

CR-134131

E-2795

MISSION SL-4 (AS 208/CM 118/IMU 34)

G&N ERROR ANALYSIS

(SKYLAB 4)

by

S. B. HELFANT

October 1973

(NASA-CR-134131) MISSION SL-4 (AS 208/CM 118/IMU 34) G AND N ERROR ANALYSIS (SKYLAB 4) (Draper (Charles Stark) Lab., Inc.) ³³ p HC \$3.75 ₃₄ CSCL 22C N74-12504 Unclas 63/31 22831



The Charles Stark Draper Laboratory, Inc.
 Cambridge, Massachusetts 02139

E-2795

MISSION SL-4 (AS 208/CM 118/IMU 34)

G&N ERROR ANALYSIS

(SKYLAB 4)

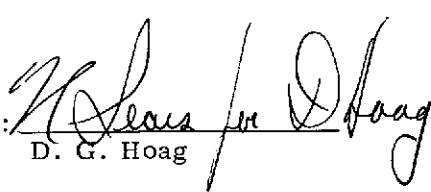
by

S. B. Helfant

October 1973

THE CHARLES STARK DRAPER LABORATORY, INC.
CAMBRIDGE, MASSACHUSETTS 02139

Approved:


D. G. Hoag

ACKNOWLEDGMENT

This report was prepared by the Charles Stark Draper Laboratory under Contract NAS 9-4065 with the L. B. Johnson Space Center of the National Aeronautics and Space Administration.

The author wishes to acknowledge the contributions made to this report by Julius Feldman. Mr. Feldman helped in the review of this and previous reports and many of his suggestions have been included.

This volume is the combined effort of the following additional people: Linda Willy prepared the component performance tabulation and performed the plotting for the inertial components. William Beaton provided the failure rates for the success probability. Their contribution to the preparation of this volume is greatly appreciated.

The publication of this report does not constitute approval by the National Aeronautics and Space Administration of the findings or the conclusions contained herein. It is published only for the exchange and stimulation of ideas.

E-2795

MISSION SL-4 (AS 208/CM 118/IMU 34)
G&N ERROR ANALYSIS
(SKYLAB 4)

ABSTRACT

This document presents data on G&N system performance and operation for the CM. For data on the effects of Block II and of measured CM IMU test data deviation uncertainties on earth orbit insertion indication uncertainties and on deorbit burn and reentry uncertainties, the reader is referred to E-2760, the G&N error analysis report for Skylab 2).

by: S.B. Helfant
October 1973

TABLE OF CONTENTS

	<u>Page</u>
GYRO DRIFT TEST POSITIONS.....	1
G&N MISSION RELIABILITY ANALYSIS	2
CM MISALIGNMENT DATA	3
CM IMU.....	6
a. IRIG and PIPA Performance Tabulation	7
b. Standard Deviations of the IRIG and PIPA Parameter Uncertainties	25
c. Proposed Gyro and Accelerometer Performance Compensations	25
DICTIONARY OF TERMS	26
APPENDIX ELECTRICAL POWER REQUIREMENTS.....	27

~~PRECEDING PAGE BLANK NOT FILMED~~

GYRO DRIFT TEST POSITIONS
FOR
SUNDANCE, LUMINARY, COLOSSUS, AND ON

STABLE MEMBER POSITION	STABLE MEMBER ORIENTATION	HORIZONTAL DRIFT	VERTICAL DRIFT
1	X DOWN Y SOUTH Z WEST	NBDY-ADOAY	
2	X DOWN Y WEST Z NORTH	+NBDZ-ADOAZ	-NBDZ+ADIAX
3	X SOUTH Y WEST Z DOWN	NBDX-ADOAX	
4	X EAST Y SOUTH Z DOWN	+NBDY+ADSRAY	+NBDZ+ADIAZ
5*	X WEST Y UP Z NORTH	+NBDZ-ADSRAZ	
6*	X SOUTH Y DOWN Z EAST	+NBDX+ADSRAZ	-NBDY+ADIAZ
7	X NORTH Y UP-WEST Z UP-EAST	-NBDX+(ADSRAZ/ $\sqrt{2}$)	
8	X EAST Y UP-NORTH Z UP-SOUTH	$(-NBDZ-NBDY)/\sqrt{2}$ +(ADIAZ-ADIAZ)/2 +(ADSRAZ+ADSRAZ)/2	
9	X UP-EAST Y UP-WEST Z SOUTH	-NBDZ+(ADSRAZ/ $\sqrt{2}$)	
10	X UP-NORTH Y UP-SOUTH Z EAST	$(NBDY-NBDX)/\sqrt{2}$ +(ADIAZ-ADIAX)/2 +ADSRAZ/2	
11	X NORTH Y WEST Z UP	-NBDX-ADOAX	
12	X UP Y SOUTH Z EAST	+NBDY+ADOAY	
13	X UP Y EAST Z NORTH	+NBDZ+ADOAZ	

* Positions 5 and 6 are lab test only.

SKYLAB 4

G&N MISSION RELIABILITY ANALYSIS

Failure rates used were obtained, for the most part, from observed Apollo field and flight experience of the PGNS. Each reported failure was analyzed with respect to its likelihood of occurrence in flight and the impact on the Mission should such failure occur. The result was to count only those reported failures which could occur in flight and which would degrade the Mission, should they occur.

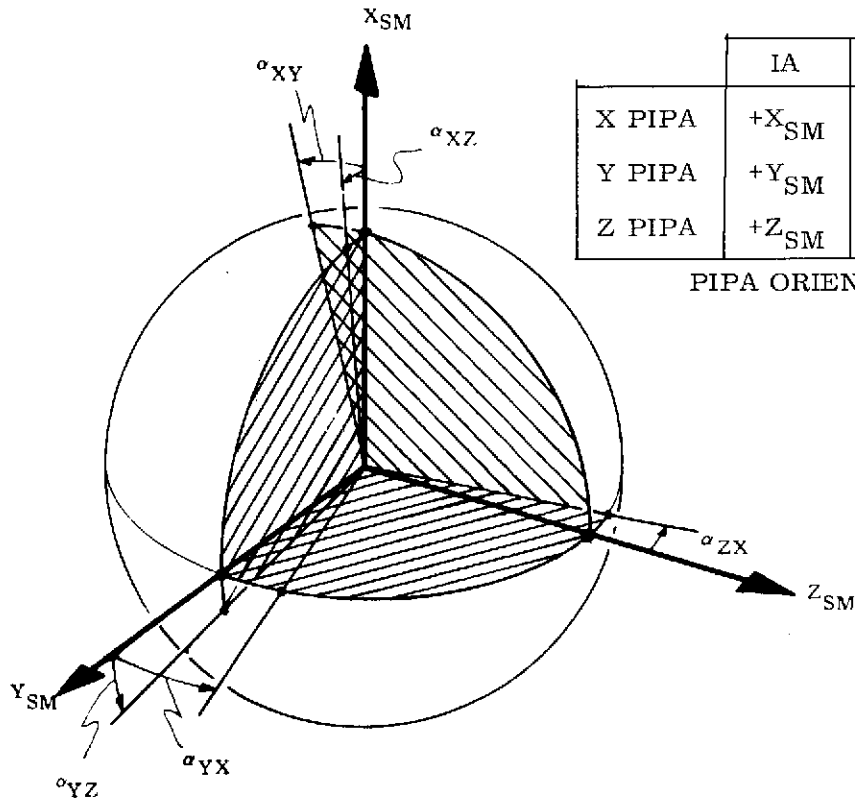
SUBSYSTEM	MODE (time/cycles)	FAILURE RATE ($\lambda \times 10^6$)	MISSION DURATION (hrs or cycles)	$e^{-\lambda t}$
AGC	Operate	19.2	61	0.99883
	Calendar	2.8	1728	0.99517
	Envirn	30.9	0.45	0.99999
	On/Off	238.1	2	0.99952
DSKY*	Operate	1.4	61	0.99999
	Calendar	0.9	1728	0.99999
	Envirn.	122.9	0.45	0.99999
	On/Off	1190.5	2	0.99999
IMU CDU**	Operate	20.2	61	0.99877
	Calendar	2.4	1728	0.99586
	Envirn	62.5	0.45	0.99997
	On/Off	1666.6	2	0.99667
IMU	Operate	94.1	61	0.99428
	Calendar	2.6	1728	0.99552
	Envirn	18.5	0.45	0.99999
	On/Off	142.9	2	0.99971
IMU Electronics (PSA)	Operate	8.4	61	0.99949
	Calendar	1.2	1728	0.99793
	Envirn	18.5	0.45	0.99999
	On/Off	714.3	2	0.99857
Optics Assembly	Operate	119.3	61	0.99275
	Calendar	1.8	1728	0.99689
	Envirn	18.5	0.45	0.99999
	On/Off	238.1	2	0.99952
Optics Electronics	Operate	17.2	61	0.99895
	Calendar	7.1	1728	0.98781
	Envirn	18.5	0.45	0.99999
	On/Off	142.9	2	0.99971

G&N MISSION RELIABILITY

CM = 0.94712

*Considers parallel redundancy $(1 - (1 - e^{-\lambda t})^2)$

**Includes CM Optics CDU



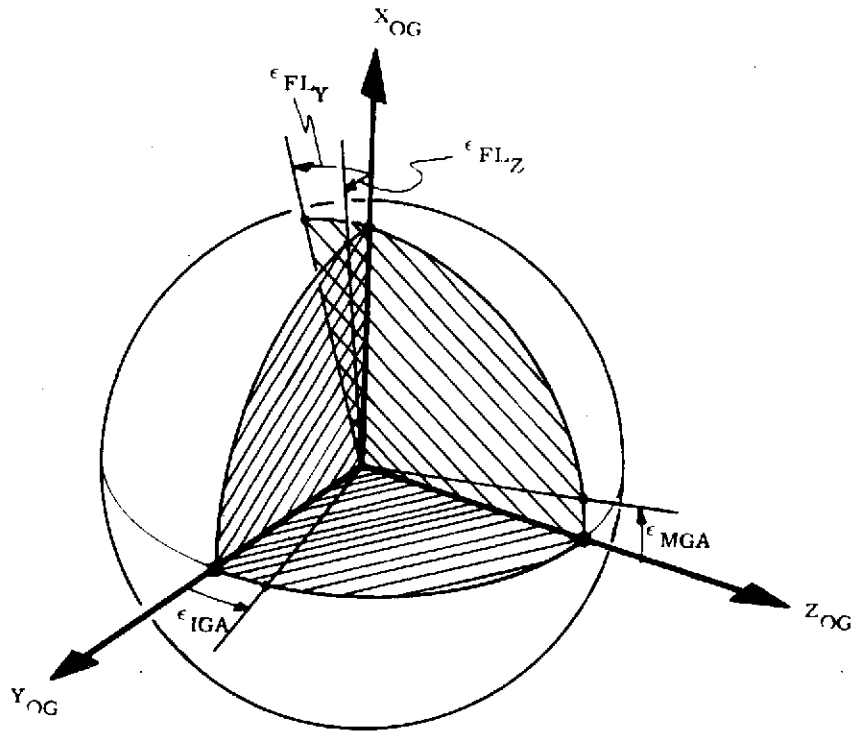
	IA	OA	PRA
X PIPA	$+X_{SM}$	$+Z_{SM}$	$-Y_{SM}$
Y PIPA	$+Y_{SM}$	$-Z_{SM}$	$+X_{SM}$
Z PIPA	$+Z_{SM}$	$+X_{SM}$	$-Y_{SM}$

