



HEMEP – Hybrid Electric Multi Engine Plane



2nd AirTN NextGen Network Meeting

June 30th 2015

OEFSE, Sensengasse 3, 1090 Vienna



Partners



Airbus Group Innovations



Battery System



Diamond Aircraft Industries



System Integration and Test Flight



Johannes Kepler University Linz – Institute for Fluid Mechanics and Heat Transfer



Aerodynamic Analysis



Siemens



Electrical Motors, Hardware and Control Software



Tera Group



Dynamic Analysis and Coupling of Range Extender





Project Goals

- Critical discussion of common power plant technologies
 - Identifying new solution to fulfil the requirements of today and tomorrow
 - **HETEP**: basic developments of a hybrid-electric twin engine airplane realized
 - **HEMEEP**: integration of a serial, hybrid-electric power plant into a prototype of Diamond Aircraft and flight test
- Proof of concept
 - Development of a certification basis
 - Confirmation of successful integration
 - Verification of increased efficiency and reduced noise level



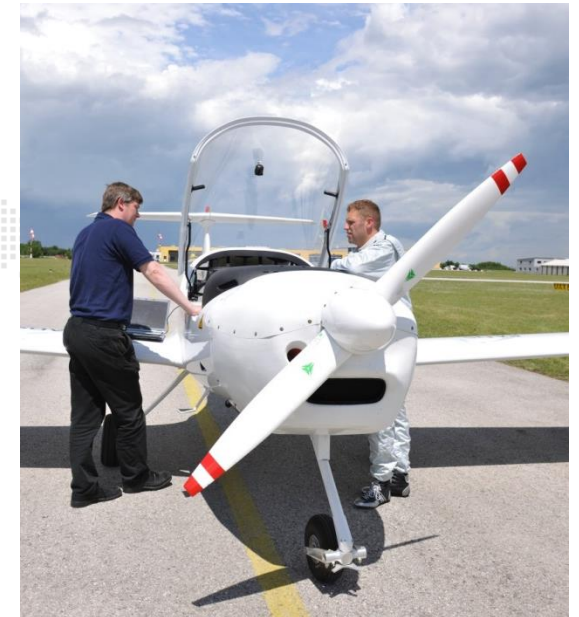


Previous Project DA36 hybrid-electric Motor Glider

First serial-hybrid Prototype: Le Bourget 2011

- MTOW: 930 kg
- Continuous Power: 30 kW
- Max. Take-Off Power: 70 kW
- Battery Capacity: 3 kWh
- Power density: ca. 5 kW/kg

