SukraHelitek

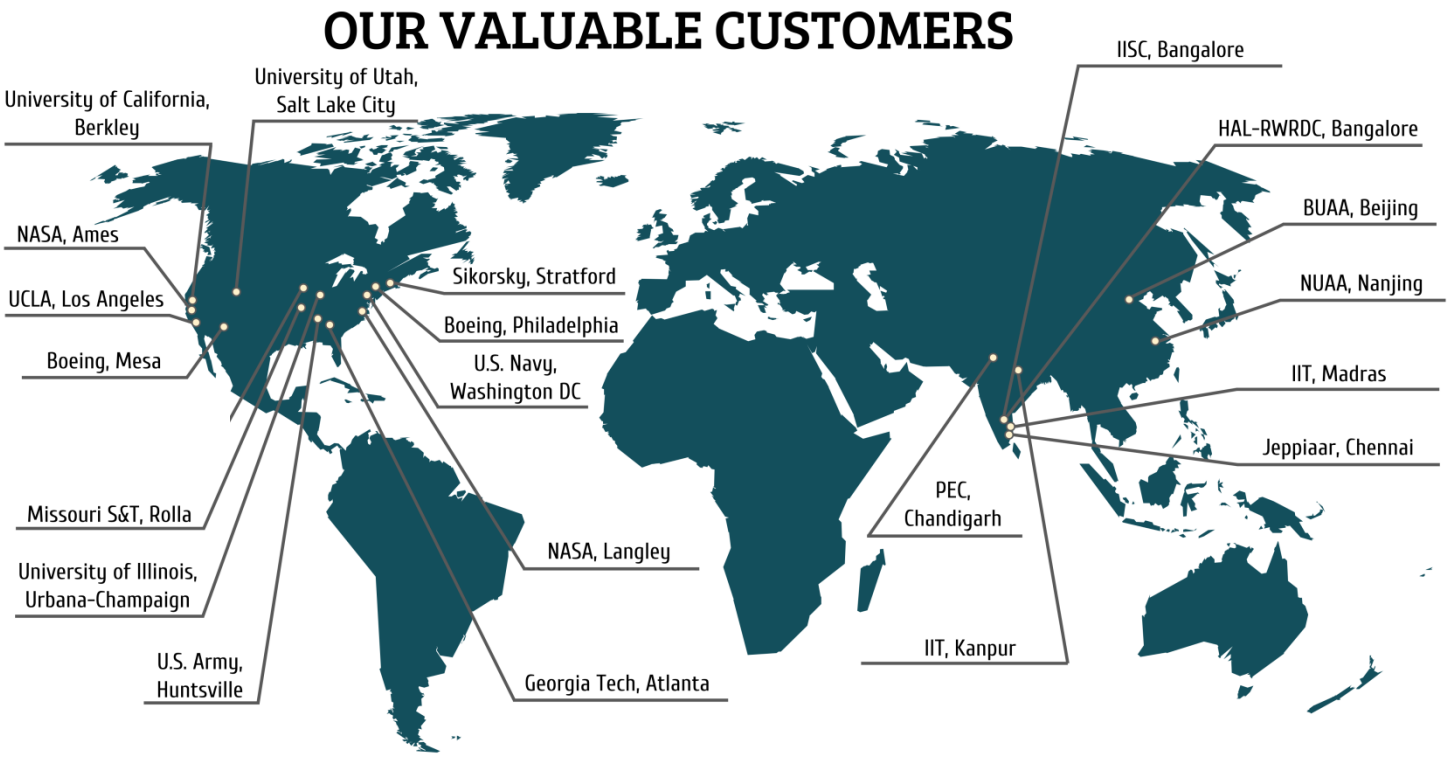
PROJECT PORTFOLIO

A list of projects completed by Sukra Helitek and their briefs

contact@sukra-helitek.com

OUR VALUABLE

CUSTOMERS

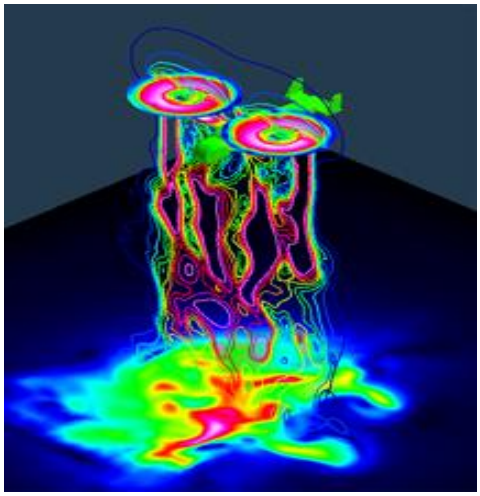


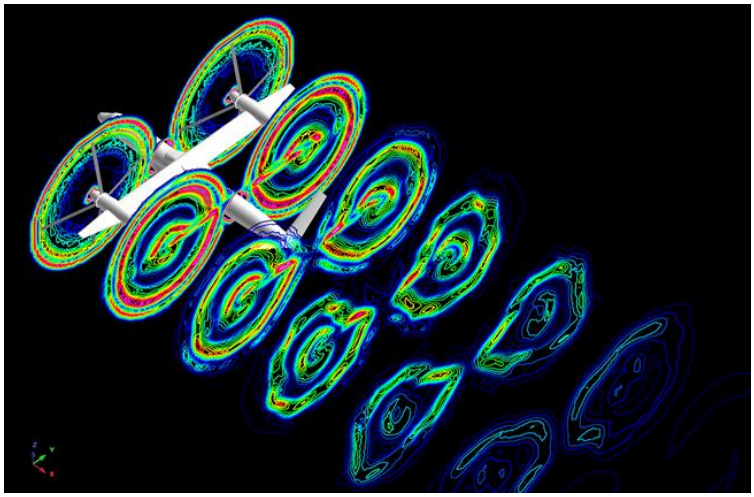
ABOUT US

Sukra Helitek, Inc. is an engineering consulting company that specializes in computational fluid dynamics (CFD) with applications such as rotorcraft, propellers and wind turbines. The company is primarily involved in developing specialized computer software for the study and analysis of engineering problems in fluid dynamics. Clients of Sukra Helitek, Inc. include companies such as Sikorsky Aircraft, Boeing Helicopters, the former McDonnell Douglas, NASA, and the U.S. Army and Navy.

Established in 1991, Sukra Helitek, Inc. has been involved in developing innovative and cost effective CFD tools for the rotorcraft industry. Sukra Helitek, Inc. develops and markets its flagship software product, RotCFD. Embedded in a user-friendly graphic environment, this software offers cutting-edge solutions to complex rotorcraft problems by using some of the most advanced and latest research techniques in CFD and computer science. Examples include simulating helicopters landing on a ship deck, performance analysis of a rotorcraft operating in a near-terminal area, numerical study of wind turbine efficiencies, and general purpose CFD simulations to augment wind tunnel data and many others.

RotCFD is widely accepted in the rotorcraft community as an effective design tool that can carry out aerodynamic simulations economically before model scale testing is considered, thereby saving cost and time and permitting a larger design space than is otherwise possible.





FOUNDER AND CEO

Prof. R. Ganesh Rajagopalan

(Professor, Dept. of Aerospace Engineering Iowa State University, USA)

EDUCATION:

- Ph.D., West Virginia University, Aerospace, 1984
- M.S., Aerospace, Indian Institute of Science (India), 1978
- B.S., Madras Institute of Technology (India), Aerospace, 1976
- B.S., Mathematics, Madras University (India), 1973

HE HAS AN EXPERIENCE OF 35+ YEARS IN TEACHING CFD, AERODYNAMICS AND WIND ENERGY COURSES.

POSITIONS OF RESPONSIBILITY:

- Held positions of Director of Graduate Education and wind energy leader at Iowa State
- Member of AHS and AIAA
- Specialist consultant to rotorcraft industry like Boeing, NASA and U.S. Army

RESEARCH INTERESTS:

Aerodynamics, CFD techniques for rotating flows, rotorcrafts and V/STOL, wind energy, parallel computing.

PROJECTS AT SUKRA HELITEK

CONFIGURATION DESIGN USING RotCFD

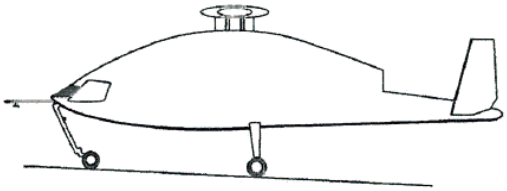
PROJECT CASE STUDIES

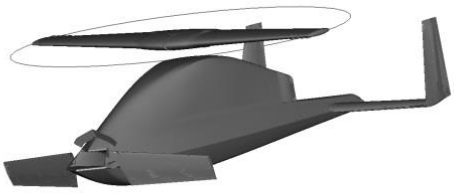
Non-Confidential Brief One Page Description

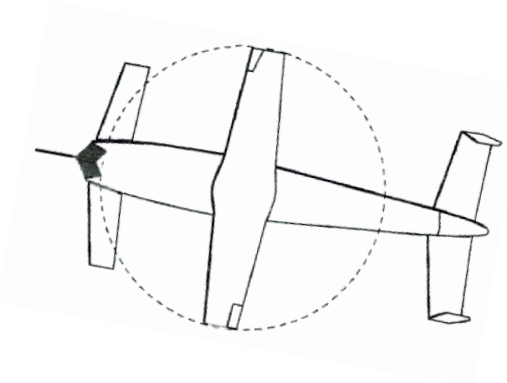
CONFIGURATION DESIGN USING RotCFD

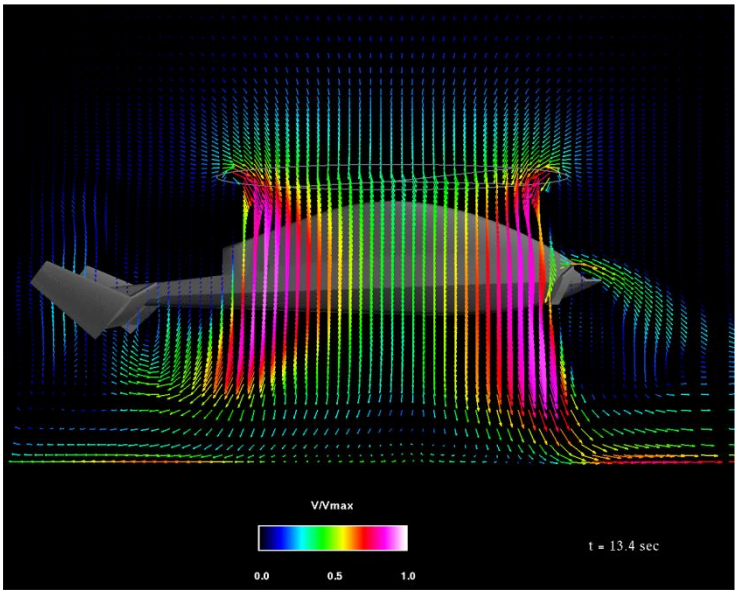
UAV DESIGN – X-50

Small unmanned aerial vehicles (UAVs) are a common type of aircraft, and a variety of rotor and propeller configurations are possible. One UAV that has been modeled in RotCFD is the Boeing X-50 Dragonfly.



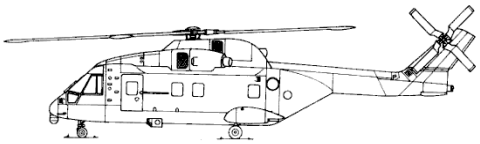


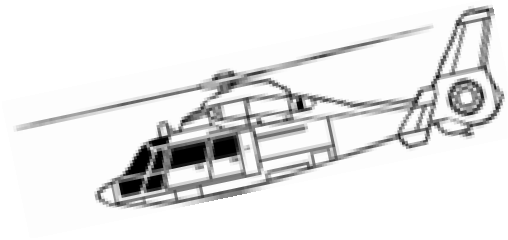


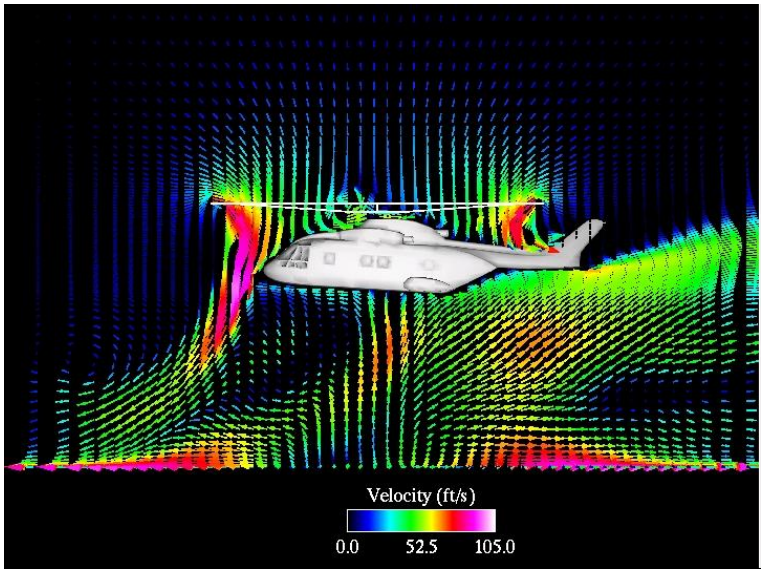


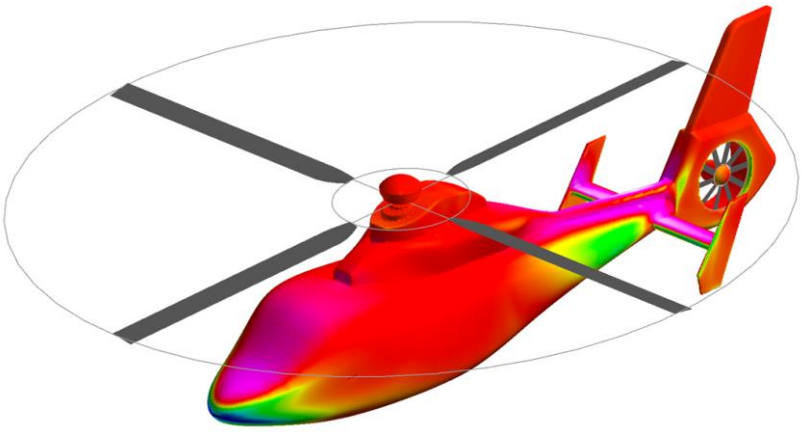
HELICOPTER DESIGN – EH101 and Dauphin

A traditional helicopter configuration uses a main rotor with a smaller tail rotor that balances the torque. Several helicopters have been run in RotCFD, including the EH101 Merlin and the AS365 Dauphin.

