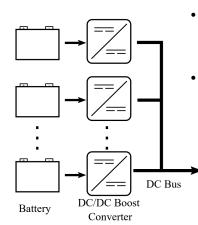
## Design and Implementation of a (Flying) Flying Capacitor **Multilevel Converter**

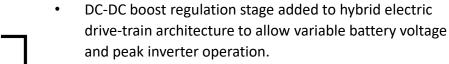


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Proposed drivetrain architecture.

## Motivation and Application



Inverter

Partnered with Ampaire and ARPA-E for flight gualification of hardware.

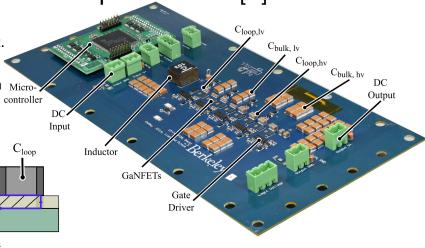
Electric Motor



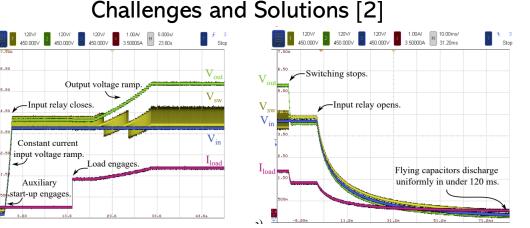
Ampaire EEL flight.

## Hardware Implementation [1]

- 10-level FCML design is light-weight and compact.
- Modified electrically thin < commutation loop design Micro controller decreases parasitic inductance. Cloop Commutation loop rendering.



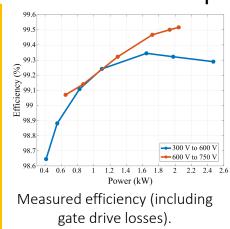
10-level FCML labelled hardware prototype.



- Start-up auxiliary circuit and control allows for safe start-up at high voltages.
- Careful shutdown control of FCML is demonstrated as to not over stress switches.

[1] S. Coday, N. Ellis, Z. Liao, and R. C. N. Pilawa-Podgurski, "A Lightweight Multilevel Power Converter for Electric Aircraft Drivetrain.," in 2021 IEEE Energy Conversion Congress and Exposition (ECCE), 2021.

[3] S. Coday, N. Ellis, N. Stokowski, and R. C. N. Pilawa-Podgurski, "Design and Implementation of a (Flying) Flying Capacitor Multilevel Converter," in 2022 IEEE Applied Power Electronics Conference and Exposition (APEC), 2022.



## **Experimental Results** [3]



Aircraft Installation

Samantha Coday, Nathan Ellis [2] S. Coday, N. Ellis, Z. Liao, and R. C. N. Pilawa-Podgurski, "Modeling and Analysis of Shutdown Dynamics in Flying Capacitor Multilevel Converters.," 2021 IEEE Workshop on Control and Modeling for Power Electronics (COMPEL), 2021. Email: {scoday, nathanmilesellis}@berkeley.edu

Table

Vibration test set-up.

Converter

