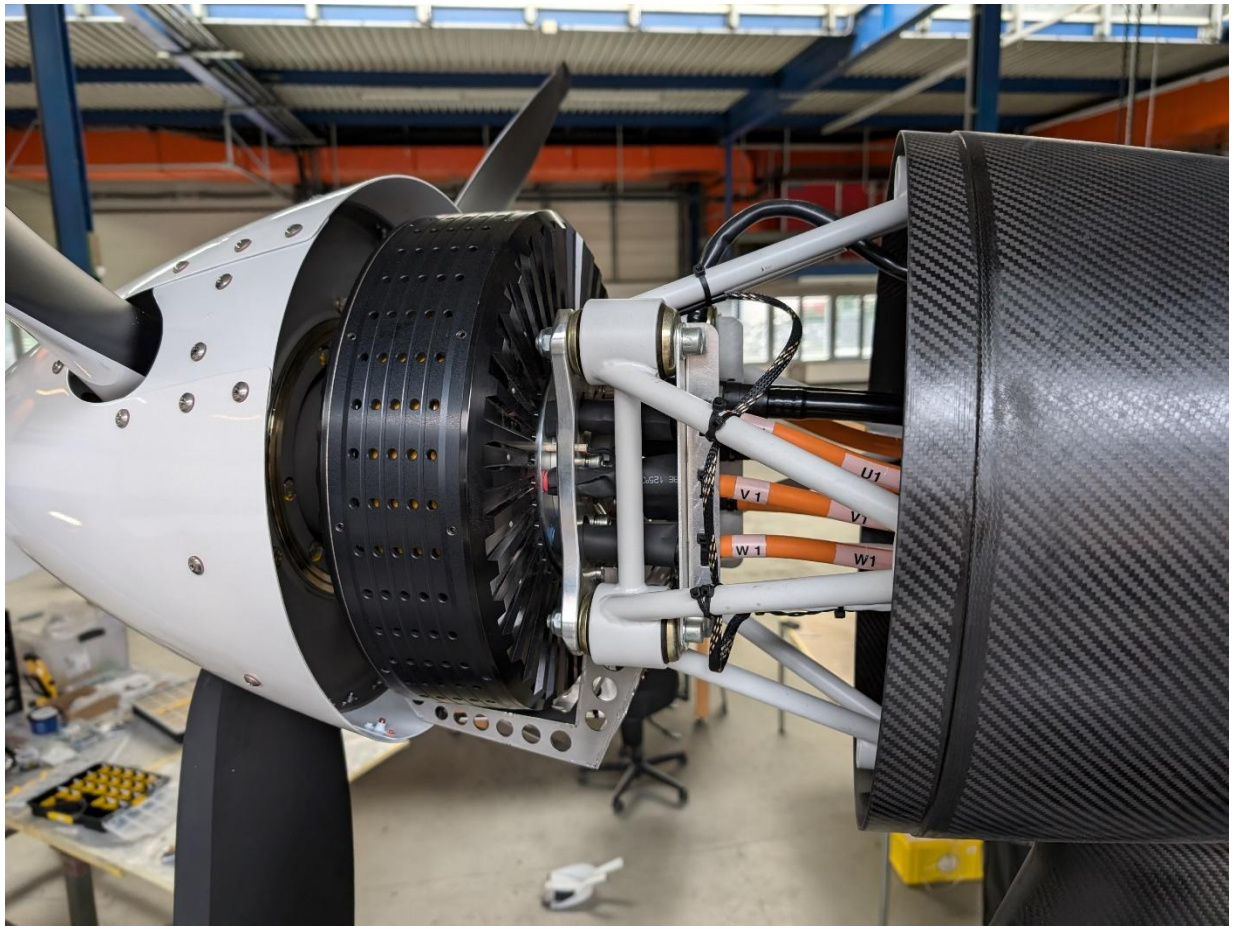

Electric Power Unit:

