

TLI						
TB 6 p		X	2	4	0	2 3
TLI	R	X	X	X	1	8 0
	P	X	X	X	0	4 5
	Y	X	X	X	0	0 1
BT		X	X	X	5	5 5
$\Delta VC'$ VI		1	0	4	0	1 1
		+	3	5	5	9 9
SEP	R	X	X	X	3	5 9
	P	X	X	X	0	7 7
	Y	X	X	X	3	2 0
EXTRACTION	R	X	X	X	3	0 1
	P	X	X	X	2	5 7
	Y	X	X	X	0	4 0
R2 ALIGN		X	X	0	4	5 0
R2 IGN		X	X	0	3	8 0
ORDEAL START		X	X	5	6	4 5
YAW		X	X	X	0	0 1

REMARKS

EJECTION TIME: 4:16:00

MANEUVER PAD

S	P	S	S	S	PURPOSE
S	P	S	S	S	PROP/GUID
+		N/A			WT N47
+	0	0	1	2	P _{TRIM} N48
-	0	0	0	1	Y _{TRIM}
+	0	0	0	2	HRS GETI
+	0	0	0	0	MIN N33
+	0	0	0	0	SEC
		N/A			ΔV_X N81
		1			ΔV_Y
		1			ΔV_Z
X	X	X	0	6	R
X	X	X	0	1	P
X	X	X	0	2	Y
+		N/A			H _A N44
		1			H _P
+			1		ΔVT
X	X	X	1		BT
X			1		ΔVC
X	X	X	X	1	SXTS
+	2	1	6	1	SFT
+	1	2	6	0	TRN
X	X	X	N/A		BSS
X	X		1		SPA
X	X	X	1		SXP
	0	N/A			LAT N61
		1			LONG
+		1			RTGO EMS
+		1			V10
		1			GET .05G

COMMENTS:

GDC ALIGN VEGA DEF SET STARS

R ALIGN 2 0 9

P ALIGN 0 0 9

Y ALIGN 3 4 9

ULLAGE _____

HORIZON/WINDOW _____

OTHER SET-UP SPS

TIMING BEING DONE

YOUNG

SPAC

SPAC

SPAC

SPAC

SPAC

MANEUVER PAD

H C C C					PURPOSE
S P S / E F H					PROP/GUID
+	6	6	5	3	WT N47
+	0	0	1	2	P _{TRIM} N48
-	0	0	0	1	Y _{TRIM}
+	0	0	0	7	HRS GETI
+	0	0	0	3	MIN N33
+	0	1	0	0	SEC
					ΔV_X N81
					ΔV_Y
					ΔV_Z
X	X	X			R
X	X	X			P
X	X	X			Y
+					H _A N44
					H _P
+	0	0	0	5	ΔVT
X	X	X			BT
X	0	0	0	0	ΔVC
X	X	X	X		SXTS
+	1	0	0	0	SFT
+	1	7	0	0	TRN
X	X	X			BSS
X	X				SPA
X	X	X			SXP
	0				LAT N61
					LONG
+					RTGO EMS
+					V10
					GET .05G

COMMENTS:

GDC ALIGN WALL SET STARS

R ALIGN 4 0 5

P ALIGN 0 0 9

Y ALIGN 3 4 1

ULLAGE MONITOR

HORIZON WINDOW PERFORMED

OTHER 2025

CIN BATT BORN SETBACK

WITNESS V. CONTROL

HEAVY

Y2000

SINGLE BANK "B"

PLAYBACK
78+31+00
78+39+00

MANEUVER PAD



						PURPOSE
						PROP/GUID
+						WT N47
	0	0				P _{TRIM} N48
	0	0				Y _{TRIM}
+	0	0				HRS GETI
+	0	0	0			MIN N33
+	0					SEC
						ΔV _X N81
						ΔV _Y
						ΔV _Z
X	X	X				R
X	X	X				P
X	X	X				Y
+						H _A N44
						H _P
+						ΔVT
X	X	X				BT
X						ΔVC
X	X	X	X			SXTS
+					0	SFT
+				0	0	TRN
X	X	X				BSS
X	X					SPA
X	X	X				SXP
	0					LAT N61
						LONG
+						RTGO EMS
+						V10
						GET .05G

COMMENTS:

GDC ALIGN _____ SET STARS

R ALIGN _____

P ALIGN _____

Y ALIGN _____

ULLAGE _____

HORIZON/WINDOW _____

OTHER _____

MANEUVER PAD

COMMENTS:

GDC ALIGN _____ SET STARS

R ALIGN _____

P ALIGN _____

Y ALIGN _____

ULLAGE _____

HORIZON/WINDOW _____

OTHER _____

						PURPOSE
						PROP/GUID
+						WT N47
	0	0	1.6	8		P _{TRIM} N48
	0	0	0.5	5		Y _{TRIM}
+	0	0				HRS GETI
+	0	0	0			MIN N33
+	0					SEC
						ΔV_X N81
						ΔV_Y
						ΔV_Z
X	X	X				R
X	X	X				P
X	X	X				Y
+						H _A N44
						H _P
+						ΔVT
X	X	X				BT
X						ΔVC
X	X	X	X			SXTS
+					0	SFT
+				0	0	TRN
X	X	X				BSS
X	X					SPA
X	X	X				SXP
	0					LAT N61
						LONG
+						RTGO EMS
+						V10
						GET .05G

MANEUVER PAD

						PURPOSE
		/				PROP/GUID
+						WT N47
	0	0				P _{TRIM} N48
	0	0				Y _{TRIM}
+	0	0				HRS GETI
+	0	0	0			MIN N33
+	0					SEC
						ΔV_X N81
						ΔV_Y
						ΔV_Z
X	X	X				R
X	X	X				P
X	X	X				Y
+						H _A N44
						H _P
+						ΔVT
X	X	X				BT
X						ΔVC
X	X	X	X			SXTS
+					0	SFT
+				0	0	TRN
X	X	X				BSS
X	X					SPA
X	X	X				SXP
	0					LAT N61
						LONG
+						RTGO EMS
+						V10
						GET .05G

COMMENTS:

GDC ALIGN _____ SET STARS

R ALIGN _____

P ALIGN _____

Y ALIGN _____

ULLAGE _____

HORIZON/WINDOW _____

OTHER _____

MANEUVER PAD

						PURPOSE
		/				PROP/GUID
+						WT N47
	0	0				P _{TRIM} N48
	0	0				Y _{TRIM}
+	0	0				HRS GET1
+	0	0	0			MIN N33
+	0					SEC
						ΔV_X N81
						ΔV_Y
						ΔV_Z
X	X	X				R
X	X	X				P
X	X	X				Y
+						H _A N44
						H _P
+						ΔVT
X	X	X				BT
X						ΔVC
X	X	X	X			SXTS
+					0	SFT
+				0	0	TRN
X	X	X				BSS
X	X					SPA
X	X	X				SXP
	0					LAT N61
						LONG
+						RTGO EMS
+						V10
						GET .05G

COMMENTS:

GDC ALIGN _____ SET STARS

R ALIGN _____

P ALIGN _____

Y ALIGN _____

ULLAGE _____

HORIZON/WINDOW _____

OTHER _____

MANEUVER PAD

						PURPOSE
		/				PROP/GUID
+						WT N47
	0	0				P _{TRIM} N48
	0	0				Y _{TRIM}
+	0	0				HRS GETI
+	0	0	0			MIN N33
+	0					SEC
						ΔV_X N81
						ΔV_Y
						ΔV_Z
X	X	X				R
X	X	X				P
X	X	X				Y
+						H _A N44
						H _P
+						ΔVT
X	X	X				BT
X						ΔVC
X	X	X	X			SXTS
+		1	2	8	0	SFT
+		3	9	2	0 0	TRN
X	X	X				BSS
X	X					SPA
X	X	X				SXP
	0					LAT N61
						LONG
+						RTGO EMS
+						V10
						GET .05G

COMMENTS:

GDC ALIGN _____ SET STARS

R ALIGN _____

P ALIGN _____

Y ALIGN _____

ULLAGE _____

1
B/D ULLAGE

HORIZON/WINDOW _____

OTHER _____

MANEUVER PAD

						PURPOSE
						PROP/GUID
+						WT N47
	0	0				P _{TRIM} N48
	0	0				Y _{TRIM}
+	0	0				HRS GETI
+	0	0	0			MIN N33
+	0					SEC
						ΔV_X N81
						ΔV_Y
						ΔV_Z
X	X	X				R
X	X	X				P
X	X	X				Y
+						H _A N44
						H _P
+						ΔVT
X	X	X				B _T (3.44)
X						ΔVC Fido
X	X	X	X			SXTS
+					0	SFT
+				0	0	TRN
X	X	X				BSS
X	X					SPA
X	X	X				SXP
	0					LAT N61
						LONG
+						RTGO EMS
+						V10
						GET .05G

COMMENTS:

GDC ALIGN _____ SET STARS

R ALIGN _____

P ALIGN _____

Y ALIGN _____

ULLAGE _____

HORIZON/WINDOW _____

OTHER _____

VERIFY RCS TB'S AFTER LAUNCH
& FU CELL TB'S.

NOMINAL

						PURPOSE
						PROP/GUID
		/				
+						WT N47
	0	0				P _{TRIM} N48
	0	0				Y _{TRIM}
+	0	0				HRS GETI
+	0	0	0			MIN N33
+	0					SEC
						ΔV_X N81
						ΔV_Y
						ΔV_Z
X	X	X				R
X	X	X				P
X	X	X				Y
+						H _A N44
						H _P
+						ΔVT
X	X	X				BT
X						ΔVC
X	X	X	X			SXTS
+					0	SFT
+				0	0	TRN
X	X	X				BSS
X	X					SPA
X	X	X				SXP
	0					LAT N61
						LONG
+						RTGO EMS
+						V10
						GET .05G

COMMENTS:

GDC ALIGN _____ SET STARS

R ALIGN _____

P ALIGN _____

Y ALIGN _____

ULLAGE _____

HORIZON/WINDOW _____

OTHER _____

1 REV LATE

						PURPOSE
			/			PROP/GUID
+						WT N47
	0	0				P _{TRIM} N48
	0	0				Y _{TRIM}
+	0	0				HRS GETI
+	0	0	0			MIN N33
+	0					SEC
						ΔV_X N81
						ΔV_Y
						ΔV_Z
X	X	X				R
X	X	X				P
X	X	X				Y
+						H _A N44
						H _P
+						ΔVT
X	X	X				BT
X						ΔVC
X	X	X	X			SXTS
+					0	SFT
+				0	0	TRN
X	X	X				BSS
X	X					SPA
X	X	X				SXP
	0					LAT N61
						LONG
+						RTGO EMS
+						V10
						GET .05G

COMMENTS:

GDC ALIGN _____ SET STARS

R ALIGN _____

P ALIGN _____

Y ALIGN _____

ULLAGE _____

HORIZON/WINDOW _____

OTHER _____

Performed on time

							PURPOSE
			/				PROP/GUID
+							WT N47
	0	0					P _{TRIM} N48
	0	0					Y _{TRIM}
+	0	0					HRS GETI
+	0	0	0				MIN N33
+	0						SEC
							ΔV_X N81
							ΔV_Y
							ΔV_Z
X	X	X					R
X	X	X					P
X	X	X					Y
+							H _A N44
							H _P
+							ΔVT
X	X	X					BT
X							ΔVC
X	X	X	X				SXTS
+						0	SFT
+					0	0	TRN
X	X	X					BSS
X	X						SPA
X	X	X					SXP
	0						LAT N61
							LONG
+							RTGO EMS
+							V10
							GET .05G

COMMENTS:

GDC ALIGN _____ SET STARS

R ALIGN _____

P ALIGN _____

Y ALIGN _____

ULLAGE _____

R1 10102

R2 01111

HORIZON/WINDOW _____

OTHER _____

ENTRY PAD

Good
6011 200
12090
7600

							AREA
X	X	X					R .05G
X	X	X					P .05G
X	X	X					Y .05G
							GET HOR
X	X	X					P CK
	0						LAT N61
							LONG
X	X	X					MAX G
+							V _{400K} N60
-	0	0					T _{400K}
+							RTGO EMS
+							V10
							RRT
X	X						RET .05G*
+	0	0					D _L MAX*
+	0	0					D _L MIN* N69
+							V _L MAX*
+							V _L MIN*
X	X	X					D ₀
X	X						RET V _{CIRC}
X	X						RETBBO
X	X						RETEBO
X	X						RETDRO
X	X	X	X				SXTS
+					0		SFT
+				0	0		TRN
X	X	X					BSS
X	X						SPA
X	X	X					SXP
X	X	X	X				LIFT VECTOR

COMMENTS: _____

A-15 UP'S (premission)

TRANSLUNAR

UP 24 SP0003P OXTKP
SP0006P FVTKP
SP0931P OXINF P
SP0930P FVINF P

UP 25 SR5013T Qd A HeTKT
SR5014T " B " " "
SR5015T " C " " "
SR5016T " D " " "

UP 26 PTC/URINE NOZ TEMP CF

UP 27 PIPA BIAS/CF0018 CLY OUT
TEMP

UP 42 SR5065T Qd A PKg T
MSK 671 SR5066T " B " "
SR5067T C " "
SR5068T D " "

UP 01 & 02 are available after
launch upon approval from GIDO.

LUNAR ORBIT

UP 01 ROLL ADOT VS ERROR

02 YAW " " "

24 Same as TLC

25 " " "

26 PITCH ADOT VS ERROR

27 Same as TLC

42 " " " but can
plot something more useful
if necessary.

