

# Electrifying propulsion

Olaf Otto - Siemens eAircraft

## Siemens eAircraft past ...

2011



First flight of the e-Star 1, the world's first hybrid-electric aircraft together with Airbus and Diamond Aircraft

2013



First flight of the improved hybrid-electric e-Star 2 together with Airbus and Diamond Aircraft

First flight of the electric WattsUp trainer together with Pipistrel

2014



2015



First run of the SP260D – the world's most lightweight electric ¼ MW aircraft motor

### Performance

$P_{\text{cont}}$	= 260 kW
$N_{\text{max}}$	= 2500 rpm
$M_{\text{cont}}$	= 1000 Nm
$\eta_{260\text{kW}}$	= 95 %
Mass	= 50 kg
P/m	> 5 kW/kg



... and present

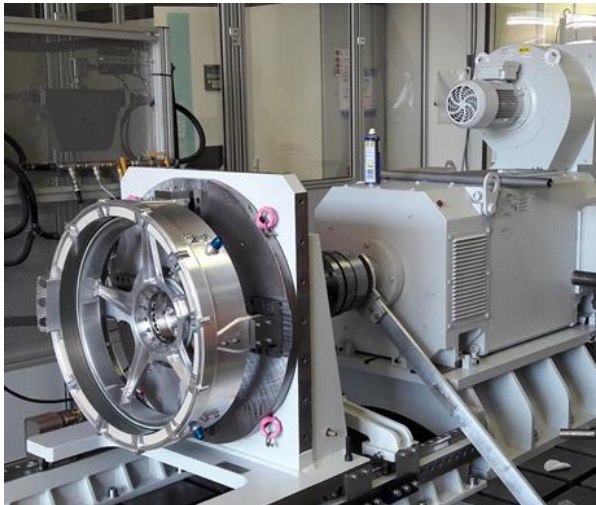
Sub- 100kW electric propulsion units



1/4 MW and greater electric propulsion units



Continued development of propulsion systems:  
Siemens SP200D EPU Direct Drive: 50% increase in Torque to Mass Ratio



	SP260D	2015		SP200D	2017
Continuous Power	260 kW			204 kW	
Rotational Speed	2500 RPM non-geared			1300 RPM non-geared	
Continuous Torque	1000 Nm			1500 Nm	
Mass	50 kg			49 kg	
Torque to Mass Ratio	20 Nm/kg		Increase by 50%	30.6 Nm/kg	
Inverter Type	Si			SiC	

# Applications are moving ahead - CityAirbus aiming for first flight in 2018

## CityAirbus

A multi-passenger, self-piloted electric vertical take-off and landing (VTOL) demonstrator designed for urban air mobility with cost efficiency, high-volume production and a low environmental footprint in mind.

### AUTONOMY

15 min

### ENGINES

- 8 fixed pitch propeller powered by direct drive engines
- 8 x 100 KW electric motors

### SIZE

Compact size for best UAM compatibility

### BATTERIES

- 4 x 140 KW power in the batteries
- 110 KWh energy in all four batteries

Ducted high lift propulsion units for efficiency, lowest acoustic footprint and safety

### CAPACITY

Design for up to 4 passengers

Avionics and Autopilot urban ATM

### CRUISE SPEED

120 Km/h

CityAirbus: Multi-passenger, self-piloted electric VTOL

2023 - fully certified  
CityAirbus becomes part of Urban transport

### Making CityAirbus a reality



VTOL: Vertical Take-Off and Landing

UAM:

ATM:

