Massachusetts Institute of Technology
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Cambridge, Massachusetts

Flight 501 Memo # 14

TO: Distribution

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DATE: August 31, 1967

SUBJECT: Values Used for the Final Verification of the AS-501 Prelaunch Erasable Memory Data Load on the MIT/IL Digital Simulator

The following is a list of the terms, their definitions, SOLRUM55 addresses, scale factors and units, decimal values, and octal equivalents used to verify the final prelaunch erasable memory data load for AS-501.

This data was incorporated into and end-to-end digital simulation of the mission (600 seconds of prelaunch alignment through Pacific splash-down) based on a lift-off at 1300 G. M. T. on October 15, 1967.

The only parameters expected to change are DTEPOCH (launch date dependant), Cold Soak gimbal angles, (launch time and launch month dependant), azimuth and elevation of prelaunch alignment optical verification targets (yet to be determined), final IMU Compensation parameters, and the two MCP gimbal pot settings (CGY, CGZ).

ERASABLE NAME	DEFINITION FOR ERASABLE DATA LOAD	ADDRESS	SCALE FACTOR(D)	DECIMAL/OCTAL VALUE		OCTAL LOAD
IMU COMPENSATION						
GBIASX	GYRO BIAS DRIFT	0744	2^{-6} (GYRO PULSES/ CENTI-SEC)	OCT 00063	(1)	00063
GBIASY		0745		OCT 76250		76250
GBIASZ		0746		OCT 76333		76333
ADIAX	ACCELERATION-SENSITIVE GYRO DRIFT ALONG THE INPUT AXIS	0747	GYRO PULSES/ PIPA PULSE	OCT 77770		77770
ADIAY		0750		OCT 77772		77772
ADIAZ		0751		OCT 00033		00033
ADSRAX	ACCELERATION-SENSITIVE GYRO DRIFT ALONG THE SPIN-REFERENCE AXIS	0752	GYRO PULSES/ PIPA PULSE	OCT 77775		77775
ADSRAY		0753		OCT 00006		00006
ADSRAZ		0754		OCT 77767		77767
PBIASX	PIPA BIAS FACTOR	0736	2^{-8} (PIPA PULSES/ CENTI-SEC)	OCT 02063		02063
PBIASY		0740		OCT 02413		02413
PBIASZ		0742		OCT 72313		72313
PIPASCFX	PIPA SCALE FACTOR	0737	2^{-11} (PIPA COUNTS/PIPA COUNT)	OCT 44571		44571
PIPASCFY		0741		OCT 72541		72541
PIPASCFZ		0743		OCT 13110		13110
PRELAUNCH ALIGNMENT						
DTEPOCH	INTERVAL BETWEEN THE TIME THE LAUNCH VECTOR PASSED THROUGH THE INERTIAL Z-X PLANE AND THE TIME THE AGC CLOCK WAS ZEROED AT MIDNIGHT OF LAUNCH DATE	1073	2^{28} CENTI-SEC	2DEC 7233936 B-28	(2)	00671 20623
VAZ	AZIMUTH OF VEHICLE Z-AXIS EAST OF NORTH	1352	1 REVOLUTION	2DEC -.25	(3)	67777 77777
LATITUDE	GEODETIC LATITUDE OF LAUNCH PAD 39A	1314	1 REVOLUTION	2DEC 0.07946763955	(4)	02426 00022