ATTACHMENT 1

CSM CONSUMABLES/WEIGHT

GET				Source
CM DRY				MPAD
SM DRY				MPAD
QD A WPR				GNC/TM
QD B WPR				"
QD C WPR				"
QD D WPR				"
SPS FUEL				"
SPS OXID				"
H ₂ TK 1				EECOM/TM
H ₂ TK 2				"
O ₂ TK 1				"
O ₂ TK 2				"
H ₂ O POTABLE				"
H ₂ O WASTE				"
CM MISC				SODB
SM MISC				SODB
CSM WEIGHT				CALC
CM DRY				MPAD
H ₂ O POTABLE				EECOM/NM
H ₂ O WASTE				"
CM MISC				SODB
CM WEIGHT				CALC
CM A				SODB
CM @ 400K				CALC

Sent to RETRO

ATTACHMENT 1

GMT-26+06+23

CSM CONSUMABLES/WEIGHT

JNL

GET				Source
CM DRY				MPAD
SM DRY				MPAD
QD A WPR				GNC/TM
QD B WPR				"
QD C WPR				"
QD D WPR				"
SPS FUEL				"
SPS OXID				"
H ₂ TK 1				EECOM/TM
H ₂ TK 2				"
O ₂ TK 1				"
O ₂ TK 2				"
H ₂ O POTABLE				"
H ₂ O WASTE				"
CM MISC				SODB
SM MISC				SODB
CSM WEIGHT				CALC
CM DRY				MPAD
H ₂ O POTABLE				EECOM/NM
H ₂ O WASTE				"
CM MISC				SODB
CM WEIGHT				CALC
CM A				SODB
CM @ 400K				CALC

DDC/TSM Form 269 (July 68)

SPS USE-ABLE
RCS USE-ABLE

P= 303
S= 304
L= 306
D= 303

A0002

TO: RETRO GNC CONSUMABLES STATUS

DKD WT _____

CSM WT _____

FOR LAUNCH PRECISION

GMT 26+09+41

GET _____

GNC _____

JNS

SM RCS

TOTAL

A

B

C

D

WPU _____ () _____ () _____ () _____ () _____ ()

Δ FP _____ () _____ () _____ () _____ () _____ ()

Δ RL _____ () _____ () _____ () _____ () _____ ()

Δ V AVAIL DAP _____ SCS _____

BT AVAIL DAP _____ SCS _____

SPS

TOTAL

FUEL

OXID

WPU _____ () 15425 () 24657 ()

Δ V REM UNDK _____ DK _____

BT REM _____

BLOWDOWN Δ V REM _____ BT REM _____

1 or 3 men

Δ V RL _____

FLIGHT DIR MISSION LOG		REV	PG
APOLLO 14/GNC		7/26/71	PRE-LAUNCH
SITE/ACQ/LOS		FLIGHT EVENTS/HISTORY/BRIEFING	
GMT 26+03+49+00		JOE DEATHING ON CONSOLE	
1		GUIDANCE CONFIRMS NBD-X WAS CHANGED TO +2.00; WAS -2.30 MER 00377g (1460 ADDRESS) IS THE VALUE LOADED AT ABOUT -23 HRS	
26+06+14		PROP IS CHANGING EXPULSION EFF. CONS SO WPU CALC'S WILL REFLECT 35 GAUGING ACCURACY. PROP HAS UPDATED WEIGHTS TAB	
26+ 09+05		RETRO GAVE USE A LM WEIGHT OF 36,220 lbs FOR ZERO MICH. TOPPED	
26+09+15		PROPS HAVE FINALLY GOT INETHL WPU VALUE'S CORRECT. EXPULSION EFFICIENCY CONSTANT CHOSEN IS 0.924. THIS GIVE WPU'S OF A=304, B=304 C=305 D= FOR PRESENT PRESSURE/TEMP CONDITIONS	
26+ 09+24		REPORTED WATER LEAK WHEN CAP WAS T OFF POTABLE SUPPLY TO PUT CLOTHES WATER.	
26+09+44		CREW REPORTS NO LEAK WHEN CAP ON TIGHT.	

FLIGHT DIR MISSION LOG	DAY	REV	PG
APOLLO 14 / GNC	7/26/71	PRI LAUNCH	2
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
26+10+09	GIMBLE TRIMS $P = -0.52$		
	AS SUPPLIED $\gamma = +1.90$		
	FROM RETRO		
	IT SEEMS WE NEED TO CHECK CAL CURVES.		
	BECOM'S FOUND A LOADED CAL CURVE WAS		
	WRONG. DICK BROWN HAS A PRINTOUT OF		
	CAL CURVES LOADED IN RTCC. JACK WALSH NEEDS		
	TO CHECK THE 4 SPS ANALOG PARAMETERS		
	DIGENOVA HAS CHECKED GEN PARAMETERS AND		
	THE PROPER GEN'S CAL'S ARE LOADED.		
	WE GAVE FIDO THE FOLLOWING MODE IV DATA;		
	THRUST: 20,655 lbf (DUAL ROBE/NORMAL) AND		
	TOTAL FLOW RATE - 65.56 lbf/sec		
	NO'S ARE W/O PU VALVE OPEN		
-300	GOLD TEMP.		
	LOADED X Y Z		
	BIAS .0283 -.0030 -.0079 ft/sec^2		
	NBD +2.0 -2.8 -4.6		
	DONT HAVE, BECOM DATA		
	(75 VOL I) 112 VOL III - HAVE		
	LATEST SUBD UPDATES FROM SPAN.		

FLIGHT DIR MISSION LOG	DAY	REV	PG 3
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
	AY DAP = 136 819 AT		
	SCS = 103 626 AT		
	SPS AY = 9266 AT 608.6		
	BD = 160 AT 18		
-1430	VER YWHEELS w/STK (-52, 1-90)		
	11 SEC TO GET SHRDS OUT		
-1406	GIMBAL TRIM & DRIVE CHECK		
	GOOD.		
-40	Armed RES. looks good.		
-23min	RECD CHANGE & C/D to		
	Flight Plan. "P&I NOT		
	INCORP'D IN GNC Console		
	copy.		
	LO OX MN NOISY ALL		
	3400 NOISY		
5430	9409 SZ SPDOWN - PREP		
6450	4 GUNDS 12MS OK.		
10445	11437 PREP CO		
	11439 C/O ONBOARD		

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS		FLIGHT EVENTS/HISTORY/BRIEFING		
011 F0117	$\sqrt{93.7/88.9}$ 425595 00008 H 02.5/91.5 F250/25V			
12443	Torque = -1 DEG			
12455	MCEW			
3404	GUIDO SWS VILADONE 2U NAV COMMS WILL PRINT IN SW			
5309	MEM 00001 N05			
CRO	-1.52 - 00019 +1.68 - 00021 +3.12 - 00061			
CREW REPORT	RES B SEC PROP ISO CLOSED A DURING LAUNCH C2EW CLOSED AT IN SECTAN. GRAVED			

FLIGHT DIR MISSION LOG		DAY	REV	PG 5
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
1+30	① 1 HR PRI & SEC CRO WERE BP. NOTICED. CREW THINKS PROBABLY BUMPED THAT SWITCH. CAN'T CORRELATE TO ANY OTHER ACTIVITY.			
2+00	^{IFOLD} MAN 7 DATA INDICATES HE DID HFIRE BETWEEN CRO & GOLDSTONE 52+52 → 1+29+50			
2+26	RECOMMENDED RATE CMD VICE AND IMPULSE FOR TLI AND HE DID SO.			
2+29	GO FOR TLI			
2+45	NO FU. PREVAIVE CLOSING FLO. RISE CONFIRMED.			
2+49	TANKS TRESS LOOK OK.			
2+55+70	MC&W DURING TLI (1+55+70 O₂ Flow) 5+51 SHUT DOWN			
	35599 75KV			
	VC +145			
	AVC -14.9 TFC +02			
	H 4353 1674 012 010.			

CH 3604 X
CH 3605 X

MISSION NOTES

SPS Sol. Hiver Anomaly Event

03 + 32 + 46 Docking (soft)

03 + 33 + 50 Docking (hard) = No
SPS Sol. Dr. events

34 + 51 Went to LBR (from THRIFT P/O)

34 + 56 DATA LOSS

35 07 DATA BACK (from THRIFT P/O)

03 + 35 + 19 HBR DATA BACK = now have
SPS Sol. Dr. events.

D. Kammann

FLIGHT DIR MISSION LOG		DAY	REV	PG 6
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	SUB GP			
	PRI B, PRI/SEC D WENT			
	B/P & RESET AT SEP.			
	TED - DRUG PITCH			
	BMAG HIT IN/C BEFORE			
	WE COULD CALL			
3+26	USED 20 LBS RES - NOT			
	DOCKED YET			
	?			
3+31	20 # USED SO FAR - NOT			
	DOCKED YET			
3+33	CAPTURE 30 # SO FAR			
3+34	RETRACT COMPLETE			
3+35	BOTH SPS POWER LIGHTS			
	ON T/M			
	CREW HAS SPS ON			
	LIGHT IN COCKPIT.			
3+39	TOLD TO PULL BOTH SPS			
	PILOT VALVE CB'S AND			
	HE DID SO.			

FLIGHT DIR MISSION LOG		DAY	REV	PG 7
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
3+50	TOOK CABIN TO 3.6 GOT 11 KEW			
4+14	26 Hz USED SO FAR			
4+34	MODE - STEP } FUNC - OFF } VERIFIED WITH CREW.			
4+36	CHARGING BAT-B.			
4+52	WATCHING			
4+56	FIDO SAYS NICC-1 @ 4/5 FPS.			
5+15	FU MAN P QUAD A oscillating by 8 PCM COUNTS - VERIFIED AT REMOTE CNT. 175 → 189			
5+26	WILL GIVE BEEN PROCEDURE DEFER P52.			
-1.46	- .102	} TARGUED AT 5+30		
-0.9	- .063			
2.37	+ .166			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				8
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
5456	READING UP OUR PROCEDURE			
	RESULTS:			
	THCCW - NO CHANGE			
	DIRECT ^{THRUST} ON - NO CHANGE IN LIGHT			
	EINS AV TEST -			
	SPS LIGHT GOT DISTINCTLY			
	BRIGHTER DURING AV TEST.			
	THCCW - NO CHANGE			
	00377 NBDX - NEW NBDX			
	(THIS WAS UPDATE TO CREW C/L ONLY)			
	HAVE 23 FT/SEC ALOTED			
	TO MCC'S.			
	KRAFT SAID CHANGED			
	TO INFLUENT LIGHT AT			
	CAPE. CHECK WITH SPAN.			
	This is wrong. The			
	Thrust on P/B was replaced			
	on the SC & the ULLAGE P/B.			

FLIGHT DIR MISSION LOG		DAY	REV	PG 9
SITE/ACQ/LOS	1500 UT FLIGHT EVENTS/HISTORY/BRIEFING			
6+30	JAK on.			
	Problems:			
	SPS D1 & D2 Lites on.			
	SPS Thrust Lite			
	3+41 to 4+11 LBR on DSE			
7+20	Procedure Estimates:			
	1. Proc. ready by GNC now			
	2. Proc. approved - 9+00 GET			
	3. Be.			
7+41	EMS AV bias test results			
	+0.9 fps			

FLIGHT DIR MISSION LOG	DAY 6/11C	REV	PG 10
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
	SPS "FLICKER" TEST RESULTS		
	Test performed at ~ 9:35 GET		
	SPS Pilot VLV cb's & EPS Group 5 cb's - pulled.		
	1. AV THRUST A - NORMAL		
	2. SPS THRUST LITE (EMSPANEL) and		
	SPS Solenoid Driver 1 & 2 Lites went		
	OUT.		
	3. AV THRUST A - OFF		
	4. AV THRUST B - NORMAL and no change.		
	5. Tapped on panel and SPS THRUST		
	Lite and SPS D1 & D2 came back on.		
	6. AV THRUST B - NORMAL and no change.		
	7. AV THRUST A - placed to center		
	between off and NORMAL and		
	had following:		
	SPS THRUST Lite - OUT		
	SPS D1 - ON		
	SPS D2 - OUT		
	8. AV THRUST A - NORMAL and following:		
	SPS THRUST Lite - on		
	SPS D1 - ON		
	SPS D2 - ON		
	9. AV THRUST A - OFF and following:		
	SPS THRUST LITE - OUT		
	SPS D1 - OUT		
	SPS D2 - OUT		
	GALC		
	GET 13+00		

VOICE OF SPS ~~AVT~~ TEST SW
problem

APOLLO 15 MISSION COMMENTARY 7/26/71 1755 CDT 0920 GET 49/1

SC --And Houston, that last NOUN 49 looked like a 60 and 16.

CAPCOM We copy.

SC Houston, this is 15. Ready on that update concerning the UV photo.

CAPCOM Roger, on page 3-15 in the flight plan, in the left column about the 17th line down we have 2 frames with filter number 2.

SC (Garbled) I found that line.

CAPCOM Roger, and instead of 2 frames at 20 seconds, we would like 1 frame at 20 seconds; and we would like a second frame at 2 seconds.

SC Roger, I copy 1 at 20 seconds and 1 at 2.

CAPCOM Roger, the reason for that is that they have recently measured a secondary light leak in that filter and they need a different exposures like this to really separate the two peaks in the filter trans-missitivity. Incidentally, this is going to pertain to all the UV photography of the earth on down the line, but we'll update it as we come to them. And 15, we have a preliminary procedure about to come

up to you to see if we can isolate whether this ground and the SPS system is in Bank-A or Bank-B, and that'll be coming up in just a few minutes. We --

SC I understand.

CAPCOM And we'd like to do that before we start the UV photography.

SC Very well.

CAPCOM 15, this is Houston, I have the preliminary procedure I spoke about and we're hoping you might be able to do it while A1 works with the P23.

SC Okay, go ahead.

CAPCOM You might refer, if you want to see what's going on, to Drawing A.9 down in area E3. We're playing with the DELTA-V thrust switch and the idea is this: first of all, let's open the Group-5 circuit breakers on panel 229, both main-A and main-B. That's back up to the SPS pilot valves on panel 8 which we also want to open. Verify that.

SC Okay, Group-5, main-A and main-B on 229. Stand by.

SC Okay, both of those are open.

CAPCOM Roger, we verify Group-5 both open, and the SPS pilot valves both open. Then, we'd like to take the DELTA-V thrust A switch and try to balance it right in a center position, tease it back and forth a little bit to see if you can get any flickering in the SPS thrust ON light.

SC Okay, stand by.

CAPCOM Jim, let's - let's hold up a little bit before we do that. We don't - we're not all set up down here to watch that also. So let's - let me read on through the procedure.

Start
w/ off
filter
TEST

5 rt
49-100
11
APOLLO 15 MISSION COMMENTARY 7/26/71 1755 CDT 0920 GET 49/2

SC Okay.

CAPCOM If the light does flicker, of course, that's going to isolate in this case if we were playing with the DELTA-V thrust A switch. That will isolate the problem into the A bank of valves. If we don't see any flicker, then we'll go ahead and try it with the B bank; actually, we would like to go ahead and do it with the B bank also. So, stand by a moment.

SC Okay, I'm standing by.

CAPCOM We'd like to have a high-gain medium.

SC High-gain medium.

