

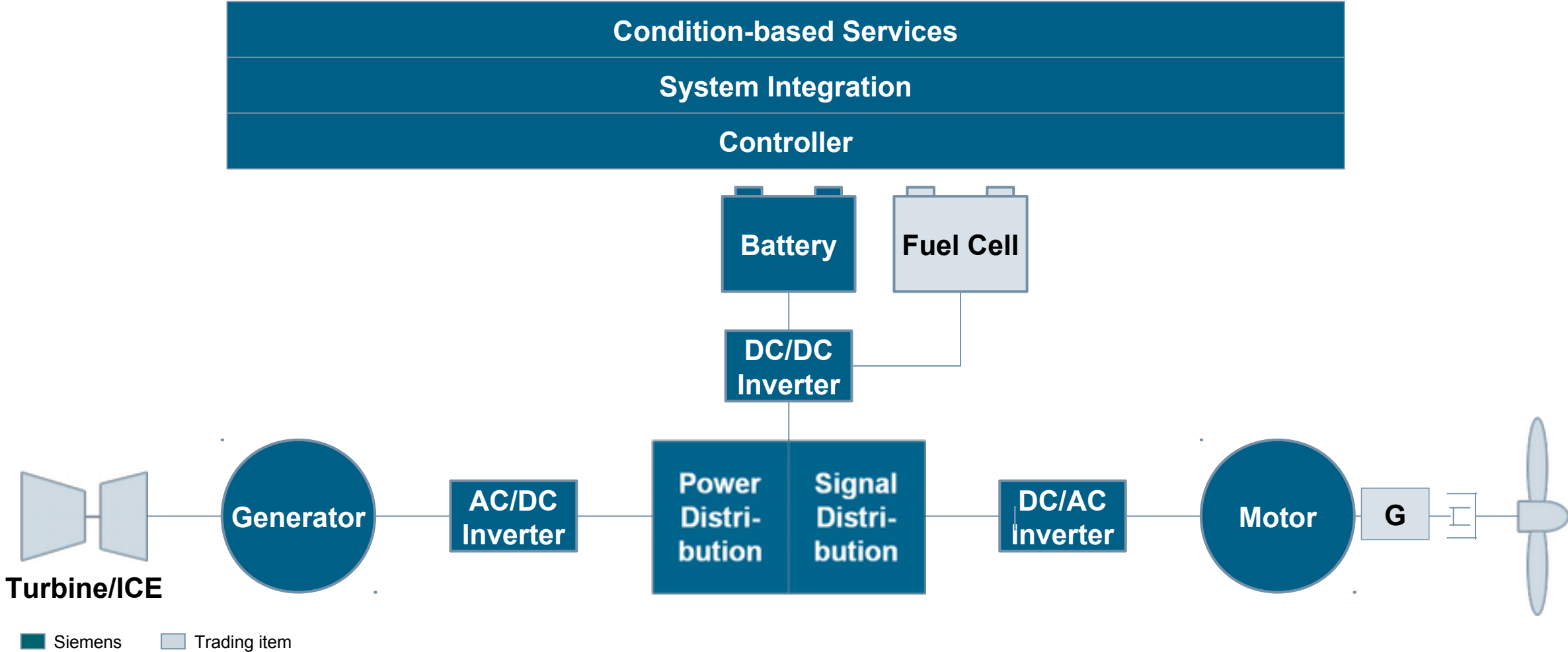
Electrical propulsion for aviation

Siemens eAircraft

What gets me out of bed in the morning ...

**Aviation should be efficient, individualized, quiet, emission-free,
affordable and easy.**

Our core portfolio – electric propulsion units (EPU) for applications with high power/weight requirements



Magnus eFusion - Maiden Flight on April 11, 2016 at Matkópuszta airfield <https://youtu.be/j3cNLsN-eCM>



The eFusion of Magnus Aircraft Corp. (Hungary) is a two-seat side-by-side low-wing monoplane with **aerobatic capability** for **upset recovery training**.

Siemens designed a **safe and robust battery propulsion system** for aviation use in the **cost-sensitive segments** of Very Light, Light Sport and Ultra Light Aircraft.