AZIMUTH	AZIMUTH OF STABLE MEMBER Z-AXIZ EAST OF NORTH	1516	1 REVOLUTION	2DEC 0.2	(5)	06314 31463
POLYENTR	TRANSFER TO PITCH MONITOR POLYNOMIAL ROUTINE	1573	-	TC POLY		05554
POLYEND	TRANSFER AT END OF POLYNOMIAL ROUTINE	1615	-	TC DANZIG		04024
POLYCOFF + 0D	COEFFICIENTS A OF THE $\sum_{n=0}^{6} A_n T^n$ POLYNOMIAL	1579	16 REVS.	2DEC +1.3300e028 E-3 B-4		00001 13453
POLYCOFF + 2D		1577		2DEC +3.4777527e E-7 B+10		00017 34652
POLYCOFF + 4D		1601	16 REV	2DEC +5.27366944 E-9 B+24		01603 35205
POLYCOFF + 6D		1603	2^{14} CENTISEC	2DEC +1.47743111 E-13 B+38		01231 14015
POLYCOFF + 8D		1605		2DEC -5.1586135? E-17 B+52		64174 40131
POLYCOFF +10D		1607		2DEC +6.47052770 E-21 B+66		17216 14327
POLYCOFF +12D		1611		2DEC -1.60920606 E-25 B+80		71614 64244
TROLL	TIME FROM LIFT-OFF AT WHICH ROLL MONITOR BEGINS	1562	2^{28} CENTI-SEC	2DEC 900 B-28	(6)	00000 01604
TPITCH	TIME FROM LIFT-OFF AT WHICH PITCH MONITOR BEGINS	1564	2^{28} CENTI-SEC	2DEC 1070 B-28		00000 02056
TENDPTCH	TIME PITCH MONITOR IS ON	1566	2^{28} CENTI-SEC	2DEC 13400 B-28		00000 32150
MAXROLL	FINAL ROLL ANGLE MINUS INITIAL ROLL ANGLE	1702	1 REVOLUTION	2DEC .05	(7)	01463 06315
1/RLLRTE	ONE OVER DESIRED ROLL RATE	1700	$\frac{3600}{2^{28}}$ CENTISEC/REV	2DEC 3.6 E4 B-28	(8)	00002 06240
TTUMON	NOMINAL TIME FROM END OF PITCH MONITOR TO START OF TUMBLE MONITOR	1572	2^{14} CENTI-SEC	DEC 4335 B-14		10357
TAZ	AZIMUTH OF LANDMARK 1 AT LAUNCH SITE	1546	ICLU SCALING		(9)	
TAZ +1	AZIMUTH OF LANDMARK 2 AT LAUNCH SITE	1547				
TEL	ELEVATION OF LANDMARK 1 AT LAUNCH SITE	1550	1/4 REV			
TEL +1	ELEVATION OF LANDMARK 2 AT LAUNCH SITE	1551				
TATLAN1	NOMINAL FLIGHT TIME TO ATLANTIC TARGET	1617	2^{28} CENTI-SEC	2DEC 140000 B-28	(10)	00010 21340
RTATLAN1	POST-LIFT ABORT TARGET VECTOR AT LIFT-OFF + TATLAN1 IN ICS COORDINATES, ASSUMING THE PLATFORM WERE INERTIAL AT LIFT-OFF	1621	HALF-UNIT VECTOR	2DEC +5.2883?5108 E-1 B-1		10554 10066

RTATLAN1 +2		1623		2DEC +1.432667770 E-2 B-1	00165 13551
RTATLAN1 +4		1625		2DEC +8.486009140 E-1 B-1	15447 27507
TPACIF1	NOMINAL FLIGHT TIME TO PACIFIC TARGET	1627	2^{28} CENTI-SEC	2DEC 30726142 B-28 (11)	00274 27256
RTPACIF1	NOMINAL PACIFIC TARGET VECTOR AT LIFT-OFF + TPACIF1 IN IMU COORDINATES, ASSUMING THE PLATFORM GOES INERTIAL AT LIFT-OFF	1631	HALF-UNIT VECTOR	2DEC +8.318152196 E-1 B-1	15236 07275
RTPACIF1 +2		1633		2DEC +5.965946720 E-2 B-1	00750 27276
RTPACIF1 +4		1635		2DEC +5.518371018 E-1 B-1	10650 24622
UNITW	POLAR AXIS IN STABLE MEMBER COORDINATES	1043	HALF-UNIT VECTOR	2DEC +0.478819807 B-1 (12)	07522 17573
UNITW +2		1045		2DEC -0.834945071 B-1	62510 44121
UNITW +4		1047		2DEC +0.271290099 B-1	04256 15045
RN	POSITION VECTOR AT GRR	0765	2^{25} METERS	2DEC +6.373394217 E+6 B-25	06050 00222
RN +2		0767		2DEC +1.707372500 E+4 B-25	00010 12616
RN +4		0771		2DEC -5.546831000 E+3 B-25	77775 51250

MISSION CONTROL PROGRAM

TDECAY	EFFECTIVE THRUST DECAY TIME	1560	2^{14} CENTI-SEC	DEC -49 B-14	77716
DELTAT	VALUE OF COMPUTING INTERVAL	1027	2^{9} CENTI-SECS	2DEC 200 B-9	14400 00000
NSHIFT	AVERAGE G ROUTINE SCALING CONSTANT	1040	-	DEC -5	77772
XSHIFT	AVERAGE G ROUTINE SCALING CONSTANT	1041	-	DEC 9	00011
ESQ(VR)	ECCENTRICITY SQUARED FOR SPS1 BURN	1546	2^{4}	2DEC 0.35218172 B-4 (13)	00550 24225
ESQ(VR) +2	ECCENTRICITY SQUARED FOR SPS2 BURN	1550		2DEC 0.99814412 B-4	01776 03140
SEMILAT	SEMI-LATUS RECTUM FOR SPS1 BURN	1552	2^{27} METERS	2DEC 1.0033120 E+7 B-27	02310 27700
SEMILAT +2	SEMI-LATUS RECTUM FOR SPS2 BURN	1554		2DEC 1.276902B E+7 B-27	03031 05110