END OF TAPE

APOLLO 15 MISSION COMMENTARY 7/26/71 CST 1805 GET 9:30:00 50/1

CAPCOM 15, this is Houston. We're ready to go ahead. Verify again the group 5 breakers and the SPS pilot valve breakers and then let's tease that Delta V thrust A switch. Try to balance it in a central position.

SC Okay, will do. We note that trying A.9 echo 3 doesn't seem to fit what you're doing.

CAPCOM Actually it's area echo 3 and 4 and it simply shows you the Delta V thrust switch is there.

SC Oh okay, okay.

CAPCOM The light has a contact, whether that switch is on or off and we would like to balance it half way between so that we don't have a contact.

SC Okay, here goes Delta V A now. Okay A is up and on and the SPS thrust light is off.

CAPCOM Would you confirm that the Delta V thrust A switch is up and the light went out, is that correct?

SC That's correct. It's still in the up and on position and it went to the on position, up, the light went out.

CAPCOM Thank you.

SC I'll just leave it there while you think about it.

CAPCOM Thank you, that's stand by.

CAPCOM 15 this is Houston. We'd like to feel our way ahead here, and we'd like to have you put Delta V thrust A back to off.

SC A is off, and the light remains off.

CAPCOM We copy. 15, this is Houston. Our telemetry confirms both of your observations and we would now like to have you cycle bravo.

SC Roger. Bravo is up and on, the light is off. Now Bravo is off and the light remains off.

CAPCOM Copy. 15, we'll sit tight and think about that for a while, thank you.

SC Rog.

CAPCOM 15, this is Houston. As a final check as to what's happening in that switch, we'd like to have you tap around the Delta V thrust switches a bit. To see if any light flickering comes on.

SC Roger, in work. Would you believe it came on.

CAPCOM We copy and we saw it down here. Okay, with the light now, let's cycle Bravo on and try to tease it in the middle if it stays on.

SC Okay, cycling bravo. Okay no change at all with bravo cycling several times through the middle.

CAPCOM We copy. Okay leave Bravo off and let's cycle A again.

APOLLO 15 MISSION COMMENTARY 7/26/71 CST 1805 GET 9:30:00 50/2

SC Roger. Okay right in the center of the contacts with A right between the 2, I can get the light to go out, but now when I go up to on, up on, the light comes on again. Now I've come back to the off position and the light's off. So I think you've isolated your problem.

CAPCOM

Roger.

END OF TAPE

GNC

APOLLO 15 MISSION COMMENTARY 7/26/71 GET 9:46:40 CDT 18:21 51/1

CAPCOM 15, this is Houston. We're willing to stop playing with the light problem at the present time. We'd like to verify that both DELTA-V thrust switches are off. And we'd like to have a group 5 circuit breakers both closed, but please keep the pilot valves circuit breakers open.

SC Okay, DELTA-V thrust verified off. Pilot verified open and all closed to group 5.

CAPCOM Thank you.

SC Gram 8.9.

END OF TAPE

ADDITIONAL
on SW
APOLLO 15 MISSION COMMENTARY 7/26/71 GET 9:53 CDT 18:28 52/1

PAO This is Apollo Control at 9 hours 53 minutes. This troubleshooting with the 15 crew has just completed. It does give us confidence that the Delta-V thrust switch A is faulty whether through contamination or whether something is loose in the switch, we don't know, but it does give us confidence that both banks of ball valves in the service propulsion system are okay. We do not now plan to proceed with the procedure that had previously been planned for midcourse correction 1. We're confident that we can develop procedures to operate bank A safely whenever we burn the engine.

SC Omni Delta, please.

SC Roger. Omni Delta.

CAPCOM 15, this is Houston.

SC Houston, 15.

CAPCOM Let's summarize our situation with that thrust on light. The telemetry we got down here, we actually have two lights which show up in that area, E4 and 5 on diagram 8.9. Gave us some rather confusing data that we don't understand yet, but we'll be working on it, but we do feel confident enough that there's no need to fire the engine at the present time and since the midcourse 1 is a correction of 2.8 feet per second we don't think that we'll be having a midcourse 1. For your information at the present time midcourse 2 looks about like 5.0 feet per second.

SC Okay, understand. We'll just hold tight, skip midcourse 1, standby for 2.

CAPCOM Roger. And 15 be advised we'll have a flight plan update in the near future.

SC Roger. That was a pretty good S-IVB wasn't it?

CAPCOM Roger. Hey, and you can tell Al up there that those look like pretty good P23 markings.

SC Okay, he's glad to hear that.

SC Very good, Karl.

CAPCOM 15, if you'll give us ACCEPT, we'll send up a new state vector.

SC (garble)

CAPCOM Say again 15.

CAPCOM 15, you can have your computer back.

SC Roger.

PAO This is Apollo Control at 10 hours 20 minutes. The Apollo 15 crew now taking ultraviolet photographs of the earth as scheduled in the flight plan. Apollo 15 is 49,511 nautical miles from earth now. Travelling at a velocity of 8,407 feet per second.

END OF TAPE

T6 GNC

From F. Mussato ^{Oct 2012}

Analysis of Flicker Test

The problem has been related to the ΔV Thrust A Switch, however the switch performs 3 Functions:

Contact 1. Powers the SPS Propellant Prevalve Solenoids

Contact 2. Transfers EMS 28V from the EMS thrust on light to the SPS Solenoid Driver and SPS Thrust Direct Switch.

Contact 3. Powers the high side of the SPS Propellant Control Pilot Valve Solenoids.

Failed Contact

1.

This would be difficult since it requires two failures, i.e; that contacts 1 & 2 or 1 & 3 be shorted together and grounded. - Rather unlikely

2. This switch failed intermittently to ground would cause the problem that was indicated on telemetry and by the EMS Thrust on light.

If the short were on the contact side of the switch and by switch actuation (losing) the switch pole was not making contact in either position then D1, CH3604 would indicate "0" or ON while D2, CH3605 indicated "1" or off.

3. This switch failed intermittently to ground ~~would cause~~ on the Pole side or on the normally off side would cause the indications we had on tm and on the EMS Thrust on light.

If the short were on the normally open or contact side we

expect the problem to be corrected during the "tease test". However, D1 CH3604 and D2 CH3605 would not have disagreed i.e. they would indicate a "0" or a "1" simultaneously. Unless it is possible to have both EMS & SPS contacts in the same position (open) at the same time.

If the short were on the pole side (which is not likely to be intermittent) the failure indications would be the same as for switch contact 2 but again D1 and D2 would always be in agreement as per comment on the contact side

Conclusion

A. Failure on the contact side of switch contact 3 would not affect EMS or SPS operation

B. Failure on the contact side of contact 2 or Pole side of contact 3 we could experience a loss of auto thrust control on Bank A - the intermittent prevents positive conclusions

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
9+28	Reading up FLICKER TEST procedure.			
09+35	Doing procedure for FLICKER Test: U			
	placed AV THRUST A sw to Normal and SPSTHRUST LITE & our SPS DI & DZ went out.			
09+44+50	Tapped panel by AV THRUST A switch and light came on. Then cycled AV THRUST B sw + no indication. Put AVTH A in halfway pos. and got SPS DI on and DZ out.			
10+09	Config for UV PHOTO jets A4, C3, B4, D3, B2, D1. Rates way down. $P = 0.0004\%$ $\gamma = 0.0007\%$ $R = 0.001\%$			
10+30	Went back to coupled jets AC Roll off. No Microfish yet. Problem in RTCC. Should gel soon.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	P52 X - 00076 - 1.11 meru			
	N93 - 00088 - 1.02 "			
	+ 00181 + 2.10 "			
	Crew asked about ox Tank			
	press. We told them we're			
	reading 168 psia & expect			
	that at this time in TLE			
	due to Helium absorption into			
	the oxidation.			
12+02	Single jet att. hold for PTC			
	rate damping. Using 90% C&D,			
	standing by for completion			
	of dumping.			
13+07	B2/D2 jets on only for spin up.			
13+08	PTC start - 0.25°/s			
	Procedure looks clean.			
13+40	Stopped PTC			
	Using odd ball jet config and			
	not damping.			
	Going to adjacent quads on			
	C&D for damping.			

OPR 1

7

AS-20

0

7

7

1

L2682 B

CSM GNC MANEUVER TABLE

GMT 01:03:11:42

GETA 0013:37:41

CTE 0013:37:41

CMC 0013:37:39

CMCB 0013:37:39

GETC 0013:37:39

SITE GDS09H

1ST PTC

CSM WT

66764

DKD WT

:02904

RCS

	QA	QB	QC	QD	TOTL
WPU	270	279	271	270	1090
K	303	303	299	303	1209
PCTU	89.2	92.0	90.5	91.0	90.9
P/T BIAS	0.0	0.0	0.0	0.0	
P/T CORR	92.4	91.5	92.3	94.3	
MSN PROP REQ	174	178	180	173	705
ΔV WPU	96	101	91	105	393

DAP

SCS

	1.54	2.12	2.12	1.89	2.03	2.13	2.13	2.04
QUAD FACTOR	62	47	43	54	38	47	43	43
QUAD ΔV	30	10	0	28	0	20	10	22
PROP REM	ΔV	43	BT	256	ΔV	38	BT	207

SPS

ISP	315.1	WPUF	15050
FRF	25.37	WPUO	20633
FRO	40.49	WPU	40083
FRT	65.06	PCTU	101.1
ΔV UDK	9290	ΔVDK	4990
BT REM	600.0		

G&N

	ROLL	PITCH	YAW
CDUIR	-0.2543	-0.0077	0.019
CDUBR	-0.2543	0.0185	0.0102
ERROR	0.000	0.000	0.000
PTC ERR		-12.700	15.23

OPR 1

7

A2-00

0

YR

7

1

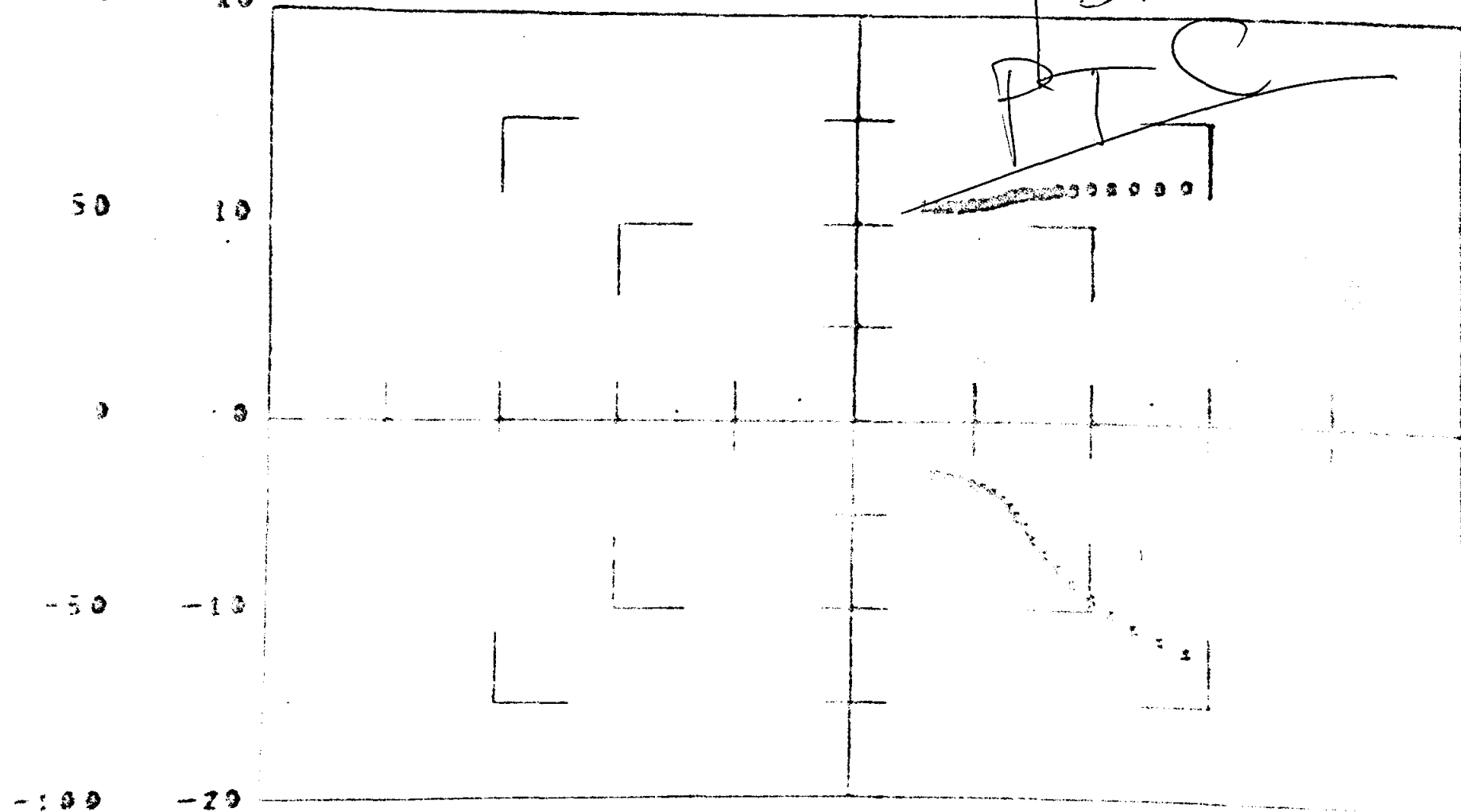
REPORT DATE 10 SEC DTC 10-10-70 POINTS 10 LIVE DATA

1175000 0
001070

5601101C
-17.302
100 10

CP0810-01
50.7020

ST



-100 -20

-25
5602102C

14.300

-0

START 5/C=013:17:55 END=013:17:55

NAV 2

7

HR 0

3

MIN 1

1

SEC 5

3

FLIGHT DIR MISSION LOG		DAY	REV	PG
				11
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	Tried start up again but slipped up & held c/w mode in Hold for too long & got some misc.			
14+16+43	Started 3rd attempt & this one looks good! Did it by ck list again but used -0.375% in N79 instead of -0.35 which gave us only -0.25% . We now have -0.28% .			
15+30+	ON CONSOLE (Joe DeAtkine)			
	Spending night completing			
	1. History of SPS Driver Circuit Problem			
	2. COMING UP WITH MCC2 BURN PROCEDURE.			
	PROP HAS RESEARCHED EARTH ORBIT			
	DELOG AND FOUND 1+48+41 - 1+48+50			
	D1 + D2 WERE ON.			
20+25	WILL PROVIDE THE WORLD WITH WRITE UP CONCERNING SPS DRIVER CIRCUIT PROBLEM. WILL INCLUDE TIME-LINE OF EVENTS AND PROCEDURES PERFORMED + RECOMMENDATIONS + PROCEDURES TO			

