DARcorporation

Design • Analysis • Research

July 2022

We Hope To See You In Oshkosh!

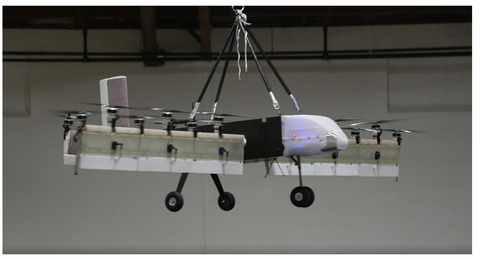
EAA Air Venture Oshkosh
EAA Fly-In Convention Grounds
July 25 - July 31

- Hanger C, Booth #3072C
- Consulting Project Samples
- Software Information and Demonstration
- Daily Air Show Schedule

Recent Technical Papers Presented

Modular Air Vehicle Research Intelligent Kit (MAVRIK) at AIAA Aviation

One of the papers presented at the 2022 AIAA AVIATION conference was on the design, building and testing of Modular Air Vehicle Research Intelligent Kit (MAVRIK), an unmanned aircraft capable of vertical take-off and landing using Distributed Electric Propulsion (DEP). Key findings include that a DEP configuration increases the wing lift by increasing the dynamic pressure and for hover the battery power required can be decreased by overlapping the rotors. The airframe is a hybrid of 3D printed and composite materials, e.g., the wings are modular so that extra 3D printed wing sections with motors can be added. The fuselage is constructed with carbon fiber panels and frames. Flight testing started with the Hover Test Bed, an aluminum version with all electronics and motors installed for a hover only flight test. This was used to tune the autopilot gains. Then MAVRIK was flown in tethered hover tests and the team is now preparing for transition testing to go from hover to forward flight.



Optimization of Propulsion Systems at Vertical Flight Society

DARcorporation presented a technical paper on the modeling and optimization of propulsion systems for eVTOL aircraft at Forum 78, organized by the Vertical Flight Society. UAV platforms often use commercial off the shelf components for propulsion and electric motor manufacturers often only include the maximum efficiency in their specifications, making it hard for UAV designers and manufacturers to predict the actual propulsion performance and efficiency. DARcorporation presents a novel method of analysis to predict the flight endurance of any motor, battery, propeller combination. A flying testbed was used to install different propulsion combinations and measure the flight endurance. The data from four different configurations was used to compare against and validate the proposed analysis method. It was shown to be accurate within 0.5%. In the future, the model could be used by UAV designers to better predict the vehicle performance using Commerical Off The Shelf (COTS) components.

Modular Air Vehicle Research Intelligent Kit (MAVRIK)

Come visit our MAVRIK page to learn more about this NASA Small Business Innovation Research (SBIR) project. MAVRIK can easily be reconfigured and serve as a test bed for new technologies using specialized components. Request a copy of our 2022 AIAA AVIATION paper.

Congratulations Transcend Air on Your USAF AFWERX Phase II Award

DARcorporation would like to congratulate the Transcend Air team for their accomplishments. DARcorporation engineers have been working with Transcend Air on the design of the Vy 400 tiltwing aircraft during the conceptual, preliminary and now detailed design phases.

Propeller Design, Prototyping and Testing for eVTOL

DARcorporation performed an in-house design of a 20" diameter 2-bladed propeller for 140 Newton thrust level. This was an eVTOL design for high efficiency at static and low speed operations. Aerodynamic design of blade sections was tuned for desired flight condition and paired with motor operating RPM as part of system level optimization. Structural analysis using Finite Element Analysis (FEA) was performed and a static load test plan was formulated. The propeller was cut on our 4'x8' CNC router from aircraft grade birch. Testing to validate aerodynamic and acoustic performance is ongoing.

New CAD Models!

12 NEW Aircraft CAD Models added to our online store:

- Bell XV-15
- Beechcraft King Air 350
- Britten-Norman BN-2A-2 Islander
- Britten-Norman BN-2A-3 Islander
- Britten-Norman BN-2A-3 Islander with Ducted Fan Mod
- Cessna 172R Skyhawk
- Cessna 210L Centurion
- Grumman AA-1 Yankee
- Lockheed P-3B Orion
- Northrop N-9M-B
- Rutan VariEze
- Tecnam P2006T

The aircraft CAD models were created by DARcorporation engineers using Siemens NX CAD. Models are 3D solids available in multiple file formats. The models were created based on publicly available, open-source data (not manufacturer's data) from sources like Jane's All the World's Aircraft, Roskam's Airplane Design Series and publicly available government reports.

Disclaimer: DARcorporation cannot guarantee the accuracy of these models due to limited public information.

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