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GUIDANCE AND NAVIGATION

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R-527 (Rev. 2)
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GUIDANCE SYSTEM OPERATIONS PLAN FOR UNMANNED LM EARTH ORBITAL MISSIONS USING PROGRAM SUNBURST

SECTION 7 G&N ERROR ANALYSES

DECEMBER 1967

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R-527 (Rev. II)

GUIDANCE AND NAVIGATION SYSTEM OPERATIONS PLAN

MISSION AS-204/LM - 1 G&N ERROR ANALYSIS

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ABSTRACT

The purpose of this document is to present a performance summary of the Guidance and Navigation System in LM-1 and to compare this performance with the requirements of Mission 204/LM-1. The calculated G&N errors are based upon system performance as of November 26, 1967. More recent data through December 1967 is included. This includes both IMU S/N 11 and S/N6. (The updated performance uncertainties derived using data up to this time period, are shown for certain parameters. Other parameters could not be derived because of system history and the lack of a large enough data sample). The system performance of all the major components are shown. The chapter contains an alignment summary of the G&N System. The one sigma standard deviation for the accelerometer and gyro performance parameters are calculated. These uncertainties are utilized to calculate the error in position and velocity. As a comparison, the Block II Performance Specifications in the Master End Item (MEI) are also utilized to calculate the mission position and velocity uncertainties. Utilizing those uncertainties from the Block II Specifications show that updating before DPS 1 burn does not reduce the perigee uncertainty in coast after APS 2 burn; in fact, it is less with no update. With an update before the second APS burn, the perigee uncertainty is slightly less than with no update.

December 1967

7.0 G&N ERROR ANALYSIS

The Guidance System Operations Plan is published as seven separate volumes (sections) as listed below:

Section 1	Pre-Launch
Section 2	Data Links
Section 3	Digital Auto Pilots
Section 4	Operational Modes
Section 5	Guidance Equations
Section 6	Control Data
Section 7	Error Analyses

This volume, Section 7 of the Guidance System Operations Plan, G&N Error Analyses for Unmanned LM Earth Orbital Mission using Program SUNBURST was based on the LM-1 missions.

The content of this volume is arranged:

7.1	Introduction
7.2	Important Results of Error Study
7.3	Effectiveness of Navigational Update
7.4	Navigational Update Uncertainties
7.5	IMU Errors and Uncertainties
7.6	Accelerometer Error Coefficients
7.7	Gyro Drift Coefficients and S. M. Drift Rate Equations
7.8	Stable Member Axes and Component Orientation Relative to S. M. Axes
7.9	Orientation of Stable Member Axes
7.10	Stable Member Pre-Launch Alignment Uncertainties
7.11	Effect of Stable Member Orientation on Flight Uncertainties
7.12	PIPA Saturation Effects
7.13	Trajectory Data for Error Studies
7.14	Error Computation Procedures
7.15	Error Table Definitions

Page 7-77 Hardware Data

7.1 Introduction

The results of an error study of the effects of IMU component errors on LM guidance and navigation for the LM-1 mission are given here. Three navigational or state vector updates were considered. These were:

a) No on-board (R, V) navigational update throughout the flight.

b) Navigational update just before DPS1 burn.

c) Navigational update just before APS2 burn.

The error studies include the effects of tracking uncertainties on the state vector updates. Updating did not apply to the alignment of the IMU Stable Member, since this is not realigned during the LM-1 flight.

The orientation of the Stable Member, relative to inertial axes, assumed for the error studies is obtained (see Fig. 7.1) by rotating:

40 deg. about X_I, then

-30 deg. about ZSM

This same orientation was assumed for the previous error study (Rev. 1 - Jan. 1967). This was chosen to prevent the middle gimbal angle magnitude from exceeding 50 degrees during the mission.

The present error study is based on a mission plan providing for two DPS and two APS burns. The previous error study had assumed short 3rd and 4th APS burns. These have now been omitted from the mission plan.

This error study was carried out for two different sets of IMU uncertainties. These are:

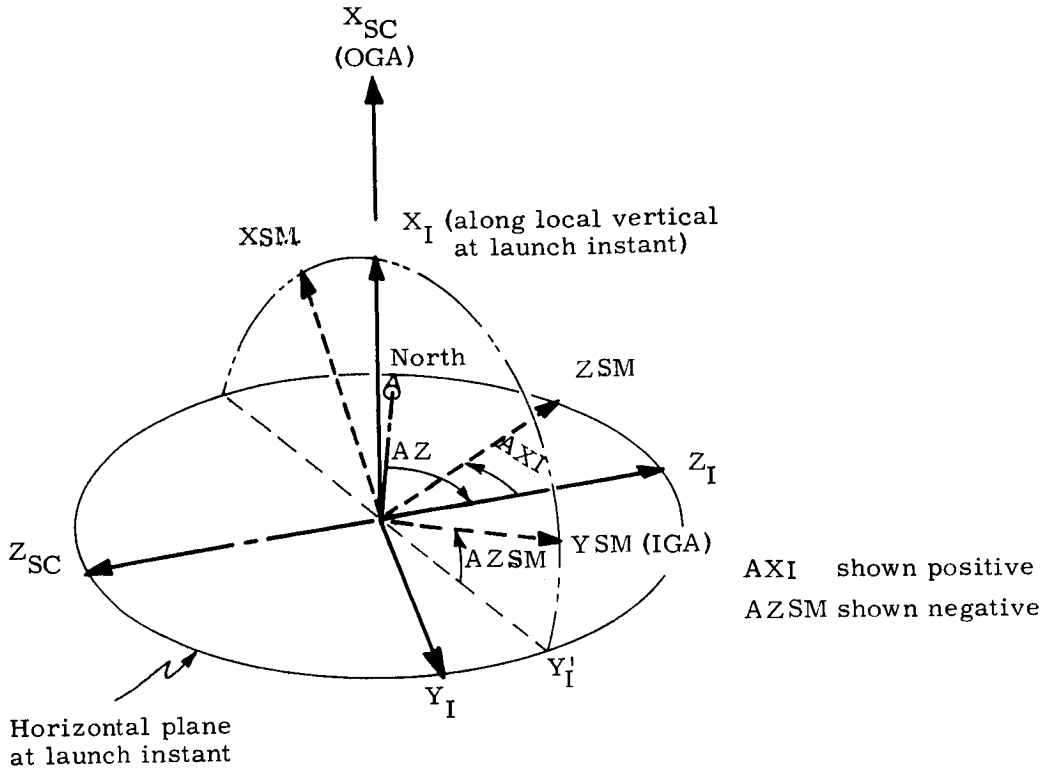
a) Block II IMU uncertainties (see Table 7.5)

b) IMU uncertainties based on most recent system test measurements and compensation values (see Table 7.5a)

Both sets as listed in the tables are one sigma uncertainties.

7.2 Important Results of Error Study

One important purpose for the error study was to determine the actual perigee altitudes for the coasts following the DPS and APS burns assuming G&N guidance of the burns with adverse three-sigma and one-sigma IMU uncertainties. Tables 7.1 and 7.2 summarize the data for Block II IMU uncertainties. Tables 7.1a and 7.2a summarize the data for most recently measured IMU uncertainties. The data for coast following SIVB cutoff are, for the normal mission, indication uncertainties, since the LM G&N only monitors the launch to earth orbit trajectory. However, see section 7.3a for the contingency case where SIVB thrust fails. The following comments can be made.

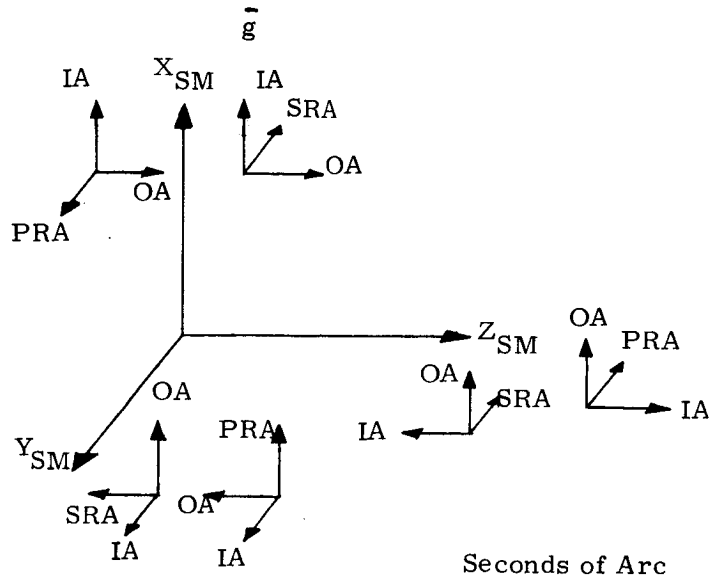


X_I, Y_I, Z_I	-	Launch Inertial Axes
XSM, YSM, ZSM	-	IMU Stable Member Axes
X_{SC}, Y_{SC}, Z_{SC}	-	Spacecraft Axes

NOTES: Orientation angles for Stable Member are AXI, AZSM To align SM to the desired orientation, the SM axes are initially set colinear with launch inertial axes. The SM is then rotated about X_I through the angle, AXI. Then it is rotated about ZSM through the angle, AZSM.

For the error study AXI = 40° and AZSM -30° were assumed. Also AZ = 72° was assumed to be the launch azimuth.

Fig. 7.1 Coordinate axes for 206 Launch Configuration



Seconds of Arc

		ϕ_X	ϕ_Y	ϕ_Z
BDX	1 meru	98	-56.9	-.1
BDY	1 meru	143	-82.6	-.06
BDZ	1 meru	-100.7	62.2	0
ADSRAX	1 meru	49.1	-28.4	-.05
ADSRAZ	1 meru	-53.8	31.1	0
ADIAX	1 meru	85.1	-49.3	-.09
ADIAY	1 meru	-71.6	+41.3	-.03
$\Delta SF/SFX$	10^3 PPM	17.3	-10.2	.02
$\Delta SF/SFY$	10^3 PPM	-91.7	53	.04
$\Delta SF/SFZ$	10^3 PPM	80	-46.3	0
γ_{XZ}	1 sec	.25	-.18	-0
γ_{XY}	1 sec	.36	-.21	-0
γ_{YZ}	1 sec	.12	-.07	-0
γ_{YX}	1 sec	-.52	.34	-0
γ_{ZX}	1 sec	-.33	.19	0
γ_{ZY}	1 sec	-.09	.05	0
ABX	1 cm/sec^2	43.7	-25.7	105
ABY	1 cm/sec^2	75.7	-44.7	182
ABZ	1 cm/sec^2	-63.8	-207	0
α_{XZ}	1 sec	-.12	.06	-.25
α_{YZ}	1 sec	-.32	.19	-.75
α_{ZX}	1 sec	.15	-.49	0

α = PIPA IA Misalignment

γ = IRIG IA Misalignment

With three-sigma Block II IMU uncertainties, dangerously low perigee altitudes (less than 65 n. miles) occur only after the 2nd APS burn and only for the navigational update before DPS1 burn case. Here the perigee altitude is 36 n. miles. With no update the perigee altitude for the coast following the 2nd APS burn is 75 n. miles, while with update before this burn the perigee altitude is 76 n. miles.

With one-sigma Block II IMU uncertainties no dangerously low perigee altitudes occur. The lowest perigee altitudes all occur after the 2nd APS burn and is lowest (100 n. miles) for the update before DPS1 burn case. The prime contributors to altitude uncertainties at this perigee are the Y and Z gyro bias drift uncertainties as Table 7.32 shows. For the no update and the update before APS2 burn cases the ADIAX and ADIAY drift uncertainties are also important contributors to lowering of perigee altitude as Table 7.29 and Table 7.37 show. In all cases the accelerometer uncertainties have a secondary effect on altitude uncertainties.

Tables 7.8, 7.9, and 7.10 give detailed summary data, with Block II IMU uncertainties, respectively, on uncertainties with no update, with update before DPS1 burn, and with update before APS2 burn.

At the end of this section will be found computer printed error tables. Tables 7.17 through 7.37 are with Block II IMU uncertainties. Tables 7.38 through 7.51 are with most recently measured IMU uncertainties.

7.3 Effectiveness of Navigational Update

Table 7.1 and Table 7.2 using Block II IMU uncertainties, show that updating before the DPS1 burn produces lower perigee altitudes than no updating for the coasts following the DPS2/APS1 burns and the APS2 burn. Further, these tables also show that updating before the APS2 burn produces perigee altitudes roughly the same as those obtained for the no update case.

Table 7.1

Altitude Uncertainties and Perigee Altitude due to 3σ
IMU Uncertainties for LM-1 Mission
(AXI = 40°, AYIP = 0°, AZSM = -30°)
with Block II IMU uncertainties

Mission Event	Update?	Nominal Perigee Altitude for Following Coast n. miles	Altitude with Adverse 3σ Altitude Uncert. n. miles	3σ Altitude Uncertainties at Event Time n. miles	Altitude Uncertainties n. miles	
					Max. In Following Coast	Min. In Following Coast
Launch	None	---	---	0	0	0
SIVB Cutoff	None	88.7	87.2	2.1	15.1	0.3
DPS 1 Cutoff	None	117.6	105.9	12.1	15.8	0.3
	Bef. DPS 1		117.6	~0	0.6	~0
APS 1 Cutoff	None	168.4	154.3	13.1	29.1	10.8
	Bef. DPS1		158.9	8.5	62.1	0.5
At Perigee in Following Coast	None	168.4	151.0	25.9	29.1	10.8
	Bef. DPS1		118.3	60.7	62.1	0.5
APS2 Cutoff	None	127.7	158.4	11.3	54.0	10.8
	Bef. DPS1		156.6	13.2	103.2	1.7
	Bef. APS2		165.8	3.9	56.2	0.1
At Perigee in Following Coast	None	127.7	74.6	53.2	54.0	10.8
	Bef. DPS1		36.2	100.2	103.2	1.7
	Bef. APS2		76.4	54.0	56.2	0.1

The principal reasons why updating fails to reduce altitude uncertainties more are:

1) Large drift angles due to gyro bias drift since launch generates velocity uncertainties during the APS2/APS1 and the APS2 burns considerably greater than those generated during the earth launch to orbit trajectory.

2) Initial Stable Member azimuth misalignments due primarily to the gyro acceleration sensitive drift undertainties, ADIAY and ADIAX, cause large altitude uncertainties after the DPS2/APS1 and APS2 burns. This is due to the fact that the thrust direction for these burns is approximately normal to the orbital plane. The initial azimuth misalignment causes the accelerometers to sense incorrectly accelerations in the orbital plane thus contributing to velocity uncertainties in the altitude-range plane.

More detailed comments on the effect of updating on altitude uncertainties follow. The principal contributors to the altitude uncertainties at perigee in coasts following APS1 and APS2 cutoffs are for all cases: NBDZ, NBDY, ADIAY and ADIAX with NBDZ as the prime contributor. (These are respectively the Z and Y gyro bias drift, and the Y and X gyro input axis acceleration-sensitive drift uncertainties.) In general the in-flight effect of the NBDZ and NBDY terms is considerably greater than the initial misalignment effect. However, for the ADIAY and ADIAX terms the initial azimuth misalignment effect is at least an order of magnitude greater than the inflight effect.

Table 7.3 gives position and velocity uncertainties due to NBDZ for all update cases. The drift angle due to NBDZ of 2 meru is 0.09 milliradian (mr.) at SIVB cutoff, while it is about 2.5 mr. for the DPS2/APS1 burns, and 3.3 mr. for the APS2 burn. The velocity uncertainty in the altitude-range plane was 2.1 ft/sec. at SIVB cutoff. However, the velocity uncertainty increase due to the DPS2/APS1 burns was 16.6 ft/sec., and the increase due to the APS2 burn was 19 ft/sec. in the same plane. The effectively large Stable Member misalignment due to drift during these burns accounts for the large increase in velocity uncertainty during these burns in the altitude-range plane and for the large increase in altitude uncertainty at perigee in the following coasts. For the update before DPS1 burn case the velocity uncertainties generated during the APS2 burn are added effectively to those generated in the DPS2/APS1 burns with the result that the altitude uncertainty gets large at perigee after the APS2 burn. However, for the no update case, the velocity uncertainties generated during the DPS2/APS1 burns tend to cancel the uncertainties existing at burn ignition with the result that altitude uncertainties at following perigees are not as large as for the first update case.

Table 7.1a

Altitude Uncertainties and Perigee Altitude due to 3σ
IMU Uncertainties for LM-1 Mission
(AXI = 40°, AYIP = 0°, AZSM = -30°)
with most recently measured IMU uncertainties

Mission Event	Update ?	Nominal Perigee Altitude for following Coast n. miles	Altitude with Adverse 3σ Altitude Uncert. n. miles	3σ Altitude Uncertainties at Event Time n. miles	Altitude Uncertainties n. miles	
					Max. In Following Coast	Min. In Following Coast
Launch	None	----	0	0	0	0
SIVB Cutoff	None	88.7	88.2	0.5	11.3	0.15
DPS1 Cutoff	None	117.6	109.4	8.2	11.6	1.2
	Def. DPS1		109.3	0.1	0.6	0.02
APS1 Cutoff	None	168.4	159.5	9.4	31.0	7.3
	Def. DPS1		162.2	6.7	58.3	0.2
At Perigee in Following Coast	None	168.4	159.7	9.0	31.0	7.3
	Def. DPS1		129.0	44.3	58.0	0.2
APS2 Cutoff	None		162.8	8.1	58.0	7.7
	Def. DPS1	127.7	160.3	10.6	101.7	1.6
	Def. APS2		167.5	3.4	59.2	0.03
At Perigee in Following Coast	None		75.1	53.1	58.0	7.7
	Def. DPS1	127.7	36.7	93.6	101.7	1.6
	Def. APS2		74.0	54.3	59.2	0.03

Table 7.2

Altitude Uncertainties and Perigee Altitudes due to 1σ
IMU Uncertainties for LM-1 Mission
(AXI = 40°, AYIP = 0°, AZSM = -30°)
with Block II IMU Uncertainties

Mission Event	Update?	Nominal Perigee Altitude for Following Coast n. miles	Altitude with Adverse 1σ Altitude Uncert. n. miles	1σ Altitude Uncertainties at Event Time n. miles	Altitude Uncertainties n. miles	
					Max. In Following Coast	Min. In Following Coast
Launch	None	---	---	0	0	0
SIVB Cutoff	None	88.7	87.7	0.4	5.0	0.1
DPS1 Cutoff	None	117.6	112.1	3.7	5.3	0.1
	Bef. DPS1		115.9	~0	0.2	~0
APS1 Cutoff	None	168.4	163.0	4.4	9.7	3.6
	Bef. DPS1		164.5	2.9	20.7	0.2
At Perigee in Following Coast	None		162.9	4.3	9.7	3.6
	Bef. DPS1	168.4	153.2	16.7	20.7	0.2
APS2 Cutoff	None		165.9	3.8	18.0	3.6
	Bef. DPS1	127.7	165.3	4.2	34.4	0.6
	Bef. APS2		168.4	1.3	18.7	0.02
At Perigee in Following Coast	None		108.8	17.4	18.0	3.6
	Bef. DPS1	127.7	99.8	30.0	34.4	0.6
	Bef. APS2		110.7	16.6	18.7	0.02

Table 7.2a

Altitude Uncertainties and Perigee Altitude due to 1σ
IMU Uncertainties for LM-1 Mission
(AXI = 40°, AYIP = 0°, AZSM = -30°)
with most recently measured IMU Uncertainties

Mission Event	Update ?	Nominal Perigee Altitude for Following Coast n. miles	Altitude with Adverse 1σ Altitude Uncert. n. miles	1σ Altitude Uncertainties at Event Time n. miles	Altitude Uncertainties n. miles	
					Max. in Following Coast	Min. in Following Coast
Launch	None	----	----	----	----	----
SIVB Cutoff	None	88.7	88.5	0.17	3.8	0.05
DPS1	None	117.6	114.9	2.7	3.9	0.4
Cutoff	Def. DPS1		114.9	0.03	0.05	0.01
APS1	None	168.4	165.8	3.1	10.3	2.4
Cutoff	Def. DPS1		166.7	2.2	19.4	0.1
At Perigee in Following Coast	None	168.4	165.8	3.1	10.3	2.4
	Def. DPS1		158.6	14.8	19.4	0.1
APS2	None	127.7	168.2	2.7	19.3	2.6
Cutoff	Def. DPS1		167.3	3.5	33.9	0.5
	Def. APS2		169.7	1.1	19.7	0.01
At Perigee in Following Coast	None	127.7	110.5	17.7	19.3	2.6
	Def. DPS1		99.1	31.2	33.9	0.5
	Def. APS2		110.2	18.1	19.7	0.01

Table 7.3

Uncertainties Due to NBDZ = 2 meru

(Combined effects of uncertainties caused by initial S.M. misalignment due to NBDZ and in-flight effect are given here)

Event	Update?	Position Uncertainties - n. miles			Velocity Uncertainties - ft/sec		
		Alt.	Track	Range	Alt.	Track	Range
Launch	None	0	0	0	0	0	0
SIVB Cutoff	None	0.04	1.19	0.05	1.76	28.02	1.14
DPS1	None	0.47	- 3.53	- 11.51	- 3.01	- 15.38	- 3.50
Cutoff	Bef. DPS1	~ 0	0	0	0.21	- 0.30	- 0.10
DPS2	None	- 0.84	1.71	- 10.34	0.06	26.69	5.22
Ignition	Bef. DPS1	- 0.03	- 0.02	- 0.04	- 0.28	0.25	0.14
APS1	None	- 0.86	1.76	- 8.88	4.03	19.85	13.73
Cutoff	Bef. DPS1	0.18*	0.21	0.94	9.71	2.53	13.48
At Perigee in Following Coast	None	- 0.85	1.83	- 8.81	4.55	19.54	13.62
	Bef. DPS1	5.05	0.38	- 2.56	29.24	-1.12	-20.61
APS2	None	- 0.89	0.48	- 30.67	- 5.54	23.20	11.71
Ignition	Bef. DPS1	- 0.04	0.17	- 40.03	- 3.71	2.87	12.99
	Bef. APS2	0	0	0	0	0	0
APS2	None	- 0.92	- 5.42	- 28.24	8.12	35.24	25.16
Cutoff	Bef. DPS1	0.33*	- 9.43	- 37.30	19.53	22.77	28.72
	Bef. APS2	- 0.03*	0.07	0.59	3.13	2.18	18.75
At Perigee	None	10.66*	3.83	- 60.28	- 18.18	- 44.53	-51.86
In Following	Bef. DPS1	17.18	9.79	- 78.31	- 2.06	- 5.46	-81.91
Coast	Bef. APS2	10.58	- 0.08	- 26.81	- 5.08	- 2.18	-55.52

*Initial misalignment and in-flight effects tend to cancel here.

Table 7.4

Uncertainties Due to Initial Stable Member Azimuth Misalignment About X_I of 50 Seconds

Event	Update?	Position Uncertainties - feet			Velocity Uncertainties ft/sec		
		Alt.	Track	Range	Alt.	Track	Range
Launch	None	0	0	0	0	0	0
SIVB Cutoff	None	- 30	-1,471	- 79	-0.22	-5.66	-0.30
DPS1 Cutoff	None	- 750	4,344	15,680	0.65	3.07	0.97
	Bef. DPS1	0	0.3	0	0	0.03	0
DPS2 Ignition	None	1,190	-2,137	14,490	0.08	-5.37	-1.19
	Bef. DPS1	0	16	0	0	-0.03	0
APS1 Cutoff	None	824	-1,609	13,372	-1.07	-3.92	-0.53
	Bef. DPS1	- 695	- 72	- 143	-2.15	-0.15	-0.30
At Perigee In Following Coast	None	802	-1,691	13,341	-1.07	-3.88	-0.50
	Bef. DPS1	-3,582	- 137	4,803	-1.66	0.06	3.03
APS2 Ignition	None	1,241	- 18	7,529	-0.94	-4.34	-0.88
	Bef. DPS1	91	- 72	18,173	-1.32	-0.17	-0.79
	Bef. APS2	0	0	0	0	0	0
APS2 Cutoff	None	573	- 26	6,905	-2.17	-4.39	0.28
	Bef. DPS1	-1,046	4,376	17,496	-4.30	-1.47	-0.18
	Bef. APS2	- 292	- 18	- 67	-1.66	-0.09	-0.34
At Perigee In Follow-Coast	None	3,076	1,023	5,424	1.75	4.27	-2.69
	Bef. DPS1	-4,720	-4,508	41,871	3.90	0.16	4.20
	Bef. APS2	-1,978	21	11,387	1.79	0.09	1.65

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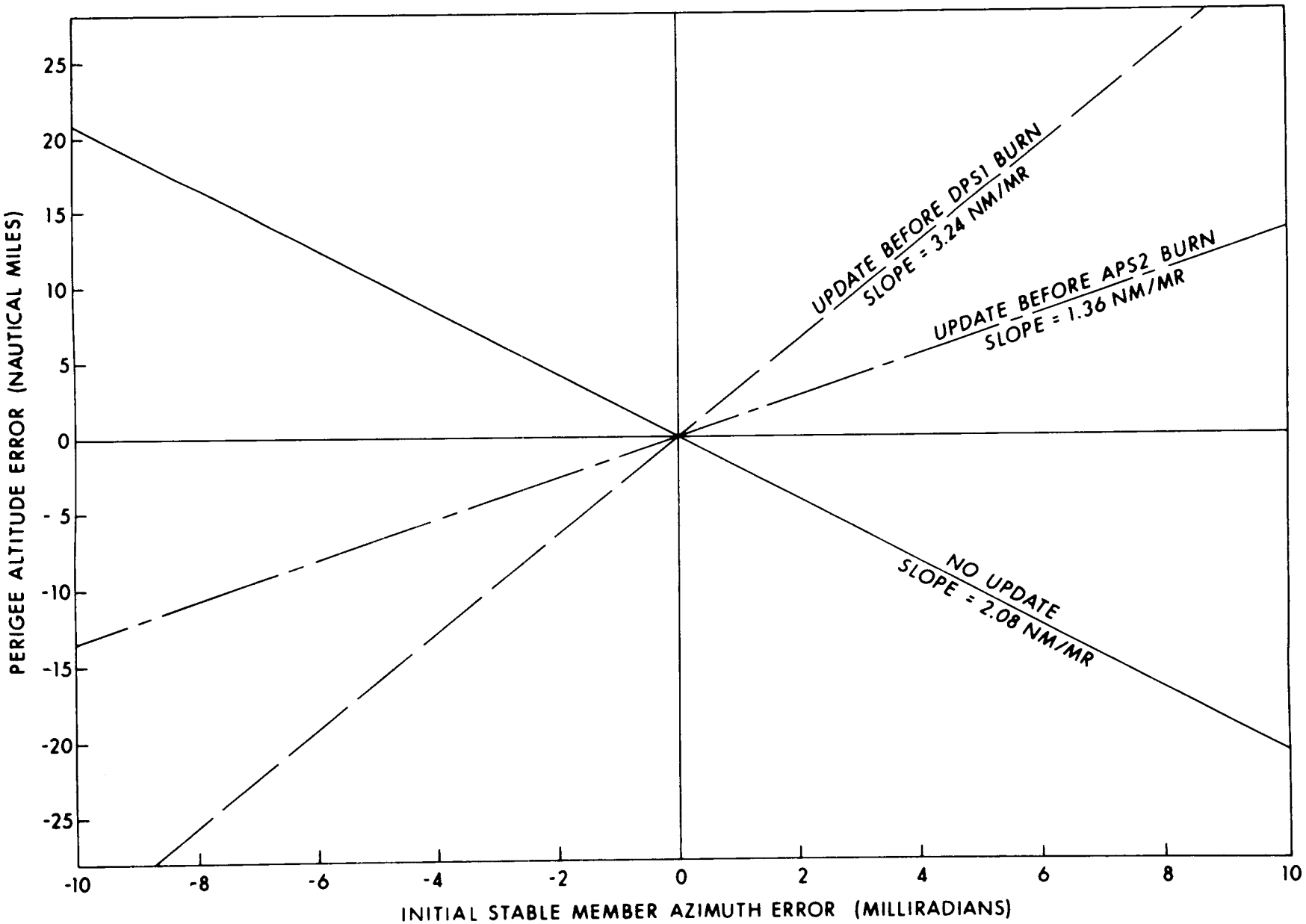

Fig. 7.2 Error in Perigee Altitude for Coast Following APS2 Burn vs. Initial Stable Member Azimuth Error for No Update and Two Update Cases.

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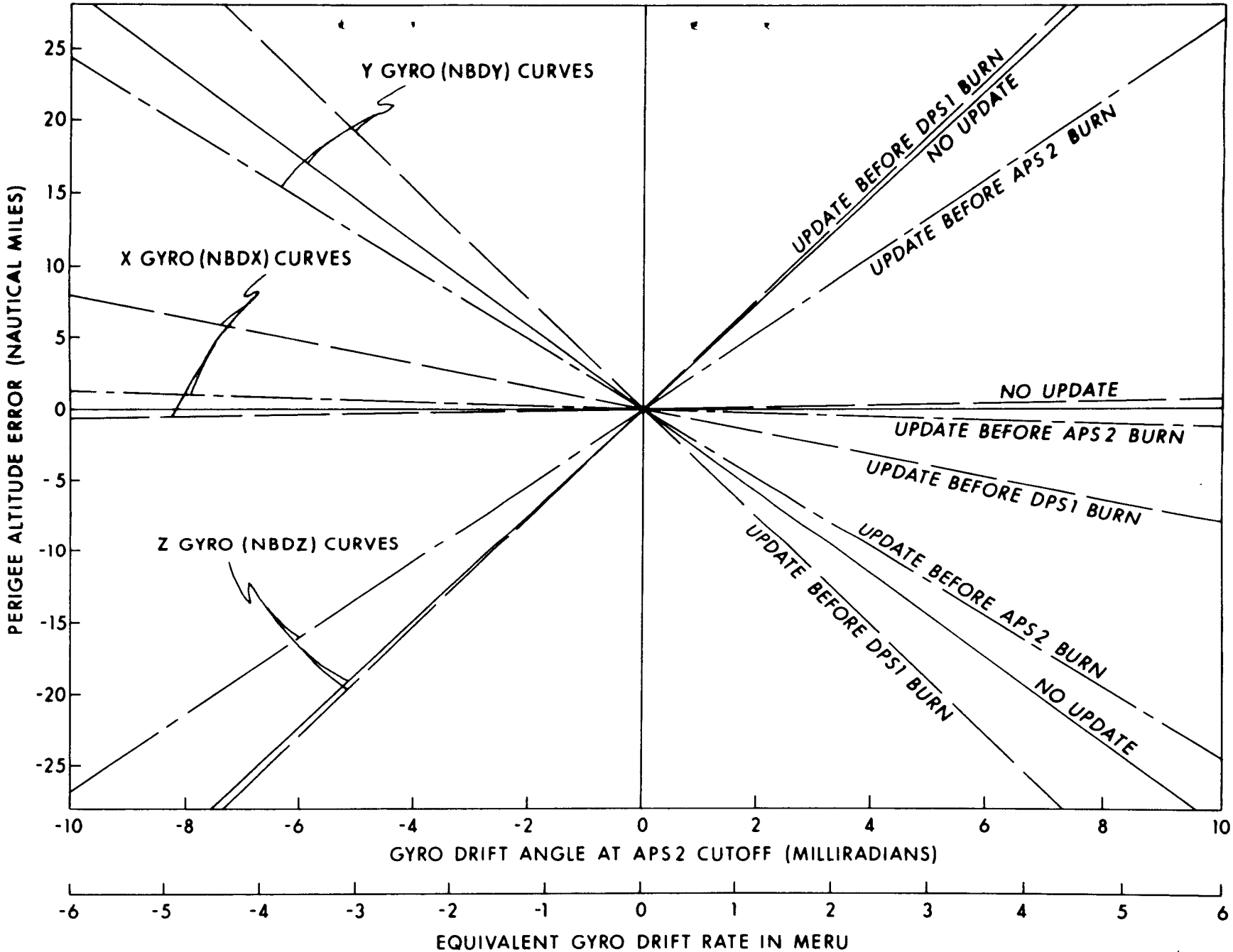


Fig. 7.3 Error in Perigee Attitude Error for Coast Following APS2 Burn vs. Gyro Bias Drift Angle at APS2 Burn Cutoff for X, Y, Z Gyros and for No Update and Two Update Cases.

The ADIAY and ADIAX terms are important contributors almost entirely through their effect on initial Stable Member misalignments. Table 7.11 with Block II uncertainties shows that the azimuth alignment uncertainty is 3.3 mr. (690 secs) for both these terms, and that they are the dominant contributors. The effect of the azimuth misalignments on altitude uncertainty may be explained with recourse to Table 7.4, which gives uncertainties due to an initial Stable Member misalignment about azimuth of 50 secs. For the update before DPS1 burn case this table shows that, while track uncertainties dominate for the DPS1 burn, the dominant uncertainties for the DPS2/APS1 burns are in the altitude-range plane. The reason for this phenomenon is as follows: The thrust direction for the DPS2/APS1 burns and for the APS2 burn are approximately normal to the orbital plane. (For the DPS1 burn the thrust is in the orbital plane.) This is shown in Table 7.16 which gives data on the ΔV components (integral of thrust acceleration) in and perpendicular to the orbital plane. With the thrust normal to the orbital plane the azimuth misalignment of the Stable Member causes the accelerometers to sense or pickup accelerations in the orbital plane contributing to velocity and position uncertainties in the altitude-range plane. For the no-update case the uncertainties generated in the DPS2/APS1 and APS2 tend to cancel partially the uncertainties existing prior to the DPS2 burn as Table 7.4 indicates.

Figure 7.3 shows the effect of initial Stable Member azimuth error on perigee altitude error for the coast following the APS2 burn for the no update and the two update conditons. These curves show that for a given azimuth error the perigee error is greater with update before DPS1 burn than with no update.

Figure 7.4 shows the effect of Stable Member drift angle due to the three gyro bias drift terms on perigee altitude error for the coast following the APS2 burn for the no update and the two update cases. The Block II bias drift rate uncertainty is 2 meru or 0.03 deg. per hour. At APS2 cutoff the accumulated drift angle about each S.M. axis is 3.3 mr. or 0.2 deg. Figure 7.4 shows that the Y and Z gyro drift terms have a much greater affect on perigee error than the X gyro. It also shows that the perigee error is greater with update before DPS1 burn than with no update for all gyro drift terms.

7.3a Errors in Perigee Following SIVB Cutoff

For the contingency where the Saturn SIVB stage fails to perform correctly, it is planned that the LM-1 will be able to perform the orbit insertion maneuver. Here IMU uncertainties will directly affect uncertainties in perigee for coast following LM-1 orbit insertion cutoff. Table 7.14 gives data on perigee uncertainties due to Block II uncertainties. This table also gives the IMU error values required to produce a 1 n. mile perigee altitude error.

7.3b Errors in Perigee for Premature Cutoff of APS2 Burn

During the APS2 burn the instantaneous perigee (the perigee associated with the free-fall coast if cutoff occurred at that instant) declines to the critically low figure of 54 n. miles before rising again to the value of 128 n. miles at normal cutoff. It is important to know how large altitude uncertainties would be at perigee if premature cutoff took place at the point where instantaneous perigee is lowest. This occurs at 270 secs after ignition and 157 secs before normal cutoff. Tabley 7.14a gives data on perigee uncertainty with Block II IMU uncertainties for the critical premature cutoff time for the no update and the two update cases.

7.4 Navigational Update Uncertainties

Navigational or state vector updates of the CSM computer's data on spacecraft position and velocity have been proposed prior to the first DPS burn and also prior to the second APS burn. These updates would be made on the basis of observations made by the radar tracking stations of the Manned Space Flight Network (MSFN). Uncertainties in the tracking data exist because of the presence of radar noise, bias, uncertainties in station location and in the knowledge of earth gravitational constant. The covariance matrices (one sigma) for the tracking uncertainties existing prior to the above burns were obtained from "Error Analysis of MSFN Tracking Data for AS-206A" by P.T. Pixley and D.H. Fessenden (MSC Internal Note No. 66-FM-60, June 22, 1966, MSC, Houston, Texas).

The one sigma position and velocity uncertainties, derived from the diagonal terms of the covariance matrices, are gien in the following table relative to local vertical axes at burn ignition. The propagated tracking update uncertainties are given near the bottom of all relevant error tables.

Burn	Position Uncert. (ft)			Velocity Uncert. (ft/sec)		
	Alt.	Track	Range	Alt.	Track	Range
DPS1	181	155	1,840	2.18	0.31	0.88
APS2	547	411	2,102	2.15	0.40	0.49

Update Uncertainties at Burn Ignition

7.5 IMU Errors and Uncertainties

IMU errors can classed into two groups. These are: (1) those errors that the LGC (lunar module guidance computer) can provide compensation for, and (2) those errors for which there is no compensation.

IMU errors are compensated as follows. The average error for the particular IMU component is first determined on the basis of system tests extending over many months. The negative of the computed average error is then stored in the LGC shortly before earth launch. Pre-launch and in-flight compensation is then effected by means of stored programs in the LGC. The rms IMU component uncertainties are then the unpredictable deviations of the actual instantaneous error from the assumed average error.

Table 7.5 lists the Block II one-sigma IMU error uncertainties that were assumed for the error studies in this chapter. These are the same as those given on p. 3-25 of MEI No. 2015000, Part I, which lists Block II specifications for the Apollo Command Module.

Table 7.5a lists the one-sigma IMU error uncertainties computed on the basis of the most recent system test measurements.

The following IMU errors are errors that the guidance computer is equipped to compensate for:

1) Accelerometer bias error
2) Accelerometer scale factor error
3) Gyro bias drift
4) Gyro input axis accel. sens. drift
5) Gyro spin ref. axis accel. sens. drift

These are defined and discussed in some detail in subsections 7.6 and 7.7.

The computer does not provide compensation for the following IMU errors:

1) Stable Member initial misalignments (those that are uncorrelated with gyro drift)
2) Accelerometer input axis misalignments
3) Accelerometer acceleration-squared indication uncertainties
4) Gyro output axis acceleration sensitive drift
5) Gyro acceleration-squared sensitive drift
6) Gyro input axis misalignments

The subject of Stable Member initial misalignments will be covered in Section 7.10. It should be noted that those sources of initial S.M. alignment errors directly due to gyro bias drift, to acceleration sensitive drift, and to accelerometer bias will, of course, be compensated for.

Accelerometer input axis misalignments will be covered in the next subsection.

Table 7.5

Block II One-Sigma IMU Error Uncertainties

Error	Error Symbol	Compen-sated?	RMS Uncertainty (after compen-sation when applicable)	Error Units
Accelerometer Errors				
Bias Error	ACB	Yes	0.20	cm/sec^2
S.F. Error	SFE	Yes	116	ppm
Accel. Sqd. Ind. Error	NC	No	10	$\mu g/g^2$
Input Axis Misalignment	α	No	20	secs.
Gyro Errors				
Bias Drift	NBD	Yes	2	meru
IA Accel. Sens. Drift	ADIA	Yes	8	meru/g
SRA Accel. Sens. Drift	ADSRA	Yes	5	meru/g
OA Accel. Sens. Drift	ADOA	No	1*	meru/g
IA Misalign. about SRA	γ_{SRA}	No	50*	secs.
IA Misalign. about OA	γ_{OA}	No	50*	secs.
Stable Member Alignment Errors				
Prelaunch Azimuth	----	No	50**	secs.
Vertical	----	No	5**	secs.
Free-Fall All Axes	----	No	20	secs.

* Listed value for ADOA is not a Block II uncertainty. It represents a reasonable value used for the error studies.

** The error values listed for S. M. prelaunch azimuth and vertical alignments are not those listed in MEI No. 2015000. They represent present estimates for these misalignments.

NOTE: 2 meru = 0.03 deg/hour

$0.2\ cm/sec^2 = 0.00656\ ft/sec^2 = 2.04\ (10^{-4})\ g$

$50\ secs = 0.242\ milliradian = 0.242\ (10^{-3})\ radian$

Table 7.5a

Most Recently Computed One-Sigma IMU Error Uncertainties

Error	Error Symbol	Computed 1σ Uncertainties			Error Units
		Input Axes			
Accelerometer Errors		X	Y	Z	
Bias Error	ACB	0.08	0.06	0.10	cm/sec^2
Scale Factor Error	SFE	92	45	76	PPM
Accel. Sqd. Ind. Error*	NC	0.2	0.2	0.2	$\mu g/g^2$
		About Y	About Z	About X	
Input Axis Misalignment	α	3.0	-9.5	20.0	secs
		About Z	About X	About Y	
Input Axis Misalignment	α	-6.3	-4.5	0	secs
		Input Axes			
Gyro Errors		X	Y	Z	
Bias Drift	BD	1.3	2.3	2.4	meru
IA Accel. Sens. Drift	ADIA	5.1	6.0	5.8	meru/g
SRA Accel. Sens. Drift	ADSRA	2.2	2.7	1.2	meru/g
OA Accel. Sens. Drift*	ADOA	1	1	1	meru/g
		About Y	About Z	About X	
Input Axis Misalignment	γ	-19.2	+19.4	-115	secs
		About Z	About X	About Y	
Input Axis Misalignment	γ	-50.4	-128.0	+87	secs
		Launch Inertial Axes			
Stable Member Alignm. Errors		X_I	Y_I	Z_I	
Prelaunch Azimuth**	----	50	----	----	secs
Prelaunch Vertical	----	----	5	5	secs

*Denotes that listed uncertainty value is based on present estimates and not on system test measurements.

**Prelaunch azimuth alignment uncertainty of 50 secs is based on rss estimate related to specifications, since gyro IA misalignment data was incomplete at time of table preparation.

NOTE: Computed uncertainty data for accelerometers were based on compilation period, June 27 - Nov. 26, 1967. Uncertainty data for gyros were based on compilation period, June 14 - Nov. 26, 1967.

Both accelerometer acceleration-squared indication and uncertainty and gyro acceleration-squared sensitive drift are difficult and time-consuming to measure. For this reason and because their effects on trajectory uncertainties are secondary, they are not compensated for. The effects of vibrations operating through these uncertainties and through rectification effects may well have a greater effect than that produced by burn thrust or reentry drag accelerations. However, no attempt was made to study vibration effects in this chapter.

Gyro output axis acceleration sensitive drift (ADOA) is a relatively difficult error to measure. The value of 1 meru/g for ADOA is a reasonable estimate for this uncertainty.

Gyro input axis misalignments affect trajectory uncertainties only in their effect on Stable Member azimuth misalignment prior to earth launch alignment when gyro compassing is used for azimuth alignment. They are the prime contributors to the pre-launch azimuth alignment uncertainty (uncorrelated) of 50 secs.

Since none of the above IMU errors are compensated for, uncertainties are the same as errors for this group.

7.6 Accelerometer Error Coefficients

Accelerometer bias (ACB) is defined as the indicated acceleration of the accelerometer with zero input acceleration. Bias is positive when the indicated acceleration is positive. This bias is due to torques about the output axis of the PIPA.

Accelerometer scale factor error (SFE) is defined as the deviation in the actual PIPA scale factor from the nominal scale factor divided by the nominal scale factor. The scale factor itself is conventionally defined as a given number of cm/sec^2 per pulse/sec. delivered to the computer. The scale factor error is positive when the mesaured scale factor (in cm/sec^2 per pulse/sec or cm/sec per pulse) is greater than the nominal. However, it should be carefully noted that when scale factor error is thought of as the deviation of indicated acceleration from the input acceleration divided by the input acceleration (where ideal scale factor would then be unity), the above definition of positive scale factor error corresponds to an indicated acceleration less than the input acceleration.

Accelerometer input axis misalignments are not compensated for. A positive misalignment is a positive rotation of the input axis about the appropriate S.M. axis. There are two misalignments associated with each accelerometer. The misalignment of the Z accelerometer input axis about YSM is nominally zero by definition. (See definition of Stable Member axes in Section 7.8) However, for earth prelaunch alignment of the Stable Member the alignment of the accelerometer, whose input axis is in the horizontal plane, is considered to be perfect relative to the horizontal plane. This, of course, assumes a zero bias accelerometer.

For the LM-1 earth launch Stable Member orientation (AXI = 40°, AYIP = 0°, AZSM = -30°) this means that, since ZIA is ideally horizontal (see Fig. 7.1), the misalignments of ZIA about XSM and about YSM are both zero. The Block II rms alignment uncertainty for each accelerometer input axis is 20 seconds. Since the misalignment of ZIA about YSM is zero, the misalignment of XIA about YSM must be 28.3 secs. (That is, 28.3 secs. is the rss of the nominal misalignments of 20 secs. of ZIA and XIA about YSM.) Likewise, the misalignment of YIA about XSM must be 28.3 secs, since misalignment of ZIA about XSM is zero. The misalignments of XIA and of YIA about ZSM are computed on the basis of the following equations:

$$\text{Mlm. XIA about ZSM} = 28.3 \cos^2 (\text{AZSM})$$

$$\text{Mlm. YIA about ZSM} = 28.3 \sin^2 (\text{AZSM})$$

where 28.3 is the rss of the nominal XIA and YIA misalignments about ZSM. Note that if AZSM is zero (YIA horizontal), the first misalignment is 28.3 secs. and the second is zero.

7.7 Gyro Drift Coefficients and S.M. Drift Rate Equations

Definitions for the gyro drift coefficients, NBD, ADIA, ADSRA, and ADOA are given here. It is assumed in the following that the gyro is servo-controlled to maintain the error signal at null.

NBD — The normal excitation bias drift. It is non-acceleration sensitive. NBD is positive when the S.M. drift rate is about the positive gyro input axis (IA). A positive NBD is due to a negative torque about the output axis. The term BD is used to designate gyro bias drift due to mechanical torques present prior to gyro electrical excitation.

ADIA — The acceleration sensitive drift rate due to gyro case acceleration of one gravity along the input axis. It is positive when the S.M. drift rate is about the positive gyro input axis in response to a positive acceleration along the positive gyro input axis. It will cause a negative torque about the output axis. Internally this term is caused by a displacement of the center of gravity with respect to the center of buoyancy of the float along the positive SRA.

ADSRA — The acceleration sensitive drift rate due to a gyro case acceleration of one gravity along the spin reference axis. It is positive when the S.M. drift rate is about the positive gyro input axis in response to a positive acceleration along the

positive gyro SRA. It will cause a negative torque about the output axis. Internally this term is caused by a displacement of the center of gravity with respect to the center of buoyancy of the float along the minus 1A.

ADOA — The acceleration sensitive drift rate due to a gyro case acceleration of one gravity along the output axis. It is positive when the S. M. drift rate is about the positive gyro input axis in response to a positive acceleration along the positive gyro OA. The ADOA drift coefficient is generally small relative to the other drift coefficients. There is no computer compensation for the ADOA terms.

The following table gives the drift rates, W_{XSM}, W_{YSM}, W_{ZSM} about the Stable Member axes, XSM, YSM, ZSM, respectively, due to the various gyro drift coefficients. Figure 7.4 in the next section shows the orientation of the Block II gyro axes relative to the Stable Member axes. (Block I gyro axes have the same orientation with the one exception that the Z gyro IA is along $+Z_{SM}$.) The acceleration components, A_{XSM}, A_{YSM}, A_{ZSM}, are positive with reference to S. M. axes. It is of interest to note that the corresponding drift rate equations for Block I IMUs have the same signs with the exception that NBDZ carries a plus sign.