FLIGHT DIR MISSION LOG	DAY	REV	PG 12
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
	ACCOMPLISH A CHECKOUT OF SPS DRIVER CIRCUITRY BY EXECUTING MCC-2 BURN		
21+30	GNC LAUNCH CRIT LIMITS STILL LOADED. H GNC-1 NOW IN.		
22+04	I GAVE PROCEDURES A DELOG REQUEST FOR SOME PRE-LAUNCH DATA ^{CTE - PRE-LAUNCH} 109+00+30 to 109+02+00. WE WANT TO CHECK FOR POSSIBLE SPS DRIVER CIRCUIT PROBLEM DURING THIS TIME.		
24+00	WATSON ON BURN AT ~ 28+30 — ~5 FPS NEEDED PRESENT ACCEL. ~ 7 FPS ² LAST MEASURED DRIFTS X 1.24 ΔT = 5.72 HRS Y .96 Z 2.21 WILL PROBABLY UPDATE ALL GYRO'S G&N WORKING UP FORM FOR THESE VALUES AND WILL USE IT IF NEXT PS2 VERIFIES. PS2 PLANNED FOR 28+00		
24+26	2.4 3 DOCKED, 3.75 UNDOCKED 6.2 D, 9.6 UND STEADY STATE ACCEL.		
24+38	DOCKED DAP 52, SCS 53 FLY BY ΔV'S UND DAP 78, SCS 77		

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	M.C.C. SPECIAL SPS BURN			
	TEST PERFORMED AT			
	28-40+22 GET.			
	1. ΔV THRUST A - NORMAL			
	SPS PILOT CB - OPEN			
	THRUST LITE - ON.			
	2. CLOSED SPS PILOT CB			
	SPS BANK A BURN			
	$\approx$ 1 SEC.			
	3. PULLED SPS PILOT CB			
	ENGINE - OFF.			
	4. ΔV THRUST A - OFF			
	AFTER ENGINE SHUT DOWN THE			
	FOLLOWING OCCURRED:			
	1. DI E D2 - OFF			
	2. 7 SECONDS LATER			
	DI E D2 ON.			
	THIS COULD HAVE BEEN ASSOC. WITH			
	TURNING OFF THE ΔV THRUST SWITCH.			
	THE RESULTS OF THIS TEST PROVED			
	THAT THE SHORT IS ON THE GROUND			
	SIDE OF THE EMS LIGHT CIRCUITRY.			
	POSSIBLE CONTAMINATION IN THE ΔV			
	THRUST A SWITCH CONTACTS ASSOCIATED			
	WITH THE EMS LIGHT.			

FLIGHT DIR MISSION LOG		DAY	REV	PG 13
SITE/ACQ/LOS		FLIGHT EVENTS/HISTORY/BRIEFING		
24+52		FOR FID — RCS FOR 1 FPS TRIM		
		9.5EC 4JET, 13.5LBS		
		2ND PTC — -X JETS ON, NO + ROLL ON,		
		— WILL LOOK AT IT SOME OTHER TIME.		
		66704 CBM WT PREDICTION FOR 28+30		
		CONSUMABLES		
		89.4, 90.7, 88.6, 91, TOT 89.9		
		94, 94, 94, 93 ONBOARD		
		91.6, 92.3, 92.3, 93.1 P/Ls		
25+13		PSZ at 26+50		
25+35		CREW AWAKE		
25+40		RETRO SAYS WT PRED. WRONG — ADDS		
		UP TO 66730. SSR RECHECKING		
		66730 IS CORRECT.		
26+01		TRIMS FROM RETRO		
		PTR 1.24		
		YTR -0.11		
		PROP OKAYED		

FLIGHT DIR MISSION LOG		DAY	REV	PG
				14
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
26+11	COMM PROBLEMS, PROBABLY GROUND PROBLEM			
26+25	THRIFT VERIFIES DI & D2 GROUNDED			
	AT 1+48+41 TO 1+48+50			
	TIC SAYS GODDARD CHECKED AND FOUND			
	CH3604 & 3605 WERE GROUNDED 1+48+41			
	TO 1+48+51 STEADY. LOS WAS			
	1+49+13 SO MIGHT BE DATA GLITCH.			
	DRIVERS ARE ON LBR. — COULD HAVE BEEN			
	AV TEST?			
26+30	FLT WANTED TO KNOW ABOUT PTC.			
	TOLD HIM 1ST START WAS ABORTED			
	BY URINE DUMP, SECOND WAS WRONG			
	JET CONFIGURATIONS. NO ONE SEEMS TO			
	HAVE AN ACCURATE ACCOUNT.			
26+41	P47 WILL NOT BE CALLED UNTIL APPROX			
	1 MINUTE BEFORE IGN TIME. FIDO			
	WANTS TO BE IN P47 (AVG-GON)			
	AS SHORT A TIME AS POSSIBLE, SO AS			
	SOON AS CREW SAYS THEY ARE READY, WE WILL			
	GIVE "GO."			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				15
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	R P Y			
26+55	PTC STOP AT 17, 8, 90			
26+59	SIM BAY DATA PROBLEMS - NOT GETTING DATA BUT SHOULD BE			
	N93			
27+23	-00329	LOOKS GOOD. GOING WITH PRELIM. DATA		
	-00256			
	+00574	27+24+00 TROVE TIME		
27+24+30	D1 & D2 ON FOR 10 SEC			
	DV TEST & NULL BIAS. OKAY.			
	THRUST LITE			
27+41	BLDG 4S WANTS FILTER DOWN & CABIN LITES DIMMED.			
27+49	BURN CHALLST READ UP TO CREW OK.			
	GETTING LBO'S UP FOR EARLY TEST OF PUSHING ON PANEL			
27+52	GO TO PUSH ON PANEL			
53+53	— PUSHING — NO DRIVERS			
53+59	— RAP — GOT LIGHT			
54+30	FLICKERS THRU NEUTRAL			
55+36	DZ OFF FOR 1 SEC — SWITCH IN MINUTE			

FLIGHT DIR MISSION LOG		DAY	REV	PG 16
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	(DV A) →			
27+57	CREW CAN TURN OFF LIGHT WITH SW IN MIDDLE. WE GET D2 OFF WHEN HIS LIGHT GOES OFF — SHOULD DO THIS			
	27+55 — NEW ^{DRIFT} TERMS IN — ALL AXIS			
27+59	CREW LEFT DV A SW OFF, LIGHT STILL ON — OKAY			
28+03	CREW TOLD TO MONITOR LIGHT INTENSITY AS WELL AS ON-OFF. USE FILTER & CABIN LITES AT THEIR OPTION			
28+15	PROCEDURE SAYS WE WONT GET FMT 30 SUB 21 IN REAL TIME BECAUSE THEY HAD TO GO NARROW BORN WIDTH ON HGA			
28+34	WE NEVER GOT DV TEST DATA AT 27 HRS. WE USED TO GET THIS AND SOME OTHERS			
28+36	STARTING GIMBAL TRIMS			
28+39	P47, AVGS ON			
28+40	+28 — BORN — 1 ~ 1 SEC			
	5.3 FPS — DSKY			

IRIG/PIPA BIAS UPDATE REQUEST

COPY (SAME AS PRELIMINARY
AT GET 23+30+00

TO: GUIDO

GET 27: 42: 58

INFO: LGC/CMC SUPPORT

CONTROL/GNC

FROM: CONTROL/GNC

UPDATED TO THESE NO'S N 27+55

IRIG DRIFT COMPENSATION

	<u>ADDRESS</u>		<u>MERU</u>	<u>OCTAL</u>		<u>MERU</u>					
	<u>CMC</u>	<u>LGC</u>									
NBDX	<u>1460</u>	<u>1460</u>	<u>3.24</u>	<table border="1"><tr><td>0</td><td>0</td><td>6</td><td>3</td><td>4</td></tr></table>	0	0	6	3	4	NBD _M X	<u>1.24</u>
0	0	6	3	4							
NBDY	<u>1461</u>	<u>1461</u>	<u>-1.84</u>	<table border="1"><tr><td>7</td><td>7</td><td>4</td><td>2</td><td>5</td></tr></table>	7	7	4	2	5	NBD _M Y	<u>.94</u>
7	7	4	2	5							
NBDZ	<u>1462</u>	<u>1462</u>	<u>-2.39</u>	<table border="1"><tr><td>7</td><td>7</td><td>3</td><td>1</td><td>7</td></tr></table>	7	7	3	1	7	NBD _M Z	<u>2.21</u>
7	7	3	1	7							

PIPA BIAS

	<u>ADDRESS</u>		<u>PULSES/SEC</u>	<u>OCTAL</u>		<u>PUL/SEC</u>					
	<u>CMC</u>	<u>LGC</u>									
PBIASX	<u>1452</u>	<u>1452</u>	_____	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr></table>						ΔPBIASX	_____
PBIASY	<u>1454</u>	<u>1454</u>	_____	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr></table>						ΔPBIASY	_____
PBIASZ	<u>1456</u>	<u>1456</u>	_____	<table border="1"><tr><td></td><td></td><td></td><td></td><td></td></tr></table>						ΔPBIASZ	_____

NBDX (Y,Z) = REQUIRED COMPENSATION

NBD_MX (Y,Z) = MEASURED DRIFT OF IRIG'S WITH PRESENT COMPENSATION

PBIASX (Y,Z) = NEW PIPA BIAS

ΔPBIASX (Y,Z) = DIFFERENCE BETWEEN PRESENT LOADED PIPA AND
MEASURED PIPA BIAS

RCS PANEL INSULATION, QUAD C, BAY 3.



SM RCS PROPELLANT TANKS, BAY 5 (QUAD D)

Thermocouple Number	X inches
471	345.58
472	345.88
474	347.14
476	347.14
477	335.65
478	327.5
480	257.94
481	295.75
482	310.00
484	270.0
485	263.0
486	270.0

