# Computers in engineering

## SpaceClaim aims to bring 3-D design to the masses

With the March 2007 launch of its flagship product, SpaceClaim Professional 2007, **SpaceClaim**, a privately held company founded in September 2005, seeks to put the benefits of 3-D mechanical design within reach of all those who contribute to the product development process.

"We are trying to put usable 3-D at the fingertips of all engineers," said Mike Payne, SpaceClaim CEO and founder of **PTC** and **SolidWorks**. "We believe that for a long time, and today, mechanical design in 3-D has remained out of reach of people who need to be involved in the product development process. Our product empowers these people, enabling them to focus on their core competency and yet get benefit from a powerful 3-D modeling tool, which helps their contributions in the design process. "

SpaceClaim bridges the gap between designers and those in the extended product development team, such as suppliers, manufacturing engineers, analysis engineers, and engineering management, who do not have the time or access to master the designers' 3-D CAD system.

"We believe there are about 5 million people worldwide who are in one way or another involved directly in mechanical product design, and four-fifths of these people are excluded from full benefits of 3-D," Payne said. "That means that 4 million people who are involved in manufacturing analysis, quality assurance, and concept design do not have access to viable 3-D systems. SpaceClaim is a addressing those 4 million people."

Previously, people who contributed to the design conceptualization, review, analysis, and manufacturing phases of a product had to communicate with the design team through view-only file formats, or even paper. SpaceClaim allows the extended team to work directly with the 3-D model to investigate the impact of each idea and validate the geometry of change requests before sharing them with the design team, improving the quality of each design iteration and freeing CAD specialists to work only with valid requests.

"We believe we have largely simplified the way people can use 3-D," Payne said. "We have a flexible 3-D design environment and a completely modern graphical user interface. We have incorporated some 2-D concepts into the 3-D world to make it more familiar to people who use 2-D today. We believe we reduce total dependency on the CAD specialist."

SpaceClaim Professional 2007 allows users to work with models created in many CAD systems, including CATIA V5 and V4, NX, Pro/ENGINEER, SolidWorks, Inventor, ACIS, Parasolid, IGES, STEP, DWG, DFX, and VDA. An open XML data format ensures that customers, rather than the software vendor, retain ownership of and access to product data.

Major modeling tasks are combined in SpaceClaim into one tool that requires minimal user interaction. Users can modify 3-D models by directly editing arbitrary cross sections for added modeling flexibility. The program's integrated part and assembly design environment is especially suited for conceptual design.

**Launched in March 2007, SpaceClaim Professional 2007 uses a modern user interface to help make 3-D design available to individuals throughout the product development process. Shown is a landing gear imported into SpaceClaim for modification.**

Designed to operate in Windows Vista, the program has the look and feel of **Microsoft** Office 2007; however, it is also compatible with Windows XP.

"It runs properly on XP and we have no difference in performance between XP and Vista," Payne said.

The program's data model was designed to ensure long-term stability, according to Payne.

"Our data model ensures that data created this year will be usable and readable next year. There is no possibility of regeneration failures in our product."

Matt Monaghan

## FiberSIM expedites composite product development process

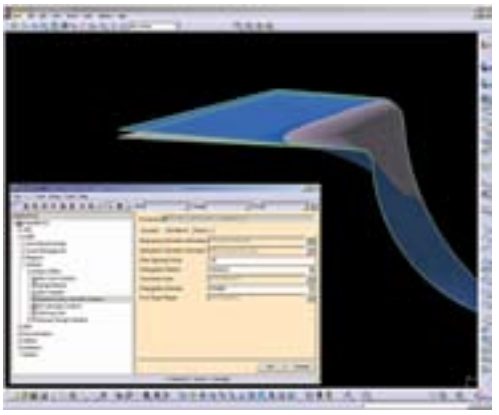
**VISTAGY** has released a new version of its FiberSIM software suite specifically created for the design and manufacture of composite products. This version of FiberSIM includes new tools for defining preliminary 3-D solids and generating product weight studies, which help engineers assess and reduce the weight of composite parts while ensuring part durability early in the design phase.

FiberSIM, powered by VISTAGY's EnCapta technology, helps aerospace engineers streamline many of the tedious, time-consuming, and complex tasks for designing and manufacturing complex parts.

For the first time, FiberSIM supports the 64-bit technology platform, maximizing speed and performance while reducing memory constraints when designing large, complex parts or assemblies.

"Because of intense competition, our customers are setting more ambitious product delivery goals than ever before and are really challenging their engineers and suppliers to reduce cycle times and achieve accurate final parts more rapidly," said Bob Flory, Vice President of Product Development, VISTAGY.