Drift Rate about S. M. Axes	Gyro Drift Coefficients			
	NBD	ADIA	ADSRA	ADOA
W_{XSM} =	NBDX	$+ADIAX(A_{XSM})$	$-ADSRAX(A_{YSM})$	$+ADOAX(A_{ZSM})$
W_{YSM} =	NBDY	$+ADIAY(A_{YSM})$	$-ADSRAY(A_{ZSM})$	$+ADOAY(A_{XSM})$
W_{ZSM} =	-NBDZ	$+ADIAZ(A_{ZSM})$	$+ADSRAZ(A_{YSM})$	$+ADOAZ(A_{ZSM})$

7.8 Stable Member Axes and Component Orientation Relative to S. M. Axes

IMU Stable Member axes are defined by the following equations:

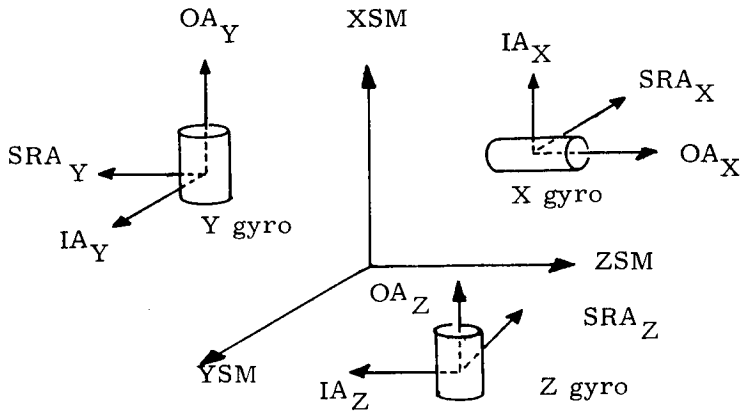
$\overline{YSM}$ = unit ($\overline{IGA}$)

$\overline{ZSM}$ = unit (component of Z_{IA} in plane normal to $\overline{YSM}$)

$\overline{XSM}$ = unit ($\overline{YSM} \times \overline{ZSM}$)

In words YSM is identical with the direction of the IMU Inner Gimbal axis. ZSM is defined by that component of the Z PIPA input axis which lies in the plane perpendicular to YSM.

The orientation of the three S.M. gyros (size - 25 IRIGs) for the Block II IMU system are shown in Figure 7.4 relative to the positive Stable Member axes, XSM, YSM, ZSM.



Block II IMU Gyro Axes Relative to S.M. Axes
Figure 7.4

The following table gives the orientation of gyro axes relative to Stable Member axes.

Gyro	IA Along	SRA Along	OA Along
X	XSM	-YSM	ZSM
Y	YSM	-ZSM	XSM
Z	-ZSM	-YSM	XSM

The input axes of the X, Y, Z accelerometers (PIPAs) lie respectively along the positive XSM, YSM, ZSM axes

7.9 Orientation of Stable Member Axes

The orientation fo the IMU Stable Member axes (XSM, YSM, ZSM) relative to launch inertial axes are shown in Fig. 7.1. The launch inertial axes, X_I and Z_I, define the initial reference trajectory plane as well as the initial pitch plane. The axis, Z_I, is in the horizontal plane at launch instant and oriented to the nominal launch azimuth of 72° from north.

The orientation of the Stable Member relative to launch inertial axes is most conveniently described by the Euler rotation angles, AXI, AYIP, and AZSM. (See Fig. 7.1) To reach the desired orientation the S. M. is first rotated about X_I through the angle, AXI. Then about Y_I (prime) through the angle, AYIP, and finally about ZSM through the angle, AZSM. For the present error study the Stable Member orientation angles assumed were:

$$AXI = 40^o, \qquad AYIP = 0^o, \qquad AZSM = -30^o$$

The corresponding IMU gimbal angles at launch were:

$$Aig = 0^o, \qquad Amg = 30^o, \qquad Aog = 140^o$$

7.10 Stable Member Pre-Launch Alignment Uncertainties

The principal contributors to Stable Member pre-launch alignment uncertainties are:

1) Effects of gyro IA alignment uncertainty on S. M. azimuth alignment. (Called S. M. misalignment (uncorrelated) in error tables.)

2) Effects of gyro drift rate uncertainties on azimuth alignment of the Stable Member. (Gyrocompassing to align the S. M. about azimuth is assumed.)

3) Effects of accelerometer bias and scale factor uncertainties on vertical erection of the Stable Member.

The ways in which IMU component uncertainties contribute to pre-launch alignment uncertainty are described by the alignment error equations given in Table 7.6. They are grouped under: 1) gyrocompassing errors, and 2) vertical erection errors. The symbol, ϕ, is used to denote the Stable Member misalignment about the inertial vector indicated by the subscript. For example, ϕ_{XI} is the S. M. misalignment about X_I. Note that misalignment about azimuth = $-\phi_{XI}$. Second order terms are omitted in these equations. These assume that AYIP = 0 and that Block II IMUs are used.

Table 7.11 gives data on initial azimuth alignment uncertainties due to gyro drift uncertainties.for several different Stable Member orientations. The data were computed, of course, from the equations of Table 7.6. Table 7.11 shows how markedly the azimuth misalignment increases as AZSM goes from zero to -30 degrees due to the effect of the gyro acceleration sensitive drift terms.

7.11 Effect of Stable Member Orientation on Flight Uncertainties

Table 7.12 for position and velocity uncertainties at SIVB cutoff shows how the track uncertainty is more than doubled as AZSM goes from zero to -30 degrees due to the effect on azimuth misalignment.

Table 7.6

Initial Stable Member Alignment Errors

Gyro-Compassing Errors

X gyro drift effects

$$\phi_{XI} = NBDX \sin(AZSM) \cos(AZ - AXI)/Wh$$
$$+ADIAX(g) \sin(AZSM) \cos(AZSM) \cos(AZ - AXI)/Wh$$
$$+ADSRAX(g) \sin^2(AZSM) \cos(AZ - AXI)/Wh$$

Y gyro drift effects

$$\phi_{XI} = NBDY \cos(AZSM) \cos(AZ - AXI)/Wh$$
$$-ADIAY(g) \sin(AZSM) \cos(AZSM) \cos(AZ - AXI)/Wh$$
$$+ ADOAY(g) \cos^2(AZSM) \cos(AZ - AXI)Wh$$

Z gyro drift effects

$$\phi_{XI} = -NBDZ \sin(AZ - AXI)/Wh$$
$$-ADSRAZ(g) \sin(AZSM) \sin(AZ - AXI)/Wh$$
$$-ADOAZ(g) \cos(AZSM) \sin(AZ - AXI)/Wh$$

Vertical Erection Errors

$$\phi_{YI} = -ACBZ/g\ (\cos(AXI) + \sin(AZSM) \sin(AXI))$$
$$-ACBY/g \cos(AZSM) \sin(AXI)$$
$$-(SFEY + SFEX)(\sin(AZSM) \cos(AZSM) \sin(AXI))$$

$$\phi_{ZI} = -ACBZ/g\ (\sin(AXI) - \sin(AZSM) \cos(AXI))$$
$$+ACBY/g \cos(AZSM) \cos(AXI)$$
$$-(SFEY - SFEX)(\sin(AZSM) \cos(AZSM) \cos(AXI))$$

where Wh = WIE cos (Lat) (earth's rate horizontal component)

AZ = azimuth angle of Z_I from north

g = acceleration due to gravity

NOTE: Aximuth alignment errors due to vertical gyro drift rate effect are not included in above equations.

Table 7.13 gives summary data on S. M. drifts and misalignments for various event times throughout the LM-1 flight.

7.12 PIPA Saturation Effects

Because of the possibility that one of the IMU accelerometers (PIPAs) might saturate during the earth launch trajectory, a special study was made of this problem.

For the S. M. orientation of AXI = 40° and AZSM = -30° the maximum acceleration sensed during earth boost was 3.06 g's by the Y PIPA. This is sensed shortly before S1B cutoff. Since the PIPA does not saturate unless the input acceleration exceeds 3.3 g's, it is clear that under nominal conditions there will be no PIPA saturation. However, with non-nominal conditions or with other Stable Member orientation, the peak acceleration input could well exceed the PIPA saturation level. This is indicated by the fact that the maximum vector acceleration reached during boost is 4.2 g's.

Although the Y PIPA will not saturate with the above S. M. orientation, a study was made with the assumption that the Y PIPA had actually saturated at 2.82 g's. This was 85% of its nominal saturation level (3.3 g's) and 92% of the peak acceleration (3.06 g's) sensed by the Y PIPA. With this saturation level the ΔV lost by the Y PIPA was 15.1 ft/sec.

Table 7.15 gives the indication uncertainties at SIVB cutoff and subsequent events due to this particular ΔV loss. Comparison of these uncertainties with the position and velocity uncertainties due to one-sigma IMU uncertainties given in Table 7.7 shows that a ΔV loss exceeding 15 ft/sec cannot be tolerated. Table 7.15 was prepared for an earlier revision of this chapter, hence the slight discrepancies in trajectory event times.

7.13 Trajectory Data for Error Studies

Error studies were made on the basis of trajectory data furnished in Volumes I and II of "Apollo Mission AS-206 Spacecraft Operational Trajectory" prepared for MSC-Houston by TRW Systems, (Vol. I date was Feb. 1967, Vol. II date was April 1967.)

Table 7.16 summarizes the trajectory data significant from the error study point of view. Delta V (ΔV) is the integral of thrust acceleration.

7.14 Error Computation Procedure

The position, velocity and other uncertainties given in the error tables were computed as follows. Approximate error equations describing the effect of IMU component errors on acceleration indication error were incorporated in a computer program. These equations included the effect of the position error on the computation of gravity. Through two successive integrations, errors in indicated trajectory

position and velocity could be obtained. The assumptions underlying the use of these equations were (1) the errors were small relative to the parameters being measured, and (2) the IMU component errors were statistically independent of each other.

Computation of the above errors required as inputs to the main computation program two sets of vectors, one for spacecraft acceleration and the other for its position. These were generated in a separate program where a nominal trajectory was simulated. At significant events, such as powered trajectory cutoff, detailed error printouts were made.

Perigee altitudes were computed as follows. For different points in coast following burn cutoff the rss of the altitude uncertainties due to IMU uncertainties propagated to that point in orbit was subtracted from the nominal orbit altitude to obtain the altitude with adverse rss uncertainties. The point in orbit where this altitude was at minimum was termed the altitude of closest approach or the perigee altitude with 1σ uncertainties. A spherical earth was assumed. The same procedure was followed with 3σ uncertainties.

7.15 Error Table Definitions

Definitions of Local Vertical Axes - Most of the error tables give position and velocity uncertainties relative to actual local vertical axes at nominal event time. (Indicated local vertical axes are used at SIVB cutoff and in following coast.) Note that actual local vertical axes are displaced from nominal local axes by the angle subtended by the range error. (In previous reports the uncertainty tables were given relative to nominal local vertical axes. For large range uncertainty the altitude rate uncertainty also becomes large when expressed relative to nominal local axes.)

Altitude	Outward along $\bar{R}$ at event time
Track	Along $\bar{V} \times \bar{R}$
Range	Along $\overline{\text{Altitude}} \times \overline{\text{Track}}$

Symbols for IMU Uncertainties

Accelerometer Bias Uncertainty

ACBX	X accelerometer bias, etc.
CM/S.SQ.	centimeters/sec^2

Accelerometer Scale Factor Uncertainty

SFUX	X accelerometer scale factor uncertainty, etc.
PPM	parts per million

Accelerometer Acceleration-Squared Indication Uncertainty

NCXX	X accelerometer accel. squared indic, uncert., etc.
MG/GSQ	micro-gs/g squared

Gyro Bias Drift

NBDXINIT	Effect on initial S.M. misalignment
NBDXFLGT	Effect of X gyro drift during burn
NBDXCOMB	Total or combined effects of X gyro bias drift
MERU	Milli-earth rate unit = 0.015 deg/hour

Gyro Acceleration Sensitive Drift

ADX-Terms	RSS of uncertainties due to X gyro's ADIAX, ADSRAX, and ADOAX drift uncertainties. Uncertainty values for ADIAX and ADSRAX are given in position and velocity uncertainty tables. (See Section 7.6 for gyro drift rate definitions.)
MERU/G	Milli-earth rate unit/g = 0.015 deg/hour/g

Gyro Acceleration Squared Sensitive Drift

ADIXX	X gyro acceleration-squared sensitive drift due to acceleration along its input axis
ADSYY	Y gyro acceleration-squared sensitive drift due to acceleration along its spin reference axis
ADIZZ	Z gyro acceleration-squared sensitive drift due to acceleration along its input axis
MERU/GSQ	Milli-earth rate unit/g^2 = 0.015 deg/hour/g^2

Table 7.7
LM-1 Mission Uncertainty Summary
with Block II IMU Uncertainties

Event	Update ?	RSS Position Uncertainty n. miles			RSS Velocity Uncertainty ft/sec		
		Alt.	Track	Range	Alt.	Track	Range
Launch	None	0	0	0	0	0	0
SIVB Cutoff	None	0.4	5.6	0.4	10	132	9
DPS1	None	3.7	16.6	69.2	18	72	29
Cutoff	Bef. DPS1	0.03	0.03	0.3	2	1	1
DPS2	None	5.6	8.2	64.2	9	125	33
Ignition	Bef. DPS1	0.6	0.1	0.6	1	1	3
APS1	None	4.4	7.0	57.6	38	99	27
Cutoff	Bef. DPS1	2.9	0.6	2.1	56	7	21
At Perigee in Following Coast	None	4.3	7.3	57.4	38	98	27
	Bef. DPS1	16.7	1.0	20.1	60	3	82
APS2	None	6.0	5.4	64.3	29	104	32
Ignition	Bef. DPS1	1.1	0.5	96.1	32	8	26
	Bef. APS2	0.1	0.1	0.3	2	0	1
APS2	None	3.8	12.9	59.0	82	123	31
Cutoff	Bef. DPS1	4.2	23.0	91.5	117	51	35
	Bef. APS2	1.3	0.2	0.9	47	5	26
At Perigee	None	17.4	10.1	123.8	85	136	93
in Following	Bef. DPS1	30.0	23.8	213.9	106	12	173
Coast	Bef. APS2	16.6	0.2	66.0	52	5	88

Table 7.8

LM-1 Flight Uncertainties With No Navigation Update with Block II IMU Uncertainties

Event	Time From Launch secs	Altitude above earth with adverse rss uncertainties n. miles	RSS Position Uncertainties n. miles			RSS Velocity Uncertainties ft/sec			Other RSS Uncertainties*		
			Alt.	Track	Range	Alt.	Track	Range	(U) V ft/sec	(U)γ deg.	(U) INC deg.
Launch	0	---	0	0	0	0	0	0	0	0	0
SIVB Cutoff	591	87.7	0.4	5.6	0.4	10	132	9	9.0	0.02	0.31
At perigee	591	87.7	0.4	5.6	0.4	10	132	9	9.0	0.02	0.31
DPS1 ignit.	14,394	112.6	3.8	16.1	68.8	14	77	31	31.1	0.03	0.31
DPS1 cutoff	14,440	112.1	3.7	16.6	69.2	18	72	29	29.3	0.04	0.31
DPS2 ignit.	16,606	164.0	5.6	8.2	64.2	9	125	33	33.2	0.02	0.31
DPS2 cutoff	17,334	163.0	4.4	7.1	57.6	38	99	28	27.6	0.08	0.25
APS1 cutoff	17,340	163.0	4.4	7.0	57.6	38	99	27	27.5	0.09	0.25
At perigee	17,361	162.9	4.3	7.3	57.4	38	98	27	26.9	0.09	0.25
APS2 ignit.	22,412	163.8	6.0	5.4	64.3	29	104	32	32.0	0.07	0.25
APS2 cutoff	22,843	165.9	3.8	12.9	59.0	82	123	31	31.5	0.19	0.35
At perigee	25,774	108.8	17.4	10.1	123.8	85	136	93	93.1	0.19	0.35

*(U)V - uncertainty in inertial velocity magnitude

(U)γ - uncertainty in inertial flight path angle

(U)INC - uncertainty in orbit inclination

Table 7.9

LM-1 Flight Uncertainties With Navigation Update
Just Before DPS1 Ignition with Block II IMU Uncertainties

Event	Time from Launch secs.	Altitude above earth with adverse rss uncertainties n. miles	RSS Position Uncertainties n. miles			RSS Velocity Uncertainties ft/sec			Other RSS Uncertainties*		
			Alt.	Track	Range	Alt.	Track	Rnge	(U)V	(U)γ	(U)INC
Launch	0				(See Table 7.8)						
SIVB cutoff	591										
At perigee	591										
DPS1 ignit.	14,394	116.4	0.03	0.03	0.30	2.2	0.3	0.9	0.9	.005	.001
DPS1 cutoff	14,440	115.9	0.03	0.03	0.31	2.2	1.0	0.9	0.9	.005	.001
DPS2 ignit.	16,606	168.9	0.56	0.08	0.64	1.2	0.8	2.8	2.8	.003	.002
DPS2 cutoff	17,334	164.6	2.84	0.59	2.09	54.9	6.6	20.6	20.6	.13	.017
APS1 cutoff	17,340	164.5	2.89	0.60	2.10	55.5	6.7	20.6	20.6	.13	.017
At perigee	18,586	153.2	16.67	1.01	20.13	59.7	3.5	82.4	82.4	.14	.017
APS2 ignit.	22,412	168.7	1.05	0.48	96.07	31.9	7.6	25.6	25.6	.07	.019
APS2 cutoff	22,843	165.3	4.22	22.96	91.48	116.7	50.5	35.0	35.0	.25	.381
At perigee	25,774	99.8	29.95	23.77	213.9	105.6	11.7	173.1	172.9	.24	.381

* (U)V - uncertainty in inertial velocity magnitude

(U)γ - uncertainty in inertial flight path angle

(U)INC - uncertainty in orbit inclination

Table 7.10

LM-1 Flight Uncertainties With Navigation Update
Just Before APS2 Ignition with Block II IMU Uncertainties

Event	Time from Launch secs.	Altitude above earth with adverse rss uncertainties n. miles	RSS Position Uncertainties n. miles			RSS Velocity Uncertainties ft/sec			Other RSS Uncertainties*		
			Alt.	Track	Range	Alt.	Tra	Rnge	(U)V	(U)γ	(U)INC
Launch	0										
SIVB cutoff	591										
At perigee	591										
DPS1 ignit.	14, 394										
DPS1 cutoff	14, 440				(See Table 7.8)						
DPS2 ignit	16, 606										
DPS2 cutoff	17, 334										
APS1 cutoff	17, 340										
At perigee	17, 361										
APS2 ignit.	22, 412	169.7	0.09	0.07	0.35	2.1	0.4	0.5	0.5	.001	.001
APS2 cutoff	22, 843	168.4	1.31	0.22	0.91	46.5	5.0	25.8	25.8	.11	.012
At perigee	25, 588	110.7	16.6	0.25	66.0	51.9	5.0	88.3	88.3	.12	.012

(U)V - uncertainty in inertial velocity magnitude

(U)γ - uncertainty in inertial flight path angle

(U)INC - uncertainty in orbit inclination

Table 7.11

Initial Azimuth Alignment Uncertainties Due to Gyro Drift Rate Uncertainties For Different Stable Member Orientations

Error Source	One Sigma Uncert. Value	S. M. Angles AXI= AYIP= AZSM=	Alighment Uncertainty about Azimuth - millirad.				
			0 0 0	0 -90 0	40 0 0	0 0 -30	40° 0° -30°
NBDX	2 meru		0.146	2.162	0.146	-0.351	-0.964
NBDY	2 meru		0.702	0.702	1.928	0.608	1.669
NBDZ	2 meru		-2.162	0.146	-1.205	-2.162	-1.205
ADIAX	8 meru/g		0.583	0	0.583	-1.217	-3.339
ADSRAX	5 meru/g		0	0	0	0.439	1.205
ADOAX	1 meru/g		0	-1.081	0	0	0
ADIAY	8 meru/g		0	0	0	1.217	3.339
ADSRAY	5 meru/g		0	1.756	0	0	0
ADOAY	1 meru/g		0.351	0	0.964	0.263	0.723
ADIAZ	8 meru/g		0	-0.583	0	0	0
ADSRAZ	5 meru/g		0	0	0	2.702	1.506
ADOAZ	1 meru/g		-1.081	0	-0.602	-0.936	-0.522
RSS			2.623	3.137	2.623	4.077	5.660

NOTE: 1. The assumed drift rate uncertainties are Block II.

2. These alignment uncertainties do not include the vertical gyro drift rate effect.

Table 7.12

SIVB Cutoff Indication Uncertainties for Different S. M. Orientations with Block II IMU Uncertainties

S. M. Orientation Angles (deg)			RSS Position Uncertainties n. miles			RSS Velocity Uncertainties ft/sec			Max. Position Uncertainty in Following Coast n. miles		Uncertainty in Orbit Inclination deg.
AXI	AYIP	AZSM	Alt.	Track	Range	Alt.	Track	Range	Alt.	Track	
0	0	0	0.37	2.64	0.22	9.00	62.25	4.95	2.84	8.95	0.15
0	-90	0	0.36	3.10	0.27	8.47	72.60	5.82	3.25	10.44	0.17
40	0	0	0.37	2.65	0.22	9.35	62.29	4.99	2.79	8.96	0.15
0	0	-30	0.37	4.03	0.30	9.12	94.40	6.78	3.83	13.58	0.22
40	0	-30	0.38	5.60	0.39	9.75	131.82	8.94	5.03	18.96	0.31

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Table 7.13

Stable Member Angles and Alignment Uncertainties with Block II IMU Uncertainties
AXI = 40°, AYIP = 0, AZSM = -30°

Event	RSS Alignment Uncertainties in milliradians								
	About Stable Member Axes			About Launch Inertial Axes			About Local Axes		
	XSM	YSM	ZSM	X_I	Y_I	Z_I	Alt.	Track	Range
Initial S. M. RSS Misalignments at Earth Launch	4.90	2.84	0.22	5.66	0.21	0.21	5.36	0.21	1.83
Stable Member Drift Angles									
At SIVB Cutoff	0.24	0.42	0.42	0.29	0.40	0.40	0.34	0.40	0.36
At DPS1 Ignition	2.11	2.14	2.14	2.12	2.14	2.14	2.14	2.14	2.12
At DPS2 Ignition	2.43	2.46	2.46	2.44	2.45	2.46	2.45	2.45	2.45
At APS2 Ignition	2.54	2.56	2.57	2.55	2.56	2.57	2.57	2.56	2.55
Overall Stable Member Misalignments									
At SIVB Cutoff	4.91	2.87	0.47	5.67	0.45	0.46	5.37	0.45	1.86
At DPS1 Ignition	5.34	3.55	2.15	6.04	2.15	2.15	3.77	2.15	5.19
At DPS2 Ignition	5.47	3.75	2.47	6.16	2.46	2.46	5.67	2.46	3.44
At APS2 Ignition	5.52	3.82	2.58	6.21	2.57	2.58	2.98	2.80	5.92

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Table 7.14

Perigee Errors in Coast Following Earth Orbit
Insertion with Active (Contingency Case) LM-1 Guidance

IMU Error	Assumed Error Value (Block II)	Resulting Perigee Error (feet)	IMU Error that results in a 1 n. mile Perigee Error
MLMXI*	50 secs	35	large
MLMYI	5 secs	-107	284 secs
MLMZI	5 secs	-3	large
MXAY**	28.3 secs	-470	366 secs
MXAZ	21.2 secs	469	274 secs
MYAX	28.3 secs	487	353 secs
MYAZ	7.1 secs	-61	706 secs
ACBX	0.2 cm/sec^2	602	2.0 cm/sec^2
ACBY	0.2 cm/sec^2	1,353	0.9 cm/sec^2
ACBZ	0.2 cm/sec^2	1,033	1.2 cm/sec^2
SFEX	116 PPM	-99	7,130 PPM
SFEY	116 PPM	-640	1,100 PPM
SFEZ	116 PPM	-139	5,060 PPM
NBDX	2 meru	-58	208 meru
NBDY	2 meru	174	70 meru
MBDZ	2 meru	-262	46 meru
ADIAX	8 meru/g	-180	270 meru/g
ADIAY	8 meru/g	207	235 meru/g
ADIAZ	8 meru/g	332	147 meru/g
ADSRAX	5 meru/g	8	3,900 meru/g
ADSRAY	5 meru/g	212	143 meru/g
ADSRAZ	5 meru/g	516	39 meru/g

*MLMXI denotes S.M. misalignment about XI, etc.

**MXAY denotes X accelerom. IA misalignment about YSM.

Given errors are for combined initial MLM and in-flight effects.

Table 14a

Instantaneous Perigee Uncertainties for Premature APS2 Burn Cutoff with 1 σ Block II IMU Uncertainties for No Update, and for Updates before DPS1 Burn and before APS2 Burn.

Time from APS2 Burn Ignition secs	Nominal Instantaneous Perigee Altitude n. miles	Attitude Uncertainty at Instantaneous Nominal Perigee in n. miles		
		With No Update	With Update Before DPS1 Burn Ign.	With Update Before APS2 Burn Ign.
-3.5	168.8	3.9	4.1	0
0	168.7	---	---	---
30	158.4	6.7	15.7	1.1
60	138.5	7.8	17.0	2.3
90	118.7	8.5	17.7	3.5
120	100.3	9.1	18.5	4.6
150	84.4	9.8	19.4	5.8
180	71.3	10.6	20.4	7.0
210	61.5	11.6	21.4	8.2
240	55.5	12.1	22.4	9.4
270	53.8	12.9	23.4	10.6
300	57.2	13.7	24.3	11.9
330	66.5	14.6	25.0	13.1
360	82.8	15.4	25.4	14.2
390	107,7	16.3	25.2	15.2
420	120.0	17.0	22.0	15.0
427.2	127.7	17.1	18.5	13.6

Note: Altitude uncertainties are computed for nominal perigee location in orbit. Computations are approximate in that the effect of altitude uncertainties on perigee location were not considered as they were in Tables 7.1 and 7.2.

Table 7.15

LM-1 Flight Indication Uncertainties due to Y PIPA Saturation during Earth Launch (Y PIPA saturation level = 2.82 g's; Y PIPA maximum acceleration input = 3.06 g's)

Event	Time from Launch Sec.	Alt. above earth with adverse rss (inc. due to IMU) uncert. n. miles	Position Uncert. n. miles			Velocity Uncert. ft/sec		
			Alt.	Track	Range	Alt.	Track	Range
Launch	0	-	0	0	0	0	0	0
SIVB Cutoff	603		-0.81	-0.72	-0.39	- 12.6	-8.1	-4.2
Closest Indic. approach	800	86.6						
DPS1 ignition	14,252		-4.03	1.16	79.7	-552.2	4.8	16.7
DPS1 cutoff	14,297		-3.88	1.19	80.1	-554.3	4.4	15.6
DPS2 ignition	16,513		-1.5	-0.7	83.7	-601	-8.1	0.5
APS1 cutoff	17,281		-4.6	-1.3	87.0	-634	1.8	12.6

Note: ΔV lost by Y PIPA because of saturation was 15.1 ft/sec.

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Table 7.16

Summary of LM-1 Mission Trajectory Data

Burn No.	Time Launch to Burn Ignition	Burn Duration	Inertial Orbit Angle-Launch to Burn Ignition	Orbit Angle-Cutoff to Next Perigee	Altitude at Cutoff	Perigee Altitude for Following Coast	Apogee Altitude for Following Coast	ΔV	ΔV Component in Traj. Plane	ΔV Component perp. to Traj. Plane
	secs.	secs.	rev-deg	deg	n.mi.	n.mi.	n.mi.	ft/sec	ft/sec	ft/sec
SIVB C.O.	---	591	---	359	89	89	124	27,110	27,106	450
DPS1	14,394	38	2-236	0	118	118	181	162	162	0
DSP2/ APS1*	16,606	726	3-25	19	169	168	187	6,992	1,169	6,894
APS2	22,412	427	4-49	163	170	128	172	6,685	827	6,633

*Duration of APS1 Burn is 5.25 secs.

[redacted]

[redacted]

Table 7.17	SIVB Cutoff Indication Uncertainties
Table 7.18	SIVB Cutoff Indication Uncertainties (AD Terms)
Table 7.19	IMU S. M. Misalignments and Drift Angles at SIVB Cutoff
Table 7.20	Flight Uncertainties at APS1 Cutoff-No Update
Table 7.21	Flight Uncertainties at APS1 Cutoff-No Update (AD Terms)
Table 7.22	Flight Uncertainties at APS1 Cutoff with Update Before DPS1 Burn
Table 7.23	Flight Uncertainties at APS1 Cutoff with Update Before DPS1 Burn (AD Terms)
Table 7.24	Flight Uncertainties at Perigee After APS1 Cutoff with Update Before DPS1 Burn
Table 7.25	Flight Uncertainties at Perigee After APS1 Cutoff with Update Before DPS1 Burn (AD Terms)
Table 7.26	Flight Uncertainties at APS2 Cutoff-No Update
Table 7.27	Flight Uncertainties at APS2 Cutoff-No Update (AD Terms)
Table 7.28	Flight Uncertainties at Perigee After APS2 Cutoff-No Update
Table 7.29	Flight Uncertainties at Perigee After APS2 Cutoff-No Update (AD Terms)
Table 7.30	Flight Uncertainties at APS2 Cutoff with Update Before DPS1 Burn
Table 7.31	Flight Uncertainties at APS2 Cutoff With Update Before DPS1 Burn (AD Terms)
Table 7.32	Flight Uncertainties at Perigee After APS2 Cutoff With Update Before DPS1 Burn
Table 7.33	Flight Uncertainties at Perigee After APS2 Cutoff With Update Before DPS1 Burn (AD Terms)
Table 7.34	Flight Uncertainties at APS2 Cutoff with Update Before APS2 Burn
Table 7.35	Flight Uncertainties at APS2 Cutoff With Update Before APS2 Burn (AD Terms)
Table 7.36	Flight Uncertainties at Perigee After APS2 Cutoff With Update Before APS2 Burn
Table 7.37	Flight Uncertainties at Perigee After APS2 Cutoff With Update Before APS2 Burn (AD Terms)

Error Tables With Latest Measured IMU Uncertainties

Table 7.38	SIVB Cutoff Indication Uncertainties
Table 7.39a	IMU S.M. Misalignments and Drift Angles at SIVB Cutoff
Table 7.39b	IMU S.M. Misalignments and Drift Angles at SIVB Cutoff
Table 7.40	Flight Uncertainties at APS1 Cutoff - No Update
Table 7.41	Flight Uncertainties at APS1 Cutoff With Update Before DPS1 Burn
Table 7.42	Flight Uncertainties at Perigee after APS1 Cutoff with Update Before DPS1 Burn
Table 7.43	Flight Uncertainties at APS2 Cutoff - No Update
Table 7.44	Flight Uncertainties at Perigee After APS2 Cutoff - No Update
Table 7.45	Flight Uncertainties at Perigee After APS2 Cutoff - No Update (AD Terms)
Table 7.46	Flight Uncertainties at APS2 Cutoff with Update Before DPS1 Burn
Table 7.47	Flight Uncertainties at Perigee After APS2 Cutoff with Update Before DPS1 Burn
Table 7.48	Flight Uncertainties at Perigee After APS2 Cutoff with Update Before DPS1 Burn (AD Terms)
Table 7.49	Flight Uncertainties at APS2 Cutoff with Update Before APS2 Burn
Table 7.50	Flight Uncertainties at Perigee After APS2 Cutoff with Update Before APS2 Burn
Table 7.51	Flight Uncertainties at Perigee After APS2 Cutoff with Update Before APS2 Burn (AD Terms)

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 0 HR, 9 MIN, 50.664 SEC (590.664 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO INDIC.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO INDIC.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	-30.0	-1471.3	-78.6	-0.215	-5.661	-0.302
ABOUT YI	5.0 SECS	117.1	6.4	-160.4	0.377	0.011	-0.393
ABOUT ZI	5.0 SECS	2.4	116.3	6.2	0.013	0.209	0.011
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	28.3 SECS	515.1	-233.4	-396.6	1.691	-0.899	-1.535
X ABOUT Z	21.2 SECS	-494.7	217.7	373.3	-1.272	0.653	1.137
Y ABOUT X	28.3 SECS	-468.1	-402.2	-248.2	-2.254	-1.547	-0.947
Y ABOUT Z	7.1 SECS	61.1	47.8	28.2	0.095	-0.001	-0.009
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		309.0	-357.5	-453.6	0.979	-0.645	-1.099
ACBYFLGT	0.200 CM/S.SQ	-938.5	418.0	714.1	-2.539	1.327	2.294
ACBXCOMB		-629.5	60.5	260.5	-1.561	0.682	1.195
ACBYINIT		-535.2	619.2	785.7	-1.695	1.118	1.904
ACBYFLGT	0.200 CM/S.SQ	-848.7	-720.2	-441.9	-3.564	-2.281	-1.376
ACBYCOMB		-1383.9	-101.0	343.8	-5.259	-1.164	0.528
ACBZINIT		-768.1	-670.2	1000.1	-2.497	-1.201	2.475
ACBZFLGT	0.200 CM/S.SQ	-280.3	783.7	-786.8	-1.927	2.485	-2.487
ACBZCOMB		-1048.4	113.5	213.2	-4.425	1.284	-0.013
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	116 PPM	82.9	82.2	57.2	-0.398	0.318	0.498
SFUYCOMB	116 PPM	655.2	247.0	35.1	2.516	0.948	0.216
SFUZCOMB	116 PPM	131.9	-370.3	371.8	0.993	-1.425	1.428
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.964 MR., DUE TO BDY 1.669 MR., DUE TO BDZ- 1.205 MR.)							
NBDXINIT	2.0 MERU	120.3	5850.0	312.3	0.863	22.507	1.200
NBDYFLGT	(0.088 MR.DRIFT	-74.2	-206.2	44.8	-0.444	-1.121	0.150
NBDXCOMB	SINCE LAUNCH)	46.0	5643.9	357.2	0.418	21.386	1.350
NBDYINIT	2.0 MERU	-204.6	-10132.7	-541.0	-1.465	-38.985	-2.079
NBDYFLGT	(0.088 MR.DRIFT	120.2	-54.9	-99.7	0.693	-0.535	-0.392
NBDYCOMB	SINCE LAUNCH)	-84.3	-10187.5	-640.7	-0.772	-39.519	-2.471
NBDZINIT	2.0 MERU	150.5	7311.0	390.3	1.080	28.128	1.500
NBDZFLGT	(0.088 MR.DRIFT	116.3	-59.5	-96.9	0.678	-0.107	-0.357
NBDZCOMB	SINCE LAUNCH)	266.9	7251.4	293.4	1.759	28.021	1.143
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX_TERMS	8.0, 5.0 MERU/G	265.7	20883.0	1322.3	2.513	80.389	4.890
ADY_TERMS	8.0, 5.0 MERU/G	274.5	20963.3	1558.9	1.612	81.884	5.949
ADZ_TERMS	8.0, 5.0 MERU/G	632.7	9506.2	376.7	3.904	36.902	1.555
GYRO ACCELERATION SQUARED SENSITIVE DRIFT							
ADIXX	0.2 MERU/GSQ	-4.5	-13.7	3.7	-0.019	-0.053	0.009
ADSYY	0.2 MERU/GSQ	12.1	-6.1	-9.2	0.074	-0.058	-0.038
ADIZZ	0.2 MERU/GSQ	11.7	-5.1	-8.8	0.072	-0.008	-0.035
RSS UNCERT.(FT AND FT/SEC)		2289.7	34012.1	2390.2	9.746	131.817	8.935
RSS UNCERT.(N.MI.AND FT/SEC)		0.376	5.597	0.393	9.746	131.817	8.935

TABLE 7.17 SIVB CUTOFF INDICATION UNCERTAINTIES

GYRO ACCELERATION SENSITIVE DRIFT

ADIAXINIT			423.4		20264.8		1081.9		3.041		77.965		4.158
ADIAXFLGT	8.0 MERU/G	-	164.6	-	502.5		135.6	-	0.533	-	1.648		0.347
ADIAXCOMB			258.4		19762.5		1217.5		2.505		76.317		4.505
ADSAXINIT		-	148.1	-	7312.6	-	390.4	-	1.061	-	28.135	-	1.500
ADSAXFLGT	5.0 MERU/G		202.6		564.4	-	125.2		1.130		2.879	-	0.402
ADSAXCOMB			54.4	-	6748.1	-	515.6		0.067	-	25.255	-	1.903
ADOAXINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADOAXFLGT	1.0 MERU/G	-	29.6	-	79.1		15.7	-	0.194	-	0.472		0.057
ADOAXCOMB		-	29.6	-	79.1		15.7	-	0.194	-	0.472		0.057
RSS FOR X GYRO			265.7		20883.0		1322.3		2.513		80.389		4.890
ADIAYINIT		-	404.3	-	20265.5	-	1082.0	-	2.894	-	77.971	-	4.158
ADIAYFLGT	8.0 MERU/G		525.3	-	231.7	-	442.9		2.808	-	2.135	-	1.655
ADIAYCOMB			121.3	-	20496.7	-	1524.9	-	0.083	-	80.103	-	5.813
ADSAYINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADSAYFLGT	5.0 MERU/G	-	239.9		123.2		179.5	-	1.516		1.194		0.778
ADSAYCOMB		-	239.9		123.2		179.5	-	1.516		1.194		0.778
ADOAYINIT		-	89.2	-	4387.6	-	234.3	-	0.639	-	16.881	-	0.900
ADOAYFLGT	1.0 MERU/G		33.2	-	8.8	-	35.6		0.099	-	0.061	-	0.097
ADOAYCOMB		-	55.9	-	4396.3	-	269.9	-	0.540	-	16.942	-	0.998
RSS FOR Y GYRO			274.5		20963.3		1558.9		1.612		81.884		5.949
ADIAZINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADIAZFLGT	8.0 MERU/G	-	372.5		156.1		276.4	-	2.384		0.256		1.120
ADIAZCOMB		-	372.5		156.1		276.4	-	2.384		0.256		1.120
ADSAZINIT		-	184.7	-	9138.9	-	487.9	-	1.323	-	35.161	-	1.875
ADSAZFLGT	5.0 MERU/G	-	317.5		167.9		269.7	-	1.717		0.310		0.950
ADSAZCOMB		-	502.3	-	8971.1	-	218.3	-	3.041	-	34.852	-	0.926
ADOAZINIT			64.9		3165.8		169.0		0.465		12.180		0.650
ADOAZFLGT	1.0 MERU/G		31.8	-	25.4	-	35.4		0.095	-	0.054	-	0.094
ADOAZCOMB			96.7		3140.4		133.6		0.560		12.146		0.556
RSS FOR Z GYRO			632.7		9506.2		376.7		3.904		36.902		1.555
RSS FOR ALL GYROS			739.2		31079.3		2078.6		4.915		120.536		7.857

TABLE 7.18 SIVB CUTOFF INDICATION UNCERTAINTIES (AD TERMS)

CONFIDENTIAL

INITIAL S.M.MLMS. AND DRIFT ANGLES SUMMARY (S.M.ANGLES AXI= 40.000, AYPI= 0.000, AZSM=- 30.000 DEG)(T= 590.664 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERT.	VALUE	MLM. ANGLE ABOUT STABLE MEMBER AXES XSM	MR. YSM	ZSM	MLM.ANGLE ABOUT LOCAL VERTICAL AXES ALT.	MR. TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED WITH ALIGNMENT UNCERT.DUE TO LISTED GYRO AND PIPA UNCERT.) ABOUT								
ABOUT XI	50	SECS	0.2099	0.1212	0.0000	0.2296	- 0.0003	- 0.0777
ABOUT YI	5	SECS	- 0.0092	0.0160	- 0.0155	0.0004	0.0242	0.0012
ABOUT ZI	5	SECS	- 0.0077	0.0134	0.0185	0.0077	- 0.0013	0.0229
INITIAL S.M. MLMS. DUE TO IMU ERROR EFFECTS ON EARTH LAUNCH ERECTION AND ALIGNMENT								
ACBX	0.200	CM/S.SQ	0.0000	0.0000	- 0.1019	- 0.0237	0.0698	- 0.0703
ACBY	0.200	CM/S.SQ	0.0000	0.0000	0.1766	0.0410	- 0.1210	0.1218
ACBZ	0.200	CM/S.SQ	0.1019	- 0.1766	0.0000	- 0.0450	- 0.1485	- 0.1323
NBDX	2.0	MERU	- 0.8346	- 0.4819	0.0000	- 0.9128	0.0013	0.3091
NBDY	2.0	MERU	1.4457	0.8346	0.0000	1.5811	- 0.0023	- 0.5354
NBDZ	2.0	MERU	- 1.0431	- 0.6022	0.0000	- 1.1408	0.0016	0.3863
ADIAX	8.0	MERU/G	- 2.8914	- 1.6693	0.0000	- 3.1623	0.0046	1.0708
ADSRAX	5.0	MERU/G	1.0433	0.6023	0.0000	1.1411	- 0.0016	- 0.3864
ADOAX	1.0	MERU/G	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADIAY	8.0	MERU/G	2.8914	1.6693	0.0000	3.1623	- 0.0046	- 1.0708
ADSRAY	5.0	MERU/G	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADOAY	1.0	MERU/G	0.6260	0.3614	0.0000	0.6846	- 0.0009	- 0.2318
ADIAZ	8.0	MERU/G	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADSRAZ	5.0	MERU/G	1.3039	0.7528	0.0000	1.4260	- 0.0020	- 0.4829
ADOAZ	1.0	MERU/G	- 0.4516	- 0.2607	0.0000	- 0.4940	0.0007	0.1672
RSS INITIAL S.M. MLMS.			4.9025	2.8354	0.2173	5.3611	0.2112	1.8262
DRIFT ANGLES DUE TO GYRO DRIFT AFTER TRAJECTORY START								
NBDX	2.0	MERU	0.0880	0.0000	0.0000	0.0624	- 0.0321	- 0.0529
NBDY	2.0	MERU	0.0000	0.0880	0.0000	0.0585	0.0554	0.0353
NBDZ	2.0	MERU	0.0000	0.0000	- 0.0880	- 0.0204	0.0603	- 0.0607
ADIAX	8.0	MERU/G	0.0172	0.0000	0.0000	0.0122	- 0.0062	- 0.0103
ADSRAX	5.0	MERU/G	- 0.2168	0.0000	0.0000	- 0.1539	0.0792	0.1305
ADOAX	1.0	MERU/G	0.0434	0.0000	0.0000	0.0308	- 0.0158	- 0.0261
ADIAY	8.0	MERU/G	0.0000	0.3469	0.0000	0.2306	0.2185	0.1393
ADSRAY	5.0	MERU/G	0.0000	- 0.2173	0.0000	- 0.1445	- 0.1369	- 0.0872
ADOAY	1.0	MERU/G	0.0000	0.0021	0.0000	0.0014	0.0013	0.0008
ADIAZ	8.0	MERU/G	0.0000	0.0000	0.3477	0.0809	- 0.2383	0.2400
ADSRAZ	5.0	MERU/G	0.0000	0.0000	0.2168	0.0504	- 0.1486	0.1496
ADOAZ	1.0	MERU/G	0.0000	0.0000	- 0.0021	- 0.0005	0.0014	- 0.0014
RSS DRIFT ANGLE			0.2386	0.4189	0.4193	0.3402	0.3998	0.3642
OVERALL RSS MLM			4.9083	2.8662	0.4723	5.3719	0.4521	1.8622

TABLE 7.19 IMU S.M. MISALIGNMENTS AND DRIFT ANGLES AT SIVB CUTOFF

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 4 HR. 48 MIN. 59.580 SEC (17339.581 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	824.1	-1608.5	13372.2	-1.065	-3.921	-0.528
ABOUT YI	5.0 SECS	1071.9	2157.4	8416.9	-0.600	-1.553	-0.920
ABOUT ZI	5.0 SECS	-39.0	69.7	-618.2	-0.042	0.067	-0.123
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	28.3 SECS	4201.1	7036.8	30893.9	-1.896	-6.338	-3.925
X ABOUT Z	21.2 SECS	-2738.2	-4184.5	-18310.6	0.795	3.406	2.057
Y ABOUT X	28.3 SECS	3730.7	11206.5	51439.7	-4.806	-9.094	-1.683
Y ABOUT Z	7.1 SECS	-100.4	-493.2	-2228.2	0.233	0.351	0.023
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		3034.1	5608.4	24748.9	-1.492	-4.417	-2.077
ACBXFLGT	0.200 CM/S.SQ	-6741.1	-6792.1	-32617.9	3.657	9.786	9.517
ACBXCOMB		-3745.5	-1181.1	-7856.9	2.197	5.368	7.391
ACBYINIT		-5185.8	-9717.7	-42882.5	2.548	7.652	3.682
ACBYFLGT	0.200 CM/S.SQ	4621.6	16529.5	79838.4	-10.301	-15.717	-0.625
ACBYCOMB		-727.6	6817.8	36983.7	-7.692	-8.072	2.847
ACBZINIT		-6622.5	-14286.3	-50920.9	4.046	9.649	6.685
ACBZFLGT	0.200 CM/S.SQ	7126.1	25203.5	88271.2	-14.835	-12.699	-7.200
ACBZCOMB		282.2	10929.5	37393.3	-10.676	-3.065	-0.803
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	116 PPM	-2033.3	-5046.1	-20976.7	1.113	3.447	1.105
SFUYCOMB	116 PPM	-2038.9	-7667.3	-34103.2	2.892	5.317	1.058
SFUZCOMB	116 PPM	-4361.2	-14506.1	-52720.2	5.841	8.309	3.642
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.964 MR., DUE TO BDY 1.669 MR., DUE TO BDZ- 1.205 MR.)							
NBDXINIT	2.0 MERU	-3195.0	6396.5	-53177.8	4.222	15.590	2.204
NBDXFLGT	(2.531 MR.DRIFT	-7006.7	-1633.1	-1023.2	-18.113	-0.567	2.520
NBDXCOMB	SINCE LAUNCH)	-10199.7	4765.1	-54218.1	-13.918	15.028	4.683
NBDYINIT	2.0 MERU	5843.2	-11074.4	92069.2	-7.360	-27.008	-3.416
NBDYFLGT	(2.531 MR.DRIFT	-1338.7	799.4	4569.7	-11.891	-3.789	-10.533
NBDYCOMB	SINCE LAUNCH)	4523.4	-10275.9	96643.4	-19.290	-30.803	-13.874
NBDZINIT	2.0 MERU	-3972.5	7994.2	-66460.8	5.274	19.483	2.780
NBDZFLGT	(2.531 MR.DRIFT	-1243.1	2717.1	12487.3	-1.213	0.366	10.997
NBDZCOMB	SINCE LAUNCH)	-5252.5	10712.3	-53974.9	4.030	19.848	13.727
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX_TERMS	8.0, 5.0 MERU/G	12595.4	20059.5	201401.5	15.850	57.891	10.221
ADY_TERMS	8.0, 5.0 MERU/G	17574.9	15780.1	223616.3	17.683	63.152	11.867
ADZ_TERMS	8.0, 5.0 MERU/G	4317.9	16349.1	72747.5	6.269	22.698	2.292
GYRO ACCELERATION SQUARED SENSITIVE DRIFT							
ADIXX	0.2 MERU/GSQ	-30.2	-77.0	-115.0	-0.004	0.010	0.031
ADSYY	0.2 MERU/GSQ	112.5	167.3	819.8	-0.068	-0.192	-0.147
ADIZZ	0.2 MERU/GSQ	98.4	179.1	732.5	-0.026	-0.128	-0.046
RSS UNCERT.(FT AND FT/SEC)		26861.2	42751.6	350019.3	37.899	98.944	27.499
RSS UNCERT.(N.MI.AND FT/SEC)		4.420	7.036	57.605	37.899	98.944	27.499