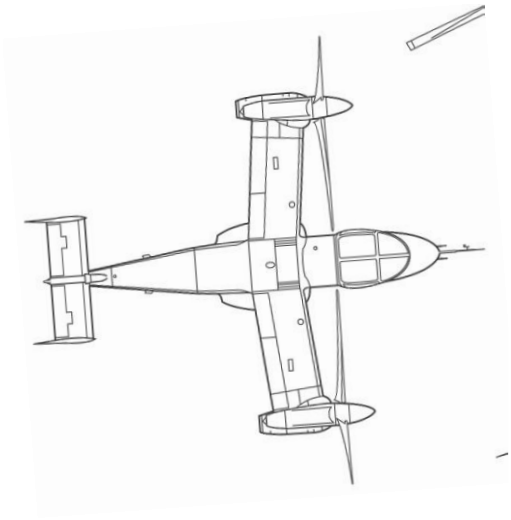






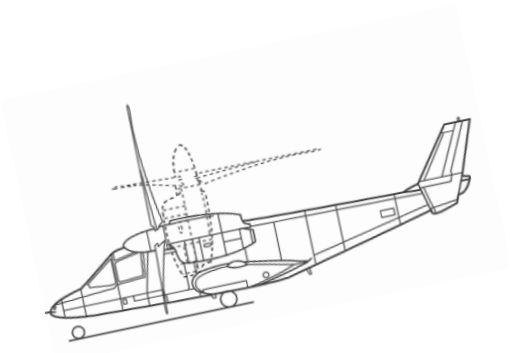


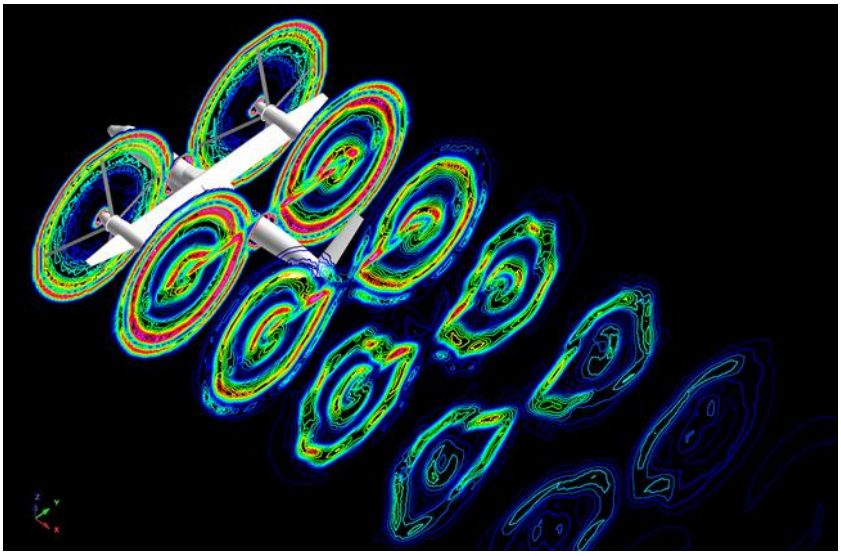
TILTROTOR DESIGN – LCTR2 and V-22

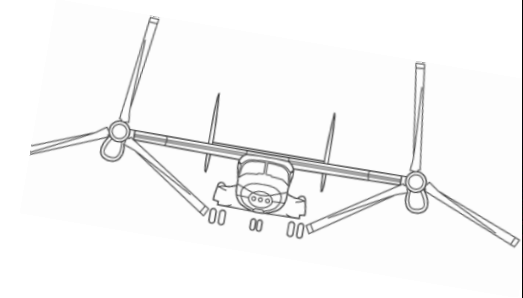


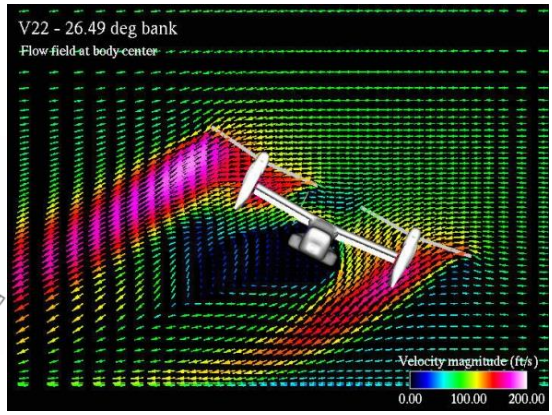
A tiltrotor configuration utilizes rotors that are capable of rotating to either produce vertical left or horizontal thrust. These configurations typically consist of two rotors near the ends of a fixed wing.

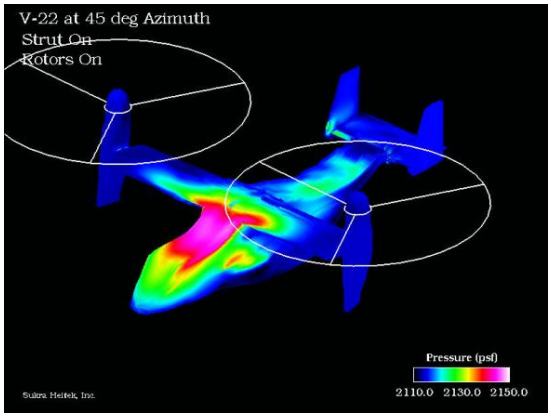
Two tiltrotor configurations that have been run in RotCFD are NASA's 2nd-generation Large Civil Tilt Rotor (LCTR2) and the Bell Boeing V-22 Osprey.





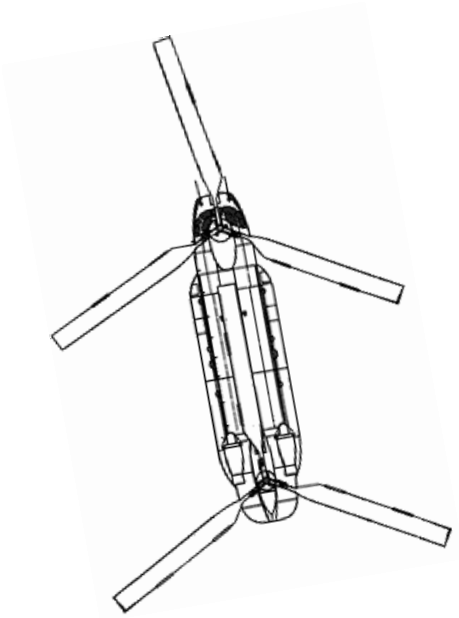


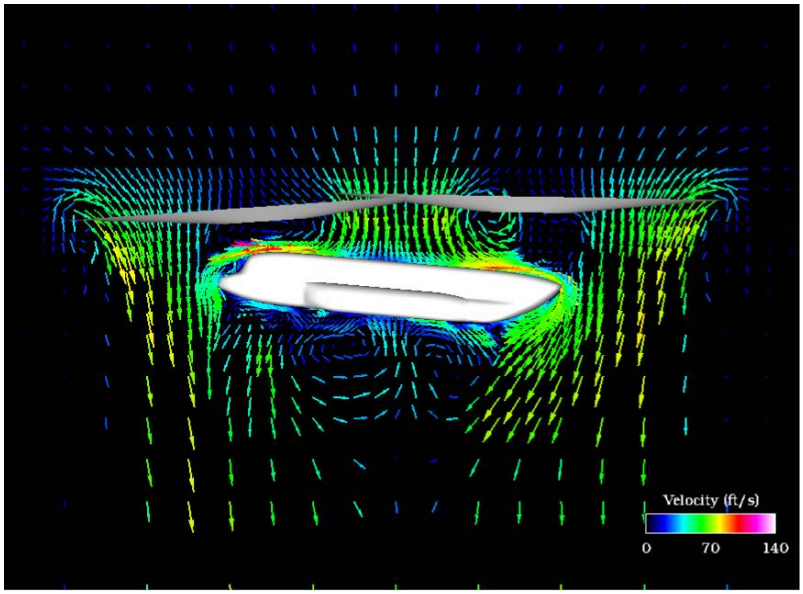


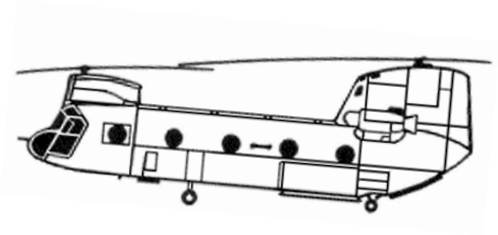


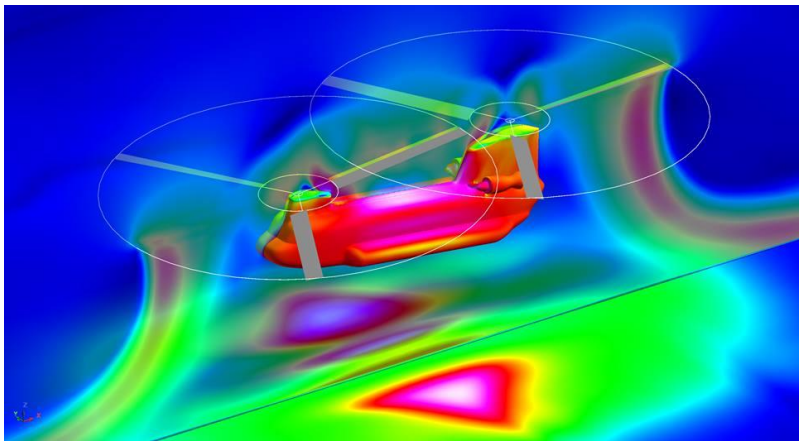
TANDEM ROTOR DESIGN – CH-47

A tandem rotor aircraft utilizes two counter-rotating rotors: one in front and one in back. The Boeing CH-47 Chinook is one such tandem rotor that has been simulated in RotCFD.

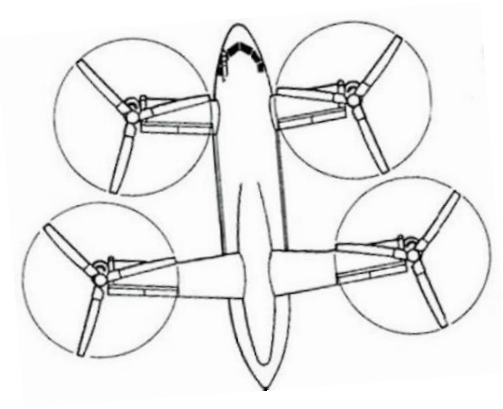




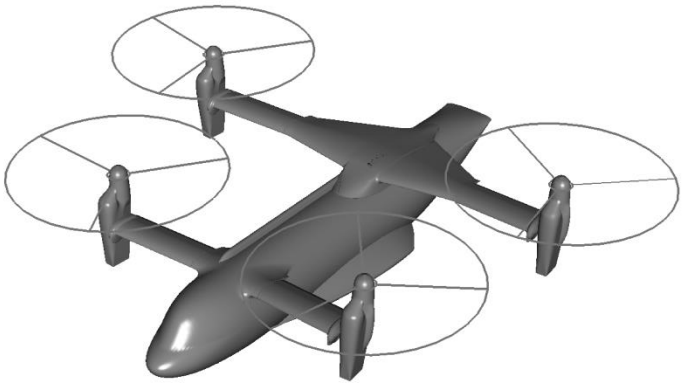


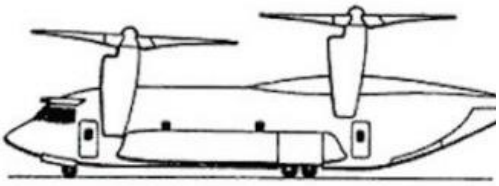


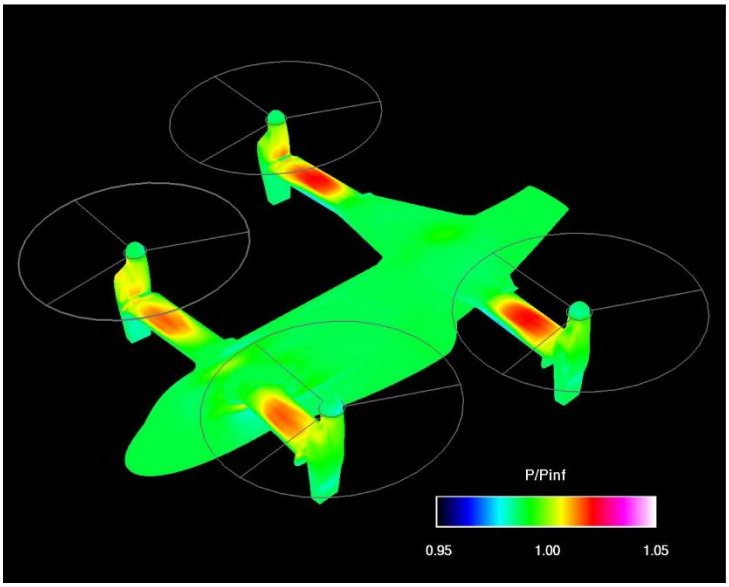
QUAD TILTROTOR DESIGN – QTR

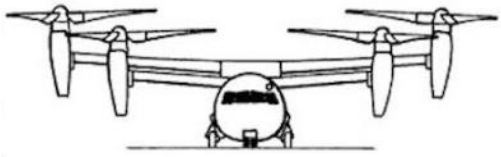


The Bell Boeing Quad Tilt Rotor (QTR) is a variation on the standard tiltrotor design. This configuration, which is designed for large payloads, utilizes four rotors that are able to rotate about a nacelle.

