Gridgen
Reliable CFD Meshing

Gridgen Keeps E2C Flying High

The accuracy and flexibility of Gridgen grid generation and pre-processing CFD software combined with the robust, efficient capabilities of NASA's Overflow solvers provide optimum results for Northrop Grumman Integrated Systems' Warren H. Davis, Ph.D., the Aero CFD Principal Engineer who leads a team responding to continual updates, additions, and enhancements to his company's U.S. Navy electronics surveillance workhorse, the E-2C Hawkeye. The Hawkeye provided stellar success in Afghanistan missions in 2002.

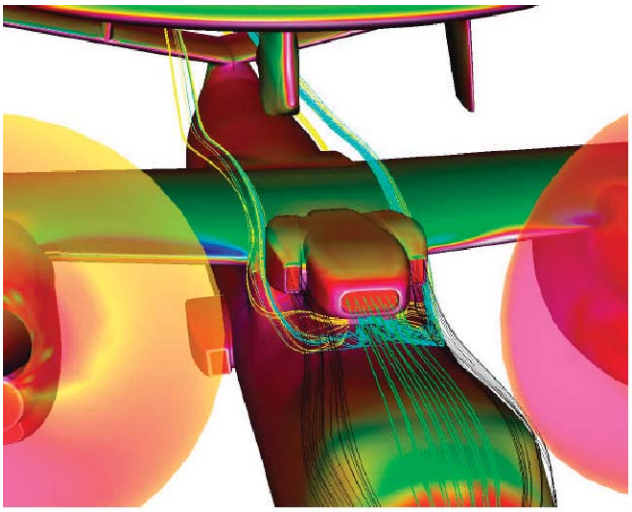
Dr. Davis and his team gauge adaptations on the computer, using two remarkable programs (among other tools): Gridgen and Overflow.

Gridgen is Pointwise Inc.'s grid generation and pre-processing CFD enabling bridge connecting computer aided design (CAD) software and CFD solvers such as Overflow, Fluent, STAR-CD, and CFX. The program generates hexahedral, tetrahedral, and hybrid (prisms and pyramids) meshes, reads geometry from CAD systems, and includes meshing tools and direct solver interfaces. Overflow is a Navier-Stokes flow solver that uses single block grids or Chimera overset (structured) grid systems. Chimera overset grids are body-fitted hexahedral grids around each component. They can overlap each other instead of requiring exact point-to-point interface matching like traditional structured grids. This makes the engineer's grid generation task faster and easier while maintaining accuracy.

"Applied engineers and vehicle designers need solid answers. These are the mechanisms by which we can model handling and performance testing and respond very quickly," he explains. "Working together, Gridgen and Overflow are the best available tools for over-the-top response and absolutely reliable results."

Now able to overcome formerly limited abilities to handle complex geometries, Davis and his team mesh, measure, and test scoops, props, the dome, inlets, and other complex configuration components.

On his plate: gauge and analyze prop blade variations, swirl effects, vortices, and incoming flow properties. Also, how would proposed changes to the propellers—changing the four-blade configuration to eight-blade on the E-2C's co-rotating propellers—affect handling and performance? What would be the wing and tail surface effects? Also, with increased power requirements for an advanced radar installation, the need for alternate radar liquid cooling scoops required designing new, larger scoops to provide cooling via clean airflow. The original inlets were positioned just behind swirling flow from the propellers, engine nacelle and fuselage surfaces. How would additions or modifications to the scoops impact performance? Would a repositioning be advantageous for the larger scoops?



Radar liquid cooling scoops side mounted on vapor cycle inlet.

Rather than change the whole wind tunnel model to test these changes, Dr. Davis uses Gridgen's high quality mesh cells to provide accurate simulations. "Our team can do the CFD calculations before the tunnel, with reliable, verifiable results," he stressed.

Gridgen's high accuracy was, is, and will be invaluable as the E-2C undergoes these major upgrades when combined with Overflow and ever-increasing computing power.

"Gridgen provides excellence both in initial surface grid generation and in its flexibility to fix any problems that arise at any stage of the process," Davis emphasized. He credits Gridgen's well-organized and intuitive interface and exceptional functionality. "We have the freedom to concentrate on producing the highest-quality grids in the shortest possible time."

Davis says he is continually amazed at the ease of handling and at the ability to fix problems that arise when integrating with other tools (such as CAD, flow solvers, even other grid generators).

Pointwise's John Chawner sums it up: "We like to think Gridgen's capabilities render many of the old empirical processes in the design cycle obsolete."

From a Pointwise interview with Warren Davis, PhD.

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