PIPA ORIENTATIONS

PIPA Misalignments from Ideal Stable Member Axes

Term	(Angle in $\widehat{\text{Sec}}$) CM-IMU 34
α_{XY}	- 7
α_{XZ}	-19
α_{YZ}	+ 5
α_{YX}	+26
α_{ZX}	-17

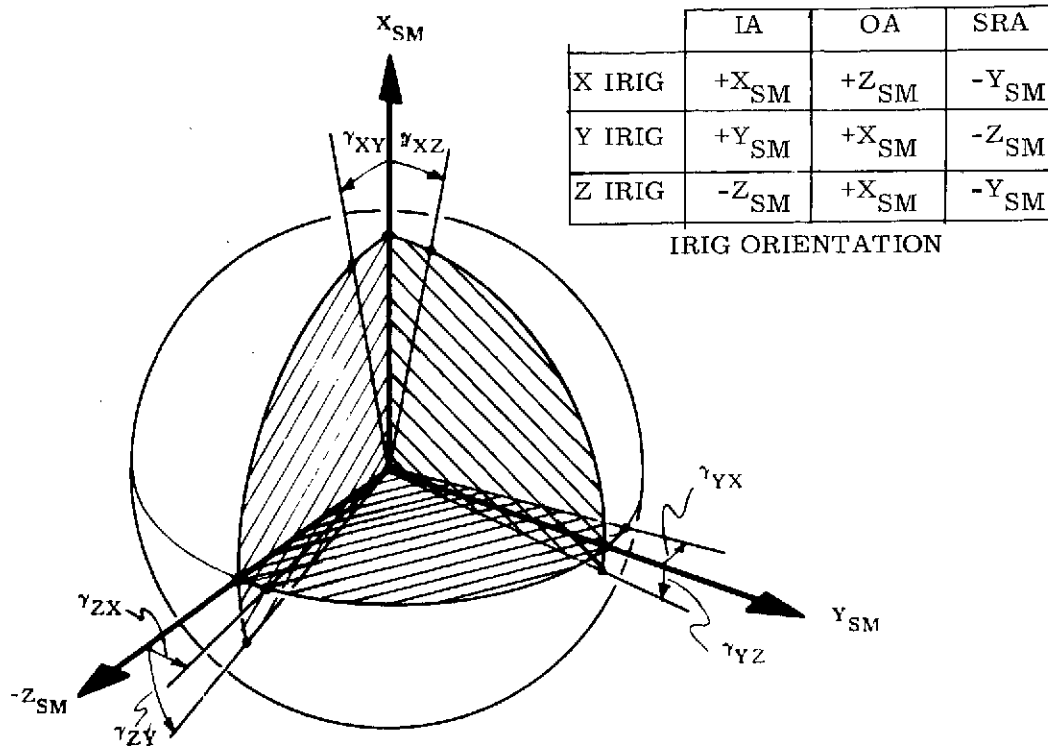
DEFINITION OF POSITIVE SENSE
PIPA INPUT-AXIS MISALIGNMENTS
with respect to
IDEAL STABLE MEMBER AXES



Gimbal Axis Orthogonality Errors and Outer Gimbal Misalignment from Casemounting Axes

Term	(Angle in Sec) CM-IMU 34
ϵ_{IGA}	0
ϵ_{MGA}	- 6
ϵ_{FLY}	0
ϵ_{FLZ}	+ 1

DEFINITION OF POSITIVE SENSE
 GIMBAL AXIS ORTHOGONALITY
 and
 OUTER GIMBAL ALIGNMENT
 with respect to
 CASE MOUNTING ALIGNMENT



IRIG Misalignments from Ideal Stable Member Axes

Term	(Angle in Sec) CM-IMU 34
γ_{XY}	- 4
γ_{XZ}	-28
γ_{YZ}	- 8
γ_{YX}	-22
γ_{ZX}	+ 9
γ_{ZY}	+ 7

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

IMU S/N 34
AS208/CM 118/G&N 222

IRIGs

X = 8A117

Y = 8A102

Z = 8A101

PIPAs

X = 3AP333

Y = 3AP334

Z = 3AP335

NASA BA-117

DATE	TST LOC	IMU TYP	GSM ASSN	SYS	NBD	ATSEA	ADIA	DELSF+	DELSP-	WHRPL PRT	HOURS	I+	I-	ID	ADDA
18AP69	A45	CSS								C107					
18AP69	A45	CSS			(15.1)	(2.6)	(- 2.2)			C 98				11.3	
18AP69	SG	84.6,	70.1,	56.0	TC	55.8,	69.2,	84.6		REF H5218					
22AP69	A44	CSS			(14.1)	(0.3)	(- 3.9)			150				9.7	
29AP69	A44	CSS			(14.5)	(0.4)	(- 0.9)			150				9.8	
1MY69	A44	CSS								153					
5MY69	COMP	SELECT													
5MY69	A44	CSS						- 159	- 120	151		85.002	85.003		
7MY69	COMP	VERIF	S/F		REPAIRED										
7MY69	A44	CSS						- 373	- 72			84.997	84.996		
7MY69	COMP	FESLCT													
7MY69	A44	CSS						321	- 96	155		85.002	85.002		
7MY69	CCMP	REVERIF													
7MY69	A44	CSS						324	- 55			84.997	84.997		
7MY69	DEMO														
7MY69	A44	CSS						289	- 137	154		84.997	84.998		
8MY69	VIB														
9MY69	EQUIPMENT	MALFUNCTION	-												
9MY69	A44	CA1			0.2	3.7	3.4								
9MY69	A44	CA2			0.2	3.6	4.4	106	- 287			84.995	84.995	11.6	
9MY69	A44	CA3			0.7	4.0	4.9			156					
12MY69	A44	CB1			1.4	3.2	1.3								
12MY69	A44	CB2			1.5	3.0	- 1.5	176	- 362			84.993	84.994	10.1	
12MY69	A44	CB3			1.4	3.0	- 0.5			155					
15MY69	A45	CC1			1.0	3.2	5.4								
15MY69	A45	CC2			0.9	3.1	4.6	31	- 318			85.002	85.001	11.8	
15MY69	A45	CC3			1.0	3.0	4.8			158	459				
					UNIT		INSTALLED								
					IN IMU		S/N 48Y,								
7AU69	A03	SPO	Y	48	0.4	1.9		40	- 351			85.008		1.6	
7AU69	A03	SPO	Y	48	1.2		- 0.1								
8AU69	A03	SPO	Y	48						C114					
8AU69	A03	SPO	Y	48						C121					
8AU69	A03	SPO	Y	48						C113	518				
3SE69	A03	SPO	Y	48	0.4	5.6		- 227	- 494			85.001		0.6	
3SE69	A03	SPO	Y	48	0.9		2.4				606				
16QC69	IMU	S/N	48												
18NO69	IMU	S/N	48												
20NO69	A01	SPO	Y	48	2.2		8.1								
21NO69	A01	SPO	Y	48	1.7	0.4		174	- 240	C110		85.021		1.4	
21NO69	A01	SPO	Y	48						C114	682				
21NO69	MILLIWATT														
5FE70	A03	SPO	Y	48	0.9										
5FE70	A03	SPO	Y	48	1.5										
6FE70	A03	SPO	Y	48	2.7										
6FE70	A03	SPO	Y	48	2.3	0.7		- 160	- 528			85.016		0.0	
12FE70	NO	FLUID													
16FE70	DATA														
16FE70	A03	SCK	Y	48	2.5										
17FE70	DATA														

7

NASA 8A-117

DATE	TST LOC	IMU TYP	GEN ASSN SYS	NBR	ADSPA	ADTA	DELSP+ DELSF-	WHEEL PRT HOURS	t+	I-	ID	ACDA
17FE70	A03	SCK	Y 48	1.3	-	9.5						
18FE70	DATA AFTER OVERNIGHT STORAGE WITH Y IA UP FOLLOWS.											
18FE70	A03	SCK	Y 48	0.0	4.1							1.3
18FE70	A03	SCK	Y 48	0.7		11.4						
19FE70	DATA AFTER OVERNIGHT STORAGE WITH Y IA DOWN FOLLOWS.											
19FE70	A03	SCK	Y 48	1.5	2.3							1.3
19FE70	A03	SCK	Y 48	1.9		8.8		811				
16MF70	IMU S/N 48 SHIPPED FROM AC/MKE TO KSC.											
12MY70	IMU S/N 48 SHIPPED FROM KSC TO AC/MKE.											
19MY70	A03	SPO	Y 48	- 1.1		7.4						
19MY70	A03	SPO	Y 48	- 1.7	- 4.5			C113				1.1
22MY70	A03	SPO	Y 48	- 0.1		5.5						
22MY70	A03	SPO	Y 48	- 0.8	- 4.2							1.1
25MY70	A03	SPO	Y 48				- 294 - 674	916	85.003			
27MY70	NO FLUID TRANSIENTS APPARENT DURING GRAVITY TRANSIENT TEST.											
7JL70	IMU S/N 48 SHIPPED FROM AC/MKE TO NR.											
13JL70	IMU S/N 48 INSTALLED IN CM-112 (GEN 217).											
11AU70	NSC	GEN	Y 48 217	4.7	4.7	0.9	15 - 485					
11AU70	ADIAI POSITION 8											
31AU70	NSC	GEN	Y 48 217					990				
31OC70	NSC	GEN	Y 48 217					995				
18NO70	NSC	GEN	Y 48 217	1.1	11.4	0.2	130 - 348					
18NO70	ADIAI POSITION 8											
7DE70												
9DE70	IMU S/N 48 SHIPPED FROM NS TO DELCO/MKE.											
28FE71												
4MR71	A03	SPO	Y 48	0.3		1.6						
4MP71	A03	SPO	Y 48	0.5	11.2							
5MP71	A03	SPO	Y 48				- 160 - 407		85.016			1.6
7MR71	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TRANSIENT TEST.											
8MR71												
8MF71	IMU S/N 48 SHIPPED FROM DELCO/MKE TO KSC.											
19MR71	IMU 48 GEN 217 INSTALLED IN CM-112.											
23MR71	K0B	GEN	Y 48 217	0.3	13.8	6.1	- 195 - 200					1.1
23MR71	ADIAI POSITION 8											
31MR71	K0B	GEN	Y 48			1.1						
13AP71	K0B	GEN	Y 48 217	- 1.7	14.4	3.3	172 - 114					1.1
13AP71	ADIAI POSITION 8											
30AP71												
19MY71	K9A	GEN	Y 48 217	- 3.9	16.4	7.0						1.2
19MY71	ADIAI POSITION 8											
31MY71	K9A	GEN	Y 48					1416				
10JE71	K9A	GEN	Y 48 217	- 3.8	15.1	6.9						1.1
10JE71	ADIAI POSITION 8											
19JE71	K9A	GEN	Y 48 217	- 2.9	15.2	4.5						1.2
19JE71	ADIAI POSITION 8											
30JE71	K9A	GEN	Y 48					1521				
11JL71	K9A	GEN	Y 48 217	- 3.2	14.8	6.8						1.0
11JL71	ADIAI POSITION 8											