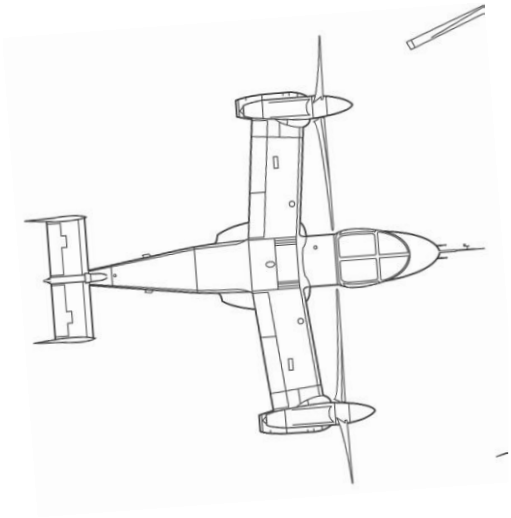


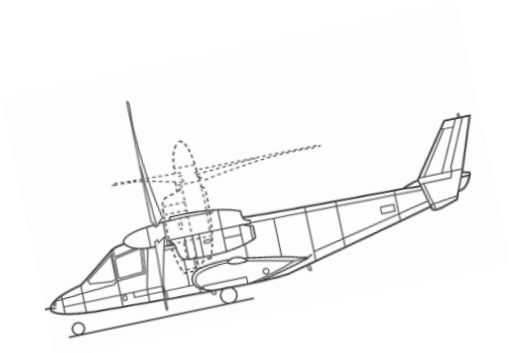


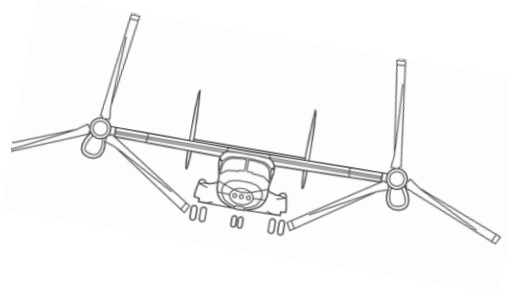




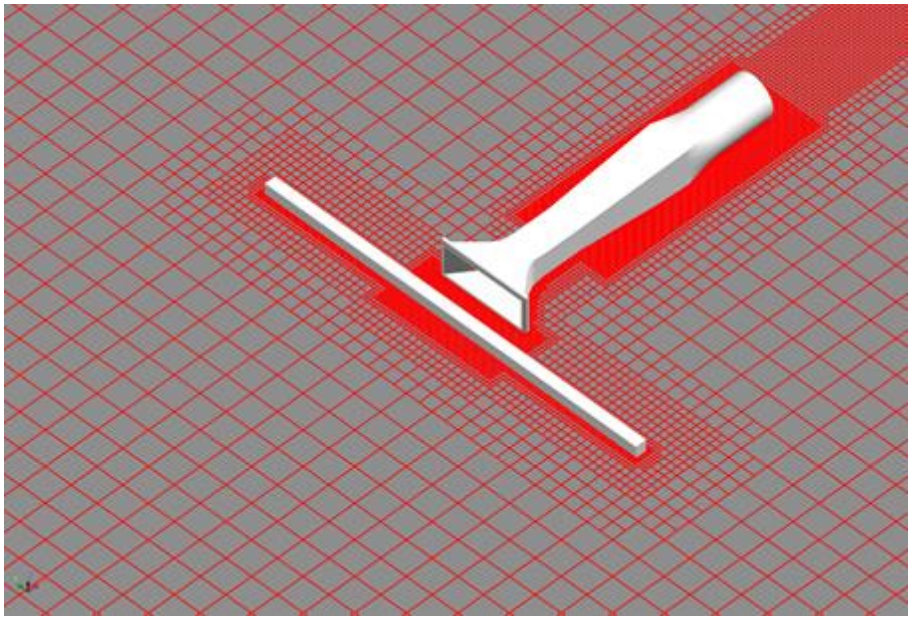
WIND TUNNEL SIMULATION

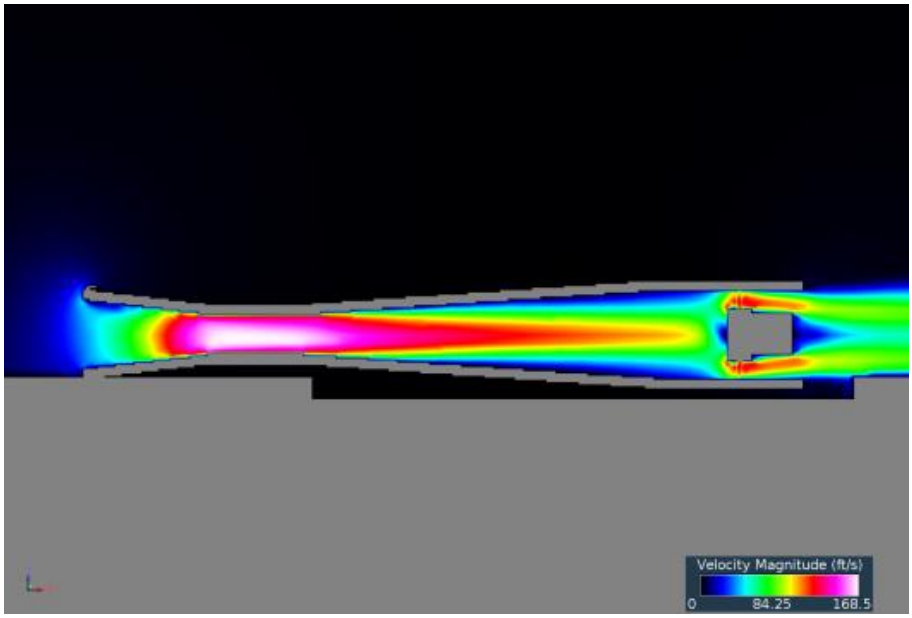




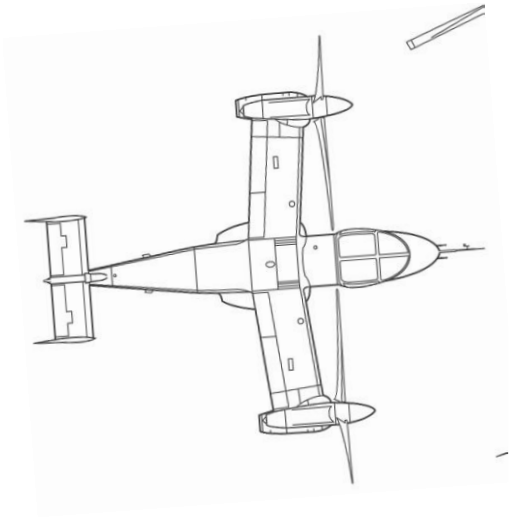


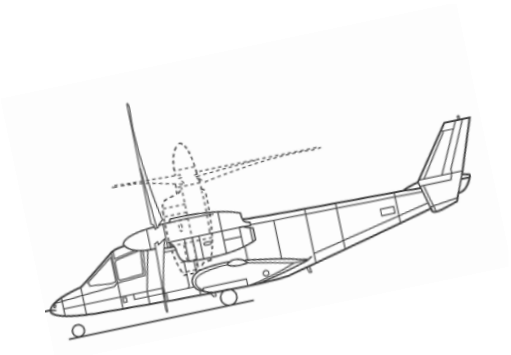
RotCFD is capable of modeling the internal flow of a wind tunnel. One such case study was a 1/50th scale model of an 80x120 wind tunnel. The effects of a '2D' blockage at various distances from the inlet were investigated.

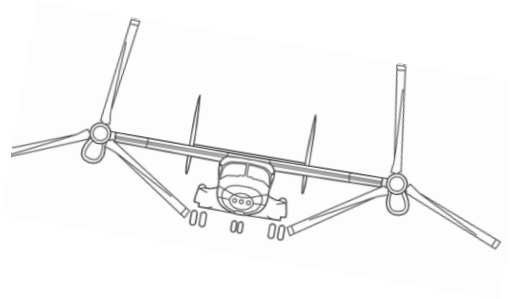




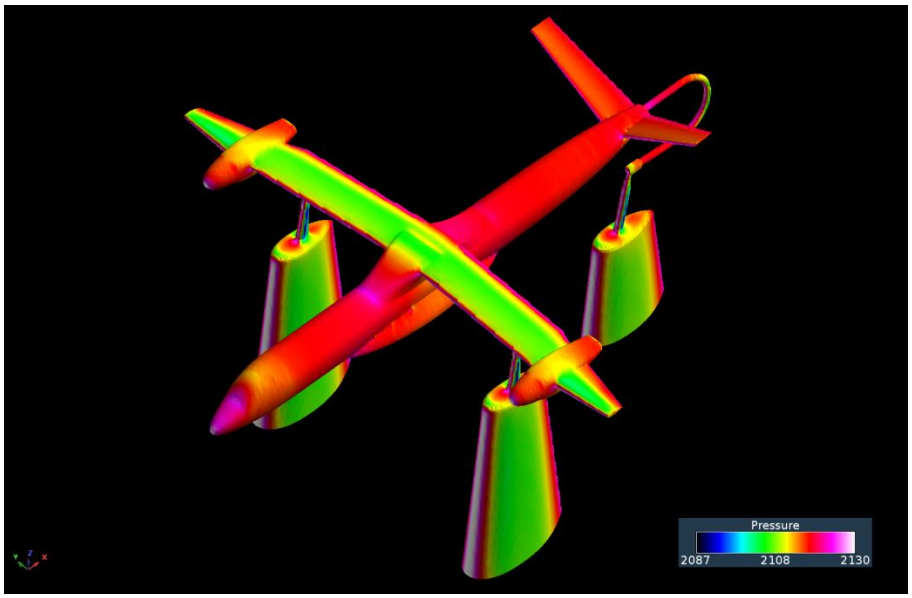
WIND TUNNEL SIMULATION WITH MODELS

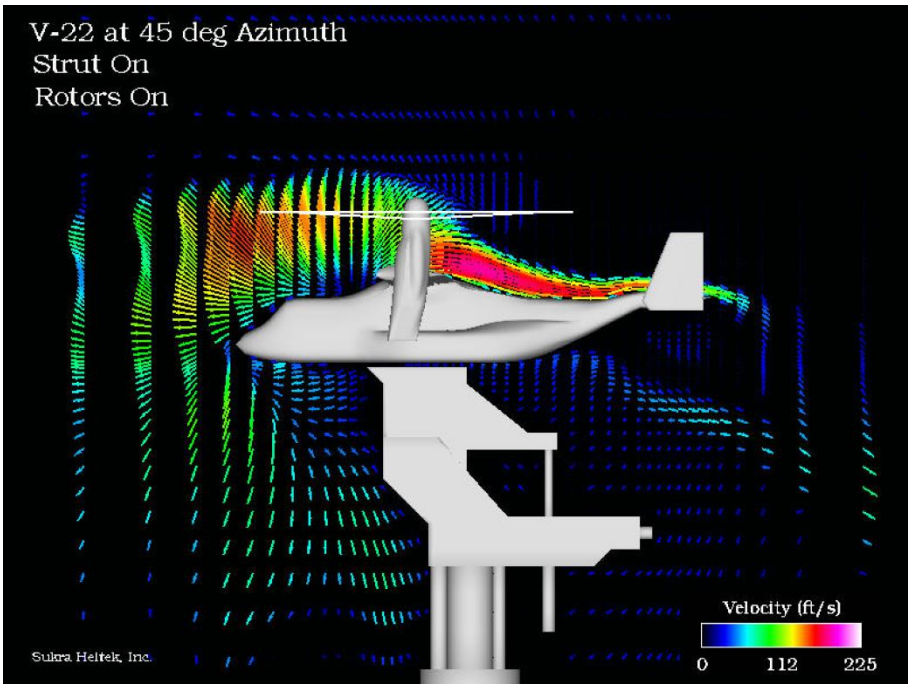






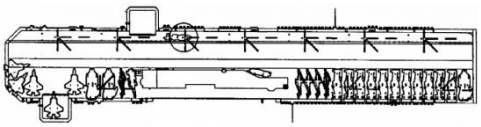
Wind tunnels require a structure to hold models in place. These structures, which can affect the flow field, can be included in RotCFD simulations.

