

Computers in engineering

Easy does it

The **CD adapco Group** has released STAR CCM+, its next-generation CFD code for flow analysis. The new software aims to deliver ease of use through an object-based tree-structured GUI, which guides even novice users through the setup and analysis of a CFD problem. STAR CCM+ uses the latest numerical algorithms, including an advanced pre-conditioned coupled and segregated solver, and state-of-the-art software coding methods.

The object-based user interface requires the user only to populate the features activated, and nothing additional appears in the interface. Unlike the conventional form-filling approach, the GUI asks the user a sequence of relevant questions. When all questions have been answered, the solver is "almost certain" to run, according to CD adapco.

A unique polyhedral cell formulation accommodates any mesh type and opens the door to another aspect of ease of use, namely that STAR CCM+ is able to import meshes from any leading grid-generation system, including those from **Ansys**, **Pointwise**, and **Fluent**, with generalized mesh interfaces such as CGNS available.

Robustness of solution is also important. The polyhedral cell approach offers faster solutions that require less memory than traditional hexahedral or



STAR CCM+ is designed to simplify the analysis of a wide range of flow regimes in the aerospace industry.

tetrahedral meshes. Advanced methods such as embedded refinement and arbitrary interfacing are available. Using parallel-processor operation requires no prior special knowledge of the setup. The user simply opens STAR CCM+, states how many processors are required, and from that point on they will be used in the simulation. The software looks to find what CPUs are available and automatically processes the job.

Visualization is integrated with analysis, for the first time enabling dynamic steering of the solution. For example, if the rate of convergence of a solution looks unsatisfactory to the engineer, he/she can intervene and

change the relaxation parameters as the process is running. While watching the flow field establish around a wing profile, the screen can be split, and it is possible to watch several monitored quantities evolve with each iteration.

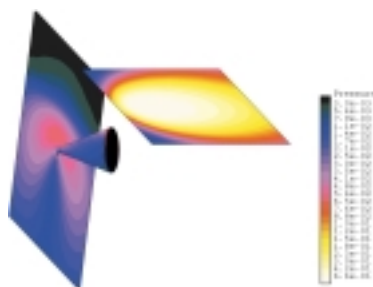
STAR CCM+ is suitable for the analysis of a wide range of flow regimes in the aerospace industry, including subsonic, transonic, and supersonic applications. It is capable of analyzing flows ranging from those found in passenger compartments, HVAC, turbine, and compressor systems to complex geometries including rotating missile bodies, highly swept turbine blades, and the external aerodynamic shape of aircraft.

David Alexander

Paracel dedicates power

The **University of Southern California** (USC) Department of Aerospace and Mechanical Engineering has a **U.S. Air Force** grant to study flow over spacecraft at high altitudes using the SMILE (Statistical Modeling In the Low-density Environment) code.

Previously, the department had to rely on shared computing resources from the **Department of Defense**, but with the computational demands of SMILE—based on the direct-simulation Monte Carlo method—they needed a dedicated system that would deliver the performance necessary with reliability and minimal administration.



The pressure distribution on a flat plate as nitrogen gas expands from a small nozzle mounted on a plenum into a vacuum is shown, calculated using SMILE parallel software running on a Paracel Cyclone Linux cluster.

Cyclone, an integrated turnkey **Linux** cluster, was pre-configured by **Paracel** to optimize the performance of the SMILE code for USC. Paracel selects and tests each component and only uses certified parts when building its high-performance computers to reduce unplanned downtime and the need for IT resources.

"The Paracel Cyclone has given us a dedicated high-performance computing resource that is easy to administer," said Sergey Gimelshein, Research Assistant Professor at USC. "The system arrived pre-configured and was running SMILE the same day."

David Alexander

LMS shakes up space testing

The European Aeronautic Defense and Space organization (EADS) Space Transportation division has decided to upgrade its existing environmental test system to LMS Test.Lab, from LMS International. The new software suite supports different testing disciplines, ranging from vibration and acoustic qualification testing to modal testing and analysis. Integrated vibration-control features protect critical specimens from receiving permanent damage.

A key factor for EADS was the capability of the system to achieve productivity gains in the test process,

from modal pre-tests and instrumentation up to fast and customizable reporting. The new environmental test solution is deployable as one large test configuration with a high channel count, or as multiple smaller setups operating in parallel.

"EADS executes vibration and acoustic environmental tests for final validation and qualification of components, subsystems, and full launcher systems, and to update and validate virtual simulation models from the CAE division," said Jean-Pierre Souyri, Manager of the Vibration Testing Section at EADS in Bordeaux. "As operating margins are often too small to fully rely on virtual simulation, additional tests are requested to perform in-between validations of design options. We are able to check specific assumptions made or parameters set in structural simulation models during the ongoing development process."