### The benefits of adding the third dimension to urban transport networks

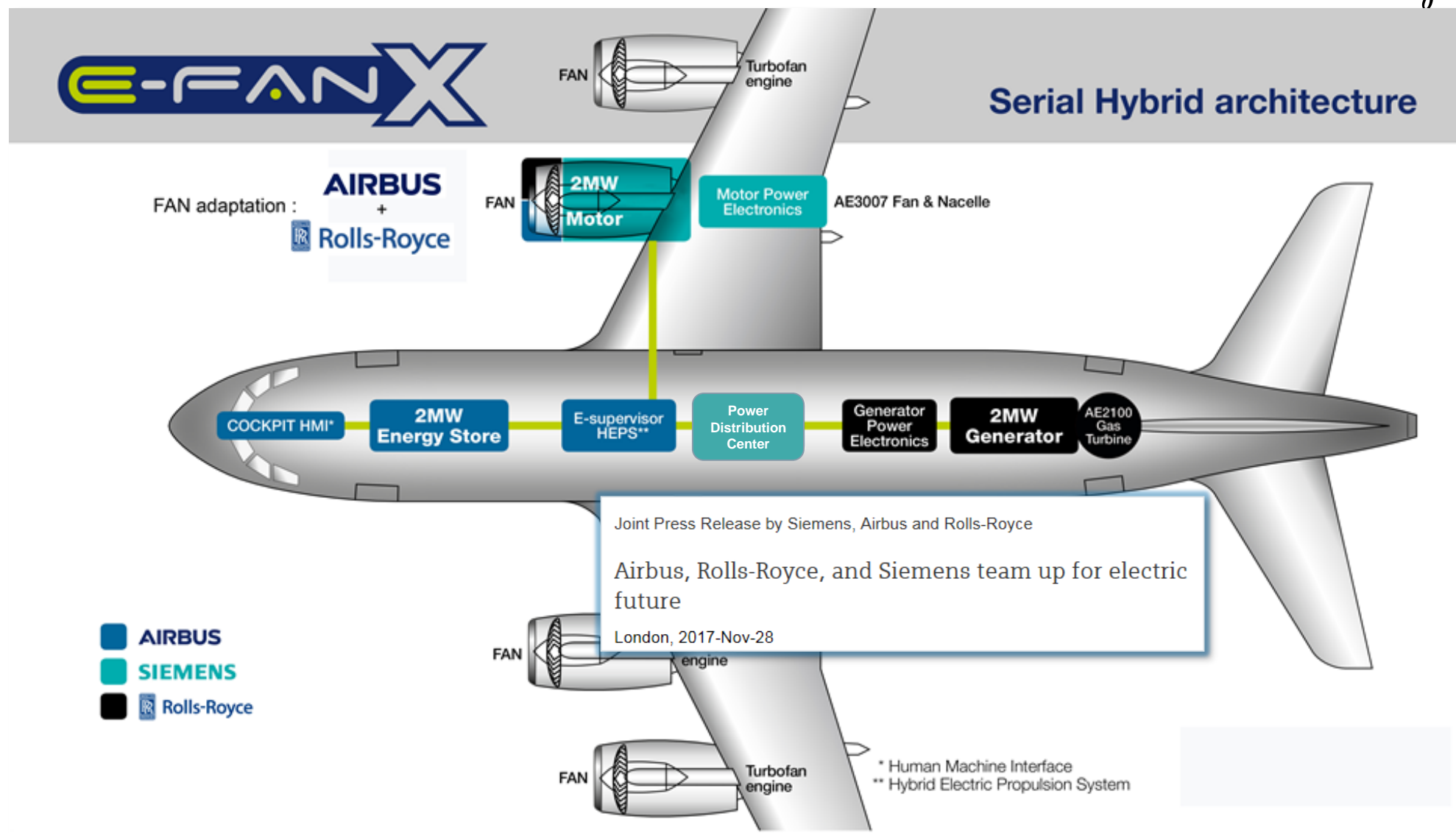


**AIRBUS**

Source:  
[www.airbus.com/newsroom/press-releases](http://www.airbus.com/newsroom/press-releases)