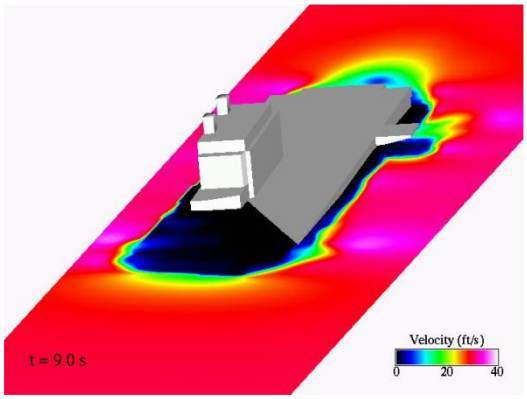


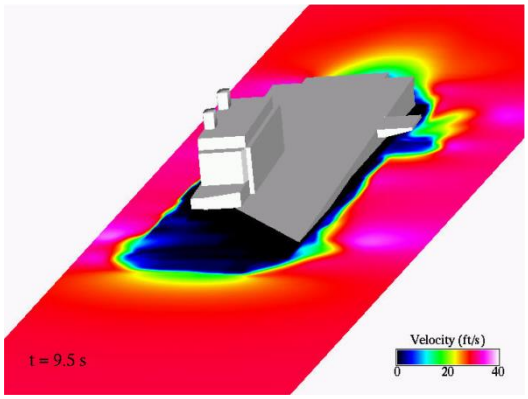


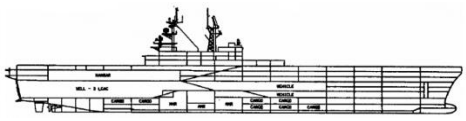
SHIP MOTION

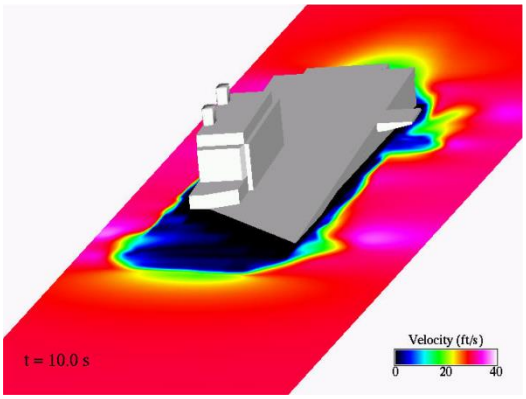
An isolated moving LHD ship geometry was simulated in RotCFD, predicting the flow field around the aircraft carrier.

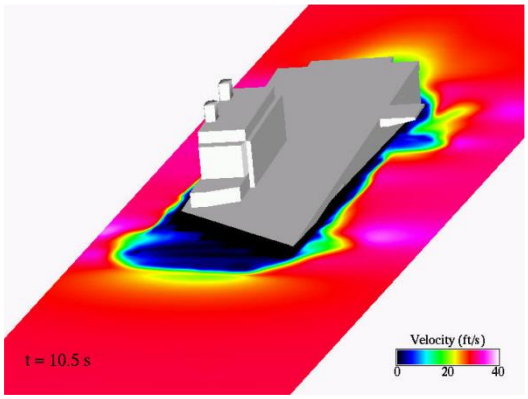


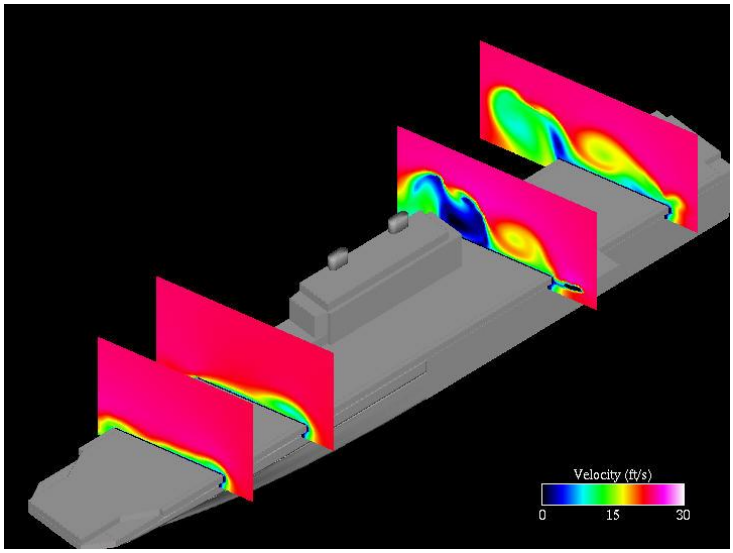




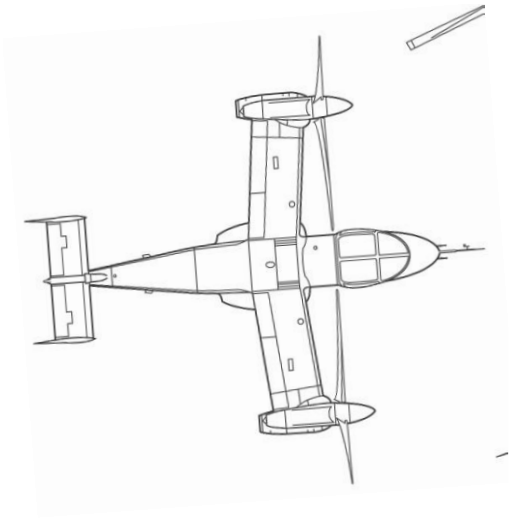




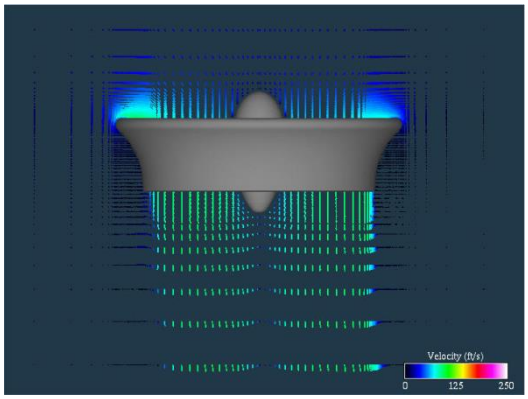


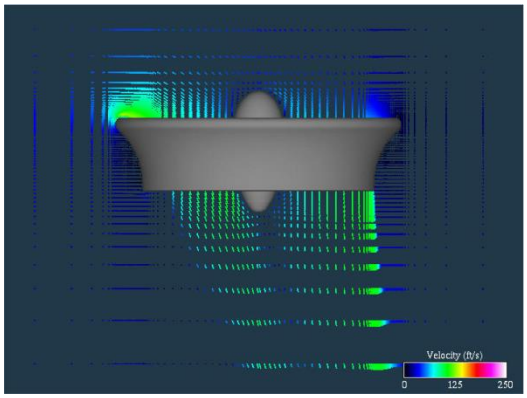


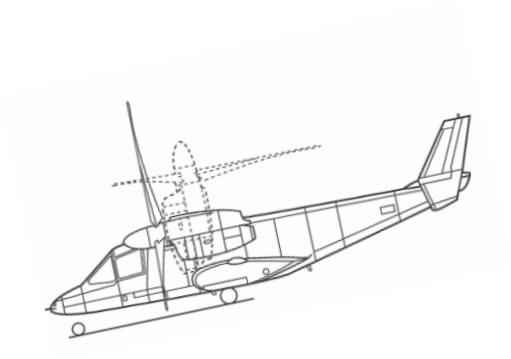
MILLENNIUM JET DUCTED FAN IN FORWARD FLIGHT

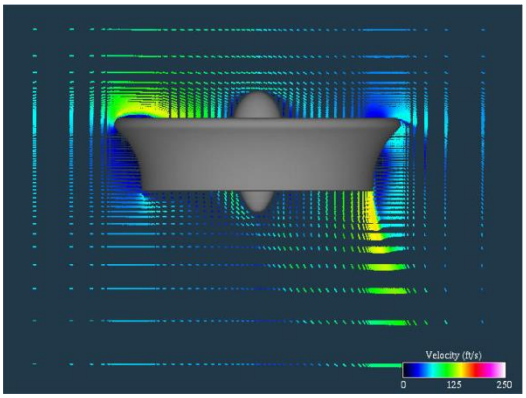


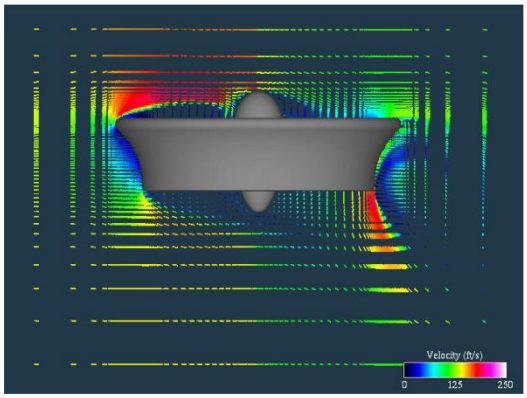
The Millennium Jet ducted fan was simulated in forward flight. Angle of attack was 0°, and advance ratio ranged from 0.03 to 0.8.

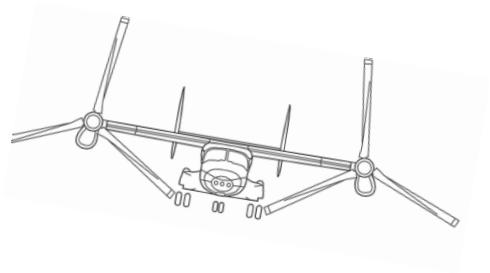


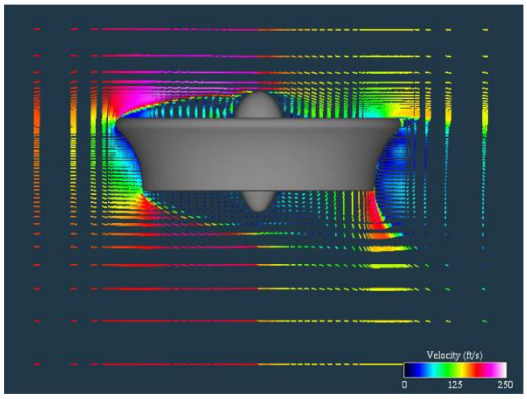






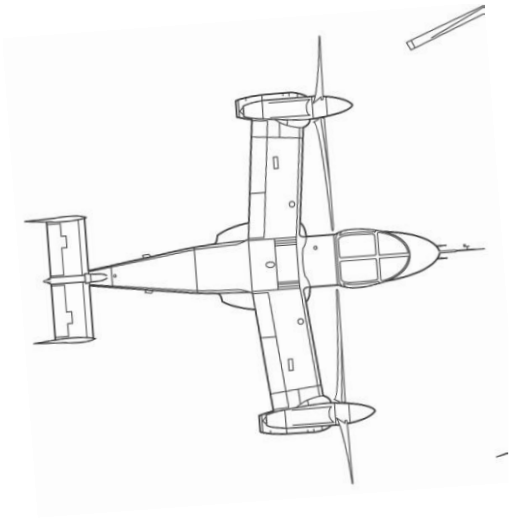




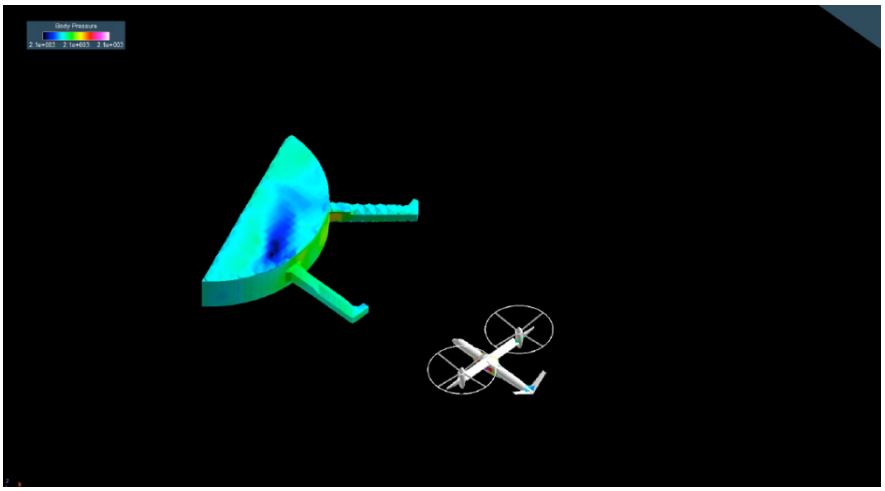


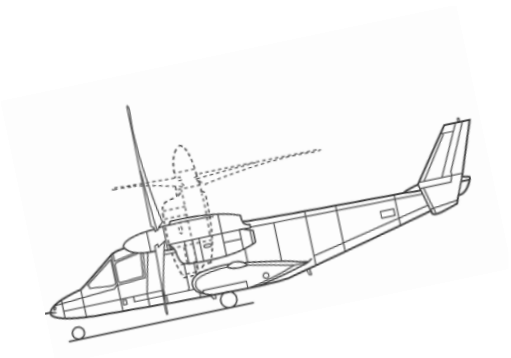
Aerodynamic Interaction

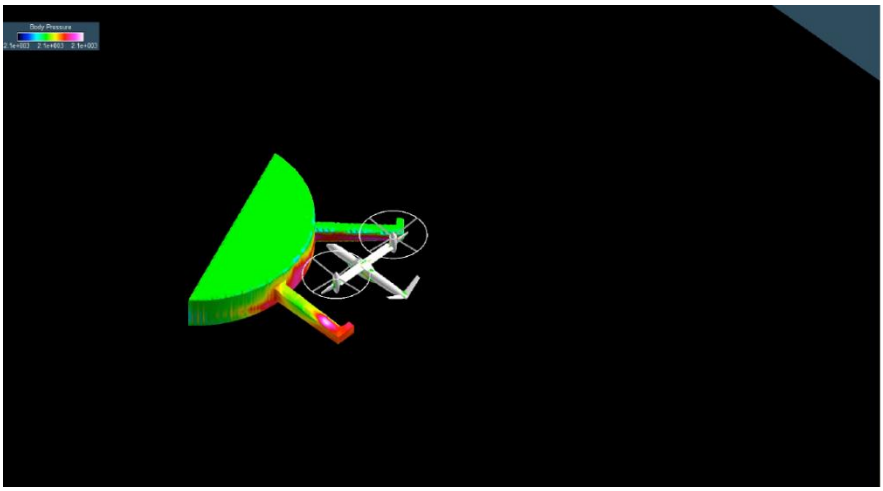
LCTR2 BUILDING INTERACTION

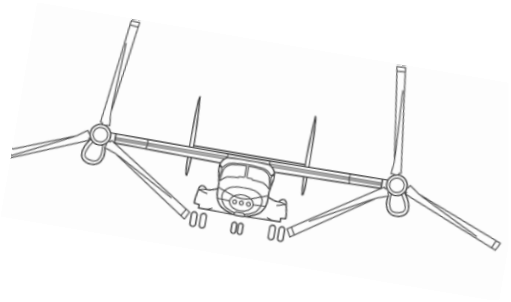


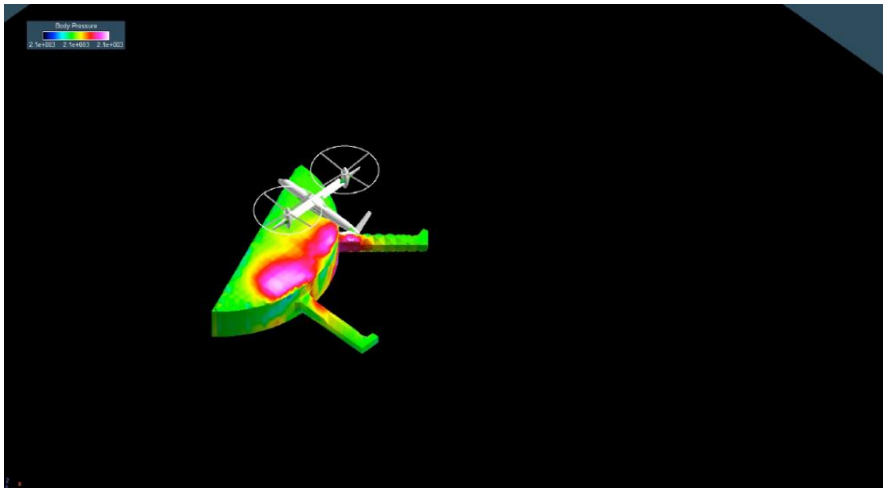
An LCTR2 aircraft was simulated in RotCFD flying over an airport terminal to determine the pressure caused by the rotor wake.