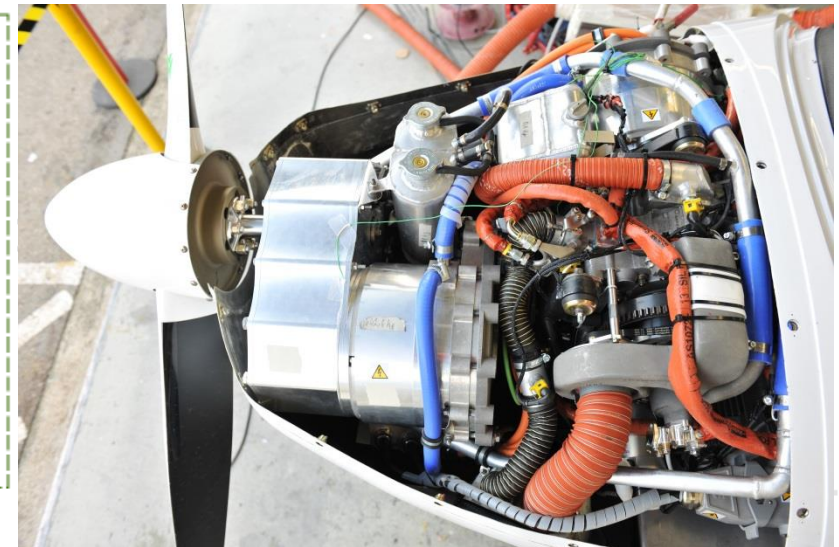
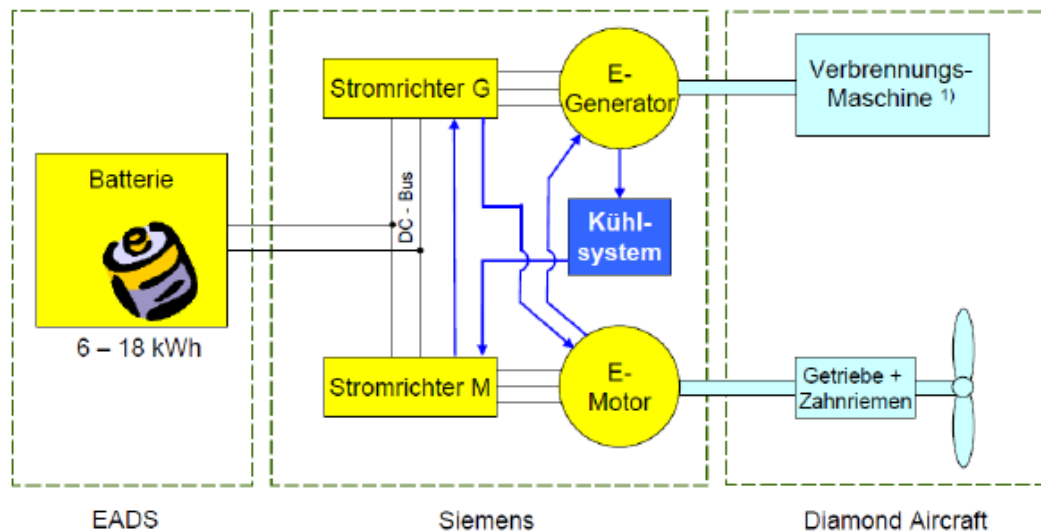
Advanced Prototype: Le Bourget 2013





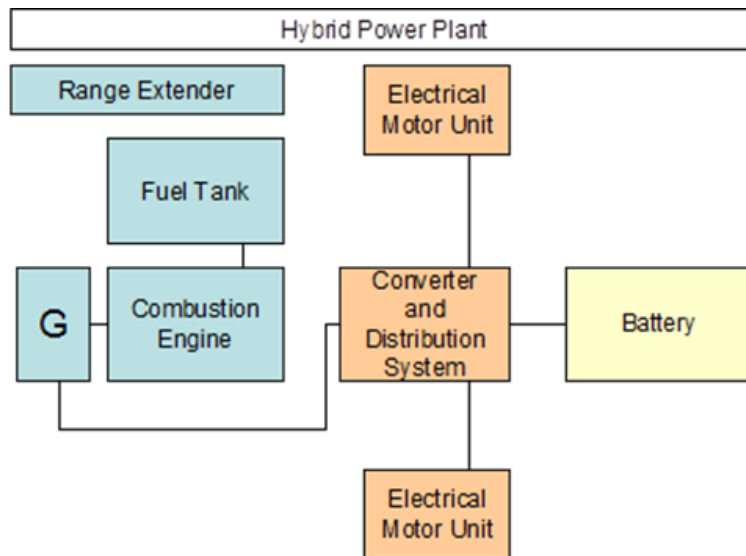
Previous Project DA36 hybrid-electric Motor Glider

- Reduction of fuel consumption and noise level through hybrid electric power plant
- Power Source: Batteries located in wings
- Charge of batteries through Wankel Engine connected to el. generator („range extender“) or on ground via external power source



HEMEP Specifications

- Airplane (fuselage/carrier): DA40
- Battery Pack Location: Rear Seats
- Range Extender Engine: AE300 Diesel/JET A1 4 Cylinder
- Electrical Motors & Propellers: 2-4 located close to fuselage or on wings



HEMEP Specifications

- Take-Off Mass: ~ 1300 kg
- Take-Off Power: 150 kW
- Full Electric Flight: 30 min



