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# Conceptualizing a DCDC-Converter for Future All-Electric Aircraft Propulsion Systems

## Introduction

- This research focuses on **preparing the path towards All-Electric Aircrafts**
- A crucial component in such aircrafts with electric propulsion system is a **DCDC-converter**, that keeps its output at a stable voltage level (e.g. 3000 V), while that of the input varies depending on the state of charge (SoC) of the battery system
- For **redundancy** purposes, **two DC Buses** are established, requiring at least two DCDC-converter

## Architecture of an All-Electric Aircraft

- The propulsion system primarily consists of **four inverter-fed engines, two separate DC Buses, two DCDC-converters and two batteries**

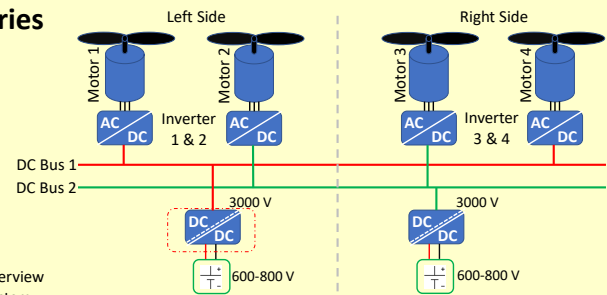
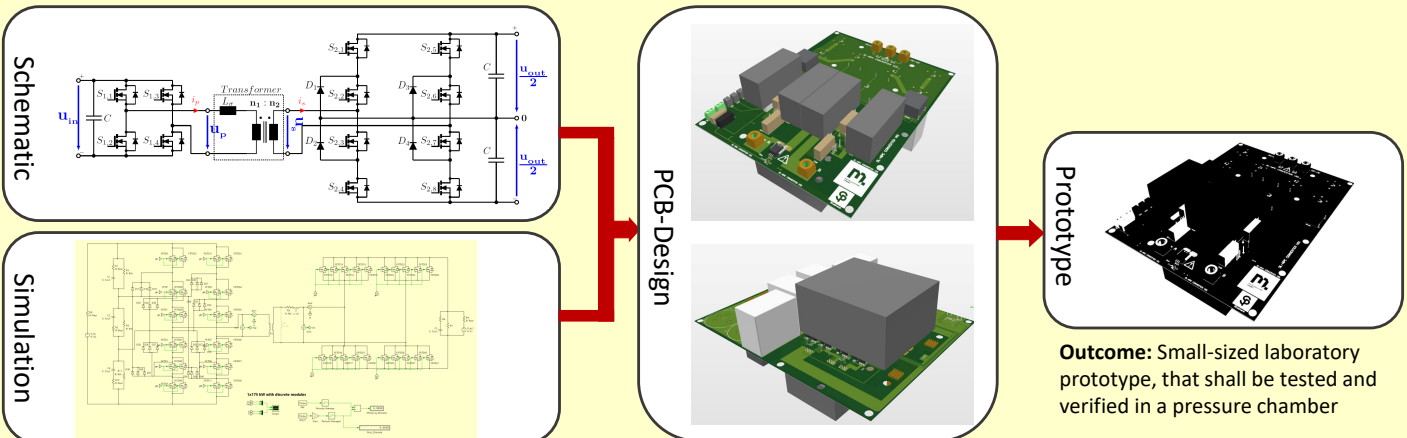


Fig. 1: Schematic overview of the propulsion system

## From Schematic To Prototype (DCDC-Converter)



## Difficulties and Issues to be Addressed

- One of the foremost important aspects to consider: **Lower ambient pressure at higher altitudes yields lower breakdown voltages**
- This has to be considered during the design, meaning that the trace widths in the PCB have to be increased

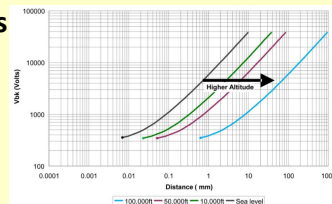
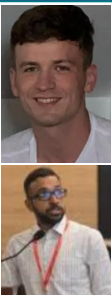


Fig. 2: Paschens curves at different indicated altitudes. Source: Advanced Energy application note AN1701

## Outcomes of this Project

- Specify the **most important requirements** in DCDC-converters with special regard to aircraft propulsion systems
- Derive design rules** for power electronic converters in aerospace applications
- Define test procedures**, which will be applied to a scaled-down model of the mentioned DCDC-converter



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### Current Research Focus of the Authors

- Power Electronics
- Drives and Machines
- Control



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