Extra 330LE – Maiden Flight on July 4, 2016 at Dinslaken airfield
<https://m.youtube.com/watch?v=fiu8TFnXYFY>

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Extra 330LE

World Record Flight on November 25, 2016 at Dinslaken airfield

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March 23rd, 2017

FAI speed world record

**337.5 km/h
(eAircraft <1000 kg)**

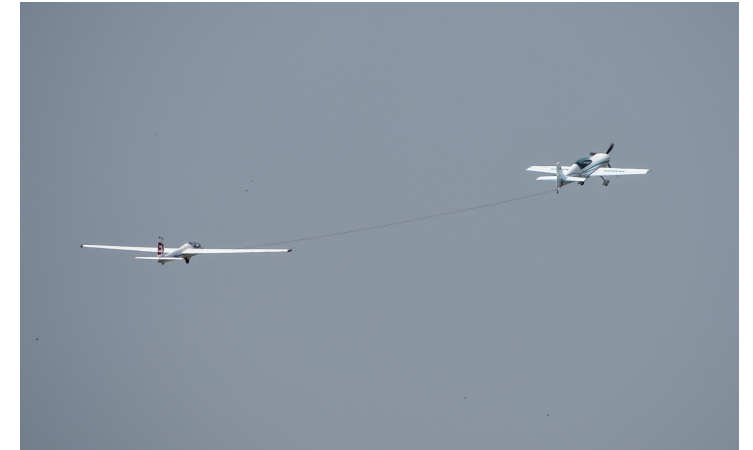
**Pilot:
Walter Extra**

**342.8 km/h
(eAircraft >1000 kg)**

**Pilot:
Walter Kampsmann**

World's strongest electric aircraft Extra 330LE with SP260D propulsion system towed FFVV Swift glider and showed aerobatics at Paris Air Show 2017

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Pilots:
Nicolas Honnons, Swift
Ulrich Schell, Extra 330LE

August 2017: First Formation Flight of Two Identical Electric Aircraft Magnus eFusion

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HEMEP – Hybrid Electric Multi Engine Plane

The project demonstrates the potential of a distributed propulsion configuration by implementing the following solutions:

- **Free-stream propeller integration**

Improvement of the overall aircraft's aerodynamics and total efficiency.

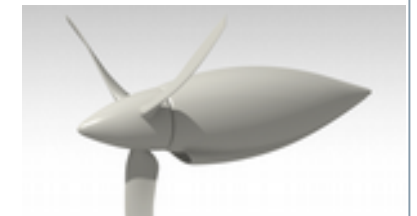
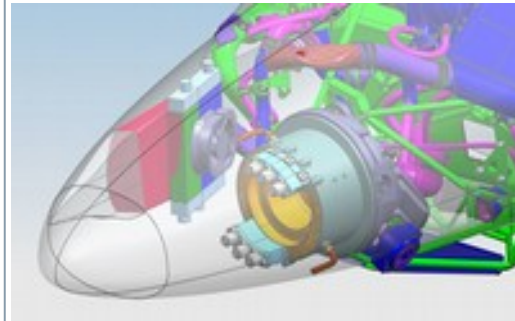
- **Ultra-light/fully integrated e-Motor**

Use of lightweight materials and fully integrated design (e.g. integrated propeller bearing, electrical fuel pumps, direct cooling system).

- **High-density battery integration**

An HV battery for silent and clean propulsion during taxi, take-off and as an emergency energy source during flight.

© Diamond Aircraft Industries GmbH



eAircraft Airbus-Siemens Collaboration – joint development agreement signed April 2016



SIEMENS

“Siemens is determined to establish hybrid-electric propulsion systems for aircraft as a future business.”

