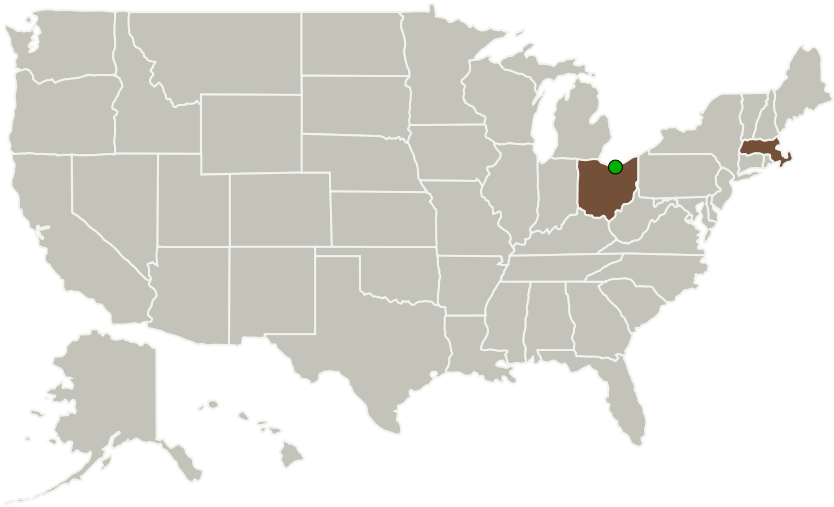
Vertical Lift by Series Hybrid Power, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

Multi-rotors (e.g. quad-copters) typically have direct electric drive, where the electric motor shaft is directly coupled to the propeller shaft. The benefit of this configuration is simple and high fidelity control. But electric drive for vertical lift typically relies on lithium polymer batteries for energy storage, and battery specific energy is extremely low compared to internal combustion fuels; Gasoline has about a 15X advantage over rechargeable batteries and diesel has about an 18X advantage. Current unmanned multi-rotor aircraft do not have the endurance or payload capability to act in place of manned observatory platforms (rechargeable batteries deliver at most two hours of endurance for multi-rotor aircraft with no payload). However, frequency response requirements tend to prohibit direct drive from an internal combustion engine. Aurora proposes to develop a reformulated Miller Cycle engine in Series Hybrid Architecture for use in small unmanned vertical lift aircraft to combine the benefits of both direct electric drive and internal combustion engine technology. The reformulated Miller Cycle will also confront the fuel mixing issues associated with sUAS sized small engines.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

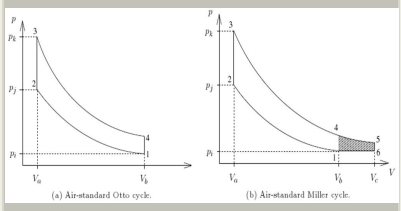


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Table of Contents

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

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations	
Massachusetts	Ohio

Project Transitions

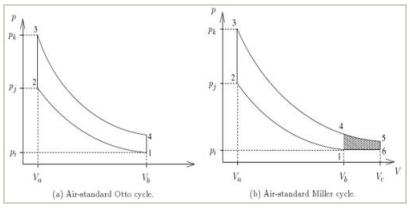
June 2015: Project Start

December 2015: Closed out

Closeout Summary: Vertical Lift by Series Hybrid Power, Phase I Project Image

Closeout Documentation:
- Final Summary Chart Image*(https://techport.nasa.gov/file/139423)*

Images



Briefing Chart Image
Vertical Lift by Series Hybrid Power, Phase I
(https://techport.nasa.gov/image/134339)

Project Management

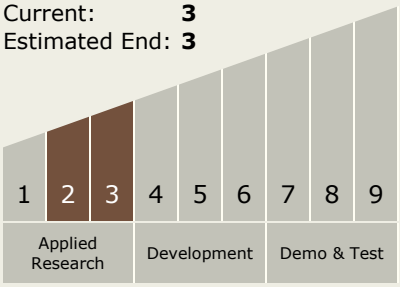
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Van Livieratos

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  └ TX12.3 Mechanical Systems
    └ TX12.3.2 Electro-Mechanical, Mechanical, and Micromechanisms

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System