TFFMIN	TIME-TO-FREE-FALL AT WHICH TO SCHEDULE SPS2 IGNITION IN 2 MINUTES	1676	2^{28} CENTI-SEC	2DEC 68700 B-28	(14)	00004 06134
TFFNOM	VALUE OF TFF TO USE TO COMPUTE TIME-OF-COAST IF TFF IS NOT COMPUTABLE	1720	2^{28} CENTI-SEC	2DEC 1620000 B-28	(15)	00142 34040
CGY	SPS1 C.G. ROTATION ABOUT S/C Y-AXIS	1704	RADIANS	2DEC 0.0229	(16)	00567 06146
CGY +2	SPS2 C.G. ROTATION ABOUT S/C Y-AXIS	1706		2DEC 0.0297		00746 23265
CGZ	SPS1 C.G. ROTATION ABOUT S/C Z-AXIS	1710		2DEC 0.0833		02324 31141
CGZ +2	SPS2 C.G. ROTATION ABOUT S/C Z-AXIS	1712		2DEC 0.0995		03136 06520
ATDT	SPS1 INTEGRATED INITIAL THRUST ACC. MAG.	1714	2^{5} M/CENTISEC	2DEC 9.589 E-2 B-5	(17)	00061 03040
ATDT +2	SPS2 INTEGRATED INITIAL THRUST ACC. MAG.	1716		2DEC 30.48 E-2 B-5		00234 01660
S2SWITCH	SWITCH TO RE-COMPUTE SPS2 BURN ATTITUDE	1722	-	OCT 0		00000
REFSWTCH	SWITCH TO FORCE 280K FT FF REFERENCE	1723	-	OCT 0		00000
REDOSPS1	SWITCH TO REPEAT SPS1 AT SPS2 IGNITION	1724	-	OCT 0		00000
ANGLEX	DESIRED COLD SOAK GIMBAL ANGLES	1673	ICDU SCALING	OCT 11355	(18)	11355
ANGLEY		1674		OCT 61462		61462
ANGLEZ		1675		OCT 02261		02261
UPTIME	TIME TO INCORPORATE 1ST R.V.I. UPDATE	1671	2^{28} CENTI-SEC	OCT 37777	(19)	37777
UPTIME +1		1672	2^{14} CENTI-SEC	OCT 37777		37777

NOTES
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0) SCALE FACTOR IS THE MAXIMUM VALUE THAT CAN BE REPRESENTED IN THE AGC FOR THIS VARIABLE
1) PRELIMINARY INERTIAL PERFORMANCE PARAMETERS FOR GAN 122 IMU SYN 11 AS OF AUGUST 18, 1967
2) ASSUMES AGC CLOCK ZEROED AT MIDNIGHT BEFORE OCTOBER 15, 1967
3) DUE WEST
4) 28 DEG, 36 MIN, 30.32 SEC OR 28.60842222 DEG GEODETIC LATITUDE
5) 72 DEGS
6) ADJUSTED TO ACCOUNT FOR CDU DRIVE LAG
7) 18 DEGS
8) DESIRED ROLL RATE = 1 DEG/SEC
9) V21 N66 DSKY LOAD - NOT VERIFIED WITH DIGITAL SIMULATOR
10) 28.29028886 DEG N GEODETIC LAT, -13.5 DEG E LONG, AT 1400.00 SECS AFTER LIFT-OFF
11) 30.04649677 DEG N GEODETIC LAT, -171.0 DEG E LONG, AT 30,921.42 SECS AFTER LIFT-OFF
12) 28.60842222 DEG N GEODETIC LAT, 278.3958666 DEG E LONG, 124.0 METERS ABOVE FISHER ELLIPSOID AT LAUNCH SITE
13) SPS1 E = 0.5934490037, A = 15,487,5[illegible]3 METERS
    SPS2 E = 0.9990716290, A = 6,891,085,630.5 METERS
14) 11 MINUTES, 27 SECONDS
15) 4 HOURS, 30 MINUTES
16) 1.31 DEGS, 1.70 DEGS, 4.77 DEGS, 5.70 DEGS
17) CORRESPONDS TO VELOCITY INCREMENTS OF 0.09585, 0.3048 METER/CENTISEC
18) 53.23 DEGS, 278.99 DEGS, 13.19 DEGS
19) INITIALIZED TO 31 DAYS, 1 HOUR, 39 MINUTES, 14.55 SECONDS