FIGURE II

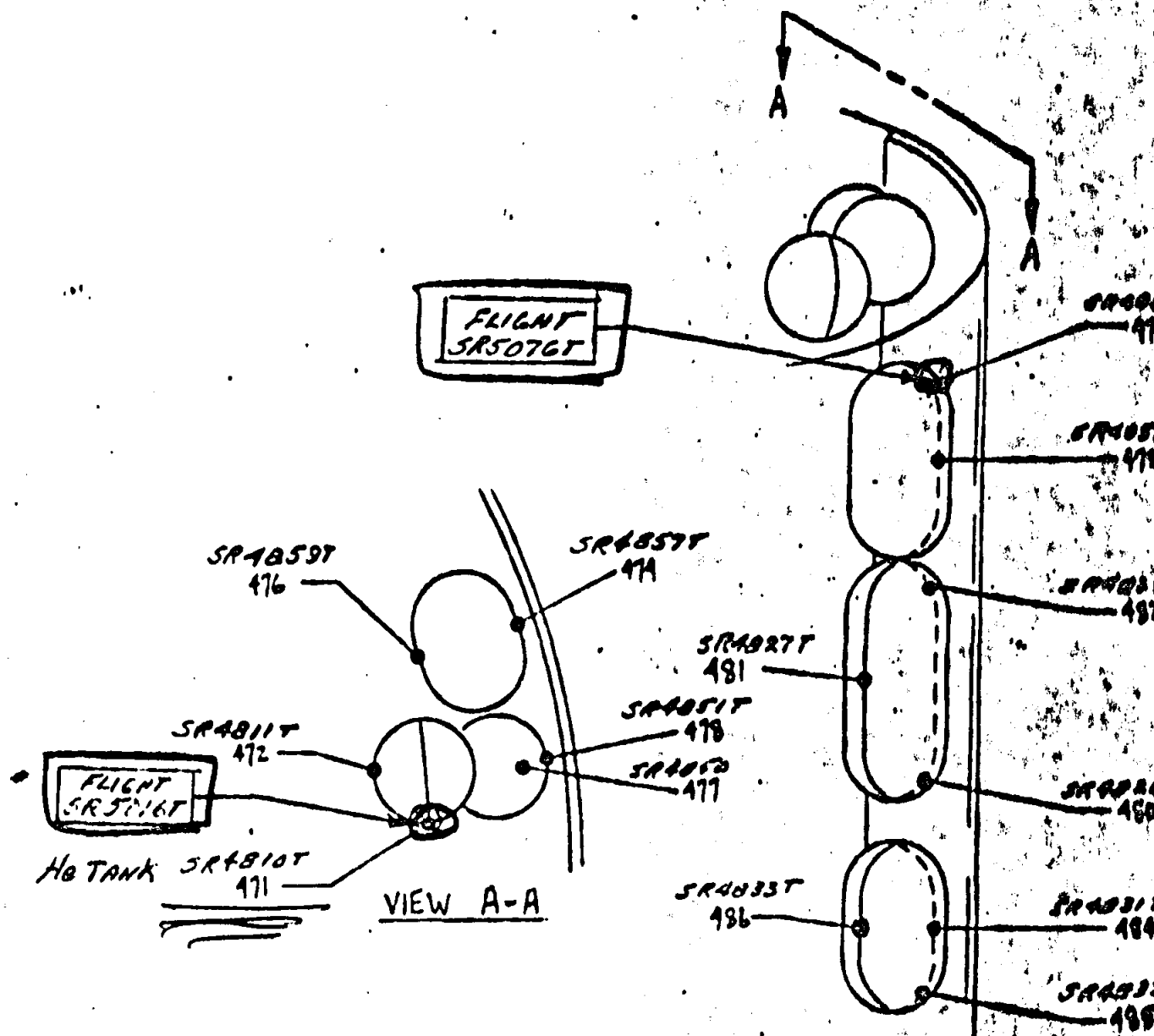
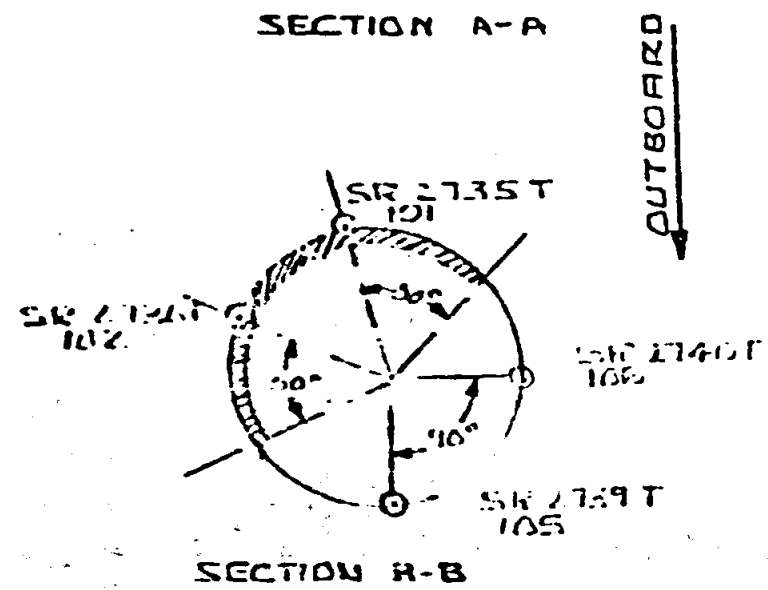
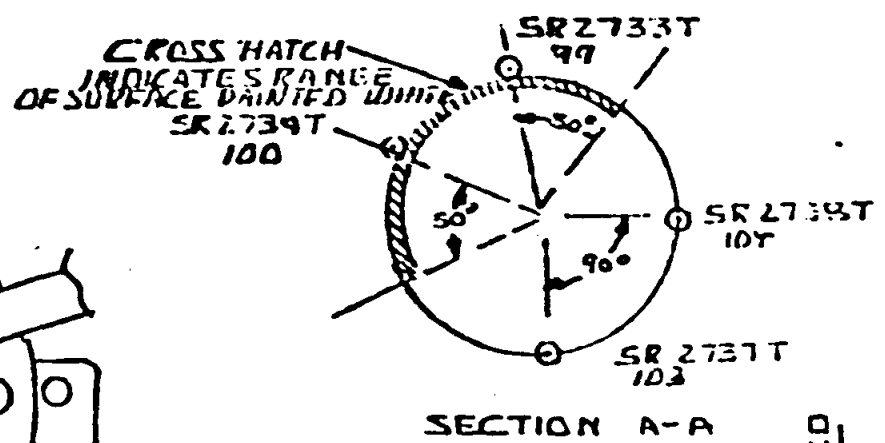
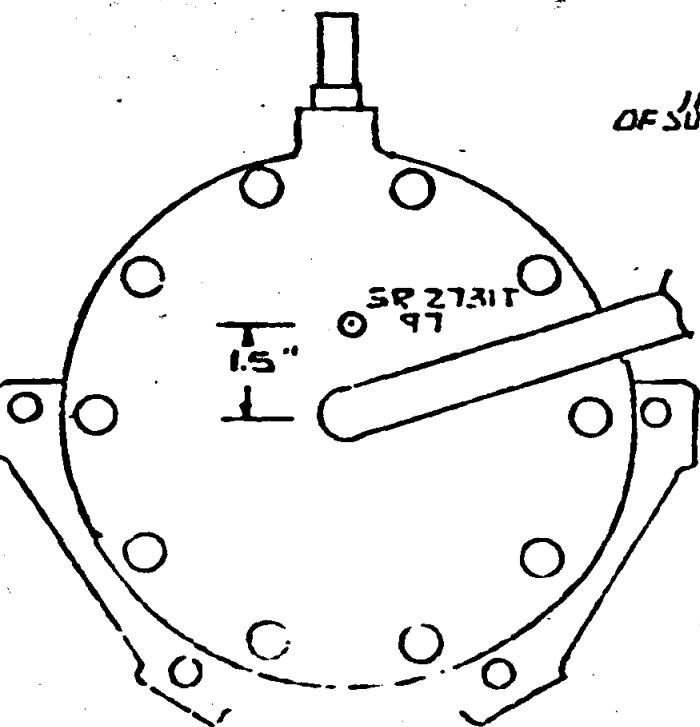
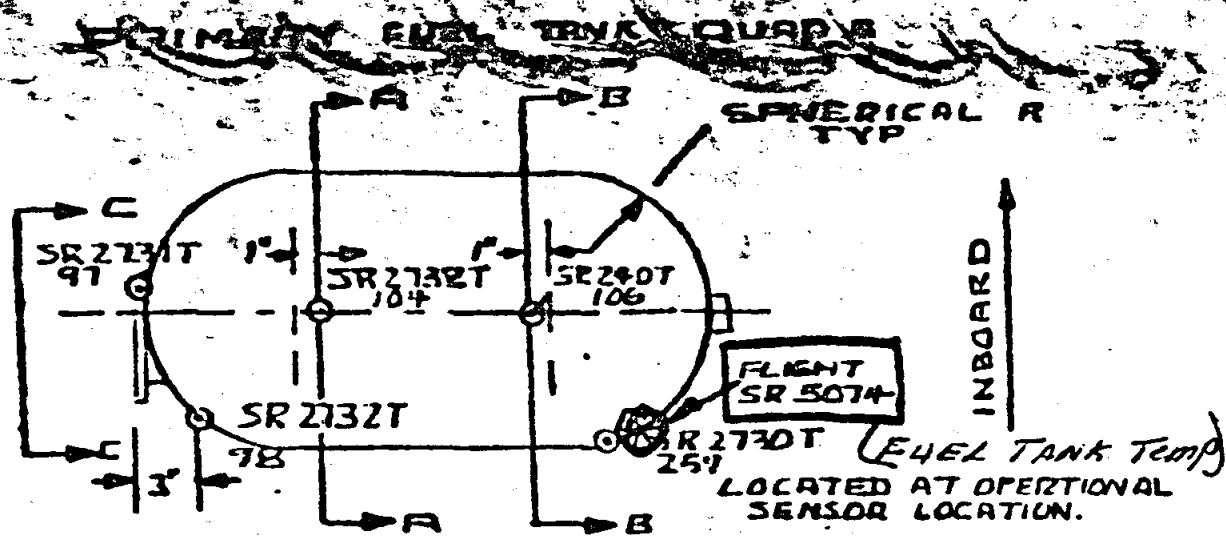


FIG II



FAO UPDATE TO ORIGINAL GNC CHECKLIST FOR MCC-2

09:15 7/27/71 (24:40 GETI)

L
4-14

RETRO UPDATE (NO COMM - use Block Data)

GETI _____ 0 .05G _____

ΔV _____

VC _____

Δtb _____

GET 400K _____

GET DROGUE _____

ENTRY R _____

P _____

Y _____

If time permits, go to G&N thrusting procedures;
if time critical, continue with SCS ΔV .

CB EPS GROUP 5 (2) - CLOSE

XX:XX

Set DET counting up to GETI

GDC ALIGN

EMS FUNC - ΔV SET/VHF RNG

SET ΔVc ~~ABORT~~ **100**

EMS FUNC - ΔV

TVC CHECK & PPEP

(8) ~~cb STAB CONT SYS (all)~~ - close **10**

~~cb SPS (12)~~ - close

MAN ATT (3) - RATE CMD

LIMIT CYCLE - on (up)

ATT DB - MIN

RATE - LOW

TRANS CONT PWR - ON

SCS TVC (2) - RATE CMD

ΔV CG - ~~CSM~~ **LM/CSM**

TVC GMBL DRIVE P&Y - AUTO

**CB SPS PILOT VLVS (2) - OPEN
(VER)**

(54:00)

(-06:00)

MN BUS TIE (2) - ON

TVC SERVO PWR #1 - AC1/MNA

TVC SERVO PWR #2 - AC2/MNB

✓ ROT CONTR PWR NORMAL (2) - AC

✓ ROT CONT PWR DIRECT (2) - OFF

✓ BMAG MODE (3) - ATT1/RATE2

✓ SC CONT - SCS

RHC #2 - ARMED

3/29/71

TLI 90 **BORT**

L
4-15

(55:00) PRIMARY TVC CHECK

(05:00) GMBL MOT P1-Y1 - START/ON (LMP Confirm)
Verify TRIM CONTROL & SET
Verify MTVC
SCS TVC (2) - AUTO
THC - CW
Verify NO MTVC

SEC TVC CHECK

GMBL MOT P2-Y2 - START/ON (LMP Confirm)
SET GPI TRIM
Verify MTVC
THC NEUTRAL
Verify GPI returns to trim
Verify NO MTVC
ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
FDAI SCALE - 5/5
LIMIT CYCLE - OFF
~~RATE - HIGH~~
UPDATE DET
SPS He vlvs (2) - AUTO (verify)

(58:00)
(-02:00)

~~ΔV THRUST A~~ - NORMAL
V37E 47E **GET THRUST LITE ON BY PUSHING**
THC - ARMED **ON PANEL FIRST, IF THIS DOESN'T**
RHC (2) - ARMED **WORK FAP ON PANEL OR CYCLING**
TAPE RCDR - HBR/RCD/FWD/CMD RESET **SWITCH. IF NO LITE DELETE TEST**

(59:30)
(-00:30)

EMS MODE - NORMAL

ON MSFN CUE C6 SPS PILOT VLV (A) CLOSE

~~00:00 ULLAGE & THRUST ON PB - PUSH~~

~~SPS THRUST LT - ON~~

~~00:03 ΔV THRUST B(A) - NORMAL~~

~~ULLAGE & THRUST ON PB - PUSH~~

**{ 1 SEC BURN
DESIRED
IF NO IGN
C6 SPS PILOT VLV
(A) - OPEN AFTER
3 SECONDS**

~~MONITOR THRUSTING~~

~~PC 95-105 psia~~

~~EMS COUNTING DOWN 2~~

SPS INJ VLVS (A) - OPEN

SPS He vlvs tb-gray

SPS FUEL/OXID PRESS - 170-195 psia

~~RUCS - BALANCED~~

**AFTER IGNITION CONFIRMED: C6 SPS PILOT VLV A(MNA)
- OPEN**

**NOTE: BURN SHOULD NOT EXCEED
1 SEC DURATION**

DATE 3/29/71

DATE

L
4-16

00:XX

ECO

ΔV THRUST ~~AX~~ - OFF
VERIFY THRUST OFF
SPS INJ VLVS (4) - CLOSED
SPS He vlvs tb (2) - bp
GMBL MTRS (4) - OFF (LMP Confirm)
TVC SERVO PWR 1&2 - OFF
MN BUS TIE (2) - OFF

19 F 16 83

ΔV XYZ (CM) (.1fps)

RECORD	ΔVC	_____
EMS FUNC - OFF	ΔVX	_____
EMS MODE - STBY	ΔVY	_____
	ΔVZ	_____

ATT DB - MAX
TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT (2) - OFF
BMAG MODE (3) - RATE 2
TAPE RCDR - off (ctr)
PCM BIT RATE - LOW

PRO

F37 00E

When CMC Acty lt out:

V66E

Go to ENTRY PREP & SUPERCIRC ENTRY PROCEDURE
pg E/1-1

AFTER TEST ~~IF~~ IF SPS LITE GOES
OUT ATTEMPT TO GET LITE ON
BY PUSHING ON PANEL.

DATE 3/29/71

SPS PROPELLANT USAGE DATA

BURN DESCRIPTION MCC²(TEST)

MISSION APOLLO 15

28:40:23.27

BANK: SINGLE ☒ DUAL ☐

TIG 28:46:22.50

S/C WT. START 102924 END 102880

BT : : # SEC .77

PAD AV RCS AV 0

BT

SEC ~~.87~~ N/A IMU AV 5.3 SPS AV 5.3

PU VALVE POS. NOR

I_{sp}

(BT FROM HOUSTON TM)

	FUEL	OXIDIZER	PROPELLANT
MED AT START OF BURN	15585	24912	
CREW READOUT LAST BURN %			
CREW READOUT END OF BURN %			
% USED			—
PUGS TM LAST BURN %			
PUGS TM END OF BURN %			
% USED			—
MED INPUT AFTER BURN	15566	24882	

	DETERMINED WITH FLOW RATE AND BURN TIME	DETERMINED WITH IMU AV PROP PROGRAM	DETERMINED FROM PUGS CREW READ OUT	DETERMINED FROM PUGS TM READOUT
FUEL USED	24	19		
OXID USED	39	30		
PROP USED	63	44		
FUEL TNKD	15561	15566		
D TNKD	24873	24882		
PROP TNKD	40434	40448		
FLOW RATE	63.5	44.94		
MIX RATIO	1.6	1.6		

MANUAL THRUST
ON AND OFF

G&N

SPS BURN SUMMARY

* NO DELOG AVAIL.

