Less Iron and More Switches Increase Range, Phase I

Completed Technology Project (2018 - 2019)

Project Introduction

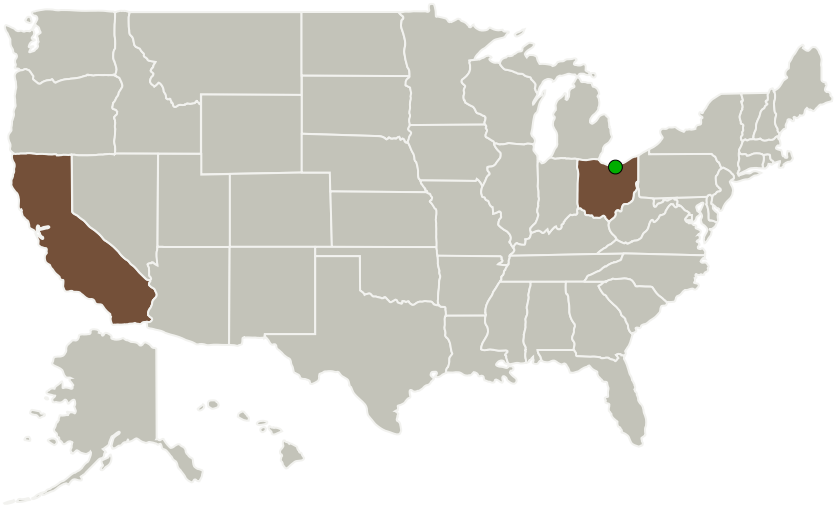
Current prototype motors and inverters for small aircraft electric propulsion have impressive efficiency of about 95 and 97% and typical power density of a little over 2kw/kg and 5kw/kg respectively. We can improve each of these metrics with a rigid winding which is formed in situ to increase slot fill and a 99.5% efficient inverter based on massively parallel, wide bandgap power switches. With independent "Brains" and "Brawn" sections, the inverter is scalable and can be distributed within the motor case, allowing fault tolerance and thermal integration benefits. The reduced weight and cooling needs represent an effective range enhancement of about 8% when configured for the X-57 cruise motors.

Anticipated Benefits

Scalable technology, at least 10-100kW for main propulsion, electric actuation, auxiliary drives etc.

Our innovations are relevant to any motor and inverter application with a high demand for performance, typically aerospace and military

Primary U.S. Work Locations and Key Partners



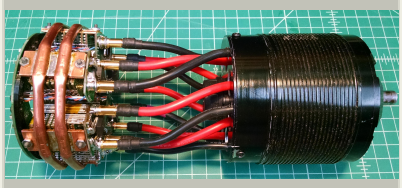


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Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destination	3

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Organizations Performing Work	Role	Type	Location
Continental Controls and Design	Lead Organization	Industry	Huntington Beach, California
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

July 2018: Project Start

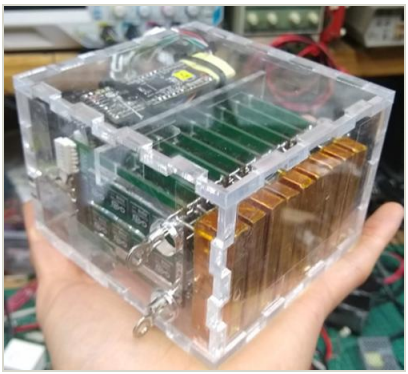
February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141147)*

Images

Briefing Chart Image
Less Iron and More Switches Increase Range, Phase I
(https://techport.nasa.gov/image/134595)



Final Summary Chart Image
Less Iron and More Switches Increase Range, Phase I
(https://techport.nasa.gov/image/126120)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Continental Controls and Design

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

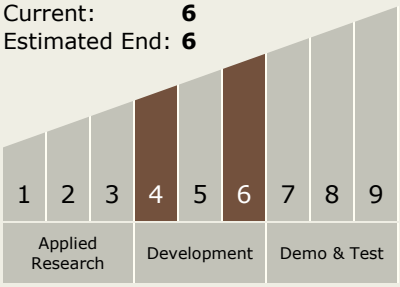
James Hynes

Co-Investigator:

James A Hynes

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX01 Propulsion Systems
  └ TX01.3 Aero Propulsion
    └ TX01.3.8 All Electric Propulsion

Target Destination

Earth