TABLE 7.20 FLIGHT UNCERTAINTIES AT APS1 CUTOFF - NO UPDATE

GYRO ACCELERATION SENSITIVE DRIFT

ADIAXINIT		-	10509.2		22165.4	-	184280.7		14.543		53.994		8.358
ADIAXFLGT	8.0 MERU/G	-	781.3	-	2600.5	-	4268.0		0.557		0.511		0.941
ADIAXCOMB		-	11257.3		19564.4	-	188557.5		15.074		54.507		9.347
ADSAXINIT			4177.6	-	7992.9		66450.0	-	5.306	-	19.491	-	2.516
ADSAXFLGT	5.0 MERU/G		1454.1		3598.4		4324.7		0.428	-	0.015	-	1.625
ADSAXCOMB			5643.5	-	4394.6		70769.5	-	4.893	-	19.505	-	4.126
ADOAXINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADOAXFLGT	1.0 MERU/G	-	265.7	-	549.7	-	572.8	-	0.215	-	0.037		0.273
ADOAXCOMB		-	265.7	-	549.7	-	572.8	-	0.215	-	0.037		0.273
RSS FOR X GYRO			12595.4		20059.5		201401.5		15.850		57.891		10.221
ADIAYINIT			12078.5	-	22142.6		184091.0	-	14.778	-	54.024	-	6.322
ADIAYFLGT	8.0 MERU/G		4843.3		7363.0		35001.6	-	2.400	-	7.839	-	5.391
ADIAYCOMB			17208.0	-	14778.6		219034.2	-	17.313	-	61.860	-	11.329
ADSAYINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADSAYFLGT	5.0 MERU/G	-	2290.1	-	3415.1	-	16771.9		1.401		3.937		3.056
ADSAYCOMB		-	2290.1	-	3415.1	-	16771.9		1.401		3.937		3.056
ADOAYINIT			2482.0	-	4796.1		39873.0	-	3.180	-	11.694	-	1.541
ADOAYFLGT	1.0 MERU/G		256.1		443.6		1924.7	-	0.134	-	0.388	-	0.239
ADOAYCOMB			2741.5	-	4352.5		41796.9	-	3.316	-	12.082	-	1.776
RSS FOR Y GYRO			17574.9		15780.1		223616.3		17.683		63.152		11.867
ADIAZINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADIAZFLGT	8.0 MERU/G	-	3191.5	-	5861.0	-	23905.3		0.857		4.169		1.442
ADIAZCOMB		-	3191.5	-	5861.0	-	23905.3		0.857		4.169		1.442
ADSAZINIT			5252.8	-	9988.5		83041.3	-	6.635	-	24.359	-	3.103
ADSAZFLGT	5.0 MERU/G	-	2687.0	-	4770.1	-	19829.0		0.790		3.565		1.711
ADSAZCOMB			2492.9	-	14758.8		63227.0	-	5.815	-	20.794	-	1.488
ADOAZINIT		-	1745.2		3461.2	-	28775.3		2.287		8.437		1.171
ADOAZFLGT	1.0 MERU/G		249.4		427.3		1884.6	-	0.109	-	0.350	-	0.187
ADOAZCOMB		-	1498.2		3888.5	-	26890.3		2.179		8.087		0.981
RSS FOR Z GYRO			4317.9		16349.1		72747.5		6.269		22.698		2.292
RSS FOR ALL GYROS			22049.2		30309.9		309611.1		24.560		88.627		15.829

TABLE 7.21 FLIGHT UNCERTAINTIES AT APS1 CUTOFF-NO UPDATE (AD TERMS)

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 4 HR, 48 MIN, 59.580 SEC (17339.581 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	-695.3	-72.4	-142.7	-2.145	-0.149	-0.298
ABOUT YI	5.0 SECS	-7.6	0.1	3.4	-0.013	0.001	0.007
ABOUT ZI	5.0 SECS	24.8	-11.6	-62.2	0.002	-0.023	-0.148
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	28.3 SECS	-40.8	-111.1	-83.5	-0.204	-0.306	-0.396
X ABOUT Z	21.2 SECS	11.0	-108.1	-174.6	-0.161	-0.236	-0.351
Y ABOUT X	28.3 SECS	-168.3	-135.4	134.4	-0.356	-0.327	0.271
Y ABOUT Z	7.1 SECS	30.1	23.4	-12.3	0.067	0.053	-0.050
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		-100.5	37.7	209.6	-0.040	0.076	0.497
ACBXFLGT	0.200 CM/S.SQ	-971.7	1465.0	3869.3	1.576	2.350	4.417
ACBXCOMB		-1072.1	1502.7	4078.9	1.536	2.426	4.914
ACBYINIT		174.0	-65.2	-363.0	0.069	-0.131	-0.860
ACBYFLGT	0.200 CM/S.SQ	-1456.3	-1102.5	398.6	-3.195	-2.333	2.341
ACBYCOMB		-1282.3	-1167.8	35.5	-3.126	-2.464	1.480
ACBZINIT		-85.1	62.1	314.3	0.074	0.116	0.753
ACBZFLGT	0.200 CM/S.SQ	-1107.9	468.7	-2185.9	-5.186	2.203	-1.521
ACBZCOMB		-1193.0	530.8	-1871.5	-5.112	2.320	-0.767
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	116 PPM	95.9	-114.1	-325.2	-0.097	-0.215	-0.549
SFUYCOMB	116 PPM	-204.5	-104.0	199.0	-0.346	-0.241	0.490
SFUZCOMB	116 PPM	182.1	-119.5	1.0	0.536	-0.241	0.119
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.964 MR., DUE TO BDY 1.669 MR., DUE TO BDZ- 1.205 MR.)							
NBDXINIT	2.0 MERU	2764.4	288.0	567.4	8.530	0.591	1.183
NBDXFLGT	(2.531 MR.DRIFT	-6652.3	-254.3	655.9	-18.494	-0.572	1.949
NBDXCOMB	SINCE LAUNCH)	-3887.9	33.8	1223.4	-9.964	0.019	3.133
NBDYINIT	2.0 MERU	-4788.1	-499.0	-983.1	-14.775	-1.024	-2.050
NBDYFLGT	(2.531 MR.DRIFT	-2586.5	-1006.9	-4041.0	-11.686	-1.943	-9.504
NBDYCOMB	SINCE LAUNCH)	-7374.3	-1506.2	-5025.1	-26.461	-2.967	-11.557
NBDZINIT	2.0 MERU	3454.7	359.9	709.1	10.660	0.738	1.479
NBDZFLGT	(2.531 MR.DRIFT	-2359.3	899.9	5024.6	-0.949	1.790	12.007
NBDZCOMB	SINCE LAUNCH)	1095.7	1259.7	5733.0	9.711	2.528	13.483
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSKA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX-TERMS	8.0, 5.0 MERU/G	9918.2	1050.2	2115.9	30.653	2.151	4.439
ADY-TERMS	8.0, 5.0 MERU/G	10135.1	1156.6	2545.2	31.687	2.353	5.407
ADZ-TERMS	8.0, 5.0 MERU/G	4397.7	564.4	1539.0	14.040	1.152	3.421
RSS UNCERT.(FT AND FT/SEC)		17203.1	3256.7	9659.5	55.481	6.668	20.341
RSS TKG.UPD.UNCERTAINTIES		3450.0	1626.8	8292.8	0.381	0.246	2.969
OVERALL RSS UNCERTAINTIES		17545.6	3640.4	12731.0	55.482	6.673	20.557

TABLE 7.22 FLIGHT UNCERTAINTIES AT APS1 CUTOFF WITH UPDATE BEFORE DPS1 BURN

GYRO ACCELERATION SENSITIVE DRIFT

ADIAXINIT		9576.2	997.4	1965.0	29.549	2.045	4.097
ADIAXFLGT	8.0 MERU/G	-99.4	-3.1	9.1	-0.318	-0.008	0.030
ADIAXCOMB		9476.8	994.3	1974.1	29.231	2.037	4.127
ADSAXINIT		-3455.5	-360.1	-709.5	-10.663	-0.739	-1.480
ADSAXFLGT	5.0 MERU/G	532.3	21.9	-52.1	1.441	0.050	-0.154
ADSAXCOMB		-2923.2	-338.2	-761.5	-9.222	-0.689	-1.634
ADOAXINIT		0.0	0.0	0.0	0.000	0.000	0.000
ADOAXFLGT	1.0 MERU/G	-126.5	-4.8	12.1	-0.359	-0.011	0.037
ADOAXCOMB		-126.5	-4.8	12.1	-0.359	-0.011	0.037
RSS FOR X GYRO		9918.2	1050.2	2115.9	30.653	2.151	4.439
ADIAYINIT		-9576.0	-998.3	-1966.7	-29.550	-2.048	-4.102
ADIAYFLGT	8.0 MERU/G	-340.7	-133.6	-511.3	-1.459	-0.254	-1.145
ADIAYCOMB		-9916.6	-1131.9	-2478.3	-31.009	-2.302	-5.248
ADSAYINIT		0.0	0.0	0.0	0.000	0.000	0.000
ADSAYFLGT	5.0 MERU/G	251.1	95.3	384.9	1.137	0.188	0.931
ADSAYCOMB		251.1	95.3	384.9	1.137	0.188	0.931
ADOAYINIT		-2073.3	-216.1	-425.7	-6.398	-0.443	-0.888
ADOAYFLGT	1.0 MERU/G	-4.9	-1.7	-7.8	-0.025	-0.004	-0.023
ADOAYCOMB		-2078.2	-217.7	-433.5	-6.423	-0.447	-0.910
RSS FOR Y GYRO		10135.1	1156.6	2545.2	31.687	2.353	5.407
ADIAZINIT		0.0	0.0	0.0	0.000	0.000	0.000
ADIAZFLGT	8.0 MERU/G	365.6	-136.6	-771.6	0.164	-0.277	-1.887
ADIAZCOMB		365.6	-136.6	-771.6	0.164	-0.277	-1.887
ADSAZINIT		-4318.5	-450.1	-886.7	-13.326	-0.923	-1.849
ADSAZFLGT	5.0 MERU/G	197.7	-74.5	-406.7	0.066	-0.147	-0.925
ADSAZCOMB		-4120.7	-524.5	-1293.4	-13.260	-1.071	-2.775
ADOAZINIT		1495.9	155.9	307.1	4.616	0.320	0.640
ADOAZFLGT	1.0 MERU/G	-4.2	1.5	9.4	-0.003	0.003	0.028
ADOAZCOMB		1491.7	157.4	316.5	4.613	0.323	0.668
RSS FOR Z GYRO		4397.7	564.4	1539.0	14.040	1.152	3.421
RSS FOR ALL GYROS		14846.9	1661.1	3650.1	46.269	3.389	7.788

TABLE 7.23 FLIGHT UNCERTAINTIES AT APS1 CUTOFF WITH UPDATE BEFORE DPS1 BURN (AD TERMS)

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 5 HR, 9 MIN, 45.863 SEC (18585.864 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	- 3582.1	- 136.9	4803.4	- 1.656	0.064	3.034
ABOUT YI	5.0 SECS	- 14.2	0.8	38.2	0.004	0.000	0.015
ABOUT ZI	5.0 SECS	- 175.2	- 20.9	- 77.1	- 0.265	0.010	0.083
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	28.3 SECS	- 846.0	- 277.1	440.0	- 0.856	0.088	0.534
X ABOUT Z	21.2 SECS	- 645.5	- 216.6	149.8	- 0.703	0.093	0.407
Y ABOUT X	28.3 SECS	- 210.6	- 298.1	980.4	0.300	0.113	0.319
Y ABOUT Z	7.1 SECS	38.2	48.8	- 168.2	- 0.056	- 0.020	- 0.059
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		526.1	69.7	351.7	0.864	- 0.033	- 0.227
ACBXFLGT	0.200 CM/S.SQ	6182.5	2206.5	2415.9	7.837	- 1.375	- 3.847
ACBXCOMB		6708.7	2276.2	2767.4	8.701	- 1.409	- 4.074
ACBYINIT		- 911.4	- 120.8	- 609.1	- 1.496	0.058	0.393
ACBYFLGT	0.200 CM/S.SQ	- 1928.7	- 2144.8	7892.1	2.567	0.962	2.882
ACBYCOMB		- 2840.2	- 2265.7	7283.3	1.071	1.020	3.276
ACBZINIT		1038.6	107.9	170.4	1.404	- 0.056	- 0.544
ACBZFLGT	0.200 CM/S.SQ	- 8794.1	1952.4	8677.0	- 4.931	- 0.252	7.354
ACBZCOMB		- 7755.4	2060.3	8847.0	- 3.527	- 0.308	6.809
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	116 PPM	- 731.3	- 199.3	- 234.4	- 0.991	0.103	0.406
SFUYCOMB	116 PPM	60.1	- 220.0	1046.8	0.693	0.088	0.184
SFUZCOMB	116 PPM	977.5	- 222.0	- 1268.1	0.511	0.106	- 0.799
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.964 MR., DUE TO BDY 1.669 MR., DUE TO BDZ- 1.205 MR.)							
NBDXINIT	2.0 MERU	14252.7	544.1	- 19082.9	6.615	- 0.254	- 12.043
NBDXFLGT	(2.712 MR.DRIFT	- 25275.1	- 524.5	43490.6	- 5.995	0.217	23.531
NBDXCOMB	SINCE LAUNCH)	- 11060.2	20.5	24357.5	0.517	- 0.036	11.426
NBDYINIT	2.0 MERU	- 24647.2	- 944.0	33111.1	- 11.339	0.439	20.932
NBDYFLGT	(2.712 MR.DRIFT	- 29125.8	- 1799.7	22543.4	- 23.208	0.901	21.178
NBDYCOMB	SINCE LAUNCH)	- 53738.9	- 2747.0	55724.0	- 34.414	1.338	42.196
NBDZINIT	2.0 MERU	17814.8	579.8	- 23844.7	8.274	- 0.317	- 15.046
NBDZFLGT	(2.712 MR.DRIFT	12852.7	1551.9	8281.5	20.952	- 0.801	- 5.573
NBDZCOMB	SINCE LAUNCH)	30658.5	2330.0	- 15556.0	29.235	- 1.120	- 20.610
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX-TERMS	8.0, 5.0 ERU/G	51514.5	1979.2	68429.6	24.284	0.927	43.282
ADY-TERMS	8.0, 5.0 ERU/G	53999.5	2172.6	70659.4	25.923	1.018	45.569
ADZ-TERMS	8.0, 5.0 ERU/G	24541.0	1062.7	30973.8	12.806	0.497	20.391
RSS UNCERT.(FT AND FT/SEC)		101246.6	6137.8	121413.4	59.667	2.893	82.376
RSS TKG.UPD.UNCERTAINTIES		1649.0	188.2	14867.1	1.993	1.883	0.877
OVERALL RSS UNCERTAINTIES		101260.0	6140.7	122320.2	59.700	3.452	82.381

TABLE 7.24 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS1 CUTOFF WITH UPDATE BEFORE DPS1 BURN

CONFIDENTIAL

GYRO ACCELERATION SENSITIVE DRIFT

ADIAXINIT			49443.7		1881.6	-	65999.6		23.124	-	0.881	-	41.589
ADIAXFLGT	8.0 MERU/G	-	412.8	-	7.2		710.6	-	0.095		0.003		0.391
ADIAXCOMB			49028.8		1874.5	-	65291.7		23.023	-	0.878	-	41.201
ADSAXINIT		-	17792.6	-	581.1		23888.4	-	8.198		0.317		15.097
ADSAXFLGT	5.0 MERU/G		1994.9		45.6	-	3416.6		0.487	-	0.019	-	1.840
ADSAXCOMB		-	15801.4	-	535.4		20466.9	-	7.722		0.298		13.251
ADOAXINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADOAXFLGT	1.0 MERU/G	-	487.5	-	10.3		836.2	-	0.117		0.004		0.453
ADOAXCOMB		-	487.5	-	10.3		836.2	-	0.117		0.004		0.453
RSS FOR X GYRO			51514.5		1979.2		68429.6		24.284		0.927		43.282
ADIAYINIT		-	49244.3	-	1890.1		66296.9	-	22.529		0.877		41.956
ADIAYFLGT	8.0 MERU/G	-	3607.8	-	235.2		2832.2	-	2.842		0.120		2.627
ADIAYCOMB		-	52843.5	-	2126.1		69146.3	-	25.338		0.997		44.604
ADSAYINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADSAYFLGT	5.0 MERU/G		2843.7		173.3	-	2198.4		2.277	-	0.085	-	2.060
ADSAYCOMB			2843.7		173.3	-	2198.4		2.277	-	0.085	-	2.060
ADOAYINIT		-	10678.7	-	408.5		14328.4	-	4.928		0.190		9.053
ADOAYFLGT	1.0 MERU/G	-	64.8	-	3.4		48.5	-	0.054		0.001		0.047
ADOAYCOMB		-	10743.5	-	411.9		14376.9	-	4.982		0.192		9.099
RSS FOR Y GYRO			53999.5		2172.6		70659.4		25.923		1.018		45.569
ADIAZINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADIAZFLGT	8.0 MERU/G	-	2017.4	-	255.4	-	1293.1	-	3.298		0.121		0.866
ADIAZCOMB		-	2017.4	-	255.4	-	1293.1	-	3.298		0.121		0.866
ADSAZINIT		-	22232.0	-	851.3		29860.3	-	10.234		0.396		18.875
ADSAZFLGT	5.0 MERU/G	-	967.5	-	136.2	-	683.5	-	1.598		0.066		0.421
ADSAZCOMB		-	23200.5	-	987.7		29177.5	-	11.831		0.462		19.297
ADOAZINIT			7710.8		294.5	-	10329.8		3.573	-	0.137	-	6.521
ADOAZFLGT	1.0 MERU/G		30.7		3.0		15.9		0.049	-	0.001	-	0.013
ADOAZCOMB			7741.6		297.5	-	10314.0		3.623	-	0.139	-	6.534
RSS FOR Z GYRO			24541.0		1062.7		30973.8		12.806		0.497		20.391
RSS FOR ALL GYROS			78561.8		3125.2		103124.8		37.758		1.465		56.073

TABLE 7.25 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS1 CUTOFF WITH UPDATE BEFORE DPS1 BURN (AD TERMS)

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 6 HR, 20 MIN, 42.640 SEC (22842.642 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	572.6	-25.8	6904.7	-2.173	-4.385	0.280
ABOUT YI	5.0 SECS	905.1	2889.5	2674.2	-1.363	-2.114	-0.338
ABOUT ZI	5.0 SECS	-33.0	600.1	2033.1	-0.136	-0.118	-0.254
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	28.3 SECS	3694.6	10821.9	14425.1	-4.418	-9.061	-1.922
X ABOUT Z	21.2 SECS	-2451.5	-4046.5	1109.0	1.903	3.871	0.709
Y ABOUT X	28.3 SECS	2710.3	13401.3	8440.3	-8.252	-11.088	1.644
Y ABOUT Z	7.1 SECS	-41.6	-630.6	-600.4	0.458	0.506	-0.204
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		2553.8	5878.8	679.7	-3.247	-5.335	-0.097
ACBXFLGT	0.200 CM/S.SQ	-6197.3	-20972.5	-56179.2	7.906	18.300	7.211
ACBXCOMB		-3650.8	-15089.6	-55492.8	4.677	12.959	7.103
ACBYINIT		-4419.6	-10185.7	-1177.6	5.618	9.245	0.169
ACBYFLGT	0.200 CM/S.SQ	2573.5	17608.8	5953.3	-15.929	-18.839	6.200
ACBYCOMB		-1854.6	7427.9	4777.0	-10.294	-9.606	6.366
ACBZINIT		-5623.7	-21874.2	-28237.6	9.490	14.276	3.587
ACBZFLGT	0.200 CM/S.SQ	4467.5	44416.1	71697.1	-27.170	-20.191	-2.091
ACBZCOMB		-1292.7	22557.8	43483.6	-17.589	-5.961	1.323
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	116 PPM	-1657.2	-4976.4	820.0	2.487	3.605	-0.613
SFUYCOMB	116 PPM	-1541.8	-10324.3	-9805.5	5.005	6.582	-0.376
SFUZCOMB	116 PPM	-3225.3	-20769.7	-23243.2	11.092	11.684	0.355
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.964 MR., DUE TO BDY 1.669 MR., DUE TO BDZ- 1.205 MR.)							
NBDXINIT	2.0 MERU	-2255.4	102.4	-27456.6	8.637	17.434	-1.074
NBDXFLGT	(3.333 MR.DRIFT	-10609.0	20835.3	89879.4	-36.593	-6.242	7.275
NBDXCOMB	SINCE LAUNCH)	-12976.7	20940.1	62418.6	-27.958	11.184	5.990
NBDYINIT	2.0 MERU	3987.7	-177.3	47542.8	-14.969	-30.197	2.006
NBDYFLGT	(3.333 MR.DRIFT	-3080.9	50980.8	195099.6	-34.784	-21.049	-16.755
NBDYCOMB	SINCE LAUNCH)	1329.0	50793.2	242616.1	-49.873	-51.211	-14.055
NBDZINIT	2.0 MERU	-2813.3	128.0	-34314.5	10.794	21.788	-1.333
NBDZFLGT	(3.333 MR.DRIFT	-2998.4	-33071.9	-137243.6	-2.584	13.431	26.180
NBDZCOMB	SINCE LAUNCH)	-5597.2	-32947.8	-171581.3	8.120	35.235	25.157
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX_TERMS	8.0, 5.0 MERU/G	9396.7	5476.3	105777.6	32.719	65.643	2.776
ADY_TERMS	8.0, 5.0 MERU/G	12655.5	17380.0	128714.3	37.478	73.668	2.857
ADZ_TERMS	8.0, 5.0 MERU/G	3043.5	4591.7	51338.4	12.404	25.227	2.705
GYRO ACCELERATION SQUARED SENSITIVE DRIFT							
ADIXX	0.2 MERU/GSQ	-30.0	-89.8	-35.4	0.001	0.025	0.028
ADSYY	0.2 MERU/GSQ	92.6	433.5	1025.2	-0.205	-0.312	-0.113
ADIZZ	0.2 MERU/GSQ	79.4	79.1	-398.6	-0.083	-0.120	0.050
RSS UNCERT.(FT AND FT/SEC)		22838.1	78361.9	358563.0	81.580	122.870	31.466
RSS UNCERT.(N.MI.AND FT/SEC)		3.758	12.896	59.011	81.580	122.870	31.466

TABLE 7.26 FLIGHT UNCERTAINTIES AT APS2 CUTOFF - NO UPDATE

GYRO ACCELERATION SENSITIVE DRIFT

ADIAXINIT		-	7666.2		354.9	-	95136.8		29.906		60.393	-	3.461
ADIAXFLGT	8.0 MERU/G	-	706.4	-	3748.2	-	4083.9		0.938		1.216		0.674
ADIAXCOMB		-	8354.9	-	3394.6	-	99225.3		30.826		61.613	-	2.757
ADSAXINIT			2867.5	-	128.0		34312.8	-	10.802	-	21.793		1.429
ADSAXFLGT	5.0 MERU/G		1418.8		4391.2		2339.5	-	0.152	-	0.855	-	1.539
ADSAXCOMB			4290.0		4262.6		36649.7	-	10.963	-	22.645	-	0.104
ADOAXINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADOAXFLGT	1.0 MERU/G	-	297.8	-	544.7		156.7	-	0.311		0.059		0.306
ADOAXCOMB		-	297.8	-	544.7		156.7	-	0.311		0.059		0.306
RSS FOR X GYRO			9396.7		5476.3		105777.6		32.719		65.643		2.776
ADIAYINIT			8078.4	-	354.6		95068.6	-	29.948	-	60.394		4.195
ADIAYFLGT	8.0 MERU/G		4161.8		15198.9		30020.0	-	6.551	-	11.735	-	3.265
ADIAYCOMB			12370.0		14838.7		125059.9	-	36.583	-	72.108		1.149
ADSAYINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADSAYFLGT	5.0 MERU/G	-	1849.4	-	9028.8	-	21614.5		4.424		6.478		2.522
ADSAYCOMB		-	1849.4	-	9028.8	-	21614.5		4.424		6.478		2.522
ADOAYINIT			1714.1	-	76.8		20588.7	-	6.480	-	13.076		0.846
ADOAYFLGT	1.0 MERU/G		214.9		674.7		864.1	-	0.357	-	0.543	-	0.153
ADOAYCOMB			1929.7		597.9		21452.6	-	6.839	-	13.619		0.694
RSS FOR Y GYRO			12655.5		17380.0		128714.3		37.478		73.668		2.857
ADIAZINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADIAZFLGT	8.0 MERU/G	-	2548.6	-	2328.8		14016.4		2.793		3.803	-	2.047
ADIAZCOMB		-	2548.6	-	2328.8		14016.4		2.793		3.803	-	2.047
ADSAZINIT			3592.0	-	160.0		42880.6	-	13.500	-	27.235		1.801
ADSAZFLGT	5.0 MERU/G	-	2280.8	-	3763.0		4258.8		2.242		3.981	-	0.139
ADSAZCOMB			1319.6	-	3922.4		47143.2	-	11.250	-	23.256		1.670
ADOAZINIT		-	1224.8		55.4	-	14857.5		4.675		9.434	-	0.589
ADOAZFLGT	1.0 MERU/G		211.8		469.4		137.1	-	0.259	-	0.429		0.006
ADOAZCOMB		-	1013.0		524.9	-	14720.3		4.416		9.006	-	0.583
RSS FOR Z GYRO			3043.5		4591.7		51338.4		12.404		25.227		2.705
RSS FOR ALL GYROS			16053.7		18792.0		174332.7		51.274		101.845		4.815

TABLE 7.27 FLIGHT UNCERTAINTIES AT APS2 CUTOFF - NO UPDATE (AD TERMS)

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 7 HR, 9 MIN, 34.034 SEC (25774.036 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	3076.2	1022.9	5423.9	1.753	4.271	-2.686
ABOUT YI	5.0 SECS	1807.8	-2271.1	885.0	1.201	2.956	-1.422
ABOUT ZI	5.0 SECS	-920.7	-544.8	5295.9	0.297	0.301	0.789
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	28.3 SECS	5260.7	-8245.5	8552.4	4.085	12.191	-3.868
X ABOUT Z	21.2 SECS	-5208.6	2973.8	14002.3	-1.368	-5.027	4.009
Y ABOUT X	28.3 SECS	15230.3	-10235.0	-8415.3	6.127	14.971	-13.146
Y ABOUT Z	7.1 SECS	-906.0	485.7	266.3	-0.314	-0.688	0.814
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		7862.4	-4384.4	-14666.7	2.302	7.025	-6.378
ACBXFLOT	0.200 CM/S.SQ	3991.4	15805.5	-84478.9	-9.652	-24.323	-4.415
ACBXCOMB		11907.7	11416.1	-99112.4	-7.273	-17.302	-10.723
ACBYINIT		-13592.5	7601.6	25428.7	-3.944	-12.165	11.082
ACBYFLOT	0.200 CM/S.SQ	31836.5	-12465.8	-27419.0	11.093	23.846	-28.228
ACBYCOMB		18207.4	-4883.2	-2044.8	7.054	11.675	-17.202
ACBZINIT		-6633.9	17589.8	-34353.2	-9.383	-20.673	4.918
ACBZFLOT	0.200 CM/S.SQ	11205.4	-37691.7	139755.2	26.227	33.533	-9.702
ACBZCOMB		4319.6	-20122.7	105461.9	17.026	12.863	-4.943
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	116 PPM	-7450.3	3921.1	16047.1	-1.451	-5.055	6.245
SFUYCOMB	116 PPM	-6892.3	8339.1	-6530.6	-4.128	-9.610	5.953
SFUZCOMB	116 PPM	-10791.3	17133.6	-29314.5	-9.949	-17.802	9.342
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.964 MR., DUE TO BDY 1.669 MR., DUE TO BDZ- 1.205 MR.)							
N3DXINIT	2.0 MERU	-12217.3	-4069.7	-21580.7	-6.999	-16.982	10.685
N3DXFLOT	(3.761 MR.DRIFT	1213.0	-18408.7	262743.7	35.992	12.593	-3.850
N3DXCOMB	SINCE LAUNCH)	-11261.4	-22488.9	241310.8	29.316	-4.389	6.646
N3DYINIT	2.0 MERU	21213.5	7038.1	37321.4	12.019	29.408	-18.479
N3DYFLOT	(3.761 MR.DRIFT	-58435.0	-43866.5	531238.6	49.391	36.474	59.853
N3DYCOMB	SINCE LAUNCH)	-36327.8	-36764.8	568152.0	60.514	65.889	42.078
N3DZINIT	2.0 MERU	-15265.0	-5086.8	-26974.1	-8.753	-21.224	13.355
N3DZFLOT	(3.761 MR.DRIFT	79596.9	28338.1	-339144.1	-9.116	-23.319	-65.563
N3DZCOMB	SINCE LAUNCH)	64749.0	23289.4	-366261.1	-18.183	-44.533	-51.860
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADUA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX-TERMS	8.0, 5.0 MERU/G	44578.9	10884.3	86295.5	27.133	65.510	38.875
ADY-TERMS	8.0, 5.0 MERU/G	46097.0	7896.6	122536.4	31.446	76.719	39.114
ADZ-TERMS	8.0, 5.0 MERU/G	19771.7	9478.0	77316.9	10.248	23.564	17.217
GYRO ACCELERATION SQUARED SENSITIVE DRIFT							
ADIXX	0.2 MERU/GSQ	5.8	79.7	12.3	-0.006	-0.053	-0.014
ADSYY	0.2 MERU/GSQ	-65.4	-341.8	1820.5	0.234	0.439	0.069
ADIZZ	0.2 MERU/GSQ	419.0	-47.9	-1448.3	0.022	0.142	-0.350
RSS UNCERT.(FT AND FT/SEC)		105633.1	61650.4	752417.3	85.175	136.172	93.038
RSS UNCERT.(N.MI.AND FT/SEC)		17.384	10.146	123.831	85.175	136.172	93.038

TABLE 7.28 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF - NO UPDATE

GYRO ACCELERATION SENSITIVE DRIFT

ADIAXINIT		-	42226.9	-	14117.6	-	74862.0	-	24.431	-	58.840		37.061
ADIAXFLGT	8.0 MERU/G	-	9.4		3293.8	-	6203.0	-	1.057	-	2.344	-	0.125
ADIAXCOMB		-	42217.0	-	10817.3	-	81077.1	-	25.520	-	61.181		36.950
ADSAXINIT			15302.8		5080.7		26941.7		8.687		21.224	-	13.340
ADSAXFLGT	5.0 MERU/G	-	989.0	-	3989.0		2577.3		0.529		2.191		1.261
ADSAXCOMB			14316.1		1094.7		29518.4		9.212		23.417	-	12.077
ADOAXINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADOAXFLGT	1.0 MERU/G		223.8		505.5		1441.3		0.237	-	0.226	-	0.302
ADOAXCOMB			223.8		505.5		1441.3		0.237	-	0.226	-	0.302
RSS FOR X GYRO			44578.9		10884.3		86295.5		27.133		65.510		38.875
ADIAYINIT			42493.5		14062.5		74570.0		23.908		58.808	-	36.924
ADIAYFLGT	8.0 MERU/G		2465.8	-	11807.3		39706.8		6.804		16.158	-	1.379
ADIAYCOMB			45088.1		2276.6		114191.0		30.517		74.975	-	38.209
ADSAYINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADSAYFLGT	5.0 MERU/G		2054.4		7125.3	-	40886.7	-	5.139	-	9.108	-	1.949
ADSAYCOMB			2054.4		7125.3	-	40886.7	-	5.139	-	9.108	-	1.949
ADOAYINIT			9177.5		3049.3		16169.6		5.220		12.735	-	8.006
ADOAYFLGT	1.0 MERU/G		190.9	-	519.0		1262.6		0.362		0.739	-	0.131
ADOAYCOMB			9369.3		2530.4		17431.5		5.581		13.474	-	8.137
RSS FOR Y GYRO			46097.0		7896.6		122536.4		31.446		76.719		39.114
ADIAZINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADIAZFLGT	8.0 MERU/G	-	14927.5		1353.4		51664.0	-	0.504	-	4.430		12.676
ADIAZCOMB		-	14927.5		1353.4		51664.0	-	0.504	-	4.430		12.676
ADSAZINIT			19129.9		6348.5		33664.2		10.846		26.524	-	16.669
ADSAZFLGT	5.0 MERU/G	-	7629.4		2678.9		22380.2	-	1.253	-	5.047		6.217
ADSAZCOMB			11536.1		9027.2		56036.5		9.578		21.476	-	10.419
ADOAZINIT		-	6614.2	-	2201.8	-	11675.5	-	3.782	-	9.190		5.781
ADOAZFLGT	1.0 MERU/G		696.7	-	349.6	-	1311.0		0.171		0.563	-	0.568
ADOAZCOMB		-	5916.7	-	2551.4	-	12986.5	-	3.611	-	8.626		5.213
RSS FOR Z GYRO			19771.7		9478.0		77316.9		10.248		23.564		17.217
RSS FOR ALL GYROS			67105.4		16451.6		168641.6		42.779		103.598		57.772

TABLE 7.29 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF - NO UPDATE (AD TERMS)

CONFIDENTIAL

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 6 HR, 20 MIN, 42.640 SEC (22842.642 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	-1046.0	4375.9	17496.2	-4.299	-1.473	-0.182
ABOUT YI	5.0 SECS	-19.2	6.9	30.9	-0.070	0.000	0.022
ABOUT ZI	5.0 SECS	36.7	459.2	1813.6	-0.055	-0.191	-0.262
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	28.3 SECS	-29.8	1611.3	6964.3	-0.460	-1.159	-0.464
X ABOUT Z	21.2 SECS	19.6	1174.6	5206.0	-0.357	-0.924	-0.428
Y ABOUT X	28.3 SECS	-231.9	-470.6	-976.4	-0.455	-0.393	0.626
Y ABOUT Z	7.1 SECS	50.7	99.6	201.3	0.122	0.101	-0.161
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		-169.1	-1461.0	-5760.8	-0.010	0.617	0.906
ACBXFLGT	0.200 CM/S.SQ	-1018.6	-10588.3	-48654.9	3.216	8.512	4.688
ACBXCOMB		-1174.2	-12049.4	-54416.3	3.201	9.130	5.609
ACBYINIT		296.6	2530.4	9977.7	0.016	-1.069	-1.565
ACBYFLGT	0.200 CM/S.SQ	-1951.8	-4093.5	-9181.3	-3.595	-2.412	4.667
ACBYCOMB		-1659.8	-1562.8	797.4	-3.575	-3.480	3.099
ACBZINIT		-72.4	-2527.7	-10006.7	0.748	1.032	1.278
ACBZFLGT	0.200 CM/S.SQ	-1775.2	11715.1	42363.3	-9.558	-0.039	-2.067
ACBZCOMB		-1868.2	9187.3	32355.9	-8.806	0.992	-0.817
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	116 PPM	135.8	1519.6	6583.7	-0.298	-1.183	-0.962
SFUYCOMB	116 PPM	-300.0	-1141.3	-3691.8	-0.437	-0.050	1.027
SFUZCOMB	116 PPM	254.5	-1500.3	-5216.0	1.103	0.007	0.207
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.964 MR., DUE TO BDY 1.669 MR., DUE TO BDZ- 1.205 MR.)							
NBDXINIT	2.0 MERU	4305.5	-17394.2	-69548.4	17.101	5.873	0.951
NBDXFLGT	(3.333 MR.DRIFT	-10326.6	23271.1	93761.2	-37.561	-6.761	6.875
NBDXCOMB	SINCE LAUNCH)	-6336.7	5864.2	24161.4	-20.525	-0.936	7.292
NBDYINIT	2.0 MERU	-6902.9	30143.1	120524.2	-29.580	-10.108	-0.791
NBDYFLGT	(3.333 MR.DRIFT	-4230.4	48775.5	193670.3	-34.011	-18.744	-16.339
NBDYCOMB	SINCE LAUNCH)	-10002.1	78936.0	314286.8	-63.634	-28.740	-15.457
NBDZINIT	2.0 MERU	5417.3	-21737.1	-86913.2	21.375	7.344	1.245
NBDZFLGT	(3.333 MR.DRIFT	-3974.7	-35573.7	-139732.0	-1.724	15.395	26.712
NBDZCOMB	SINCE LAUNCH)	2031.3	-57304.6	-226629.5	19.532	22.772	28.723
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX-TERMS	8.0, 5.0 MERU/G	16281.7	63096.6	252264.5	61.385	21.445	5.086
ADY-TERMS	8.0, 5.0 MERU/G	13702.3	67780.6	270945.8	63.839	22.837	2.278
ADZ-TERMS	8.0, 5.0 MERU/G	6355.8	31830.6	127103.9	28.300	10.992	4.368
RSS UNCERT.(FT AND FT/SEC)		25426.8	139281.1	555342.6	116.694	50.498	34.813
RSS TRG.UPD.UNCERTAINTIES		3419.1	7669.1	24036.4	0.661	0.957	3.157
- - - - - - - - - - - -							
OVERALL RSS UNCERTAINTIES		25655.6	139492.1	555862.6	116.696	50.507	34.956

TABLE 7.30 FLIGHT UNCERTAINTIES AT APS2 CUTOFF WITH UPDATE BEFORE DPS1 BURN

GYRO ACCELERATION SENSITIVE DRIFT

ADIAXINIT			15914.0	-	60223.7	-	240809.5		59.310		20.460		4.841
ADIAXFLGT	8.0 MERU/G	-	208.7		344.2		1394.8	-	0.937	-	0.110		0.137
ADIAXCOMB			15689.1	-	59880.3	-	239417.9		58.369		20.347		4.946
ADSAXINIT		-	5052.4		21752.0		86972.9	-	21.353	-	7.303	-	0.680
ADSAXFLGT	5.0 MERU/G		735.8	-	1868.0	-	7511.8		2.366		0.535	-	0.446
ADSAXCOMB		-	4348.2		19882.9		79456.4	-	18.992	-	6.772	-	1.177
ADOAXINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADOAXFLGT	1.0 MERU/G	-	193.7		442.6		1782.2	-	0.691	-	0.129		0.120
ADOAXCOMB		-	193.7		442.6		1782.2	-	0.691	-	0.129		0.120
RSS FOR X GYRO			16281.7		63096.6		252264.5		61.385		21.445		5.086
ADIAYINIT		-	13102.2		60303.4		241128.2	-	59.107	-	20.135	-	0.495
ADIAYFLGT	8.0 MERU/G	-	518.9		6011.0		23960.0	-	3.329	-	2.220	-	1.448
ADIAYCOMB		-	13341.2		66318.6		265109.9	-	62.440	-	22.329	-	1.539
ADSAYINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADSAYFLGT	5.0 MERU/G		475.1	-	4779.5	-	18975.7		3.104		1.817		1.589
ADSAYCOMB			475.1	-	4779.5	-	18975.7		3.104		1.817		1.589
ADOAYINIT		-	3075.4		13050.0		52178.7	-	12.815	-	4.387	-	0.476
ADOAYFLGT	1.0 MERU/G	-	14.5		110.8		435.7	-	0.109	-	0.046	-	0.069
ADOAYCOMB		-	3088.8		13160.9		52614.5	-	12.924	-	4.433	-	0.543
RSS FOR Y GYRO			13702.3		67780.6		270945.8		63.839		22.837		2.278
ADIAZINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADIAZFLGT	8.0 MERU/G		669.3		5631.2		22141.6		0.145	-	2.388	-	3.769
ADIAZCOMB			669.3		5631.2		22141.6		0.145	-	2.388	-	3.769
ADSAZINIT		-	6257.0		27185.9		108699.8	-	26.681	-	9.120	-	0.761
ADSAZFLGT	5.0 MERU/G		310.3		2666.7		10557.5	-	0.060	-	1.119	-	1.445
ADSAZCOMB		-	5891.1		29852.9		119259.0	-	26.750	-	10.236	-	2.133
ADOAZINIT			2300.8	-	9413.8	-	37639.6		9.252		3.175		0.470
ADOAZFLGT	1.0 MERU/G	-	11.6	-	88.0	-	340.1	-	0.016		0.040		0.096
ADOAZCOMB			2289.9	-	9501.8	-	37979.7		9.236		3.214		0.567
RSS FOR Z GYRO			6355.8		31830.6		127103.9		28.300		10.992		4.368
RSS FOR ALL GYROS			22209.1		97921.3		391413.4		92.975		33.200		7.080

TABLE 7.31 FLIGHT UNCERTAINTIES AT APS2 CUTOFF WITH UPDATE BEFORE DPS1 BURN (AD TERMS)

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 7 HR, 2 MIN, 10.429 SEC (25330.431 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	-4723.1	-4507.7	41870.7	3.897	0.162	4.201
ABOUT YI	5.0 SECS	2.8	6.5	278.0	0.074	-0.002	-0.003
ABOUT ZI	5.0 SECS	-794.1	-480.8	3417.7	-0.060	0.053	0.711
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	28.3 SECS	-1774.9	-1792.8	11787.6	0.224	0.662	1.584
X ABOUT Z	21.2 SECS	-1482.1	-1324.0	9052.1	0.153	0.561	1.332
Y ABOUT X	28.3 SECS	1332.1	365.6	-1654.4	0.686	0.522	-1.204
Y ABOUT Z	7.1 SECS	-368.5	-73.6	432.5	-0.184	-0.128	0.330
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		2569.8	1531.6	-10259.9	0.399	-0.176	-2.296
ACBXFLGT	0.200 CM/S.SQ	13403.4	11965.8	-80888.4	-1.152	-5.229	-11.959
ACBXCOMB		16012.4	13495.0	-91132.5	-0.720	-5.405	-14.209
ACBYINIT		-4439.4	-2653.6	17776.5	-0.679	0.305	3.991
ACBYFLGT	0.200 CM/S.SQ	9229.1	3395.5	-11707.5	5.266	3.557	-8.403
ACBYCOMB		4779.7	743.7	6059.0	4.565	3.863	-4.428
ACBZINIT		4287.0	2641.9	-20269.7	-0.145	-0.270	-3.811
ACBZFLGT	0.200 CM/S.SQ	-14555.0	-11229.6	103539.9	8.098	-3.382	13.354
ACBZCOMB		-10366.1	-8583.8	83235.9	7.883	-3.653	9.437
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	116 PPM	-2932.7	-1710.3	12794.1	-0.126	0.713	2.638
SFUYCOMB	116 PPM	2496.2	1081.5	-6494.9	0.842	0.383	-2.244
SFUZCOMB	116 PPM	1737.8	1437.5	-12442.3	-0.921	0.432	-1.515
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.964 MR., DUE TO BDY 1.569 MR., DUE TO BDZ- 1.205 MR.)							
NBDXINIT	2.0 MERU	19574.5	17902.5	-166296.1	-15.124	-0.629	-15.909
NBDXFLGT	(3.696 MR.DRIFT	-16180.6	-23751.1	264554.8	37.931	-0.112	16.553
NBDXCOMB	SINCE LAUNCH)	1346.0	-5814.4	97891.5	22.069	-0.789	-1.267
NBDYINIT	2.0 MERU	-30846.5	-31080.1	288720.9	27.589	1.150	30.551
NBDYFLGT	(3.696 MR.DRIFT	-77652.4	-50926.3	467332.7	27.399	4.206	78.713
NBDYCOMB	SINCE LAUNCH)	-102206.0	-82167.4	757870.3	58.667	5.474	115.608
NBDZINIT	2.0 MERU	24664.1	22368.1	-207781.5	-18.809	-0.782	-19.684
NBDZFLGT	(3.696 MR.DRIFT	77129.8	37238.8	-269054.9	14.682	-4.684	-65.177
NBDZCOMB	SINCE LAUNCH)	104402.8	59478.7	-475825.4	-2.055	-5.455	-81.914
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX-TERMS	8.0, 5.0 MERU/G	75935.1	64844.9	600270.9	51.959	2.241	53.570
ADY-TERMS	8.0, 5.0 MERU/G	65712.5	70012.8	641844.0	61.303	2.893	74.225
ADZ-TERMS	8.0, 5.0 MERU/G	35249.6	32882.3	295474.3	25.805	1.558	33.953
RSS UNCERT.(FT AND FT/SEC)		181960.3	144219.1	1299068.5	105.630	11.643	173.083
RSS TKG.UPD.UNCERTAINTIES		658.8	7547.2	32828.8	1.295	1.332	1.393
OVERALL RSS UNCERTAINTIES		181961.4	144416.5	1299483.3	105.638	11.719	173.089

TABLE 7.32 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF WITH UPDATE BEFORE DPS1 BURN

