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LUMINARY MEMO# 210 COLOSSUS MEMO# 312

TO: Distribution
FROM: P. Volante, W. Ostanek
DATE: March 23, 1971
SUBJECT: Testing on Non Sign Agreement in TEPHEM in Apollo 14.

The V70 (Update liftoff time) used during Apollo 14 to adjust GET, resulted in a TEPHEM without sign agreement - the least significant register being negative.

Normally, sign agreement of double or triple precision quantities in the AGC is not necessary when the quantity is used as double or triple precision. In the Interpreter, when sign agreement is necessary, the interpreter itself forces sign agreement as in divide and in normalize. Use of just one of the least significant registers of a multi-precision quantity with sign disagreement without regard for the rest may be incorrect when used for logical operations or for computations.

In the CMC and LGC, TEPHEM is used only in the Planetary Inertial Orientation subroutine and in the Lunar Solar Ephemerides subroutine, both of which are interpretive code and do not require TEPHEM to be in sign agreement. To show this, digital simulations were run on both COMANCHE 108 and Luminary 178 to demonstrate the effect of the lack of sign agreement. The results showed no observable ill effects.

The tests run were:

COLOSSUS:

1. P52 option 3 at EI-30 with and without sign agreement in TEPHEM, to check sun and moon position. The LOS's to sun and moon were dumped for each

run and were identical, run to run.

2. P21 current time option and one revolution later with actual Apollo 14 TEPHEM and OT, to check PIOS routine. The P21 edit program verified that moon centered lat-long computation was accurate and an interpretive trace showed proper computation using non sign agreement in TEPHEM.

LUMINARY:

1. A complete Powered Descent Hybrid run with and without sign agreement in TEPHEM. The value of RLS after P68 was checked and did not differ. All other aspects of the landing seemed normal.
2. An R05 Digital Run with and without sign agreement in TEPHEM, using Apollo 14 trajectory data. The computed pitch and yaw angles did not differ.