AIRBUS GROUP

“We believe that by 2030 **passenger aircraft** below 100 seats could be propelled by **hybrid propulsion systems...**”

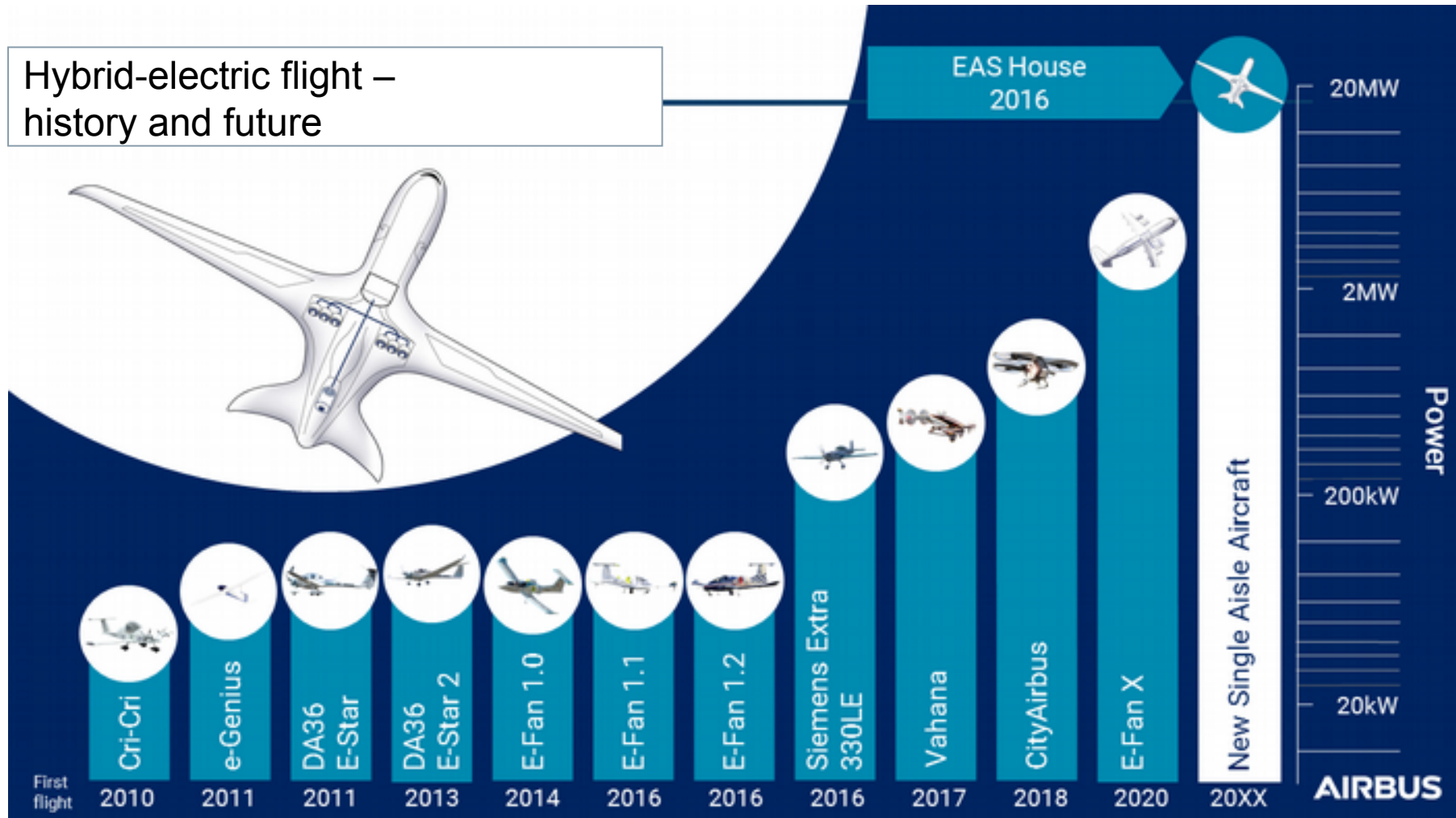
Airbus Group CEO Tom Enders

- Both companies take a significant joint development decision
- Demonstrate the technical **feasibility of various hybrid-electric propulsion systems by 2020**
- Assemble **joint development team** of some 200 employees

- Prototype propulsion systems ranging from a few **100 kW up to 10 MW** and more
- for short, local trips with aircraft below 100 seats, helicopters or UAVs up to classic short and medium-range journeys.
- Target: breakthrough innovation in **aerospace e-mobility**