- Emrax 348
- liquid-air cooled
- double windings
- 160 kW for 2 min.
- 120 kW MCP

how we operate smartflyer

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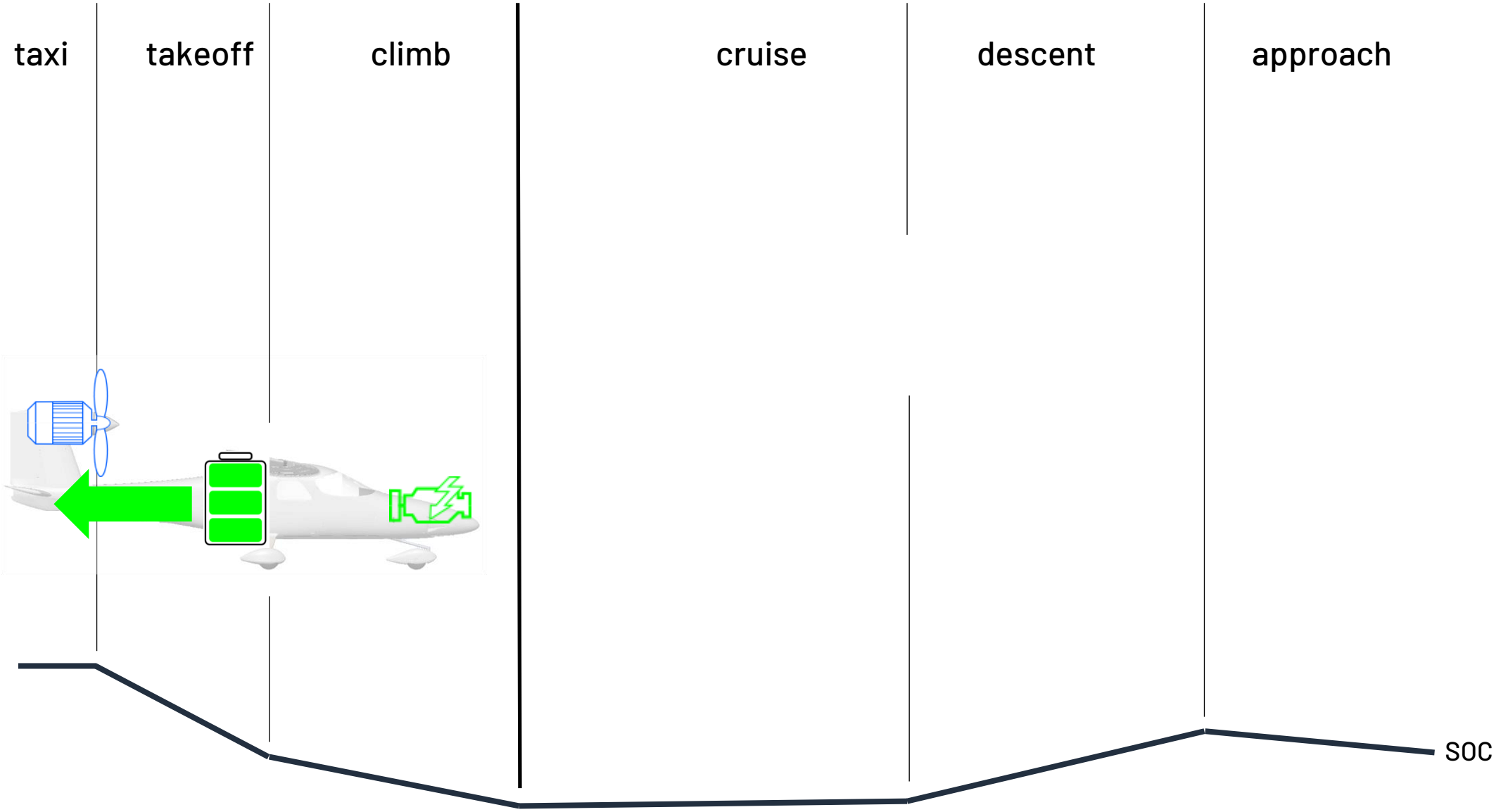