GYRO ACCELERATION SENSITIVE DRIFT

ADIAXINIT			73297.3		61863.1	-	574832.1	-	49.868	-	2.080	-	49.682
ADIAXFLGT	8.0 MERU/G	-	364.9	-	353.2		5374.1		0.936		0.007		0.324
ADIAXCOMB			72789.2		61512.6	-	569483.9	-	48.984	-	2.077	-	49.489
ADSAXINIT		-	22651.7	-	22421.7		208278.6		19.733		0.822		21.668
ADSAXFLGT	5.0 MERU/G		1203.7		1903.6	-	18538.7	-	2.355		0.023	-	0.989
ADSAXCOMB		-	21627.9	-	20515.0		189708.2		17.314		0.841		20.509
ADOAXINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADOAXFLGT	1.0 MERU/G	-	322.9	-	451.6		4908.2		0.689	-	0.003		0.275
ADOAXCOMB		-	322.9	-	451.6		4908.2		0.689	-	0.003		0.275
RSS FOR X GYRO			75935.1		64844.9		600270.9		51.959		2.241		53.570
ADIAYINIT		-	57802.2	-	62237.9		578316.9		56.939		2.384		64.884
ADIAYFLGT	8.0 MERU/G	-	7265.3	-	6235.3		49124.3		2.479		0.414		6.549
ADIAYCOMB		-	63738.1	-	68506.6		627785.9		60.116		2.824		72.776
ADSAYINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADSAYFLGT	5.0 MERU/G		7486.0		4965.6	-	43585.2	-	2.165	-	0.378	-	6.553
ADSAYCOMB			7486.0		4965.6	-	43585.2	-	2.165	-	0.378	-	6.553
ADOAYINIT		-	13833.6	-	13447.5		124912.6		11.730		0.488		12.764
ADOAYFLGT	1.0 MERU/G	-	300.2	-	116.1		1373.6		0.071		0.013		0.267
ADOAYCOMB		-	14125.8	-	13563.9		126288.8		11.806		0.501		13.038
RSS FOR Y GYRO			65712.5		70012.8		641844.0		61.303		2.893		74.225
ADIAZINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADIAZFLGT	8.0 MERU/G	-	10813.4	-	5909.1		41039.7	-	1.732		0.688		9.745
ADIAZCOMB		-	10813.4	-	5909.1		41039.7	-	1.732		0.688		9.745
ADSAZINIT		-	27993.0	-	28028.1		260364.8		24.805		1.034		27.387
ADSAZFLGT	5.0 MERU/G	-	4012.9	-	2794.9		17711.9	-	0.546		0.315		3.625
ADSAZCOMB		-	31789.5	-	30831.6		278149.2		24.407		1.351		31.249
ADOAZINIT			10432.7		9692.0	-	90027.6	-	8.257	-	0.343	-	8.767
ADOAZFLGT	1.0 MERU/G		289.2		92.8	-	824.8		0.058	-	0.013	-	0.256
ADOAZCOMB			10725.3		9784.6	-	90850.8	-	8.196	-	0.356	-	9.019
RSS FOR Z GYRO			35249.6		32882.3		295474.3		25.805		1.558		33.953
RSS FOR ALL GYROS			106427.4		100935.1		927142.9		84.401		3.977		97.632

TABLE 7.33 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF WITH UPDATE BEFORE DPS1 BURN (AD TERMS)

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 6 HR, 20 MIN, 42.640 SEC (22842.642 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	- 291.9	- 17.6	- 66.7	- 1.661	- 0.094	- 0.342
ABOUT YI	5.0 SECS	- 10.9	0.0	2.8	- 0.057	0.000	0.014
ABOUT ZI	5.0 SECS	6.4	- 3.3	- 29.2	0.002	- 0.017	- 0.151
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	28.3 SECS	- 3.8	- 62.6	- 52.3	- 0.080	- 0.325	- 0.272
X ABOUT Z	21.2 SECS	- 3.3	- 54.3	- 45.4	- 0.070	- 0.280	- 0.234
Y ABOUT X	28.3 SECS	- 50.3	- 40.7	53.2	- 0.213	- 0.212	0.277
Y ABOUT Z	7.1 SECS	17.9	14.5	- 19.0	0.076	0.076	- 0.099
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		- 50.3	10.6	101.5	- 0.158	0.053	0.526
ACBXFLGT	0.200 CM/S.SQ	27.0	457.2	382.5	0.565	2.078	1.738
ACBXCOMB		- 23.3	467.8	484.0	0.407	2.131	2.264
ACBYINIT		87.0	- 18.4	- 175.8	0.273	- 0.091	- 0.911
ACBYFLGT	0.200 CM/S.SQ	- 370.7	- 297.4	389.3	- 1.349	- 1.352	1.775
ACBYCOMB		- 283.6	- 315.8	213.4	- 1.076	- 1.443	0.863
ACBZINIT		35.6	18.0	139.8	0.356	0.092	0.727
ACBZFLGT	0.200 CM/S.SQ	- 511.8	240.9	- 244.6	- 2.751	1.095	- 1.105
ACBZCOMB		- 476.2	259.0	- 104.8	- 2.395	1.188	- 0.377
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	116 PPM	20.2	- 80.8	- 113.2	- 0.019	- 0.419	- 0.588
SFUYCOMB	116 PPM	- 74.1	- 34.6	102.1	- 0.285	- 0.179	0.528
SFUZCOMB	116 PPM	58.9	- 27.9	28.4	0.353	- 0.145	0.147
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.964 MR., DUE TO BDY 1.569 MR., DUE TO BDZ- 1.205 MR.)							
NBDXINIT	2.0 MERU	1160.5	70.0	265.1	6.602	0.373	1.358
NBDXFLGT	(3.333 MR.DRIFT	- 3147.2	- 61.5	344.4	- 16.720	- 0.359	1.859
NBDXCOMB	SINCE LAUNCH)	- 1985.7	8.5	609.5	- 10.118	0.014	3.218
NBDYINIT	2.0 MERU	- 2010.0	- 121.2	- 459.2	- 11.435	- 0.646	- 2.353
NBDYFLGT	(3.333 MR.DRIFT	- 2480.3	- 372.0	- 2408.9	- 16.305	- 1.938	- 12.544
NBDYCOMB	SINCE LAUNCH)	- 4490.3	- 493.2	- 2868.3	- 27.740	- 2.585	- 14.899
NBDZINIT	2.0 MERU	1450.3	87.4	331.3	8.251	0.466	1.698
NBDZFLGT	(3.333 MR.DRIFT	- 1623.0	342.7	3279.5	- 5.121	1.712	17.058
NBDZCOMB	SINCE LAUNCH)	- 172.6	430.1	3610.5	3.130	2.178	18.754
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX-TERMS	8.0, 5.0 MERU/G	4135.8	254.8	991.5	23.524	1.356	5.091
ADY-TERMS	8.0, 5.0 MERU/G	4299.0	276.9	1133.5	24.580	1.465	5.781
ADZ-TERMS	8.0, 5.0 MERU/G	1858.7	139.0	733.6	10.726	0.729	3.788
RSS UNCERT.(FT AND FT/SEC)		7974.1	996.2	4976.9	46.523	4.945	25.783
RSS TKG.UPD.UNCERTAINTIES		445.5	919.1	2344.8	0.198	0.443	0.357
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OVERALL RSS UNCERTAINTIES		7985.6	1355.5	5501.6	46.523	4.965	25.785

TABLE 7.34 FLIGHT UNCERTAINTIES AT APS2 CUTOFF WITH UPDATE BEFORE APS2 BURN

GYRO ACCELERATION SENSITIVE DRIFT

ADIAXINIT			4020.0		242.3		918.1		22.871		1.292		4.705
ADIAXFLGT	8.0 MERU/G	-	96.0	-	2.0		10.6	-	0.583	-	0.013		0.065
ADIAXCOMB			3924.0		240.3		928.7		22.288		1.279		4.770
ADSAXINIT		-	1450.6	-	87.5	-	331.4	-	8.253	-	0.466	-	1.698
ADSAXFLGT	5.0 MERU/G		145.2		2.8	-	15.8		0.732		0.015	-	0.081
ADSAXCOMB		-	1305.4	-	84.7	-	347.2	-	7.521	-	0.451	-	1.780
ADOAXINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADOAXFLGT	1.0 MERU/G	-	52.9	-	1.0		5.8	-	0.286	-	0.006		0.032
ADOAXCOMB		-	52.9	-	1.0		5.8	-	0.286	-	0.006		0.032
RSS FOR X GYRO			4135.8		254.8		991.5		23.524		1.356		5.091
ADIAYINIT		-	4020.0	-	242.4	-	918.4	-	22.871	-	1.292	-	4.707
ADIAYFLGT	8.0 MERU/G	-	182.9	-	27.4	-	177.2	-	1.151	-	0.135	-	0.871
ADIAYCOMB		-	4202.9	-	269.7	-	1095.7	-	24.022	-	1.427	-	5.577
ADSAYINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADSAYFLGT	5.0 MERU/G		208.3		31.3		202.5		1.392		0.166		1.077
ADSAYCOMB			208.3		31.3		202.5		1.392		0.166		1.077
ADOAYINIT		-	870.4	-	52.5	-	198.8	-	4.952	-	0.280	-	1.019
ADOAYFLGT	1.0 MERU/G	-	9.5	-	1.4	-	9.3	-	0.070	-	0.009	-	0.056
ADOAYCOMB		-	879.9	-	53.9	-	208.1	-	5.021	-	0.288	-	1.075
RSS FOR Y GYRO			4299.0		276.9		1133.5		24.580		1.465		5.781
ADIAZINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADIAZFLGT	8.0 MERU/G		218.0	-	46.0	-	440.9		0.711	-	0.235	-	2.343
ADIAZCOMB			218.0	-	46.0	-	440.9		0.711	-	0.235	-	2.343
ADSAZINIT		-	1812.9	-	109.3	-	414.1	-	10.314	-	0.583	-	2.122
ADSAZFLGT	5.0 MERU/G		74.9	-	15.9	-	151.0		0.217	-	0.075	-	0.741
ADSAZCOMB		-	1738.0	-	125.2	-	565.2	-	10.097	-	0.658	-	2.864
ADOAZINIT			628.0		37.9		143.4		3.573		0.202		0.735
ADOAZFLGT	1.0 MERU/G	-	5.2		1.3		12.6	-	0.024		0.008		0.075
ADOAZCOMB			621.8		39.1		156.0		3.549		0.209		0.811
RSS FOR Z GYRO			1858.7		139.0		733.6		10.726		0.729		3.788
RSS FOR ALL GYROS			6246.3		401.1		1675.1		35.674		2.126		8.584

TABLE 7.35 FLIGHT UNCERTAINTIES AT APS2 CUTOFF WITH UPDATE BEFORE APS2 BURN (AD TERMS)

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 7 HR, 6 MIN, 28.199 SEC (25588.201 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	-1977.6	21.4	11387.1	1.786	0.094	1.647
ABOUT YI	5.0 SECS	18.0	0.0	185.0	0.057	0.000	-0.020
ABOUT ZI	5.0 SECS	-499.6	4.0	1177.3	0.021	0.017	0.443
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	28.3 SECS	-939.6	75.5	2549.9	0.125	0.325	0.828
X ABOUT Z	21.2 SECS	-809.4	65.5	2197.3	0.108	0.280	0.713
Y ABOUT X	28.3 SECS	805.8	49.1	-1049.2	0.181	0.211	-0.728
Y ABOUT Z	7.1 SECS	-287.9	-17.5	374.8	-0.065	-0.076	0.260
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		1659.1	-12.7	-3293.3	0.086	-0.053	-1.481
ACBXFLGT	0.200 CM/S.SQ	6022.9	-539.3	-16462.1	-0.839	-2.074	-5.291
ACBXCOMB		7684.6	-551.9	-19753.3	-0.748	-2.127	-6.768
ACBYINIT		-2872.6	22.0	5705.3	-0.147	0.091	2.566
ACBYFLGT	0.200 CM/S.SQ	5027.0	350.8	-6287.3	1.151	1.349	-4.559
ACBYCOMB		2152.8	372.9	-584.1	0.999	1.440	-1.995
ACBZINIT		2587.0	-21.7	-7558.5	-0.478	-0.092	-2.267
ACBZFLGT	0.200 CM/S.SQ	-5197.3	-284.3	23540.0	3.053	-1.093	4.431
ACBZCOMB		-2618.4	-306.0	15976.8	2.566	-1.185	2.156
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	116 PPM	-1952.6	97.6	4704.9	0.109	0.419	1.730
SFUYCOMB	116 PPM	1599.1	41.8	-2637.3	0.219	0.179	-1.436
SFUZCOMB	116 PPM	666.9	33.7	-3002.9	-0.390	0.145	-0.567
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.964 MR., DUE TO BDY 1.569 MR., DUE TO BDZ- 1.205 MR.)							
NBDXINIT	2.0 MERU	7921.9	-84.8	-45254.4	-7.058	-0.373	-6.499
NBDXFLGT	(3.734 MR.DRIFT	-2278.9	75.9	73085.4	17.178	0.359	1.104
NBDXCOMB	SINCE LAUNCH)	5490.4	-8.9	27799.5	10.059	-0.014	-5.515
NBDYINIT	2.0 MERU	-13497.5	147.1	78460.8	12.381	0.646	11.450
NBDYFLGT	(3.734 MR.DRIFT	-49006.1	450.3	184074.3	19.748	1.937	43.802
NBDYCOMB	SINCE LAUNCH)	-61836.6	598.0	262831.8	32.729	2.582	55.860
NBDZINIT	2.0 MERU	9915.0	-106.0	-56551.1	-8.811	-0.466	-8.109
NBDZFLGT	(3.734 MR.DRIFT	54054.3	-409.8	-106557.0	3.341	-1.710	-47.702
NBDZCOMB	SINCE LAUNCH)	64256.9	-515.3	-162919.9	-5.083	-2.177	-55.518
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX-TERMS	8.0, 5.0 MERU/G	29412.6	308.7	163182.9	24.953	1.356	23.630
ADY-TERMS	8.0, 5.0 MERU/G	31006.0	335.8	174196.4	26.979	1.464	26.993
ADZ-TERMS	8.0, 5.0 MERU/G	16890.6	168.2	80765.6	11.709	0.729	14.552
RSS UNCERT.(FT AND FT/SEC)		100888.5	1192.7	400899.7	51.937	4.939	88.296
RSS TKG.UPD.UNCERTAINTIES		583.5	903.9	3571.9	0.126	0.458	0.482
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OVERALL RSS UNCERTAINTIES		100890.2	1496.5	400915.6	51.937	4.960	88.297

TABLE 7.36 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF WITH UPDATE BEFORE APS2 BURN

GYRO ACCELERATION SENSITIVE DRIFT

ADIAXINIT			27845.0	-	293.6	-	156625.8	-	24.169	-	1.292	-	22.163
ADIAXFLGT	8.0 MERU/G	-	43.3		2.6		2415.8		0.597		0.013		0.004
ADIAXCOMB			27784.3	-	291.1	-	154213.3	-	23.579	-	1.279	-	22.173
ADSAXINIT		-	9769.5		106.1		56614.3		8.916		0.466		8.239
ADSAXFLGT	5.0 MERU/G		127.4	-	3.4	-	3270.3	-	0.752	-	0.015	-	0.062
ADSAXCOMB		-	9650.6		102.8		53342.1		8.160		0.451		8.170
ADOAXINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADOAXFLGT	1.0 MERU/G	-	38.0		1.3		1241.4		0.294		0.006		0.015
ADOAXCOMB		-	38.0		1.3		1241.4		0.294		0.006		0.015
RSS FOR X GYRO			29412.6		308.7		163182.9		24.953		1.356		23.630
ADIAYINIT		-	26710.8		294.4		157020.3		24.960		1.292		23.145
ADIAYFLGT	8.0 MERU/G	-	3482.7		32.7		12908.0		1.336		0.134		3.015
ADIAYCOMB		-	30099.9		327.2		169969.9		26.380		1.426		26.246
ADSAYINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADSAYFLGT	5.0 MERU/G		4268.8	-	37.9	-	15703.2	-	1.607	-	0.166	-	3.682
ADSAYCOMB			4268.8	-	37.9	-	15703.2	-	1.607	-	0.166	-	3.682
ADOAYINIT		-	5879.4		63.7		33962.4		5.337		0.280		4.928
ADOAYFLGT	1.0 MERU/G	-	216.9		1.8		793.8		0.081		0.009		0.188
ADOAYCOMB		-	6095.1		65.5		34756.7		5.419		0.288		5.117
RSS FOR Y GYRO			31006.0		335.8		174196.4		26.979		1.464		26.993
ADIAZINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADIAZFLGT	8.0 MERU/G	-	7399.2		55.3		14708.9	-	0.380		0.235		6.614
ADIAZCOMB		-	7399.2		55.3		14708.9	-	0.380		0.235		6.614
ADSAZINIT		-	12186.2		132.7		70761.0		11.158		0.583		10.316
ADSAZFLGT	5.0 MERU/G	-	2325.2		18.9		4615.1	-	0.115		0.075		2.078
ADSAZCOMB		-	14496.3		151.5		75386.4		11.065		0.657		12.410
ADOAZINIT			4275.2	-	45.9	-	24493.6	-	3.828	-	0.202	-	3.527
ADOAZFLGT	1.0 MERU/G		241.1	-	1.6	-	479.4		0.014	-	0.008	-	0.215
ADOAZCOMB			4516.8	-	47.5	-	24972.6	-	3.813	-	0.209	-	3.741
RSS FOR Z GYRO			16890.6		168.2		80765.6		11.709		0.729		14.552
RSS FOR ALL GYROS			45954.0		486.2		251984.4		38.570		2.125		38.713

TABLE 7.37 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF WITH UPDATE BEFORE APS2 BURN (AD TERMS)

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 0 HR, 9 MIN, 50.664 SEC (590.664 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL. TO NOM. AXES) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL. TO NOM. AXES) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	29.9	1471.2	78.5	0.120	5.660	0.301
ABOUT YI	5.0 SECS	-117.1	-6.3	160.3	-0.568	-0.010	0.392
ABOUT ZI	5.0 SECS	-2.3	-116.2	-6.1	-0.004	-0.208	-0.010
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	3.0 SECS	-54.5	24.7	42.0	-0.229	0.094	0.162
X ABOUT Z	1.4 SECS	31.4	-13.8	-23.7	0.108	-0.041	-0.071
Y ABOUT X	29.5 SECS	488.1	419.4	258.8	2.040	1.612	0.987
Y ABOUT Z	0.5 SECS	-3.8	-2.9	-1.7	-0.003	0.000	0.000
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		-123.5	142.9	181.3	-0.608	0.257	0.439
ACBXFLGT	0.080 CM/S.SQ	375.3	-167.1	-285.5	1.357	-0.530	-0.917
ACBXCOMB		251.7	-24.1	-104.1	0.748	-0.272	-0.477
ACBYINIT		160.5	-185.7	-235.6	0.790	-0.334	-0.570
ACBYFLGT	0.060 CM/S.SQ	254.5	216.0	132.5	0.909	0.683	0.412
ACBYCOMB		415.1	30.2	-103.0	1.700	0.348	-0.157
ACBZINIT		384.0	335.0	-499.9	1.846	0.600	-1.236
ACBZFLGT	0.100 CM/S.SQ	140.0	-391.7	393.3	0.492	-1.241	1.243
ACBZCOMB		524.1	-56.6	-106.5	2.339	-0.641	0.005
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	92 PPM	-65.7	-65.1	-45.3	0.369	-0.251	-0.394
SFUYCOMB	45 PPM	-254.1	-95.7	-13.5	-0.959	-0.367	-0.083
SFUZCOMB	76 PPM	-86.3	242.5	-243.5	-0.358	0.933	-0.935
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.547 MR., DUE TO BDY 2.001 MR., DUE TO BDZ- 1.445 MR.)							
NBDXINIT	1.3 MERU	-67.6	-3317.0	-177.0	-0.273	-12.762	-0.680
NBDXFLGT	(0.057 MR.DRIFT	48.1	133.9	-29.0	0.323	0.728	-0.096
NBDXCOMB	SINCE LAUNCH)	-19.4	-3183.0	-206.2	0.049	-12.033	-0.777
NBDYINIT	2.3 MERU	248.0	12148.2	648.5	1.001	46.740	2.492
NBDYFLGT	(0.101 MR.DRIFT	-138.2	63.0	114.5	-0.933	0.614	0.449
NBDYCOMB	SINCE LAUNCH)	109.7	12211.3	763.1	0.067	47.355	2.942
NBDZINIT	2.4 MERU	-179.1	-8773.1	-468.3	-0.723	-33.754	-1.799
NBDZFLGT	(0.106 MR.DRIFT	-139.5	71.3	116.2	-0.952	0.127	0.428
NBDZCOMB	SINCE LAUNCH)	-318.7	-8701.7	-352.0	-1.676	-33.626	-1.370
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX-TERMS	5.1, 2.2, 1.0 M/G	129.9	11409.6	728.7	0.598	43.988	2.684
ADY-TERMS	6.0, 2.7, 1.0 M/G	160.2	16700.2	1216.4	1.538	65.159	4.635
ADZ-TERMS	5.6, 1.2, 1.0 M/G	310.2	3627.2	239.1	2.115	14.035	0.979
GYRO ACCELERATION SQUARED SENSITIVE DRIFT							
ADIXX	0.2 MERU/GSQ	4.4	13.6	-3.6	0.022	0.052	-0.008
ADSYY	0.2 MERU/GSQ	-12.0	6.0	9.1	-0.084	0.057	0.037
ADIZZ	0.2 MERU/GSQ	-11.6	5.0	8.7	-0.082	0.007	0.034
RSS UNCERT.(FT AND FT/SEC)		1049.4	25683.5	1736.6	4.976	99.661	6.586
RSS UNCERT.(N.MI.AND FT/SEC)		0.172	4.226	0.285	4.976	99.661	6.586

TABLE 7.38 SIVB CUTOFF INDICATION UNCERTAINTIES

INITIAL S.M.MLMS. AND DRIFT ANGLES SUMMARY (S.M.ANGLES AXI= 40.000, AYPI= 0.000, AZSM=- 30.000 DEG)(T= 590.664 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERT. VALUE		MLM. ANGLE ABOUT STABLE MEMBER AXES XSM	MR. YSM	ZSM	MLM. ANGLE ABOUT LOCAL VERTICAL AXES ALT.	MR. TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED WITH ALIGNMENT UNCERT. DUE TO LISTED GYRO AND PIPA UNCERT.) ABOUT								
ABOUT XI	50	SECS	0.2099	0.1212	0.0000	0.2296	- 0.0003	- 0.0777
ABOUT YI	5	SECS	- 0.0092	0.0160	- 0.0155	0.0004	0.0242	0.0012
ABOUT ZI	5	SECS	- 0.0077	0.0134	0.0185	0.0077	- 0.0013	0.0229
INITIAL S.M. MLMS. DUE TO IMU ERROR EFFECTS ON EARTH LAUNCH ERECTION AND ALIGNMENT								
ACBX	0.080	CM/S.SQ	- 0.0000	0.0000	- 0.0407	- 0.0094	0.0279	- 0.0281
ACBY	0.060	CM/S.SQ	0.0000	- 0.0000	0.0529	0.0123	- 0.0363	0.0365
ACBZ	0.100	CM/S.SQ	0.0509	- 0.0883	- 0.0000	- 0.0225	- 0.0742	- 0.0661
NBDX	1.3	MERU	- 0.4732	- 0.2732	0.0000	- 0.5176	0.0007	0.1752
NBDY	2.3	MERU	1.7333	1.0007	0.0000	1.8957	- 0.0027	- 0.6419
NBDZ	2.4	MERU	- 1.2517	- 0.7227	0.0000	- 1.3690	0.0019	0.4635
ADIAX	5.1	MERU/G	- 1.6079	- 0.9283	0.0000	- 1.7586	0.0025	0.5955
ADSRAX	2.2	MERU/G	0.4929	0.2845	0.0000	0.5390	- 0.0007	- 0.1825
ADDAX	1.0	MERU/G	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADIAY	6.0	MERU/G	2.2608	1.3052	0.0000	2.4726	- 0.0036	- 0.8372
ADSRAY	2.7	MERU/G	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADDAY	1.0	MERU/G	0.6721	0.3880	0.0000	0.7351	- 0.0010	- 0.2489
ADIAZ	5.8	MERU/G	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADSRAZ	1.2	MERU/G	0.3313	0.1913	0.0000	0.3624	- 0.0005	- 0.1227
ADDAZ	1.0	MERU/G	- 0.4055	- 0.2341	0.0000	- 0.4435	0.0006	0.1501
RSS INITIAL S.M. MLMS.			3.6753	2.1236	0.0838	4.0194	0.0957	1.3639
DRIFT ANGLES DUE TO GYRO DRIFT AFTER TRAJECTORY START								
NBDX	1.3	MERU	0.0572	0.0000	0.0000	0.0406	- 0.0208	- 0.0344
NBDY	2.3	MERU	- 0.0000	0.1012	- 0.0000	0.0672	0.0637	0.0406
NBDZ	2.4	MERU	0.0000	- 0.0000	- 0.1056	- 0.0245	0.0723	- 0.0728
ADIAX	5.1	MERU/G	0.0109	0.0000	0.0000	0.0078	- 0.0040	- 0.0066
ADSRAX	2.2	MERU/G	- 0.0954	- 0.0000	0.0000	- 0.0677	0.0348	0.0574
ADDAX	1.0	MERU/G	0.0434	0.0000	- 0.0000	0.0308	- 0.0158	- 0.0261
ADIAY	6.0	MERU/G	- 0.0000	0.2602	- 0.0000	0.1729	0.1639	0.1044
ADSRAY	2.7	MERU/G	- 0.0000	- 0.1173	- 0.0000	- 0.0780	- 0.0739	- 0.0471
ADDAY	1.0	MERU/G	- 0.0000	0.0021	- 0.0000	0.0014	0.0013	0.0008
ADIAZ	5.8	MERU/G	- 0.0000	0.0000	0.2521	0.0586	- 0.1728	0.1740
ADSRAZ	1.2	MERU/G	- 0.0000	0.0000	0.0520	0.0121	- 0.0356	0.0359
ADDAZ	1.0	MERU/G	0.0000	0.0000	- 0.0021	- 0.0005	0.0014	- 0.0014
RSS DRIFT ANGLE			0.1199	0.3030	0.2785	0.2281	0.2735	0.2386
OVERALL RSS MLM			3.6773	2.1452	0.2908	4.0258	0.2897	1.3846

TABLE 7.39a IMU S.M. MISALIGNMENTS AND DRIFT ANGLES AT SIVB CUTOFF

INITIAL S.M.MLMS. AND DRIFT ANGLES SUMMARY (S.M.ANGLES AXI= 40.000, AYPI= 0.000, AZSM=- 30.000 DEG)(T= 590.664 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERT.	VALUE	MLM. ANGLE ABOUT INERTIAL AXES XI	MR. YI	ZI	MLM. ANGLE ABOUT IMU GIMBAL AXES OGA	MR. IGA	MGA
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED WITH ALIGNMENT UNCERT.DUE TO LISTED GYRO AND PIPA UNCERT.) ABOUT								
ABOUT XI	50	SECS	0.2424	0.0000	0.0000	0.0000	0.0000	0.0000
ABOUT YI	5	SECS	0.0000	0.0242	0.0000	0.0000	0.0000	0.0000
ABOUT ZI	5	SECS	0.0000	0.0000	0.0242	0.0000	0.0000	0.0000
INITIAL S.M. MLMS. DUE TO IMU ERROR EFFECTS ON EARTH LAUNCH ERECTION AND ALIGNMENT								
ACBX	0.080	CM/S.SQ	0.0000	0.0262	- 0.0312	0.0000	0.0000	0.0000
ACBY	0.060	CM/S.SQ	0.0000	- 0.0340	0.0405	0.0000	0.0000	0.0000
ACBZ	0.100	CM/S.SQ	0.0000	- 0.0781	- 0.0655	0.0000	0.0000	0.0000
NBDX	1.3	MERU	- 0.5465	0.0000	0.0000	0.0000	0.0000	0.0000
NBDY	2.3	MERU	2.0014	0.0000	0.0000	0.0000	0.0000	0.0000
NBDZ	2.4	MERU	- 1.4454	0.0000	0.0000	0.0000	0.0000	0.0000
ADIAX	5.1	MERU/G	- 1.8567	0.0000	0.0000	0.0000	0.0000	0.0000
ADSRAX	2.2	MERU/G	0.5691	0.0000	0.0000	0.0000	0.0000	0.0000
ADCAX	1.0	MERU/G	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADIAY	6.0	MERU/G	2.6105	0.0000	0.0000	0.0000	0.0000	0.0000
ADSRAY	2.7	MERU/G	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADCAY	1.0	MERU/G	0.7761	0.0000	0.0000	0.0000	0.0000	0.0000
ADIAZ	5.8	MERU/G	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADSRAZ	1.2	MERU/G	0.3826	0.0000	0.0000	0.0000	0.0000	0.0000
ADCAZ	1.0	MERU/G	- 0.4682	0.0000	0.0000	0.0000	0.0000	0.0000
RSS INITIAL S.M. MLMS.			4.2434	0.0966	0.0930	0.0000	0.0000	0.0000
DRIFT ANGLES DUE TO GYRO DRIFT AFTER TRAJECTORY START								
NBDX	1.3	MERU	0.0495	- 0.0219	- 0.0183	0.0000	0.0000	0.0000
NBDY	2.3	MERU	0.0506	0.0671	0.0563	0.0000	0.0000	0.0000
NBDZ	2.4	MERU	- 0.0000	0.0678	- 0.0809	0.0000	0.0000	0.0000
ADIAX	5.1	MERU/G	0.0095	- 0.0042	- 0.0035	0.0000	0.0000	0.0000
ADSRAX	2.2	MERU/G	- 0.0826	0.0365	0.0306	0.0000	0.0000	0.0000
ADCAX	1.0	MERU/G	0.0376	- 0.0166	- 0.0139	0.0000	0.0000	0.0000
ADIAY	6.0	MERU/G	0.1301	0.1726	0.1448	0.0000	0.0000	0.0000
ADSRAY	2.7	MERU/G	- 0.0586	- 0.0778	- 0.0653	0.0000	0.0000	0.0000
ADCAY	1.0	MERU/G	0.0010	0.0014	0.0011	0.0000	0.0000	0.0000
ADIAZ	5.8	MERU/G	- 0.0000	- 0.1620	0.1931	0.0000	0.0000	0.0000
ADSRAZ	1.2	MERU/G	- 0.0000	- 0.0334	0.0398	0.0000	0.0000	0.0000
ADCAZ	1.0	MERU/G	0.0000	0.0013	- 0.0016	0.0000	0.0000	0.0000
RSS DRIFT ANGLE			0.1837	0.2731	0.2747	0.0000	0.0000	0.0000
OVERALL RSS MLM			4.2474	0.2897	0.2900	0.0000	0.0000	0.0000

TABLE 7.39b IMU S.M. MISALIGNMENTS AND DRIFT ANGLES AT SIVB CUTOFF

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 4 HR, 48 MIN, 59.580 SEC (17339.580 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	824.5	-1608.4	13372.5	-1.064	-3.920	-0.527
ABOUT YI	5.0 SECS	1072.0	2157.2	8416.6	-0.599	-1.552	-0.919
ABOUT ZI	5.0 SECS	-38.9	69.6	-618.1	-0.041	0.066	-0.122
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	3.0 SECS	443.4	746.4	3277.1	-0.199	-0.671	-0.418
X ABOUT Z	1.4 SECS	-174.7	-266.2	-1165.0	0.050	0.216	0.129
Y ABOUT X	29.5 SECS	3895.4	11687.6	53657.3	-5.012	-9.484	-1.752
Y ABOUT Z	0.5 SECS	-6.3	-31.3	-141.7	0.014	0.021	0.000
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		1210.3	2243.3	9900.2	-0.594	-1.766	-0.834
ACBXFLGT	0.080 CM/S.SQ	-2702.8	-2716.0	-13042.1	1.469	3.913	3.798
ACBXCOMB		-1498.5	-472.2	-3141.7	0.879	2.146	2.955
ACBYINIT		-1565.2	-2914.6	-12860.8	0.768	2.294	1.093
ACBYFLGT	0.060 CM/S.SQ	1355.3	4959.3	23955.4	-3.082	-4.716	-0.230
ACBYCOMB		-224.6	2045.2	11094.5	-2.307	-2.421	0.842
ACBZINIT		-3327.7	-7141.6	-25450.8	2.032	4.823	3.322
ACBZFLGT	0.100 CM/S.SQ	3516.2	12603.3	44147.1	-7.397	-6.353	-3.666
ACBZCOMB		133.0	5464.6	18696.3	-5.336	-1.533	-0.415
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	92 PPM	-1614.7	-4001.7	-16634.2	0.883	2.733	0.874
SFUYCOMB	45 PPM	-797.9	-2974.0	-13227.9	1.122	2.062	0.402
SFUZCOMB	76 PPM	-2873.7	-9502.9	-34532.0	3.832	5.442	2.366
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.547 MR., DUE TO BDY 2.001 MR., DUE TO BDZ- 1.445 MR.)							
NBDXINIT	1.3 MERU	-1828.5	3626.6	-30148.4	2.396	8.839	1.228
NBDXFLGT	(1.645 MR.DRIFT -	4554.3	-1061.3	-664.6	-11.772	-0.367	1.637
NBDXCOMB	SINCE LAUNCH)	-6382.2	2565.9	-30813.1	-9.386	8.473	2.852
NBDYINIT	2.3 MERU	7055.6	-13276.6	110410.7	-8.830	-32.382	-4.036
NBDYFLGT	(2.910 MR.DRIFT -	1539.0	919.1	5254.1	-13.674	-4.356	-12.111
NBDYCOMB	SINCE LAUNCH)	5542.4	-12358.7	115664.7	-22.558	-36.747	-16.046
NBDZINIT	2.4 MERU	-4744.7	9593.2	-79736.8	6.324	23.379	3.369
NBDZFLGT	(3.037 MR.DRIFT -	1490.6	3260.3	14983.2	-1.453	0.438	13.196
NBDZCOMB	SINCE LAUNCH)	-6288.5	12855.0	-64753.7	4.826	23.817	16.493
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ALX-TERMS	5.1, 2.2, 1.0 M/G	7028.2	10903.1	110297.0	8.776	31.725	5.382
ALY-TERMS	6.6, 2.7, 1.0 M/G	13490.6	12830.2	176278.7	13.893	49.874	9.288
ALZ-TERMS	5.6, 1.2, 1.0 M/G	2746.6	6642.0	33781.5	2.527	9.475	1.416
GYRO ACCELERATION SQUARED SENSITIVE DRIFT							
ALIXX	0.2 MERU/GSQ	-30.1	-76.9	-114.9	-0.003	0.009	0.030
ALSYY	0.2 MERU/GSQ	112.4	167.1	819.7	-0.067	-0.191	-0.146
ALIZZ	0.2 MERU/GSQ	98.3	179.0	732.3	-0.025	-0.127	-0.045
RSS UNCERT.(FT AND FT/SEC)		19529.7	30821.3	261209.1	31.229	75.745	25.994
RSS UNCERT.(N.MI.AND FT/SEC)		3.214	5.072	42.989	31.229	75.745	25.994

TABLE 7.40 FLIGHT UNCERTAINTIES AT APS1 CUTOFF - NO UPDATE

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 4 HR, 48 MIN, 59.580 SEC (17339.580 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	-695.2	-72.3	-142.6	-2.144	-0.148	-0.297
ABOUT YI	5.0 SECS	-7.5	0.0	3.3	-0.012	0.000	0.006
ABOUT ZI	5.0 SECS	24.7	-11.5	-62.1	0.001	-0.022	-0.147
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	3.0 SECS	-4.2	-11.7	-8.8	-0.021	-0.031	-0.041
X ABOUT Z	1.4 SECS	0.6	-6.8	-11.0	-0.009	-0.014	-0.021
Y ABOUT X	29.5 SECS	-175.4	-141.2	140.1	-0.370	-0.340	0.282
Y ABOUT Z	0.5 SECS	1.8	1.4	-0.7	0.003	0.002	-0.002
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		-40.1	15.0	83.7	-0.015	0.029	0.198
ACBXFLGT	0.080 CM/S.SQ	-388.7	585.9	1547.5	0.629	0.939	1.766
ACBXCOMB		-428.8	601.0	1631.4	0.613	0.969	1.965
ACBYINIT		52.1	-19.5	-108.8	0.020	-0.038	-0.257
ACBYFLGT	0.060 CM/S.SQ	-436.8	-330.6	119.5	-0.957	-0.699	0.701
ACBYCOMB		-384.6	-350.2	10.6	-0.937	-0.738	0.443
ACBZINIT		-42.4	31.0	157.1	0.036	0.057	0.376
ACBZFLGT	0.100 CM/S.SQ	-553.9	234.3	-1092.8	-2.592	1.101	-0.759
ACBZCOMB		-596.4	265.3	-935.6	-2.555	1.159	-0.383
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	92 PPM	76.0	-90.4	-257.8	-0.076	-0.170	-0.435
SFUYCOMB	45 PPM	-79.2	-40.2	77.1	-0.133	-0.092	0.189
SFUZCOMB	76 PPM	119.2	-78.2	0.6	0.350	-0.157	0.077
GYRO BIAS DRIFT (INIT.EARTH LOH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.547 MR., DUE TO BDY 2.001 MR., DUE TO BDZ- 1.445 MR.)							
NBDXINIT	1.3 MERU	1567.4	163.2	321.7	4.836	0.334	0.670
NBDXFLGT	(1.645 MR.DRIFT	-4323.9	-165.2	426.1	-12.020	-0.371	1.266
NBDXCOMB	SINCE LAUNCH)	-2756.4	-1.8	747.9	-7.183	-0.036	1.937
NBDYINIT	2.3 MERU	-5740.4	-598.2	-1178.3	-17.713	-1.226	-2.457
NBDYFLGT	(2.910 MR.DRIFT	-2974.3	-1157.8	-4646.5	-13.438	-2.233	-10.928
NBDYCOMB	SINCE LAUNCH)	-8714.5	-1756.5	-5824.9	-31.152	-3.462	-13.391
NBDZINIT	2.4 MERU	4145.6	431.8	850.9	12.792	0.885	1.773
NBDZFLGT	(3.037 MR.DRIFT	-2830.9	1079.8	6028.8	-1.137	2.147	14.407
NBDZCOMB	SINCE LAUNCH)	1314.9	1511.5	6879.8	11.654	3.032	16.178
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ACX-TERMS	5.1, 2.2, 1.0 M/G	5446.2	575.5	1155.9	16.820	1.178	2.422
ACY-TERMS	6.0, 2.7, 1.0 M/G	8059.1	912.5	1986.8	25.169	1.857	4.211
ACZ-TERMS	5.8, 1.2, 1.0 M/G	1722.0	217.4	706.0	5.340	0.443	1.646
RSS UNCERT.(FT AND FT/SEC)		13567.5	2679.1	9553.0	45.995	5.409	21.813
RSS TKG.UPD.UNCERTAINTIES		3450.0	1626.8	8294.1	0.381	0.246	2.969
OVERALL RSS UNCERTAINTIES		13999.3	3134.4	12651.2	45.997	5.415	22.014

TABLE 7.41 FLIGHT UNCERTAINTIES AT APS1 CUTOFF WITH UPDATE BEFORE DPS1 BURN

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 5 HR, 9 MIN, 36.766 SEC (18576.766 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	-3567.1	-137.4	4737.5	-1.676	0.061	3.016
ABOUT YI	5.0 SECS	14.1	0.7	37.8	0.003	0.000	0.014
ABOUT ZI	5.0 SECS	-172.7	-20.9	-79.5	-0.263	0.009	0.079
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	3.0 SECS	-88.8	-29.4	45.1	-0.090	0.008	0.055
X ABOUT Z	1.4 SECS	-40.6	-13.7	8.8	-0.044	0.005	0.024
Y ABOUT X	29.5 SECS	-222.4	-311.9	1017.0	0.307	0.113	0.335
Y ABOUT Z	0.5 SECS	2.4	3.0	-10.5	-0.003	-0.000	-0.003
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		207.2	27.9	143.6	0.344	-0.012	-0.086
ACBXFLGT	0.080 CM/S.SQ	2444.2	887.5	1006.1	3.136	-0.538	-1.505
ACBXCOMB		2651.6	915.5	1149.8	3.481	-0.551	-1.592
ACBYINIT		-269.2	-36.3	-186.5	-0.447	0.016	0.112
ACBYFLGT	0.060 CM/S.SQ	-585.9	-645.9	2353.3	0.757	0.280	0.872
ACBYCOMB		-855.2	-682.3	2166.7	0.309	0.297	0.985
ACBZINIT		512.8	54.1	92.9	0.701	-0.026	-0.264
ACBZFLGT	0.100 CM/S.SQ	-4375.0	977.0	4257.4	-2.491	-0.113	3.649
ACBZCOMB		-3862.1	1031.1	4350.4	-1.789	-0.141	3.384
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFLXCOMB	92 PPM	-572.7	-158.7	-194.7	-0.785	0.079	0.313
SFLYCOMB	45 PPM	20.8	-85.5	405.6	0.266	0.032	0.073
SFLZCOMB	76 PPM	637.3	-145.9	-819.3	0.337	0.067	-0.519
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.547 MR., DUE TO BDY 2.001 MR., DUE TO BDZ- 1.445 MR.)							
NBDXINIT	1.3 MERU	8045.8	309.7	-10680.8	3.790	-0.139	-6.793
NBDXFLGT	(1.762 MR.DRIFT	-16403.6	-341.9	27925.0	-4.044	0.136	15.239
NBDXCOMB	SINCE LAUNCH)	-8371.3	-31.7	17244.1	-0.290	-0.002	8.423
NBDYINIT	2.3 MERU	-29421.8	-1136.6	39116.4	-13.750	0.511	24.963
NBDYFLGT	(3.118 MR.DRIFT	-33250.5	-2079.1	25320.5	-26.787	1.009	24.080
NBDYCOMB	SINCE LAUNCH)	-62627.0	-3220.3	64436.7	-40.358	1.519	49.159
NBDZINIT	2.4 MERU	21291.2	818.9	-28249.0	10.060	-0.370	-17.947
NBDZFLGT	(3.253 MR.DRIFT	15194.5	1990.4	10163.2	25.091	-0.937	-6.425
NBDZCOMB	SINCE LAUNCH)	36472.8	2806.9	-18085.7	35.163	-1.310	-24.360
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX-TERMS 5.1, 2.2, 1.0 M/G		28116.3	1090.0	37122.3	13.404	0.494	23.647
ADY-TERMS 6.0, 2.7, 1.0 M/G		42647.1	1721.7	55248.3	20.769	0.782	35.902
ADZ-TERMS 5.8, 1.2, 1.0 M/G		9184.4	411.2	11740.5	5.072	0.186	7.616
RSS UNCERT.(FT AND FT/SEC)		89735.2	5011.2	96923.5	59.341	2.315	70.794
RSS TKG.UPD.UNCERTAINTIES		1666.9	196.2	14842.6	1.995	1.882	0.897
OVERALL RSS UNCERTAINTIES		89750.7	5015.0	98053.4	59.375	2.984	70.800

TABLE 7.42 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS1 CUTOFF WITH UPDATE BEFORE DPS1 BURN

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 6 HR, 20 MIN, 42.640 SEC (22842.640 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL. TO ACT. AXES AT NOM. TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL. TO ACT. AXES AT NOM. TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	573.0	-26.4	6901.8	-2.172	-4.384	0.279
ABOUT YI	5.0 SECS	905.3	2888.7	2672.2	-1.362	-2.113	-0.337
ABOUT ZI	5.0 SECS	-32.9	600.0	2033.1	-0.135	-0.117	-0.253
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	3.0 SECS	391.2	1147.7	1529.4	-0.467	-0.960	-0.204
X ABOUT Z	1.4 SECS	-156.0	-257.3	70.7	0.120	0.245	0.044
Y ABOUT X	29.5 SECS	2828.6	13973.5	8791.0	-8.605	-11.563	1.713
Y ABOUT Z	0.5 SECS	-2.6	-40.0	-38.1	0.028	0.031	-0.012
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		1021.5	2350.9	269.5	-1.298	-2.133	-0.038
ACBXFLGT	0.080 CM/S.SQ	-2498.9	-8386.4	-22461.7	3.174	7.317	2.859
ACBXCOMB		-1478.5	-6034.8	-22192.1	1.879	5.182	2.818
ACBYINIT		-1326.6	-3054.3	-350.1	1.685	2.772	0.050
ACBYFLGT	0.060 CM/S.SQ	771.0	5281.4	1780.4	-4.774	-5.653	1.857
ACBYCOMB		-556.3	2227.5	1430.2	-3.087	-2.882	1.908
ACBZINIT		-2819.7	-10933.7	-14109.0	4.750	7.134	1.785
ACBZFLGT	0.100 CM/S.SQ	2194.5	22207.0	35844.5	-13.567	-10.108	-1.101
ACBZCOMB		-659.2	11277.2	21735.5	-8.793	-2.984	0.639
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	92 PPM	-1314.8	-3945.5	653.9	1.972	2.858	-0.484
SFUYCOMB	45 PPM	-599.5	-4004.0	-3800.3	1.941	2.552	-0.146
SFUZCOMB	76 PPM	-2119.1	-13604.5	-15217.5	7.269	7.651	0.227
GYRO BIAS DRIFT (INIT. EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.547 MR., DUE TO BDY 2.001 MR., DUE TO BDZ- 1.445 MR.)							
NBDXINIT	1.3 MERU	-1283.9	59.6	-15560.3	4.897	9.885	-0.615
NBDXFLGT	(2.167 MR.DRIFT	-6939.7	13540.7	58392.8	-23.801	-4.064	4.646
NBDXCOMB	SINCE LAUNCH)	-8265.1	13601.3	42832.5	-18.904	5.816	3.952
NBDYINIT	2.3 MERU	4796.5	-218.5	56986.3	-17.946	-36.203	2.423
NBDYFLGT	(3.833 MR.DRIFT	-3382.4	58628.0	224309.6	-40.028	-24.192	-19.042
NBDYCOMB	SINCE LAUNCH)	1995.7	58395.0	281284.8	-58.140	-60.348	-15.660
NBDZINIT	2.4 MERU	-3371.9	157.8	-41154.4	12.951	26.145	-1.586
NBDZFLGT	(4.000 MR.DRIFT	-3489.1	-39687.7	-164663.7	-3.149	16.115	31.529
NBDZCOMB	SINCE LAUNCH)	-6552.3	-39535.3	-205813.8	9.670	42.284	30.389
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ACX-TERMS 5.1, 2.2, 1.0 M/G		5163.1	2928.1	58084.7	17.989	35.981	1.602
ACY-TERMS 6.0, 2.7, 1.0 M/G		9751.5	12146.1	100209.3	29.395	57.984	1.789
ACZ-TERMS 5.8, 1.2, 1.0 M/G		2082.7	2002.2	20482.1	5.288	10.385	1.626
GYRO ACCELERATION SQUARED SENSITIVE DRIFT							
ACIXX	0.2 MERU/GSQ	-29.8	-89.7	-35.2	0.000	0.024	0.027
ACSYY	0.2 MERU/GSQ	92.5	433.3	1024.9	-0.204	-0.311	-0.112
ACIZZ	0.2 MERU/GSQ	79.4	78.9	-398.6	-0.082	-0.119	0.049
RSS UNCERT. (FT AND FT/SEC)		16137.0	76912.5	372168.0	72.668	102.504	34.762
RSS UNCERT. (N.MI. AND FT/SEC)		2.655	12.658	61.250	72.668	102.504	34.762

