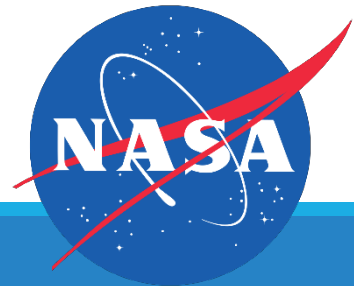

NASA RVLT Power System Efforts

Xavier Collazo Fernandez
October 10, 2022

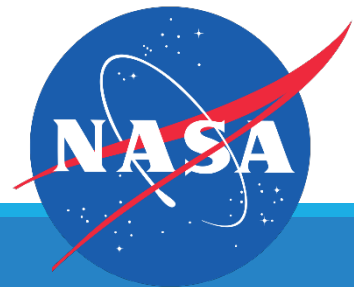
NASA Glenn Research Center
Cleveland, OH 44135

IEEE Energy Conversion Congress & Expo 2022
October 9-13, 2022, Detroit, MI



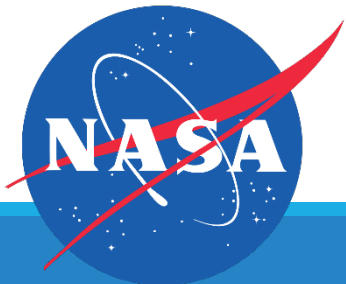
Overview

- Introduction
- Power Quality
- Experimentation and Validation
- Test beds Overview
- Team



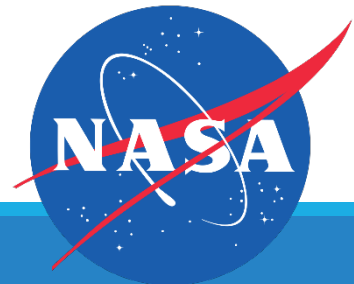
Introduction - RVLT

- Revolutionary Vertical Lift Technology (RVLT) Project
 - Primary Focus:
 - Advanced Air Mobility (AAM)
 - On-Demand Mobility (ODM)
 - Addressing industry gaps:
 - Tool Development
 - Standards Development
 - Model Verification



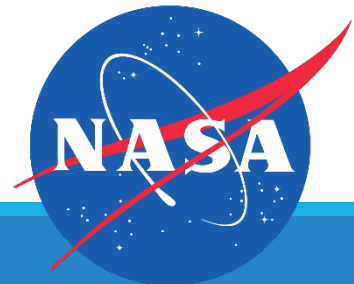
Experimentation and Validation

- NASA is addressing numerous aspects regarding electrical power system integration
- Standing up two facilities for:
 - Power Quality Analysis
 - Software/Equipment Validation
 - Motor Reliability Evaluation
 - Advanced Thermal research
- Scaled Power ELectrified Drivetrain (SPEED)
- Advanced Reconfigurable Electrified Aircraft Laboratory (AREAL)



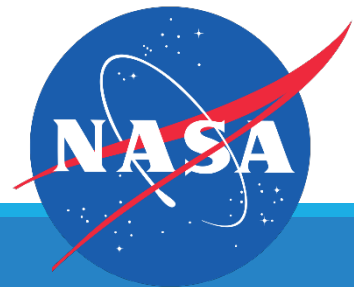
Power Quality

- A physical description of the electrical characteristics that allow the system to function properly without significant loss of performance or life. The physical description includes:
 - Steady State Voltage
 - Transient Voltage Limits in Normal/Abnormal conditions
 - Ripple Voltage
 - Stability
 - Fault conditions
 - Among others