8

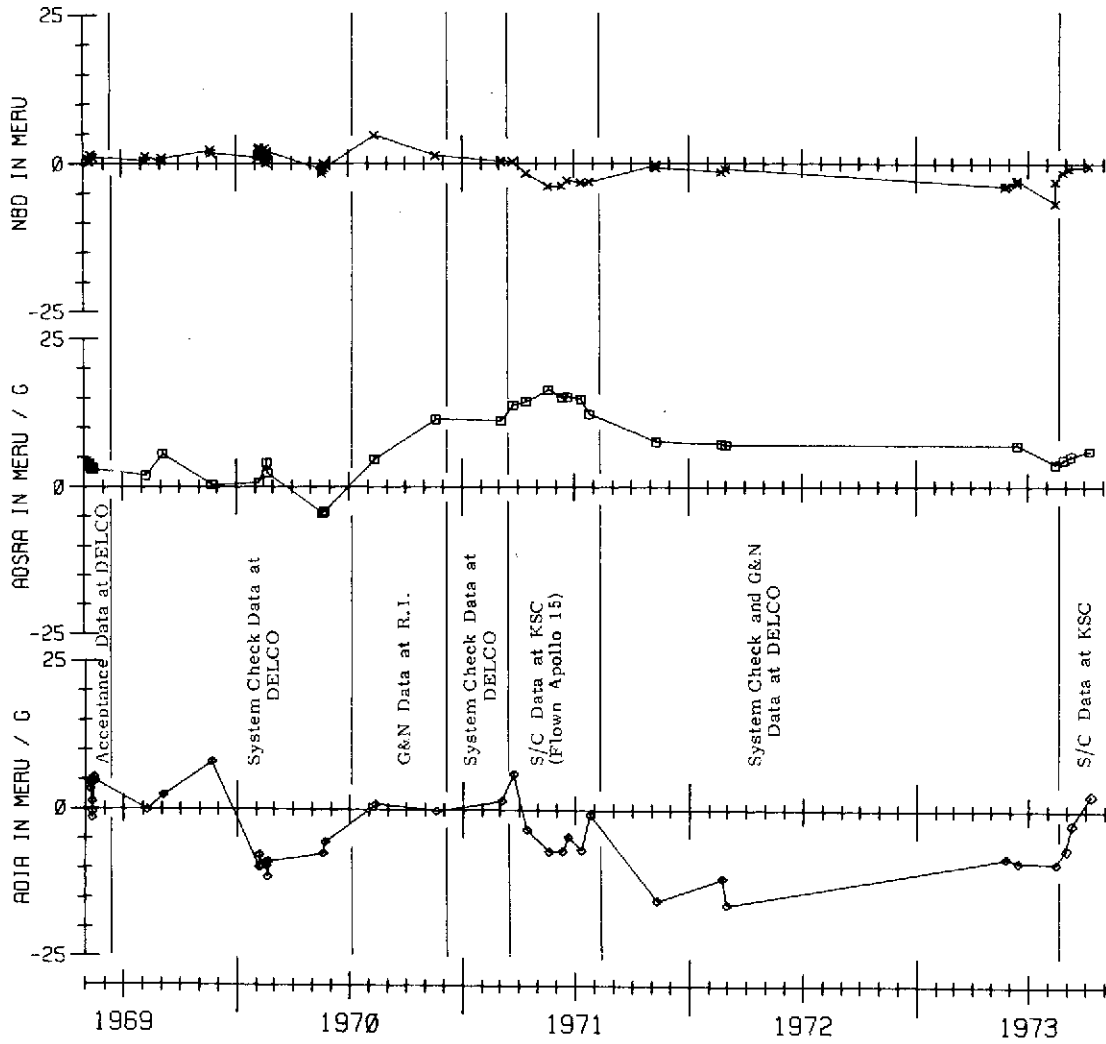
NASA BA-117

DATE	LOC	TST TYP	IMU ASSN	GRN SYS	KBD	ADSPA	ADTA	DELSE+	DELSE-	WHEPI FDI HOURS	I+	I-	ID	ADDA
24JL71	K9A	GRN Y 48	217		- 3.1	12.3	- 0.7							1.0
24JL71	ADIAZ POSITION 9 - 4.8													
24JL71	PRE-LAUNCH COMPENSATIONS NBD -2.8 ATSPA 15.0 ADIA -5.0													
27JL71	NBD VALUE INCORPORATED AT 27 HRS 52 MIN GMT -1.8													
26JL71	K9A	GRN Y 48								1671				
26JL71	IMU 48	GRN 217	CM-112	LAUNCHED. APOLLO 15.										
7AU71	IMU 48	GRN 217	CM-112	RECOVERED										
7AU71														
15OC71	IMU 48	SHIPPED FROM NR TO DELCO/HKS.												
9NO71	A04	SPO Y 48			- 3.2		- 15.3							
9NO71	A94	SPO Y 48			- 0.7	7.6								1.7
10NO71	A04	SPO Y 48							83 - 274		85.004			
19NC71	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TRANSIENT TEST.													
22FE72	ALC	GRN Y 48			- 1.5	7.2	- 11.5							1.2
29FE72	ALC	GRN Y 48			- 1.0	7.0	- 16.0			2246				1.5
4MY73	UNIT ASSIGNED TO IMU-34, X-POSITION REPLACING BA141.													
25MY73	SB6	SPO Y 34			- 3.9		- 8.0			C113				
29MY73	SB6	SPO X 34			- 3.7	8		- 8 - 13	C112		85.000			1.7
13JE73	SB6	SPO X 34			- 3.2		- 9.7							
13JE73	SB6	SPO X 34			- 2.8	7.0								1.6
15JE73	10 MIN TRANSIENT OBSERVED DURING GRAVITY TEST.													
30JE73														
10AU73	SB6	SPO X 34						111 - 269		2385				84.998
14AU73	SB6	SPO X 34			- 6.7		- 8.9		C113					
14AU73	SB6	SPO X 34			- 3.0	3.8								
21AU73	IMU-34 SHIPPED FROM DELCO TO KSC.													
24AU73	IMU-34 INSTALLED IN CM-118 (SKYLAB-4).													
28AU73	K9B	GEN X 34	222		- 1.8	4.2	- 6.7							2.6
4SE73	K9B	GEN X 34	222		- 1.5	4.8	- 1.8							2.5
10OC73	K9B	GEN X 34	222		- 0.8	5.3	1.8							2.5

6

BA-117 COMPLETED

G&N 222, CM 118, IMU 34, APOLLO IRIG 8A117, X AXIS



DRIFT PLOTTED BY TIME

MASA BA-102

DATE	LOC	TST TYP	TMO	GEN	ASSN	SYS	NBD	ADSPA	ADIA	DELSF+	DELSF-	WHEEL PDT HOURS	I+	I-	ID	ADDA
3NO68	SG	83.6, 70.2, 56.2	TG	58.4, 70.9, 86.6				REF H5201								
4NO68	A42	CSS										C103				
4NO68	A42	CSS				(- 4.5)	(- 1.7)	(- 2.3)				C102			-15.2	
11NO68	A45	CSS				(- 5.9)	(- 0.3)	(- 6.1)				148			-16.6	
14NO68	A45	CSS				(- 5.6)	(- 0.3)	(- 5.4)				141			-15.9	
19NO68	A44	CSS	COMP. SELECT							417	112	133	85.005	85.006		
20NO68	A44	CSS										142				
20NO68	A44	CSS										146				
26NO68	A44	CSS	COMP VERIF TM + OOS													
26NO68	A44	CSS								- 725	160		85.002	85.004		
26NO68	DEMO		T/F = 1213													
26NO68	A44	CSS								- 225		152	84.997	84.997		
27NO68	A44	CSS										141				
4DE68	VIB	IA	ALIGN = +0.1													
5DE68	A44	CA1				- 2.1	- 1.5	- 9.4								
5DE68	A44	CA2				- 2.6	- 1.0	- 9.0	+ 62	95		84.998	84.998	-16.6		
5DE68	A44	CA3				- 2.2	- 0.9	- 10.5			149					
8DE68	A44	CB1				- 1.9	- 1.3	- 10.6								
8DE68	A44	CB2				- 1.9	- 1.3	- 10.6	- 111	341		84.997	84.997	-17.7		
8DE68	A44	CB3				- 1.9	- 1.5	- 9.1			146					
10DE68	A44	CC1				- 0.6	- 2.7	- 8.7								
10DE68	A44	CC2				- 1.7	- 2.7	- 7.4	- 159	163		84.997	84.997	-15.8		
10DE68	A44	CC3				- 1.8	- 2.8	- 5.9			150					
11DE68	A42	CRT										137				
12DE68	A44	CRT										153	514			
14JA69	ACCEPTED ON WAIVEPS C1241, C1234 & R1412															
14JA69	UNIT INSTALLED IN IMU S/N 39Y, REPLACING 7A-200															
28JA69	A17	SPO	Y	39		0.6	0.7		- 284	217		85.006			1.6	
28JA69	A17	SPO	Y	39		1.0		- 7.9								
30JA69	A17	SCK	Y	39		0.4	- 0.1								1.3	
30JA69	A17	SCK	Y	39		0.4		- 8.7				604				
10FE69	A17	GEN	Y	39		2.1	- 0.6	- 8.6	- 264	148						
10FE69	A17	GEN	Y	39		1.3										
10FE69	A17	GEN	Y	39		1.5						659				
26FE69	IMU	S/N	39	SHIPPED TO GARC												
6MR69	G20	GEN	Y	39	613	- 1.5	- 0.6	- 5.6	- 333	206		684				
23MY69	G20	GEN	Y	39	613	- 2.8	- 5.6	- 17.6	- 249	208		694				
13AU69	GSC	GEN	Y	39	613	- 3.7	- 1.1	0.2	- 119	198						
13AU69	GSC	GEN	Y	39	613	- 4.9		4.6								
13AU69	GSC	GEN	Y	39	613	- 5.1		9.5				756				
13AU69	POSITION B ADIAY = -10.66															
25OC69	GSC	GEN	Y	39	613	- 5.7	- 0.7	- 0.7	- 142	160		823				
25OC69	ADIA POSITION B = -10.6															
3DE69	GSC	GEN	Y	39	613	- 4.4	- 0.3	3.1	- 198	322		880				
3DE69	ADIA POSITION B															
31MR70	GSC	GEN	Y	39	613							922				
30AP70	GSC	GEN	Y	39	613							942				
7MY70	IMU	S/N	39	SHIPPED FROM GARC TO AC/MKE.												