DA40



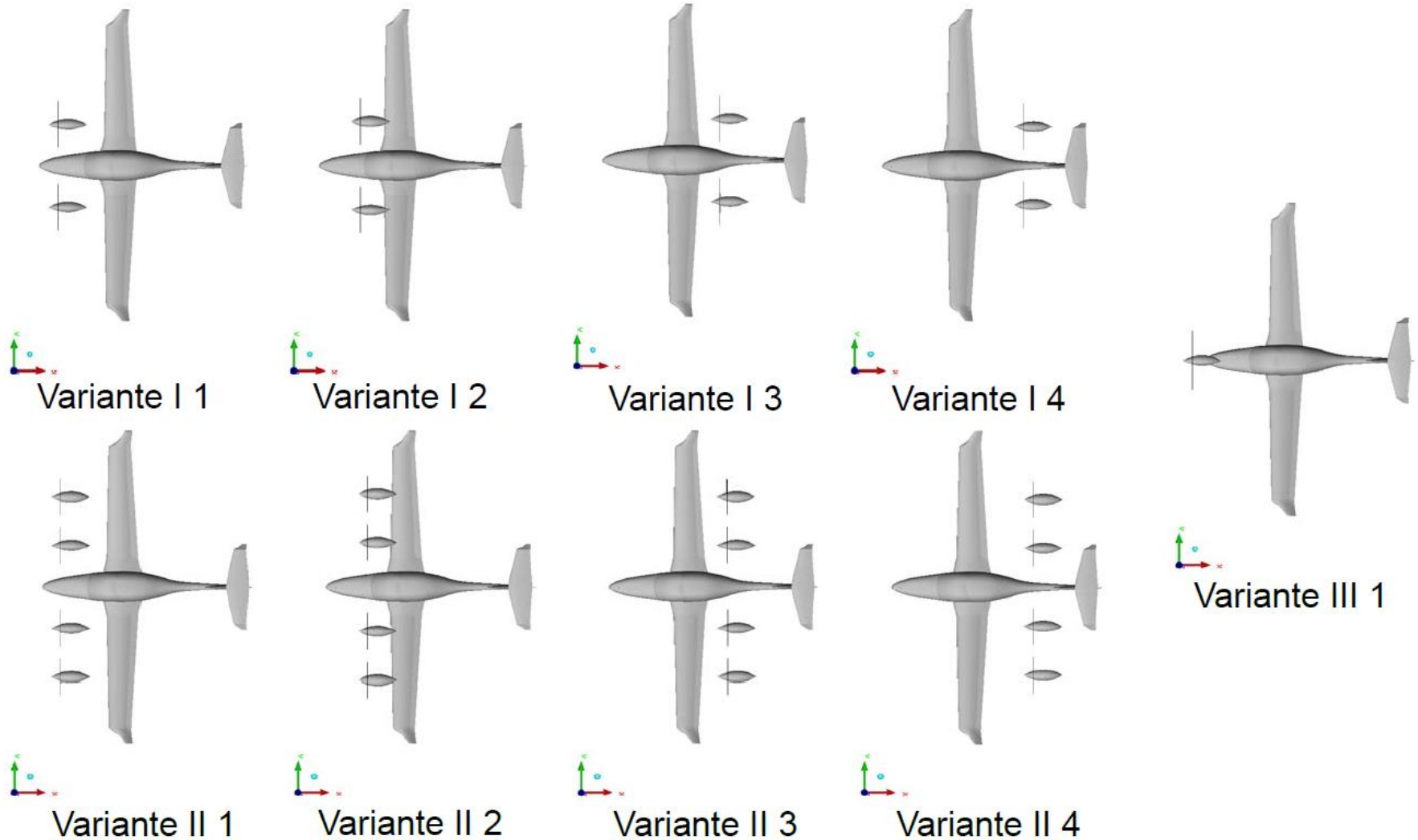
HEMEP Concept



Aerodynamic Analysis & Optimization



