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## Database of Properties of Meteors

*Marshall Space Flight Center, Alabama*

A database of properties of meteors, and software that provides access to the database, are being developed as a contribution to continuing efforts to model the characteristics of meteors with increasing accuracy. Such modeling is necessary for evaluation of the risk of penetration of spacecraft by meteors. For each meteor in the database, the record will include an identification, date and time, radiant properties, ballistic coefficient, radar cross section, size, density,

and orbital elements. The property of primary interest in the present case is density, and one of the primary goals in this case is to derive densities of meteors from their atmospheric decelerations. The database and software are expected to be valid anywhere in the solar system. The database will incorporate new data plus results of meteoroid analyses that, heretofore, have not been readily available to the aerospace community. Taken together, the database and software con-

stitute a model that is expected to provide improved estimates of densities and to result in improved risk analyses for interplanetary spacecraft. It is planned to distribute the database and software on a compact disk.

*This program was written by Rob Suggs of Marshall Space Flight Center and Coster Anthea of Massachusetts Institute of Technology Lincoln Laboratories. For further information, contact Rob Suggs at [rob.suggs@nasa.gov](mailto:rob.suggs@nasa.gov). MFS-32243-1*

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## Computing Spacecraft Solar-Cell Damage by Charged Particles

*Goddard Space Flight Center, Greenbelt, Maryland*

General EQFlux is a computer program that converts the measure of the damage done to solar cells in outer space by impingement of electrons and protons having many different kinetic energies into the measure of the damage done by an equivalent fluence of electrons, each having kinetic energy of 1 MeV. Prior to the development of General EQFlux, there was no single computer program of

fering this capability: For a given type of solar cell, it was necessary to either perform the calculations manually or to use one of three Fortran programs, each of which was applicable to only one type of solar cell. The problem in developing General EQFlux was to rewrite and combine the three programs into a single program that could perform the calculations for three types of solar cells and run in a

Windows environment with a Windows graphical user interface. In comparison with the three prior programs, General EQFlux is easier to use.

*This program was written by Edward M. Gaddy of Goddard Space Flight Center. For further information, contact the Goddard Innovative Partnerships Office at (301) 286-5810. GSC-14791-1*

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## Thermal Model of a Current-Carrying Wire in a Vacuum

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

A computer program implements a thermal model of an insulated wire carrying electric current and surrounded by a vacuum. The model includes the effects of Joule heating, conduction of heat along the wire, and radiation of heat from the outer surface of the insulation on the wire. The model takes account of the temperature dependences of the thermal and electrical properties of the wire, the emissivity of the

insulation, and the possibility that not only can temperature vary along the wire but, in addition, the ends of the wire can be thermally grounded at different temperatures. The resulting second-order differential equation for the steady-state temperature as a function of position along the wire is highly nonlinear. The wire is discretized along its length, and the equation is solved numerically by use of an iterative algorithm

that utilizes a multidimensional version of the Newton-Raphson method.

*This program was written by James Borders 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-41067.*

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## Program for Analyzing Flows in a Complex Network

*Marshall Space Flight Center, Alabama*

Generalized Fluid System Simulation Program (GFSSP) version 4 is a general-purpose computer program for analyzing steady-state and transient flows in a complex fluid network. [GFSSP version 2.01 was reported in a prior issue of *NASA Tech Briefs*.] The

program is capable of modeling compressibility, fluid transients (e.g., water hammers), phase changes, mixtures of chemical species, and such externally applied body forces as gravitational and centrifugal ones. A graphical user interface enables the user to interac-

tively develop a simulation of a fluid network consisting of nodes and branches. The user can also run the simulation and view the results in the interface. The system of equations for conservation of mass, energy, chemical species, and momentum is solved nu-