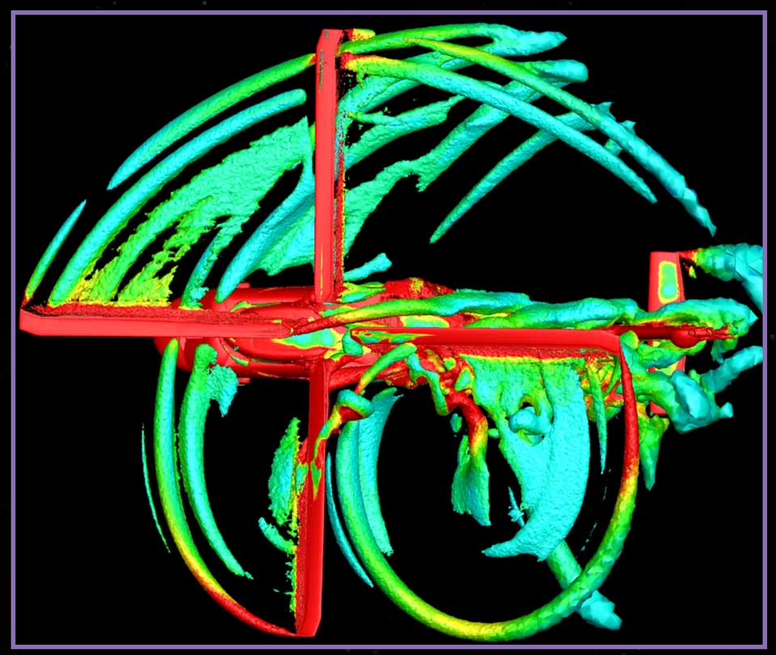
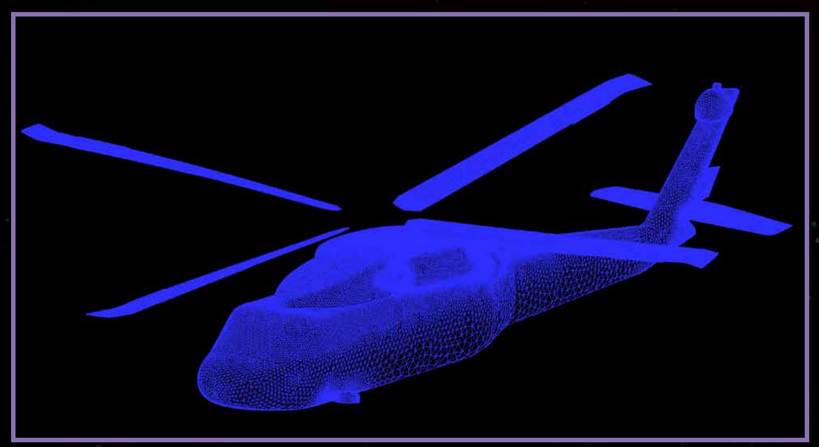
National Aeronautics and Space Administration

UH-60A Blackhawk Helicopter Aerodynamics



Isosurfaces of the vortex cores highlight the wake structures of the UH-60A Blackhawk helicopter. Cores are colored by vorticity magnitude, with red indicating areas of high vorticity in the flow.
Elizabeth Lee-Rausch, NASA/Langley



Unstructured surface grid for the UH-60A Blackhawk helicopter.
Elizabeth Lee-Rausch, NASA/Langley

As a part of NASA's Fundamental Aeronautics Program, the Subsonic Rotary Wing Project is developing the next generation of comprehensive rotorcraft analysis and design tools using high-fidelity models. FUN3D is a suite of unstructured-grid computational fluid dynamics (CFD) codes being developed for high-fidelity aerodynamic analysis and design of rotorcraft.

The prediction of rotorcraft airloads (aerodynamic forces and moments) presents a significant challenge for CFD due to complex flow physics, nonlinear structural dynamics, and the geometrical complexity of rotorcraft. Under this project:

- FUN3D is used to compute the rotor airloads on a UH-60A Blackhawk helicopter at high-speed and high-thrust conditions
- Computed airloads are compared with flight data to validate the simulation method
- FUN3D's unique adjoint-based technique for design optimization is currently being extended for use in rotorcraft aerodynamic design

Ensuring that rotorcraft analysis and design tools can be scaled to a large number of processors and a variety of hardware types will reduce the time and cost of designing next-generation rotorcraft. Additionally, the development and validation of more accurate analysis tools will increase the confidence in new design concepts.

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