DRAGON grid in alternation with USM3D, which is invoked on the unstructured subgrids of the DRAGON grid. The USM3D and OVERFLOW modules then immediately exchange their solutions and other data. As a result, USM3D and OVERFLOW are coupled seamlessly.

This program was written by Meng-Sing Liou of **Glenn Research Center** *and Yao Zheng of Taitech, Inc. 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: Steve Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-17509-1.

☢ Avoiding Obstructions in Aiming a High-Gain Antenna

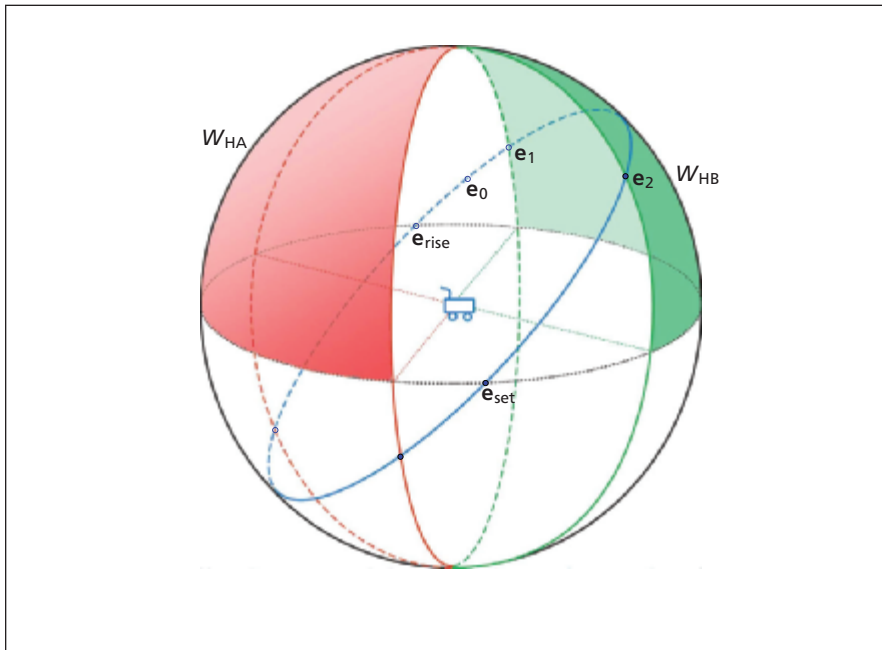*NASA's Jet Propulsion Laboratory, Pasadena, California*

The High Gain Antenna Pointing and Obstruction Avoidance software performs computations for pointing a Mars Rover high-gain antenna for communication with Earth while (1) avoiding line-of-sight obstructions (the Martian terrain and other parts of the Rover) that would block communication and (2) taking account of limits in ranges of motion of antenna gimbals and of kinematic singularities in gimbal mechanisms. The software uses simplified geometric models of obstructions and of the trajectory of the Earth in the Martian sky (see figure). It treats all obstructions according to a generalized approach, computing and continually updating the time remaining before interception of each obstruction. In cases in which the gimbal-mechanism design allows two aiming solutions, the algorithm chooses the solution that provides the longest obstruction-free Earth-tracking time. If the communication session continues until an obstruction is encountered in the current pointing solution and the other solution is now unobstructed, then the algorithm automatically switches to the other position. This software also notifies communication-managing software to cease transmission during the switch to the unobstructed position, resuming it when the switch is complete.

In this **Pointing Strategy Example**, the rover is flat and level on the Martian surface. The Hardstop Occlusions W_{HA} and W_{HB} are indicated as shrouded regions on the celestial sphere. The Earth trajectory as a function of time is depicted by e.

This program was written by Khaled Ali and Charles Vanelli 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 Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-42960.

☢ Analyzing Aeroelastic Stability of a Tilt-Rotor Aircraft

Langley Research Center, Hampton, Virginia

Proprotor Aeroelastic Stability Analysis, now at version 4.5 (PASTA 4.5), is a FORTRAN computer program for analyzing the aeroelastic stability of a tilt-rotor aircraft in the airplane mode of flight. The program employs a 10-degree-of-freedom (DOF), discrete-coordinate, linear mathematical model of a rotor with three or more blades and its drive system coupled to a 10-DOF modal model of an airframe. The user can select which DOFs are included in the analysis. Quasi-steady strip-theory aerodynamics is employed for the aerodynamic loads on the blades, a quasi-steady representation is employed for the aerodynamic loads acting on the vibrational modes of the airframe, and a stability-derivative approach is used for the aerodynamics associated with the rigid-body DOFs of the airframe. Blade parameters that vary with the blade collective pitch can be obtained by interpolation from a user-defined table. Stability is determined by examining the eigenvalues that are obtained by solving the coupled equations of motions as a matrix eigenvalue problem. Notwithstanding the relative simplicity of its mathematical foundation, PASTA 4.5 and its predecessors have played key roles in a number of engineering investigations over the years.

This program was written by Raymond G. Kvaternik of **Langley Research Center**. *Further information is contained in a TSP (see page 1). LAR-17175-1*