8A-102 CONTINUED

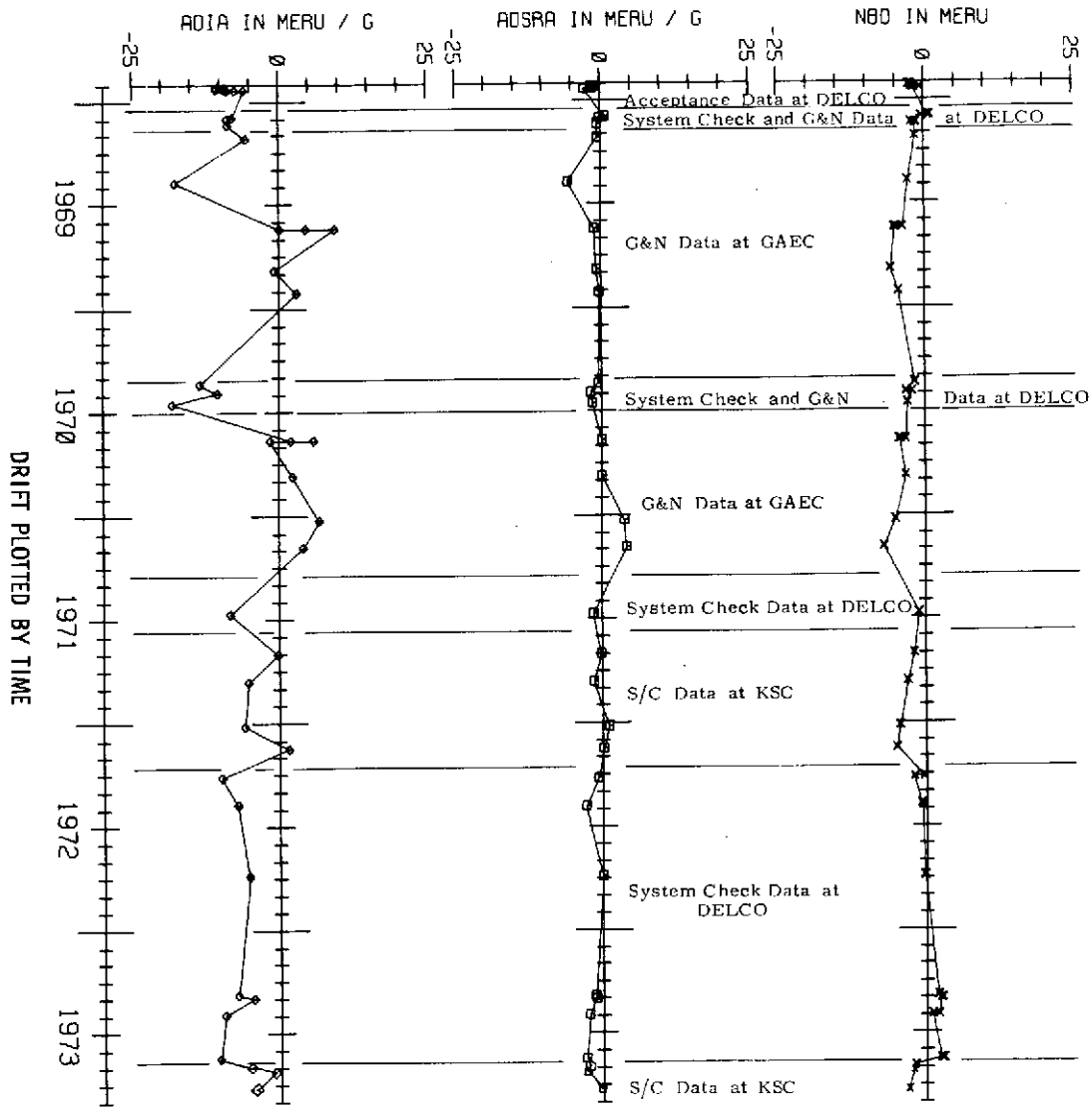
NASA RA-102

DATE	LOC	TST TYP	IMU ASSN	GEN SYS	NBD	ADSF A	ADIA	DELSF+	DELSF-	WHEEL RET HOURS	I+	I-	ID	ADDA
12MY70	A05	SCK	Y 39		- 1.7		- 13.4							
12MY70	A05	SCK	Y 39		- 1.8	- 0.5				C111				1.7
12MY70	A05	SCK	Y 39							C108	973			
12MY70	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TRANSIENT TEST.													
28MY70	A07	SPO	Y 39		- 3.2		- 10.4							
28MY70	A07	SPO	Y 39		- 2.2	- 1.8				C110	1016			1.2
1JE70	A07	SPO	Y 39					- 484	60		85.007			
12JE70	A07	GEN	Y 39 615					- 571	35					
16JE70	A07	GEN	Y 39 615		- 3.0	- 1.5	- 18.1				1113			
24JE70	IMU S/N 39 SHIPPED FROM AC/MKE TO GAC.													
15JL70	IMU S/N 39 INSTALLED IN LM-11 (GEN 615).													
20AU70	GSC	GEN	Y 39 615		- 3.3	0.1	2.0	- 315	261					
20AU70	ADIA POSITION 8													
20AU70	GSC	GEN	Y 39 615		- 4.4		5.9							
20AU70	ADIA POSITION 8													
20AU70	GSC	GEN	Y 39 615		- 4.2		1.5							
20AU70	ADIA POSITION 8													
31AU70	GSC	GEN	Y 39 615								1156			
30SE70	GSC	GEN	Y 39 615								1177			
22OC70	GSC	GEN	Y 39 615		- 3.3	0.1	2.3	- 264	114					
22OC70	ADIA POSITION 8													
31OC70	GSC	GEN	Y 39 615				- 10.4							
30NO70	GSC	GEN	Y 39 615								1231			
8JA71	GSC	GEN	Y 39 615		- 5.1	3.8	6.8	- 294	84		1239			
8JA71	ADIA POSITION 8													
31JA71	GSC	GEN	Y 39 615				- 9.4							
24FE71	GSC	GEN	Y 39 615		- 7.0	4.2	4.1	- 259	186		1263			
24FE71	ADIA POSITION 8													
28FE71	GSC	GEN	Y 39 615				- 8.4							
28FE71	ADIA POSITION 8													
31MR71	GSC	GEN	Y 39 615								1343			
31MR71	ADIA POSITION 8													
11AP71	GSC	GEN	Y 39 615								1355			
11AP71	ADIA POSITION 8													
22AP71	IMU S/N 39 SHIPPED FROM GAC TO DELCO/MKE.													
21JE71	A07	SPO	Y 39		- 1.1		- 8.3							
21JE71	A07	SPO	Y 39		- 1.2	- 1.5								
22JE71	A07	SPO	Y 39					- 461	50	C114	85.006			1.0
25JE71	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TRANSIENT TEST.													
27JL71	IMU 39 SHIPPED FROM DELCO/MKE TO KSC.													
11AU71	IMU 39 INSTALLED IN LM-11													
31AU71	KOB	GEN	Y 39 615		- 2.0	- 0.2	- 0.2	- 530	44					1.2
31AU71	ADIA POSITION 8													
19OC71	KOB	GEN	Y 39 615		- 3.1	- 1.4	- 5.3							1.6
19OC71	ADIA POSITION 8													
6JA72	K9A	GEN	Y 39 615		- 4.4	1.1	- 5.9	- 432	181					1.4
6JA72	ADIA POSITION 8													
14FE72	K9A	GEN	Y 39 615		- 5.0	0.2	1.6							2.3
14FE72	ADIA POSITION 8													
29FE72	ADIA POSITION 8													
22MR72	IMU S/N 39 REMOVED FROM LM-11 DUE TO BAD Y-PIPA.													
23MP72	IMU S/N 39 SHIPPED FROM KSC TO DELCO/MKE.													

NASA 8A-102

DATE	LOC	TST TYP	IMU ASSN	GEN SYS	NBD	ADSEFA	ADIA	DELSF+	DELSF-	WHEEL RDT HOURS	I+	I-	ID	ADDA
5AP72	A07	SPO	Y 39		- 0.4		- 9.8							
6AP72	A07	SPO	Y 39		- 2.0	- 0.7		- 407	60		85.005			
22MY72	A07	SPO	Y 39		- 0.8		- 7.1							
25MY72	A07	SPO	Y 39		- 0.6	- 2.8		- 407	7		85.006			
26SE72	SB6	SPO	Y 39		- 0.3		- 5.2							
26SE72	SB6	SPO	Y 39		- 0.2	0.0		- 397	195		85.000			
26SE72	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TEST.													
10JA73	UNIT REMOVED FROM IMU-39.													
10JA73	UNIT ASSIGNED TO IMU-34, Y-POS. REPLACES 7C033.													
10JA73														
12AP73	SB6	SPO	Y 34					- 751	- 202	2078	84.999			
24AP73	SB6	SPO	Y 34		2.0		- 7.2							
25AP73	SB6	SPO	Y 34		2.0	- 1.3								0.3
25AP73	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TEST.													
30AP73														
30AP73	SB6	SPO	Y 34		2.7		- 4.5			2203				
30AP73	SB6	SPO	Y 34		2.4	- 1.2				C114				
29MY73	SB6	SPO	Y 34		2.0		- 9.4			C116				
29MY73	SB6	SPO	Y 34		1.0	- 2.3		- 673	- 228	C113	85.000			0.1
30JE73														
13AU73	SB6	SPO	Y 34					- 594	- 135	2363	85.000			
14AU73	SB6	SPO	Y 34		2.5		- 10.3			C115				
15AU73	SB6	SPO	Y 34		2.9	- 2.9								
21AU73	IMU-34 SHIPPED FROM DELCO TO KSC.													
24AU73	IMU-34 INSTALLED IN CM-118 (SKYLAB-4).													
28AU73	K9B	GEN	Y 34 222		- 1.4	- 2.7	- 4.4	- 770	- 272					2.0
28AU73	ADIAI POSITION-8													
4SE73	K9B	GEN	Y 34 222		- 1.8	- 2.9	- 1.3							1.7
4SE73	ADIAI POSITION-8													
100C73	K9B	GEN	Y 34 222		- 2.9	- 0.2	- 3.9							2.1
100C73	ADIAI POSITION-8													