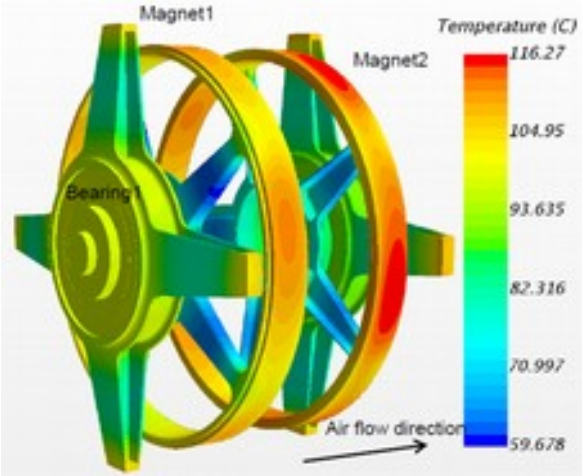
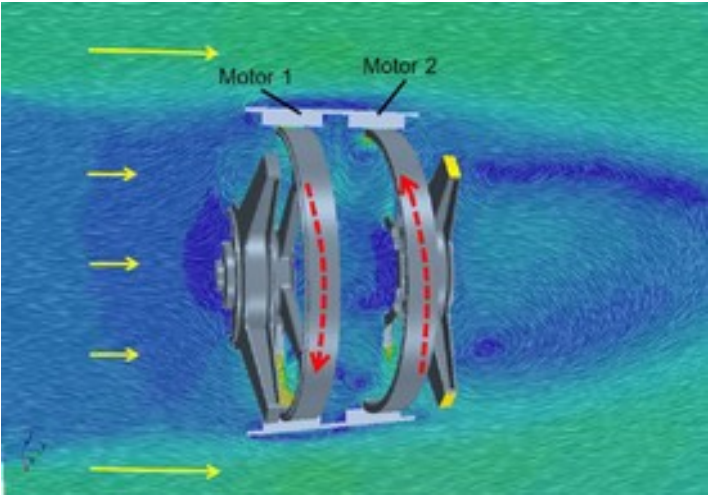
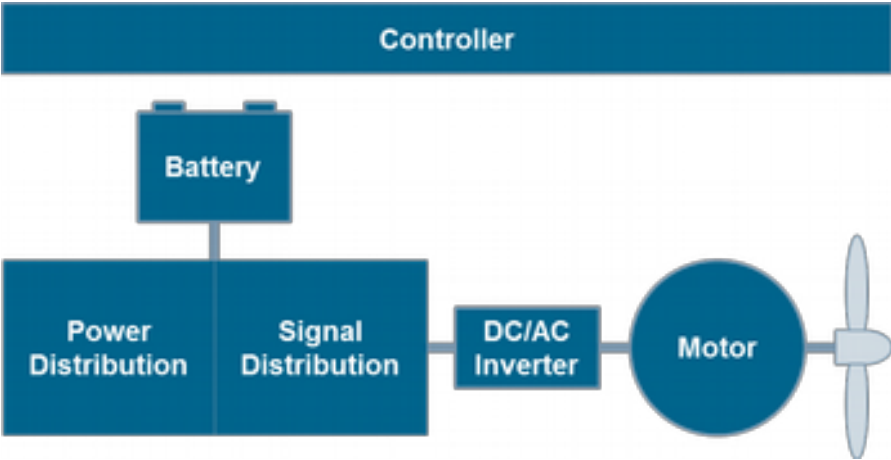
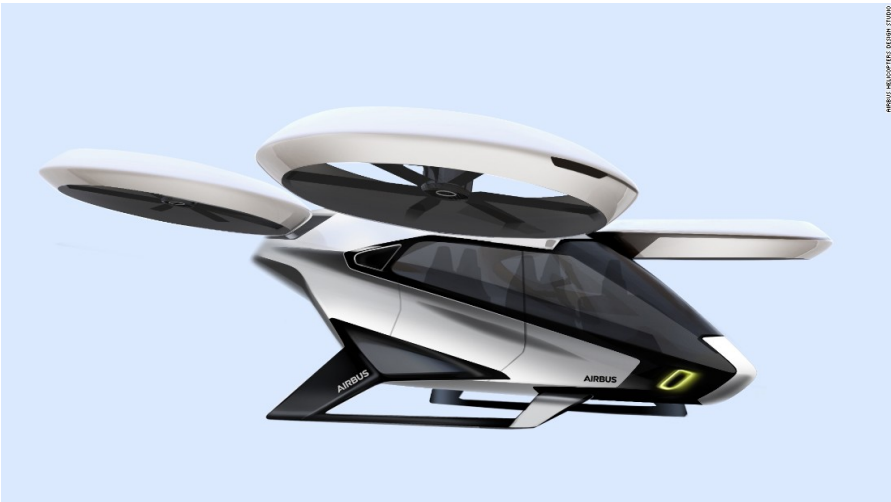
Siemens-Airbus collaboration roadmap

