APOLLO SPACECRAFT SOFTWARE CONFIGURATION CONTROL BOARD PROGRAM CHANGE REQUEST

NUMBER *(Completed by FSB)*

1.0 COMPLETED BY ORIGINATOR

1.1 ORIGINATOR	DATE	1.2 ORGANIZATION	APPROVAL	DATE
Work/Weissman	11/30/70	MIT/DL		

1.3 EFFECTIVITY	1.4 TITLE OF CHANGE
LUMINARY 1E	Update mass-dependent calculations in 1/ACCS

1.5 REASON(S) FOR CHANGE

See page 2

1.6 DESCRIPTION OF CHANGE

See page 3

2.0 SOFTWARE CONTROL BOARD OR FLIGHT SOFTWARE BRANCH DECISION FOR VISIBILITY IMPACT ESTIMATE BY MIT

2.1 ☐ APPROVED ☐ DISAPPROVED

2.2 REMARKS:

2.3 SOFTWARE CONTROL BOARD OR FLIGHT SOFTWARE BRANCH SIGN OFF

DATE

3.0 MIT VISIBILITY IMPACT EVALUATION:

3.1 SCHEDULE IMPACT

3.2 IMPACT OF PROVIDING DETAILED EVALUATION

3.3 STORAGE IMPACT

None

3.4 REMARKS:

3.5 MIT COORDINATOR

DATE

4.0 SOFTWARE CONTROL BOARD ACTION

4.1 ☐ IMPLEMENT AND PROVIDE DETAILED CHANGE EVAL. ☐ PROVIDE DETAILED CHANGE EVALUATION ☐ DIS-APPROVED

4.2 REMARKS

4.3 SOFTWARE CONTROL BOARD SIGN OFF

DATE

5.0 MIT DETAILED PROGRAM CHANGE EVALUATION

5.1 MIT COORDINATOR

DATE

5.2 MIT EVALUATION

6.0 SOFTWARE CONTROL BOARD DECISION ON MIT DETAILED PROGRAM CHANGE EVALUATION

6.1 ☐ START OR CONTINUE IMPLEMENTATION ☐ DISAPPROVED OR STOP IMPLEMENTATION

6.2 REMARKS:

6.3 SOFTWARE CONTROL BOARD SIGN OFF

DATE

1.5 Reasons for change

The control authorities of the RCS jets and the GTS gimbal drives are calculated as functions of mass and of vehicle configuration in the 1/ACCS routine. The constants used in these calculations have not been changed since Apollo 9 (SUNDANCE). The addition of the Rover and the associated enlargement of the DPS tanks in LM 10 have caused appreciable changes in the mass properties. Calculations of the control authorities based upon the latest SODB data for LM 10 shows differences from the values computed in 1/ACCs of up to 11% for the descent LM configuration. This is excessive for a nominal error.

The 1/ACCS values match the SODB data for the staged LM 10 to within 3%. In view of the 10% uncertainty in the SODB data, it is proposed to leave unchanged the constants used in the ascent computations.

Table 3.3-1. The constants used in connection with the generalized hyperbolic equation.

Identification of Constants by Use		Values
For Use in the Jet-Acceleration Calculations Associated with the LM Ascent Configuration	P axis	a = 0.0065443852 b = 0.000032 c = -0.006923
	Q axis	a = 0.0035784354 b = 0.162862 c = 0.002588
	R axis	a = 0.0056946631 b = 0.009312 c = -0.023608
For Use in the Jet-Acceleration Calculations Associated with the LM Descent Configuration	P axis	a = .0071756944 b = 0.0 c = .0460844
	Q axis	a = .0014551624 b = .0183742 c = -.0605832
	R axis	a = .0008936540 b = .0226132 c = -.0680959
For Use in the Descent-Engine Moment-Arm Calculation		a = .0197118964 b = .1937973 c = -.0735453

The following scaling is employed in connection with these constants:

1) The mass m is scaled at 2^{16} kg.

2) For jet accelerations, which are scaled at $\pi/4$ rad/sec^2,
   a is scaled at $(\pi/4)\ 2^{16}$ kg rad/sec^2,
   b is scaled at $\pi/4$ rad/sec^2, and
   c is scaled at 2^{16} kg.

3) For jerk accelerations, in which the distance L is scaled at 8 ft,
   a is scaled at $8(2^{16})$ ft kg,
   b is scaled at 8 ft, and
   c is scaled at 2^{16} kg.