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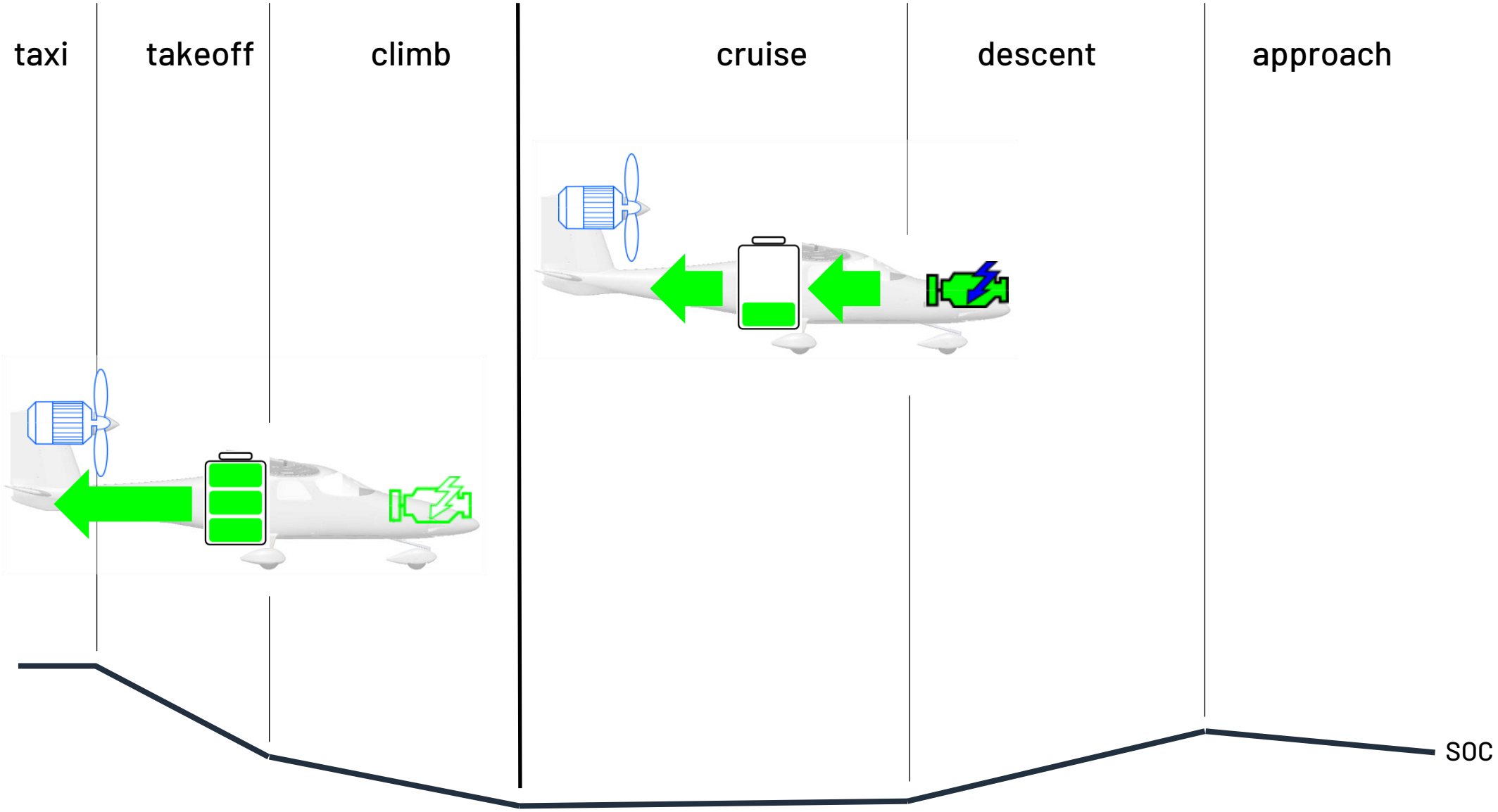

