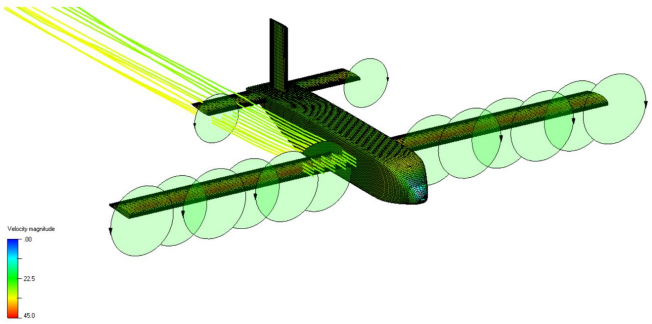
Modular Air Vehicle Research Intelligent Kit

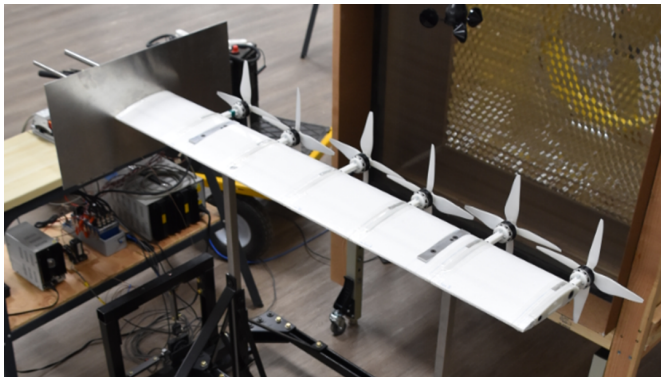
Design, Build, Fly

MAVRIK Aircraft Assembled

Flight Testing



Analysis in FlightStream®



Distributed Electric Propulsion Testing

The Modular Air Vehicle Research Intelligent Kit, or MAVRIK, is an unmanned aerial system that can be easily reconfigured by selecting different prefabricated components to perform customized missions and act as a test bed for new technologies, such as a tiltable wing with Distributed Electric Propulsion (DEP).

Designed From the Ground Up

The MAVRIK system is designed from the ground up using Advanced Aircraft Analysis (AAA). The tilt wing DEP aircraft features 12 motors and propellers installed on the wing, two motors and propellers on the tiltable horizontal tail and a custom-designed tilt mechanism and tilt schedule.

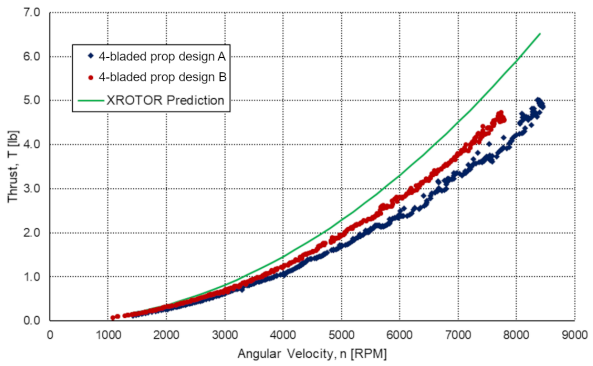
Analysis

Extensive analysis was performed using FlightStream® to understand the effects of propeller size, spacing and overlap on the required aircraft power loading and wing loading. The use of DEP technology drops the required wing area by nearly 50%. These effects are then tested on DARcorporation's in-house test stands.

Finite Element Analysis (FEA) has been performed to calculate the loads and stresses to ensure propellers, major aircraft members and avionics mounting points are structurally sound.

In-House Manufacturing

The aircraft is 90% composite with 3D printed, wood and aluminum components. The MAVRIK fuselage structure is comprised of carbon fiber panels for the skin and internal structure with a 3D printed nose section. The MAVRIK wing incorporates fiberglass skins with wooden ribs and aluminum motor mounts. The horizontal and vertical tails are foam-core fiberglass composite utilizing balsa wood control surfaces.