G&N 222, CM 118, IMU 34, APOLLO IRIG 8A102, Y AXIS



NASA 8A-101

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	NBD	ADSPA	ADIA	DELSP+	DELSP-	WHFFL RDT HOURS	I+	I-	ID	ADDA			
19NO68	SG	84.2,	69.0,	57.3	TA	54.7,	68.8,	32.2	SEP H5202								
20NO68	A41	CSS							C104								
20NO68	A41	CSS				(10.7)	(- 0.4)	(- 3.7)	C105			12.5					
25NO68	A43	CSS				(14.3)	(- 2.4)	(- 0.5)	139			16.8					
28NO68	A42	CSS				(18.1)	(1.1)	(- 6.6)	131			20.2					
28NO68	BANK #2	CSS OOS	- UNIT DEGAUSSED & CSS PERUM														
29NO68	A42	CSS				(12.6)	(- 3.7)	(0.8)	130			11.8					
30NO68	A42	CSS							126								
30DE68	A42	CSS				(11.1)	(- 3.0)	(2.7)	128			12.1					
9DE68	COMP SELECT																
9DE68	A42	CSS							72	369	135	85.002	85.002				
10DE68	COMP VERIF																
10DE68	A42	CSS							- 783	232				85.002	85.003		
10DE68	DEMO	T/F = 1196.33															
10DE68	A42	CSS							44	324	137	85.002	85.002				
10DE68	VIB	IA ALIGN = -0.5															
12DE68	A45	CA1				- 1.7	2.9	0.0									
12DE68	A45	CA2				- 1.7	2.9	0.7	144	314				85.002	85.003	11.0	
12DE68	A45	CA3				- 1.7	2.9	- 1.3	139								
15DE68	A45	CB1				- 0.9	3.1	- 3.5									
15DE68	A45	CB2				0.1	3.0	- 6.1	131	327				85.003	85.003	12.4	
15DE68	A45	CB3				- 0.3	2.5	- 5.0	139								
18DE68	A44	CC1				1.5	3.5	- 3.4									
18DE68	A44	CC2				2.7	3.4	- 6.0	93	317				84.989	84.990	16.2	
18DE68	A44	CC3				1.6	3.4	- 3.4	138			523					
13JA69	ACCEPTED ON WAIVERS E1415 & C1231 REV. 1																
13JA69	UNIT INSTALLED IN IMU S/N 397, REPLACING 7A-135																
28JA69	A17	SPO Z 39				2.6	10.2				451	50				85.007	1.0
28JA69	A17	SPO Z 39				3.2	- 15.0										
30JA69	A17	SCK Z 39				2.3	10.3										
30JA69	A17	SCK Z 39				2.8	- 15.5				613			1.1			
10FE69	A17	G&N Z 39				3.7	8.0	- 13.3	242	13							
10FE69	A17	G&N Z 39				3.2											
10FE69	A17	G&N Z 39				4.0							668				
26FE69	IMU S/N 39	SHIPPED TO GAEC															
6MR69	G20	G&N Z 39 613				1.7	6.4	- 14.4	107	- 38				692			
23MY69	G20	G&N Z 39 613				2.3	13.9	- 20.3	200	216				703			
13AU69	GSC	G&N Z 39 613				4.3	1.6	- 11.8	320	94				765			
25OC69	GSC	G&N Z 39 613				4.6	- 0.7	- 10.4	363	206				832			
3DE69	GSC	G&N Z 39 613				4.9	- 1.6	- 8.2	231	104				849			
31MR70	GSC	G&N Z 39 613													935		
30AP70	GSC	G&N Z 39 613													955		
7MY70	IMU S/N 39	SHIPPED FROM GAEC TO AC/YRE.															
12MY70	A05	SCK Z 39				3.7	- 11.4										
13MY70	A05	SCK Z 39				4.5	5.6							1.8			
13MY70	A05	SCK Z 39													C104		
13MY70	A05	SCK Z 39													C109		
13MY70	A05	SCK Z 39													C107		
13MY70	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TRANSIENT TEST.																
28MY70	A07	SPO Z 39													C105		
1JE70	A07	SPO Z 39				3.0	- 14.3							1029			

15

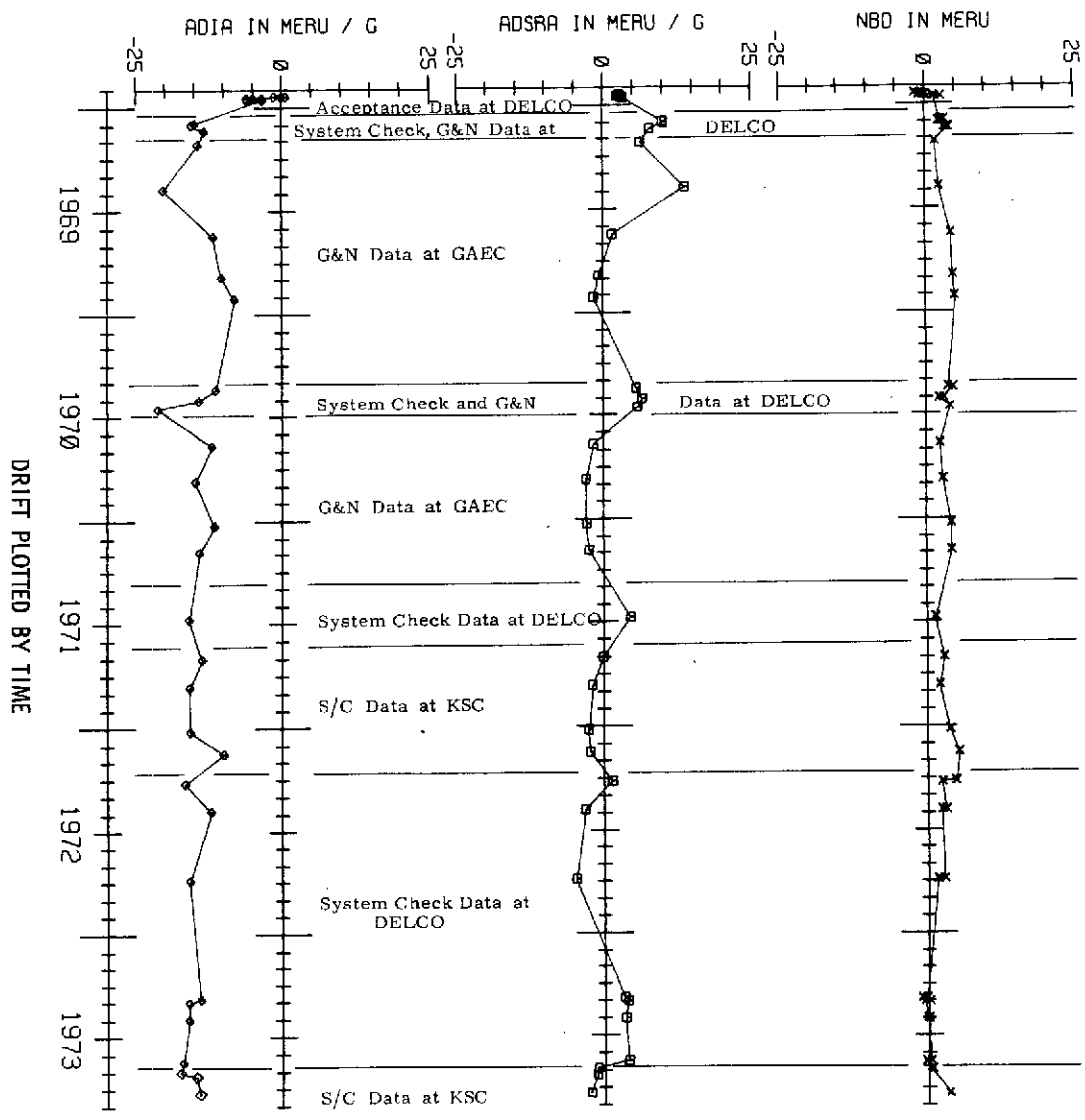
NASA 8A-101

DATE	LOC	TST TYP	IMU ASSN	GEN SYS	N5D	ADSF A	ADIA	DELSF+	DELSF-	WHEEL PDT HOURS	I+	I-	ID	ADDA
1JE70	A07	SPO	Z	39	2.2	6.6		384	- 60		85.007			1.2
12JF70	A07	GEN	Z	39 615				227	- 170					
16JE70	A07	GEN	Z	39 615	4.0	5.8	- 21.2			1126				
24JE70	IMU	S/N	39	SHIPPED FROM AC/MKE TO GAC.										
15JL70	IMU	S/N	39	INSTALLED IN LM-11 (GEN 615).										
20AU70	GSC	GEN	Z	39 615	2.3	- 1.7	- 12.0	341	73					
31AU70	GSC	GEN	Z	39 615						1168				
30SE70	GSC	GEN	Z	39 615						1190				
22OC70	GSC	GEN	Z	39 615	2.8	- 3.0	- 14.8	221	31					
31OC70	GSC	GEN	Z	39 615						1244				
31NO70	GSC	GEN	Z	39 615						1252				
8JA71	GSC	GEN	Z	39 615	4.2	- 2.9	- 11.6	338	38					
31JA71	GSC	GEN	Z	39 615						1276				
24FE71	GSC	GEN	Z	39 615	4.2	- 2.4	- 14.2	297	55					
28FE71	GSC	GEN	Z	39 615						1356				
31MR71	GSC	GEN	Z	39 615						1368				
11AP71	GSC	GEN	Z	39 615						1390				
22AP71	IMU	S/N	39	SHIPPED FROM GAC TO DELCO/MKE.										
22JE71	A07	SPO	Z	39	1.5		- 15.9							
22JE71	A07	SPO	Z	39	1.4	4.5		298	- 174	C113	85.006			1.7
25JE71	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TRANSIENT TEST.													
27JL71	IMU	39	SHIPPED FROM DELCO/MKE TO KSC.											
11AU71	IMU	39	INSTALLED IN LM-11											
31AU71	KOB	GEN	Z	39 615	2.9	- 0.1	- 13.7	- 66	244					1.5
19OC71	KOB	GEN	Z	39 615	2.1	- 1.9	- 15.8							1.6
6JA72	K9A	GEN	Z	39 615	3.8	- 2.6	- 15.7	116	513					1.4
14FE72	K9A	GEN	Z	39 615	5.3	- 2.3	- 10.0							1.2
29FE72														
22MR72	IMU	S/N	39	REMOVED FROM LM-11 DUE TO BAD Y-PIPA.										
23MR72	IMU	S/N	39	SHIPPED FROM KSC TO DELCO/MKE.										
5AP72	A07	SPO	Z	39	4.7	1.4								
6AP72	A07	SPO	Z	39	2.4		- 16.6	361	40		85.005			
25MY72	A07	SPO	Z	39	3.1		- 12.2							
25MY72	A07	SPO	Z	39	2.4	- 3.2		394	40		85.006			
26SE72	SB6	SPO	Z	39	2.8		- 15.8							
26SE72	SB6	SPO	Z	39	1.6	- 4.8		594	140		85.000			
26SE72	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TEST.													
10JA73	UNIT REMOVED FROM IMU-39.													
10JA73	UNIT ASSIGNED TO IMU-34, Z-POS. REPLACES 7B189.													
10JA73														
13AP73	SB6	SPO	Z	34				176	- 443		2092	84.999		
25AP73	SB6	SPO	Z	34	- 0.3		- 14.0							
25AP73	SB6	SPO	Z	34	- 1.1	3.4								- 1.8
25AP73	NO FLUID TRANSIENTS DETECTED DURING GRAVITY TEST.													
30AP73														
1MY73	SB6	SPO	Z	34	0.2		- 16.0							
1MY73	SB6	SPO	Z	34	- 0.6	3.9				C114				
31MY73	SB6	SPO	Z	34	- 0.2		- 16.0			C111				
31MY73	SB6	SPO	Z	34	0.1	3.5		135	- 187	C112	85.000			- 2.2
30JE73														