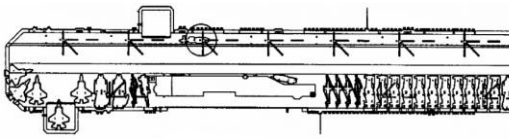




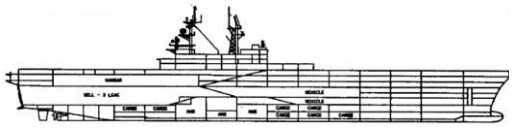


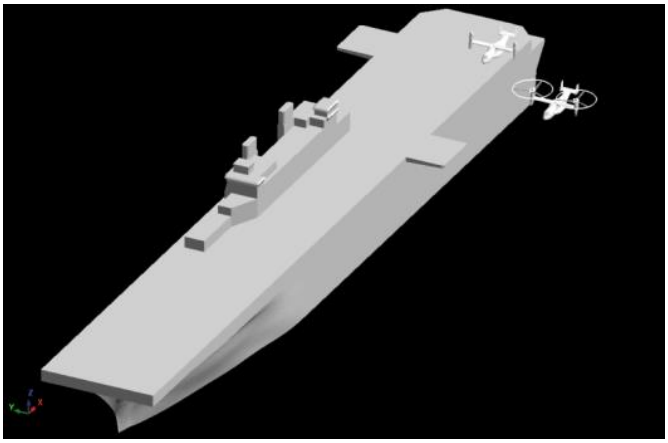


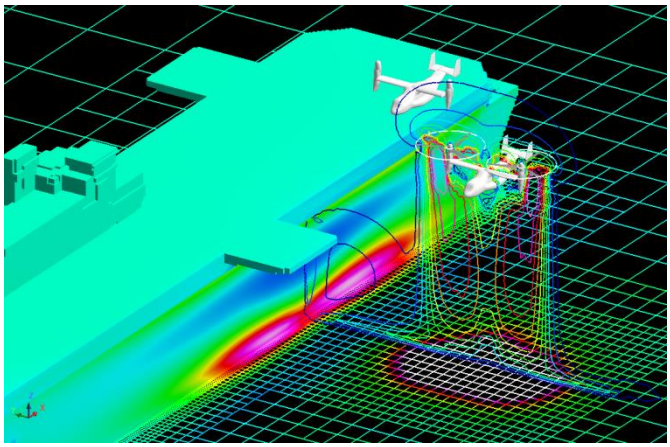
SHIPBOARD OPERATIONS OF V-22 AND OTHER AIRCRAFT

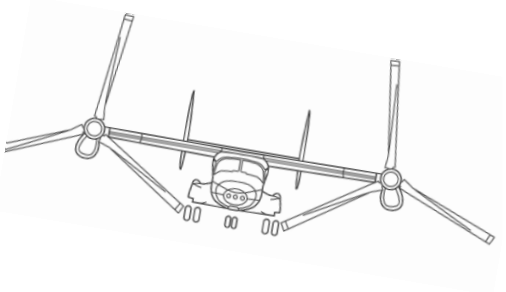


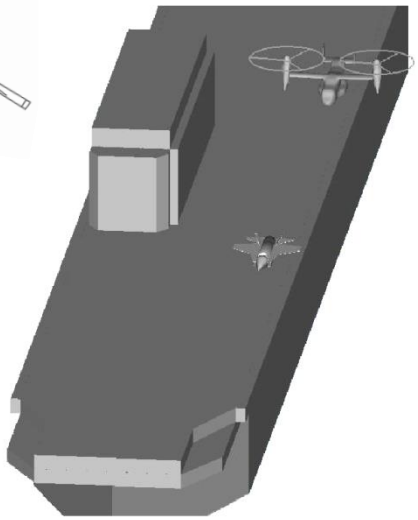
RotCFD has simulated multiple aircraft, such as the V22, operating near a ship, modeling the interactions between all vehicles.

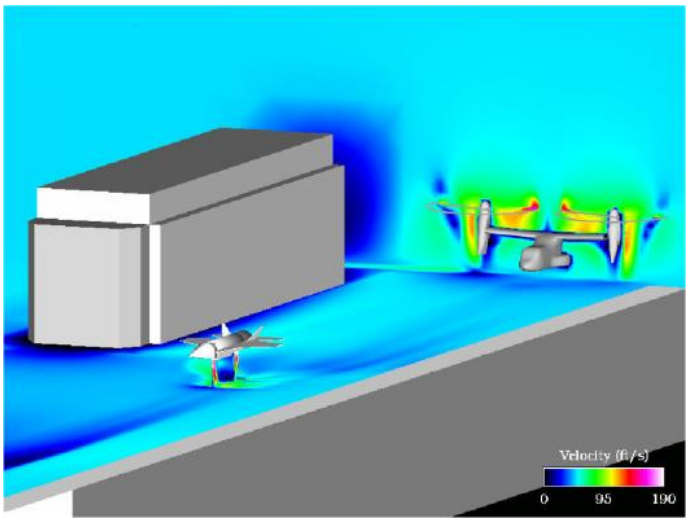






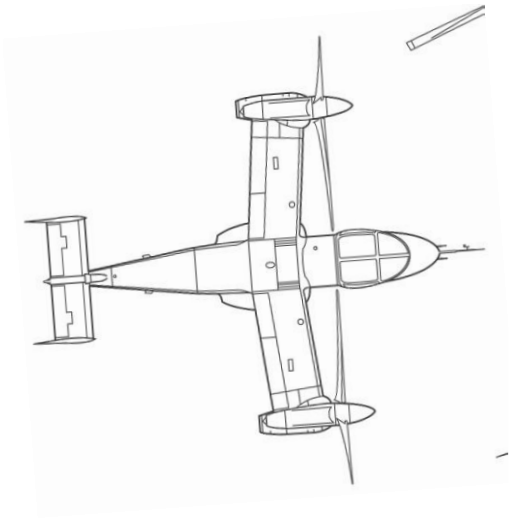


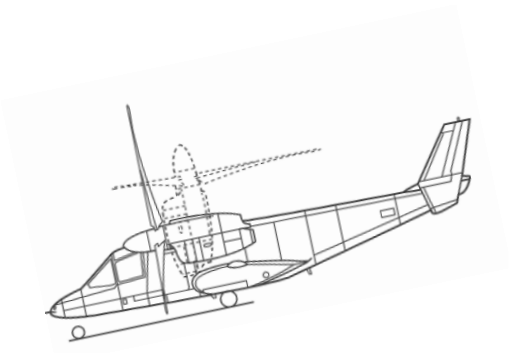


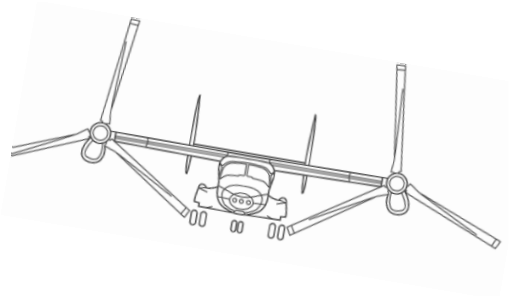


RotCFD FEATURES AND TOOLS

GRID OPTIONS AVAILABLE IN ROTCFD

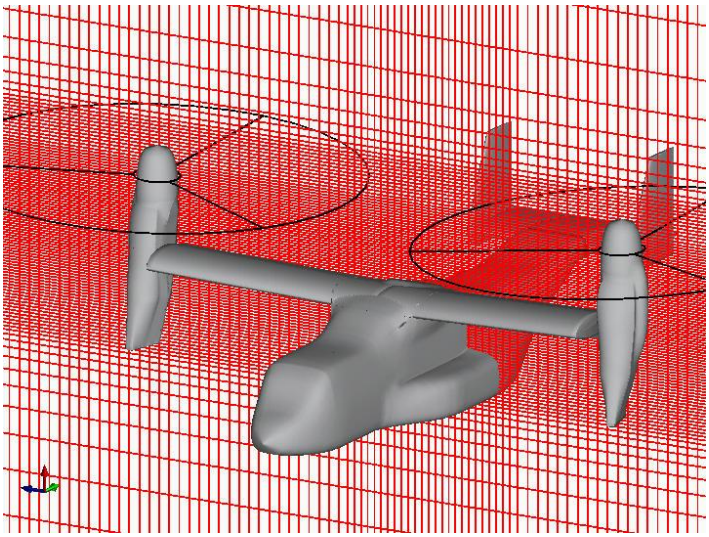


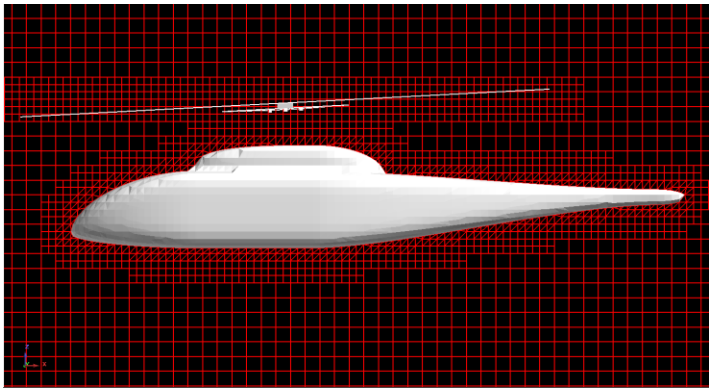


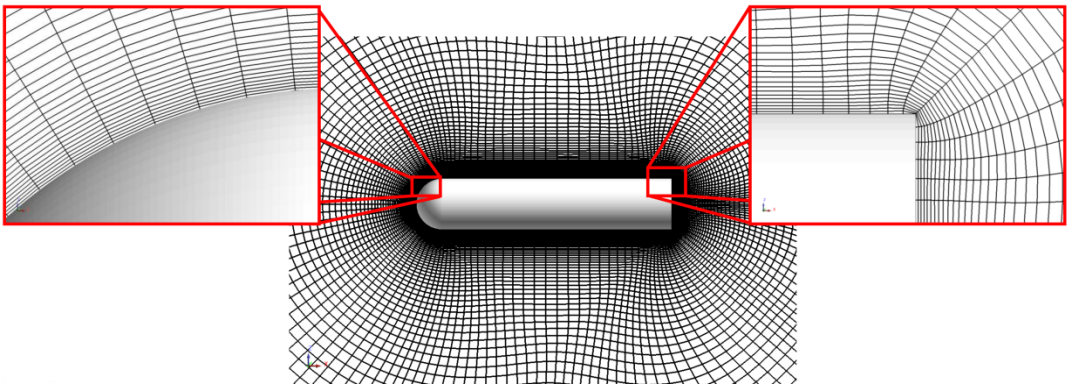


The unstructured Cartesian grid in RotCFD is capable of dynamically refining the grid to adapt to flow features, such as vorticity.