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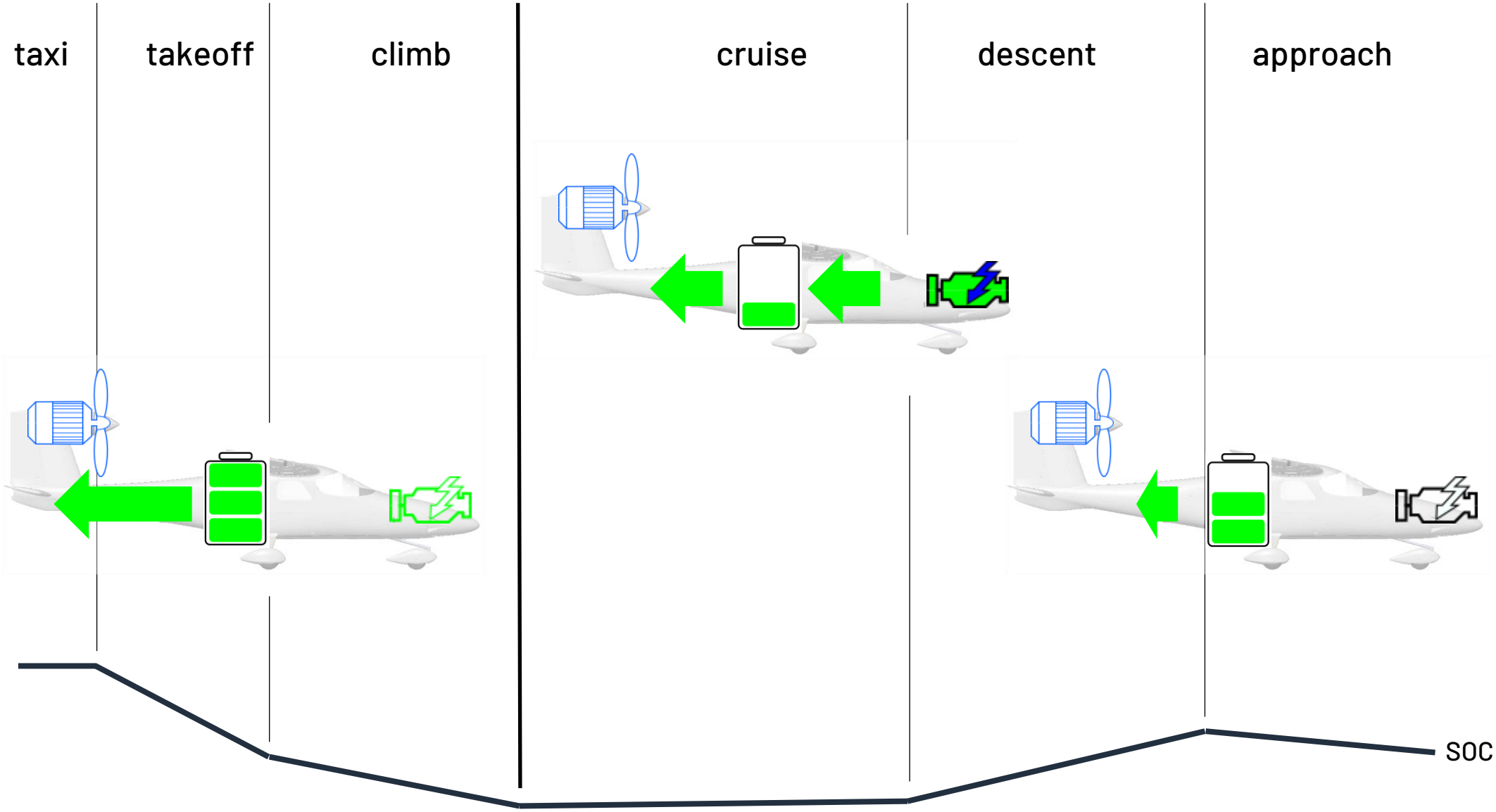