TIG 28+40+22.5

BURN

MCC2

GN (SCS)

MISSION

15

CMC TIME

DR1

DR2

ACDU PITCH

ACDU YAW

ACDU ROLL

PACTOFF

PITCH GMB POS

PACTOFF/GMB POS Δ

OCDU SHAFT DAC

SODB P Trim

YACTOFF

YAW GMB POS

YACTOFF/GMB POS Δ

OCDU TRUNION DAC

SODB Y Trim

LM WEIGHT

CSM WEIGHT

MAX PITCH RT

MAX YAW RT

N81 BEFORE BURN

N85 END OF BURN

VG X

VG Y

VG Z

V_C

P DIFF CLUTCH CURR

Y DIFF CLUTCH CURR

*ESTIMATED GMB MISTRIM

SYSTEM STATUS

ORIGINATOR

TIG

NA

BEFORE BURN

TEVENT

*

END OF BURN

Δ

-

Δ

-

-

-

-

-

1.04

-

-

-

-

0

-

-

-

-

-

-

-

-

-

-

-

-

4.7

-4

-22

+13

+6

0

Co

*GMB MISTRIM = Gp - GS
GP = GBL POS BEFORE BURN
GS = GBL STEADY STATE POS
AFTER IGN

FLIGHT DIR MISSION LOG		DAY	REV	PG 17
SITE/ACQ/LOS		FLIGHT EVENTS/HISTORY/BRIEFING		
		D1 & D2 APPEARED TO GO OFF FOR		
		~7-8 SEC AFTER BURN, THEN BACK		
		ON STEADY.		
		TIG 28+40+22.5		
		1.0 SEC PC		
~28+50	EWS MNA & MN B CB'S PULSED			
28+51	WE WANT TO MNVR FOR BETTER DATA			
		SO EECOM WONT LOSE DATA		
		D1 & D2 28+40+23 OUT (EVENT RECORDER)		
		D1 OFF 7 SEC		
		D2 OFF 8 SEC		
		BACK ON STEADY		
29+06	CREW SAYS THEY ARE NOT SURE WHAT			
		SR THRUST LITE DID AFTER BURN AS THEY		
		WERE GETTING OUT OF P47 ETC.		
		THEY THINK IT STAYED ON. CANT BE		
		SURE.		
29+08	DELETE P52 AT 30 HRS			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				18
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	EIMS CHECKS - FLT. PLAN			
	2+24 (COULD HAVE BEEN 1+48)			
	7+30 (07+41+30) $\Delta V_c = 0.9$			
	27+24 $\Delta V_c = 0.7$			
29+28	WTS TAB UPDATED - NEW FUDOX			
	IMU ΔV METHOD FOR PROP USED YIELDS			
	44 LBS PROP USED, FLOW RATE X BT = 77 LBS			
	WILL UPDATE WTS TAB W/ IMU ΔV .			
29+50	PROP CALCULATES 0.87 SEC BT USING			
	MIN IMPULSE CURVE.			
30+10	COEN WORKING ON REVISED P40 CKLST			
	FOR LOI, DOT ETC. WILL PROBABLY SHOT-			
	DOWN BANK A AT LOI C/O - 40 SEC			
	TO GET GOOD SINGLE BANK THRUST DATA			
	FOR <u>DOI</u> , CIRC, ETC.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				19
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
31+15	DAK on			
	Holding att. at SXT PHOTO ATT.			
	(270, 12, 51)			
32+13	-X jets off for SXT PHOTOTEST			
	FLY BY RCS AV DU's worked up			
	DAP SCS back at 24+38			
	Docked 70 61 are wrong as			
	Und 104 81 per pre-mission			
	agreement form.			
32+40	coupled jets			
32+50	-X jets off for more SXT PHOTOS			
32+53	Back to coupled jets. / AC ROLL OFF			
	Man. to UV PHOTOS (150, 052, 000)			
33+09	-X jets off using B2, D1 for Roll			
33+11	Going to TV att. (200, 090, 000).			

SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING
33+47	Site problem. Loss of TM. (23+21+00 2)
33+49	AC Bus 2 undervolt, MND undervolt
	Data was lost at the time.
	Had site problem for data loss.
	(LIEB AC 2 cb#33 popped at approx. this time apparently but was not found until 36+40) (See 36+40 time for comment.)
33+57	TV
	LM has broken pane of glass on tapemeter.
35+30	OX FDLN A Temp (SR5069) now up to 106°F. CKing with SPAN on possible overtemp problem.
	Have written plan for all subsequent burn relative to our AUTHRST A switch prob.
	LOI - DUAL - Bank B, then Bank A
	DOI - Single - Bank B
	CIRC - Single - Bank B
	LOPC - Single - Bank B
	Shayre - Single - Bank B
	TEI - Dual - Bank B then Bank A

FLIGHT DIR MISSION LOG		DAY	REV	PG
				21
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
36+00	We wrote up the results of MCC 2 and entered as Addendum 1 to the "SPS IGNITION CIRCUIT ANOMALY."			
	Figured up rough back at LOI of DOI Thrust of $\dot{w}$:			
	<u>LOI</u>			
	$\bar{T}$ 20736	Use single bore		
	$\dot{w}$ 65.8	Shutdown impulse (12850 lb-sec).		
	<u>DOI</u>	$\bar{T}$ -		
	$\bar{T}$ 20500	Use single bore		
	$\dot{w}$ 65.0	tailoff times		
36+20	Passed above to 1100@37+50			
	D. Freeburn will work up new SODB Thrust of $\dot{w}$ for LOI & DOI based on C-35 procedure for P40 ok List. He will supply these numbers to Joe Kordic's at ~1300 CDT tomorrow, 7/28/61.			

FLIGHT EVENTS/HISTORY/BRIEFING

~~SECRET~~ *SECRET*

Crew reported that
LEB AC2 cb popped on
RHEB 226 (cb33). This
cb was checked during
a special cb ck of the
AC2 cb's due to the
previous AC2 undervolt.
We lost the following
lighting:

1. EMS Scroll (electroluminescent alphabetic characters)
2. EMS RSI (electroluminescent)
3. NAV DSKY Keyboard lights
- " " Status indicator lights
- " " power supply dimmer

SPAN

APOLLO 15 STATUS REPORT
July 27, 1971

GET: 38:00

COMMUNICATIONS

Communication system performance has been nominal. Playback of the data recorded on the DRR indicated that the high gain antenna reaction to the intentional drop of the S-band uplink carrier was as expected.

DISPLAYS AND CONTROLS

No change in status.

INSTRUMENTATION

No change in status.

POWER DISTRIBUTION AND SEQUENCING

At approximately 33:47:24 GET, a CSM DC Bus "B" undervoltage and AC Bus 2 voltage alarm occurred. A quiz of crew activities at the time revealed no unusual activities. An inspection of all circuit breakers revealed the Integral Lighting breaker CB33 on panel 226 was open. An analysis indicates a short circuit of the magnitude required to open this breaker is sufficient to cause the above alarms. It is not planned to reset the breaker.

CREW SYSTEMS

No change in status.

GUIDANCE AND CONTROL

No change in status.

PROPULSION AND POWER

SPS: All parameters continue to be normal.

CSM RCS: Pressures and Temperatures - All parameters within expected limits for extended attitude hold.

SM RCS Propellant Remaining:

	A	B	C	D	TOTAL
Actual Remaining (Wpu)	263	263	262	264	1052
Planned Remaining					
(Flight Plan)					1065
Red Line (Flight Plan)					810
*Delta from Planned					-13
*Delta from Red Lines					+242

*(+ indicates excess; - indicates shortage)

See over
for RCS temp
note.

Fuel Cells & Cryogenics: The fuel cells are normal delivering approximately 78 amps to the spacecraft systems. The cryogenic system is normal with approximately 872 pounds of oxygen remaining and approximately 73.1 pounds of hydrogen remaining. O₂ tank 3 dropped to 803 psi from 875 psi during the PTC as a result of destratification. Tank 3 is not on C&W and thus gave no alarm. This is not a problem and causes no concern.

Batteries:

CM Batteries:	Batt A:	AH ₀	1.61	AH Remaining	38.39
	Batt B:	AH ₀	3.13	AH Remaining	36.87
	Batt C:	AH ₀	2.11	AH Remaining	37.89

LM Batteries: No change.

Battery A is still charging.

THERMAL

The temperature of the SM RCS Quad A oxidizer feedline (measurement SR 5069T) reached a maximum of 123°F at GET 37:00 as a result of an approximately 4 hour hot soak of Quad A. Although the feedline temperature limit is 175°F, an isolation valve located just upstream of the transducer has a temperature limit of 105°F. This type of temperature response is expected to occur on any of the RCS Quads under similar conditions, therefore, appropriate analyses and test data will be examined to determine the effects of this thermal behavior.

J. L. C. Jones

GET 37:53

R. W. White

38:18

SPS BURN PLAN

LOI - Bank B, then Bank A 5 sec
after Ign and Bank A off
at Ign + 6 min

DOI - Bank B only

CIRC - Bank B only

PCI - Bank B only

Shaping - Bank B only

TEI - Bank B, then Bank A 5 sec
after Ign and Bank A
off at cutoff - 5 sec.

See page 24 of this
Log. Joe D.

GNC / J. Kamman
6ct 38400

FLIGHT DIR MISSION LOG		DAY	REV	PG 23
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
36+55+13	Comm. ck. Lost data momentarily due to Pindale 1 SA test.			
	Use Qd A & D for damping. B & D for spin up of .375 rate.			
37+01+30	Uncoupled for rate damping.			
37+14	Spin up. Still has AI turned on. Told him to turn off if he complied.			
37+26	Crew told of LOI SPS burn planning if they agree.			
	EECOM wants to ck SPS Pitch 1 Bat A & SPS Yaw 1 Bat A if they're open. They may not have been open after the cluggy MCC 2.			
38+56	SPS PI & Y1 BAT A ch's were verified open by the crew.			

FLIGHT DIR MISSION LOG	DAY	REV	PG 24
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
39+32	JOE DEATKINE ON CONSOLE		
	REFERENCE C-48 AND SPS BURN		
	PLAN TEI		
	The submitted SPS BURN PLAN for TEI		
	calls for cut off of BANK A at T-5SEC		
	at end of burn. There is a problem here. -		
	The CMC bases shutdown on time at		
	Tgo - 4secs. Therefore if CREW is slow		
	in turning off BANK A, they will change		
	the thrust (≈ 300 lbs) during the last 4		
	seconds of burn and cause residuals as		
	high as 3-4 ft/sec. (This is not too bad).		
	Worst thing that could happen is to have		
	a transient ^(thrust) occur during BANK A shutdown		
	when the CMC is doing its last Tgo		
	computation (this could mean big residuals).		
	We could move BANK A shutdown		
	to Tgo - 10sec but this would leave us		
	open to a BANK B failure which would		
	cause a trim problem with RCS.		
	The best way to go maybe to base		
	BANK A shutdown on NOUN 40 - Tgo when Tgo is		
	less than 4 seconds and accept the 3-4 ft/sec		
	residuals.		
	NR is making sim run to see effect		
	on burn; they'll give results to MIT.		

FLIGHT DIR MISSION LOG		DAY	REV	PG	TO
		7/28/71	TLC	25	10
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING				
	MIT SHOULD COME OUT WITH A PAPER ON THIS.				
43+50	LUNNEY WANTS US TO CONSIDER THE POSSIBILITY OF MOVING THE SPS PILOT VLV MNB - CLOSE FROM TIC - 02:00 TO SOME WHERE ... SAY WHEN AVG G COMES ON. HE'S AFRAID OF BANK A PROBLEM APPEARING IN BANK B - PREMATURELY STARTING BURN.				
	NOTE: SEE C-34 FOR BLDG 45'S VERSION OF BANK A PROBLEM. According to the 45 people our 8.9 drawing is wrong. The AV THRUST SWITCHES ARE BACKWARDS. - The two poles are on ERS ch. side and center wiper arm is on solenoid side.				
	Phil Shaffer has a memo out called OPTICS BIAS DURING P23. I have it filed with the Chit reports. It says crew ought to manually decrease trunnion to less than 10° before zeroing optics. Otherwise, optics will race past zero point hitting stop and causing a bias.				

FLIGHT DIR MISSION LOG		DAY	REV	PG
				26
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
48+24	WATSON ON			
	RCS 92'S FOR CREW			
	86.4 87.1 85.9 87.4 86.7 TOT			
	89.6 88.3 89.6 89.9 P/T'S			
	90 89 90 89 CREW			
48+29	FLT PLAN HAS BEEN UPDATED TO CHG FROM			
	FAO (54:50 - 60:00)			
48+37	EBCOMS WORKING ON PROCEDURE TO			
	ISOLATE AC 2 SHORT. INVOLVES REMOVING			
	KNOB'S FROM LIGHTING RHEOSTATS AND TURNING			
	TO "OFF" POSITION. THIS WILL OPEN A SWITCH			
	CONTACT. NAV. DSKY NUMERICS CONTROLLED BY			
	NUMERICS RHEOSTAT — IF THEY TURN THIS DOWN			
	ALL THE WAY, WE MIGHT NOT BE ABLE TO READ			
	DSKY.			
49+10	CREW AWAKE			
49+23	RCS 90 89 90 89 CREW REPORTS			
50+09	ZEROING OPTICS WITH TRUNNION > 10° CAN			
	CAUSE TRUNNION TO HIT -10° STOP. IS NO PROBLEM			
	FOR P52'S. NOT REQ'D TO DO FOR P52			
	ZERO.			

FLIGHT DIR MISSION LOG		DAY	REV	PG 27
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
50+44	AS PER LUNNEY REQUEST WE ARE LOOKING AT PROCEDURES TO ARM ENGINE CLOSER TO TIG TIME, AS OPPOSED TO TIG-2 MIN. POSSIBLY ARM ΔV THRUST SW'S AFTER "PRO" ON FV99N40 (REQUEST ENGINE ON ENABLE). IF PROBLEM WERE TO OCCUR ON BANK B SIMILAR TO BANK A WE COULD IGNITE AT TIG-2 MIN. THE CMC WILL NOT STEER ENGINE UNTIL RECEIVING "PRO" AND REACHING TIG TIME. CANNOT GET TVC DAP ON EARLY. ARMING ENGINE SOMETIME AFTER TIG-30 SEC IS DESIRABLE AS AVE-6 IS RUNNING, EHS IS SET UP. IF PREMATURE IGNITION, GO SCS, PRO ON V99N40, RETURN TO CMC CONTROL AFTER TIG TIME, MANUAL CUTOFF.			
51+00	REQUEST TO SPAN FOR SPS THRUST VALUES BASED ON PLAN IN C-48.			
51+34	FAO'S JUST ABOUT FINISHED WITH LOT CHECKLIST. CB'S WILL GO IN AT TIG-2 MIN (ΔV THRUST A & B ARE OFF). ΔV THRUST B WILL BE ARMED ~ TIG-30 TO TIG-5 SEC, ΔV THRUST A ON AT TIG+3 SEC.			
51+36~	STARTED VENTING LEM NO EFFECT TO PTC			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				28
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
52+20	FIDO SAYS MCL4 ~ 6 FPS.			
	PROP CALCULATES .95 SEC BT			
53+12	LONG TALK WITH JACK GARDIAN - AGC			
	SUPPORT - REFERENCE ZEROING OPTICS			
	FROM LARGE TRUNNION ANGLE. P23			
	MEASURES THE ANGLE BETWEEN THE			
	LANDMARK LINE OF SIGHT AND THE STAR -			
	LINE OF SIGHT IN THE SXT. IF ZEROED FROM			
	GREATER THAN 10° TRUN, MIRROR CAN SHIFT			
	FROM HITTING STOPS. P23'S ON MONDAY			
	SHOVED CAL ANGLE CHANGED ~ 30 ARC SEC.			
	OUR P52'S SHOULD NOT BE AFFECTED AS THESE			
	CHANGES WILL BE LOST IN TORTUING ANGLES.			
	PROCEDURE USED TO BE ALWAYS DRIVE			
	TRUNNION TO <10° BEFORE ZEROING BUT CREWS			
	HAD IT REMOVED FROM CKST SINCE THEY SAID ALWAYS			
	DID IT. WE MIGHT WATCH NEXT P52 AND			
	SEE WHAT THEY DO. IF THEY ZERO WITH T > 10°			
	WE MIGHT ADVISE THEM TO MANUALLY DRIVE TO			
	<10°. THEY WERE TOLD TO DO THIS			
	EARLIER TODAY WITH REGARDS TO P23'S.			
53+52	CALCULATED ETDECAY FOR DOI SINGLE			
	BANK ETDECAY = $\frac{ID}{F} = \frac{12850}{20497} = 0.6269 \text{ SEC}$			
	LOADED VALUE = 0.640. M&N RULE IS DON'T			

} OPTICS
CAL
ANGLE

LONG AGC

SPS BURN PROCEDURES

1) ~~For~~ form LOI AS FOLLOWS:

- a) CB SPS PILOT VALV AND - CLOSE @ -2 MIN.
- b) AV THROST A & B - NORMAL after PRO
at T16 - 5 SEC.
- c) CB SPS PILOT VALV AND A - CLOSE @ +3 SEC.
- d) ~~For~~ O/K IGN CLARE AND PILOT CB.
- e) C/A SPS PILOT VALV AND A - OPEN @ 06:00.