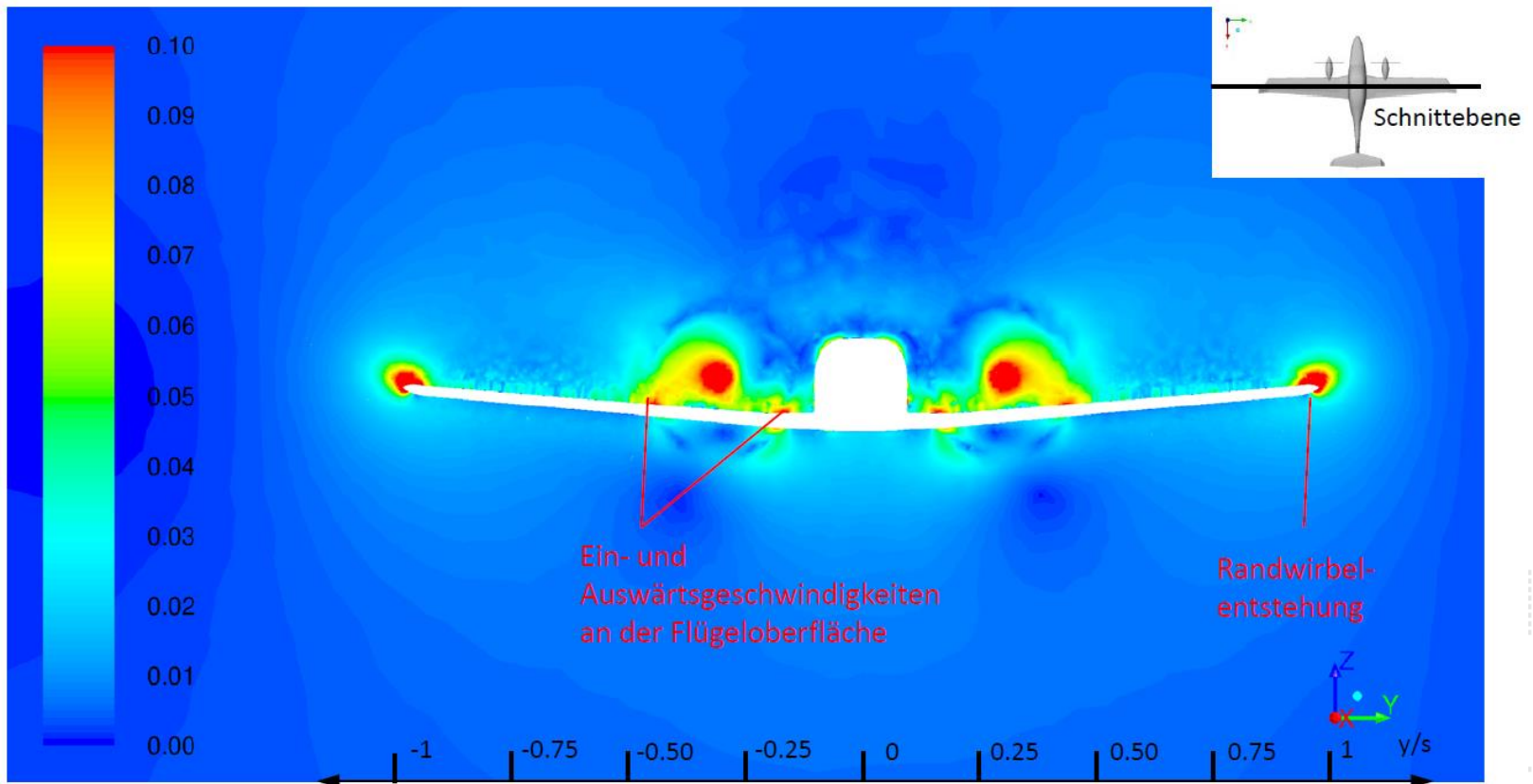
Analysis of different configurations





Aerodynamic Analysis & Optimization