NASA BA-101

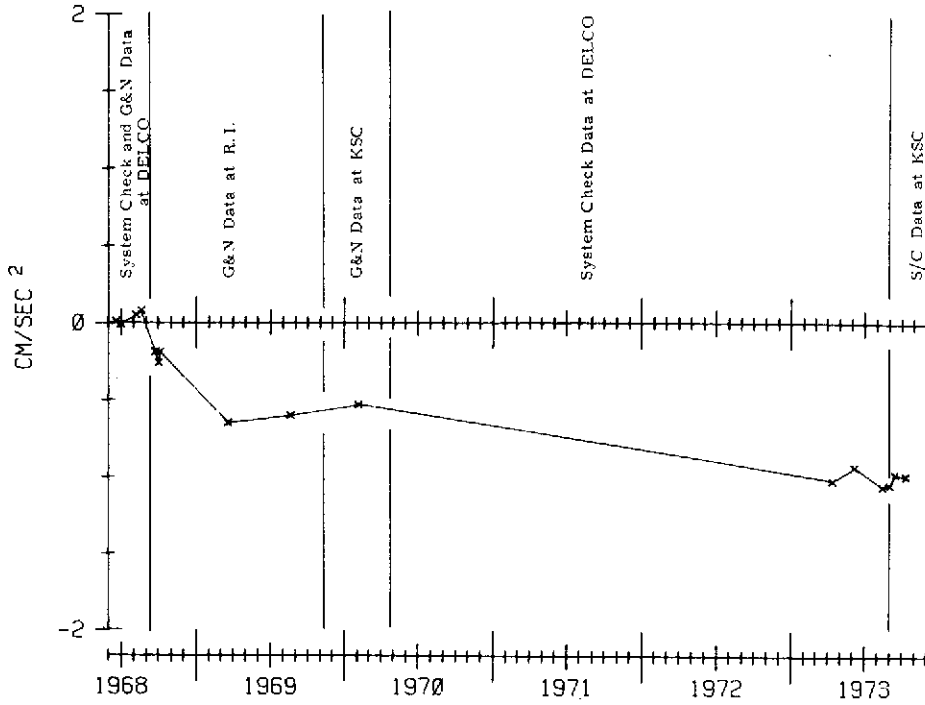
DATE	LOC	TST	IMD	GEN	ASSN	SYS	HRD	ADSPA	ADIA	DELSF+	DELSF-	WHEEL RET HOURS	I+	I-	ID	ACOA
13AU73	SB6	SPO	Z	34						250	- 121	C115	84.998			
15AU73	SB6	SPO	Z	34			0.4		- 17.0							
15AU73	SB6	SPO	Z	34			- 0.4	4.1								
21AU73	IMU-34 SHIPPED FROM DELCO TO KSC.															
24AU73	IMU-34 INSTALLED IN CR-118 (SKYLAB-4).															
28AU73	K9B	GEN	Z	34	222		0.6	- 1.0	- 17.9	- 70	- 259					1.3
4SE73	K9B	GEN	Z	34	222		1.5	- 1.1	- 14.0							1.4
10OC73	K9B	GEN	Z	34	222		2.9	- 2.0	- 12.9							1.2

G&N 222, CM 118, IMU 34, APOLLO IRIG 8A101, Z AXIS

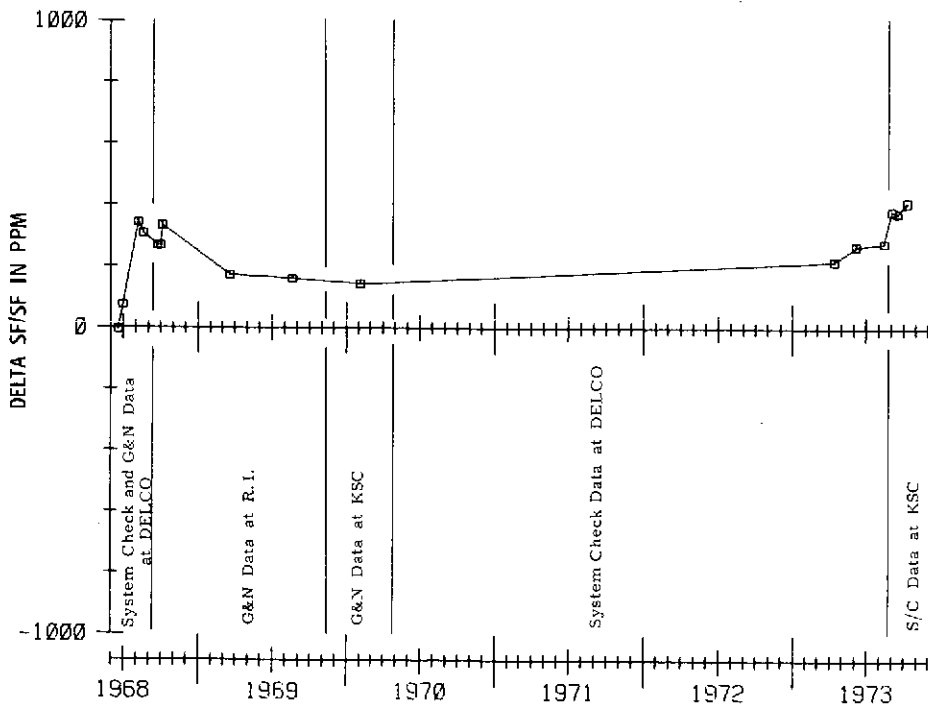


NASA 3AP-333

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	DELTA SP	IG BIAS	MULL BIAS	ROT-AL-WOB ANGLE	TRANS.	TORQ MCN CURRNT
19JE67	S48	ACC			118		0.00			104.1125
13MY68	UNIT ASSN TO IMU S/N 34, X									
5JE68	A03	SPR	X	34	(458)	(0.27)	(0.64)			104.1100
9JE68	A03	SPR	X	34	(- 117)	(-0.93)	(-0.93)			104.1077
18JE68	A03	SPR	X	34	- 4	0.01	0.03			104.1055
18JE68	AFTER DEGAUSSING AND ADJUSTMENT									
30JE68	A03	SPO	X	34	(37)	(0.88)	(0.89)			104.1085
30JE68	D CRITERIA LIMITS EXCEEDED. PIP DEGAUSSED									
30JE68	A03	SPO	X	34	75	-0.01	-0.02			104.1068
30JE68	A03	SAL	X	34			(0.01)	- 6 - 9		
31JL68	A03	SAL	X	34			(0.01)	- 11 - 34		
6AU68	A07	G&N	X	34	344	0.05				
15AU68	A03	SAL	X	34			(-0.19)	- 12 - 12		
19AU68	A07	G&N	X	34	308	0.08				
18SE68	IMU S/N 34 SHIPPED TO NR									
23SE68	N02	G&N	X	34	214	268	-0.19			
24SE68	N02	GAL	X	34	214			- 51 - 53		
10C68	N02	G&N	X	34	214	269	-0.26			
40C68	N02	G&N	X	34	214	334	-0.19			
19MR69	NSC	G&N	X	34	214	172	-0.65			
19AU69	NSC	G&N	X	34	214	160	-0.60			
17NO69	CM-110 SHIPPED TO KSC WITH IMU S/N 34, G&N 214 INSTALLED									
4FE70	K0B	G&N	X	34	214	144	-0.53			
27AP70	IMU S/N 34 SHIPPED FROM KSC TO MKE									
13AP73	SB6	SPO	X	34	219	-1.02	-0.98		0.04	104.0964
26AP73	SB6	SAL	X	34			(-0.88)	- 11 - 4		
26AP73	SB6	SAL	X	34			(-0.90)	- 18		
26AP73	SB6	SAL	X	34			(-0.92)	- 19		
6JE73	SB6	SPO	X	34	269	-0.93	-0.90		0.03	104.1003
11JE73	SB6	SAL	X	34			(-0.89)	- 20 - 3		
16AU73	SB6	SPO	X	34	279	-1.06	-1.06		0.03	104.0963
16AU73	SB6	SAL	X	34			(-1.04)	- 19 - 7		
21AU73	IMU-34 SHIPPED FROM DELCO TO KSC.									
24AU73	IMU-34 INSTALLED IN CM-118 (SKYLAB-4).									
28AU73	K9B	G&N	X	34	222	369	-1.03			
4SE73	K9B	G&N	X	34	222	363	-0.96			
10OC73	K9B	G&N	X	34	222	404	-0.98			