2) MCC - U. & DOI - Use same procedures
except do Bank B burn only; i.e.
do not close and A pilot C/hot AV THROSTA.

*this was
normal
burn
and
pro*
3) C/R & Plane changes Use same
procedures except do single Bank B burn
AND PERFORM THROST E - NORMAL @ T16 - 2 MIN.
If IGNITION occurs prematurely delay
one Rev.

4) TET - Same as LOI except will have
a new Bank A Off Time.

END 2 Following

GNC J. Coen

1.0 Hz

FLIGHT DIR MISSION LOG		DAY	REV	PG 29
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	UPDATE FOR CHANGE < .050 SEC.			
53+58	ΔV TEST & NULL BIAS			
	TEST OKAY -21.0, .8 FPS			
	RECD THRUST & FLOWRATE DATA FROM SPAN			
	FOR BUENS. TEI DATA WILL FOLLOW. LOOKS			
	LIKE WE WILL UPDATE EFIMP 16 BEFORE			
	CIRC, WILL LEAVE IN FOR SHAPE.			
54+07	REFERENCE LIGHTING PROBLEM: CERNAN			
	FOUND THAT YOU CAN GET THE NAV DISK ^(CFS ANNUNCIATION)			
	STATUS LIGHTS ENABLED BY TURNING			
	NUMERICS RHEOSTAT FULL ON IF 84 PPS			
	FUSE HAS NOT BLOWN. SAME GOES FOR			
	MISSION TIMER.			
	WILL PROBABLY RECOMMEND THAT			
	THEY TURN ONE RHEOSTAT ALL THE WAY DOWN			
	AND THE OTHER ALL UP, CHECK LIGHTS, REVERSE			
	RHEOSTATS, CHECK LIGHTS.			
	WORD IS FUSE WILL NOT BLOW EVEN			
	WITH DIRECT SHORT BECAUSE RESISTOR			
	LIMITS CURRENT. (DWG 11.2 #74)			
55+08	WROTE UP PROCEDURE FOR CHKING LEB			
	LIGHTING — PASSING AROUND FOR COMMENTS.			

FLIGHT DIR MISSION LOG	DAY	REV	PG 30
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
55+20	P52 N93		
	-021 -05 meru		
	-034 -08 "		
	+016 +03 "		
	55+21+30 TORPED		
55+30	VAK on		
55+55	UV photos (LBR) uncoupled		
56+15	UM CKOUT ATT (305,90,0)		
56+34	Went to 5° DB		
57+30	FLT BRIEFING ON LOS procedures		
	1. Milt didn't like bringing Bank A		
	on at TIG + 3 sec. vice last night's		
	5 sec number we decided on.		
	2. What if MCC 4 doesn't light		
	on Bank B? Discussion was		
	to hold up the burn, not use		
	Bank A, and try to get Bank B		
	started or find out what's		
	wrong with it. If Bank B is		
	unusable, will probably RCS MCC 4		
	and go single Bank A for LOS.		

LIGHTING LOST AS RESULT
of popped cb 33 (LEB 226).
(LIGHTING-NUMERICS/INTEGRAL LEB AC2)

1. EMS SCROLL Lite
2. EMS RST Lite
3. Electroluminescent Lites on:
 - a. LIGHTING CONTROL PNL 100 (LEB)
 - b. Comm. PNL 10 (RHEB)
 - c. cb PNL 225 (RHEB)
 - d. cb PNL 226 (RHEB)
 - e. Mission & Event Timer PNL 306 (LHFEB)
 - f. System Test Meter PNL 101 (LEB)
 - g. Optics PNL 122 (LEB)

- THE 4. NAV DSKY KEYBOARD PNL 140 (LEB)
7. 5. NAV DSKY ANNUNCIATOR PNL 140 (LEB)
- ? 6. ~~Optics ANNUNCIATOR PNL 122 (LEB)~~
7. Mission Timer Counters PNL 306 (LHFEB)

GNC

60+30

passed to FLT, CAPCOM
GIDO, SPAN, FAO, G#N

Integral Lighting Loss

DSKY CAUTION STATUS (NAV DSKY)

1. UPLK ACTY - Loss of indication for maneuver request during PLO rendezvous tracking. If track error becomes greater than 10° UPLK ACTY signals crew to ~~execute~~^{key} V58E to execute auto maneuver to track attitude.

2. TEMP - Loss of temperature fail indication. Onboard. Ground can monitor PIPA temp. Crew will receive a PGNS~~is~~ Light on GNIC panel and can view the MAIN DSKY to determine the caution status. No problem.

3. NO ATT - Lit in coarse align. If inadvertent coarse align ground can monitor. Will normally be off. No problem.

4. Gimbal Lock - If the MGA becomes greater than $\pm 70^\circ$ the PGNS Light on the GNIC panel will be lit and the crew can view the MAIN DSKY to determine the caution status. No Problem.

5. STANDBY - If standby mode is desired, view the main DSKY. Light is normally not lit. No problem.

6. PROG - If a program alarm occurs the PGNS Light on the GNIC panel will be lit and the crew can view the main DSKY to determine the caution status. No problem.

7. KEY REL - ILLUMINATED when a priority display is active and another display is requested or V/N Keyed. Should be no problem with close monitor by ground of crew activity. Nominal procedures ~~do not require~~ include Keying KEY REL when a new display is requested.
8. RESTART - If a random restart occurs the PGNS light on the GNIC panel will be lit and the crew can view the MAIN DSKY to determine the caution status. No problem.
9. OPR ERR - Keying errors will not be accepted by the CMC while erroneous program inputs in program will cause a recycle or exit to occur. If CMC response ~~is~~ ^{looks} questionable to crew they can view the MAIN DSKY to determine if the OPR ERR exists. No problem.
10. TRACKER - If an OCDU Fail or Data Good Los occurs the PGNS light will be lit and the crew can view the MAIN DSKY to determine status. No problem.

KEYBOARD BACKLIGHTS (NAV DSKY)

The keys are an ivory coloring with black numerals while the DSKY is grey. Enough contrast exists to allow keying with low cabin lighting intensity.

≡ NIC PANEL Backlighting for V/N List and star/
Landmark code List.

Probably not distinguishable with low intensity
cabin lighting. Flight data file also contains the
information.

TO: GNC

DUE TO LOSS OF
LEB AC2 NUMERICS/INTEGRAL LIGHTING-CB

EMS SCHROLL LTS (DS1 & DS2) INCANDESCENT

RSI LTS

EL LTS ON

LEB 100 (DS1)

RHEB 10 (DS1)

RHEB 225 (DS1)

RHEB 226 (DS1)

LHFEB 306 (DS1 & M1)

LEB 101 ~~CLOCK TIMER AND TEST~~ (DS1 & M4)

GYN PANEL (DS2, DS53, DS55-DS17)

LEB 122

DSKY EL KEYS (S1-S19)

DSKY C/S ANNUNCIATOR (DS2)

~~DSKY NUMERICS PWR SUPPLY (DS1)~~ ~~AL~~

LHFEB 306 MISSION TIMER (M2)

Apollo 15/GET 57:00
AGC/JRGarman
7/28/71

More on the Optics

Based on the large optics calibration shift observed on Monday, and on our suspicion that performing "optics zero" from a high (greater than 10 degrees) trunnion angle may be the cause, the crew was advised this morning to always drive the optics to less than 10 degrees before performing optics zero during P23 activities. The whole subject of optics and the way the crew is using them still has me a little concerned and I'd like to explain why.

First, some background and facts from conversations I've been in and observations I've made during the past couple days. For as long as I can remember, it has been a standard required procedure at KSC for the optics trunnion to be manually driven to zero prior to zeroing the optics. This procedure, a long time ago, was in the crew checklist, but was removed at crew request since they said it was absolutely standard procedure with them (around the time of Apollo 9 I believe). On Apollo 10, it is believed that an optics calibration angle shift similar to what we've seen on 15 took place, but the evidence then was inconclusive because the mark data was not nearly as good as it's been on this mission. MIT suspects that zeroing the optics from a trunnion angle of greater than 10 or so degrees could be the cause of our angle shift. This is because the trunnion motor reaches its full drive rate of 10 deg/sec in one second, and if the trunnion is moving a full speed when it reaches zero degrees, it is virtually guaranteed that it will overshoot and hit the spring at around -11 degrees, or even the hard stop at around -13 degrees. In either case, the sextant (SXT) mirror (and perhaps other things) is jarred and could possibly shift or even in a very remote case, become inoperable. I understand that NAR once broke one in this way, but that some design changes were made subsequently. At any rate, if the above theory is correct, then one could be haunted (like me) by a vision of continued zeroings causing continuing shifts (which could well be cumulative) leading to a calibration angle of sufficient magnitude to affect such things as P24 tracking. This would be no problem to the most important program, P23, since it would know about the angle by dint of calibrations that always precede marking (and the crew has been told to be careful during P23). Other programs, however, assume the calibration angle to be zero! Charles Manry (G&CD x3566) performed some tests on a real (but well used) set of optics today. These tests conclusively showed that zeroing the optics from a high trunnion angle will cause the trunnion to overshoot at least into the spring. By doing this a number of times followed by an optics calibration each time, they were able to positively show an optics calibration angle shift. In addition, the shifts seemed to be in the same direction. However, because of 1 g environment, etc., shift magnitude data from these tests is very inconclusive.

Out of all this a couple of conclusions are beginning to form in at least my head. I believe that we should go ahead and tell the crew to always drive the optics to near zero trunnion angle before turning the optics zero switch on. All of the optics experts I've talked to today were

(over...)

quite surprised that we'd specified only P23, and we're quite sure that the crew took the comment literally since we've seen the optics zeroing from a high trunnion angle during non-P23 activity since the comment was read up to them. Once again, there is no problem for P23 since it will know the angle; and I doubt that we'd ever be worried about P52's. But, no one has yet been able to tell me for sure that we wouldn't have problems in other programs (P24, P20) if enough little shifts added up to a big enough offset. Anyway, it's such an easy thing to ask the crew to do, and it just doesn't seem right to be knocking any piece of precision gear around when we don't have to! (and we did observe a calibration shift). Just to keep it from being too easy, though, I guess I should point out that MIT informed me that the optics trunnion angle can drift out while the optics is off (and in } zero which is how he does it). Hence, simply turning the optics on in that configuration is the same as zeroing from a high trunnion angle. Thus, we made need to add a postscript that says always turn the optics on in manual, drive to zero, then optics zero. This is little change since he's supposed to cycle the optics zero switch off and on anyway after powering up the optics.

Another conclusion I'm coming to is that we should have the crew perform a simple optics calibration. There must be some time tomorrow that he is in ATT HOLD anyway, and, we wouldn't specifically be trying to prove any theories, we'd simply be verifying that the optics are still good and would be good for those other programs. I'm sure that this is what we should have suggested in the first place, and I believe that Manry is going to initiate just such a request via building 45 and SPAN. What we'd be looking for is a calibration angle that is very small and close to that last one he measured. We'd at least be able to get an idea of what kind of shifts to expect if the above comment isn't read to the crew (always vice just P23 comment), and some proof that the mirror isn't loose or any other such nightmares.

For a couple of closing remarks, let me point out that we are unable, on the ground, to observe how much the optics drifts while off, since the optics CDU's themselves also go off. The fact that the optics can drift while off is what makes it virtually mandatory to cycle optics zero from off to on after power up. I'm quite sure that the crew does not always do this. The "postscript" mentioned above, however, takes care of it. And finally: no, I don't know how we've done so many missions without this bag of worms appearing before. I suspect it's because crews used to drive to zero before zeroing which gets rid of the whole problem; or we were just lucky (e.g. different optics, or didn't happen to zero from high angles much); or a combination.



John R. Garman

MISSION NOTES

FIDO: -et 57+00.

Effective SPS Performance for LOI/DOI

LOI Before xover

After xover

T = 20607

20715

W = 65.40

65.74

CSM wt. @ xover wt = 48940

BT = 4+25

~~LOI/DOI~~

GNC/PAK

FLIGHT DIR MISSION LOG		DAY	REV	PG 31
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
57+57	Rate Damping for PTC. Using A & D. (304,90,000)			
58+14	PTC started - looks good and tight.			
59+00	Voicing up SPS procedure for P40 (GS-1) Crew agrees with proc but may go 5sec after TIC to bring on Bank A.			
59440	Doing <u>Test</u> to see if DSKY STATUS Lites can be read. see over for TEST 2 o'clock position on Numerics switch which is about half power so that would prob. not lite lites. The crew is now tapering the switches (Integral & Numerics) down. They said they may have changed the position of them since the cb popped. Crew said they knew what lighting was lost & we didn't have to go through that but I made up the new list anyway.			

FLIGHT DIR MISSION LOG	DAY	REV	PG 33
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
62+00	Another LOI briefing with all pertinent troops (in house) Note: Maroon GNC will be in MOCK for MCC 4 in case something happens which affects LOI; as per Maroon FLT request.		
62+15	pre-sleep cklist 29 86 89 86		
63+50	JOE DeATHLINE ON CONSOLE		
64+39	THERE WILL BE NO OPTICS CALIBRATION N SPAN PEOPLE THOUGHT IT'S NOT THAT BIG-A- PROBLEM - SO THEY DROPPED THE OPTICS CAL. PASSED TO RETRO SIM RCS CAPABILITY FOR FLY-BY DV		
	DAP	SCS	
	UNDOCKED	99	77
	DOCKED	65	58
67+00	FRANK MUSSATO SUBMITTED A CHIT-79 ASKING "WHAT IF TRUNNION SPRING IS BROKEN" REFERENCED TO C-66		

TO MORROW.