TABLE 7.43 FLIGHT UNCERTAINTIES AT APS2 CUTOFF - NO UPDATE

CONFIDENTIAL

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 7 HR, 7 MIN, 7.165 SEC (25627.165 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	2797.6	384.3	6300.2	2.033	4.413	-2.354
ABOUT YI	5.0 SECS	1623.0	-2668.8	1372.3	1.309	2.449	-1.203
ABOUT ZI	5.0 SECS	-957.6	-580.6	5014.2	0.205	0.185	0.832
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	3.0 SECS	492.0	-1050.4	1051.7	0.456	1.095	-0.332
X ABOUT Z	1.4 SECS	-317.3	233.0	798.8	-0.106	-0.276	0.237
Y ABOUT X	29.5 SECS	14839.2	-12793.0	-4215.4	7.823	13.209	-12.475
Y ABOUT Z	0.5 SECS	-54.2	36.7	0.0	-0.025	-0.036	0.047
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		2991.1	-2137.9	-4979.0	1.152	2.410	-2.372
ACBXFLGT	0.080 CM/S.SQ	2096.1	7650.0	-33167.1	-3.480	8.298	-2.442
ACBXCOMB		5094.2	5511.1	-38146.2	-2.315	-5.888	-4.805
ACBYINIT		-3883.5	2778.2	6467.9	-1.494	-3.130	3.084
ACBYFLGT	0.060 CM/S.SQ	8988.8	-4731.3	-5442.0	4.264	6.283	-7.817
ACBYCOMB		5102.9	-1955.0	1025.8	2.763	3.151	-4.735
ACBZINIT		-2628.7	10172.3	-17981.1	-4.784	-8.395	1.633
ACBZFLGT	0.100 CM/S.SQ	3509.1	-21016.3	71229.0	13.637	12.673	-2.600
ACBZCOMB		811.4	-10848.2	53248.1	8.888	4.266	-1.009
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	92 PPM	-5703.3	3648.3	11013.1	-1.652	-3.316	4.704
SFUYCOMB	45 PPM	-2421.7	3730.4	-3287.3	-1.833	-3.014	2.010
SFUZCOMB	76 PPM	-6075.3	12759.8	-21140.2	-7.091	-9.208	4.939
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.547 MR., DUE TO BDY 2.001 MR., DUE TO BDZ- 1.445 MR.)							
NBDXINIT	1.3 MERU	-6300.5	-866.8	-14204.0	-4.597	-9.951	5.313
NBDXFLGT	(2.431 MR.DRIFT	-3091.6	-12984.1	170650.9	24.356	5.625	1.313
NBDXCOMB	SINCE LAUNCH)	-9503.3	-13854.9	156448.1	19.861	-4.327	6.547
NBDYINIT	2.3 MERU	23154.1	3170.4	52019.0	16.703	36.443	-19.418
NBDYFLGT	(4.300 MR.DRIFT	-74020.6	-55867.7	585693.0	50.691	31.109	78.074
NBDYCOMB	SINCE LAUNCH)	-49474.0	-52623.1	637650.2	66.425	67.586	59.750
NBDZINIT	2.4 MERU	-16643.5	-2293.8	-37567.1	-12.195	-26.321	14.064
NBDZFLGT	(4.487 MR.DRIFT	96956.0	37548.7	-380076.3	-0.522	-20.640	-79.905
NBDZCOMB	SINCE LAUNCH)	80967.1	35292.7	-417624.6	-13.011	-46.940	-65.282
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX-TERMS 5.1, 2.2, 1.0 M/G		22130.6	1284.5	54534.6	17.052	36.538	18.558
ADY-TERMS 6.0, 2.7, 1.0 M/G		32740.2	7807.8	102608.2	27.655	59.675	26.564
ADZ-TERMS 5.8, 1.2, 1.0 M/G		12000.6	2330.8	39588.6	4.821	10.409	10.131
GYRO ACCELERATION SQUARED SENSITIVE DRIFT							
ADIXX	0.2 MERU/GSQ	6.4	86.1	15.4	-0.002	-0.035	-0.013
ADSYY	0.2 MERU/GSQ	-98.6	-400.7	1793.0	0.218	0.362	0.108
ADIZZ	0.2 MERU/GSQ	413.0	-67.8	-1325.5	0.058	0.129	-0.342
RSS UNCERT.(FT AND FT/SEC)		105651.9	69246.1	790899.0	79.199	110.307	96.386
RSS UNCERT.(N.MI.AND FT/SEC)		17.388	11.396	130.165	79.199	110.307	96.386

TABLE 7.44 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF - NO UPDATE

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GYRC ACCELERATION SENSITIVE DRIFT (RAX = 1)

ADIAXINIT		-	21368.1	-	2947.3	-	48258.0	-	15.687	-	33.813		18.074
ADIAXFLGT	5.1 MERU/G		90.0		2286.8	-	3926.4	-	0.634	-	1.045	-	0.194
ADIAXCOMB		-	21269.6	-	658.2	-	52184.4	-	16.332	-	34.857		17.886
ADSAXINIT			6571.7		902.3		14792.9		4.772		10.364	-	5.529
ADSAXFLGT	2.2 MERU/G	-	461.7	-	1869.8		971.6		0.126		0.593		0.586
ADSAXCOMB			6110.6	-	967.0		15764.5		4.897		10.958	-	4.943
ADCAXINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADCAXFLGT	1.0 MERU/G		184.8		530.9		1518.3		0.293	-	0.120	-	0.256
ADCAXCOMB			184.8		530.9		1518.3		0.293	-	0.120	-	0.256
RSS FOR X GYRO			22130.6		1284.5		54534.6		17.052		36.538		18.558
ADIAYINIT			30225.9		4134.1		67850.9		21.746		47.535	-	25.316
ADIAYFLGT	6.0 MERU/G		1096.0	-	10493.5		30118.1		5.030		10.136	-	0.157
ADIAYCOMB			31414.0	-	6345.0		97968.4		26.665		57.680	-	25.407
ADSAYINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADSAYFLGT	2.7 MERU/G		1493.9		4508.9	-	21665.3	-	2.582	-	4.063	-	1.527
ADSAYCOMB			1493.9		4508.9	-	21665.3	-	2.582	-	4.063	-	1.527
ADCAYINIT			8963.9		1230.3		20172.2		6.503		14.133	-	7.538
ADCAYFLGT	1.0 MERU/G		137.6	-	619.2		1305.1		0.363		0.622	-	0.068
ADCAYCOMB			9102.7		611.3		21477.3		6.865		14.755	-	7.605
RSS FOR Y GYRO			32740.2		7807.8		102608.2		27.655		59.675		26.564
ADIAZINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADIAZFLGT	5.8 MERU/G	-	10707.8		1434.9		34235.4	-	1.344	-	2.964		9.014
ADIAZCOMB		-	10707.8		1434.9		34235.4	-	1.344	-	2.964		9.014
ADSAZINIT			4417.2		606.7		9945.7		3.210		6.968	-	3.718
ADSAZFLGT	1.2 MERU/G	-	1778.2		810.0		4844.3	-	0.444	-	1.062		1.424
ADSAZCOMB			2641.3		1416.5		14789.9		2.766		5.906	-	2.292
ADCAZINIT		-	5399.5	-	742.8	-	12171.3	-	3.939	-	8.528		4.553
ADCAZFLGT	1.0 MERU/G		667.6	-	426.6	-	1112.6		0.225		0.484	-	0.534
ADCAZCOMB		-	4731.2	-	1169.5	-	13283.9	-	3.714	-	8.044		4.020
RSS FOR Z GYRO			12000.6		2330.8		39588.6		4.821		10.409		10.131
RSS FOR ALL GYROS			41300.3		8249.0		122759.0		32.846		70.744		33.952

TABLE 7.45 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF - NO UPDATE (AD TERMS)

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 6 HR, 20 MIN, 42.640 SEC (22842.640 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	-1045.9	4375.8	17495.3	-4.297	-1.472	-0.181
ABOUT YI	5.0 SECS	-19.0	6.8	30.8	-0.069	0.000	0.021
ABOUT ZI	5.0 SECS	36.6	459.1	1813.5	-0.054	-0.190	-0.261
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	3.0 SECS	-3.2	170.8	738.6	-0.048	-0.122	-0.048
X ABOUT Z	1.4 SECS	1.1	74.6	331.2	-0.022	-0.058	-0.026
Y ABOUT X	29.5 SECS	-241.8	-490.8	-1018.2	-0.474	-0.409	0.652
Y ABOUT Z	0.5 SECS	3.1	6.2	12.7	0.007	0.005	-0.009
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		-67.7	-584.3	-2304.2	-0.003	0.246	0.361
ACBXFLGT	0.08C CM/S.SQ	-420.9	-4235.1	-19460.9	1.290	3.403	1.858
ACBXCOMB		-486.6	-4819.5	-21765.2	1.285	3.650	2.222
ACBYINIT		88.4	759.0	2993.3	0.004	-0.320	-0.469
ACBYFLGT	0.06C CM/S.SQ	-585.9	-1227.9	-2754.1	-1.077	-0.722	1.399
ACBYCOMB		-497.8	-466.7	239.1	-1.071	-1.043	0.929
ACBZINIT		-36.7	-1263.7	-5003.2	0.373	0.515	0.637
ACBZFLGT	0.10C CM/S.SQ	-898.4	5857.2	21179.8	-4.778	-0.020	-1.049
ACBZCOMB		-940.4	4593.4	16176.5	-4.403	0.494	-0.417
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	92 PPM	107.5	1205.1	5221.5	-0.235	-0.937	-0.762
SFUYCOMB	45 PPM	-116.3	-442.6	-1432.0	-0.169	-0.018	0.397
SFUZCOMB	76 PPM	173.1	-982.8	-3417.3	0.722	0.004	0.135
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.547 MR., DUE TO BDY 2.001 MR., DUE TO BDZ- 1.445 MR.)							
NBDXINIT	1.3 MERU	2412.4	-9863.8	-39443.2	9.694	3.326	0.494
NBDXFLGT	(2.167 MR.DRIFT	-6760.4	15123.7	60915.2	-24.430	-4.402	4.379
NBDXCOMB	SINCE LAUNCH)	-4464.2	5255.1	21472.0	-14.759	-1.093	4.677
NBDYINIT	2.3 MERU	-8191.8	36141.6	144449.4	-35.457	-12.108	-0.818
NBDYFLGT	(3.833 MR.DRIFT	-4707.5	56093.0	222657.1	-39.135	-21.542	-18.567
NBDYCOMB	SINCE LAUNCH)	-11339.7	92257.4	367069.8	-74.652	-33.495	-17.079
NBDZINIT	2.4 MERU	6544.4	-26083.1	-104319.4	25.652	8.817	1.561
NBDZFLGT	(4.000 MR.DRIFT	-4656.1	-42689.7	-167639.5	-2.122	18.473	32.173
NBDZCOMB	SINCE LAUNCH)	2735.8	-68763.3	-271944.2	23.358	27.337	34.838
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADCA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ALX-TERMS	5.1, 2.2, 1.0 M/G	8629.9	34602.9	138383.6	33.609	11.718	2.313
ALY-TERMS	6.0, 2.7, 1.0 M/G	11214.5	53615.0	214203.6	50.695	18.084	1.909
ALZ-TERMS	5.8, 1.2, 1.0 M/G	2626.3	12106.8	48293.7	10.722	4.250	2.850
RSS UNCERT.(FT AND FT/SEC)		19123.9	132487.2	526886.4	100.958	48.692	39.392
RSS TRG.UPD.UNCERTAINTIES		3418.7	7667.8	24036.2	0.661	0.957	3.156
OVERALL RSS UNCERTAINTIES		19427.1	132708.9	527434.4	100.960	48.701	39.518

TABLE 7.46 FLIGHT UNCERTAINTIES AT APS2 CUTOFF WITH UPDATE BEFORE DPS1 BURN

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POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 7 HR, 3 MIN, 7.378 SEC (25387.378 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	-4492.8	-4487.3	42393.2	4.072	0.516	3.936
ABOUT YI	5.0 SECS	7.0	-6.6	277.2	0.073	-0.001	-0.007
ABOUT ZI	5.0 SECS	-796.4	-476.6	-3510.6	-0.026	0.090	0.713
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	3.0 SECS	-186.9	-185.6	1271.9	0.030	0.084	0.165
X ABOUT Z	1.4 SECS	-93.7	-81.9	586.9	0.013	0.041	0.083
Y ABOUT X	29.5 SECS	1428.3	411.2	-1892.5	0.653	0.512	-1.301
Y ABOUT Z	0.5 SECS	-24.0	-5.0	30.2	-0.010	-0.007	0.021
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		1035.0	607.1	-4225.2	0.115	-0.118	-0.928
ACBXFLGT	0.080 CM/S.SQ	5289.8	4657.3	-32997.1	-0.719	-2.464	-4.784
ACBXCOMB		6331.5	5264.1	-37222.4	-0.598	-2.583	-5.705
ACBYINIT		-1343.3	-788.7	5488.7	-0.148	0.153	1.207
ACBYFLGT	0.060 CM/S.SQ	2854.2	1077.1	-3847.9	1.451	0.984	-2.624
ACBYCOMB		1509.7	288.4	1640.7	1.300	1.138	-1.418
ACBZINIT		2134.2	1310.0	-10386.3	-0.162	-0.238	-1.900
ACBZFLGT	0.100 CM/S.SQ	-7102.8	-5695.4	52576.8	4.302	-1.245	6.340
ACBZCOMB		-4994.0	-4384.3	42190.4	4.121	-1.484	4.412
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	92 PPM	-2329.3	-1320.8	10418.6	-0.001	0.670	2.095
SFUYCOMB	45 PPM	985.4	426.9	-2634.9	0.284	0.114	-0.891
SFUZCOMB	76 PPM	1102.0	955.5	-8281.1	-0.646	0.207	-0.951
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.547 MR., DUE TO BDY 2.001 MR., DUE TO BDZ- 1.445 MR.)							
NBDXINIT	1.3 MERU	10436.3	10109.8	-95574.8	-9.051	-1.159	-8.575
NBDXFLGT	(2.408 MR.DRIFT	-9477.9	-15401.2	173018.3	24.889	1.133	8.794
NBDXCOMB	SINCE LAUNCH)	188.7	-5279.7	77447.5	15.587	-0.043	-0.495
NBDYINIT	2.3 MERU	-34581.5	-37102.1	349979.4	34.691	4.322	34.947
NBDYFLGT	(4.260 MR.DRIFT	-86491.8	-58173.4	546164.4	35.944	9.451	89.722
NBDYCOMB	SINCE LAUNCH)	-112087.9	-95478.4	895590.8	75.598	13.950	133.624
NBDZINIT	2.4 MERU	28526.8	26716.5	-252763.8	-23.545	-3.049	-21.774
NBDZFLGT	(4.445 MR.DRIFT	93886.7	44225.9	-334597.9	14.395	-9.144	-78.486
NBDZCOMB	SINCE LAUNCH)	126335.3	70757.2	-587205.5	-6.146	-12.174	-95.877
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ADX-TERMS	5.1, 2.2, 1.0 M/G	38264.5	35439.2	333998.0	30.652	4.056	28.755
ADY-TERMS	6.0, 2.7, 1.0 M/G	50754.4	55087.9	513134.7	50.006	6.588	54.007
ADZ-TERMS	5.8, 1.2, 1.0 M/G	14546.8	12439.1	113447.8	10.045	1.619	12.653
RSS UNCERT.(FT AND FT/SEC)		181312.4	136625.3	1243300.8	97.845	20.410	176.154
RSS TKG.UPD.UNCERTAINTIES		715.7	7600.9	32693.3	1.148	0.742	1.472
OVERALL RSS UNCERTAINTIES		181313.8	136836.6	1243730.6	97.852	20.424	176.160

TABLE 7.47 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF WITH UPDATE BEFORE DPS1 BURN

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GYRO ACCELERATION SENSITIVE DRIFT (RAX = 1)

ALIAXINIT			37187.8		34305.9	-	324681.2	-	30.014	-	3.908	- 27.439
ALIAXFLGT	5.1 MERU/G	-	198.5	-	224.4		3450.3		0.605		0.022	0.166
ALIAXCOMB			36937.4		34082.3	-	321232.1	-	29.426	-	3.887	- 27.320
ALSAXINIT		-	10416.4	-	10539.1		99537.0		9.619		1.217	9.373
ALSAXFLGT	2.2 MERU/G		468.1		836.1	-	8211.9	-	1.052	-	0.056	- 0.367
ALSAXCOMB		-	9986.4	-	9702.4		91325.3		8.555		1.160	8.970
ALLAXINIT			0.0		0.0		0.0		0.000		0.000	0.000
ALOAXFLGT	1.0 MERU/G	-	283.3	-	450.7		4941.7		0.699		0.033	0.228
ALLAXCOMB		-	283.3	-	450.7		4941.7		0.699		0.033	0.228
RSS FOR X GYRO			38264.5		35439.2		333998.0		30.652		4.056	28.755
ALIAYINIT		-	43968.7	-	48415.1		456453.0		45.729		5.663	46.686
ALIAYFLGT	6.0 MERU/G	-	5347.6	-	4647.0		37460.6		2.072		0.679	4.773
ALIAYCOMB		-	48514.5	-	53081.6		493886.5		48.200		6.357	52.265
ALSAYINIT			0.0		0.0		0.0		0.000		0.000	0.000
ALSAYFLGT	2.7 MERU/G		3959.7		2663.7	-	24006.5	-	1.338	-	0.415	- 3.466
ALSAYCOMB			3959.7		2663.7	-	24006.5	-	1.338	-	0.415	- 3.466
ALLAYINIT		-	14089.6	-	14374.0		135731.0		13.166		1.662	12.893
ALLAYFLGT	1.0 MERU/G	-	295.8	-	115.1		1408.3		0.083		0.022	0.262
ALLAYCOMB		-	14376.5	-	14489.3		137139.2		13.255		1.684	13.163
RSS FOR Y GYRO			50754.4		55087.9		513134.7		50.006		6.588	54.007
ALIAZINIT			0.0		0.0		0.0		0.000		0.000	0.000
ALIAZFLGT	5.8 MERU/G	-	7910.0	-	4244.6		30664.5	-	0.932		0.836	7.134
ALIAZCOMB		-	7910.0	-	4244.6		30664.5	-	0.932		0.836	7.134
ALSAZINIT		-	7054.1	-	7084.6		66921.6		6.446		0.817	6.252
ALSAZFLGT	1.2 MERU/G	-	970.8	-	664.7		4363.7	-	0.091		0.128	0.876
ALSAZCOMB		-	8011.2	-	7749.9		71285.2		6.364		0.946	7.143
ALLAZINIT			8916.7		8663.6	-	81897.1	-	7.767	-	0.994	- 7.374
ALLAZFLGT	1.0 MERU/G		292.2		91.8	-	858.8		0.046	-	0.020	- 0.260
ALLAZCOMB			9212.2		8755.3	-	82755.9	-	7.718	-	1.015	- 7.630
RSS FOR Z GYRO			14546.8		12439.1		113447.8		10.045		1.619	12.653
RSS FOR ALL GYROS			65205.9		66673.6		622681.8		59.508		7.906	62.481

TABLE 7.48 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF WITH UPDATE BEFORE DPS1 BURN (AD TERMS)

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 6 HR, 20 MIN, 42.640 SEC (22842.640 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	- 291.8	- 17.5	- 66.6	- 1.660	- 0.093	- 0.341
ABOUT YI	5.0 SECS	- 10.8	0.0	2.7	- 0.056	0.000	0.013
ABOUT ZI	5.0 SECS	6.3	- 3.2	- 29.1	0.001	- 0.016	- 0.150
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	3.0 SECS	- 0.3	- 6.5	- 5.4	- 0.008	- 0.033	- 0.028
X ABOUT Z	1.4 SECS	- 0.1	- 3.4	- 2.8	- 0.003	- 0.017	- 0.014
Y ABOUT X	29.5 SECS	- 52.4	- 42.4	55.3	- 0.221	- 0.220	0.288
Y ABOUT Z	0.5 SECS	1.0	0.8	- 1.1	0.004	0.004	- 0.005
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		- 20.0	4.1	40.5	- 0.062	0.020	0.209
ACBXFLGT	0.080 CM/S.SQ	10.7	182.8	152.9	0.225	0.830	0.694
ACBXCOMB		- 9.2	187.0	193.5	0.162	0.851	0.905
ACBYINIT		26.0	- 5.4	- 52.6	0.081	- 0.026	- 0.272
ACBYFLGT	0.060 CM/S.SQ	- 111.1	- 89.1	116.7	- 0.404	- 0.405	0.531
ACBYCOMB		- 85.0	- 94.6	63.9	- 0.322	- 0.432	0.258
ACBZINIT		17.7	6.9	69.8	0.177	0.045	0.363
ACBZFLGT	0.100 CM/S.SQ	- 255.8	120.4	- 122.2	- 1.375	0.547	- 0.551
ACBZCOMB		- 238.0	129.4	- 52.3	- 1.197	0.593	- 0.188
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	92 PPM	15.9	- 64.0	- 89.7	- 0.014	- 0.331	- 0.465
SFUYCOMB	45 PPM	- 28.6	- 13.3	39.5	- 0.110	- 0.069	0.204
SFUZCOMB	76 PPM	38.5	- 18.2	18.5	0.230	- 0.094	0.095
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.547 MR., DUE TO BDY 2.001 MR., DUE TO BDZ- 1.445 MR.)							
NBDXINIT	1.3 MERU	657.9	39.6	150.2	3.743	0.211	0.769
NBDXFLGT	(2.167 MR.DRIFT -	2045.6	- 39.9	223.7	- 10.867	- 0.232	1.208
NBDXCOMB	SINCE LAUNCH) -	1387.5	- 0.2	374.0	- 7.124	- 0.021	1.978
NBDYINIT	2.3 MERU -	2409.8	- 145.2	- 550.4	- 13.709	- 0.774	- 2.820
NBDYFLGT	(3.833 MR.DRIFT -	2852.2	- 427.7	- 2769.8	- 18.749	- 2.228	- 14.425
NBDYCOMB	SINCE LAUNCH) -	5262.0	- 573.1	- 3320.3	- 32.459	- 3.003	- 17.249
NBDZINIT	2.4 MERU	1740.3	104.8	397.4	9.900	0.558	2.036
NBDZFLGT	(4.000 MR.DRIFT -	1947.4	411.1	3935.0	- 6.144	2.054	20.469
NBDZCOMB	SINCE LAUNCH) -	207.0	516.0	4332.5	3.756	2.613	22.504
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADDA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ALX-TERMS 5.1, 2.2, 1.0 M/G		2262.0	139.3	542.6	12.857	0.741	2.786
ALY-TERMS 6.0, 2.7, 1.0 M/G		3415.3	218.4	886.2	19.518	1.156	4.520
ALZ-TERMS 5.8, 1.2, 1.0 M/G		729.3	57.8	376.9	4.123	0.303	1.984
RSS UNCERT.(FT AND FT/SEC)		6864.8	656.0	5587.5	41.064	4.391	29.008
RSS TKG.UPD.UNCERTAINTIES		446.5	919.1	2344.9	0.198	0.443	0.357
OVERALL RSS UNCERTAINTIES		6879.3	1256.0	6059.6	41.064	4.413	29.010

TABLE 7.49 FLIGHT UNCERTAINTIES AT APS2 CUTOFF WITH UPDATE BEFORE APS2 BURN

CONFIDENTIAL

POSITION AND VELOCITY UNCERTAINTIES ALONG LOCAL AXES AT TIME FROM LAUNCH = 7 HR, 6 MIN, 43.186 SEC (25603.186 SEC)

UNCERT. SOURCE	ONE SIGMA UNCERTAINTY	POSITION UNCERTAINTIES IN FEET (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE	VELOCITY UNCERTAINTIES IN FT/SEC (REL.TO ACT.AXES AT NOM.TIME) ALT.	TRACK	RANGE
INITIAL STABLE MEMBER MISALIGNMENTS (UNCORRELATED) ABOUT LAUNCH INERTIAL AXES							
ABOUT XI	50.0 SECS	-1950.6	22.6	11444.8	1.802	0.092	1.615
ABOUT YI	5.0 SECS	18.8	0.0	184.3	0.056	0.000	-0.020
ABOUT ZI	5.0 SECS	-499.2	4.1	1192.6	0.025	0.016	0.442
ACCELEROMETER INPUT AXIS MISALIGNMENTS							
X ABOUT Y	3.0 SECS	-99.4	8.4	273.4	0.013	0.033	0.087
X ABOUT Z	1.4 SECS	-51.3	4.3	141.3	0.006	0.017	0.044
Y ABOUT X	29.5 SECS	843.1	54.5	-1120.4	0.178	0.218	-0.762
Y ABOUT Z	0.5 SECS	-18.3	-1.1	24.3	-0.003	-0.004	0.016
Z ABOUT X	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
Z ABOUT Y	0.0 SECS	0.0	0.0	0.0	0.000	0.000	0.000
ACCELEROMETER BIAS							
ACBXINIT		664.0	-5.3	-1337.9	0.026	-0.020	-0.592
ACBXFLGT	0.080 CM/S.SQ	2402.3	-228.0	-6660.6	-0.362	-0.824	-2.111
ACBXCOMB		3066.8	-233.4	-7998.6	-0.334	-0.845	-2.703
ACBYINIT		-862.4	6.9	1738.0	-0.034	0.026	0.769
ACBYFLGT	0.060 CM/S.SQ	1512.9	111.2	-1933.7	0.326	0.401	-1.373
ACBYCOMB		650.2	118.2	-195.6	0.291	0.429	-0.603
ACBZINIT		1289.4	-11.5	-3819.3	-0.252	-0.045	-1.129
ACBZFLGT	0.100 CM/S.SQ	-2578.7	-150.2	11845.5	1.547	-0.542	2.185
ACBZCOMB		-1291.3	-161.7	8026.1	1.292	-0.588	1.053
ACCELEROMETER SCALE FACTOR UNCERTAINTIES							
SFUXCOMB	92 PPM	-1547.2	82.2	3778.8	0.102	0.330	1.370
SFUYCOMB	45 PPM	621.4	17.2	-1042.4	0.077	0.068	-0.558
SFUZCOMB	76 PPM	432.9	23.4	-1980.6	-0.259	0.093	-0.366
GYRO BIAS DRIFT (INIT.EARTH LCH.S.M.MLMS.ABT.XI - DUE TO BDX- 0.547 MR., DUE TO BDY 2.001 MR., DUE TO BDZ- 1.445 MR.)							
NBDXINIT	1.3 MERU	4419.8	-51.2	-25802.4	-4.048	-0.209	-3.623
NBDXFLGT	(2.428 MR.DRIFT -	1342.0	52.7	47533.3	11.151	0.232	0.499
NBDXCOMB	SINCE LAUNCH)	3021.2	1.5	21730.9	7.080	0.021	-3.167
NBDYINIT	2.3 MERU	-15924.7	187.9	94495.0	15.006	0.770	13.496
NBDYFLGT	(4.296 MR.DRIFT -	55875.2	551.3	212930.8	23.426	2.215	50.126
NBDYCOMB	SINCE LAUNCH) -	70867.5	740.2	307406.0	39.257	2.985	64.470
NBDZINIT	2.4 MERU	11756.6	-135.5	-68242.6	-10.662	-0.556	-9.525
NBDZFLGT	(4.483 MR.DRIFT	64996.8	-522.0	-130184.8	3.445	-2.041	-57.209
NBDZCOMB	SINCE LAUNCH)	77161.2	-656.8	-198421.9	-6.658	-2.598	-66.306
GYRO ACCELERATION SENSITIVE DRIFT (RSS OF UNCERTAINTIES DUE TO ADIA, ADSRA, AND ADOA DRIFT UNCERTAINTIES FOR EACH GYRO)							
ALX-TERMS	5.1, 2.2, 1.0 M/G	15775.2	179.9	89807.5	13.857	0.737	12.783
ALY-TERMS	6.0, 2.7, 1.0 M/G	24215.7	282.2	138446.3	21.540	1.150	20.775
ALZ-TERMS	5.8, 1.2, 1.0 M/G	7632.3	74.5	31561.7	4.472	0.301	6.585
RSS UNCERT.(FT AND FT/SEC)		109078.1	1096.8	403550.5	48.134	4.365	96.000
RSS TKG.UPD.UNCERTAINTIES		583.7	901.8	3583.4	0.126	0.464	0.482
OVERALL RSS UNCERTAINTIES		109079.7	1419.9	403566.4	48.134	4.390	96.001

TABLE 7.50 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF WITH UPDATE BEFORE APS2 BURN

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GYRO ACCELERATION SENSITIVE DRIFT (RAX = 1)

ADIAXINIT			15141.6	-	174.1	-	87662.9	-	13.671	-	0.715	-	12.203
ADIAXFLGT	5.1 MERU/G	-	21.9		1.8		1540.5		0.380		0.008	-	0.004
ADIAXCOMB			15113.5	-	172.4	-	86122.5	-	13.293	-	0.707	-	12.212
ADSAXINIT		-	4570.5		53.4		26872.2		4.239		0.219		3.802
ADSAXFLGT	2.2 MERU/G		51.0	-	1.6	-	1440.2	-	0.331	-	0.007	-	0.021
ADSAXCOMB		-	4521.3		51.8		25431.9		3.908		0.212		3.779
ADOAXINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADOAXFLGT	1.0 MERU/G	-	33.6		1.4		1242.2		0.294		0.006		0.010
ADOAXCOMB		-	33.6		1.4		1242.2		0.294		0.006		0.010
RSS FOR X GYRO			15775.2		179.9		89807.5		13.857		0.737		12.783
ADIAYINIT		-	20689.6		245.2		123253.6		19.630		1.005		17.676
ADIAYFLGT	6.0 MERU/G	-	2597.5		26.0		9759.0		1.027		0.100		2.243
ADIAYCOMB		-	23231.5		271.3		133012.0		20.706		1.105		19.970
ADSAYINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADSAYFLGT	2.7 MERU/G		2290.5	-	21.8	-	8551.4	-	0.892	-	0.089	-	1.974
ADSAYCOMB			2290.5	-	21.8	-	8551.4	-	0.892	-	0.089	-	1.974
ADOAYINIT		-	6224.3		72.9		36643.8		5.786		0.299		5.192
ADOAYFLGT	1.0 MERU/G	-	215.7		1.9		800.4		0.083		0.009		0.187
ADOAYCOMB		-	6438.6		74.8		37444.2		5.871		0.307		5.380
RSS FOR Y GYRO			24215.7		282.2		138446.3		21.540		1.150		20.775
ADIAZINIT			0.0		0.0		0.0		0.000		0.000		0.000
ADIAZFLGT	5.8 MERU/G	-	5369.1		42.7		10826.7	-	0.219		0.169		4.799
ADIAZCOMB		-	5369.1		42.7		10826.7	-	0.219		0.169		4.799
ADSAZINIT		-	3076.6		35.9		18066.8		2.848		0.147		2.553
ADSAZFLGT	1.2 MERU/G	-	558.5		4.8		1124.8	-	0.022		0.018		0.499
ADSAZCOMB		-	3634.1		40.7		19191.7		2.827		0.165		3.053
ADOAZINIT			3785.5	-	43.9	-	22109.8	-	3.471	-	0.180	-	3.107
ADOAZFLGT	1.0 MERU/G		241.3	-	1.7	-	486.8		0.011	-	0.007	-	0.215
ADOAZCOMB			4027.3	-	45.6	-	22596.7	-	3.459	-	0.188	-	3.321
RSS FOR Z GYRO			7632.3		74.5		31561.7		4.472		0.301		6.585
RSS FOR ALL GYROS			29891.8		343.0		168014.7		26.001		1.400		25.267

TABLE 7.51 FLIGHT UNCERTAINTIES AT PERIGEE AFTER APS2 CUTOFF WITH UPDATE BEFORE APS2 - BURN (AD TERMS)

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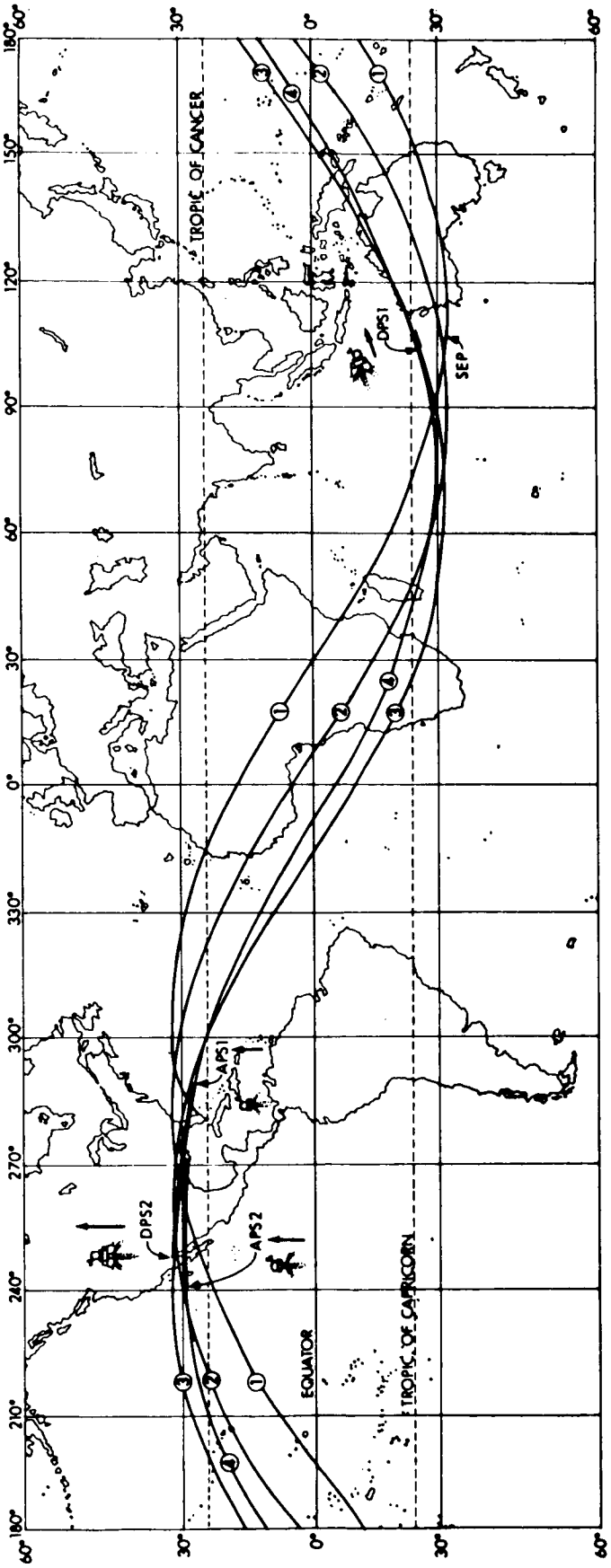


Fig. 7-5 Apollo 5 LM Orbit and Burn Sequence

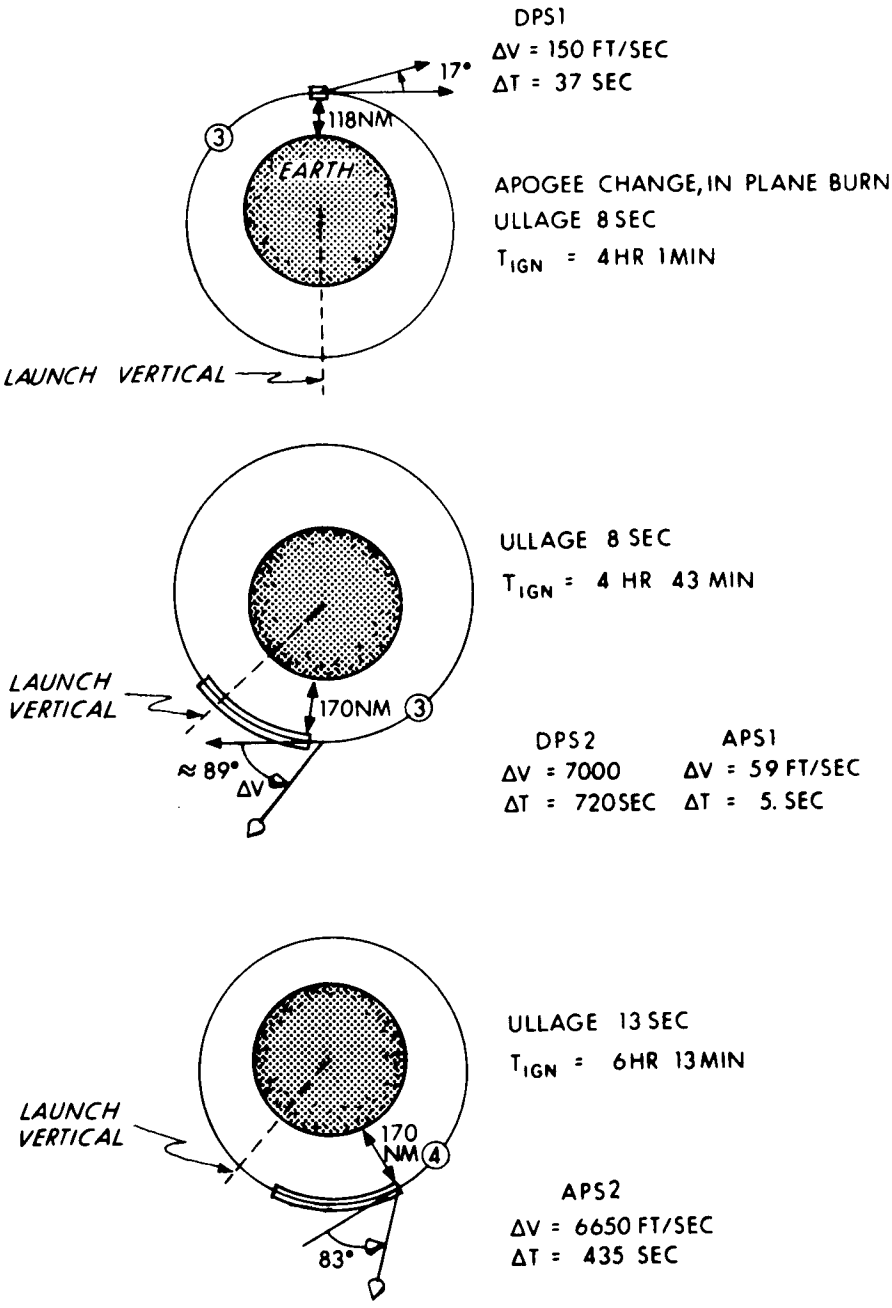
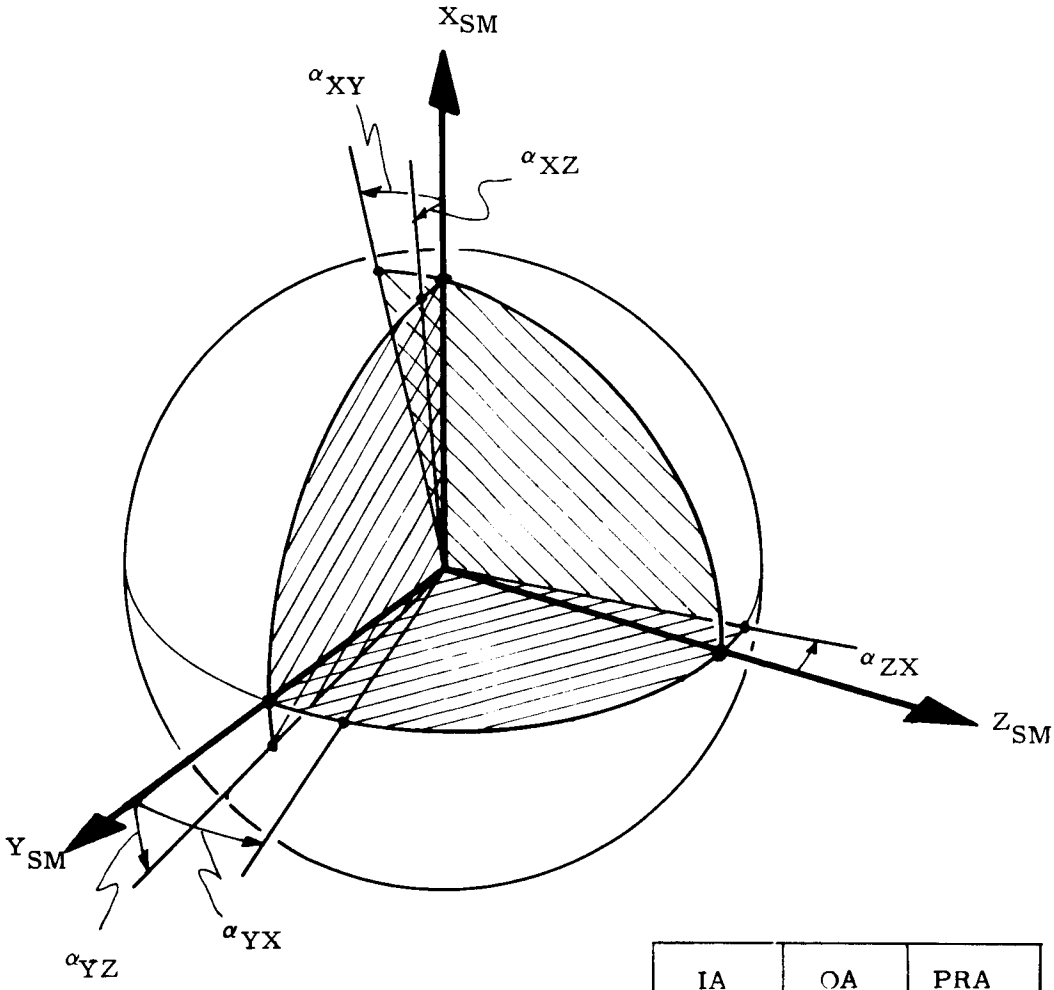


Fig. 7-6 Apollo 5 LM Orbit and Burn Sequence



	IA	OA	PRA
X PIPA	$+X_{SM}$	$+Z_{SM}$	$-Y_{SM}$
Y PIPA	$+Y_{SM}$	$-Z_{SM}$	$+X_{SM}$
Z PIPA	$+Z_{SM}$	$+X_{SM}$	$-Y_{SM}$

PIPA ORIENTATIONS

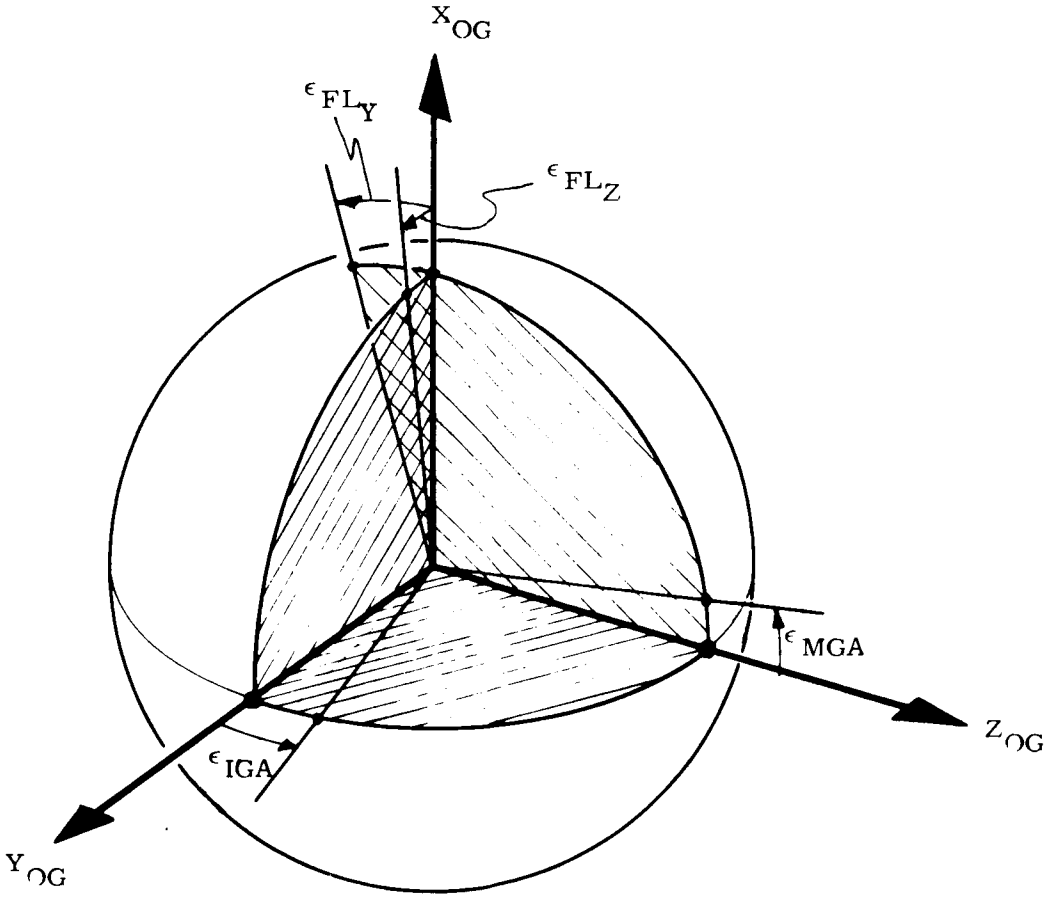
DEFINITION OF POSITIVE SENSE

PIPA INPUT-AXIS MISALIGNMENTS
with respect to
IDEAL STABLE MEMBER AXES

Fig. 7-7

PIPA Misalignments from Ideal Stable Member Axes (See Fig. 7-7 for Definition of Positive Sense)

Term	Angle in $\widehat{\text{Sec}}$ IMU 6	IMU 11
α_{XY}	+3	+37
α_{XZ}	-6	+36
α_{YZ}	-10	+7
α_{YX}	-4	-22
α_{ZX}	+20	-20



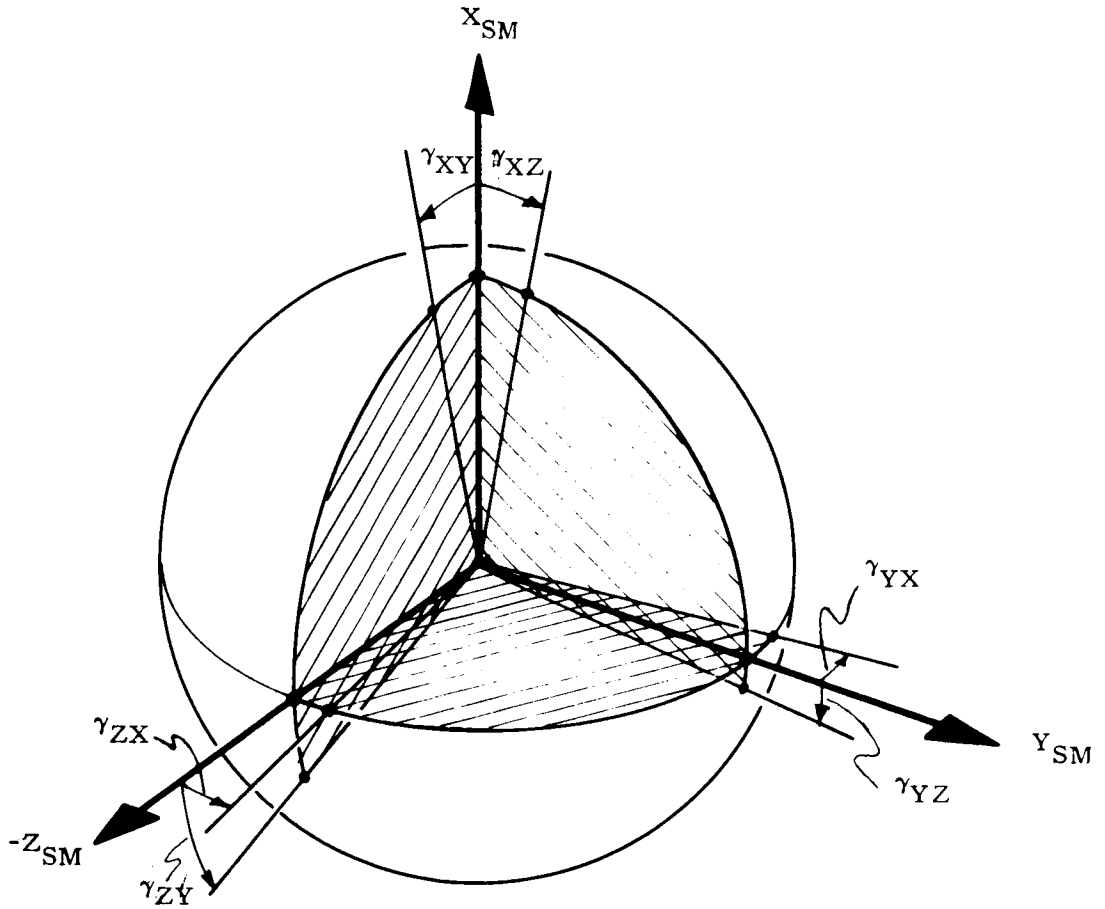
DEFINITION OF POSITIVE SENSE

GIMBAL AXIS ORTHOGONALITY
and
OUTER GIMBAL ALIGNMENT
with respect to
CASE MOUNTING ALIGNMENT

