Software

Code for Analyzing and Designing Spacecraft Power System Radiators

GPHRAD is a computer code for analysis and design of disk or circular-sector heat-rejecting radiators for spacecraft power systems. A specific application is for Stirling-cycle/linear-alternator electric-power systems coupled to radioisotope general-purpose heat sources. GPHRAD affords capabilities and options to account for thermophysical properties (thermal conductivity, density) of either metal-alloy or composite radiator materials. GPHRAD also enables specification of a heat-pipe radiator design with a radial location of the embedded heat-pipe condenser section determined numerically so that minimum radiator area is obtained. Alternatively, the user can specify a radial location of the heat-pipe condenser section for easier assembly with other components. In this case, GPHRAD determines the tradeoff cost in increased radiator area for this choice. A third option is to design a radiator without heat pipes, with heat flowing radially outward from the cylindrical cold section of the Stirling power system. A major subroutine, TSCALC, calculates an equilibrium sink temperature for a radiator, taking account of the solar absorptivity and thermal emissivity of the radiator surface, the spacecraft-to-Sun distance expressed in astronomical units (AU), the angle at which solar radiation is incident on the radiator surface, and the view factor to space of the radiator surface and the infrared absorptivity-to-emissivity ratio for planetary thermal radiation, if any. The sink temperature, along with the heat-source temperature and properties of the radiator material, serve as inputs to the GPHRAD code, which then calculates dimensions of, and temperature distribution within the radiator for a required heat-rejection load at given heat-rejection source temperature, such as the Stirling power system "cold" side temperature. The option to specify the disk tip-to-hub thickness ratio permits investigation of mass savings achieved by trapezoidal of parabolic tapering of the disk radiator design.

This program was written by Albert Juhasz 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: Steve Fedor, Mail Stop 4-8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-17053-1.

Decision Support for Emergency Operations Centers

The Flood Disaster Mitigation Decision Support System (DSS) is a computerized information system that allows regional emergency-operations government officials to make decisions regarding the dispatch of resources in response to flooding. The DSS implements a real-time model of inundation utilizing recently acquired lidar elevation data as well as real-time data from flood gauges, and other instruments within and upstream of an area that is or could become flooded. The DSS information is updated as new data become available. The model generates real-time maps of flooded areas and predicts flood crests at specified locations. The inundation maps are overlaid with information on population densities, property values, hazardous materials, evacuation routes, official contact information, and other information needed for emergency response. The program maintains a database and a Web portal through which real-time data from instrumentation are gathered into the database. Also included in the database is a geographic information system, from which the program obtains the overlay data for areas of interest as needed. The portal makes some portions of the database accessible to the public. Access to other portions of the database is restricted to government officials according to various levels of authorization. The Flood Disaster Mitigation DSS has been integrated into a larger DSS named REACT (Real-time Emergency Action Coordination Tool), which also provides emergency operations managers with data for any type of impact area such as floods, fires, bomb emergencies, and the like.

This program was written by Craig Harvey, Joel Lawhead, and Zack Watts of NVision Solutions, Inc., for **Stennis Space Center**.

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 SSC-00206-1, volume and number of this NASA Tech Briefs *issue, and the page number.*

NASA Records Database

The NASA Records Database, comprising a Web-based application program and a database, is used to administer an archive of paper records at Stennis Space Center. The system begins with an electronic form, into which a user enters information about records that the user is sending to the archive. The form is "smart": it provides instructions for entering information correctly and prompts the user to enter all required information. Once complete, the form is digitally signed and submitted to the database. The system determines which storage locations are not in use, assigns the user's boxes of records to some of them, and enters these assignments in the database. Thereafter, the software tracks the boxes and can be used to locate them. By use of search capabilities of the software, specific records can be sought by box storage locations, accession numbers, record dates, submitting organizations, or details of the records themselves. Boxes can be marked with such statuses as checked out, lost, transferred, and destroyed. The system can generate reports showing boxes awaiting destruction or transfer. When boxes are transferred to the National Archives and Records Administration (NARA), the system can automatically fill out NARA records-transfer forms. Currently, several other NASA Centers are considering deploying the NASA Records Database to help automate their records archives.

This program was written by Christopher Callac and Michelle Lunsford 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-00195.