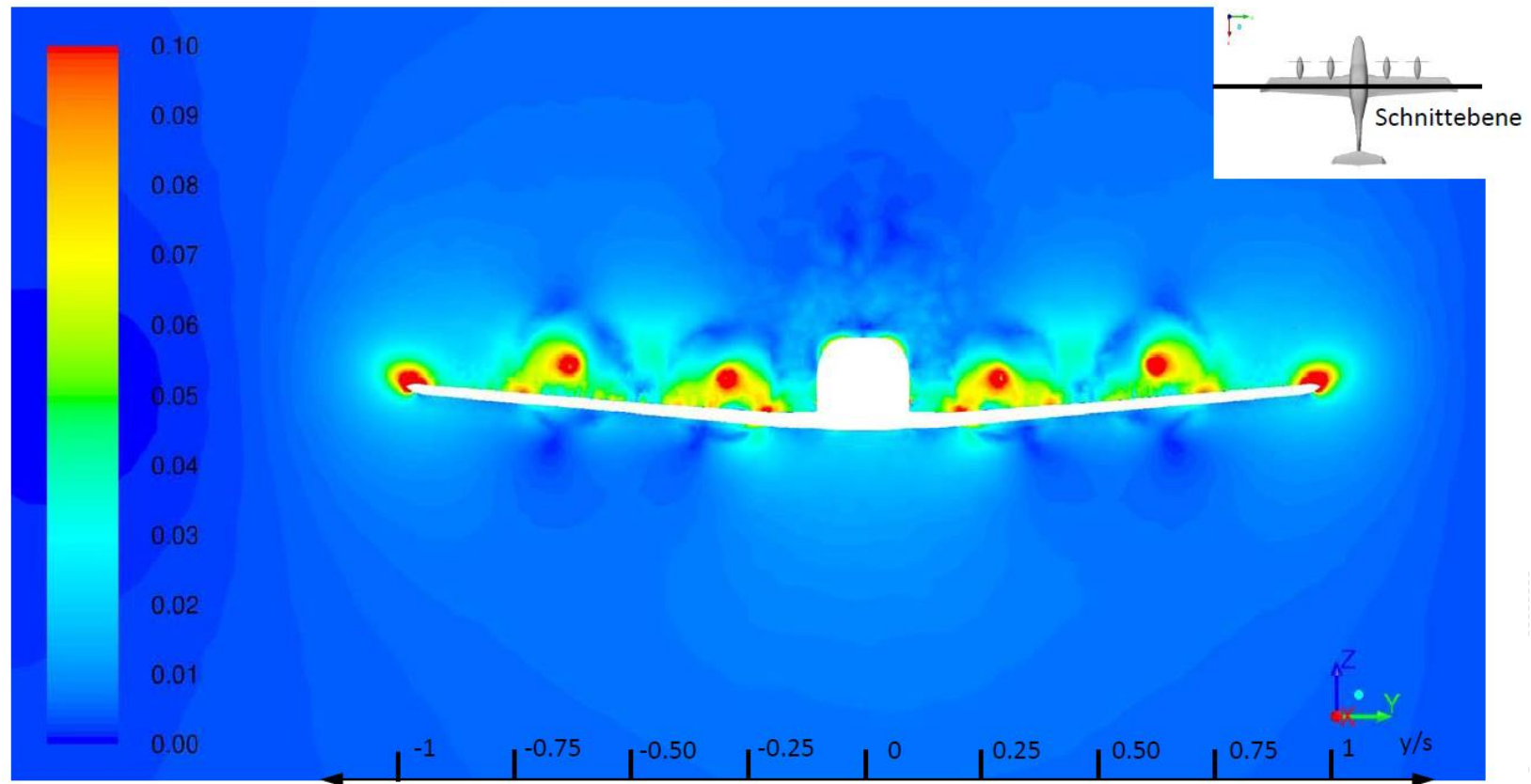
Analysis of different configurations: two engines („Variante I 2“)