Fig. 7-8

Gimbal Axis Orthogonality Errors and Outer Gimbal Misalignment from Case-Mounting Axes (See Fig. 7-8 for Definition of Positive Sense)

Term	Angle in Sec IMU 6	IMU 11
ϵ_{IGA}	+23	+21
ϵ_{MGA}	+5	-2
ϵ_{FLY}	+28	+3
ϵ_{FLZ}	-2	+5



	IA	OA	SRA
X IRIG	$+X_{SM}$	$+Z_{SM}$	$-Y_{SM}$
Y IRIG	$+Y_{SM}$	$+X_{SM}$	$-Z_{SM}$
Z IRIG	$-Z_{SM}$	$+X_{SM}$	$-Y_{SM}$

IRIG ORIENTATION

Block II G&N
DEFINITION OF POSITIVE SENSE
IRIG INPUT-AXIS MISALIGNMENTS
with respect to
IDEAL STABLE MEMBER AXES

Fig. 7-9

IRIG Misalignments from Ideal Stable Member Axes (See Fig. 7-9 for Definition of Positive Sense)

Term	Angle in $\widehat{\text{Sec}}$ IMU 6	IMU 11
γ_{XY}	-19	-28
γ_{XZ}	-50	-100
γ_{YZ}	+19	-28
γ_{YX}	-128	+42
γ_{ZX}	-115	-34
γ_{ZY}	+87	-58

LM-1
G&N 603
IMU S/N 6

	IRIGs	PIPAs
X	7A103	2AP168
Y	7A132	2AP163
Z	7A81	2AP213

LM-1
Spare
IMU S/N 11

	IRIGs	PIPAs
X	7A195	2AP196
Y	7A177	2AP249
Z	7A171	3AP301

Dictionary of Terms

ACC	Acceptance of Data
ACD	After Cooldown
ADOA	Acceleration Sensitive Drift Due to Acceleration along the OA
AV ACC	Average of Acceptance Data
AV RT	Average of Retest Data
Blank	12 Day Storage
BIA	Bias Adjusted
BCSW	Binary Current Switch
CRQ	Component Requalification
CDN	Post Cooldown
CVR	Component Verification
DGI	Degaussed IRIG
DGS	Degaussed
G&N	Guidance & Navigation System Measurement
GP	Gaussed PIPAs
HBS	Hi Buss Voltage
I&A	Inspection and Acceptance
IG CDU PROBLEM	Inner Gimbal CDU Problem
KSC	Kennedy Space Center
LBS	Lo Buss Voltage
LNO	Loop Not Open
NAA	North American Aviation
NBS	Nominal Buss Voltage
OOS	Out of Spec
PRE ACC	Pre Acceptance Data
RESIS CHG	Resistor Changed
RET	Retest
S/C	Spacecraft
SCK	ISS Check
SF, SFA	Scale Factor, Scale Factor Adjusted
SPO	ISS Post Vibration
SPR	ISS Pre Vibration
SVM	ISS Post Visual/Mechanical Inspection
VIB	After Vibration
WCM	Recheck After Welding Calibration Module
5PT	5 Point Test

NASA 7A-103 ACE H-223-1

NASA ACC	TEMP SENS	MAX SD OF 1 DEG PTS	THERM AT 135	SUS CAP MOD SG	TG	RAW XFR FUNCTION	AVG RDT	RDT SD	ACCEP WH HR	THERM PAD SG	XFR FUNC TG RESISTOR	BIAS RES	TORQR RES +	-
29MR66	0.2	1.4	663.7	.0505		10.2	117	1.4	569	106	36	138	318	324

DA MO YR	LOC	TYP	ASSN	WHEEL HOURS	NBD	ADSRA	ADIA	ID	RDT	DELSF+	DELSF-	I+	I-	ADOA	NOTES
9/FE/66	A44	CA1		-	2.3	2.9	- 10.0			- 444	229	84.995	84.996		
9/FE/66	A44	CA2		-	2.1	2.7	- 9.4								
9/FE/66	A44	CA3		536 -	2.3	2.8	- 8.2	13.5	116						
12/FE/66	A44	CB1		-	1.9	2.9	- 5.8			- 496	198	84.995	84.997		ACD
12/FE/66	A44	CB2		-	2.1	3.2	- 9.0								
13/FE/66	A44	CB3		552 -	2.3	3.1	- 7.5	13.8	118						
21/FE/66	A44	CC1		-	1.2	4.3	- 7.4			- 786	- 125	84.995	84.996		ACD
21/FE/66	A44	CC2		-	1.9	4.0	- 6.1								
21/FE/66	A44	CC3		569 -	1.9	4.0	- 5.2	14.2	118						
5/JL/66	A45	CRT		-	0.8	3.3	1.8			580	717	85.003	85.003		
5/JL/66	A45	CRT		-	1.0	3.5	2.1								
6/JL/66	A45	CRT		655 -	1.0	3.4	1.6	13.7	119						
4/AU/66	A46	CRT		-	1.5	3.9	4.3			563	577	85.001	85.000		
4/AU/66	A46	CRT		-	2.0	3.8	4.0								
4/AU/66	A46	CRT		677 -	2.0	3.4	4.3	13.1	114						
													ADIA SHIFT		
9/AU/66															
										11AU66 IMU 17 ENTERED G+N 207					
15/SE/66	A03	SPR	207Y	-	2.5	2.8									
15/SE/66	A03	SPR	207Y	-	2.7		8.5			441	384				
3/OC/66	A03	SPR	207Y	-	5.5	4.0									RET
3/OC/66	A03	SPR	207Y	-	4.6		5.6								
21/OC/66	A03	SPR	207Y	-	3.7	3.5									
25/OC/66	A03	SPR	207Y	1172 -	3.9		- 33.2			394	561	85.012	85.012		NBS,OOS
								26OC66 RMV 7A-103 FROM IMU 17 IN G+N 207							
5/NO/66	AR1	CVR		-	3.3	3.6	- 25.1								
5/NO/66	AR1	CVR		-	3.1	3.8	- 24.9								
5/NO/66	AR1	CVR		1188 -	3.4	4.0	- 24.1	14.1	122						
7/NO/66	AR1	CVR		-	1.8	3.4	- 26.2								
7/NO/66	AR1	CVR		1196 -	2.2	3.8	- 25.5								
7/NO/66	AR1	CVR		-	2.3	3.8	- 24.9	14.9	125						
								8NO66 7A-103 REINSTALLED IN IMU 17 IN G+N 207							
25/NO/66	A01	SPR	207Y	-	4.9	5.5									RET
25/NO/66	A01	SPR	207Y	-	5.6		- 25.5			240	394	85.013	85.013		
13/DE/66	A04	SPO	207Y	-	4.9	1.9									
13/DE/66	A04	SPO	207Y	-	5.8		- 32.6			307	384	85.014	85.014	0.89	NBS
						23DE66 SYS WAIVED,ADIA OOS,26DE66 IMU 17 ENTERED G+N 204									
28/DE/66	N02	G+N	204Y	-	4.7	0.7	- 6.1			643	49				
29/DE/66	N02	G+N	204Y	-	5.1		- 29.4								
29/DE/66	N02	G+N	204Y	-	4.5	1.3	- 26.1								RERUN
30/DE/66	N02	G+N	204Y	-	6.7		- 26.8								
										11JA67 G+N 204 ENTERED S/C 101					
17/JA/67	N3	GSC	204Y	1600 -	1.5 -	0.3	- 41.1			335	908			1.92	
27/JA/67				1605											
										ADOA - 5FE67 1.31, 11MR67 0.46					
29/AP/67				1607											

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CONTINUED NASA 7A-103 ACE H-223-1

DA MO YR	LOC	TYP	ASSN	WHEEL HOURS	NBD	ADSRA	ADIA	ID RDT	DELSF+	DELSF-	I+	I-	ADOA	NOTES
								29AP67 RMV IMU 17 FROM S/C,RETURNED TO LAB						
14/JE/67														
								14JE67 END CAP RETROFIT 15G VIB.CHG R3.NEW VALUE 773.0						
14/JE/67	A45	CRO		-	2.2	5.3	- 31.2		-	589	546	85.004	85.007	
14/JE/67	A45	CRO		-	2.2	5.2	- 31.4							
14/JE/67	A45	CRO		1650 -	2.2	5.1	- 32.1	12.6 118						
												20JE67 ENTERED IMU 6		
23/JE/67	A17	SCK	X	-	5.4	5.4								
23/JE/67	A17	SCK	X	-	4.9		- 36.4		-	393	93	85.006		
31/JL/67	K11	SCK	X	-	6.1	5.1								
31/JL/67	K11	SCK	X	-	6.2		- 39.2		-	306	260	85.007		
										G&N 603 ENTERED SPACECRAFT LM1				
6/AU/67	K	GSC	603X	-	5.1	5.8	- 38.9							
18/SE/67				2041										
26/NO/67	K	GSC	603X	-	4.4	7.1	- 39.6							
26/NO/67	K	GSC	603X	-	5.1		- 42.2							
26/NO/67	K	GSC	603X	-	5.6	7.7	- 26.0							
5/DE/67	K	GSC	603X	-	10.3		- 7.0							
5/DE/67	K	GSC	603X				- 11.0							
5/DE/67	K	GSC	603X				- 62.6							

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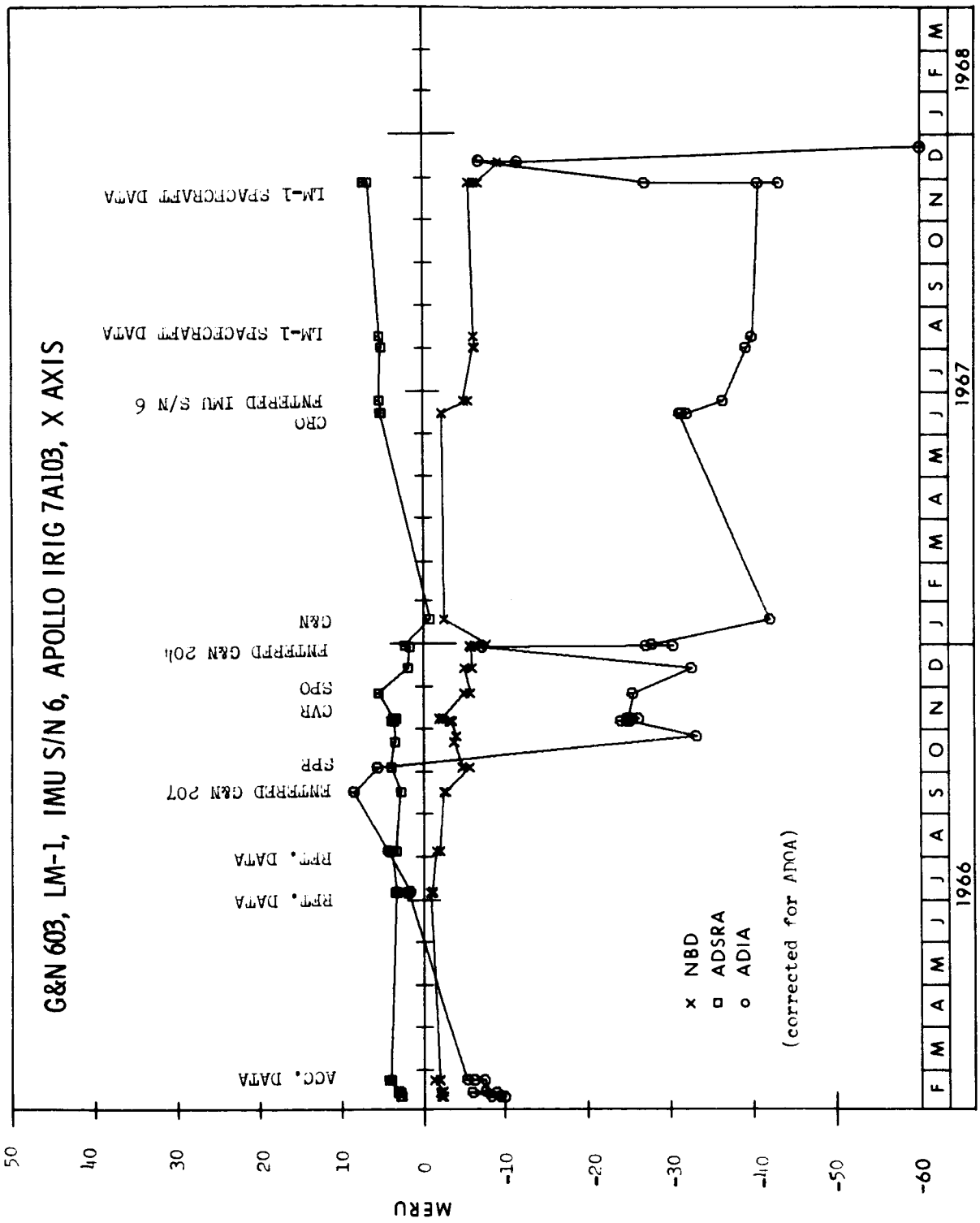

Fig. 7-10 Drift Plotted by Time

NASA ACC	TEMP SENS	MAX SD OF 1 DEG PTS	THERM AT 135	SUS CAP SG	MOD TG	RAW XFR FUNCTION	AVG RDT	RDT SD	ACCEP WH HR	THERM PAD SG	XFR FUNC TG	RESISTOR	BIAS RES	TORQR RES +	TORQR RES -
6MY66	0.2	0.4	705.2	.0491		8.9	156	3.9	353	66		34	571	173	174

DA MO YR	LOC	TYP	ASSN	WHEEL HOURS	NBD	ADSRA	ADIA	ID RDT	DELSF+	DELSF-	I+	I-	ADOA	NOTES
15/AP/66	A44	CVA			-0.2	2.8 - 7.8			-462	297	84.997	84.997		
15/AP/66	A44	CA1			0.0	2.6 - 8.6			-210	287	84.997	84.996		
16/AP/66	A44	CA2		324	0.1	2.5 - 8.7		1.3 159						
16/AP/66	A44	CA3			0.7	1.4 - 9.7			-407	167	84.997	84.997		ACD
17/AP/66	A44	CB1			1.1	1.4 - 9.4								
17/AP/66	A44	CB2		338	1.6	1.2 - 9.5		3.6 160						
18/AP/66	A44	CB3			-0.8	2.0 - 13.1			-276	58	84.997	84.997		ACD
19/AP/66	A44	CC1			-1.1	1.6 - 9.0								
19/AP/66	A44	CC2		352	-0.6	1.3 - 10.5		0.4 154						
19/AP/66	A44	CC3			1.0	2.6 - 4.7			82	341	85.003	85.001		
15/JL/66	A45	CRT			1.0	2.3 - 8.7			-218	314	85.003	85.001		
15/JL/66	A45	CRT		422	1.6	2.6 - 8.4		2.8 161						
15/JL/66	A45	CRT			-1.5	5.7 - 4.7								
15/AU/66	A46	CRT			-1.4	5.5 - 9.3								
15/AU/66	A46	CRT		457	-1.4	4.3 - 10.1		-0.6 165						
15/AU/66	A46	CRT						19AU66	IMU 15 ENTERED G+N 607 TO RPL 7A-44					
30/SE/66				636										
				RMV IMU15,X FROM G+N607,SHORT IN END CAP FROM PREAMP HI TO HEATER LO										
27/MR/67	A44	CVR		703				163						
									PRE-AMP FAILURE					
17/JE/67														
									END CAP RETROFIT					
17/JE/67	A44	CRO			-0.8	-1.7 - 20.0			-65	-16	85.008	85.008		
17/JE/67	A44	CRO			-0.6	-1.5 - 18.1								
17/JE/67	A44	CRO		725	-0.5	-1.7 - 19.4		2.6 169						
21/JE/67	A44	CRO			-1.0	-0.2 - 22.3			-230	-60	85.008	85.008		
21/JE/67	A44	CRO			-1.0	0.0 - 21.4								
21/JE/67	A44	CRO		737	-0.9	-0.4 - 19.5		2.6 170						
3/JL/67														
									3JL67 ENTERED IMU 6					
17/JL/67	A08	SCK	Y		-1.8	1.2								
17/JL/67	A08	SCK	Y		-2.0		-19.6		-550	-440	85.006		1.57	
31/JL/67	K11	SCK	Y		-0.7	0.3								
31/JL/67	K11	SCK	Y		0.1		-26.7		-616	-349	85.007		0.87	
5/AU/67									G+N 603 ENTERED SPACECRAFT LM1					
6/AU/67	K	GSC	603Y		-3.3	0.7 - 6.4								
6/AU/67	K	GSC	603Y		-0.2		-16.5							
6/AU/67	K	GSC	603Y		-1.6		-22.6							
18/SE/67				1128										
26/NO/67	K	GSC	603Y		-5.1	6.0 - 21.2								
26/NO/67	K	GSC	603Y		-5.6									
26/NO/67	K	GSC	603Y		-4.8									

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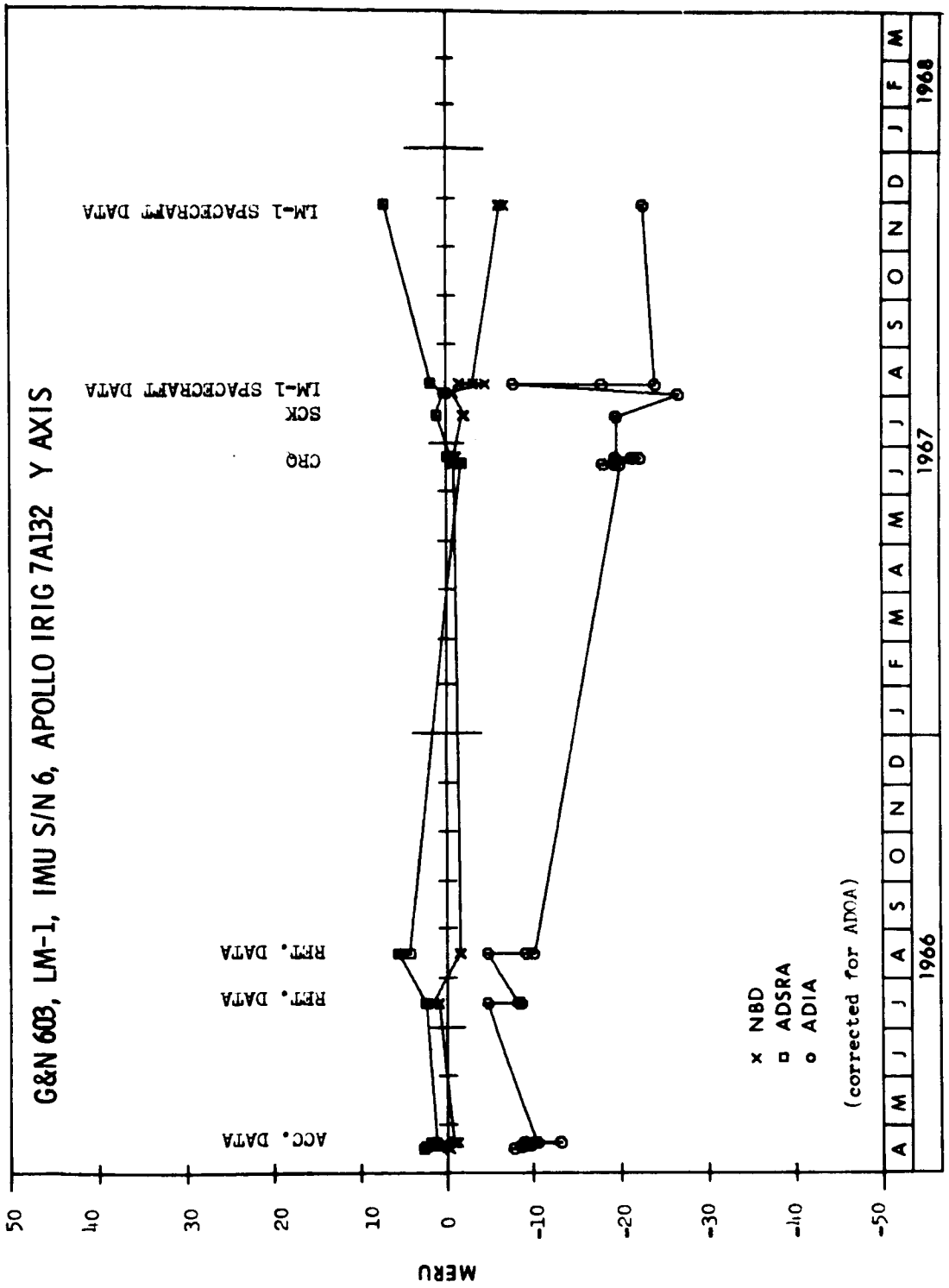

Fig. 7-11 Drift Plotted by Time.

NASA ACC	TEMP SENS	MAX SD OF 1 DEG PTS	THERM AT 135	SUS CAP MOD SG	TG	RAW XFR FUNCTION	AVG RDT	RDT SD	ACCEP WH HR	THERM PAD SG	TG	XFR FUNC RESISTOR	BIAS RES	TORQR RES +	-
1FE66	0.1	2.8	702.4	.0469		9.3	137	4.6	292	62		33	200	196	200

DA MO YR	LOC	TYP	ASSN	WHEEL HOURS	NBD	ADSRA	ADIA	ID	RDT	DELSF+	DELSF-	I+	I-	ADOA	NOTES
3/JA/66	A45	CA1			0.9 -	1.2 -	3.0			- 380	44	85.003	85.004		
4/JA/66	A45	CA2			0.8 -	0.9 -	6.2								
4/JA/66	A45	CA3		261	0.7 -	0.9 -	2.0	- 12.1	133	- 314	65	85.004	85.005		ACD
6/JA/66	A45	CB1			1.8 -	0.9	2.4								
6/JA/66	A45	CB2			1.9 -	0.9	1.1								
6/JA/66	A45	CB3		274	2.1 -	0.8	0.1	- 11.4	137	- 342	171	85.011	85.008		ACD
24/JA/66	A45	CC1			1.3 -	0.2	4.0								
24/JA/66	A45	CC2			1.5 -	0.3	3.0								
25/JA/66	A45	CC3		292	1.6 -	0.4	8.1	- 11.0	127	- 55	- 212	85.002	85.001		
22/AU/66	A46	CRR			2.7	0.8 -	1.1							CHG R5	
22/AU/66	A46	CRR			2.9	0.5 -	6.9								
22/AU/66	A46	CRR		374	2.8	0.4 -	5.2	- 11.0	133	- 10	- 318	85.005	85.004		
5/SE/66	A45	CRT			1.1 -	0.1 -	1.4								
5/SE/66	A45	CRT			1.3 -	0.2	1.9								CHG R5.
5/SE/66	A45	CRT		395	1.2 -	0.3	0.4	- 12.0	138						
										70C66 ENTERED IMU 17 IN G+N 207					NBS
24/OC/66	A03	SPR	207Z		2.0 -	0.6									
24/OC/66	A03	SPR	207Z		1.8		- 13.4			73 -	750	82.602	82.602		
														ADIA OOS	
25/OC/66	A03	SPR	207Z	578	1.8		- 12.2								
										RMV FOR ENG EVALUATION					
5/NO/66	AR1	CVR			6.0	1.0 -	13.8								
5/NO/66	AR1	CVR			3.2 -	1.0 -	11.3								
5/NO/66	AR1	CVR			6.0	1.3 -	15.3	- 9.2	140						
7/NO/66	AR1	CVR			4.8	0.2 -	6.5								
7/NO/66	AR1	CVR			5.3 -	0.2 -	7.0								
7/NO/66	AR1	CVR			5.4	1.5 -	6.4								
7/NO/66	AR1	CVR		618	5.5	0.0 -	5.6		139						RET
25/NO/66	A01	SPR	207Z		2.4 -	1.5									
25/NO/66	A01	SPR	207Z		3.6		- 8.2			240 -	660	85.012	85.013		
13/DE/66	A04	SPO	207Z		2.5 -	1.4									
13/DE/66	A04	SPO	207Z		3.9		- 10.7			227 -	727	85.013	85.013		NBS
										23DE66 SYS WAIVED,ADIA OOS,26DE66 IMU 17 ENTERED G+N 204					
28/DE/66	N02	G+N	204Z		- 0.9 -	3.6	4.1			- 903 -	81			2.24	
29/DE/66	N02	G+N	204Z		- 1.4 -	4.6	3.4								RERUN
30/DE/66	N02	G+N	204Z		- 1.4 -	2.0									
										11JA67 G+N 204 ENTERED S/C 101					
17/JA/67	N3	GSC	204Z		1.0 -	5.3	4.4			- 862 -	76			0.93	
27/JA/67				1051											
										ADOA - 5FE67 0.72, 11MR67 1.24					
29/AP/67				1053											
										29AP67 RMV IMU 17 FROM S/C,RETURNED TO LAB					
14/JE/67															
										14JE67 END CAP RETROFIT 15G VIB,CHG R3,NEW VALUE 767.5					
15/JE/67	A41	CRO			0.7 -	0.8	7.1			179 -	112	85.011	85.010		

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DA MO YR	LOC	TYP	ASSN	WHEEL HOURS	NBD	ADSRA	ADIA	ID	RDT	DELSF+	DELSF-	I+	I-	ADOA	NOTES
15/JE/67	A41	CRO			1.0	- 0.4	3.1								
15/JE/67	A41	CRO		10[illegible]1	0.5	- 0.9	0.1	- 10.5	145						
															20JE67 ENTERED IMU 6
24/JE/67	A17	SCK	Z		1.6	- 0.6									
24/JE/67	A17	SCK	Z		2.3		- 7.6					227 -	974	85.005	
31/JL/67	K11	SCK	Z		1.3	0.4									
31/JL/67	K11	SCK	Z		2.0		- 1.3					250 -	1027	85.007	
5/AU/67															G+N 603 ENTERED SPACECRAFT LM1
6/AU/67	K	GSC	603Z		- 9.4	- 4.1	- 5.2								
6/AU/67	K	GSC	603Z		- 4.6										
6/AU/67	K	GSC	603Z		- 9.5										
18/SE/67				1482											
26/NO/67	K	GSC	603Z		- 4.9	- 6.6	- 7.9								
26/NO/67	K	GSC	603Z		- 3.2										
26/NO/67	K	GSC	603Z		- 3.4										

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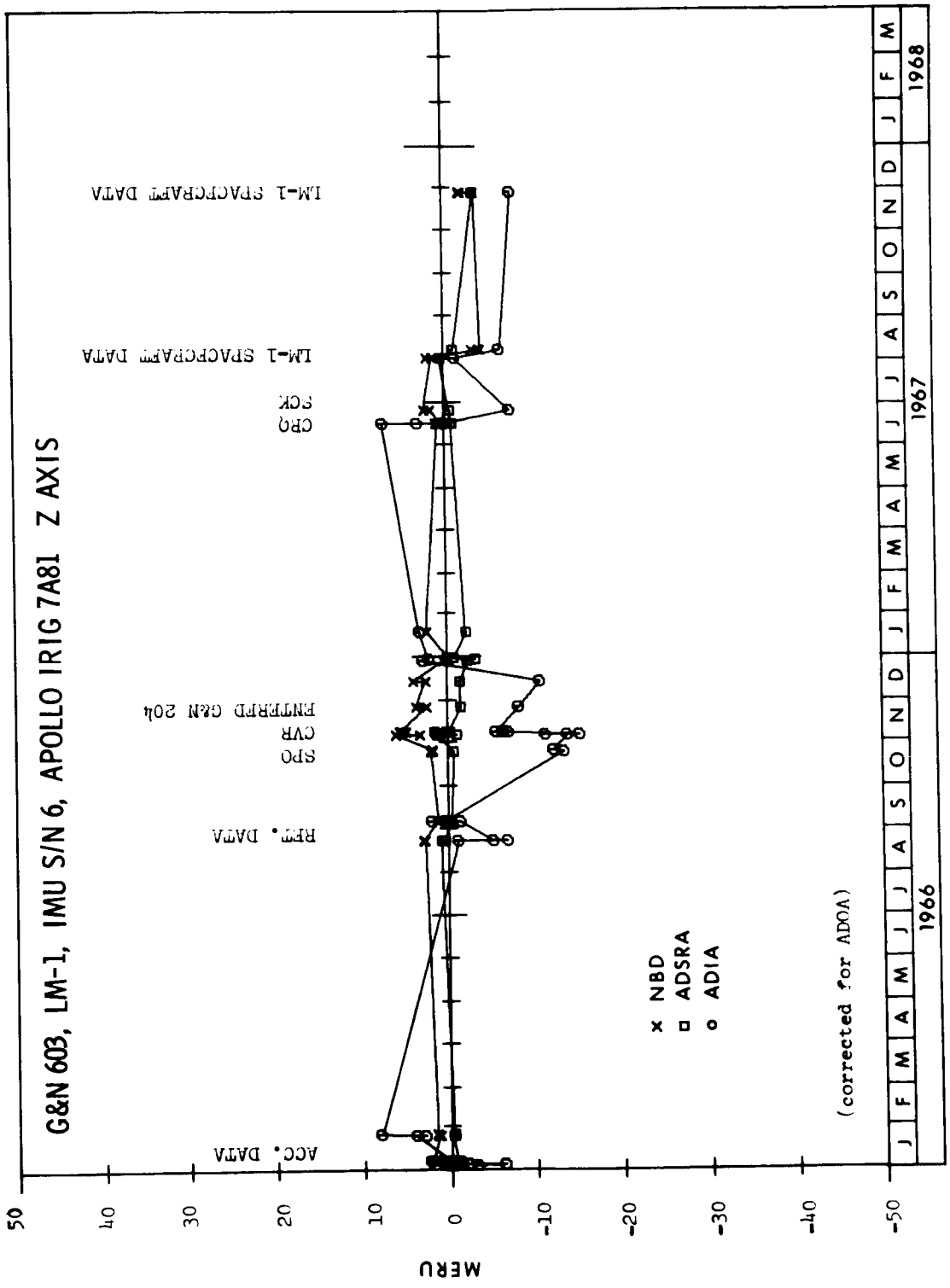

Fig. 7-12 Drift Plotted by Time.

DATE	MOD	C3	C4	R13	R14	R11	R12	R5	R6
11MR66	13	.00348	.00348			140.725	29.209	103.75	96.25

DA MO YR	LOC	TYP	ASSN	CLOSD HOURS	=-----1G-------- ITM	DELSF	CBIAS	NBIAS	NC	AR	AW	AAS	---------DEVIATIONS---------- IA	NB	ITM	PVR	SF	CT	CB	MD	NOTES
21/DE/65	S48	ACC		36	103.1287	= 704		0.00	4			4.0	5.0	-.06	2	1	6	5		33	
11/MR/66	A45	R&I		36																	
11/MR/66	A45	I&A		43	43.2549	= 148	-0.03	0.0	- 9												
13/MR/66	A45	I&A		66						5	8										
14/MR/66	A45	I&A		75						6	8										
14/MR/66	A45	I&A		80	43.2514	40	-0.10	-0.02													
15/MR/66	A45	I&A		89	43.2512	20	-0.02	-0.02													
15/MR/66	A45	I&A		93									- 2.0	.01	6	-28	78		-.08		
15/MR/66	A45	I&A		101	43.2528	168	-0.08	-0.04		- 5	- 5										SF&BIA
											11AP66 IMU 6 ENTERED G+N 603										
19/AP/66	A08	SPR	603X		43.2260	85	-0.01	-0.06													SF&BIA
4/MY/66	A08	SPO	603X					0.17		- 1	1										
5/MY/66	A08	SPO	603X		43.2288	20	0.19	0.13													NBS
6/MY/66	A08	SPO	603X		43.2267	24	0.24	0.24													LBS
10/MY/66	A08	SPO	603X		43.2298	= 10	0.22	0.19													HBS
18/MY/66	A08	SPO	603X					0.48		- 7											RET
													RET AFTER ENGR INVEST								
11/JE/66	A08	SPO	603X					-0.12		17	6										RET
12/JE/66	A08	SPO	603X		43.2270	= 20	-0.04	-0.04													NBS
1/JL/66	A19	SCK	603X					0.32		- 4	0										
6/JL/66	G20	G+N	603X		43.2280	= 99	0.42														
6/JL/66	G20	G+N	603X			= 97															
7/JL/66	G20	G+N	603X			= 101	0.40														
16/AU/66	G20	SCK	603X					0.29													
30/AU/66	G20	SCK	603X					0.36													
31/AU/66	G20	SCK	603X					0.57													OOS
6/SE/66				721																	
											24JA67 IMU 6 ENTERED G+N 606										
3/FE/67	G20	SCK	606X		43.2225	= 159	0.09	0.03													
13/FE/67	G	G+N	606X		43.2228	= 116	0.05														
31/MR/67				834																	
11/AP/67	G	SCK	606X					0.15		- 6											VOID
11/AP/67	G	SCK	606X					0.15		1	- 1										
											14AP67 IMU 6 ENTERED G+N 605										
16/JE/67				939																	
												16JE67 IMU 6 LEFT G+N 605										
26/JE/67	A17	SCK	X		43.2264	= 385	0.35	0.34													
26/JE/67	A17	SCK	X					0.38		-12	- 1										
17/JL/67	A08	SCK	X		43.2276	= 246	0.22	0.14													
18/JL/67	A08	SCK	X					0.18		6	3										
31/JL/67	K11	SCK	X		43.2263	= 340	0.23	0.18													
1/AU/67	K11	SCK	X					0.23		- 2											
4/AU/67																					
											4AU67 IMU 6 ENTERED G+N 603										
5/AU/67																					
										G+N 603 ENTERED SPACECRAFT LM1										

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DA MO YR	LOC	TYP ASSN	CLOSD HOURS	ITM	DELSF	CBIAS	NBIAS	NC	AR	AW	AAS	IA	NB	ITM	PVR	SF	CT	CB	MD	NOTES
					==========1G=========							---------DEVIATIONS---------								
6/AU/67	K	GSC 603X			= 227	0.20														
18/SE/67			1330																	
26/NO/67	K	GSC 603X			- 343	0.11														
26/NO/67	K	GSC 603X			- 147	0.16														
26/NO/67	K	GSC 603X			- 167															

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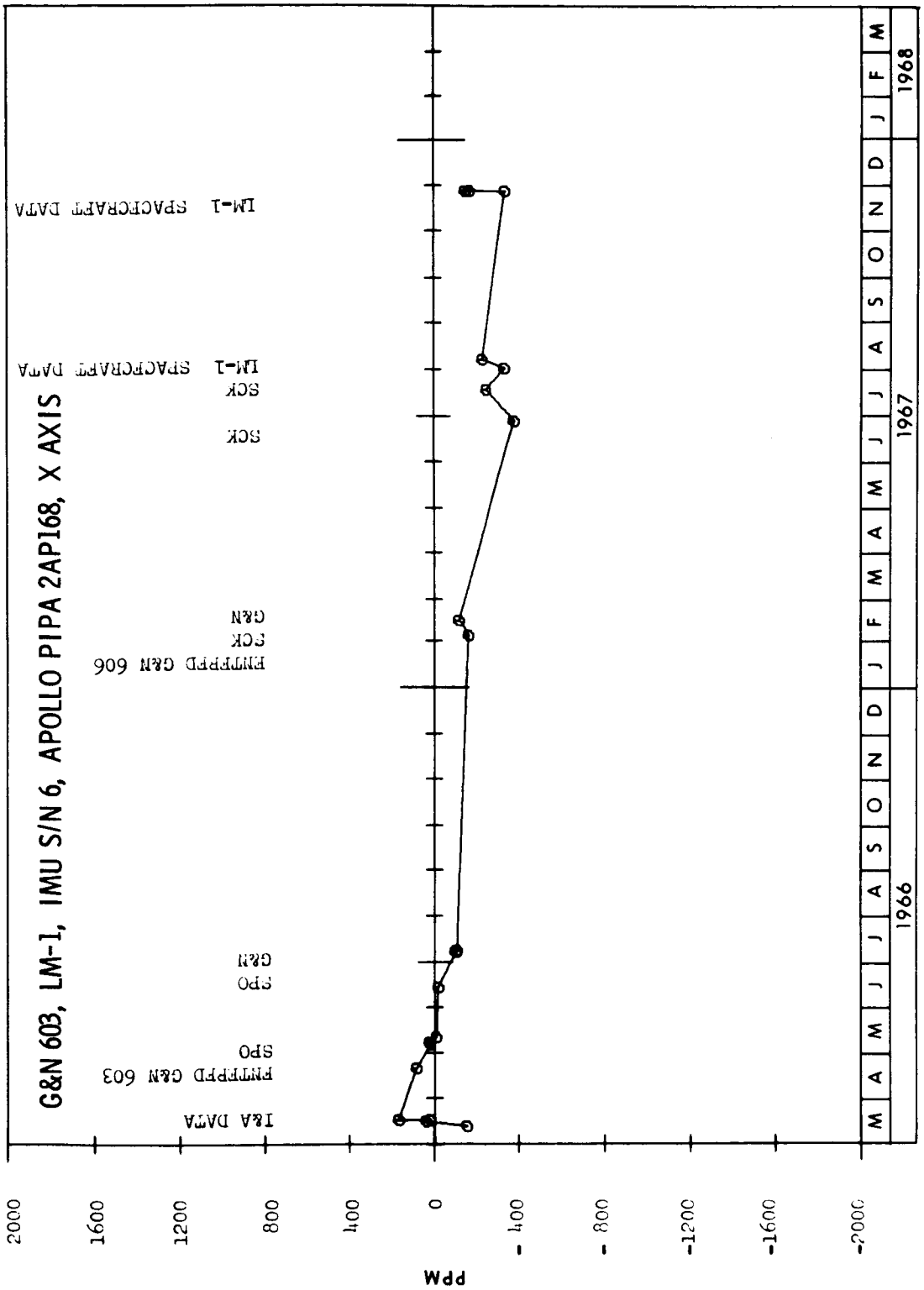

Fig. 7-13 Delta Scale Factor/Scale Factor Plotted by Time.

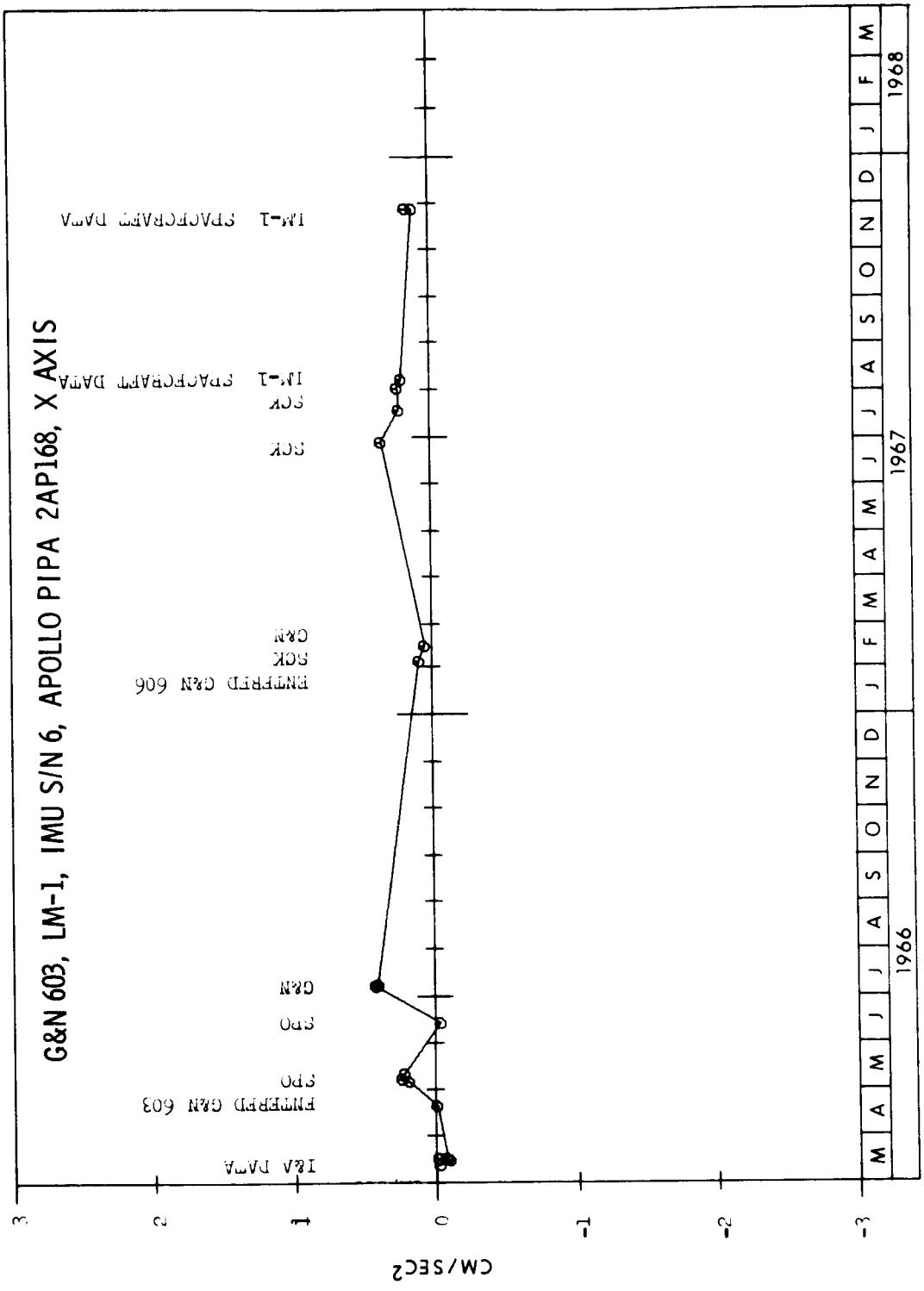

Fig. 7-14 1g Bias Plotted by Time.

DATE	MOD	C3	C4	R13	R14	R11	R12	R5	R6
11MR66	18	.00326	.00326		746	140.725	17.525	102.50	97.50

DA	MO	YR	LOC	TYP	ASSN	CLOSD HOURS	ITM	DELSF	CBIAS	NBIAS	NC	AR	AW	AAS	IA	NB	ITM	PVR	SF	CT	CB	MD	NOTES
							---------10--------								---------DEVIATIONS---------								
1	DE	65	S46	ACC		62	103,4030	= 156		0.00	4			2.2	- 8.5	-.04	- 5	6	- 19	11		33	
13	FE	66	A48	R&I		62								4.0									
11	MR	66	A48	I&A		78	43.3977	154	0.00	0.02	1												
11	MR	66	A48	I&A		82					1												
13	MR	66	A45	I&A		86	43.3964	270	.08	-0.00	- 2												
16	MR	66	A45	I&A		96						- 5	-12										
16	MR	66	A45	I&A		106						-13	-15										
16	MR	66	A45	I&A		115	43.3930	= 19	0.04	-0.01					- 1.0	.03	21	- 5	67		-.08		
18	MR	66	A45	I&A		119						5	-23										
18	MR	66	A45	I&A		121	43.3936	26	0.02	0.03													SF&BIA
														11AP66 IMU 6 ENTERED G•N 603									
19	AP	66	A08	SPR	603Y		43,3603	= 34	-0.02	0.02													SF&BIA
4	MY	66	A08	SPO	603Y					-0.46		- 9	- 6										
6	MY	66	A08	SPO	603Y		43,3563	30	-0.04	-0.04													SF&BIA
9	MY	66	A08	SPO	603Y		43,3661	= 32	-0.20	-0.29													NBS
9	MY	66	A08	SPO	603Y		43,3648	= 45	-0.18	-0.17													LBS
10	MY	66	A08	SPO	603Y		43,3682	26	-0.13	-0.11													HBS
24	MY	66	A08	SPO	603Y		43.3667	19	-0.18	-0.21													NBS,RET
12	JE	66	A08	SPO	603Y					0.83			- 5										AR IS 128
12	JE	66	A08	SPO	603Y		43,3647	30	0.05	0.85													RET,NBS
13	JE	66	A08	SPO	603Y					0.06		6											
13	JE	66	A08	SPO	603Y					0.06													RET
1	JL	66	A19	SCK	603Y					0.10		1	- 4										
6	JL	66	G20	G•N	603Y		43.3640	= 73	0.37														
7	JL	66	G20	G•N	603Y			= 119	0.45														
4	SE	66	G20	SCK	603Y		43,3650	= 76	0.36	0.36													
6	SE	66				848																	
														24JA67 IMU 6 ENTERED G•N 606									
3	FE	67	G20	SCK	606Y		43.3596	= 217	-0.06	0.02													
13	FE	67	G20	G•N	606Y		43.3593	14	0.14														
31	MR	67				961																	
12	AP	67	G	SCK	606Y					-0.19		-12	- 4										
														14AP67 IMU 6 ENTERED G•N 605									
16	JE	67				1066																	
														16JE67 IMU 6 LEFT G•N 605									
26	JE	67	A17	SCK	Y		43,3630	= 263	0.01	0.07													
26	JE	67	A17	SCK	Y					-0.04		-13	- 4										
17	JL	67	A08	SCK	Y		43,3642	= 232	-0.17	-0.17													
17	JL	67	A08	SCK	Y					-0.23		-10	- 4										
31	JL	67	K11	SCK	Y		43,3621	= 235	-0.06	-0.08													
4	AU	67																					
														4AU67 IMU 6 ENTERED G•N 603									
5	AU	67																					
														G•N 603 ENTERED SPACECRAFT LM1									
6	AU	67	K	GSC	603Y			= 145	-0.12														
18	SE	67				1457																	

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DA	MO	YR	LOC	TYP	ASSN	HOURS	ITM	DELSF	CBIAS	NBIAS	NC	AR	AW	AAS	IA	ITM	PVR	SF	CT	CB	MD	NOTES
26	NO	67	K		GSC 603Y			-270	-0.12													

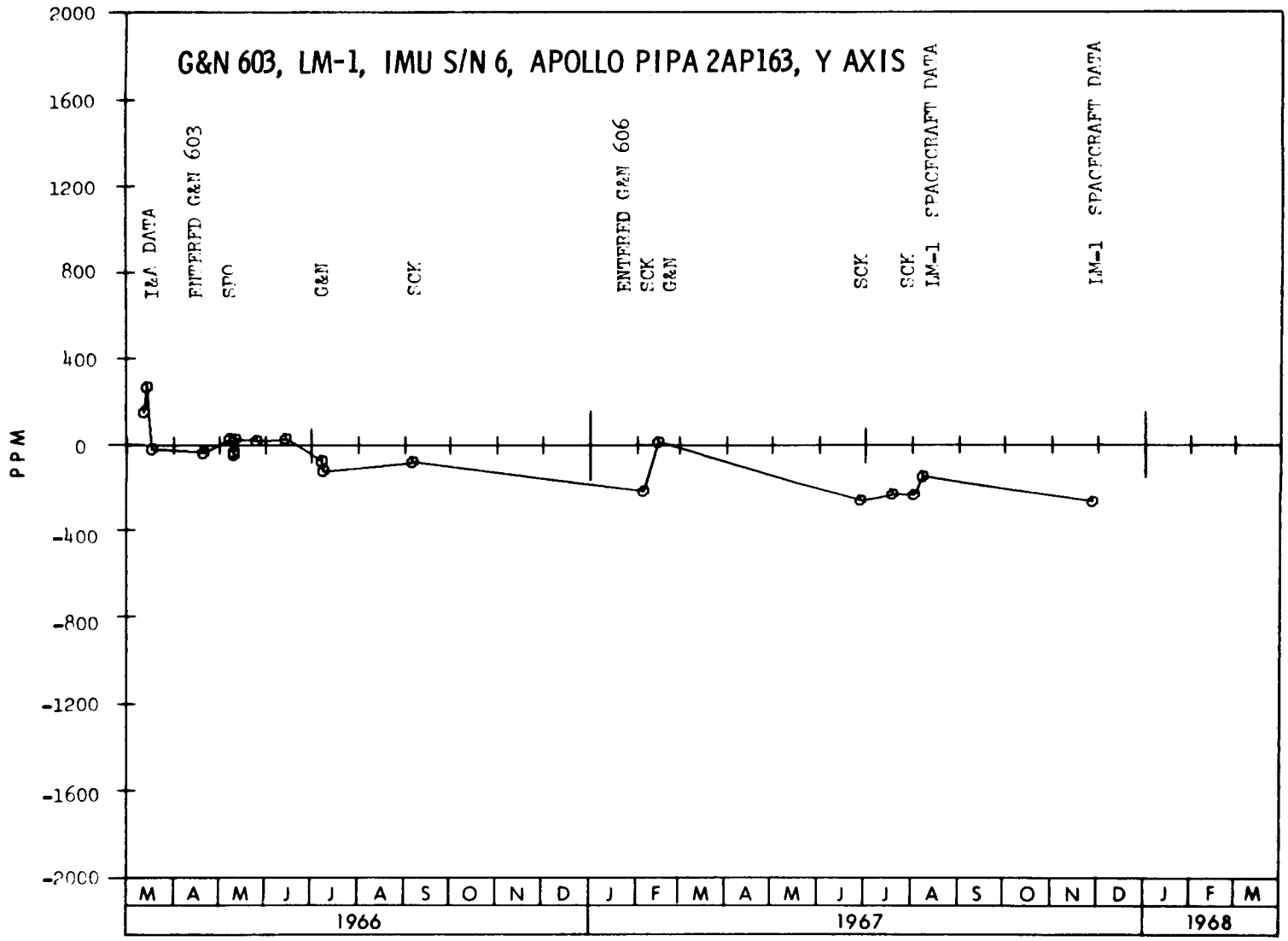

Fig. 7-15 Delta Scale Factor/Scale Factor Plotted by Time.

