sion of traversability maps that result from pose estimation uncertainties, dealing with boundary effects to enable tighter maneuvers, and handling a wider range of obstacles.

This work advances what has been previously developed and integrated on the Mars Exploration Rovers by using algorithms that are capable of traversing more rock-dense terrains, enabling tight, thread-the-needle maneuvers. These algorithms were integrated on the newly refurbished Athena Mars research rover, and were fielded in the JPL Mars Yard. Forty-three runs were conducted with targets at distances ranging from 5 to 15 m, and a success rate of 93% was achieved for placement of the instrument within 2–3 cm of the target.

This work was done by Issa A. Nesnas and Mihail N. Pivtoraiko of Caltech, Alonzo Kelly of Carnegie Mellon University, and Michael Fleder of MIT 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-48062.

Computing Radiative Transfer in a 3D Medium

NASA's Jet Propulsion Laboratory, Pasadena, California

A package of software computes the time-dependent propagation of a narrow laser beam in an arbitrary three- dimensional (3D) medium with absorption and scattering, using the transient-discrete-ordinates method and a direct integration method. Unlike prior software that utilizes a Monte Carlo method, this software enables simulation at very small signal-to-noise ratios. The ability to simulate propagation of a narrow laser beam in a 3D medium is an improvement over other discrete-ordinate software. Unlike other direct-integration software, this software is not limited to simulation of propagation of thermal radiation with broad angular spread in three dimensions or of a laser pulse with narrow angular spread in two dimensions. Uses for this software include (1) computing scattering of a pulsed laser beam on a material having given elastic scattering and absorption profiles, and (2) evaluating concepts for laser-based instruments for sensing oceanic turbulence and related measurements of oceanic mixed-layer depths. With suitable augmentation, this software could be used to compute radiative transfer in ultrasound imaging in biological tissues, radiative transfer in the upper Earth crust for oil exploration, and propagation of laser pulses in telecommunication applications.

This program was written by Paul Von Allmen and Seungwon Lee 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-44719.

Architectural Implementation of NASA Space Telecommunications Radio System Specification

NASA's Jet Propulsion Laboratory, Pasadena, California

This software demonstrates a working implementation of the NASA STRS (Space Telecommunications Radio System) architecture specification. This is a developing specification of software architecture and required interfaces to provide commonality among future NASA and commercial software-defined radios for space, and allow for easier mixing of software and hardware from different vendors.

It provides required functions, and supports interaction with STRS-compliant simple test plug-ins ("waveforms"). All of it is programmed in "plain C," except where necessary to interact with C++ plug-ins. It offers a small footprint, suitable for use in JPL radio hardware.

Future NASA work is expected to develop into fully capable software-defined radios for use on the space station, other space vehicles, and interplanetary probes.

This work was done by Kenneth J. Peters, James P. Lux, Minh Lang, and Courtney B. Duncan 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-47328.

Journal and Wave Bearing Impedance Calculation Software

John H. Glenn Research Center, Cleveland, Ohio

The wave bearing software suite is a MALTA application that computes bearing properties for user-specified wave bearing conditions, as well as plain journal bearings. Wave bearings are fluid film journal bearings with multi-lobed wave patterns around the circumference of the bearing surface. In this software suite, the dynamic coefficients are outputted in a way for easy implementation in a finite element model used in rotor dynamics analysis. The software has a graphical user interface (GUI) for inputting bearing geometry parameters, and uses MATLAB's structure interface