The new version of FiberSIM aids in preliminary design with the addition of zone-based solid generation and preliminary zone-based weight calculation. Designers are now able to define zones and shapes to check for space allocation and interferences early in the design process. Zone-based weight allocation helps engineers reduce part weight and



This flange was modified using design data from FiberSIM to accommodate for spring-back. The green lines represent the laminate boundaries. The spring-back gap is represented at left by the space between the blue and gray planes.

assess whether the final part will meet weight requirements.

A new composite stacking tool provides an integrated laminate stacking and sequencing capability for automatically establishing the order of plies and generating symmetric and balanced laminates.

Material specification data can be imported or exported between FiberSIM and **Microsoft** Excel, via the preliminary design interface. This allows for automatic sharing and reporting of design information.

A new feature allows engineers to account for the impact of thermal deformation, which can cause a part to "spring back" when removed from the manufacturing tool. The spring-back for manufacturing laminate feature accurately maps the engineering boundaries of a laminate skin and transfers them onto the "sprung" skin tool surface, providing full associativity between the engineering part and the manufacturing sprung part to ensure all changes made in the design dataset automatically transfer to the manufacturing dataset.

Enhancements in 2-D laminate creation provide users with more options for transferring composite data from 3-D to 2-D. Specific composite development processes, such as tape laying, are taken into account to ensure final parts are created accurately.

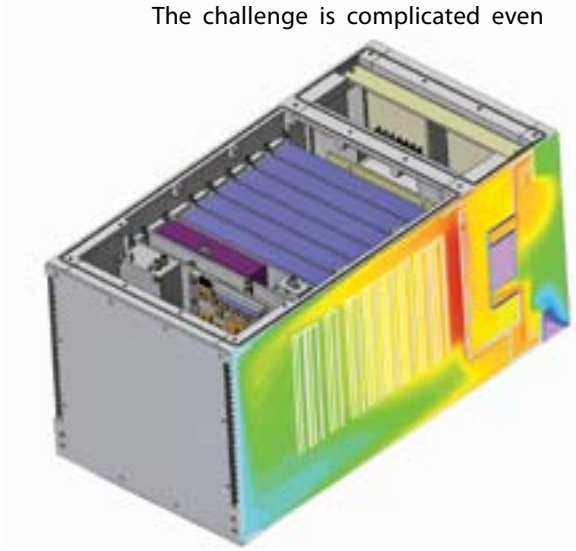
"By establishing a model-based process with FiberSIM, engineers will utilize the software's powerful new capabilities to more efficiently and easily create conceptual designs that are the basis for composite products while streamlining the manufacturing phase to meet delivery deadlines and specification requirements," said Flory.

Matt Monaghan

## Thermal simulation helps keep aircraft electronics cool

As electronics have become more widespread in aircraft, thermal management challenges have become increasingly complex. Several decades ago, air transport rack (ATR) form-factor systems typically dissipated 50 to 60 W; today's systems are likely to dissipate up to 200 W.

The challenge is complicated even further at high altitudes. At 50,000 ft, air has only one-eighth of its density at sea level, forcing the volumetric flow of air to be increased by a factor of eight to maintain the same level of cooling.



Hybricon used Flomerics' Flotherm 3-D CFD software to cool an ATR form-factor chassis that dissipates almost 200 W and operates at altitudes up to 50,000 ft.

**Hybricon**, a designer and manufacturer of backplanes, card frames, and powered enclosures for the electronics packaging marketplace, was recently tasked by a defense contractor to cool an ATR form-factor chassis that dissipates almost 200 W and operates up to 50,000 ft.

Thermal simulation was conducted using **Flomerics**' Flotherm 3-D CFD software, and a range of possible design configurations was evaluated, focusing on heat sink design and fan performance at high altitudes.

Hybricon engineers used Flotherm's parametric design capabilities to optimize the heat sink design, varying the fin count and thickness over a range. The software automatically set up each design iteration and simulated flow velocity and temperatures throughout the enclosure. The results showed that the design was optimized when 21 fins were used.

However, the optimized heat sink design met the temperature requirements at altitudes up to 35,000 ft, but did not meet them at 50,000 ft. The 35,000-ft operating altitude was deemed acceptable for the initial demonstration version, but the customer said a solution needed to be developed for operation at 50,000 ft.

Further simulations were then conducted to evaluate the impact of using a higher-capacity air-moving device. The simulation showed that a high-performance fan would meet the customer's original specification for operation at 50,000 ft altitude.

In that application, engineers optimized the heat sink design to squeeze the last bit of cooling out of the limited mass of air that could be drawn through the chassis at high altitude. According to Hybricon, its engineers were then able to answer the what-if questions that made it possible for them to develop their thermal management strategy for both the current demo version and a future production version of the system.

Matt Monaghan