is not just a GUI front-end, but an integrated environment that can perform sophisticated computational tasks, e.g. importing industry standard file formats and employing parameter sweep functions, which are both lacking in SE, and require minimal interaction by the user. These functions are created using a mixture of Visual Basic and the SE script language. These form the foundation for a high-performance front-end that substantially simplifies use without sacrificing the proven capabilities of SE. The real power of SE-FIT lies in its automated pre-processing, pre-defined geometries, convergence computation operation, computational diagnostic tools, and crash-handling capabilities to sustain extensive computations.

SE-FIT performance is enabled by its so-called file-layer mechanism. During the early stages of SE-FIT development, it became necessary to modify the original SE code to enable capabilities required for an enhanced and synchronized communication. To this end, a file-layer was created that serves as a command buffer to ensure a continuous and sequential execution of commands sent from the front-end to SE. It also establishes a proper means for handling crashes. The file layer logs input commands and SE output; it also supports user interruption requests, back and forward operation (i.e. 'undo' and 'redo'), and others. It especially enables the batch mode computation of a series of equilibrium surfaces and the searching of critical parameter values in studying the stability of capillary surfaces. In this way, the modified SE significantly extends the capabilities of the original SE.

There is a growing need for SE in subjects such as flows related to microgravity tankage, inkjet printing, nanotechnologies, transport in porous media, capillary self-assembly and self-alignment, microscale wicking structures, foams, and more. It is hoped that SE-FIT will prove to be an essential tool for myriad capillary design and analysis applications as well as a tool for both education and inquiry.

*This work was done by Yongkang Chen, Mark Weislogel, Ben Schaeffer, Ben Semerjian, and Lihong Yang of the Portland State University Office of Research and Sponsored Projects; and Gregory Zimmerli of Glenn Research Center. Further information is contained in a TSP (see page 1).*

*Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steven Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18824-1.*

## Scalable Integrated Multi-Mission Support System Simulator Release 3.0

*Goddard Space Flight Center, Greenbelt, Maryland*

The Scalable Integrated Multi-mission Support System (SIMSS) is a tool that performs a variety of test activities related to spacecraft simulations and ground segment checks.

The GSFC Mission Services Evolution Center (GMSEC) has been advancing new technologies using its architecture to aid missions in the development of control centers, and to enable the interoperability of mission operations center (MOC) components. These new technologies are intended to provide missions with low-cost solutions in implementing their ground systems. SIMSS Version 2.0 was developed to run within the GMSEC architecture as a plug-in component. To accomplish this, SIMSS is integrated with GMSEC application programming interface (API) 3.0 libraries, which allows SIMSS to successfully operate in the GMSEC environment and communicate with other components using GMSEC messages that are transmitted over the GMSEC messaging middleware interface bus.

This innovation (SIMSS Release 3.0) provides a Generic Simulator module, which supports the use of an XTCE-based project database (PDB) from which telemetry data is generated, and then is published onto the GMSEC message bus.

SIMSS is a distributed, component-based, plug-and-play client-server system useful for performing real-time monitoring and communications testing. SIMSS runs on one or more workstations and is designed to be user-configurable or to use predefined configurations for routine operations. SIMSS consists of more than 100 modules that can be configured to create, receive, process, and/or transmit data. The SIMSS/GMSEC innovation is intended to provide missions with a low-cost solution for implementing their ground systems, as well as significantly reducing a mission's integration time and risk.

*This work was done by John Kim, Sarma Velamuri, and Taylor Casey of Goddard Space Flight Center; and Travis Bemann of Honeywell. For further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810. GSC-16041-1*

## Mars Express Forward Link Capabilities for the Mars Relay Operations Service (MaROS)

*NASA's Jet Propulsion Laboratory, Pasadena, California*

This software provides a new capability for landed Mars assets to perform forward link relay through the Mars Express (MEX) European Union orbital spacecraft. It solves the problem of standardizing the relay interface between lander missions and MEX.

The Mars Operations Relay Service (MaROS) is intended as a central point for relay planning and post-pass analysis for all Mars landed and orbital assets. Through the first two phases of implementation, MaROS supports relay coordination through the Odyssey orbiter and the Mars Reconnaissance Orbiter (MRO).

