

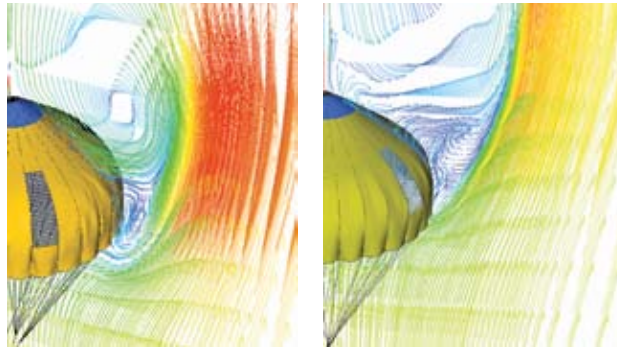
Computers in engineering

SGI helps Irvin Aerospace build a better parachute

Irvin Aerospace, a Santa Ana, CA-based designer, developer, and manufacturer of parachutes, has begun using SGI technology to enhance its engineering simulation and analysis capabilities. The technology will be used to couple CFD and FEA, creating a fluid structure interaction (FSI) analysis capability.

The complementary architectures of SGI's Altix shared-memory server and Altix XE cluster provide a mixed workflow environment for both capacity and capability computing, enabling design engineers to do more complex analyses on a greater variety of fluid flow problems, resulting in accelerated application run time and the optimized performance of software applications. As a result of the increased computing power, Irvin Aerospace can create computer models ten times larger than previously possible, according to SGI.

By running the FSI application on SGI's Linux-based Altix system, Irvin Aerospace can model a range of real-world conditions, including water landing of a variety of spacecraft systems and the flying performance of parachute designs in subsonic and



With the SGI Altix family of servers, Irvin Aerospace engineers can simulate small modifications of size and form to improve design performance without the high cost and time consumption of field product testing. The far left image illustrates no air flowing through the parachute canopy, while the image alongside shows airflow by applying a computation formula.

supersonic flight regimes.

Among the software applications used by Irvin Aerospace are LS-DYNA, a general-purpose transient dynamic finite element program to simulate the deployment of parachutes as well as CFD effects and impact, and Altair OptiStruct, a finite element-based software for design optimization.

"With this computing power, Irvin engineers can simulate small modifications of size and form to improve design performance without the unnecessary high cost and time consumption of field product testing," said Robert Shiley, General Manager of Irvin's engineering organization. "These analysis and pre-

dictive capabilities and services can be bundled and optimized to help our customers to optimize designs, reduce cost and development time and risk, and enhance value."

Irvin Aerospace designs, develops, and manufactures parachutes for space and air vehicle recovery systems; deceleration systems for high-performance aircraft; military, personnel, and cargo parachute systems as well as ordnance flare chutes, airbags, and weapons delivery systems. Irvin's R&D group also designs a variety of deceleration systems for custom applications.

Matt Monaghan

K-1 takes shape with UGS NX software

Rocketplane Kistler (RPK) has employed UGS' NX software in the design, production, and testing of its Kistler K-1 launch vehicle. As part of the Commercial Orbital Transportation Services Program, RPK was recently awarded a \$207 million contract by NASA to complete the development of K-1's International Space Station (ISS) cargo capabilities and commence commercial cargo flights to the ISS by 2009.

A fully reusable, two-stage orbital launch vehicle, the K-1 will perform a variety of missions including deployment of commercial and government satellites to low-Earth orbit, medium-Earth orbit, and geostationary orbit, as well as servicing of the ISS with pressurized and unpressurized cargo. Depending on satellite requirements, the K-1 offers both standard and ex-

tended payload modules.

RPK and its key contractors, Northrop Grumman, Aerojet, and Lockheed Martin, are using UGS NX 3 for all CAD work supporting the continued design and development of the K-1's structures and systems, allowing for seamless integration across the various contractors.

"UGS' CAD software has formed the foundation of K-1 vehicle physical design, allowing for the three-dimensional integration of the structures and systems of the K-1," said Dave Cochran, K-1 Structures and Cargo Module Program Manager, Rocketplane.

The NX software has been used to design the structures, propulsion systems, electronic systems, and portions of the landing and thermal protection systems, according to Cochran. "The



UGS' NX software has been used extensively by Rocketplane Kistler in the development of the K-1 aerospace vehicle. The K-1 will deploy commercial and government satellites and service the International Space Station with pressurized and unpressurized cargo.

electronic models built with NX also feed into our various systems-level analyses, including loads, thermal, and environmental assessment," he continued.

"Without a robust three-dimensional CAD solution, integration of complex vehicles like the K-1 is significantly more expensive and time-consuming," Cochran said. "NX allows us to do a digi-

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tal mock-up of the vehicle, route wiring and tubing, and mount components without the need to construct any full-scale physical mock-ups to validate the design. This has allowed us to validate designs, conduct trade studies, and assess change impacts very rapidly and at very low cost."

RPK has also employed Teamcenter 9, UGS' product life-

cycle management solution, as the critical organizational and control tool for all CAD files that make up the K-1 vehicle. Teamcenter ensures synchronization of the entire vehicle CAD database among the key subcontractors.

Matt Monaghan

SABCA 'shakes and bakes' with LMS Test.Lab

Belgian aerospace company SABCA (Sociétés Anonyme Belge de Constructions Aéronautiques) has implemented LMS Test.Lab for use in the development of components and assemblies for a range of aircraft and space projects, including the **European Space Agency's** new VEGA launcher. SABCA has been active for more than 80 years, designing, testing, and manufacturing parts and systems for major aircraft and spacecraft, including the Ariane 5 launch vehicle and several Airbus aircraft.



Belgian firm SABCA is using LMS Test.Lab software to conduct qualification tests of thrust vector control systems (shown) to be used in the European Space Agency's VEGA launcher.

SABCA will use LMS Test.Lab Environmental software to perform "shake and bake" qualification testing with sine profiles, shock, and random inputs in a vibration range of 1 to 22 g, from 5 to 2000 Hz. These tests are conducted to ensure that prototype assemblies properly operate under the severe vibration environment of rocket liftoff and in-flight conditions.

Data will be acquired via LMS SCADAS III front-end units with a capacity of 24 input channels. The systems are scalable, however, to allow for additional channels and offer the ability to interconnect multiple SCADAS units to further increase channel count. Channel count is critical when acquiring the large amount of measurement data generated through the testing campaigns, according to SABCA engineers.

A particularly high level of accuracy is needed when qualifying SABCA's new mechatronic systems, which contain complex electronic control systems and intricate parts made of lightweight materials.

SABCA's mechatronics department is currently developing a thrust vector control (TVC) system made up of electromechanical actuators, integrated power drive control electronics, sets of Li-ion batteries, and cable harnesses for use in the VEGA launcher.

These actuators control the positioning of the launcher nozzles, making them critical to the trajectory of the vehicle

and the success of the mission. The new TVC design uses lightweight materials and contains control electronics, including a proprietary HBRISC2 processor designed and ESA-qualified by SABCA for demanding aerospace applications. Due to the high amount of electronic circuitry in the new TVC design, tests entail a more refined vibration control for three axes simultaneously, requiring more channels than available on the former system.

The LMS system provides the capability to monitor results online in real time, enabling engineers to confirm the validity of data as tests are being run and also remotely shut down the system in case of emergency without destroying the test specimen.

Matt Monaghan



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