



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS 77058

R. L. LAPSON

APR 22 1970

IN REPLY REFER TO 70-FS55-97

RECEIVED

APR 23 1970

R. A. LAPSON

MEMORANDUM TO: PA/Chief, Data Priority Coordination
FROM : FS5/Chief, Flight Software Branch
SUBJECT : Phase Elapsed Time (PET) in the AGC

1. Initial investigations have shown no serious problem with using a varying time-base in the CMC and LGC as long as the following ground rules are followed.

- a. The computer clock will never be negative.
- b. Ephemeris time will be maintained (i.e., TEPHEM + computer clock time will always be total elapsed time from midnight prior to July 1 -- the V70 uplink facilitates this maintenance and also corrects vector timetags).
- c. The CMC and LGC will always have the same time-base (as should the ground).
- d. Concurrent with 1.a, it would be best if the clocks were never less than some reasonable value (e.g., two hours) -- i.e., switchover to a new time-base would always occur (e.g.) two hours into that time-base.

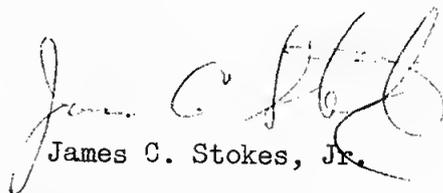
2. A crew and ground training problem is possible due to the probable complexity of choosing both time-base values and times to update, as well as the mechanics of actually updating. As implied above, there currently exists in both the LGC and CMC an option to the uplink program (P27) that will change the clock (decremented), TEPHEM (incremented), and both state vector timetags (decremented) with a single ΔT octal input. It is called the "lift-off time update" and is initiated via V70E. There are methods that the crew could currently use to compute the V70 octal input themselves.

3. Use of V70 would satisfy the ground rule in 1.b and would eliminate the necessity of uplinking new vectors just because a time-base was changed. V73 or V55 would (should) continue to be used to correct clock ERROR.

4. The ground rule in 1.a is necessary because of some assumptions that current routines make that could possibly be worked around (or, of course, corrected via PCR). Some possible remote-site downlink problems might be incurred. In addition, a much more thorough investigation and program verification study would have to be done. The ground rule in 1.d is desirable mainly because of the "present time" option available in many routines (i.e., input of zero time taken to mean current time). An example of the type of procedural difficulty that might turn up is the LGC AGS-Kfactor used to correctly bias LGC time to AGS time. If the time-base change were done after the AGS clock was aligned, then this quantity also might need updating. Ground interface problems are probably more than trivial, too. For instance, there is at least one RTCC processor that takes in time-tagged mark data from the CMC, and will take it in either live or playback. One could, therefore, envision having to update the RTCC conversion factor for CMC to GMT base time (GMTZS) back and forth if the time to do time-base changes was not carefully chosen. As another simple example of ground interface procedures that become more complex, TEPHEM is carried in the crew checklist as part of the CMC Erasable Load and hence would have to be updated each time the time-base was changed.

5. In summary then, from an onboard computer standpoint alone, with the given ground rules, it is not felt that an occasional change of time-base will cause any sizable impact or necessitate any program changes. However, it is felt that extreme care must be taken in generating and verifying the various procedures that will be followed by crew and ground in order to maintain a valid air/ground time interface.

6. Any questions concerning PET in the AGC should be directed to Mr. J. R. Garman at extension 2111.


James C. Stokes, Jr.

cc:
MIT/SDL/S. Copps
R. Larson
M. Hamilton ✓
TRW(Houston)/J. L. Norton
W. F. Harwood
FC/C. B. Parker
W. E. Fenner
W. S. Presley
K. W. Russell
FS/L. C. Dunseith

FS5/J. R. Roundtree
L. J. Dungan
C. D. Sykes
W. S. Ankney
J. W. Jurgensen
T. Cook (MIT/SDL)
J. A. Martin, Jr.
J. E. Williams, Jr.
G. R. Sabionski
T. G. Price

FS55:JRGarman:jvm