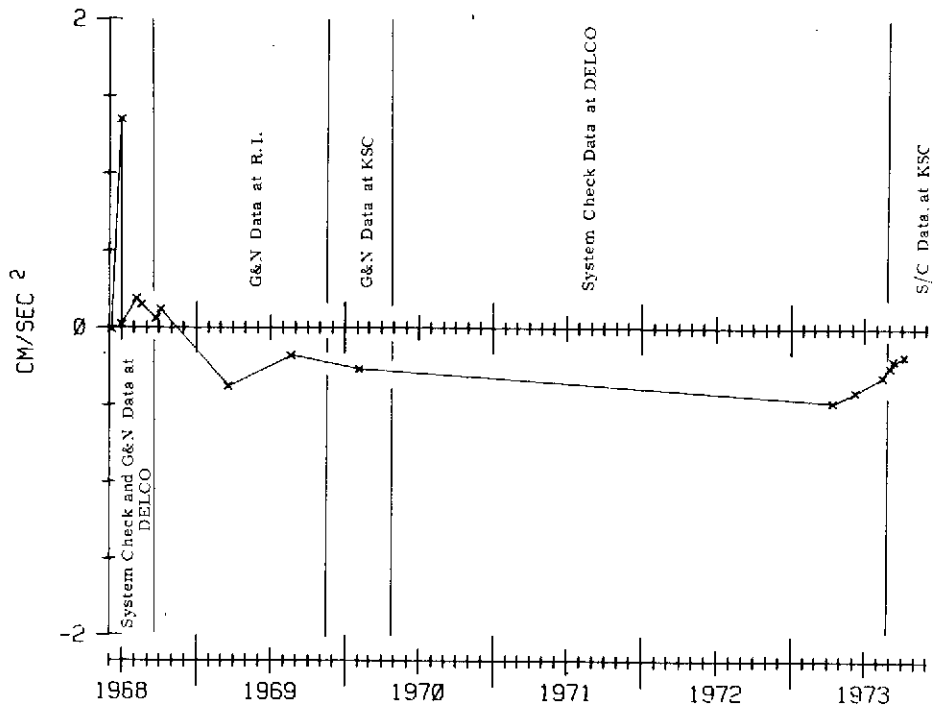
1-G BIAS DRIFT PLOTTED BY TIME



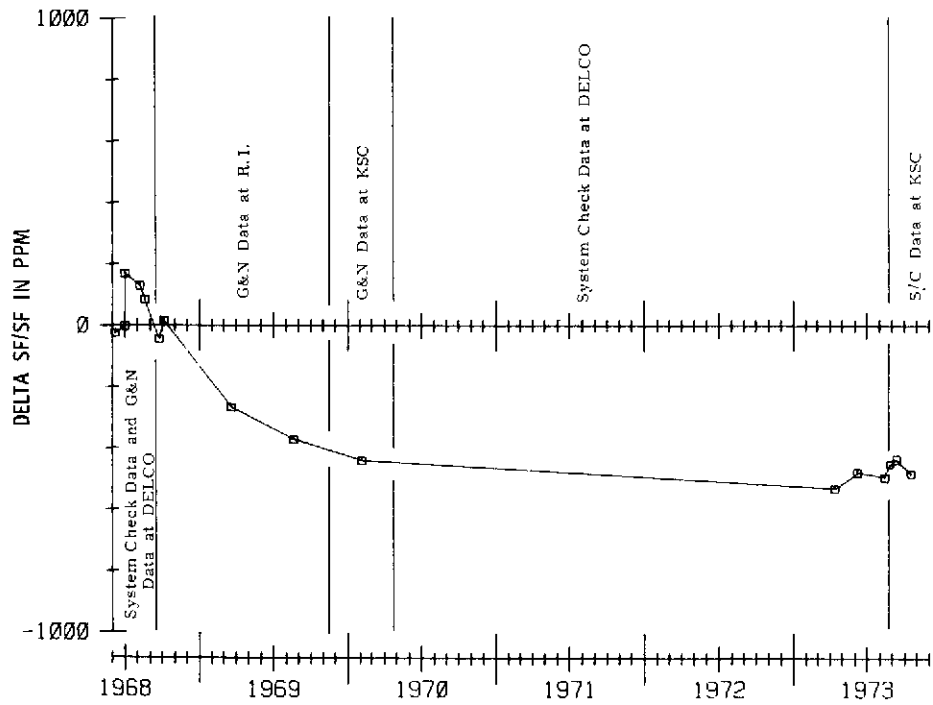
SCALE FACTOR DRIFT PLOTTED BY TIME

NASA 3AP-334

DATE	LOC	TST TYP	IMU ASSN	G&N SYS	DELTA SP	IG BIAS	NULL BIAS	ROT-AL-WOB ANGLE	TRANS.	TORQ MON CURPENT
23JE67	S42	ACC			- 274		0.00			104.1810
13MY68			UNIT ASSN TO IMU S/N 34, Y							
5JE68	A03	SPR Y	34		(- 196)	(0.22)	(0.21)			104.2230
6JE68	A03	SPF Y	34		- 25	-0.01	-0.09			104.2283
6JE68		AFTER DEGAUSSING AND ADJUSTMENT								
30JE68	A03	SPO Y	34		- 2	1.35	1.30			104.2275
30JE68		D CRITERIA LIMITS EXCEEDED. PIP DEGAUSSED								
30JE68	A03	SPO Y	34		168	0.02	-0.01			104.2268
30JE68	A03	SAL Y	34				(-0.05)	- 6	23	
31JL68	A03	SAL Y	34				(0.03)	0	20	
6AU68	A07	G&N Y	34		129	0.19				
15AU68	A03	SAL Y	34				(-0.14)	1	26	
19AU68	A07	G&N Y	34		83	0.15				
18SE68	IMU	S/N	34	SHIPPED TO NR						
23SE68	N02	G&N Y	34	214	- 45	0.06				
24SE68	N02	GAL Y	34	214					17	
40C68	N02	G&N Y	34	214	15	0.12				
19MR69	NSC	G&N Y	34	214	- 267	-0.38				
19AU69	NSC	G&N Y	34	214	- 371	-0.18				
17NO69	CM-110	SHIPPED TO KSC WITH IMU S/N 34, G&N 214 INSTALLED								
4PE70	K08	G&N Y	34	214	- 439	-0.27				
27AP70	IMU	S/N	34	SHIPPED FROM KSC TO MKE						
13AP73	SB6	SPO Y	34		- 531	-0.48	-0.49		0.03	104.2176
27AP73	SB6	SAL Y	34				(-0.51)	9	0	
7JE73	SB6	SPO Y	34		- 478	-0.41	-0.40		0.03	104.2201
12JE73	SB6	SAL Y	34				(-0.35)	7	26	
16AU73	SB6	SPO Y	34		- 494	-0.31	-0.32		0.05	104.2233
17AU73	SB6	SAL Y	34				(-0.33)	5	26	
21AU73	IMU-34	SHIPPED FROM DELCO TO KSC.								
24AU73	IMU-34	INSTALLED IN CM-118 (SKYLAB-4).								
28AU73	K9B	G&N Y	34	222	- 431	-0.26				
4SE73	K9B	G&N Y	34	222	- 421	-0.20				
10OC73	K9B	G&N Y	34	222	- 483	-0.18				



1-G BIAS DRIFT PLOTTED BY TIME



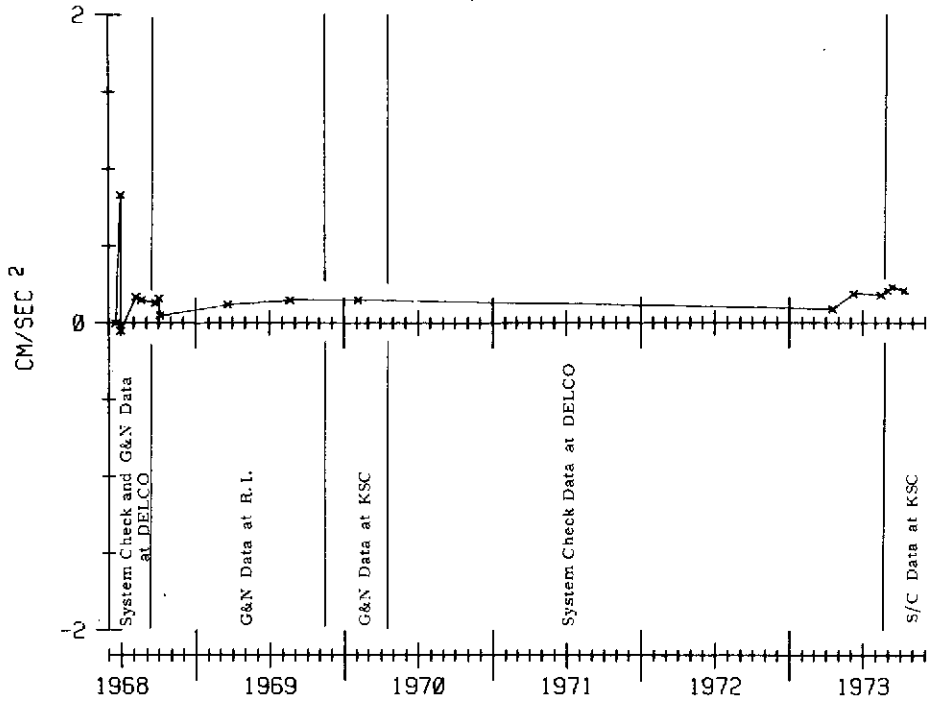
SCALE FACTOR DRIFT PLOTTED BY TIME

NASA 3AP-335

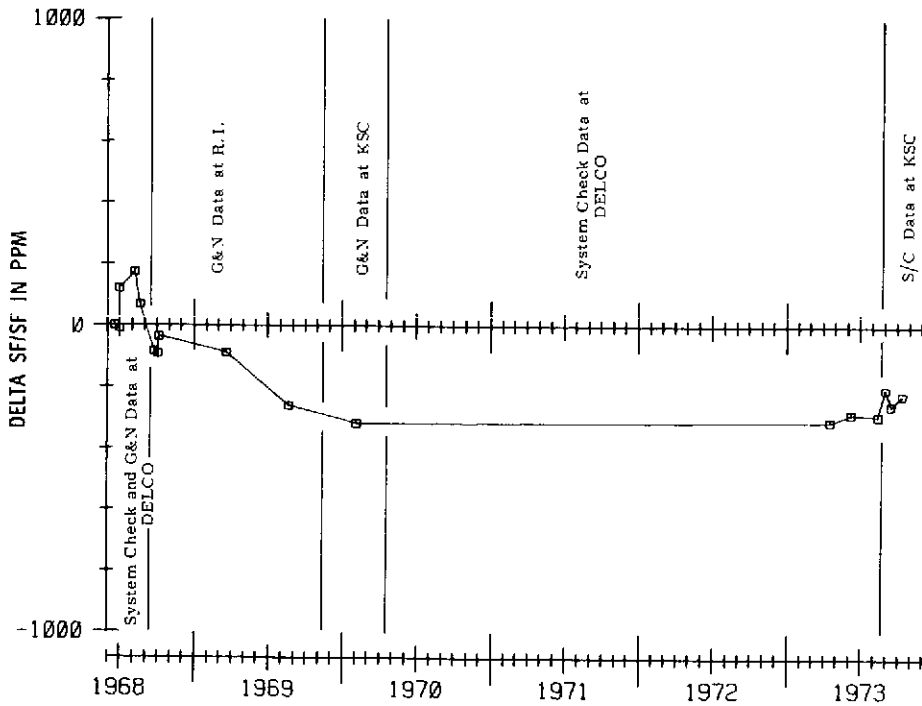
DATE	LOC	TST TYP	IMU ASSN	GEN SYS	DELTA SP	IG BIAS	NULL BIAS	ROT-AL-WOB ANGLE	TEAKS.	TORQ MON CURRENT
13MY68			UNIT ASSN TO IMU S/N 34, Z							
5JE68	A03	SPR	Z 34		(246)	(0.55)	(0.46)			104.0280
9JE68		RESELECT NULL/COINCIDENCE PERSISTOP								
9JE68	A03	SPR	Z 34		(253)	(-1.14)	(-1.08)			104.0340
18JE68	A03	SPR	Z 34		0	-0.00	0.07			
18JE68		AFTER DEGAUSSING AND ADJUSTMENT								
30JE68	A03	SPO	Z 34		- 10	0.83	0.86			104.0129
30JE68		D CRITERIA LIMITS EXCEEDED. PIP DEGAUSSED								
30JE68	A03	SPO	Z 34		121	-0.05	-0.09			104.0130
30JE68	A03	SAL	Z 34				(-0.05)	- 32		
31JL68	A03	SAL	Z 34				(0.28)	- 12		
6AU68	A07	GEN	Z 34		175	0.17				
15AU68	A03	SAL	Z 34				(0.25)	- 44		
19AU68	A07	GEN	Z 34		68	0.15				
18SP68		IMU S/N 34 SHIPPED TO NP								
23SE68	N02	GEN	Z 34 214		- 84	0.13				
24SP68	N02	GAL	Z 34 214					- 59 - 36		
10C68	N02	GEN	Z 34 214		- 92	0.16				
40C68	N02	GEN	Z 34 214		- 36	0.05				
19MR69	NSC	GEN	Z 34 214		- 88	0.12				
19AU69	NSC	GEN	Z 34 214		- 261	0.15				
17NO69		CM-110 SHIPPED TO KSC WITH IMU S/N 34, GEN 214 INSTALLED								
4FE70	K0B	GEN	Z 34 214		- 318	0.15				
27AP70		IMU S/N 34 SHIPPED FROM KSC TO MKE								
16AP73	SB6	SPO	Z 34		- 309	0.09	0.08		0.05	104.0037
27AP73	SB6	SAL	Z 34				(-0.18)	- 18		
7JE73	SB6	SPO	Z 34		- 284	0.19	0.22		0.04	104.0068
12JE73	SB6	SAL	Z 34				(0.24)	- 17		
16AU73	SB6	SPO	Z 34		- 291	0.18	0.22		0.03	104.0100
16AU73	SB6	SAL	Z 34				(0.26)	- 17		
21AU73		IMU-34 SHIPPED FROM DELCO TO KSC.								
24AU73		IMU-34 INSTALLED IN CM-118 (SKYLAB-4).								
28AU73	K9B	GEN	Z 34 222		- 205	0.20				
4SE73	K9B	GEN	Z 34 222		- 259	0.23				
10OC73	K9B	GEN	Z 34 222		- 234	0.21				