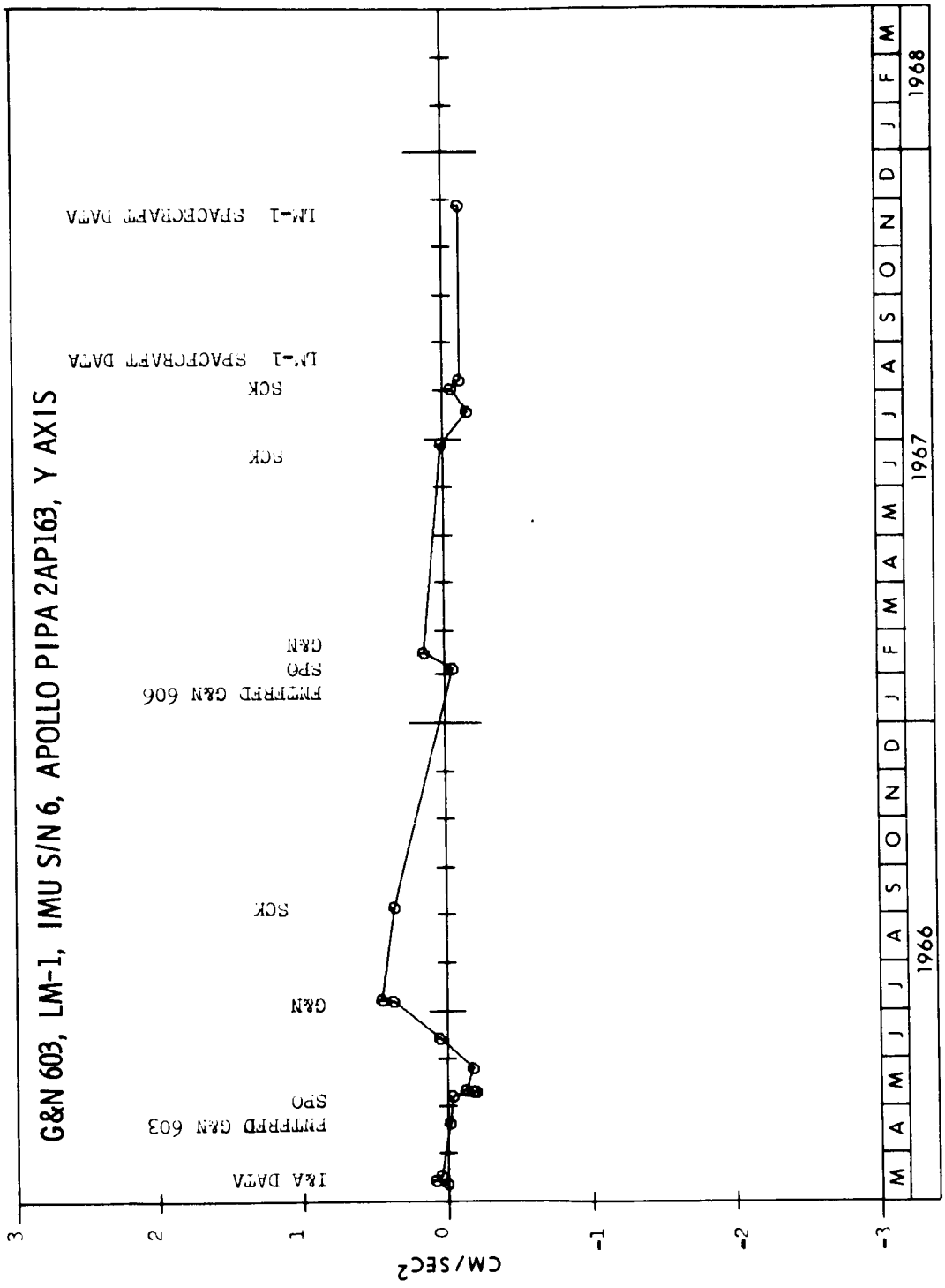

Fig. 7-16 1g Bias Plotted by Time.

DATE	MOD	C3	C4	R13	R14	R11	R12	R5	R6
5MY66	C15	.0037	.0037			139.397	87.627	102.5	97.5

DA	MO	YR	LOC	TYP	ASSN	CLOSD HOURS	ITM	DELSF	CBIAS	NBIAS	NC	AR	AW	AAS	IA	NB	ITM	PVR	SF	CT	CB	MD	NOTES
							=-------10--------								---------DEVIATIONS----------								
3/MR/66			S48	ACC		11	103.8710 =	12		0.0	1			2.8	- 2.0	-.03	3	0	57	10		33	
5/MY/66			A48	I&A		31	43.5135	280	-0.43	0.01	5												
5/MY/66			A48	I&A		32					6												
6/MY/66			A48	I&A		35	43.5092 =	46	0.02	-0.01	7												
6/MY/66			A48	I&A		45						1	- 5										
6/MY/66			A48	I&A		57						- 2	-10										
7/MY/66			A48	I&A		69	43.5098	42	-0.01	0.01					-24.0	.00	- 15	12	4		-.10		
7/MY/66			A48	I&A		71						3	- 8										
8/MY/66			A48	I&A		72	43.5116	179	0.02	0.02													
														R7#12 TURNS FROM CW LIMIT									
16/JE/66														16JE66 IMU 11 ENTERED G+N 605									
23/JE/66			A19	SPR	605Z	142	43.4986 =	11	-0.00	0.04												ADJ	
12/JL/66			A19	SPO	605Z	256				-0.08		19											
13/JL/66			A19	SPO	605Z		43.4945 =	100	0.07	0.06												NBS	
13/JL/66			A19	SPO	605Z		43.4940 =	108	0.06	0.06												LBS	
13/JL/66			A19	SPO	605Z	294	43.4943 =	50	0.06	0.07												HBS	
3/AU/66			A19	G+N	605Z		43.4913	30	-0.05														
														RPL OF Y PIPA PRE-AMP									
8/AU/66			A19	SCK	605Z					-0.04		23											
														RET PER APM 13307									
16/NO/66			G20	SCK	605Z		43.4910 =	6	-0.01	0.06												SF+BIA	
19/NO/66			G20	SCK	605Z		43.4939	70	-0.10	0.07												NBS	
														POST TEMP CYCLE									
19/NO/66			G20	SCK	605Z		43.4942	88	-0.08	0.08												LBS	
														POST TEMP CYCLE									
19/NO/66			G20	SCK	605Z		43.4938	99	-0.11	0.08												HBS	
														POST TEMP CYCLE									
28/NO/66			G20	SCK	605Z		43.4936 =	9	0.12	0.18												NBS	
29/NO/66			G20	SCK	605Z		43.4944 =	148	-0.05	0.11												LBS	
29/NO/66			G20	SCK	605Z		43.4936	20	0.09	0.11												HBS	
5/DE/66			G20	SCK	605Z		43.4943 =	70	-0.02	0.08												NBS	
														1ST PRE-DEGAUSS									
6/DE/66			G20	SCK	605Z		43.4946	186	0.04	0.12												NBS	
														1ST POST-DEGAUSS									
7/DE/66			G20	SCK	605Z		43.4950	215	0.10	0.20												NBS	
														2ND POST-DEGAUSS									
12/DE/66						634																	
														24JA67 IMU 6 ENTERED G+N 606									
3/FE/67			G20	SCK	606Z		43.4910			0.00													
														N,T-Z IN ERROR									
4/FE/67			G20	SCK	606Z		43.4917 =	208	0.04	0.06													
13/FE/67			G	G+N	606Z		43.4903 =	282	0.20														
31/MR/67						747																	
12/AP/67			G	SCK	606Z					0.11		-32											
														14AP67 IMU 6 ENTERED G+N 605									

DA MO YR	LOC	TYP	ASSN	CLOSD HOURS	ITM	DELSF	CBIAS	NBIAS	NC	AR	AW	AAS	IA	NB	ITM	PVR	SF	CT	CB	MD	NOTES
					----------10--------								---------DEVIATIONS---------								
16/JE/67				852																	
												16JE67 IMU 6 LEFT G•N 605								
26/JE/67	A17	SCK	Z		43.4928	= 448	-0.11	-0.10													
26/JE/67	A17	SCK	Z					-0.10		-28											
17/JL/67	A08	SCK	Z		43.4946	= 413	0.15	0.14													
18/JL/67	A08	SCK	Z					0.11		-20											
31/JL/67	K11	SCK	Z		43.4932	= 427	0.09	0.04													
4/AU/67												4AU67 IMU 6 ENTERED G•N 603									
5/AU/67												G•N 603 ENTERED SPACECRAFT LM1									
6/AU/67	K	GSC	603Z			= 353	0.16														
18/SE/67				1243																	
26/NO/67	K	GSC	603Z			- 580	0.10														

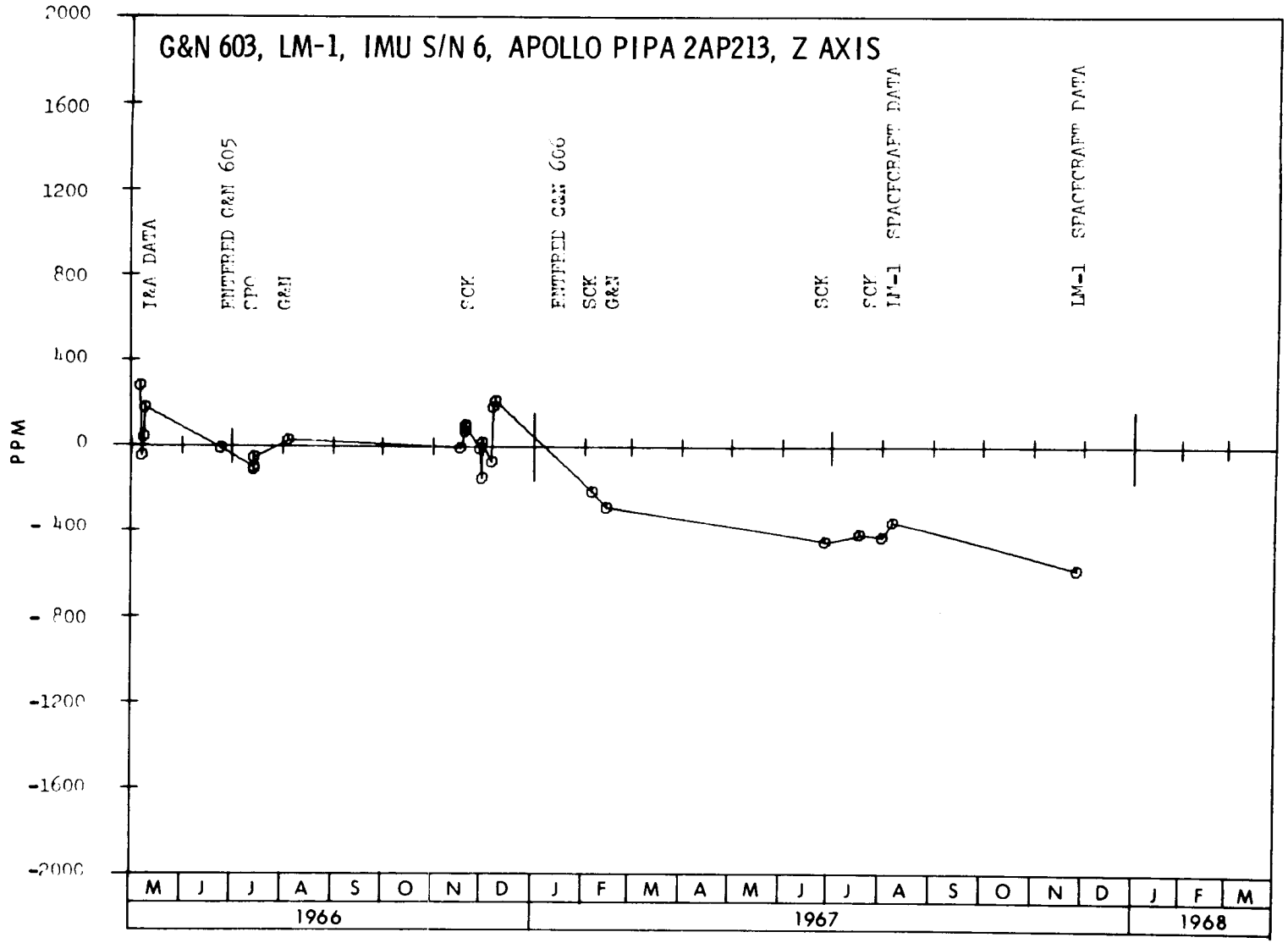

Fig. 7-17 Delta Scale Factor/Scale Factor Plotted by Time.

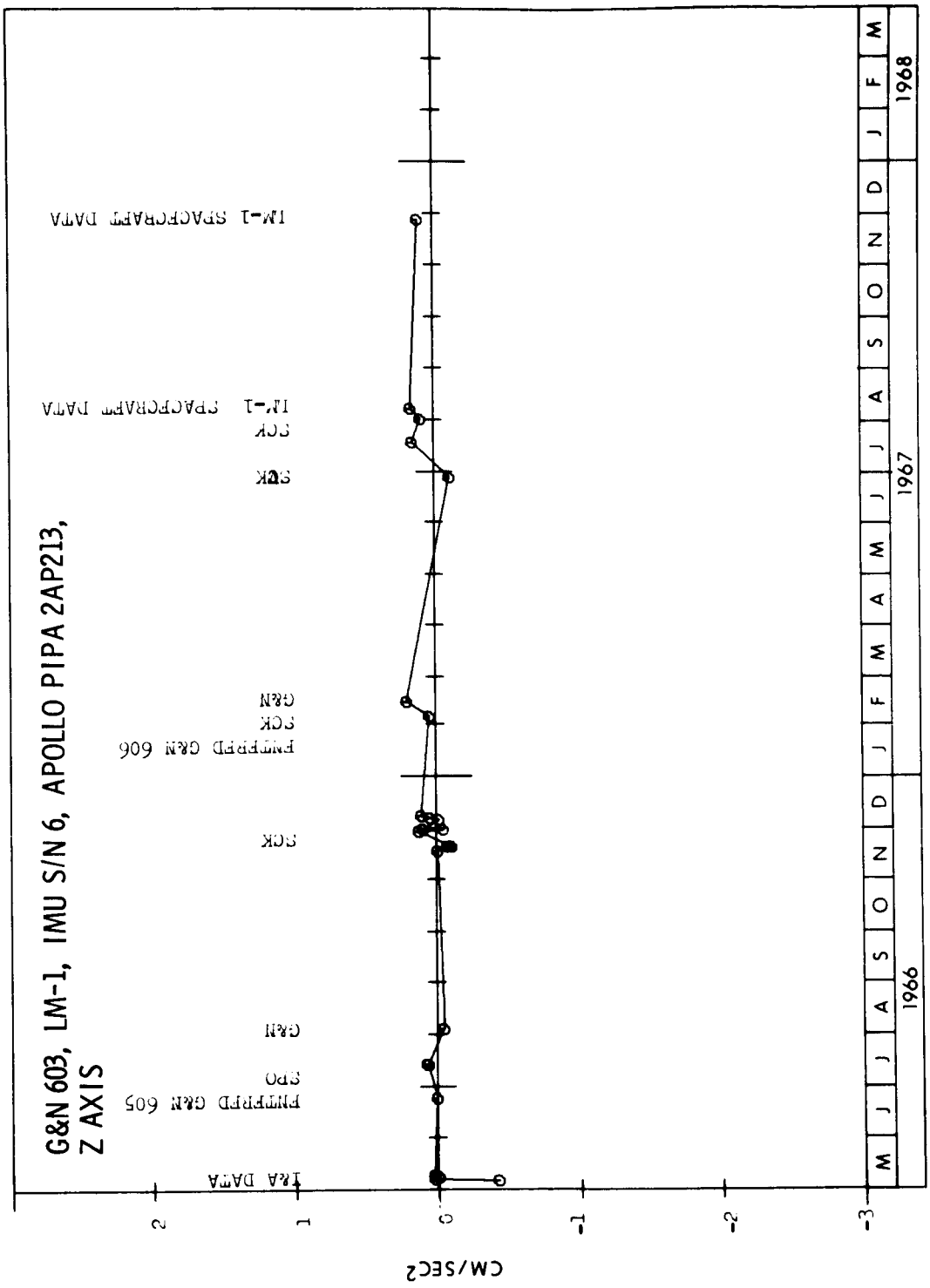

Fig. 7-18 1g Bias Plotted by Time.

NASA 7A-195 ACE H-322-2

NASA ACC	TEMP SENS	MAX SD OF 1 DEG PTS	THERM AT 135	SUS CAP MOD SG	TG	RAW XFR FUNCTION	AVG RDT	RDT SD	ACCEP WH HR	THERM PAD SG	TG	XFR FUNC RESISTOR	BIAS RES	TORQR RES +	-
7DE66	0.8	0.7	769.6	.0469		9.6	122	1.4	390	92		33	800	181	178

DA MO YR	LOC	TYP	ASSN	WHEEL HOURS	NBD	ADSRA	ADIA	ID	RDT	DELSF+	DELSF-	I+	I-	ADOA	NOTES
11/NO/66	A45	CVA								- 134	- 37	85.004	85.004		
20/NO/66	A45	CA1			1.0	10.7	6.5			- 30	55	85.004	85.005		
20/NO/66	A45	CA2			1.2	10.8	5.8								
20/NO/66	A45	CA3		358	1.2	10.4	3.2	0.3	122						
25/NO/66	A45	CB1			0.7	10.9	9.3			52	79	85.005	85.004		ACD
25/NO/66	A45	CB2			0.8	10.4	5.5								
25/NO/66	A45	CB3		373	0.9	9.0	4.9 -	0.6	120						
28/NO/66	A45	CC1			0.5	9.6	10.1			107	154	85.002	85.001		ACD
28/NO/66	A45	CC2			0.5	9.3	5.2								
28/NO/66	A45	CC3		390	0.8	9.0	3.4	0.1	125						
15/JA/67	A44	CRT			0.0	3.2 -	0.5			110	- 10	85.002	85.003		
15/JA/67	A44	CRT			0.0	3.0 -	1.0								
15/JA/67	A44	CRT			0.1	2.9 -	1.2	0.3	122						
18/JA/67	A43	CRT			0.9	3.7	4.7			158	88	85.002	85.002		
18/JA/67	A43	CRT			1.0	3.6	4.2								
18/JA/67	A43	CRT		489	0.5	3.3	7.4 -	1.3	126						
11/AP/67	A45	CVR		545					126						
23/JL/67	A43	CRT			1.2	12.8	2.8			117	- 64	85.001	85.002		
23/JL/67	A43	CRT			1.1	12.1	2.5								
23/JL/67	A43	CRT		559	1.1	11.7	3.0 -	0.8	126						
24/JL/67	A43	CRT			0.9	10.6 -	5.8			418	65	85.001	85.002		
24/JL/67	A43	CRT			0.8	10.3 -	6.2								
24/JL/67	A43	CRT		574	0.7	10.1 -	7.0 -	1.1	117						
													ADSRA DEV OUS		
30/AU/67	A44	CRQ			0.1	12.9	6.6			- 216	- 282	85.009	85.009		
30/AU/67	A44	CRQ			0.5	12.0	7.0								
30/AU/67	A44	CRQ		604	0.1	12.4	6.1 -	1.0	93						
						15G VIB.	CHG R3 TO 768.2, R2 TO 1000, R5 TO 180, R4 TO 177								
23/SE/67	A08	SPR	X		3.0	3.9		ENTERED IMU S/N II							
23/SE/67	A08	SPR	X		2.6	-	2.9			- 426	- 483	85.007			
9/OC/67	A08	SPO	X		2.3	4.9									
9/OC/67	A08	SPO	X		3.5		7.9			- 383	- 450	85.008			
23/OC/67				985											
18/NO/67	A	SPO	X		0.7	5.2	-5.8								
18/NO/67	A	SPO	X		0.4	5.7	-2.8								
26/NO/67	K	G&N	X		3.0	1.8									
26/NO/67	K	G&N	X			4.6									
3/DE/67	K	SCK	X		-1.1		-4.9								
3/DE/67	K	SCK	X		-0.4	5.3									

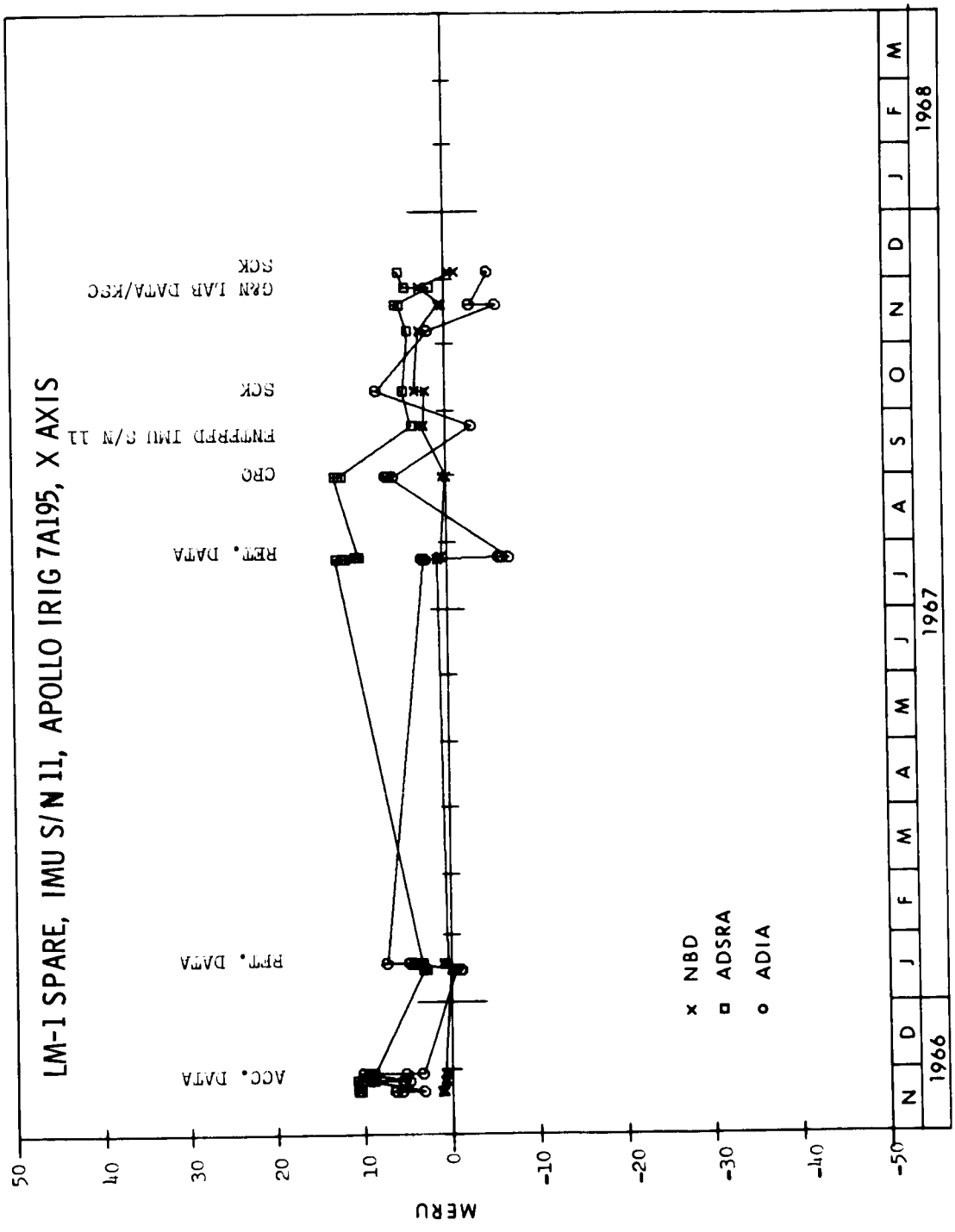

Fig. 7-19 Drift Plotted by Time.

NASA 7A-177 ACE H-310-1

NASA ACC	TEMP SENS	MAX SD OF 1 DEG PTS	THERM AT 135	SUS CAP MOD SG	TG	RAW XFR FUNCTION	AVG RDT	RDT SD	ACCEP WH HR	THERM PAD SG	TG	XFR FUNC RESISTOR	BIAS RES	TORQR RES +	-
14SE66	0.0	1.3	769.6	.0480		8.9	131	2.1	303	82		28	400	179	169

DA MO YR	LOC	TYP	ASSN	WHEEL HOURS		NBD	ADSRA		ADIA		ID RDT	DELSF+	DELSF-	I+	I-	ADOA	NOTES
27/AU/66	A43	CVA										10	- 3	84.993	84.994		
27/AU/66	A43	CA1			-	1.6	4.8		1.6			107	85	84.993	84.994		
27/AU/66	A43	CA2			-	1.6	4.5	-	2.6								
27/AU/66	A43	CA3		272	-	1.0	4.5	-	3.6	-	3.5 131						
7/SE/66	A43	CB1			-	1.6	4.7	-	3.8			- 79	89	81.929	84.994		ACD
7/SE/66	A43	CB2			-	1.2	4.8	-	3.6								
7/SE/66	A43	CB3		287	-	0.9	4.6	-	6.7	-	2.5 133						
9/SE/66	A43	CC1			-	1.8	4.5	-	0.4			- 138	- 113	84.991	84.991		ACD
9/SE/66	A43	CC2			-	1.6	4.4		1.1								
9/SE/66	A43	CC3		302	-	1.7	4.0	-	0.2	-	5.1 130						
4/DE/66	A43	CRT			-	1.7	5.1		3.5								
4/DE/66	A43	CRT			-	0.8	5.0		1.7								
4/DE/66	A43	CRT		320	-	0.8	4.7	-	2.0	-	3.6 134						
12/MY/67	A41	CVR			-	0.8	3.3	-	4.6			193	270	85.012	85.010		
12/MY/67	A41	CVR			-	1.2	3.3	-	4.8								
12/MY/67	A41	CVR		446	-	1.5	3.0	-	4.6	-	5.4 131						
20/SE/67	A45	CVR			-	1.8	0.5	-	12.8			128	- 132	85.001	85.000		
20/SE/67	A45	CVR			-	2.2	0.8	-	19.9								
20/SE/67	A45	CVR		485	-	1.7	0.4	-	17.1	-	4.6 144						
											22SE67	15G VIB, CHG R3 TO 767.0, R2 TO 364					
24/SE/67	A45	CVR				0.6	2.6	-	23.8			- 78	- 201	85.001	85.001		
24/SE/67	A45	CVR			-	1.1	1.4	-	15.3								
24/SE/67	A45	CVR		497	-	0.9	1.1	-	16.4	-	3.3 145						
19/NO/67	A	SPR	Y		-	0.5	0.8	-	3.6			ENTERED IMU S/N II					
19/NO/67	A	SPO	Y		-	0.2	1.8	-	1.7								
3/DE/67	K	SCK	Y		-	0.5			1.0								
3/DE/67	K	SCK	Y			0.0		-	2.6								
3/DE/67	K	SCK	Y		-	0.6		-	13.8								
3/DE/67	K	SCK	Y		-	1.3	0.7										

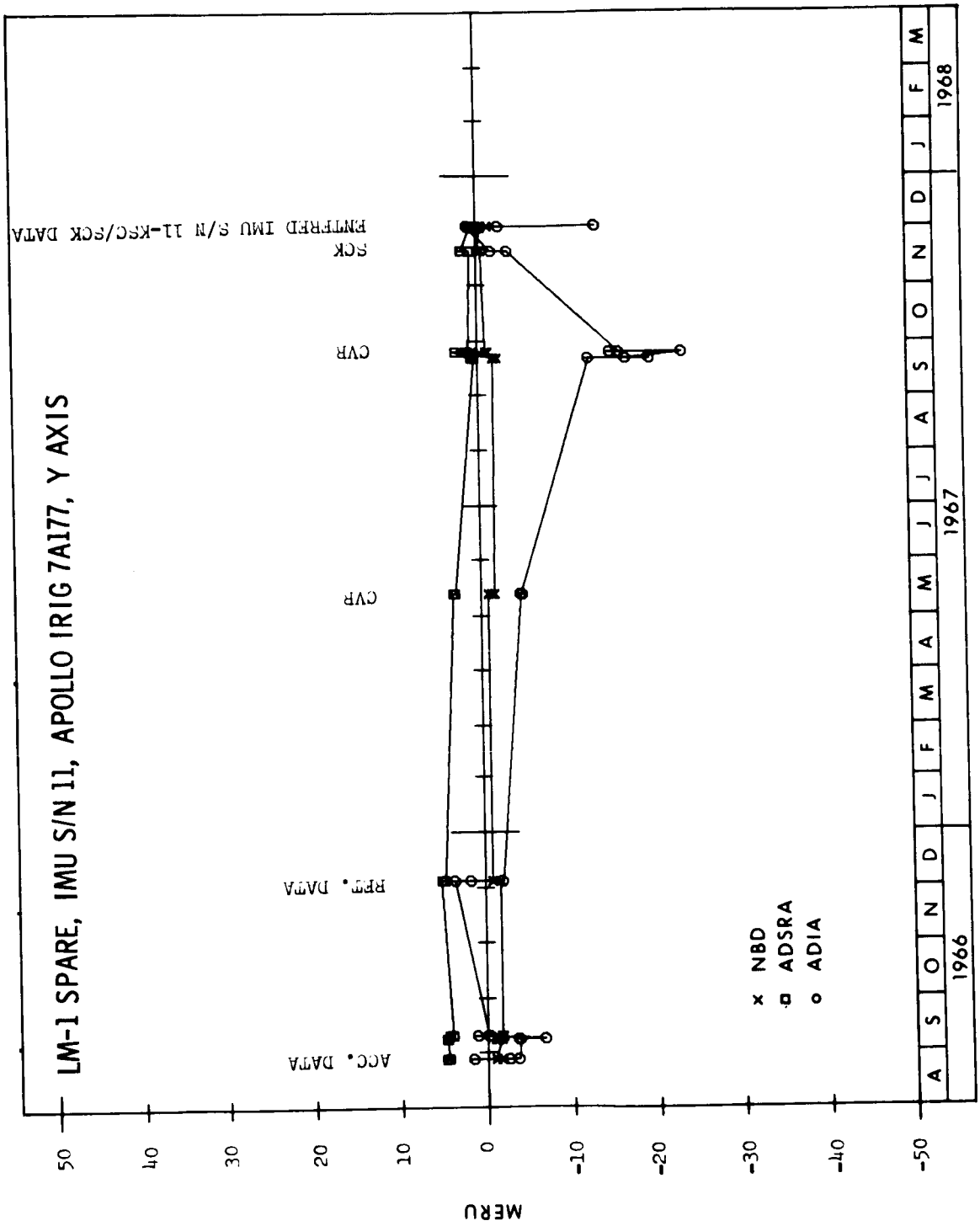

Fig. 7-20 Drift Plotted by Time.

NASA ACC	TEMP SENS	MAX SD OF 1 DEG PTS	THERM AT 135	SUS CAP MOD SG	TG	RAW XFR FUNCTION	AVG RDT	RDT SD	ACCEP WH HR	THERM PAD SG	XFR FUNC TG	RESISTOR	BIAS RES	TORQR RES +	-
29AU66	0.0	0.8	679.2	.0479		8.9	146	2.0	348	90		33	1000	196	192

DA MO YR	LOC	TYP	ASSN	WHEEL HOURS	NBD	ADSRA	ADIA	ID	RDT	DELSF+	DELSF-	I+	I-	ADOA	NOTES
12/JE/66	A44	CVA								141	171	84.999	85.000		
12/JE/66	A44	CA1			0.1	4.8	2.7			207	273	84.999	85.000		
13/JE/66	A44	CA2			0.4	5.0	- 4.4								
14/JE/66	A44	CA3		313	0.1	4.7	- 2.5	2.7	146						
15/JE/66	A44	CB1			0.7	3.2	- 5.9			259	345	84.999	85.000		ACD
15/JE/66	A44	CB2			0.9	3.1	- 3.1								
16/JE/66	A44	CB3		328	1.4	3.3	1.3	3.0	149						
29/JE/66	A43	CC1			0.2	3.0	- 2.7			193	495	84.994	84.993		ACD
29/JE/66	A43	CC2			0.6	3.4	- 2.9								
30/JE/66	A43	CC3		348	0.8	3.4	- 3.8	2.2	142						
15/DE/66	A44	CRT		-	1.0	0.1	- 15.0			238	153	85.002	85.003		
15/DE/66	A44	CRT		-	1.1	- 0.4	- 14.1								
15/DE/66	A44	CRT		364	- 1.6	0.1	- 12.9	2.2	146						
										CHG R3 NEW VALUE 766.4,UNIT VIBRATED					
10/FE/67	A45	CVR		-	0.1	- 5.3	- 17.2			- 249	- 379	85.003	85.003		
10/FE/67	A45	CVR		-	2.0	- 2.8	- 19.3								
10/FE/67	A45	CVR		438	- 1.0	- 4.4	- 20.9	2.1	146						
24/FE/67	A41	CVR		-	1.5	- 5.0	- 23.5			555	44	85.011	85.009		
24/FE/67	A41	CVR		-	0.9	- 6.5	- 23.9								
24/FE/67	A41	CVR		458	- 2.3	- 5.3	- 22.1	- 0.1	151						
										18MY67 WAIVED, ACCEPTED FOR SYSTEM USE					
24/MY/67															
										24MY67 ENTERED IMU 19 IN G+N 609					
26/JE/67	A08	SCK	609X		2.5	- 9.3									
26/JE/67	A08	SCK	609X		1.6		- 26.5								
28/JE/67	A08	SCK	609X							394	150	85.006			
30/JE/67				527											
14/JL/67				625											
8/AU/67	A17	G+N	609X		1.8	- 11.2	- 20.6			386	356				
3/SE/67	A45	CRQ		-	1.1	- 9.6	- 28.1			701	150	85.000	85.000		
3/SE/67	A45	CRQ		-	2.0	- 9.8	- 28.6								
3/SE/67	A45	CRQ		798	- 1.8	- 10.0	- 28.8	- 1.9	113						
										3SE67 15G VIB, CHG R3 TO 771.2					
24/SE/67	A08	SCK	Z		2.5	- 9.1									
24/SE/67	A08	SCK	Z		2.4		- 28.9			1128	- 293	85.007			
10/OC/67	A08	SPO	Z		1.8	- 12.2									
10/OC/67	A08	SPO	Z		1.4		- 22.5			851	117	85.009			
23/OC/67				1179											
										ENTERED IMU S/N II					
7/NO/67	A	SCK	Z		1.6	- 0.4	- 21.6								
7/NO/67	A	SCK	Z		1.0	- 2.8	- 22.6								
7/NO/67	A	SCK	Z		0.3	- 7.3									

DA	MO	YR	LOC	TYP	ASSN	WHEEL HOURS	NBD	ADSBA	ADIA	ID	RDT	DFLSF+	DFLSF-	I+	I-	ADOA	NOTES
17	NO	67	A	SPR	Z		-2.6	-1.0	-21.9								
17	NO	67	A	SPO	Z		-1.4	0.0	-20.3								
26	NO	67	K	G&N	Z		-3.4	-5.4	-15.2								
26	NO	67	K	G&N	Z		-3.6	-2.4									
26	NO	67	K	G&N	Z		-3.4	-1.1									
26	NO	67	K	G&N	Z		-1.9	2.4									
3	DE	67	K	SCK	Z		-0.4	2.7	-25.4								

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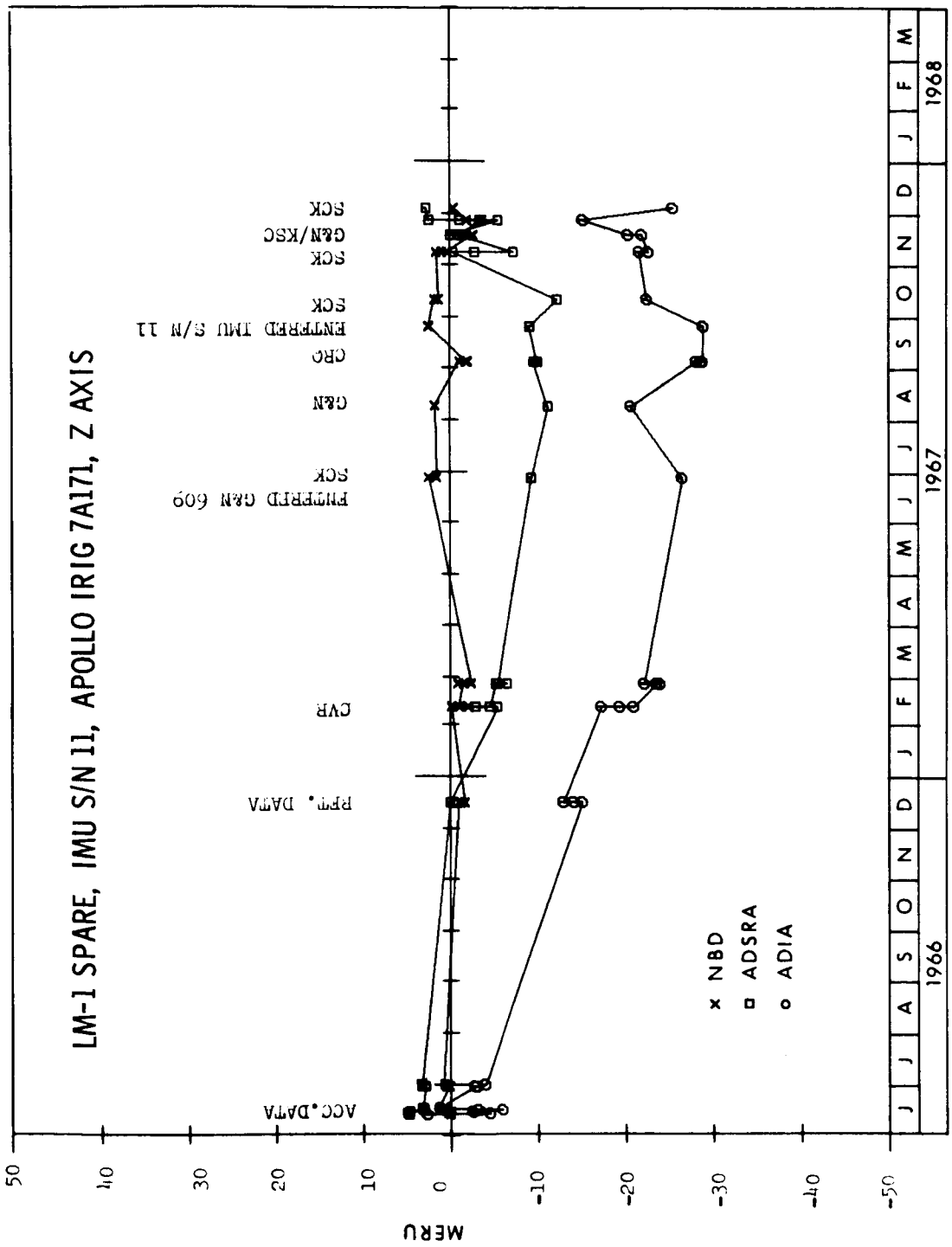

Fig. 7-21 Drift Plotted by Time.

