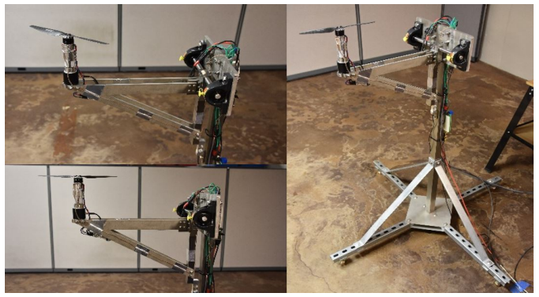
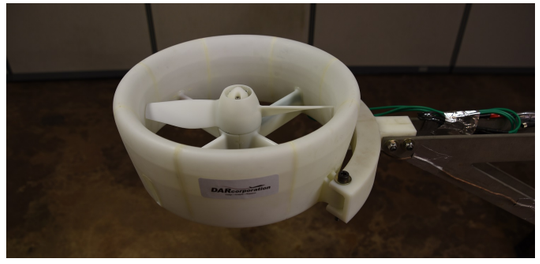
Sample Projects



UAV Propeller Test Stand



In-house 3D Printed Ducted Fan on Test Stand

Helicopter Rotor Blade

- Design, prototyping and testing of a UAV propeller/rotor for enhanced thrust and reduced noise for an international consumer electronics OEM.
- Design and manufacturing support of the propeller for a large UAV helicopter (350 kg) for an international UAV OEM.
- Duct and propeller aerodynamic design for Rivers Aeronautical UAV.
- Aerodynamic design of the inlet for Samson Motors Switchblade.
- Design and support of prototyping and manufacturing of an open-loop vertical wind tunnel fan assembly (rotor blades, hub and duct section) for Aviator (Beijing) Investment Co., Ltd.
- Design and support of prototyping and manufacturing of two recirculating vertical wind tunnel fan assemblies with different test section sizes (rotor blades, hub and duct sections).
- Design and support of prototyping and manufacturing of an outdoor vertical wind tunnel fan-rotor assembly for Liaoning Ante Steel Group.
- University of Kansas large wind tunnel rotor blades composite overwrap refurbishment.
- Ground test development and test management for a propeller propulsion system.
- Rotor blade aerodynamic and structural design for Sterna Composite Aircraft

About Us

DARcorporation (Design, Analysis and Research Corporation) is an aeronautical engineering firm, located in Lawrence Kansas, that has been offering aeronautical engineering consulting services, software and books since 1991.

Experience in the design, detailed analysis and building of prototypes gives DARcorporation a unique advantage over other companies, since we can go from initial design all the way through full size prototype manufacturing and testing. We will work with you to design and optimize your propeller, open rotor or ducted fan for performance, manufacturability and cost. Let us know how we can support your projects.

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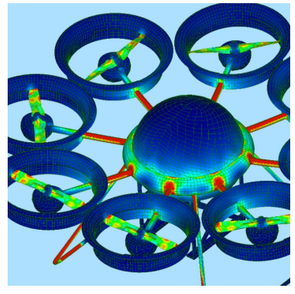
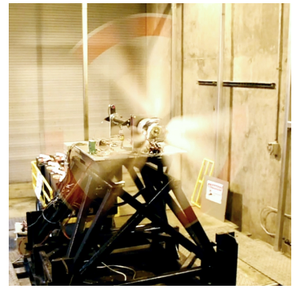
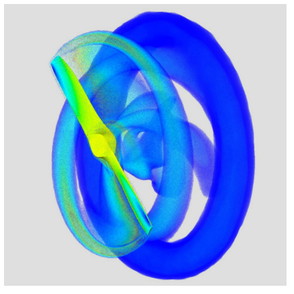
Propeller and Ducted Fan

DESIGN, PROTOTYPING AND TESTING







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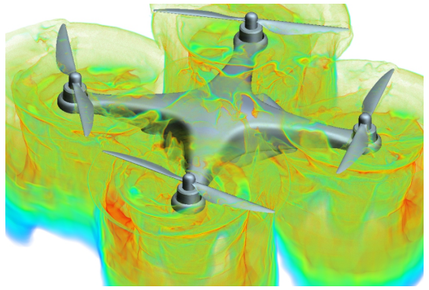
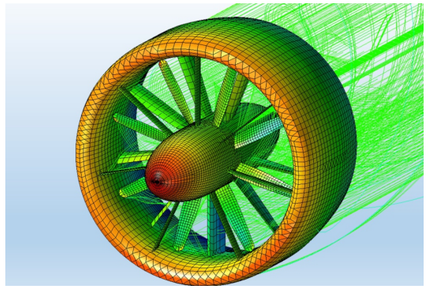
Design, Analysis and Research Corporation (DARcorporation) is a world class aeronautical engineering and prototype development company that boasts a team of highly skilled aeronautical engineers, software developers, project managers and prototype production personnel. Our primary objective is to help you design, prototype and test your propellers, ducted fan and open rotor systems.

Propeller and Ducted Fan DESIGN, PROTOTYPING AND TESTING

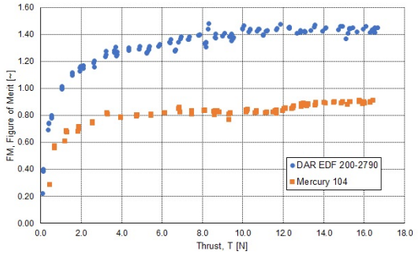
Our expertise includes propeller, ducted fan and open rotor aerodynamic and structural design, analysis, performance testing, structural testing, motor selection and characterization, rapid prototyping, acoustic analysis and test planning and management.



