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NASA TECH BRIEF



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Computer Program Determines Thermal Environment and Temperature History of Lunar Orbiting Space Vehicles

The problem:

The manned space program is about ready to break away from earth orbits and head for the moon. The temperatures of lunar orbiting spacecraft must be controlled to satisfy requirements of instruments or payload packages. Control requirements for a vehicle are influenced by its outer surface temperatures. Surface temperatures are, in turn, determined by thermal radiation characteristics of the surface, vehicle configuration and orientation, orbit parameters, the external environment, and internal power generation.

The solution:

A program to compute the thermal environment of a spacecraft in a lunar orbit. The quantities determined include the incident flux (solar, both direct and albedo, and lunar emitted radiation), total radiation absorbed by a surface, and the resulting surface temperature as a function of time and orbital position.

How it's done:

Computation is begun by providing approximate values of the various surface temperatures at perigee. The program then computes temperatures at successive intervals around the orbit until it has returned to perigee. Chances are that the approximate value and the newly computed temperature at perigee will not

agree. The program then repeats the computation utilizing the new temperature as an initial value. This iteration process is repeated until initial and final temperatures converge to within an acceptable tolerance. Thus, the program obtains a transient temperature history during a particular revolution of the space vehicle.

Notes:

1. The program is written in Fortran IV and runs under the standard IBSYS version 13 system on the IBM 7094.
2. Inquiries concerning this program may be directed to:

COSMIC
Computer Center
University of Georgia
Athens, Georgia 30601
Reference: B67-10307

Patent status:

No patent action is contemplated by NASA.

Source: K. L. Mitchell and D. E. Head
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