- Structured Cartesian
- Unstructured Cartesian with body-fitting
- Viscous grids

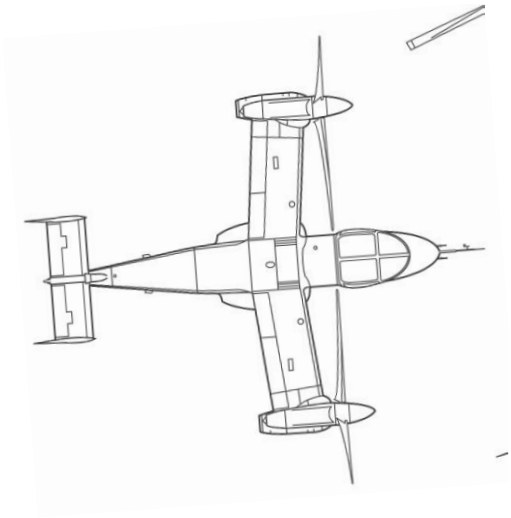


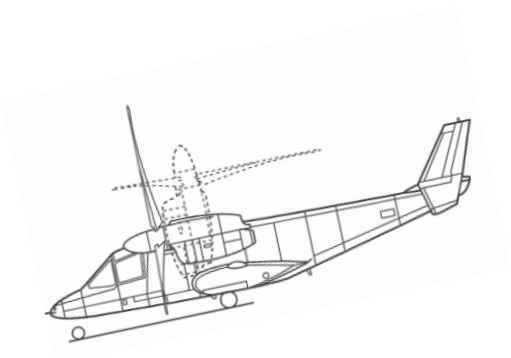


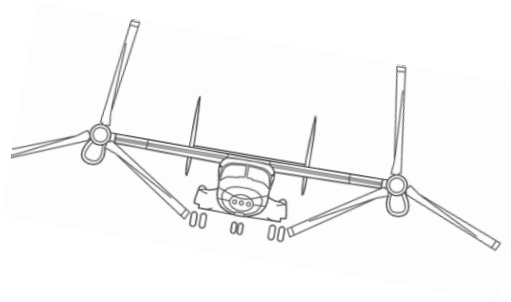


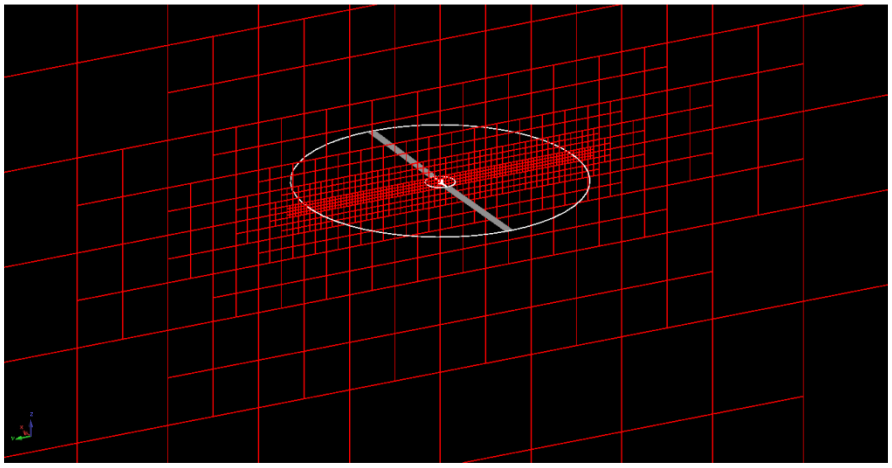
GRID ADAPTATION

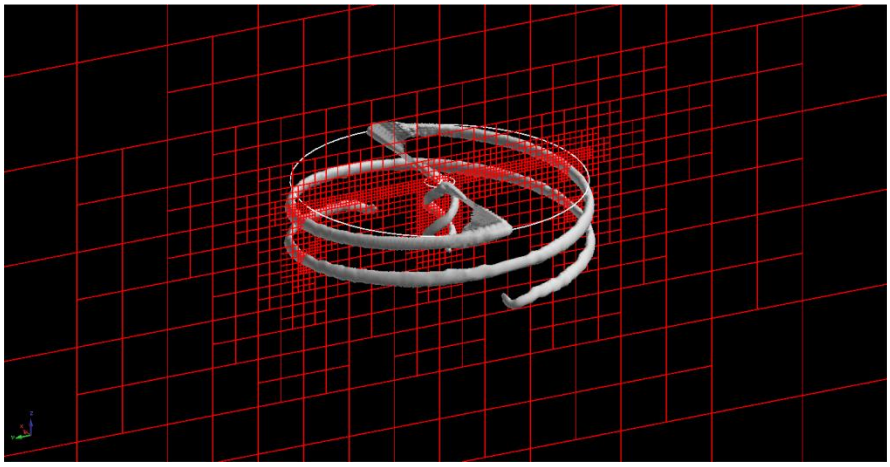
The unstructured Cartesian grid in RotCFD is capable of dynamic localized refinement to adapt to flow features, such as vorticity.

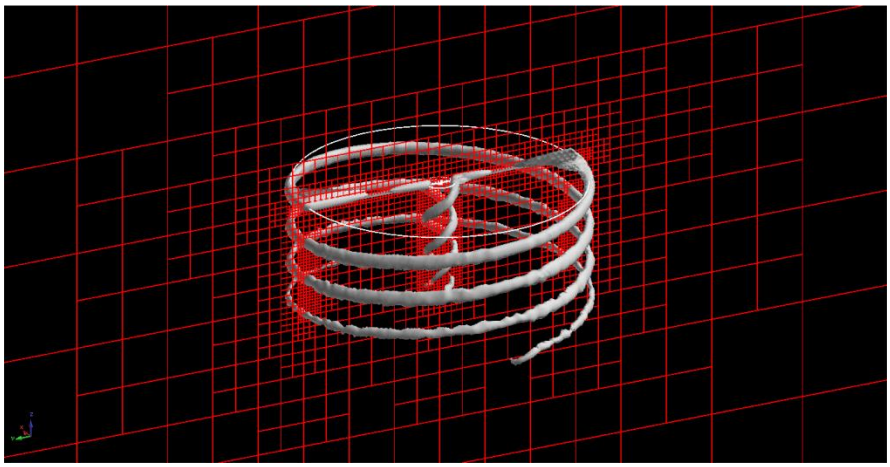




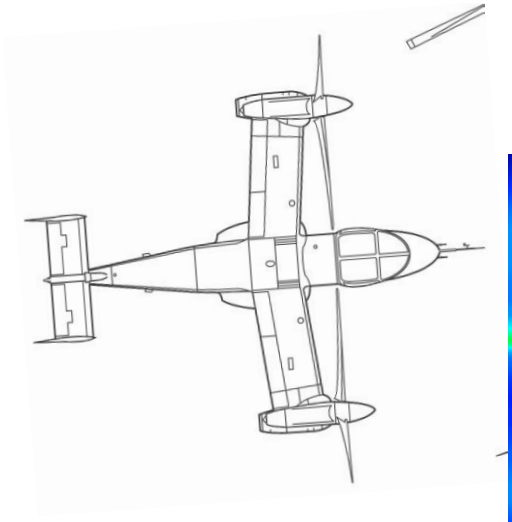




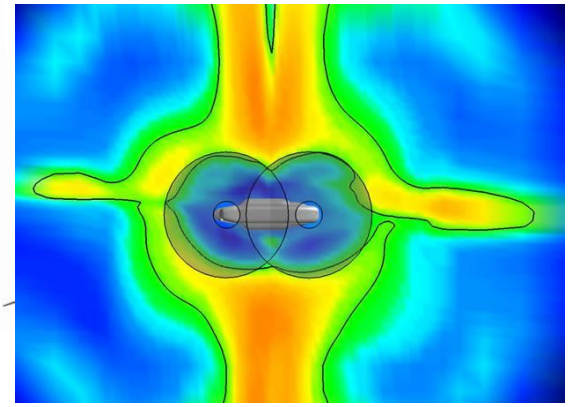


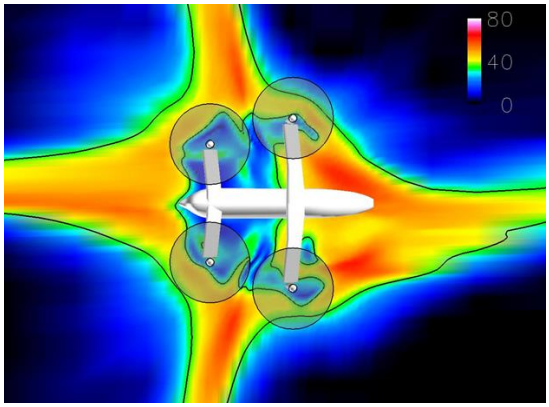


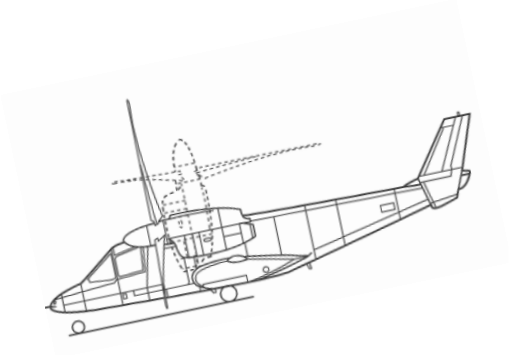
GROUND EFFECT



Rotorcraft in ground effect incur complex aerodynamics and can cause a significant amount of shear stress on the ground.

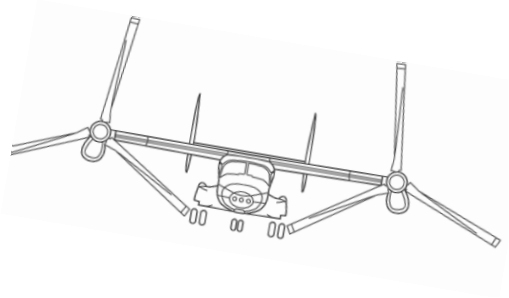


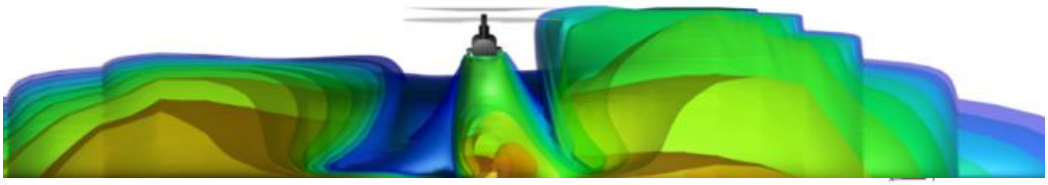


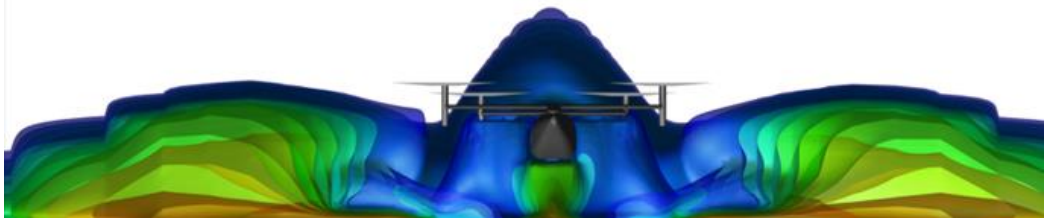


DUST MODELING – BROWNOUT

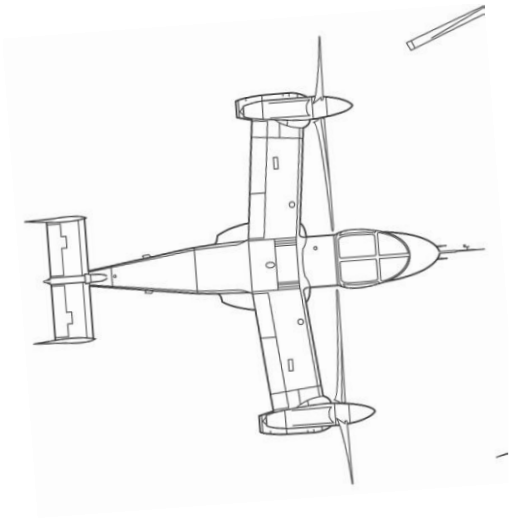
The shear stress on the ground caused by rotorcraft can result in the entrainment of dust particles, potentially leading to brownout conditions. RotCFD is able to model the dust density of rotorcraft in ground effect.