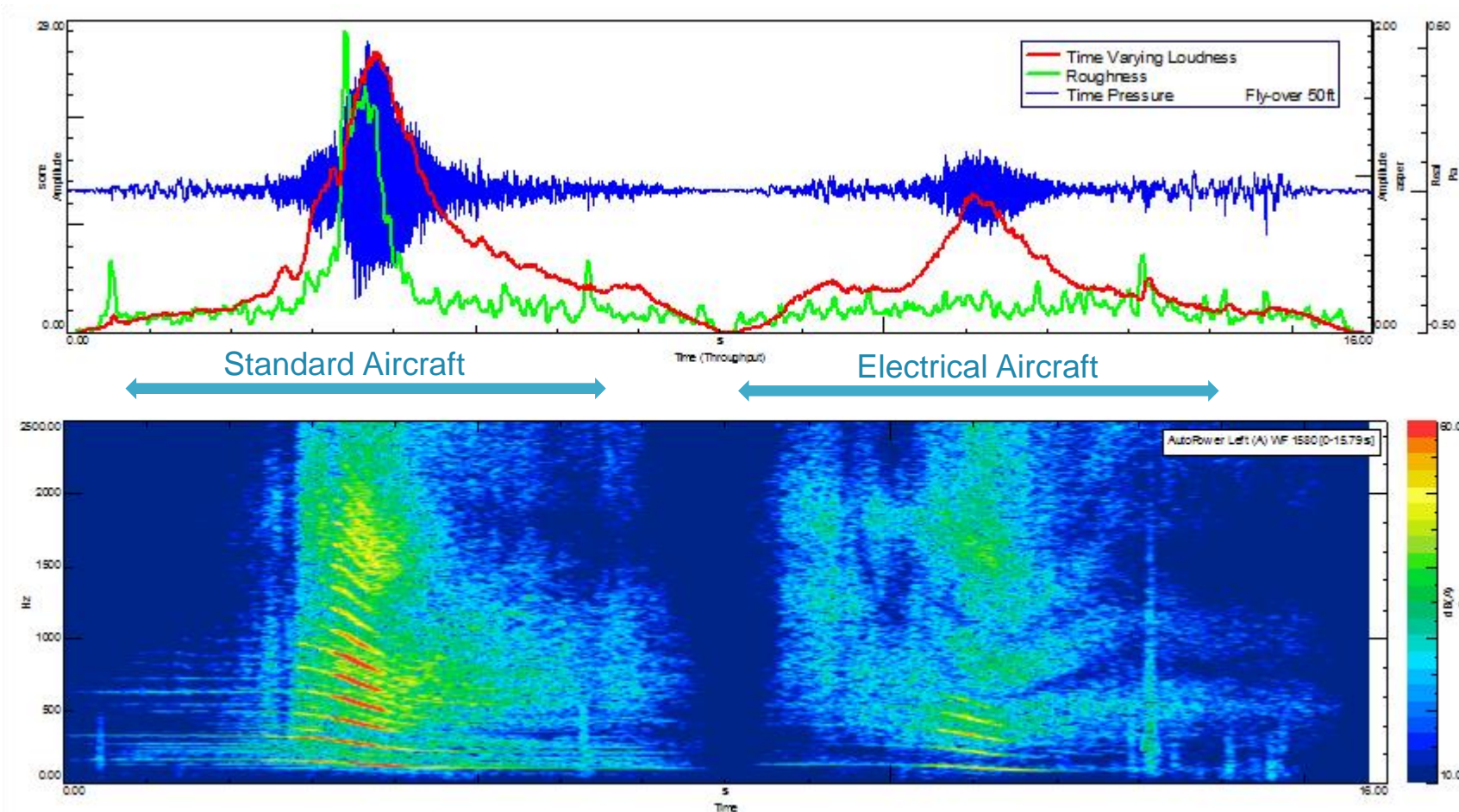
## High Power Class already moving to demonstrator stage



## Three core areas to address

- **Range**
  - storage energy density
  - roadmaps to >400 Wh/kg convincing
  - fuel cell emerging as strong contender
- **Certifiability**
  - safety
  - architectures to reach CS-level safety coming into focus
- **Utility**
  - power density
  - already >5 kW/kg on equipment level
  - paths to meet density of traditional propulsion on system level clear

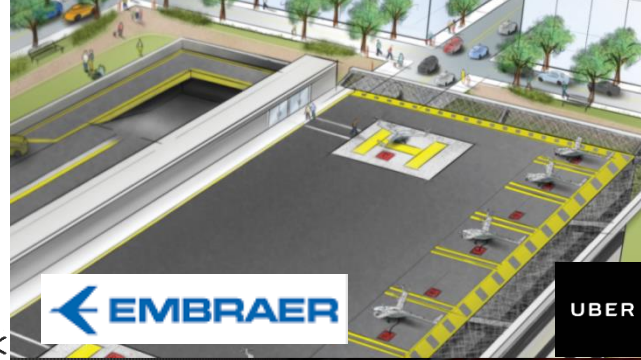
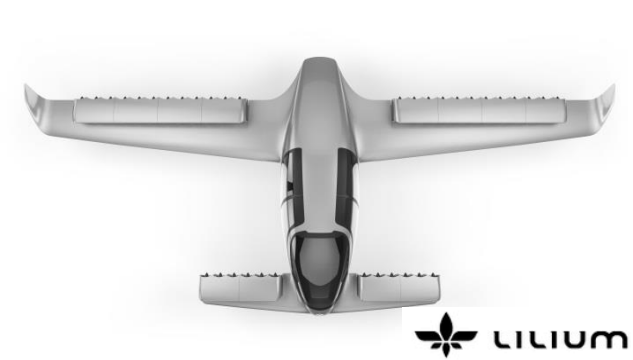
## Fly-over noise measurement – Acoustic analysis Fly-over 50 ft