DATE	MOD	C3	C4	R13	R14	R11	R12	R5	R6
23AP66	C21	.00392	.00392			139.397	31.864	96.25	103.75
3MY66	C21	.00392	.00392			139.397	38.945	96.25	103.75

DA MO YR	LOC	TYP	ASSN	CLOSD HOURS	ITM	DELSF	CBIAS	NBIAS	NC	AR	AW	AAS	IA	NB	ITM	PVR	SF	CT	CB	MD	NOTES
					=-=-=-=-1G--------								---------DEVIATIONS----------								
7/FE/66	S42	ACC		46	104.0305	8		0.0	5			2.4	4.5	-.01	0	0	39	4		33	
23/AP/66	A44	I&A		69	43.5928	= 338	-0.26	0.01	7												
29/AP/66	A44	I&A		71					9												
3/MY/66	A44	I&A		75	43.6000	25	-0.06	-0.03	4												
3/MY/66	A44	I&A		83						-26	4										
4/MY/66	A44	I&A		87						-12	8										
4/MY/66	A44	I&A		93	43.5920	32	0.01	-0.07					1.0	-.05	- 79	- 3	- 35		-.07		
4/MY/66	A44	I&A		97						- 6	7										
5/MY/66	A44	I&A		99	43.5891	31	-0.10	0.09													
						R7#10 TURNS FROM CW LIMIT							R10#10 TURNS FROM CW LIMIT								
16/JE/66																					
										16JE66 IMU 11 ENTERED G&N 605												
22/JE/66	A19	SPR	605X	154	43.5700	6	-0.01	0.11													ADJ
11/JL/66	A19	SPO	605X	286				0.05		-25	18										
13/JL/66	A19	SPO	605X		43.5747	= 233	-0.01	0.03													NBS
13/JL/66	A19	SPO	605X		43.5740	= 234	0.00	-0.00													LBS
13/JL/66	A19	SPO	605X	318	43.5742	= 194	-0.02	0.05													HBS
3/AU/66	A19	G&N	605X		43.3714	= 295	-0.03														
													RPL OF Y PIPA PRE-AMP								
8/AU/66	A19	SCK	605X					0.07		-24	26										
													RET PER APM 13307								
15/NO/66	G20	SCK	605X		43.5710	14	-0.01	0.09													SF&BIA
18/NO/66	G20	SCK	605X		43.5891	64	0.06	0.26													NBS
													POST TEMP CYCLE								
19/NO/66	G20	SCK	605X		43.5898	198	0.16	0.24													LBS
													POST TEMP CYCLE								
19/NO/66	G20	SCK	605X		43.5882	102	0.02	0.22													HBS
													POST TEMP CYCLE								
28/NO/66	G20	SCK	605X		43.5886	= 33	0.56	0.67													NBS
28/NO/66	G20	SCK	605X		43.5897	= 5	0.53	0.58													LBS
29/NO/66	G20	SCK	605X		43.5878	18	0.53	0.58													HBS
5/DE/66	G20	SCK	605X		43.5883	= 248	0.04	0.22													NBS
													1ST PRE-DEGAUSS								
5/DE/66	G20	SCK	605X		43.5890	= 176	0.05	0.25													NBS
													2ND PRE-DEGAUSS								
6/DE/66	G20	SCK	605X		43.5883	= 223	3.15	3.05													NBS
													1ST POST DEGAUSS								
6/DE/66	G20	SCK	605X		43.5894	= 202	3.10	2.99													NBS
													2ND POST DEGAUSS								
8/DE/66	G20	SCK	605X		43.5896																ABORTED
12/DE/66				671						13DE66 IMU 11 ENTERED LEM SPARE 2											
16/DE/66	A08	SCK	LS2X		43.5880	= 379	1.69	1.70													
16/DE/66	A08	SCK	LS2X		43.5881	= 354	1.70	1.76													
26/FE/67	A08	SCK	LS2X		43.5896	= 563	-2.99	-2.99													

DA	MO	YR	LOC	TYP	ASSN	CLOSD HOURS	ITM	DELSF	CBIAS	NBIAS	NC	AR	AW	AAS	IA	NB	ITM PVR	SF CT	CB	MD	NOTES
							-------10--------								---------DEVIATIONS---------						
27/FE/67	A08		SCK	LS2X			43,5902	10	-0.00	-0.00											SF*BIA,DGS
3/MR/67	A08		SCK	LS2X			43,5934	= 180	-0.13	-0.12											NBS
4/MR/67	A08		SCK	LS2X			43,5936	= 160	-0.13	-0.26											NBS
4/MR/67	A08		SCK	LS2X			43,5938	= 140	-0.10	-0.23											NBS
6/MR/67	A08		SCK	LS2X			43,5936	= 120	0.02	0.03											LBS
7/MR/67	A08		SCK	LS2X						-0.13		-32									AW IS 123
													26AP67 IMU 11 LEFT LEM SPARE 2								
22/SE/67	A08		SCK		X		43,5969	= 720	-0.15	-0.45											
22/SE/67	A08		SCK		X		43,5965	= 680	-0.15	-0.45											
22/SE/67	A08		SCK		X		43,5964	= 679	-0.13	-0.34											
25/SE/67	A08		SCK		X		43,5958	= 622	-0.05	-0.22											
25/SE/67	A08		SCK		X		43,5943	= 651	-0.09	-0.35											
									X*Y ELECTRONICS INTERCHANGED PER DIAG MEMO 141												
26/SE/67	A08		SCK		X		43,5957	= 658	0.00	-0.24											
8/OC/67	A08		SPO		X		43,5972	= 774	-0.10	-0.15											
8/OC/67	A08		SPO		X					-0.31		-21	32								
25/OC/67	A		SPR		X			- 741	-0.08	-0.26											DGS
26/OC/67	A		SPO		X			- 20	-0.21	-0.41											
7/NO/67	A		SPO		X			- 226	-0.10	-0.26											
22/NO/67	A		SPO		X			- 321	-0.01	0.00											
26/NO/67	K		GBN		X			- 257	-0.04												
2/DE/67	K		SCK		X			- 249	0.01	-0.31											
								- 294	0.03	-0.24											

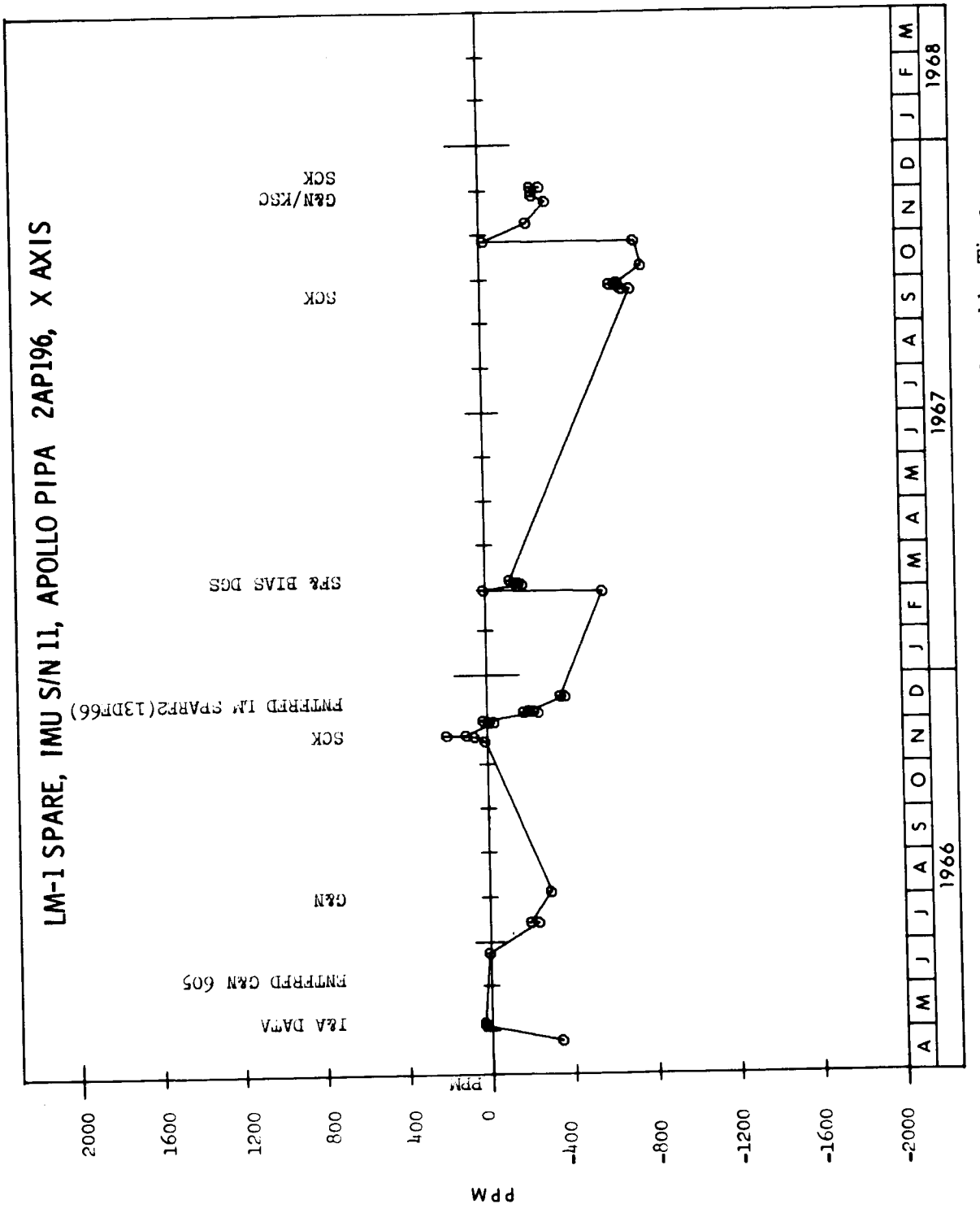

Fig. 7-22 Delta Scale Factor/Scale Factor Plotted by Time.

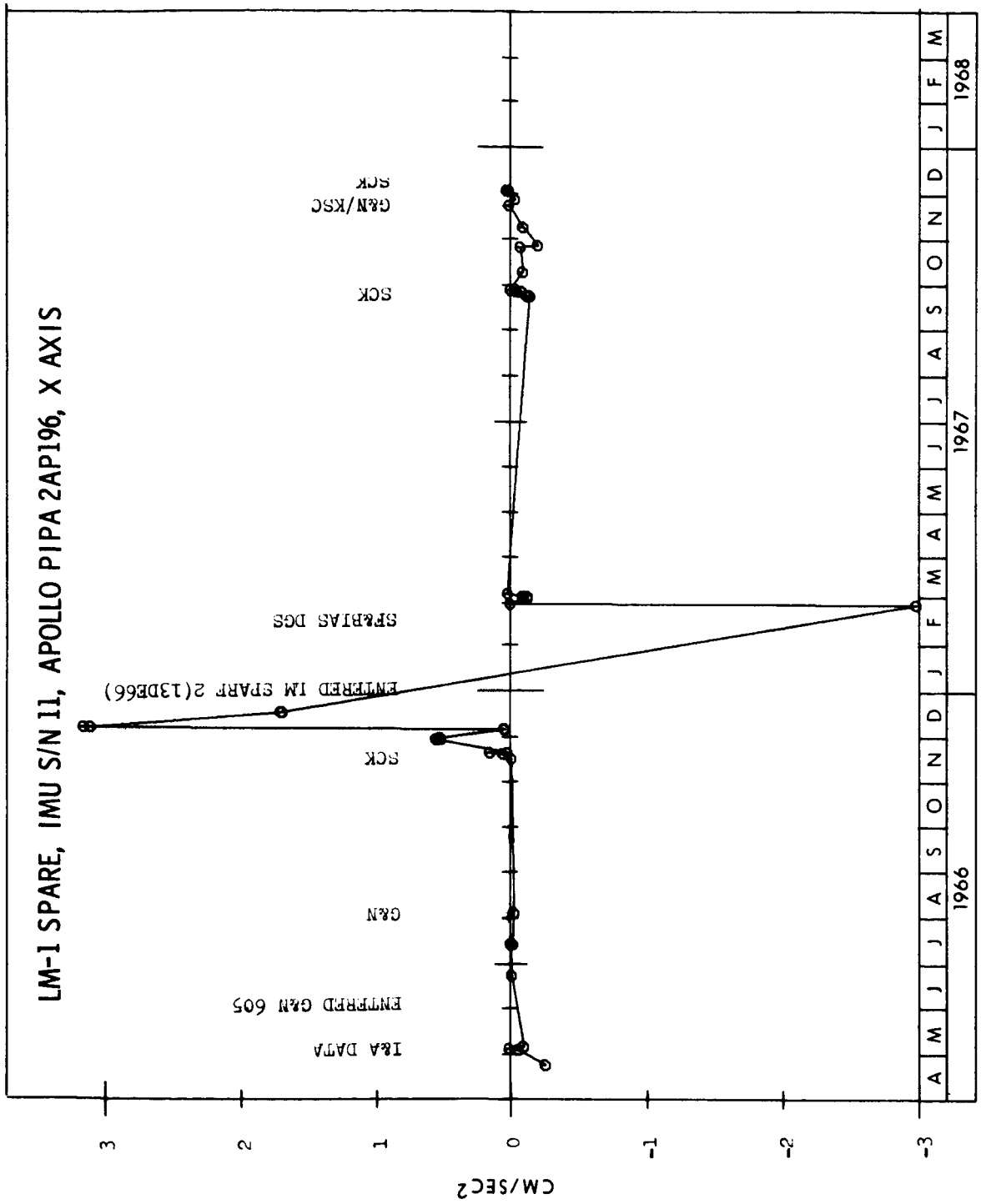

Fig. 7-23 1g Bias Plotted by Time.

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NASA 2AP-249 SPERRY 108077-4

DA MO YR	LOC	TYP	ASSN	CLOSD HOURS	=-------10-------- ITM	DELSF	CBIAS	NBIAS	NC	AR	AW	AAS	---------DEVIATIONS---------- IA	NB	ITM	PVR	SF	CT	CB	MD	NOTES
13/DE/66	S48	ACC		18	104.8365	= 31		0.00	3			1.4	0.0	-.06	27		33	6		33	
13/DE/66											13DE66 IMU 11 ENTERED LEM SPARE 2										
15/DE/66	A08	SCK	LS2Y		44.0533	59	0.54	0.39													
15/DE/66	A08	SCK	LS2Y		44.0536	50	0.56	0.46													
													AFTER TRANSIENT TEST								
26/FE/67	A08	SPR	LS2Y		43.8984	= 241	-0.07	-0.07													DGS
27/FE/67	A08	SPR	LS2Y		43.8982																NBS
3/MR/67	A08	SPO	LS2Y		43.8984	= 51	0.09	0.08													
6/MR/67	A08	SPO	LS2Y		43.8985	= 71	0.13	0.15													
7/MR/67	A08	SPO	LS2Y					0.09		8 -22											
										26AP67 IMU 11 LEFT LEM SPARE 2											
22/SE/67	A08	SCK	Y		43.9006	= 690	0.28	0.23													
23/SE/67	A08	SCK	Y		43.9008	= 683	0.30	0.28													
23/SE/67	A08	SCK	Y		43.9004	= 695	0.30	0.34													
25/SE/67	A08	SCK	Y		43.9001	= 652	0.31	0.32													
26/SE/67	A08	SCK	Y		43.9025	= 646	0.32	0.32													
								X*Y ELECTRONICS INTERCHANGED PER DIAG MEMO 141													
26/SE/67	A08	SCK	Y		43.9002	= 687	0.19	0.16													
8/OC/67	A08	SPO	Y		43.9026	= 732	0.33	0.34													
8/OC/67	A08	SPO	Y					0.27		8 -24											
26/OC/67	A	SPR	Y			- 793	0.33	0.32													DGS
26/OC/67	A	SPR	Y			- 188	0.20	0.09													
7/NO/67	A	SPO	Y			- 254	0.16	0.16													
22/NO/67	A	SPO	Y			- 388	0.08	0.06													
26/NO/67	K	G&N	Y			- 338	0.09														
2/DE/67	K	SCK	Y			- 352	0.05	0.03													

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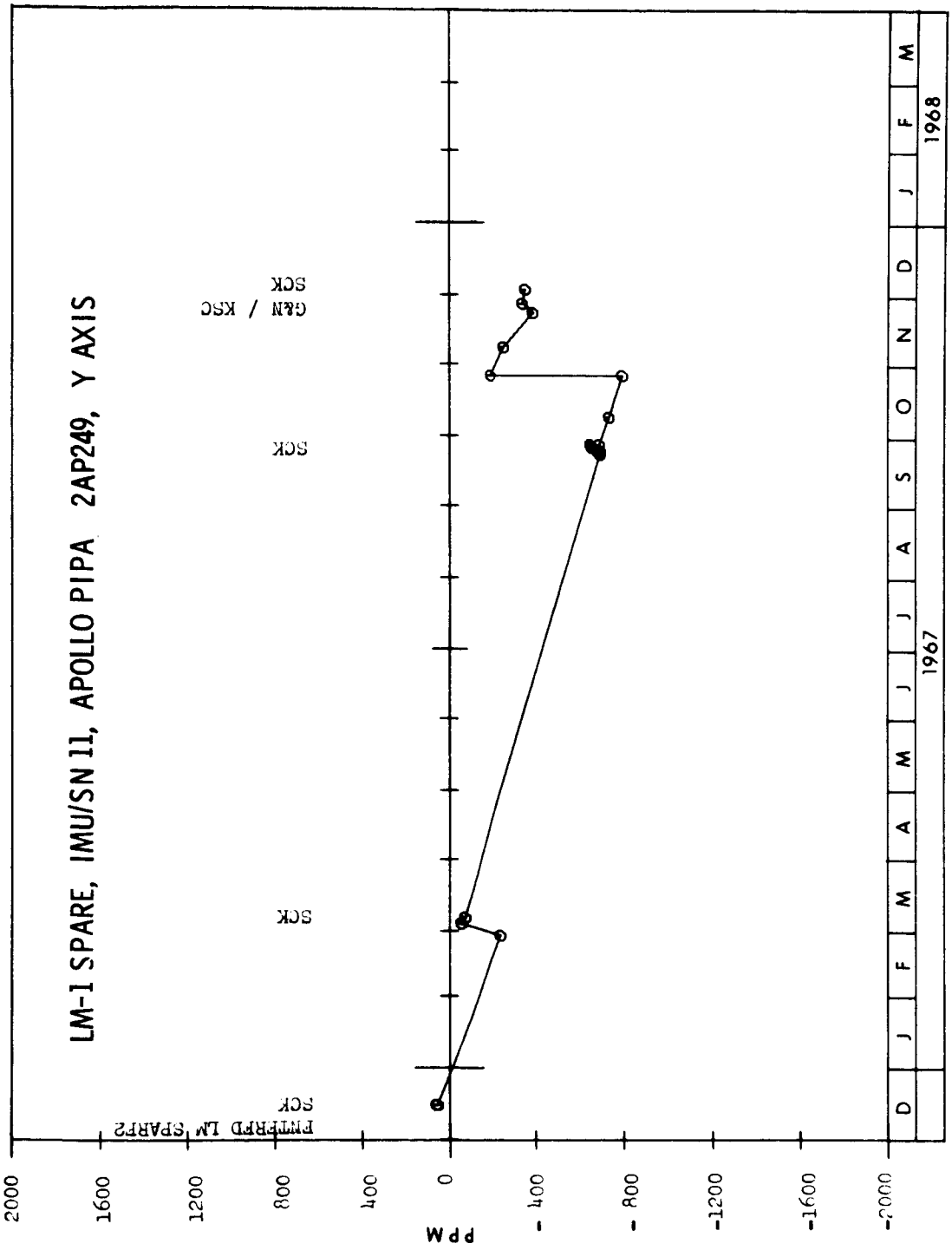


Fig. 7-24 Delta Scale Factor/Scale Factor Plotted by Time.

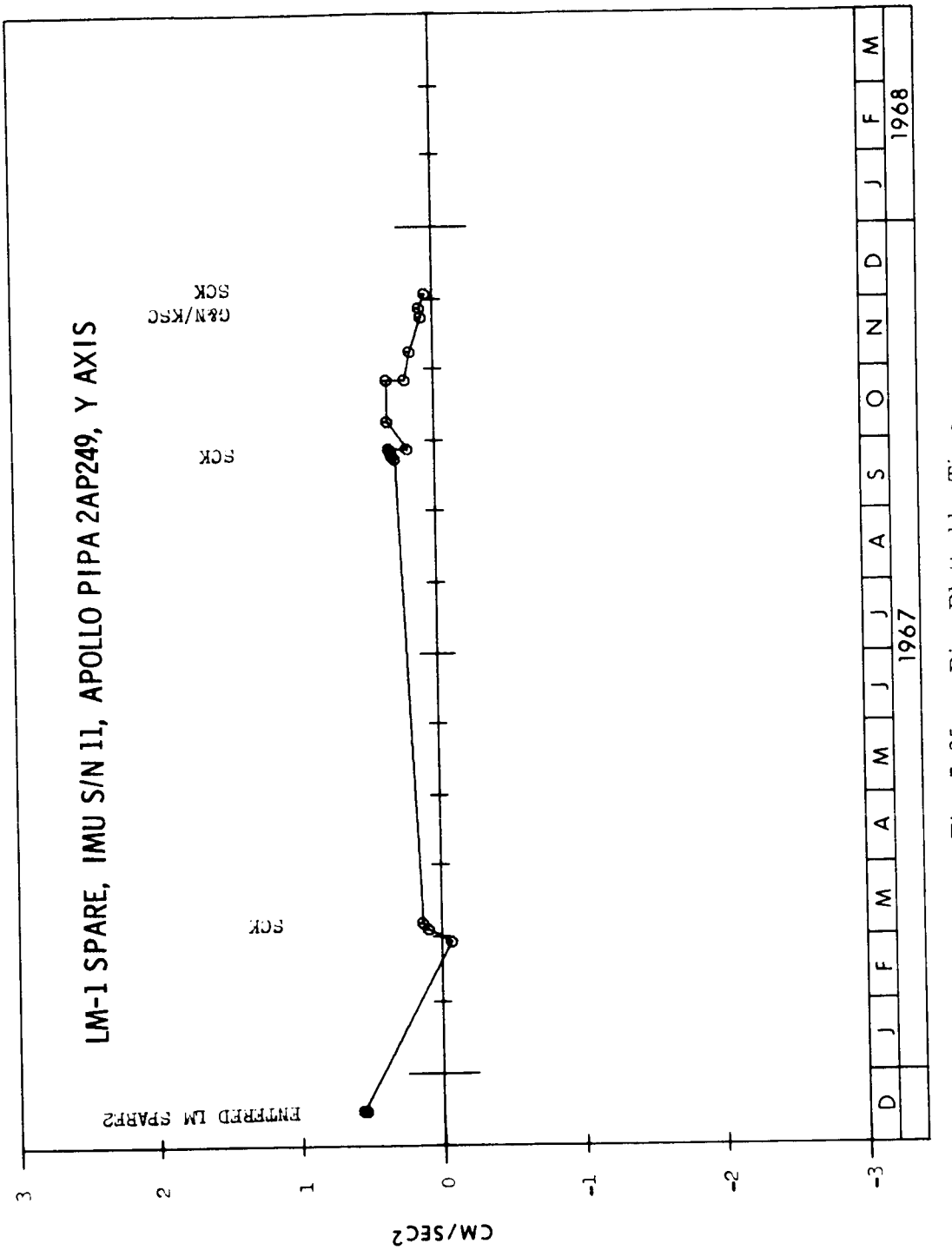


Fig. 7-25 1g Bias Plotted by Time.

NASA 3AP-301 SPERRY

DATE	MOD	C3	C4	R13	R14	R11	R12	R5	R6
30AU67	C60	.00348	.00348			139.397	50.073	98.75	101.25

DA MO YR	LOC	TYP	ASSN	CLOSD HOURS	ITM	DELSF	CBIAS	NBIAS	NC	AR	AW	AAS	IA	NB	ITM	PVR	SF	CT	CB	MD	NOTES
					10								DEVIATIONS								
8/AP/67	S46	ACC		56	104,1070	- 249		0.00	2				- 2.0	-.03			- 44			33	
28/AU/67	A48	I&A			43,5620	37	-0.09	0.01	2	- 7	10										
29/AU/67	A48	I&A			43,5620	44	-0.16	-0.11		- 8	8			-.12	0	0	7		-.07	33	
30/AU/67	A48	I&A			43,5611	- 28	-0.11	-0.16		- 9	3										
7/NO/67	A	SPR	Z			374	-0.27	-0.19													
7/NO/67	A	SPO	Z			517	-0.38	-0.42													DGS
7/NO/67	A	SPO	Z			- 18	-0.01	0.04													ADJ
22/NO/67	A	SPO	Z			- 377	-0.19	0.17													
26/NO/67	K	G&N	Z			- 294	0.17														
2/DE/67	K	SCK	Z			- 197	- 1.23	- 1.35													
2/DE/67	K	SCK	Z			- 235	0.20	0.26													
2/DE/67	K	SCK	Z			- 235	0.20	0.16													
4/DE/67	K	SCK	Z			- 237	0.20	0.22													
5/DE/67	K	SCK	Z			- 241	0.21	0.18													

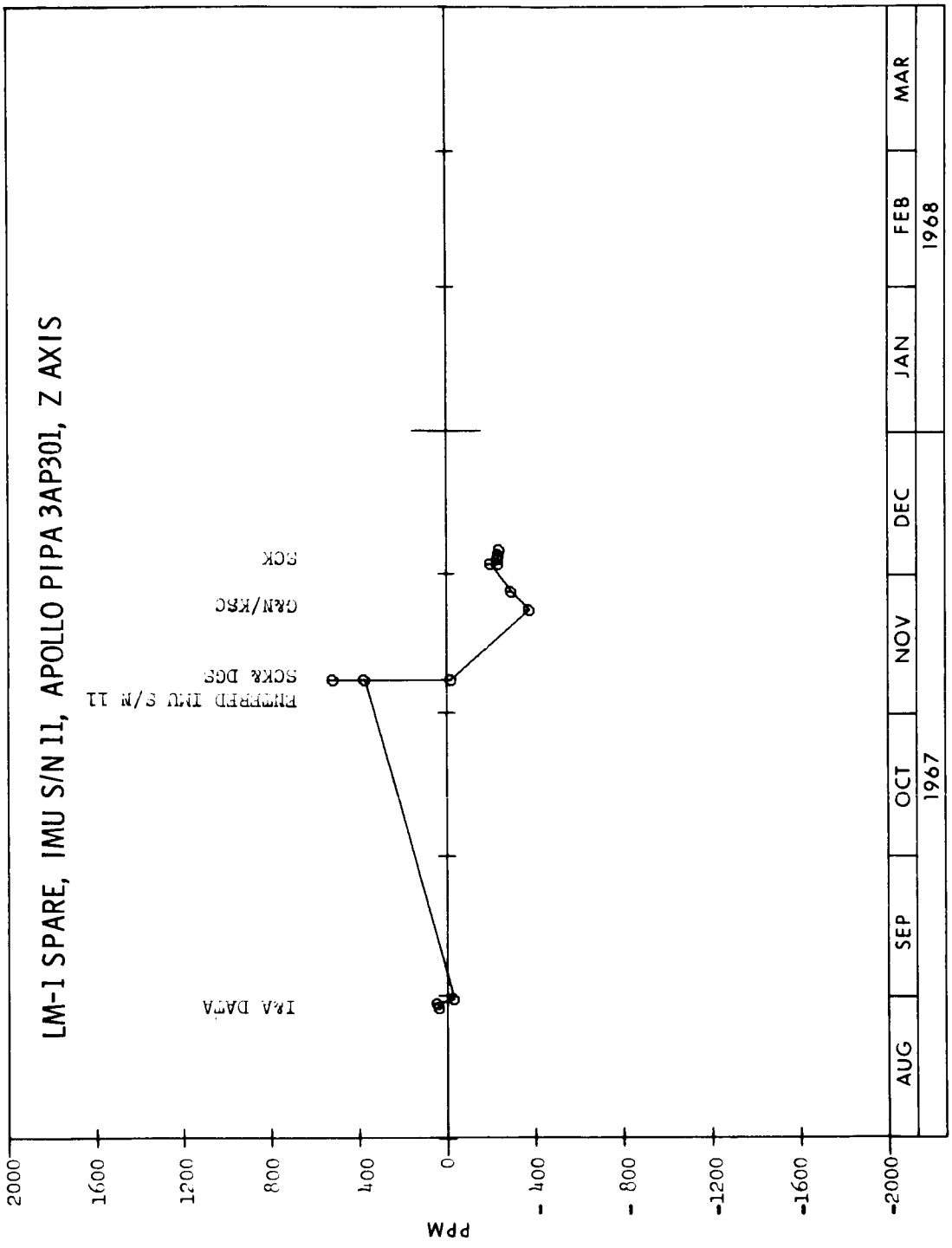


Fig. 7-26 Delta Scale Factor/Scale Factor Plotted by Time.

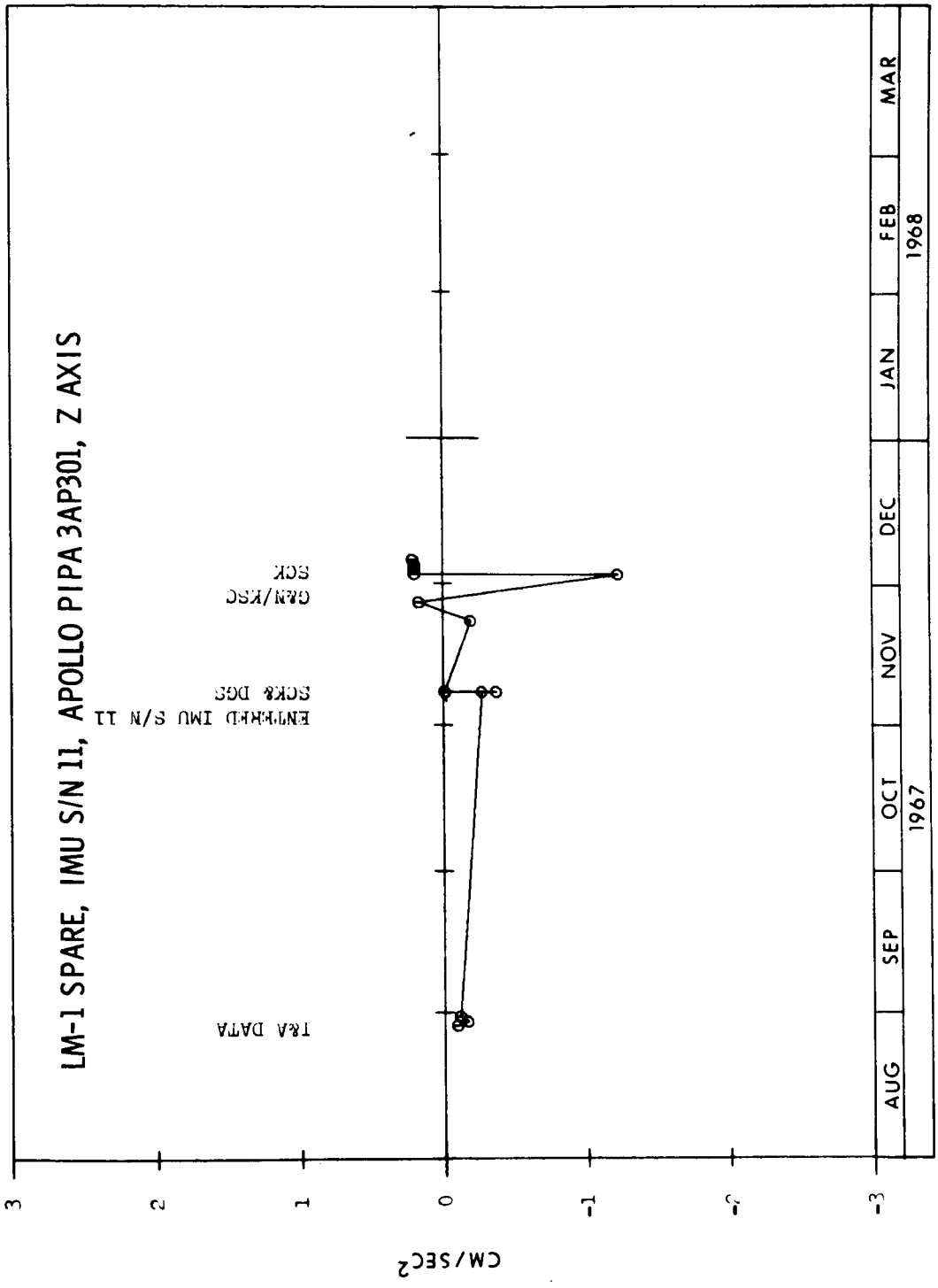


Fig. 7-27 1g Bias Plotted by Time.

STANDARD DEVIATION (1σ) OF THE IRIG AND PIPA
PARAMETER UNCERTAINTIES USED FOR
MISSION PERFORMANCE SUMMARY
(Corrected for ADOA)

IMU S/N 6

PARAMETER			
IMU Axis PIPAs	X	Y	Z
Data Compilation Period	(6/26-11/26/67)	(6/26-11/26/67)	(6/26-11/26/67)
Accelerometer Bias (cm/sec^2)	+.08	+.06	+.10
Scale Factor (ΔSF/SF ppm)	(2/3/67-11/26/67)		
	92	45	76
IMU Axis IRIGs	X	Y	Z
Data Compilation Period	(6/14-11/26/67)	(6/14-11/26/67)	(6/12-11/26/67)
Bias Drift (MERU)	1.3	2.3	2.4
ADSRA (MERU/g)	2.2	2.7	1.2
ADIA (MERU/g)	5.1	6.0	5.8

Data is based upon performance in the IMU. Point-to-point stability in operation is much better than the above data. The error computation for Mission 204 uses the above data.

Accelerometer data taken prior to degaussing following incorrect procedures has been excluded.

Current (11/26/67) Inertial Compensation Parameters are corrected for ADOA and tablulated:

PARAMETER	IMU AXIS		
	X	Y	Z
Accelerometer Bias (cm/sec^2)	+.21	-.10	+.08
Scale Factor (ΔSF/SF ppm)	-237	-229	-444
Bias Drift (MERU)	-4.9	-4.7	-3.8
ADSRA (MERU/g)	+5.7	+0.5	-1.0
ADIA (MERU/g)	-35.6	-20.0	-1.6

Gyro data is the average of all KSC data. PIP data the averages after last degauss at KSC.

CORRECTIONS FOR THE ADOA DRIFT TERM

A drift term proportional to the acceleration along the output axis (ADOA) is evident in the Apollo Gyro.

Due to the mechanization of G&N and spacecraft tests a factor times this term is included in the NBD, ADSRA, and ADIA measurements. Table 7-52 gives the drift values measured for each test configuration.

The Gyro data tabulation shown on pages 7-87, 88, 90, 92 and 93 include the ADOA errors in each test configuration Table 7-52 shows. The Gyro curves on pages 7-89, 91, and 94 and the standard deviation calculated for page 7-124 have been corrected for these ADOA errors.

A tabulation for the ADOA releases are given on page 7-127.

Table 7-52

ERROR IN GYRO DRIFT TEST DUE TO ADOA TERM
FOR VARIOUS TEST CONFIGURATIONS

Drift Term Measured	ISS Test	G&N Test	Spacecraft
NBD	NBD_X	$NBD_X + ADOA_X$	$NBD_X + ADOA_X$
	NBD_Y	$NBD_Y + ADOA_Y$	$NBD_Y + ADOA_Y$
	NBD_Z	$NBD_Z - ADOA_Z$	$NBD_Z - ADOA_Z$
ADSRA	$ADSRA_X$	$ADSRA_X - ADOA_X$	$ADSRA_X + 0.414\ ADOA_X$
	$ADSRA_Y$	$ADSRA_Y - ADOA_Y$	$ADSRA_Y - ADOA_Y$
	$ADSRA_Z$	$ADSRA_Z - ADOA_Z$	$ADSRA_Z - 2.414\ ADOA_Z$
ADIA	$ADIA_X$	$ADIA_X + ADOA_X$	$ADIA_X + ADOA_X$
	$ADIA_Y$	$ADIA_Y + ADOA_Y$	$ADIA_Y + 2\ ADOA_X - 0.414\ ADOA_Y$
	$ADIA_Z$	$ADIA_Z + ADOA_Z$	$ADIA_Z + ADOA_Z$

Table 7-53

The ADOA data included in the G&N NBD measurements are tabulated below:

ADOA
IMU S/N 6

X*	12/13/66	1/17/67	2/5/67	3/11/67	Average
	0.89	1.52	1.31	0.46	1.0
Y	7/17/67	7/31/67			
	1.57	0.89			1.23
Z	12/28/66	1/17/67	2/5/67	3/11/67	
	2.24	0.93	0.73	1.24	1.28

*7A97 had ADOA of 1.60 meru on 12/13/66 for calculation of correction to S/C ADIA on 1/17/67.

G&N MISSION RELIABILITY ANALYSIS

FAILURE RATES EXPRESS IN "FAILURES PER 10^6 HOURS"

MISSION		IMU Assembly		IMU Electronics (PSA)		Optics Assembly		Optics Electronics (PSA)		IMU CDU		Optics CDU		AGC		DSKY		D&C		Mission Reliability
		ON	STBY	ON	STBY	ON	OFF	ON	OFF	ON	STBY	ON	OFF	ON	STBY	ON	OFF	ON	OFF	
AGE 122 FLIGHT 501 UNMANNED	OPER HRS	8.63	-	8.63	-	-	-	-	-	8.63	-	-	-	8.63	-	8.63	-	8.63	-	.9931
	λ	195	-	224	-	-	-	-	-	111	-	-	-	257	-	12	-	6	-	
AGE 123 FLIGHT 502 UNMANNED	OPER HRS	8.3	-	8.3	-	-	-	-	-	8.3	-	-	-	8.3	-	8.3	-	8.3	-	.9933
	λ	195	-	224	-	-	-	-	-	111	-	-	-	257	-	12	-	6	-	
C/M FLIGHT 503 MANNED	OPER HRS	31.3	208	31.3	208	14.2	225	14.2	225	31.3	208	31.3	208	31.3	208	31.3	208	31.3	208	.9626
	λ	129	10.2	110	6.3	94	-	77	-	155	-	91	-	235	60.5	2.3		2.3	-	
L/M FLIGHT 503 MANNED	OPER HRS	8.4	120	8.4	-	8.4	-	8.4	-	8.4	-	8.4	-	8.4	-	8.4	-	8.4	-	.9923
	λ	129	1.6	110	-	38	-	1.33	-	155	-	112	-	235	-	110	-	1.2	-	
AGE 603 FLIGHT 204* UNMANNED LM	OPER HRS	9.6	-	9.6	-	-	-	-	-	9.6	-	-	-	9.6	-	9.6	-	-	-	.9938
	λ	129	-	110	-	-	-	-	-	155	-	-	-	235	-	12	-	-	-	
C/M DES. REF.	OPER HRS	13.8	55.6	13.8	55.6	9.1	60.3	9.1	60.3	13.8	55.6	13.8	55.6	13.8	55.6	13.8	55.6	13.8	55.6	.9840
	λ	129	10.2	110	6.3	94	-	77	-	155	-	91	-	235	60.5	2.3	-	2.3	-	
LM DES. REF	OPER HRS	3.25	66.3	3.25	66.3	3.25		3.25	-	3.25	-	3.25	-	3.25	-	3.25	-	3.25	-	.9969
	λ	129	1.6	110	-	38		1.33	-	155	-	112	-	235	-	110	-	1.2	-	

*206 REDESIGNATED 204/LM1

AUGUST 1967

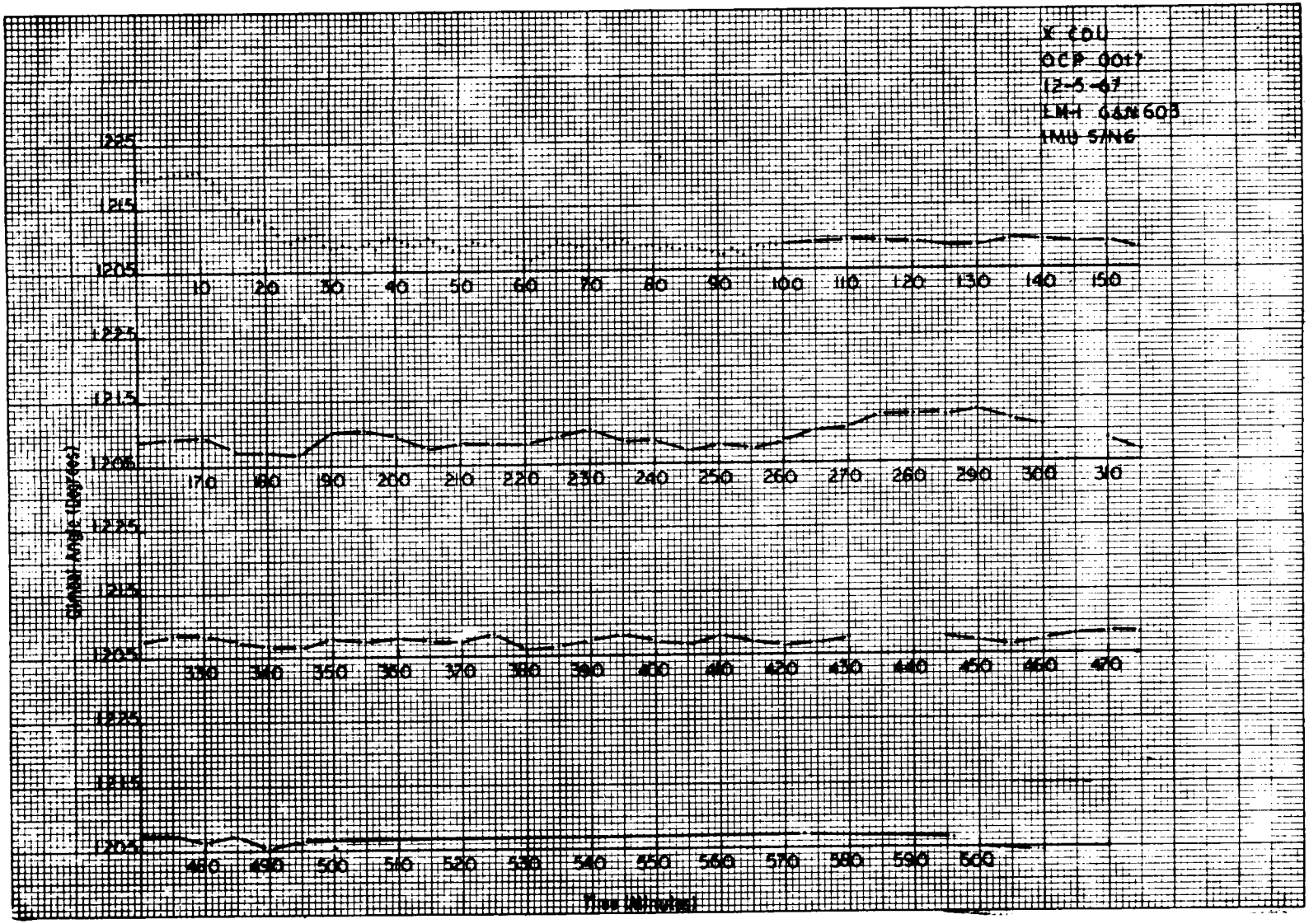


Fig. 7-28

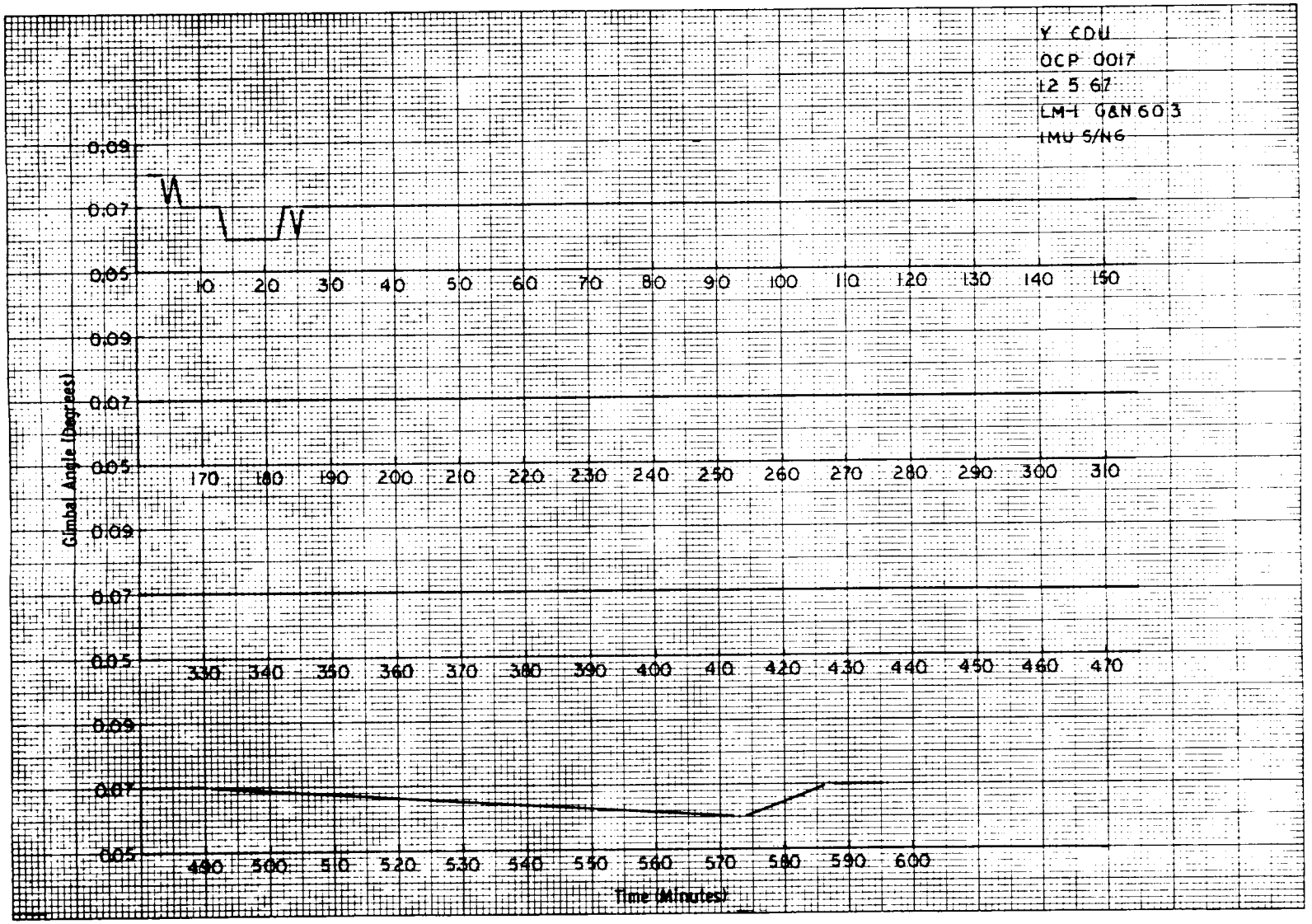
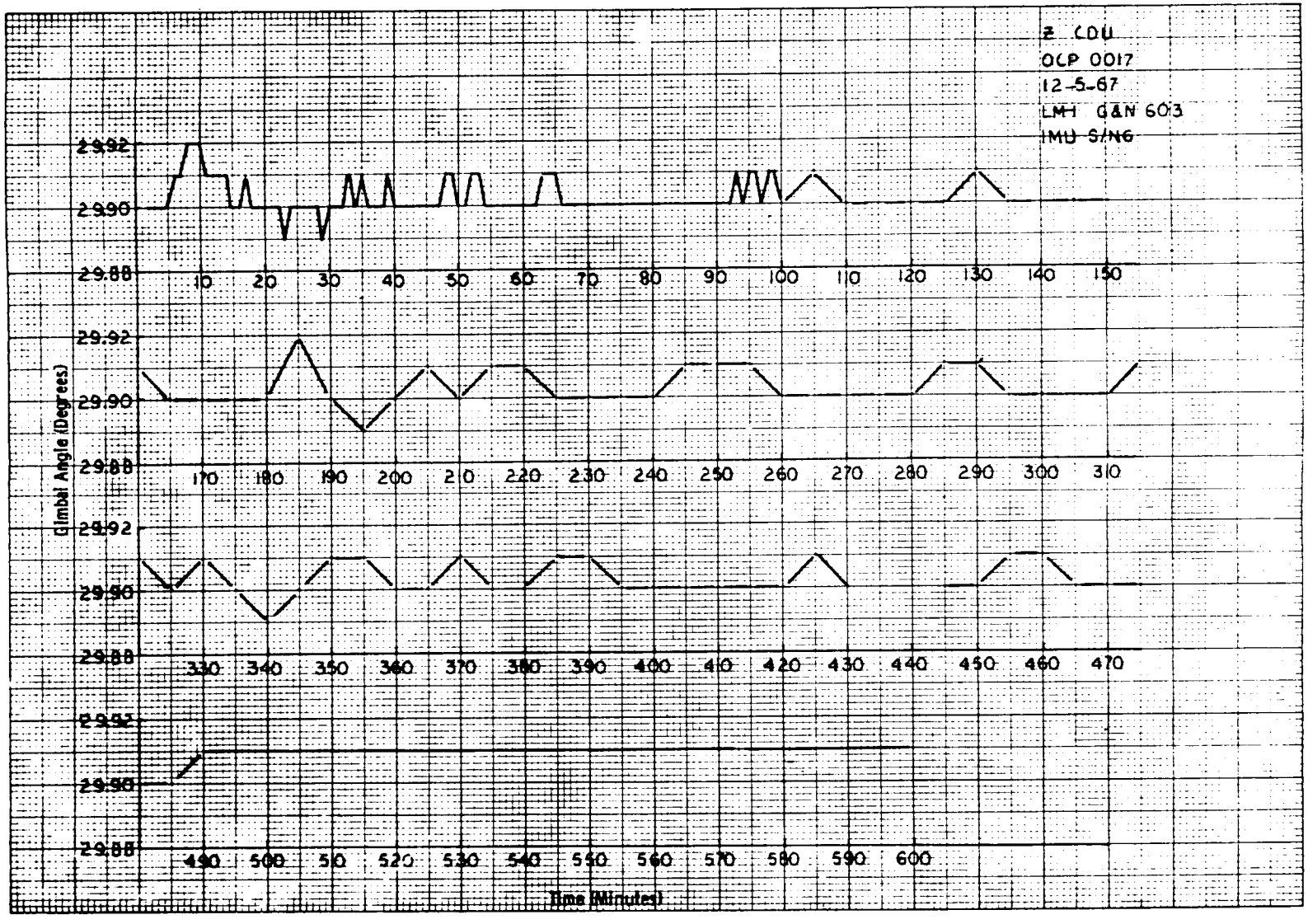

Y CDU
OCP 0017
12 5 67
LM-1 G&N 603
IMU S/N6
Gimbal Angle (Degrees)
0.09
0.07
0.05
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
170 180 190 200 210 220 230 240 250 260 270 280 290 300 310
330 340 350 360 370 380 390 400 410 420 430 440 450 460 470
490 500 510 520 530 540 550 560 570 580 590 600
Time (Minutes)

Fig. 7-29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OCP 0017
12-5-67
LM-1 G&N 603
IMU S/N6
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29.90
29.88
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29.92
29.90
29.88
170 180 190 200 210 220 230 240 250 260 270 280 290 300 310
29.92
29.90
29.88
330 340 350 360 370 380 390 400 410 420 430 440 450 460 470
29.92
29.90
29.88
490 500 510 520 530 540 550 560 570 580 590 600
Gimbal Angle (Degrees)
Time (Minutes)

Fig. 7-30

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