Software

Software for Collaborative Engineering of Launch Rockets

The Rocket Evaluation and Cost Integration for Propulsion and Engineering software enables collaborative computing with automated exchange of information in the design and analysis of launch rockets and other complex systems. RECIPE can interact with and incorporate a variety of programs, including legacy codes, that model aspects of a system from the perspectives of different technological disciplines (e.g., aerodynamics, structures, propulsion, trajectory, aeroheating, controls, and operations) and that are used by different engineers on different computers running different operating systems. RECIPE consists mainly of (1) ISCRM — a file-transfer subprogram that makes it possible for legacy codes executed in their original operating systems on their original computers to exchange data and (2) CONES — an easy-to-use file-wrapper subprogram that enables the integration of legacy codes. RECIPE provides a tightly integrated conceptual framework that emphasizes connectivity among the programs used by the collaborators, linking these programs in a manner that provides some configuration control while facilitating collaborative engineering tradeoff studies, including "design to cost" studies. In comparison with prior collaborative-engineering schemes, one based on the use of RECIPE enables fewer engineers to do more in less time.

This program was written by Thomas Troy Stanley of International Space Systems, Inc., for **Marshall Space Flight Center**. *Further information is contained in a TSP (see page 1). MFS-31692*

Software Assists in Extensive Environmental Auditing

The Base Environmental Management System (BEMS) is a Web-based application program for managing and tracking audits by the Environmental Office of Stennis Space Center in conformity with standard 14001 of the International Organization for Standardization (ISO 14001). (This standard specifies requirements for an environmental-management system.) BEMS saves time by partly automating what were previously manual processes for creating audit checklists; recording and tracking audit results; issuing, tracking, and implementing corrective-action requests (CARs); tracking continuous improvements (CIs); and tracking audit results and statistics. BEMS consists of an administration module and an auditor module. As its name suggests, the administration module is used to administer the audit. It helps administrators to edit the list of audit questions; edit the list of audit locations; assign mandatory questions to locations; track, approve, and edit CARs; and edit completed audits. The auditor module is used by auditors to perform audits and record audit results: it helps the auditors to create audit checklists, complete audits, view completed audits, create CARs, record and acknowledge CIs, and generate reports from audit results.

This program was written by Christopher Callac and Charlie Matherne of Lockheed Martin Corp. for **Stennis Space Center**.

Inquiries concerning rights for the commercial use of this invention should be addressed to the Intellectual Property Manager, Stennis Space Center, (228) 688-1929. Refer to SSC-00180.

Software Supports Distributed Operations via the Internet

Multi-mission Encrypted Communication System (MECS) is a computer program that enables authorized, geographically dispersed users to gain secure access to a common set of data files via the Internet. MECS is compatible with legacy application programs and a variety of operating systems. The MECS architecture is centered around maintaining consistent replicas of data files cached on remote computers. MECS monitors these files and, whenever one is changed, the changed file is committed to a master database as soon as network connectivity makes it possible to do so. MECS provides subscriptions for remote users to automatically receive new data as they are generated. Remote users can be producers as well as consumers of data. Whereas a prior program that provides some of the same services treats disconnection of a user from the network of users as an error from which re-covery must be effected, MECS treats disconnection as a nominal state of the network: This leads to a different design that is more efficient for serving many users, each of whom typically connects and disconnects frequently and wants only a small fraction of the data at any given time.

This program was written by Jeffrey Norris, Paul Backes, and Robert Steinke of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to

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Refer to NPO-30448, volume and number of this NASA Tech Briefs *issue, and the page number.*

Software Estimates Costs of Testing Rocket Engines

Simulation-Based Cost Model (SiCM), a discrete event simulation developed in Extend™, simulates pertinent aspects of the testing of rocket propulsion test articles for the purpose of estimating the costs of such testing during time intervals specified by its users. A user enters input data for control of simulations; information on the nature of, and activity in, a given testing project; and information on resources. Simulation objects are created on the basis of this input. Costs of the engineering-design, construction, and testing phases of a given project are estimated from numbers and labor rates of engineers and technicians employed in each phase, the duration of each phase; costs of materials used in each phase; and, for the testing phase, the rate of maintenance of the testing facility. The three main outputs of SiCM are (1) a curve, updated at each iteration of the simulation, that shows overall expenditures vs. time during the interval specified by the user; (2) a histogram of the total costs from all iterations of the simulation; and (3) table displaying means and variances of cumulative costs