Aerodynamic Analysis & Optimization

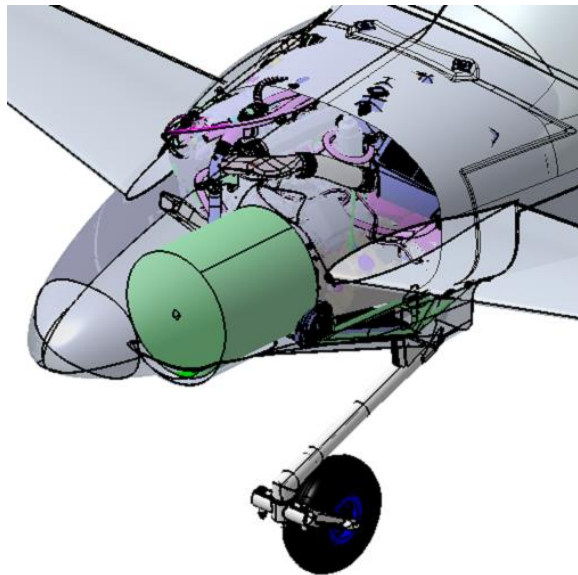
Analysis of different configurations: four engines („Variante II 2“)



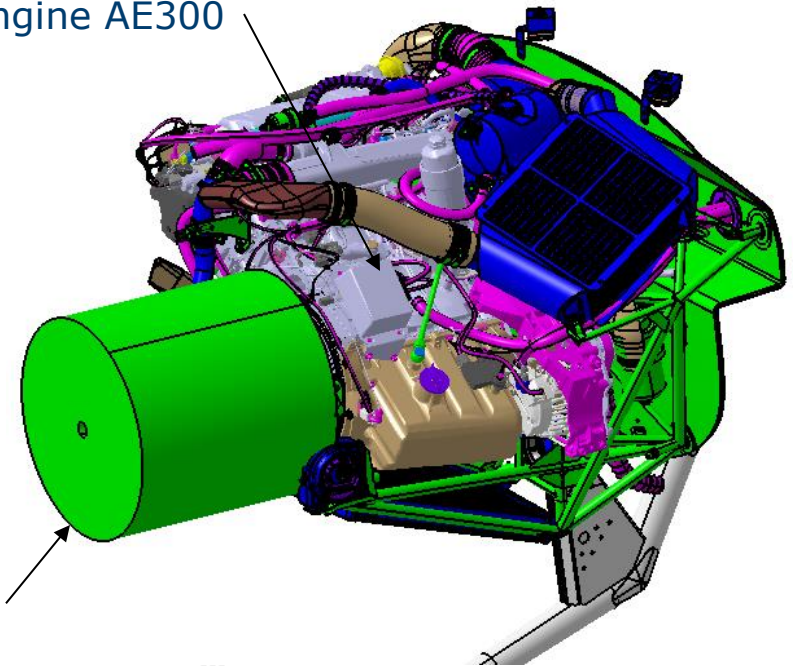
Normalized transversal velocity

Range Extender

- Generation of electrical power for motor units and charge of battery pack
- Maximum el. power: 125 kW