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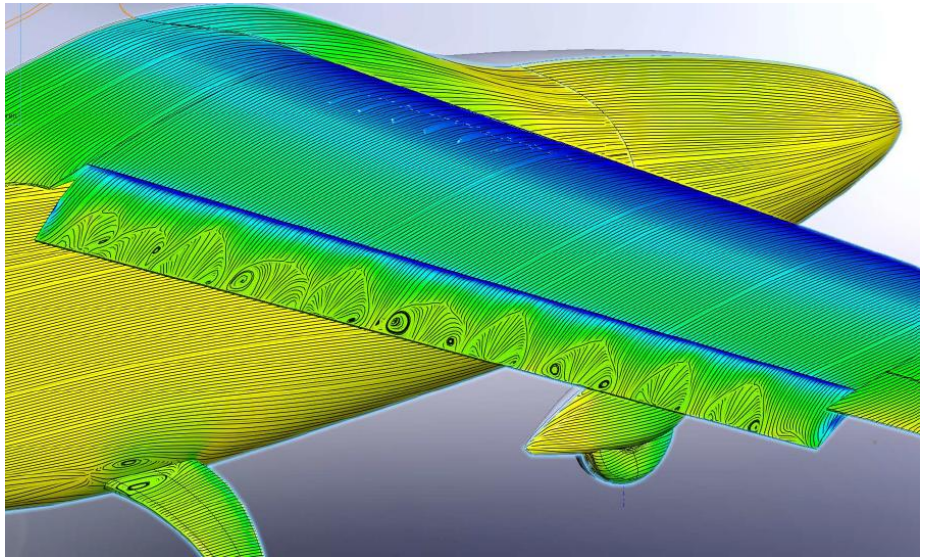
EASA Certification Specifications CS-23 Amdt. 5

- prototype is designed and constructed with full respect to CS-23
- latest Amendment 5 compliant (ASTM)
- more than 4500 specification rules adapted
- aerodynamic and structural analysis and tests
- extensive flutter and whirlflutter analysis by Swiss company AeroFEM



from proof-of-concept to type certificate

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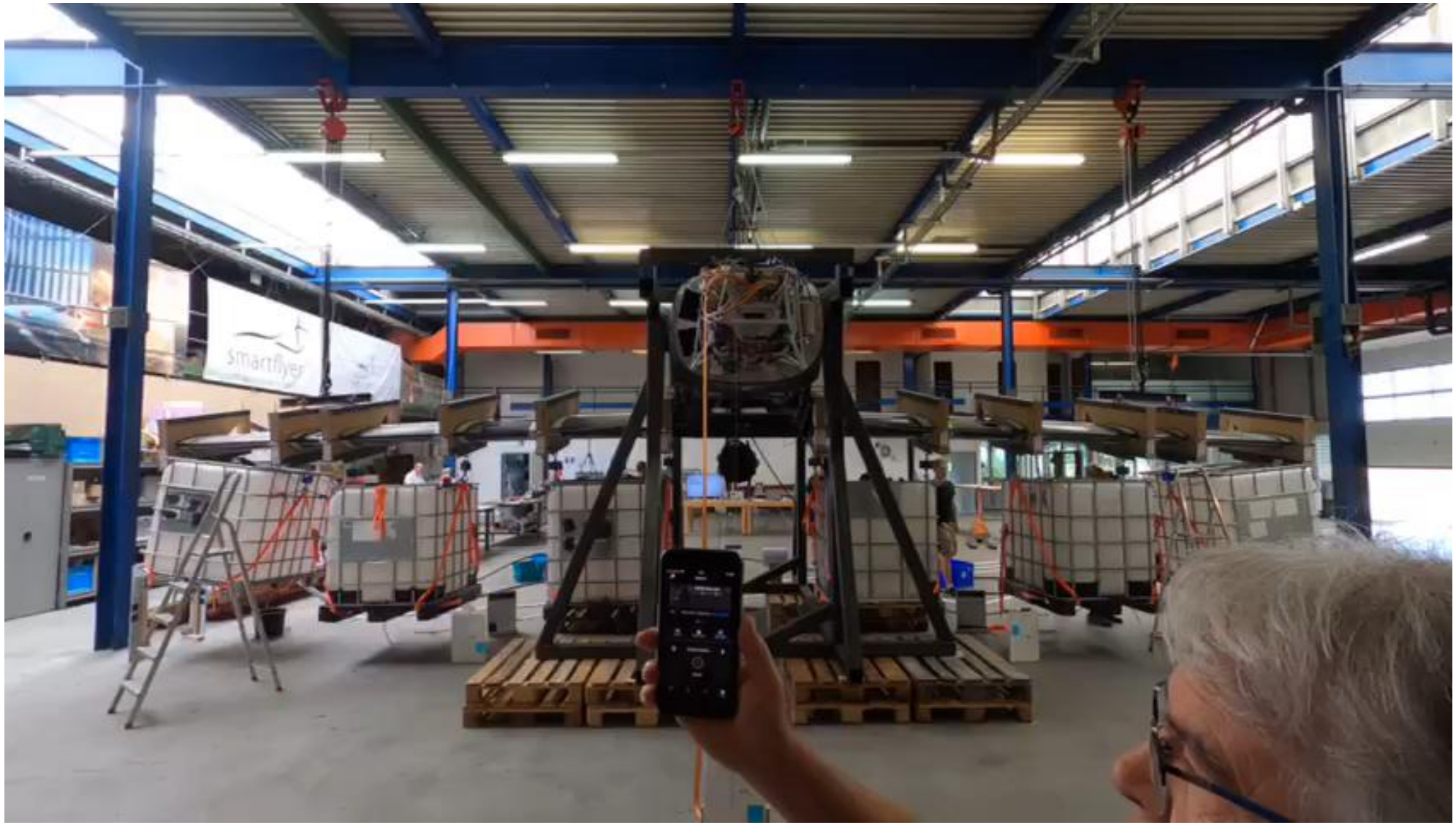