23

3AP-335 COMPLETED



I-G BIAS DRIFT PLOTTED BY TIME



SCALE FACTOR DRIFT PLOTTED BY TIME

STANDARD DEVIATION (1σ) OF THE IRIG AND PIPA
PARAMETER UNCERTAINTIES USED FOR
MISSION PERFORMANCE SUMMARY
CM 118 IMU S/N 34

PARAMETER

IMU Axis	<u>X</u>	<u>Y</u>	<u>Z</u>
PIPAs			
Data Compilation Period 8/28/73 - 10/10/73			
Accelerometer Bias (cm/sec ²)	0.03	0.03	0.01
Scale Factor (SF/SF ppm)	5	8	22
IRIGs			
Data Compilation Period 8/28/73 - 10/10/73			
Bias Drift (MERU)	0.4	0.6	0.9
ADSRA (MERU/g)	0.4	1.2	0.4
ADIA (MERU/g)	3.5	1.4	2.1
ADOA (MERU/g)	0.0	0.2	0.1

Data is based upon performance in the IMU. Point-to-point stability operation is much better than the above data.

PROPOSED GYRO AND ACCELEROMETER
PERFORMANCE COMPENSATIONS

PARAMETER

IMU Axis	<u>X</u>	<u>Y</u>	<u>Z</u>
PIPAs			
Accelerometer Bias (cm/sec ²)	-0.98	-0.18	+0.21
Scale Factor (SF/SF ppm)	+400	-480	-230
IRIGs			
Bias Drift (MERU)	-0.3*	-2.9	+2.9
ADSRA (MERU/g)	+5	0	-2
<u>ADIA (MERU/g)</u>	+2	-4	-13

* Compensation selected as NBD +.5

Dictionary of Terms

ACC	Acceptance Test Data
ACD	After Cooldown
ACE	A. C. Electronics (presently Delco Electronics)
ADJ	Adjusted
ADOA	Acceleration Sensitive Drift Due to Acceleration along the OA
BCSW	Binary Current Switch
BIA	Bias Adjusted
BUSS	High, Low, or Nominal Direct Current Test
CDN	Post Cooldown
CQL	Component Qualification
CRQ	Component Requalification
CRR	Retest after Minor Adjustment or Resistor Changes
CRT	Retest Data
CSS	Short Servo Test
CVR	Component Verification
DGI	Degaussed IRIG
DGS	Degaussed
F/F	Float Freedom
FST	Final Stability
GAL	Guidance & Navigation PIPA Alignment
G&N	Guidance & Navigation System Measurement
GP	Gaussed PIPAs
HBS	Hi Bus Voltage
I&A	Inspection and Acceptance
ISS	Inertial Subsystem Data
KSC	Kennedy Space Center
LBS	Lo Bus Voltage
MW	Milliwatt
NAR	North American Rockwell (presently Rockwell International, Inc.)
NBS	Nominal Bus Voltage
OOS	Out of Spec
RDT	Wheel Rundown Time, Seconds
RI	Rockwell International

APPENDIX

ELECTRICAL POWER REQUIREMENTS

This section was extracted from the MIT/IL Report E-1142 (Rev. 59) "SYSTEM STATUS REPORT". It is included in this report for convenience.

Electrical power and energy reporting is based upon the inflight spacecraft sequence of events for the Design Reference Mission as developed by the Apollo Mission Planning Task Force (AMPTF). (Reference GAEC Report Volume III - LED-540-12, dated October 30, 1964).

The accompanying diagrams present the power drawn through the spacecraft circuit breakers. It is assumed that power is drawn from the spacecraft's primary +28VDC supply and a 400 cps-115 VAC single-phase inverter.

Intermittent power peaks can exist, particularly during operation of displays and controls at random times. The energy content in these peaks is considered negligible.

All values (except those mentioned above) are actual expected levels of power at 28.0 VDC. They are based on measured values on G&N systems 207 and 208 for the Block II Command Module. No margin factor has been applied to protect against possible differences between G&N systems and spacecrafts. Thus, these values should not be taken as "not to exceed" extremes.

The following Interface Control Documents serve as the guidelines for reporting power figures.

CM Block II MH01-01327-216 "G&N Electrical Input Power" signed 15 July 1965.

BLOCK II GUIDANCE & NAVIGATION LOAD ON PRIMARY +28 VDC COMMAND MODULE

BASED UPON 198.5 HOURS (18.27 DAY) LUNAR ORBIT MISSION
DESIGN REFERENCE MISSION

STATUS OCTOBER 1967

REFERENCE GAFC REPORT - LED 540-12, 30 OCTOBER 1964
APOLLO MISSION PLANNING TASK FORCE

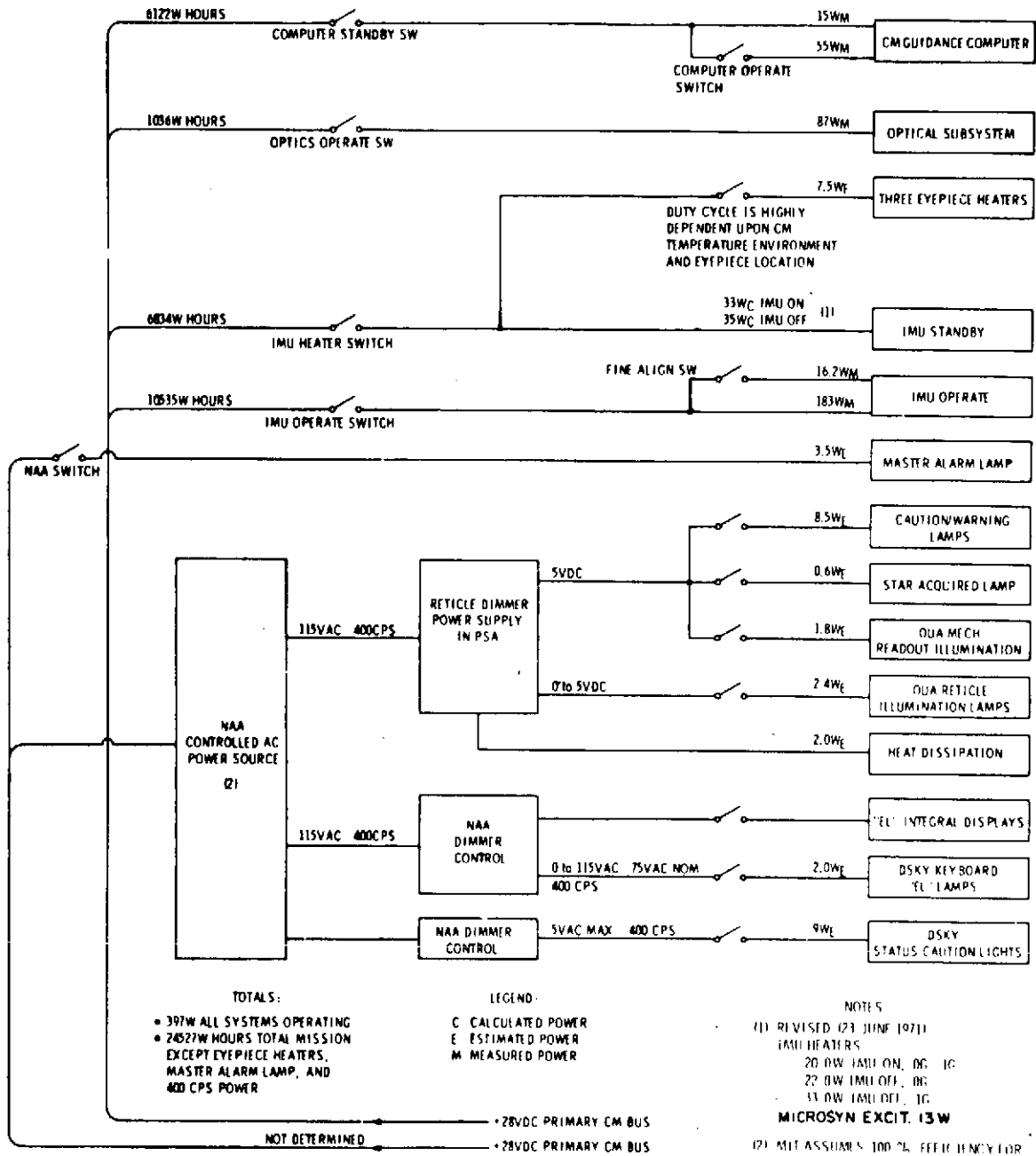


Figure A-1