Hybrid-electric flight –
history and future



Airbus Siemens Collaboration - SP200D

City Airbus Picture, public release June 2017

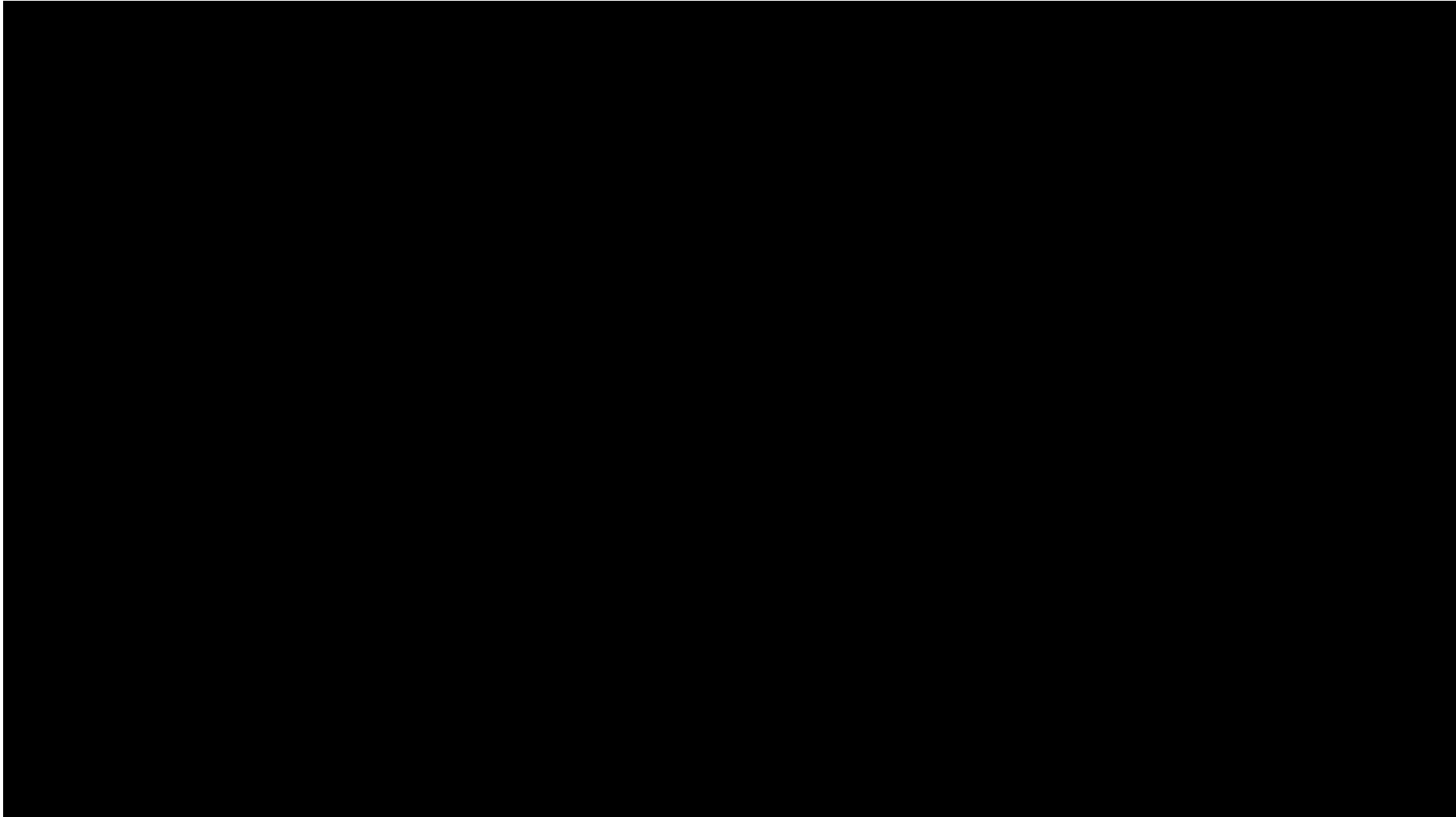


Electric Propulsion Unit EPU Data	
$P_{cont.}$	Not released
N_{max}	
$M_{cont.}$	
U_{zk}	
η_{Motor}	
$M_{motor, drive, propeller bearing}$	