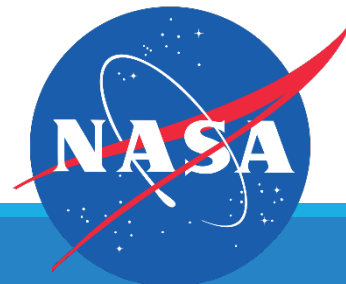
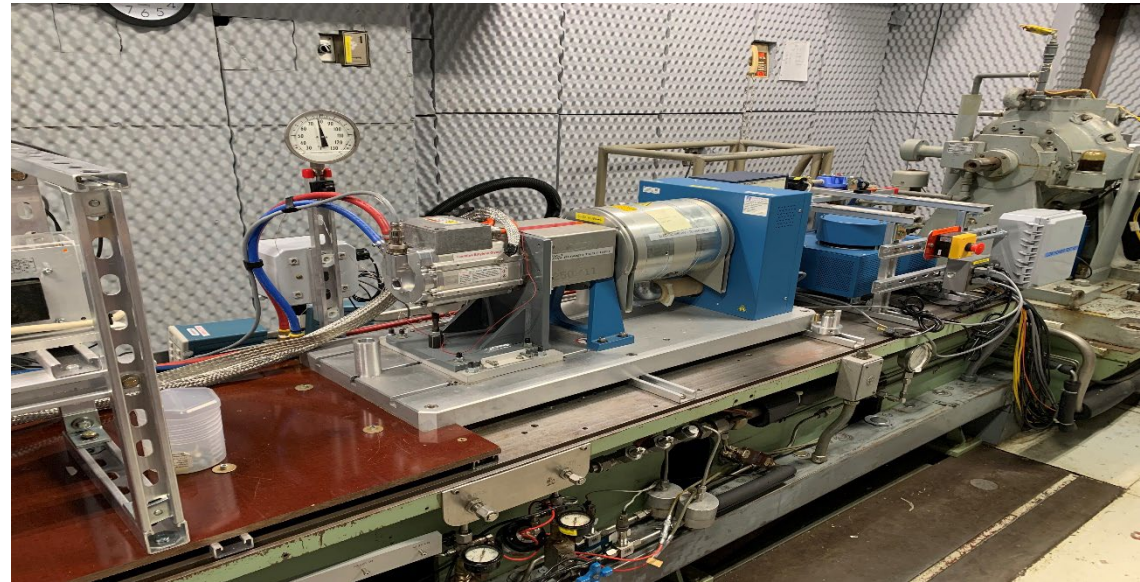
Power Quality

- Why does it matter?
 - Properly defined Power Quality allows power distribution systems to operate within boundaries to reduce component failures
 - System Stability
 - Fault Recovery
 - Designing system/components to a Power Quality standard can drive one to a 'plug and play' approach to design and integration



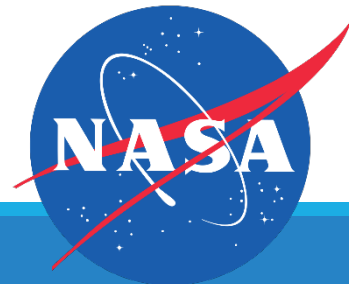
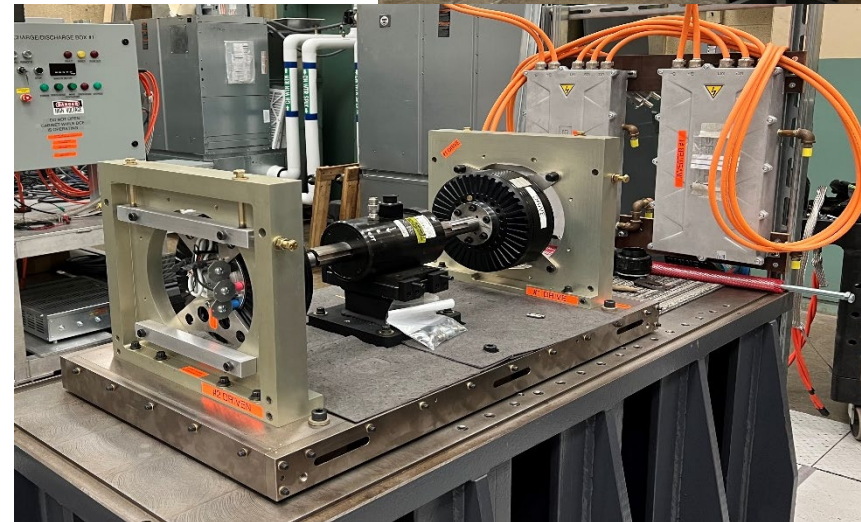
Scaled Power Electrified Drivetrain (SPEED)

- Scope:
 - Test Motor, Control, Communication, and Grounding Techniques
 - Support AREAL development
 - Mechanical and Electrical data
- Capabilities:
 - 400VDC and 12,000 RPM
 - Up to 7 kW (Dyno limit)
- Experiments
 - Motor/inverter characterization



Advanced Reconfigurable Electrified Aircraft Laboratory (AREAL)

- Scope:
 - Power Quality Investigation
 - Fault Testing Capability
 - Feed Standards development (AS7499, AS8441)
- Capabilities:
 - Emulated, Reconfigurable System
 - Single and Multi String
 - Up to 1kVDC
 - 200kW Nominal Source Capacity
- Experiments
 - Nominal, Transient, and Fault Operation
 - Characterization and Response



The RVLTP EP Team

- Peggy Cornell
- Linda Taylor
- David Sadey
- Patrick Hanlon
- Nuha Nawash
- Trey Rupp
- Brian Malone
- Greg Kimnach
- Mark Valco
- John Venziano
- John Koudelka
- Casey Theman
- George Thomas
- Paul Nowak
- Keith Hunker
- Xavier Collazo-Fernandez
- Henry Fain
- Mark Valco
- Al Revilock