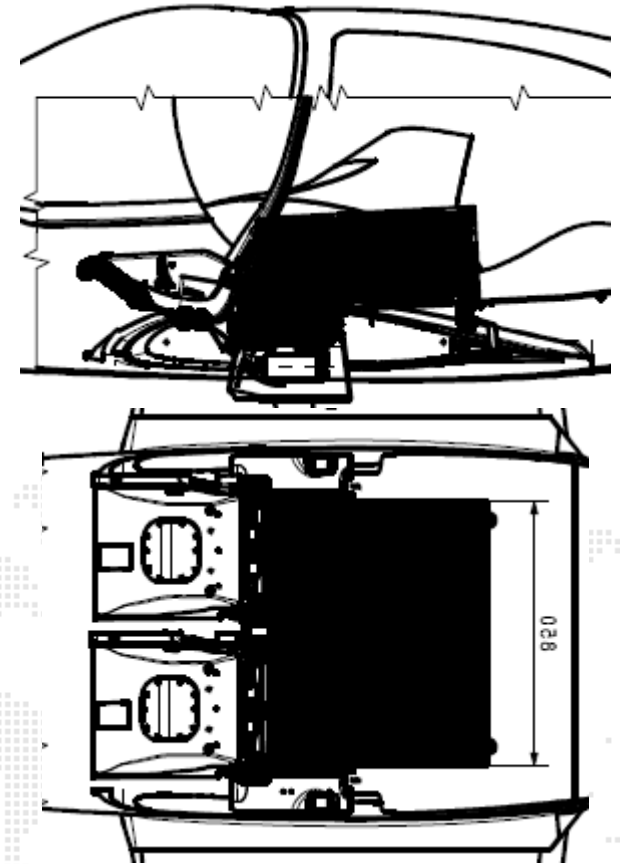
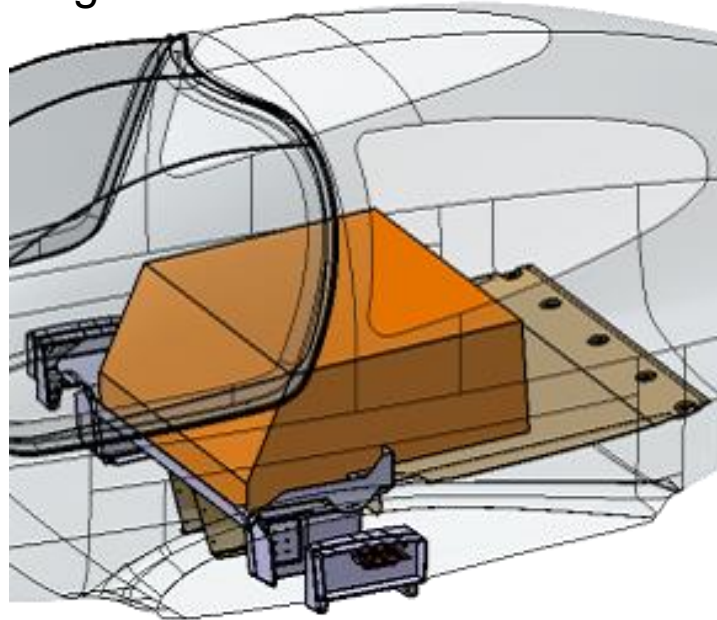
Combustion Engine AE300



Generator and Converter

Battery System

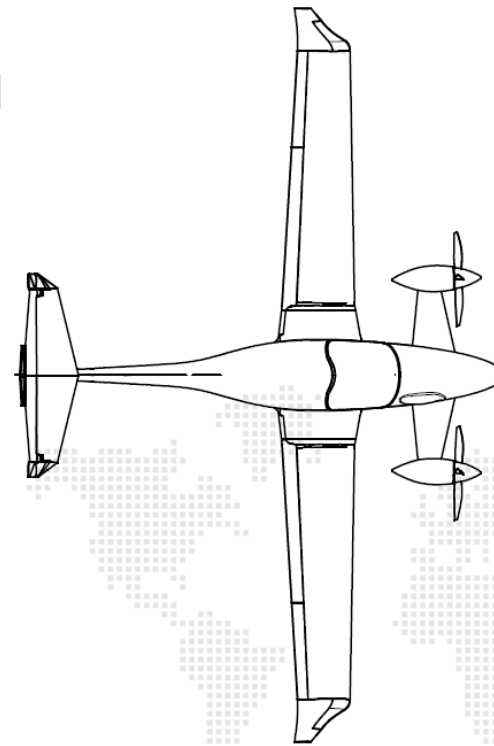
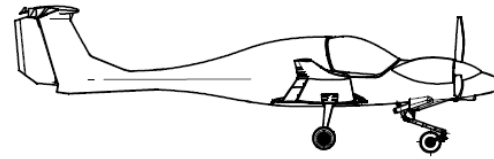
- Backup and booster mode for take-off and emergency
- Designed for full electric flight capability of 30min
- Capacity ~ 28 kWh
- Mass ~ 200 kg





Motor Units

- Final configuration is an optimum between aerodynamics, integration effort and safety/certification aspects
- Two fully redundant energy sources
- Large propellers for high efficiency and low noise
- Mass ~40 kg per Motor Unit





Time Schedule

- Q4/2015 CDR of electrical components
- Q2/2016 Component Integration
- Q4/2016 Maiden Flight and Flight Test Phase





Thank you for
your attention!

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