- Loudness reduced from 26 to 13 Sones
- Roughness reduced from 1.9 to 0.3 Asper
- Tonal components greatly reduced

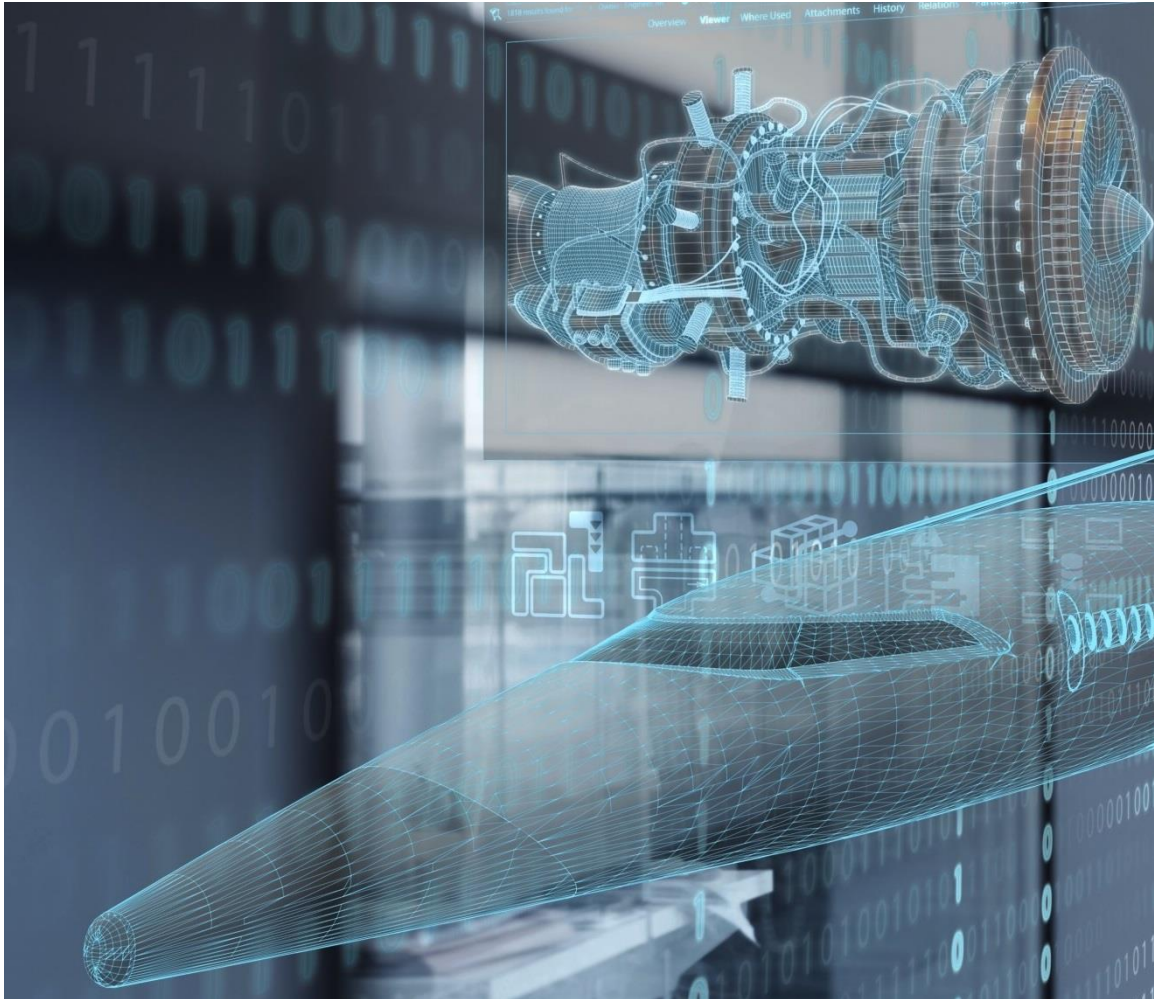
	$L_{ASmax}$ (dBA)
Siemens e-Aircraft	69.2
Piston Aircraft	83.7
<b>Noise Reduction</b>	<b>14.5</b>







## Contact



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