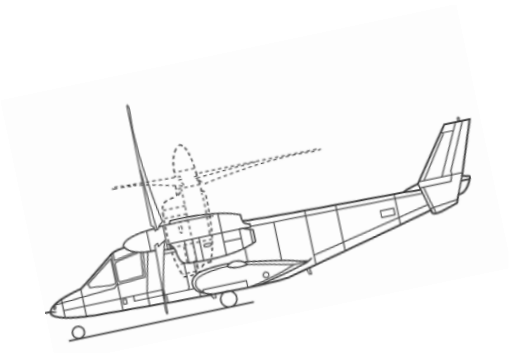


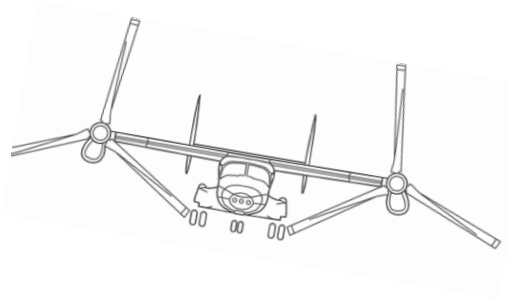




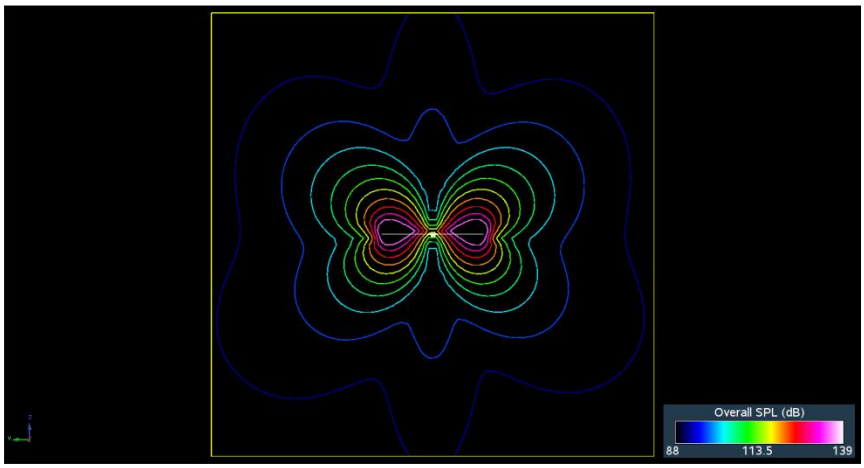
AEROACOUSTIC ANALYSIS

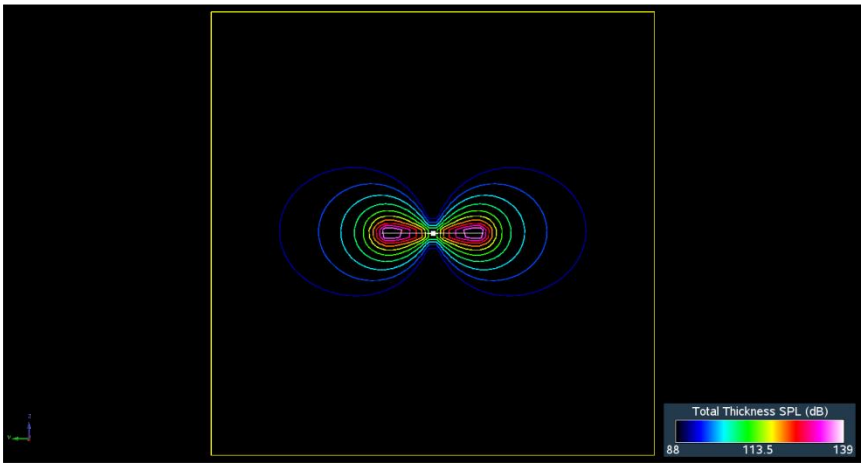


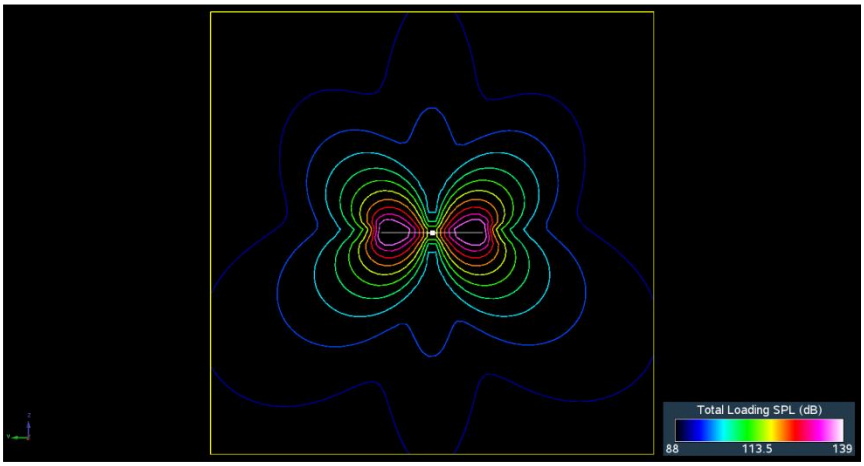




RotCFD has been coupled with an aeroacoustic analysis module. This module uses the RotCFD rotor solution as input to calculate the sound pressure levels at various points in the flow field.

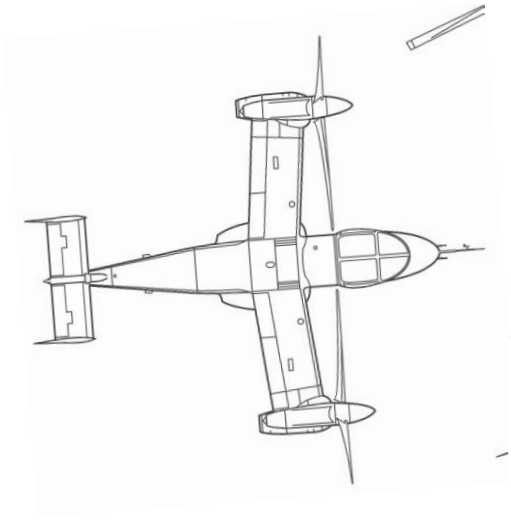




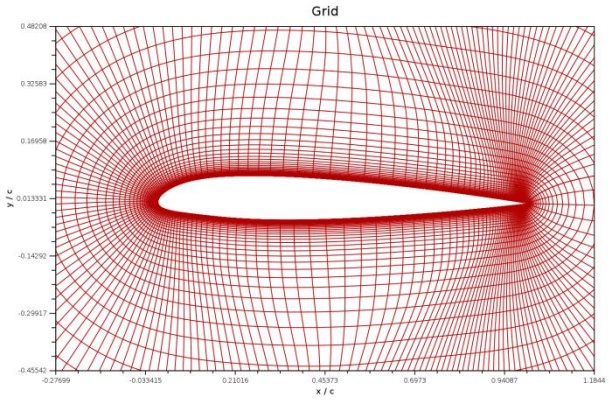


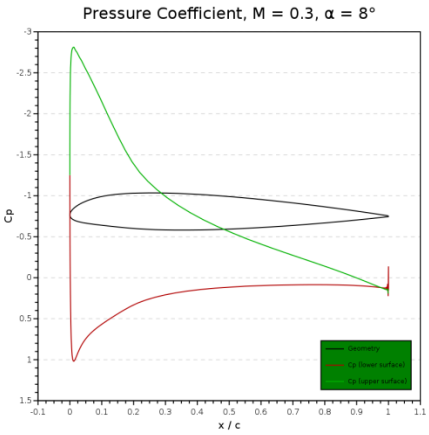
SUKRA SUPPORTIVE SOFTWARE

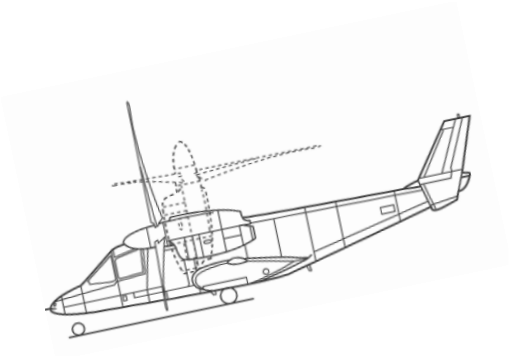
C81GEN – AIRFOIL TABLE GENERATOR USING NASA'S ARC2D AIRFOIL SOLVER



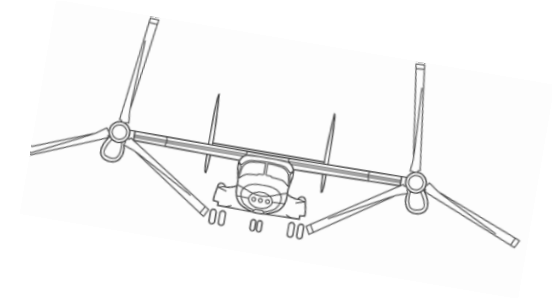
C81Gen is a Navier-Stokes based program that generates an airfoil table in the C81 format that can be used with comprehensive codes. The table is generated from a given airfoil geometry, and all inputs are given through the GUI.

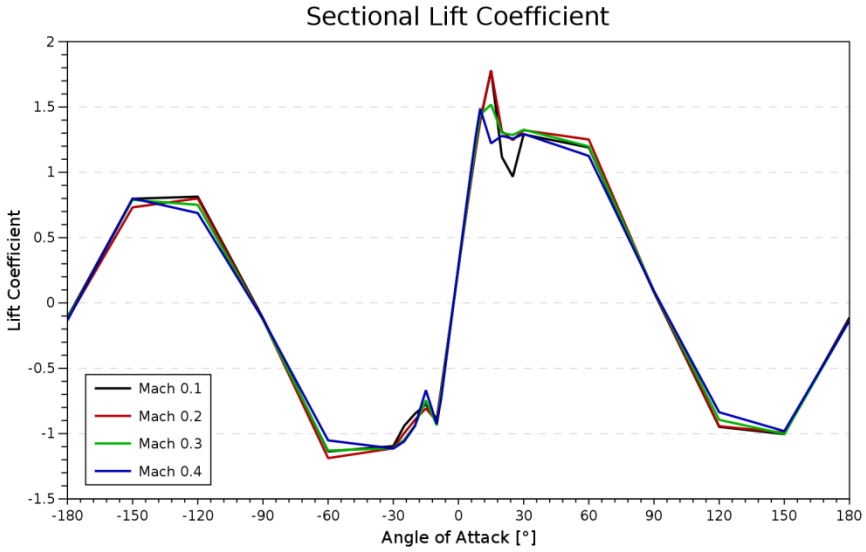




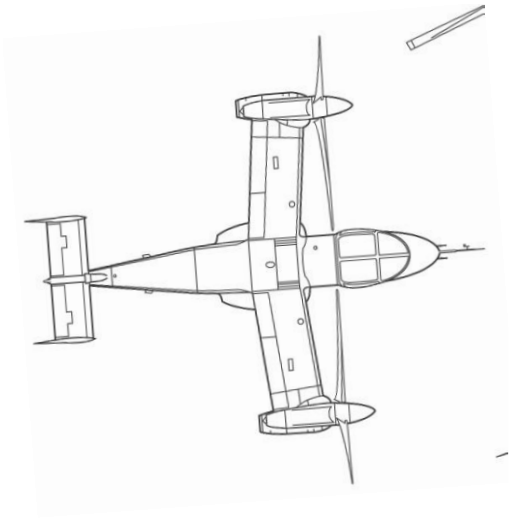


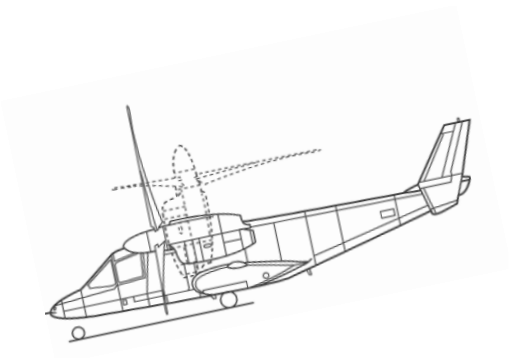
C81Gen provides a table of lift, drag, and moment coefficients in C81 format based on user-specified Mach numbers and angles of attack.

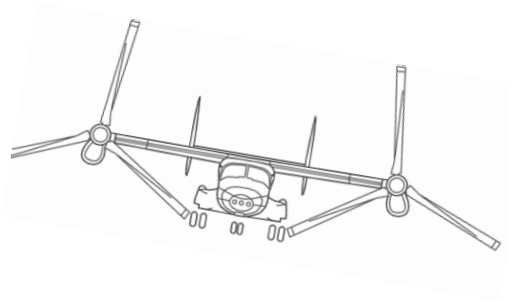




HELIOSPLOT – PLOTTING AND ANALYSIS SOFTWARE INTERFACE FOR ARMY'S PROPRIETARY CODE, HELIOS

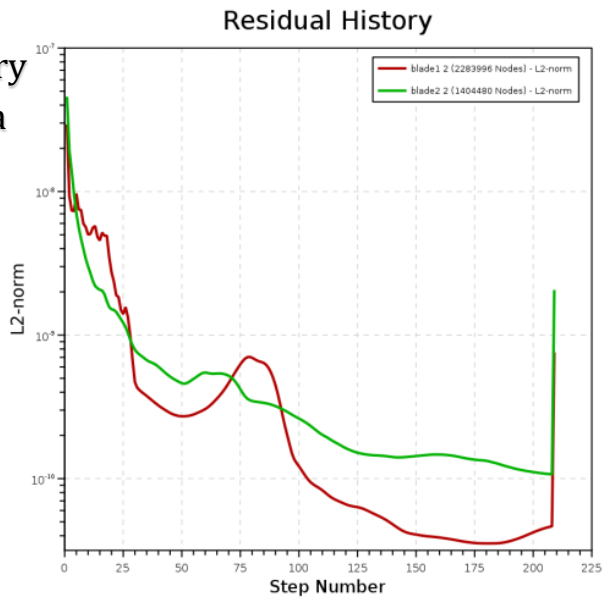


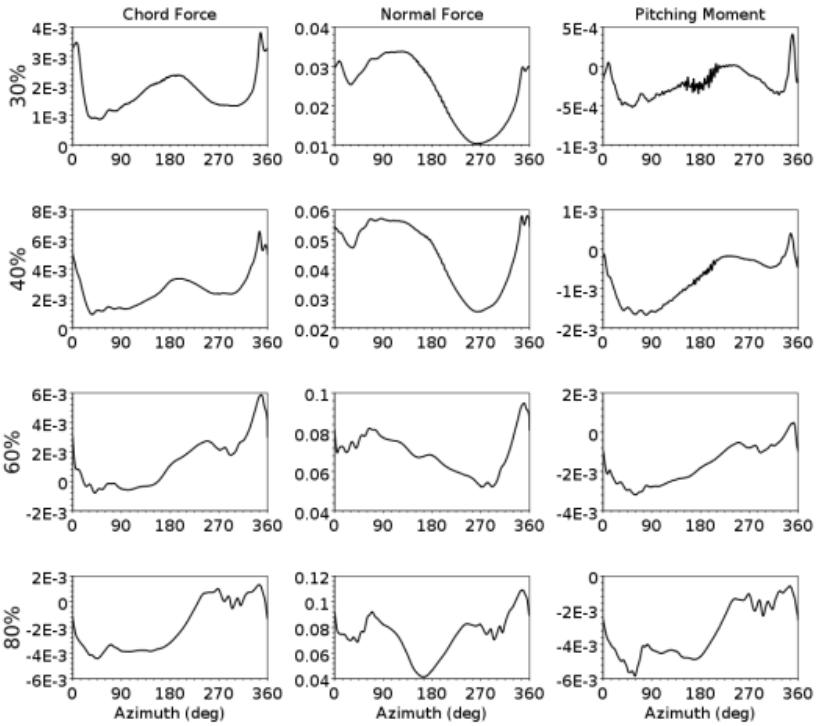




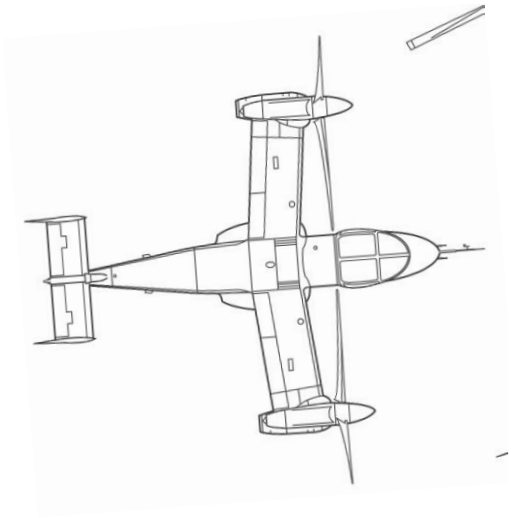
HeliosPlot is a post-processing tool capable of displaying line data output by the Helios software:

- Residual history
- Force/moment history
- Matrix of airload data



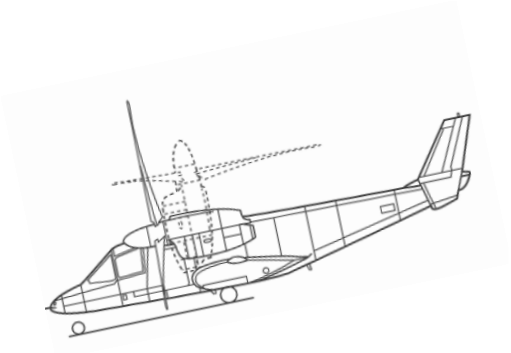


SERVICES



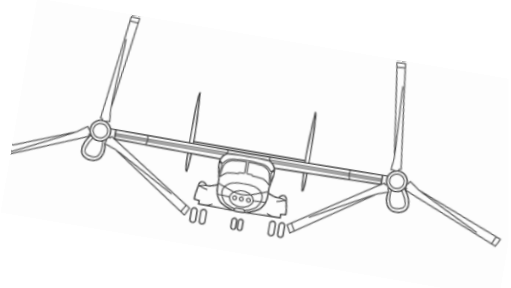
Sukra Helitek provides the following services:

- Workshops
- Consulting services
- Software development
- Technical authoring, reviewing and editing
- Fit for purpose engineering consultancy, using CFD simulations where appropriate
- Advice and guidance on flow challenges and simulations
- Guidance and support for starting to use CFD tools and developing an in-house capability
- Bespoke training including easy-start training in CFD techniques and applications
- Predictive engineering hand-calculations
- How to implement and benefit from simulation driven design and optimization

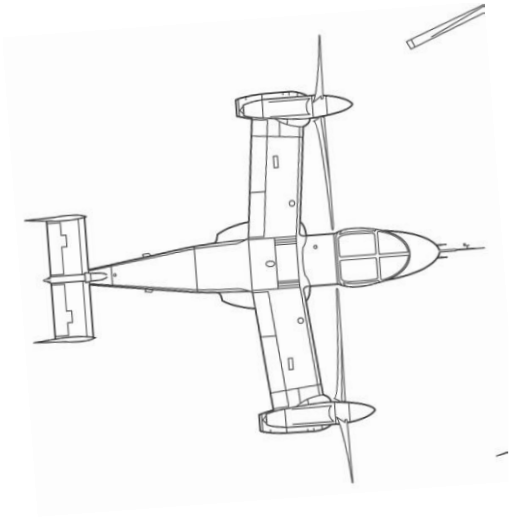


WORKSHOP

While our university curriculum is quite strong in theory, it lacks in imparting hands-on training to students by way of solving real-life problems, resulting in engineers that are found wanting in the above mentioned skill-set. It is this gap between the industry expectation and students' proficiency that Sukra Helitek seeks to bridge through its innovative workshop programs. Taking advantage of the easy availability of PCs in engineering colleges and drawing from its experience in CFD software development, Sukra Helitek has designed computer based training modules that impart hands-on experience in aerodynamics, CFD and CAD. While the workshops are conducted using in-house tools, the focus is on training students in the process of engineering design, simulation and analysis, so that they become capable in quickly adapting to any engineering software tool.



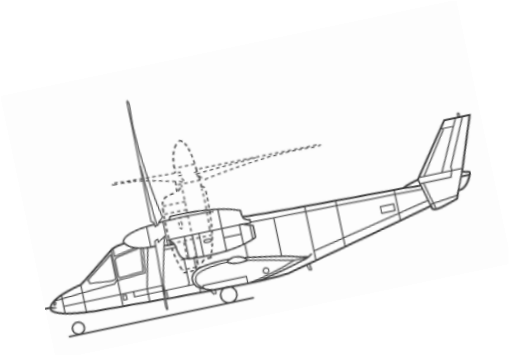
What sets apart Sukra Helitek workshop programs is the fact that the workshop structure and supporting lecture material has been prepared by Prof. Ganesh Rajagopalan, founder of Sukra Helitek and faculty at the department of the aerospace engineering, Iowa State University (U.S.A.). With his 35+ years of experience in teaching and aerospace industry consulting, Prof. Rajagopalan brings a unique perspective of the U.S.



methodology of practical training and moulds it to the needs of the theoretically strong Indian student. Also, unlike programs conducted by third-party training institutions, Sukra Helitek workshops are conducted by our own engineers, who share their day-to-day experiences of handling real-life engineering problems. Workshops also include live guest lectures by Prof. Rajagopalan and other faculty from deemed universities. We are currently offering a workshop on CFD titled **"Introduction to Engineering Modelling and Simulation."** Some salient features of the workshop are:

- Introduction to steps involved in CFD simulation and analysis, with focus on correlation to theory and experiment
- Hands-on exercises from simple problems in CFD to real-life engineering examples
- Suitable for UG (2nd to 4th year) and PG students from mechanical, automobile and aerospace engineering
- Resource requirement: Standard PCs or laptops with windows, Linux or MAC OS and a white board

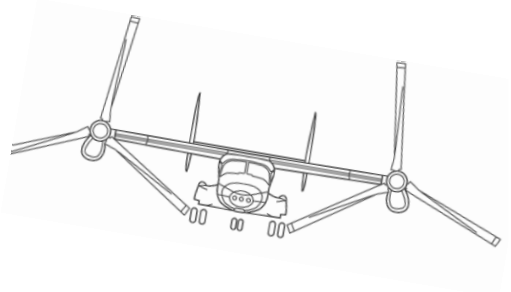
What you will learn



✓Understand the fundamental and physics of governing Equation.
✓ Conceptual Understanding of Fluid mechanics, Navier-stoke's equation, finite Volume and other CFD techniques.
✓ CFD Fundamentals.
✓ Geometry handling -2D, 3D
✓Hands on Training with RotCFD
✓ Post-processing Analysis and Plotting.
✓ Preprocessing Analysis-Geometry creation, Grid Generation, Problem Set up.

SERVICES

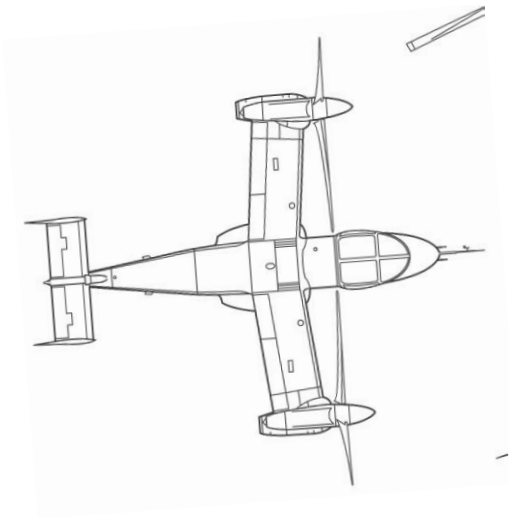
Consulting Service

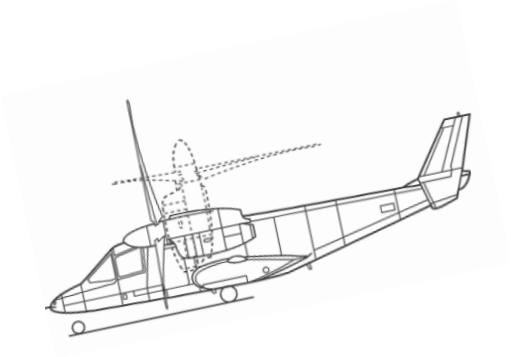


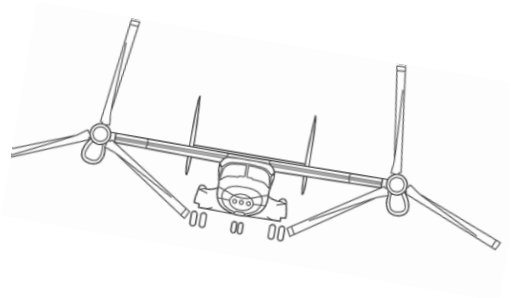
Sukra provides CFD consulting services to industry and academia for the research and development of engineering systems. The areas for research and development of engineering systems CFD-propeller design, helicopter and UAV/MAV aerodynamics, low-speed aircraft analysis, wind turbine performance analysis, aerodynamics of land vehicles etc. Company employs highly qualified and dedicated professionals with experience in the fields of computer science, mathematics, computational fluid dynamics and engineering to fulfill customer needs.

Educational Software

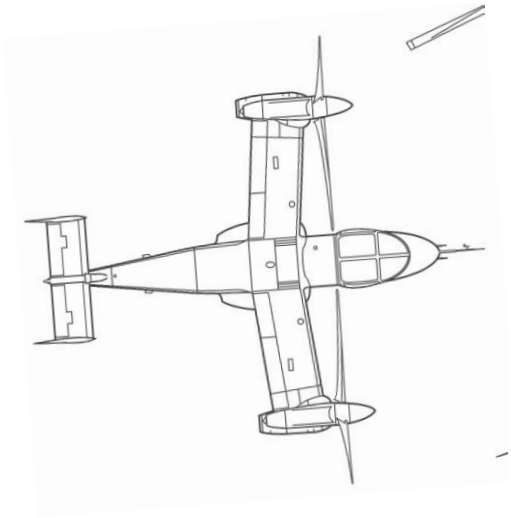
Educational software modules in aerodynamics, rotorcraft dynamics and CFD, with focus on step-by- step learning, from basic physics to real-life engineering problems; a teaching tool that complements text-book learning. An innovative, computer-based learning tool to impart basic aerospace engineering knowledge in an interesting, yet educational, framework.







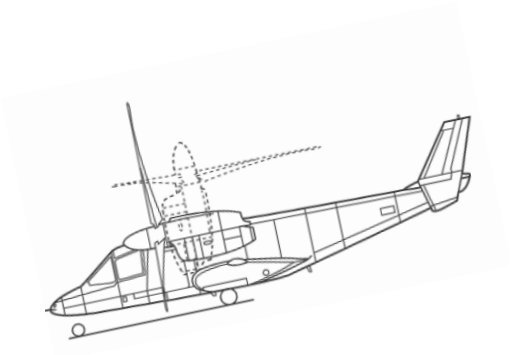
ACHIEVEMENT

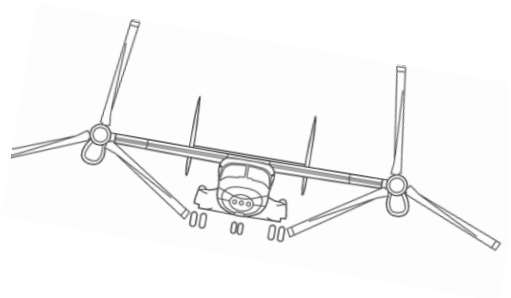


NASA published a newsletter SPIN OFF about the Sukra Helitek, giving a complete introduction about the company and the work done inside it.

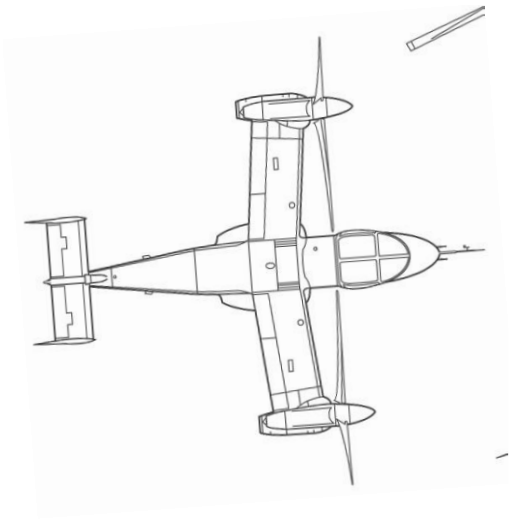
Follow the link below to know more about it:

https://spinoff.nasa.gov/Spinoff2017/t_5.html





CONTACT US :



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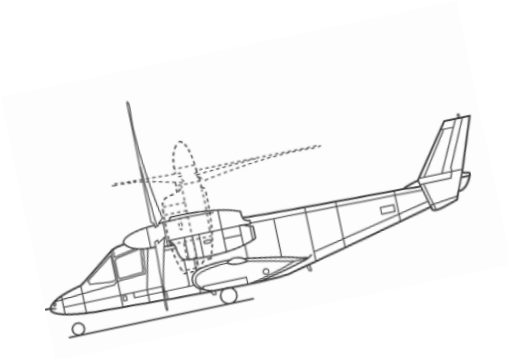

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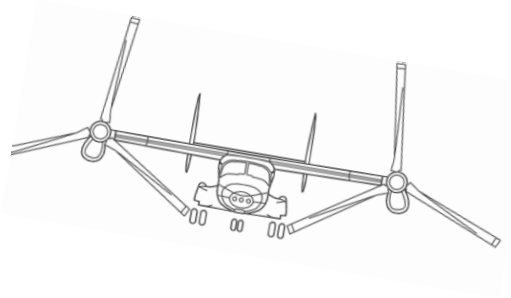

FIND US AT:

www.sukra-helitek.com