Three core areas to address

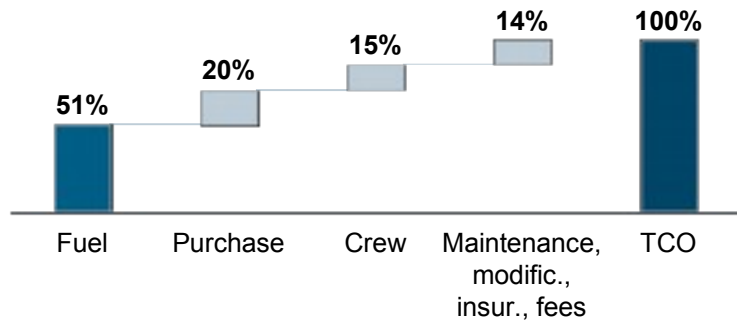
- **Storage energy density**
- **Certiability (safety)**
 - **Noise**

The sound of silence

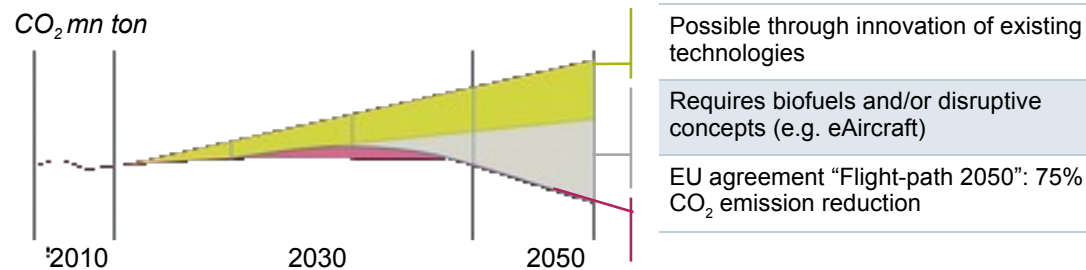


Economics and regulation push the aviation industry towards electrified propulsion