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from proof-of-concept to type certificate

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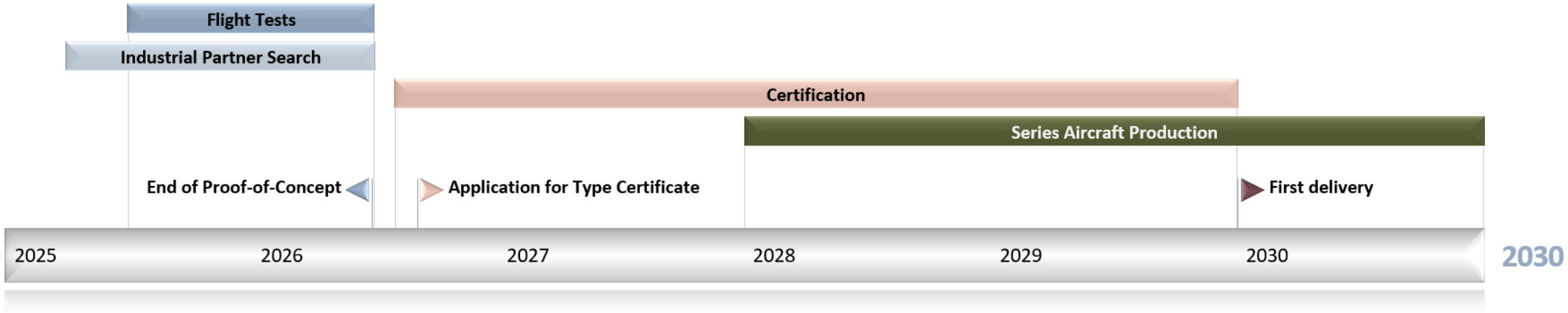

Strategic Planning for smartflyer:

- maiden flight 2025
- cooperation with industrial partner after initial flight tests
- certification process with Type Certificate EASA/FAA
- series aircraft production
- first delivery 2030

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- The forecast shows that between 2023-2042, 45,200 new passenger aircraft will be delivered at an estimated value of $3.2 trillion. (source: Cirium Aviation Analytics)