UAV Computational Fluid Dynamics



Ducted Fan Computational Fluid Dynamics



Thrust and Figure of Merit Comparison between In-house 3D Printed Ducted Fan (DAR EDF 200-2790) and Off-the-Shelf Ducted Fan (Mercury 104)

DARcorporation engineers work with customers to solve their most critical problems and combine extensive engineering experience with computerized simulation tools to provide the services our customers want. Through the following four disciplines, DARcorporation provides professional services for the design and analysis of propellers and ducted fan systems:

Aerodynamic Design and Analysis

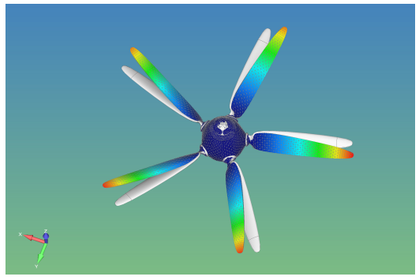
Based on Blade Element Momentum (BEM) theory, DARcorporation has developed and customized in-house software for initial aerodynamic design of propeller blades in ducted or unducted configurations. Employing a robust surface vorticity panel code and lifting line axisymmetric ducted fan analysis tool, thrust coefficient and power coefficient versus advance ratio charts are obtained. Using high-fidelity computational fluid dynamics (CFD) software with rotation simulation, the full power-thrust curve can be constructed. The deliverables of aerodynamic design include recommendations on the number of blades, airfoil selection, chord and pitch distribution, rotor diameter, RPM, etc. If a motor has not been selected based on the propeller power requirements, DARcorporation engineers have the ability to select the ideal motor for your configuration, either fuel burning or electric. Services include:

- Blade Element Momentum Aerodynamic Code
- Full Navier-Stokes CFD Analysis
- Airfoil Design and Analysis
- Propeller/Rotor Blade Design and Analysis
- Duct Design and Analysis
- Motor/Engine Selection

Acoustic Analysis and Testing

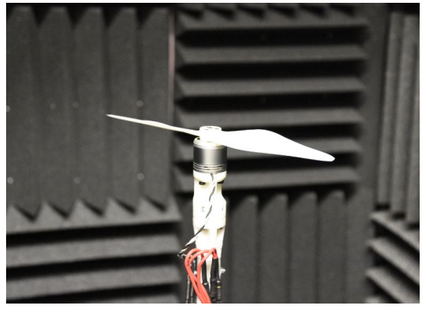
DARcorporation engineers have the capability to perform analytical and experimental analyses of propeller and ducted fan noise. Using first-order acoustic analytical tools, the noise characteristics can be obtained as a function of fan angle. The physics-based high-fidelity simulation tools we use predict the sound pressure levels at various propeller/ducted fan working conditions. With an on-site acoustic chamber and acoustic testing instruments, we can measure and compare the acoustic/noise signature of different propellers and ducted fans. These measurements allow us to help customers design/select the quietest propeller/ducted fan possible for their vehicle.

Propeller and Ducted Fan DESIGN, PROTOTYPING AND TESTING

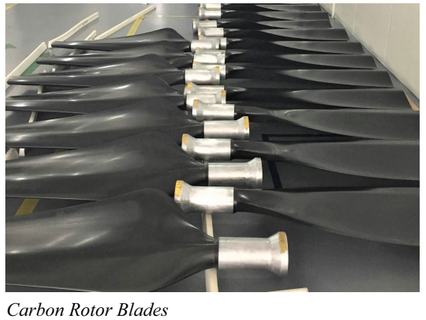


5-bladed Propeller Finite Element Analysis

Electric Motor Characterization



Propeller in Acoustic Chamber



Carbon Rotor Blades

Structural Design and Analysis

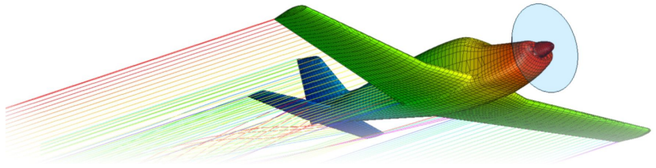
Our engineers use Finite Element Analysis (FEA) methods and software to analyze propeller/rotor and duct structures for strength, stiffness, dynamic modes, fatigue, flutter, etc. Results such as stresses, deformations, buckling factors, natural frequencies, flutter speeds, etc. are compared against possible failure modes to ensure structural integrity. Unwanted vibrations are identified and designed out of the system. The structural analysis yields a selection of materials, material thicknesses and composite layup schedules and produces an optimized structural configuration. Services include:

- Loads Analysis
- Structural Analysis
- Fatigue and Crack Growth
- Aeroelasticity (Flutter, Divergence)
- Structural Testing
- Ground Vibration Tests

Prototyping, Manufacturing and Testing

DARcorporation can generate manufacturing drawings and build a designed structure for structural, aerodynamic and performance testing. We have experience using composite, metal and 3D printed plastic materials. Our engineers have extensive experience in data acquisition, test planning and test management to ensure the propeller or ducted fan performance meets your design goals. In addition to designing your propeller/ducted fan, we will use our state-of-the-art testing facilities to test your propeller/ducted fan system through a range of sizes and operating conditions. Services include:

- Manufacturing Drawings
- Motor/Engine Characterization
- Rapid Prototyping
- Prototype Assembly
- Test Planning
- Test Management



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