Launch vehicles and related infrastructure are thoroughly tested under extreme operating conditions. EADS Space Transportation engineers perform climatic, thermal, and pyrotechnic shock tests, as well as applying varying pressure loads to examine the static and dynamic performance of launcher subsystems and components.

Large-scale environmental tests are executed to qualify and validate complete launcher systems. To obtain the characteristics of the tested assembly in real time, hundreds of transducer signals are measured and processed in parallel, using data reduction techniques.

At the EADS Space Transportation site in Bordeaux, the installation consists of a vibration-control station and a 540-channel acquisition and analysis station. Both stations are standardized on LMS SCADAS III hardware, and run the LMS Test.Lab software suite. Optic cables connect the front-end racks with the equipment in the control room.

During the pre-test phase, the environmental test system performs modal tests and analyses to identify

Briefs

MTS Systems Corp. has released AeroPro 4.0 software, a new version of its data-acquisition and control software for aerospace structural testing. AeroPro 4.0 allows test engineers to employ a single, integrated user interface to perform both synchronized and stand-alone data-acquisition and control functions. AeroPro 4.0 software also supports a number of advanced test optimization techniques, such as forward loop optimization, which reduce test operation time. New data archiving features enable users to more efficiently store and manage large amounts of test data.

Lockheed Martin has been awarded a research and development contract from the **U.S. Army** to develop software to aid the survivability of manned and unmanned rotorcraft in combat situations. The SPAR (survivability planner associate rerouter) system will receive data from existing aircraft sensors and off-board communication nodes, evaluate the information in relation to the battlefield terrain, and recommend the most appropriate action.

NASA Ames Research Center and the **Jet Propulsion Laboratory** have jointly developed a software tool that uses artificial intelligence to help develop a plan of action for the Mars Exploration Rover mission. MAPGEN (mixed activity planning generator) is an automated tool that makes it easy to build, modify, and work with complex science plans. The software reduces complexity of the planning task and allows uniform enforcement of the flight and mission rules for the two Rovers.

Rockwell Collins, in collaboration with **Innovative Media Solutions**, will provide **British Airways** with eOffload, an Internet-based service that manages in-flight entertainment (IFE) use and information. The service gathers and displays data on passenger use of broadcast and on-demand audio and video, and IFE data such as flight information uploads and seat resets. eOffload is supported by Rockwell Collins' enCompass IFE service.

Smiths Aerospace has selected the CsLEOS real-time operating system from **BAE Systems** to underpin the boom control actuator electronics on the **Boeing 767** tanker transport aircraft. The system is certifiable to the aviation industry's highest safety standards, and accommodates a mixture of criticality levels among functions, saving the time and expense associated with certifying the entire system to level A.



EADS has achieved productivity gains in its vibration- and acoustic-qualification test process by implementing LMS Test.Lab from LMS International.

the optimal measurement locations on the structure under test. Weak points are identified up-front, and the instrumentation of the actual qualification test adjusted accordingly.

LMS Test.Lab automates to a large extent the physical instrumentation of hundreds of sensors. The system supports TEDS (transducer electronic data sheet) transducers, from which it automatically receives serial number; calibration date; x,y,z measurement directions; and sensitivities. LMS Test.Lab controls the data flow and has the capacity to run a variety of tests serving different purposes.

Testing productivity is also leveraged by the LMS hardware, which can easily be deployed in any test configuration. LMS SCADAS III offers high-bandwidth channels, with

low noise-distortion and phase-shift characteristics, and it is scalable hardware, which allows for future needs.

At least as important as expanding channel count is the modularity of the system. In most of the parallel setups, the vibration-control and data-acquisition functions are combined to be able to drive and control the shaker system independently. Housing these essential functions in one system increases the efficiency and maintainability of the complete system, and improves the security of expensive launcher assemblies.

At any moment during the execution of an environmental test, LMS Test.Lab can monitor any measurement or control signal on the display. The operator is immediately

notified about signals exceeding thresholds, while remaining in full control of the test setup.

With a remote-control keyboard, the operator can access the most important online functions while standing next to the structure being tested, and can, if needed, abort the test with a single push on a button. All the acquired data is safely and securely stored.

At the end of a test cycle, shortly after receiving the analysis results, LMS Test.Lab generates environmental test reports. Batch reporting, active picture capabilities, and tight integration with **Microsoft** Office are among the reporting features appreciated by EADS engineers.

David Alexander

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