With this new software, MaROS now fully integrates the Mars Express spacecraft into the relay picture. This new software generates and manages a new set of file formats that allows for relay request to MEX for forward and return link relay, including the parameters specific to MEX.

Existing MEX relay planning interactions were performed via email exchanges and point-to-point file transfers. By integrating MEX into MaROS, all transactions are managed by a centralized service for tracking and analysis. Additionally, all lander missions have a single, shared interface with MEX and do not have to integrate on a mission-by-mission basis.

Relay is a critical element of Mars lander data management. Landed assets depend largely upon orbital relay for data delivery, which can be impacted by the availability and health of each orbiter in the network. At any time, an issue may occur to prevent relay. For this reason, it is imperative that all possible orbital assets be integrated into the overall relay picture.

*This work was done by Daniel A. Allard, Michael N. Wallick, Roy E. Gladden, and Paul Wang of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).*

*This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-48345.*

# FERMI/GLAST Integrated Trending and Plotting System Release 5.0

*Goddard Space Flight Center, Greenbelt, Maryland*

An Integrated Trending and Plotting System (ITPS) is a trending, analysis, and plotting system used by space missions to determine performance and status of spacecraft and its instruments. ITPS supports several NASA mission operational control centers providing engineers, ground controllers, and scientists with access to the entire spacecraft telemetry data archive for the life of the mission, and includes a secure Web component for remote access.

FERMI/GLAST ITPS Release 5.0 features include the option to display dates (*yyyy/ddd*) instead of orbit numbers along orbital Long-Term Trend (LTT) plot axis, the ability to save statistics from daily production plots as image files, and removal of redundant "edit/create Input Definition File (IDF)" screens. Other features are a fix to address invalid packet lengths, a change in naming convention of image files in order to use in script, the ability to save all ITPS plot images (from Windows or the Web) as GIF or PNG format, the ability to specify $y_{min}$ and $y_{max}$ on plots where previously only the desired range could be specified, Web interface capability to plot IDFs that contain out-of-order page and plot numbers, and a fix to change all default file names to show *yyyy-dddhhmmss* time stamps instead of *hhmmssdddyyyy*.

A Web interface capability sorts files based on modification date (with newest one at top), and the statistics block can be displayed via a Web interface. Via the Web, users can graphically view the volume of telemetry data from each day contained in the ITPS archive in the Web digest.

The ITPS could be also used in non-space fields that need to plot data or trend data, including financial and banking systems, aviation and transportation systems, healthcare and educational systems, sales and marketing, and housing and construction.

*This work was done by Sheila Ritter of Goddard Space Flight Center, and Haim Brumer and Denise Reitan of Honeywell Technology Solutions. Further information is contained in a TSP (see page 1). GSC-15974-1*

# Where's My Data — WMD

*NASA's Jet Propulsion Laboratory, Pasadena, California*

WMD provides a centralized interface to access data stored in the Mission Data Processing and Control System (MPCS) GDS (Ground Data Systems) databases during MSL (Mars Science Laboratory) Testbeds and ATLO (Assembly, Test, and Launch Operations) test sessions. The MSL project organizes its data based on venue (Testbed, ATLO, Ops), with each venue's data stored on a separate database, making it cumbersome for users to access data across the various venues.

WMD allows sessions to be retrieved through a Web-based search using several criteria: host name, session start date, or session ID number. Sessions matching the search criteria will be displayed and users can then select a session to obtain and analyze the associated data.

The uniqueness of this software comes from its collection of data retrieval and analysis features provided through a single interface. This allows users to obtain their data and perform the necessary analysis without having to worry about where and how to get the data, which may be stored in various locations. Additionally, this software is a Web application that only requires a standard browser without additional plug-ins, providing a cross-platform, lightweight solution for users to retrieve and analyze their data.

This software solves the problem of efficiently and easily finding and retrieving data from thousands of MSL Testbed and ATLO sessions. WMD allows the user to retrieve their session in as little as one mouse click, and then to quickly retrieve additional data associated with the session.

*This work was done by William L. Quach, Tadas Sesplaukis, Kyran J. Owen-Mankovich, and Lori L. Nakamura of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov.*

*This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-48362.*