1. Reduction of fuel consumption: main lever to reduce aircraft TCO (example 737-800)

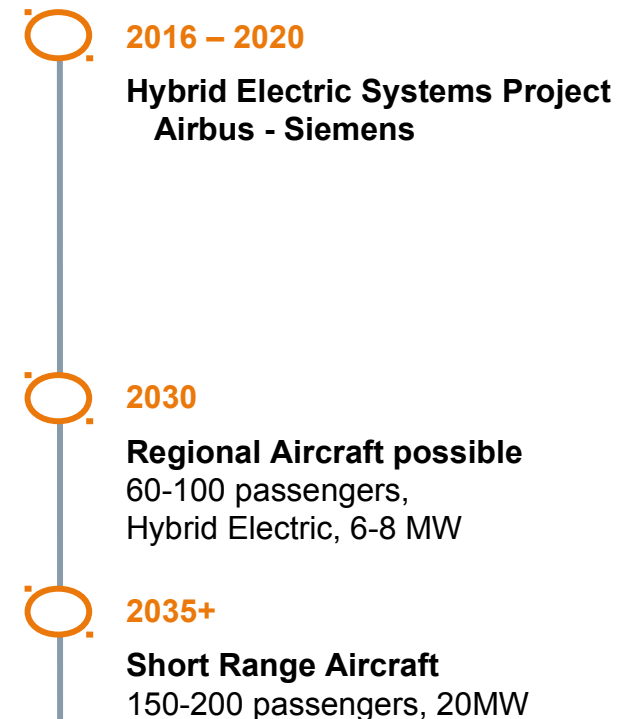


2. Projected emission goals: can only be reached with disruptive concepts ¹⁾



3. Customer perspective: extension of potential operating hours through noise reduction

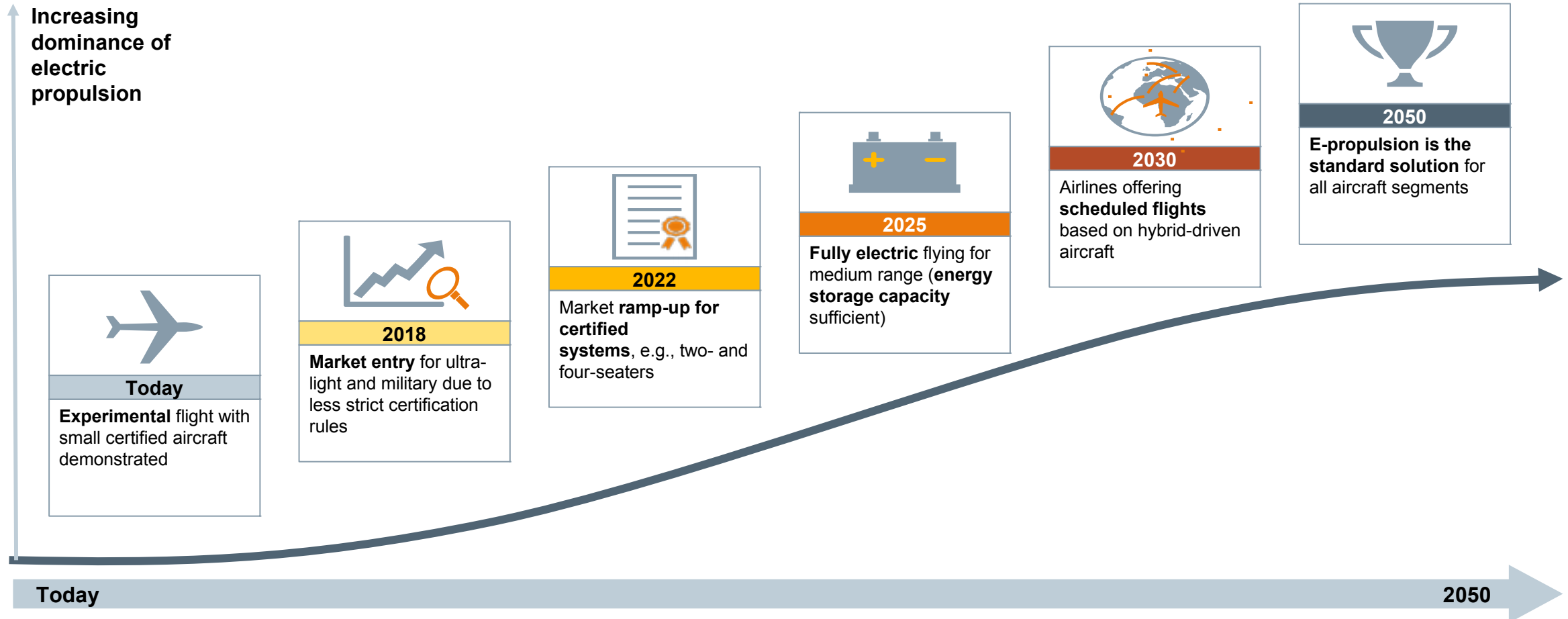
Major companies have realized this and define their roadmaps accordingly



1) IATA technology roadmap, June 2013

We expect e-propulsion to be in regular commercial flights by 2030

Milestone outlook for e-propulsion market



Contact



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