- Over the next 20 years there is a need for an additional 680,000 new technicians, 590,000 new pilots and 920,000 new cabin crew, totalling more than 2.2 million additional skilled people calling for the industry to intensify efforts to attract and train talents.(source: Airbus Global Services Forecast 2023-2042)

Military/Defence:

- specially designed for training of airforce pilots
- avionics and sytems modeled on the future fighter aircraft
- cockpit layout to the later fighter aircraft

training aircraft for commercial pilots

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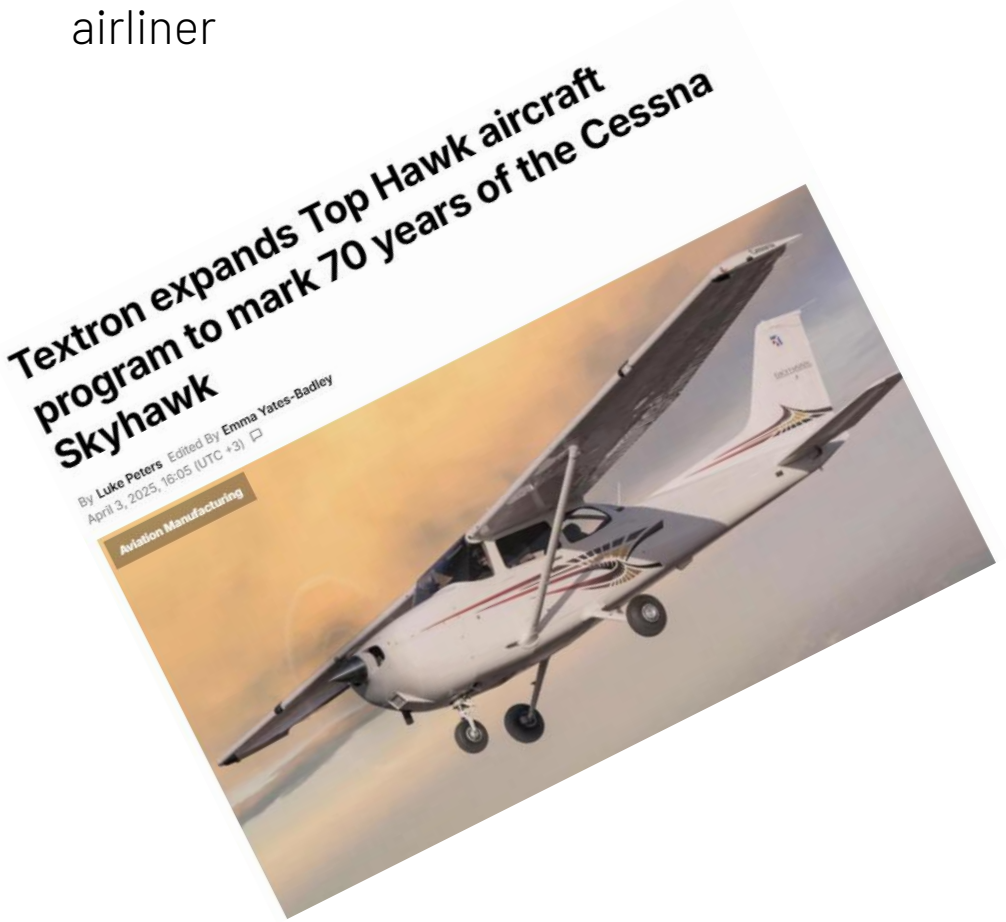
Military/Defence:

- specially designed for training of airforce pilots
- avionics and sytems modeled on the future fighter aircraft
- cockpit layout to the later fighter aircraft

Civil/commercial pilots:

- basic training on leasure aircraft not designed for this mission
- avionics and systems for light sport aircraft
- flight deck has nothing in common to an airliner



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- flight deck layout adapted to the airliner
- power and warning/status display
- system display
- thrust related instruments/operations in center console
- no propeller in front of the crew
- handling of state-of-the-art powertrain

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AERO
FRIEDRICHSHAFEN

Hall A7, just at the entrance

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