Propeller Performance Test Data

DARcorporation

Design • Analysis • Research

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Modular Air Vehicle Research Intelligent Kit

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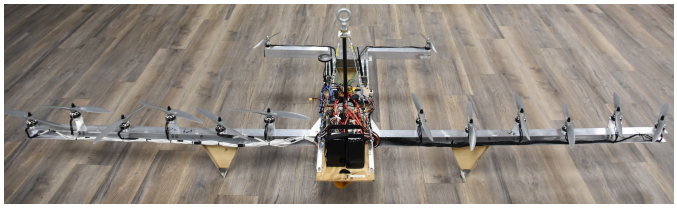
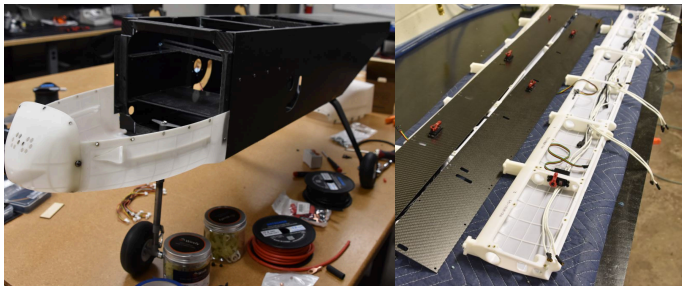
MAVRIK Tethered Hover Tests



Hover Test Bed (HTB)

HTB Tethered Hover Tests



MAVRIK Manufacturing

Testing The Aircraft

DARcorporation developed a Hover Test Bed (HTB) vehicle to validate the hover characteristics of the MAVRIK DEP layout. The HTB is a simplified beam structure with motors positioned in the same layout as the 14 motor MAVRIK configuration.

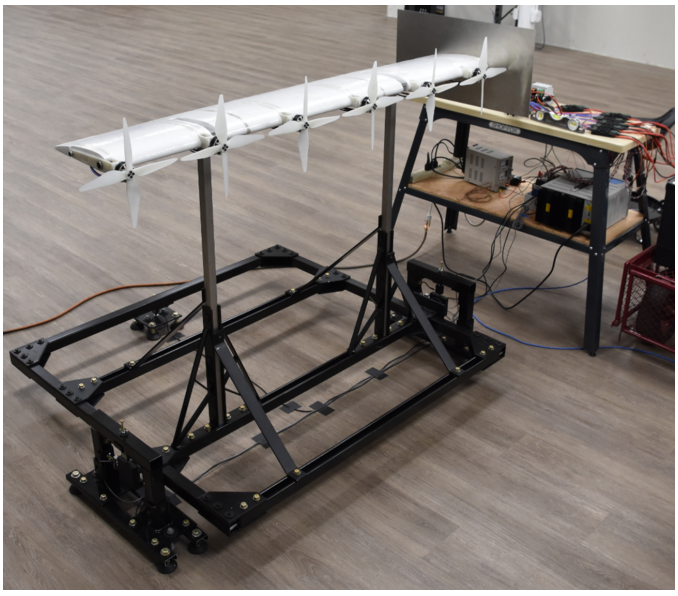
Tether testing of the HTB confirmed the control scheme and allowed DARcorporation engineers to fine tune the flight controller gains before testing the actual MAVRIK vehicle.

MAVRIK tether testing and further control gain adjustments ensured MAVRIK is well-behaved during VTOL and hover flight. Additional hover testing, transition to horizontal flight and conventional flight test is ongoing.

Capabilities/Services

The use of the MAVRIK platform provides DARcorporation engineers with expanded capabilities, including:

- Testing New Rapid-Prototyping Manufacturing Methods
- Testing New Autopilot Hardware/Software
- Testing Kill System/Parachute Systems
- Provide a Low-Cost UAS for Civilian and Military Applications and a Research Platform for Universities and Research Institutions



Distributed Electric Propulsion Test Stand

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