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# NASA TECH BRIEF



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## Expanded Sun-Look Angle Program

### The problem:

To devise a method of quickly and efficiently producing a time history of the flight of a space vehicle relative to variables identifying the flight pattern.

### The solution:

This program provides a time history of the sun aspect angles as seen from a vehicle. It can also generate a binary tape containing a time history of the position, velocity, and body attitude angles of the vehicle in the local horizontal, local vertical system.

### How it's done:

Input is a vehicle ephemeris tape and the *AFMTC Standardized Theoretical Trajectory Magnetic Tape*. The output binary tape may be used as input to a post-processor trajectory program. The main program reads-in the input to the Sun-Look Angle Program from cards and trajectory data tape.

The data tape is positioned to the first requested file and processed, a record at a time, using NTRAN. Negative IBM 7094 floating point numbers are converted to negative UNIVAC 1108 floating point numbers. If longitude is measured positive west of Greenwich on the data tape, the program will switch the sign to measure longitude positive east of Greenwich. If the altitude, position, and velocity of the vehicle are input in meters and meters per second, respectively, the program will correspondingly convert these to international feet and international feet per second.

Computation of the sun-look angles requires the position of the sun with respect to the vehicle. The position of the sun with respect to the earth-fixed geocentric (EFG) system is computed by using ephemeris tape, the ephemeris routine, and a transformation matrix which carries a vector in the earth-centered inertial system into a vector in the EFG system. The

position of the vehicle with respect to the EFG system is given via output. The position of the sun with respect to the vehicle can be found by a simple vector subtraction.

If a binary tape is to be generated, the velocity and body attitude angles of the vehicle with respect to the earth are computed, and this information is stored on the binary tape.

If the time on some record exceeds the input termination time for a file, or if the last record on a file is read, the data tape will be positioned to the next requested file and processing will continue. The program will write a final record on the binary tape which indicates the end of processing for this file.

When the final file has been processed, the program will read a new set of data cards if no binary tape is generated. If a binary tape is generated, the program will list the data from the binary tape on the output printer and then read a new set of data cards.

### Notes:

1. This program was written in FORTRAN V language and SLEUTH II for use on the UNIVAC 1108 computer.
2. Inquiries may be directed to:  
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