Tools for optimizing design, engineering, and manufacturing

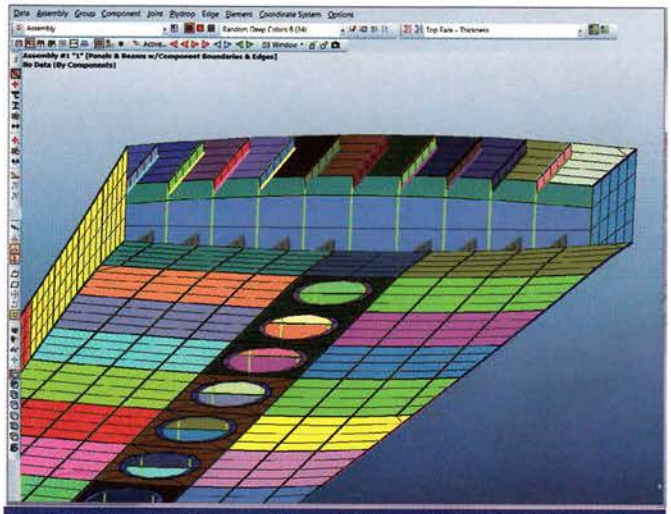
Structural Sizing and Analysis Tool Improves Design, Manufacturability of Composites and Metals

HAMPTON, Va.—The latest version of a structural sizing and analysis software product from Collier Research Corporation is reported to improve the design and manufacturability of composites and metals used in such industries as aerospace, aviation, wind energy, and automotive. HyperSizer®v6.2 structural sizing and analysis software, released this summer by Collier, includes new modeling capabilities for airframe wing box designs, as well as laminate zone and ply-count optimization enhancements to improve manufacturing efficiency.

"Composites are booming due to stepped-up fuel consumption efficiency goals," said Craig Collier, president of Collier Research, in a press release announcing the new version of the software. "This is pushing the movement towards light-weighting. But creation of lighter, stronger designs is limited by many of today's standard industry practices. Weight is needlessly added because engineers have only a partial view of options. They often overdesign to play it safe."

To overcome such drawbacks, HyperSizer targets weight while serving as an independent and neutral data exchange hub for CAD, FEA, and composite software packages. It iterates with FEA solvers, calculates margins of safety, validates failure predictions with test data, and sequences composite laminates for fabrication—avoiding weight growth as designs mature.

"HyperSizer works from preliminary design through flight certification," says Collier. "This gives the engineering team a more wide-open conceptual design space for performing trade studies involving thousands of alternatives. They can find robust solutions that lead to significant weight and cost savings. On average, our customers reduce weight by 20 percent."



Using the discrete stiffener modeling (DSM) capability in Collier Research Corporation's HyperSizer v6.2, engineers designing airframe wing boxes can identify each stiffener as a separate panel segment, apply failure analyses, and determine unique margins of safety for each. This added flexibility allows for the creation of panel bays with stringers of varying dimensions and materials, and captures the strength and weight benefits of non-uniform spacing and termination. Image courtesy of Collier Research Corporation.

HyperSizer has been used on a variety of NASA spacecraft projects, including the current Space Launch System (SLS) rocket, previous Ares I and V launch vehicles, the Composite Crew Module, and the metal Orion Multi-Purpose Crew Vehicle. Commercial aviation customers include Boeing, Bombardier, Goodrich, Gulfstream, and Lockheed Martin. HyperSizer's capabilities are also appropriate for applications in wind turbine blades, ship hull and superstructures, high-speed railcars, and automobile body components.

"In the past, our designs were often overweight," says Ian Fernandez, former materials and analysis lead on NASA Ames Research Center's LADEE satellite project. "HyperSizer has enabled our Center to be more competitive in this regard. It's a robust analysis tool that allows us to complete our weight and strength studies in far less time, while finding optimal ply coverages."

One of the new enhancements in HyperSizer v6.2 is discrete stiffener modeling. For airframe wing box and fuselage structures, the software automatically identifies, in the FEM, skin shell and stiffener beam elements and optimizes their spacings, heights, and laminates. This provides the flexibility for designing panel bays with non-uniformly spaced stiffeners of varying directions, dimensions, and materials, while also assigning margins to each unique stiffener panel segment.

HyperSizer v6.2 (www.hypersizer.com) also includes laminate optimization for manufacturability. An improved six-step process is said to optimize laminates (transition zones, ply-count compatibility, ply drops/adds, and global ply tracking) while balancing strength, stability, and manufacturability. This leads to fabrication efficiencies and factory-floor cost-savings.

Other enhancements are said to include new puck composite failure analysis for 2D and 3D fiber fracture; new curved (skin) local buckling analysis; upgraded compression and shear post-buckling analyses; enhanced panel concepts (PRSEUS, reinforced core sandwich, and tapered tube beam); improved test data and other graphical displays and functions; and new methods documentation.

In addition to providing engineering software for NASA, Collier is currently collaborating with Sandia National Laboratories Wind Energy Technology Department on the use of optimization in wind turbine blade prototype design.

Cloud-Based, Pay-As-You-Go Model Reported to Break Down Barriers to Simulation

SAN FRANCISCO—Autodesk, Inc. recently unveiled Autodesk Simulation 360, calling it "a comprehensive set of tools delivered securely in the cloud, with a pay-as-you-go pricing model that enables any company to make simulation part of their everyday design and engineering processes." Designers, engineers, and analysts can use Autodesk Simulation 360, the company says, to more easily predict, optimize, and validate the performance of things in the world around us. According to the company, the "virtually infinite power of the cloud" enables mainstream designers to perform complex engineering tests that were once limited to simulation specialists.

For example, product designers can test how various ergo-