FLIGHT DIR MISSION LOG		DAY	REV	PG 34
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	I AM WITHDRAWING FRANK'S CHIT BECAUSE IT'S			
	A "WHAT IF" QUESTION/ AND MIT E BLDG 45 SAY			
	IT'S NOT A HARDWARE FAILURE, BUT A			
	PROCEDURAL PROBLEM. FAO SUPPLIED FD			
	WITH A NEW OPTICS PROCEDURE WHICH			
	WILL BE READ UP TO CREW. IT IS:			
	(1) WHEN TRUN > 10°; MANUALLY DRIVE ^{CLOSE} TO ZERO			
	AND THEN ZERO OPTICS.			
	(2) WHEN OPTICS PWR IS OFF			
	(a) SWITCH TO MANUAL			
	(b) TURN OPTICS PWR ON			
	(c) MANUALLY DRIVE "CLOSE" TO ZERO			
	(d) NOW ZERO OPTICS			
	(see flight plan update 69hrs)			
	STEVE BALES SAYS THIS WAS IN THE			
	CREW'S PROCEDURES MANY MISSIONS AGO, BUT			
	WAS DELETED BECAUSE CREW'S SAID			
	THEY ALWAYS EXERCISE THE PROCEDURE ANYWAY.			
	"HOW SOON THEY FORGET"			
67+32	JAY GREENE SAYS MCC-A WILL BE A			
	ΔV = 4.1 FT/SEC BURN (IMPULSE BURN)			
68+50	"EL BUCKO" CALLED FROM ALASKA			
	He's on console (FDD) UP THERE			

FLIGHT DIR MISSION LOG		DAY	REV	DATA	SEARCH
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING				Pg 1 of 2
	APOLLO 11		SPS OX TK D		
1+1	186		11		
4+38	179		11		
4+40	EVASIVE (2.8 Sec)				
7+26	172		11		
26+39	168		11		
26+45	MCC2 (3 Sec)				
28+19	173		(Δ = 2 PSI)		11
74+59	171		(47 HRS)		11
75+55	LOI				
	APOLLO 12				
1+1	173		11		
30+50	166		11		
30+52	MCC2 (9 Sec)				
31+20	175				11
71+37	171		Δ = 4 PSI		11
83+05	170		52 HRS		11
83+31	LOI				
	APOLLO 14				
1+1	178.4		11		
30+34	165.9		11		
30+35	MCC2				
30+40	178.4		Δ = 4 PSI		11
76+57	174.2		46 HRS		11
76+58	MCC4				
76+59	175.2		11		

FLIGHT DIR MISSION LOG		DAY	REV	PG	DATA SEARCH
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING				PG 2 of 2
	APOLLO 14 (CONT)				
81+53	173.2	SPS OX TK D			
81+57	LOI				
	APOLLO 15				
1+00	176.8	11			
28+30	166.1	11			
28+40	MCC 2				
28+00	168.3	$\Delta = 6$ PSI	11		
68+00	162	39 HRS	11		
	Hmmm				
	interesting helium absorption				
	this mission. I don't believe				
	it means anything. If the				
	press drops below 160, then				
	I might believe it means				
	something.				
	S. Conin				

69:00

READ UP 2

2 70+30

FLIGHT PLAN UPDATE

- | TIME | ITEM |
|-----------------|---|
| 1. ~71:00 | HGA ON MSFN CUE
S-BD AUX TV - SCI
PANORAMIC CAMERA MODE - STBY (VERIFY)
PANORAMIC CAMERA PWR - ON
PANORAMIC CAMERA SELF TEST - HTRS
MAPPING CAMERA ON - STBY |
| 2. AFTER 5 MIN: | PANORAMIC CAMERA PWR - OFF
S-BD AUX TV - OFF |
| 3. 71:15 | AFTER "CM/LM PRESSURE EQUALIZATION (DECAL)"
ADD: "PRESS EQUAL VLV - CLOSE" |
| 4. 81:42 | FOR "CONFIGURE CAMERA: (TERMINATOR PHOTOS)"
USE CM3 (HATCH) INSTEAD OF CM4 |
| 5. 84:24 | FOR "CONFIGURE CAMERA: (TERMINATOR PHOTOS)"
USE CM3 (HATCH) INSTEAD OF CM4 |
| 6. 84:40 | CHANGE "EL - ON (T START -2:40)" TO
"EL - ON (T START -1:40)" |
| 7. 84:42 | CHANGE "EL - OFF (T START -1 MIN)" TO
"EL - OFF (T START)" |

GENERAL NOTES:

1. NOTE: PRIOR TO SIM DOOR JETTISON VERIFY CM5 LEXAN SHIELD IS MOUNTED WITH CARDBOARD SHADE OFF
2. THE TLC OPTICS CAL FOLLOWING AN OPTICS ZERO AND A GROUND DEMONSTRATION SHOWED A SHIFT IN THE SXT MIRROR WHEN ZEROING THE OPTICS FROM A TRUNNION ANGLE OF ~26°. TO AVOID HIGH TRUNNION RATES FOR ALL OPTIC ZEROING, USE THE FOLLOWING PROCEDURES
 - a. IF OPTICS POWER OFF, PLACE ZERO SWITCH OFF BEFORE TURNING OPTICS POWER ON. DRIVE OPTICS MANUALLY TO TRUNNION <10° BEFORE PLACING ZERO SWITCH ON
 - b. IF OPTICS POWER ON, DRIVE OPTICS MANUALLY TO TRUNNION <10° BEFORE PLACING ZERO SWITCH ON

FLIGHT DIR MISSION LOG		DAY	REV	PG
				35
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
69+36	PASSED MINIMUM DV ALLOWABLE FOR SPS TRAPOLE BURN TO FIDO $\Delta V = 2.44$ ft/sec BASED ON 0.5 SEC BURN.			
69+51	RECEIVED LOI UPDATES FOR 3 MISSION RULES PAGE 3-21 + CREW CHART FROM RETRO.			
69+56	PASSED TO FLIGHT THAT 5 ft/sec RCS BURN WILL TAKE 255 lbs OF RCS			
	CONSUMABLES UPDATE			
	OURS - 84% TOT A=25 B 84 C 84 D 85			
70-27	CREW UP AND READ DOWN $\downarrow$ A=90 B 87 C 84 D 88			
70+57	COLD TEAM ON.			
	CAPCOM JUST TOLD CREW THAT WATER DUMP IS STABILIZED. PTC WHERE DID HE GET THAT GOOD INFO?			
	RETRO'S TRIMS $\rightarrow$ P 1.23 Y -0.12			
	PLEASE MAKE SURE THAT WHEN YOU CHANGE, CORRECT, ETC YOU KEEP A COPY OF WHAT YOU'RE			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				36
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	FIXING IN THE LOG.			
	REF ACZ CB33 WRITE-UP.			
71+30	TOLD SPAN, FAO, GUIDO, CAPCOM, FLIGHT, GEN TO STRIKE ITEM 6 FROM ACZ CB33 LOSS LIST.			
	NO EMS PERFORMANCE SUMMARY AVAILABLE ON GEN CONSOLE. FRANK D PUTTING ONE TOGETHER.			
71+40	EMS TEST: 1.0 ON EMS IN 100 SECONDS			
71+47	CREW WILL GET MAN. PAD @ 72+50			
72+61	FIDO ESTIMATES MCC4 = 5.2 ^{AV} , .9 AT OUR AT = .85 SEC			
72+04	GAVE FIDO LOT THRUST 20607 BEFORE X'O 20715 AFTER X'O			
72+46	PASSING MCC-4 PAD. METU.			
72+53	N93 +.012 +.05 -.051 -.19 AT=17.5 MRS Z+.015 +.06			
	CANIN-TRAVEL WILL HOLD YOUR MONEY 4 MORE DAYS			

FLIGHT DIR MISSION LOG	DAY	REV	PG 37
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
	BEFORE X10 19,989 ; 20247 } TO FIDO 63.5 / 64.3 } SHG. FIDO		
73+15	GPNLS DID NOT MAKE P-BURN SUMMARY ON FIRST BURN.		
73+31	GAVE RETED LIT CONSUM. ESTIMATE (RETRIEVED - WAS WRONG)		
73+26	G/MBAI TRIM CHECK		
N/855	- 2	- 81	SECONDS
	- .1		ON T/M
	+ .1		
	MCC4	AVC -2.3	
73+31+14	BURN WAS ON TIME.		
73+35	CREW APARENTLY DID NOT START RECORDER FOR MCC-4 FLIGHT TO GIVE THEM A REMINDER PRE LOI.		
73+40	BURN LOOKS GOOD, RE GETTING PLAYBACKS		
	EECOM SAYSSAW 20 AMP GLITCH ON BUS. (SEE ^{LOG} ENTRY @ 74400		
	HE P- NO CHANGE		
	VALVE T- 64 PRE-59 POST		

FLIGHT DIR MISSION LOG	DAY	REV	PG 38
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY BRIEFING		
	PRE POST		
	FU TK	162 173	173
	FU INT	163 173	173
	OT TK	162	167
	ON INT	163	168
	(POSTMC4)		
73+59	GAVE RETRO CORRECTED		
	WT ESTIMATE FOR LOI.		
	73+28+39 START TIME		
74+00	EECOM SAYS WAS 12 AMP		
	FOR 2 10 SEC EVERY 2 SEC @		
	100 MS DURATIONS, STARTED		
	AFTER SEC. GIMBAL CHECK		
	AND PRIOR TO IGNITION.		
74+06	DOOR JET		
74+06	NO VISUAL ON DOOR YET		
	RCS B PRI T/B WENT		
	TO B/P AT DOOR JETT		
	AND THEY REOPENED		
74+09	CAN SEE DOOR OUT OF WINDOW		
	TUMBLING SLOWLY		
	CREW SAID SMALL SHUDDER ON		
	S/C AT DOOR JET.		
74+14	MC&W- UNEXPLAINED. LOOKS OK TO		
	ME. (<3 SEC)		

SPS PROPPELLANT USAGE DATA

BURN DESCRIPTION ATC 4MISSION APOLLO 15

TCO 73 : 51 : 15.91

BANK: SINGLE B DUAL72:31:15S/C-WT. START 1024787 END 1024712BT : : SEC .91PAD AV 5.4 RCS AV

PAD BT SEC

IMJ AV (5.5 SEC TO PAD) SP3 AV 5.4VALVE POS. APOLLO

Isp

	FUEL	OXIDIZER	PROPELLANT
WTD AT START OF BURN	<u>15566</u>	<u>24882</u>	<u>40448</u>
CREW READOUT LAST BURN %	/	/	/
CREW READOUT END OF BURN %			
% USED			
FUGS TM LAST BURN %			
FUGS TM END OF BURN %			
% USED			
INPUT AFTER BURN	<u>15539</u>	<u>24940</u>	<u>40379</u>

	DETERMINED WITH FLOW RATE AND BURN TIME	DETERMINED WITH IMJ AV PROP PROGRAM	DETERMINED FROM FUGS CREW READ OUT	DETERMINED FROM FUGS TM READOUT
FUEL USED	<u>25</u>	<u>27</u>	/	/
OXID USED	<u>41</u>	<u>42</u>		
PROP USED	<u>66</u>	<u>69</u>		
FUEL TKWD	<u>15541</u>	<u>15539</u>		
OXID TKWD	<u>24841</u>	<u>24840</u>		
TKWD	<u>40832</u>	<u>40379</u>	/	/
FLOW RATE	<u>67.5</u>	<u>67.4</u>		
MIX RATIO	<u>1.6</u>	<u>1.6</u>		

4509400 C 1040379 2.465.1
2.5652.565
5.13 = AV

* No DELOG AVAIL.

G&N

SPS BURN SUMMARY

102787

BURN

MCC4

GN SCS

MISSION

15

TIG

TEVENT

Δ

CMC TIME

73+31+14.02

*

-

DR1

*

BEFORE BURN

END OF BURN

Δ

DR2

*

ACDU PITCH

*

*

-

ACDU YAW

*

*

-

ACDU ROLL

*

*

-

PACTOFF

*

*

-

PITCH GMB POS

1.25

1.25

0

PACTOFF/GMB POS Δ

-

-

-

OCDU SHAFT DAC

*

*

-

SODB P Trim

+1.199

YACTOFF

*

*

-

YAW GMB POS

- .06

- .06

0

YACTOFF/GMB POS Δ

-

-

-

OCDU TRUNION DAC

*

*

-

SODB Y Trim

- .127

LM WEIGHT

*

CSM WEIGHT

*

*

-

MAX PITCH RT

- .05

MAX YAW RT

- .01

N81 BEFORE BURN

N85 END OF BURN

VG X

+ 1.9

*

VG Y

- 3.6

*

VG Z

+ 3.5

*

V_C

3.2

N.A.

-

P DIFF CLUTCH CURR

- 4

- 23

+ 19

Y DIFF CLUTCH CURR

- 9

- 15

+ 6

*ESTIMATED GMB MISTRIM

0

SYSTEM STATUS

GO

ORIGINATOR

PRICE

*GMB MISTRIM = Gp - Gs
GP = GBL POS BEFORE BURN
GS = GBL STEADY STATE POS
AFTER IGN

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS		CM 187	66,244 RETRO PRED	
		SM -160	FOR LOI	
74+48		DOCKED 50:08	TO RETRO	
		UNDocked 9369		
		SIM BAY DOOR A DISAPPEARED FROM VIEW.		
74+51		N93	AT -37HR	4.5
		.025		-2.0
75+15		- .011		2
		.001		
OPTION 1 HAD LARGER LIS.				
SAD = ALL O'S				
PI WAS ON THROUGHT MCC-4				
D2 OFF AT AT TAST BON ON AT IGNITION,				
GOT 2 NUISANCE ALARMS PT/A				
87.3% SET AT 60% 4 JETT				
TOLD RETRO 15 SEC DOLOC.				
12 SEC 4 JETT/ALL				
TEL PADS				
1 FT/SEC IN 100 SEC				
EIMS DRIFT				

FLIGHT DIRECTOR'S MISSION LOG

Q/LOS	FLIGHT EVENTS/HISTORY/BRIEFING
	DATA ON D2 DURING MCC4 ^{FROM} LBO
	DZ = 1 PRE-BURN (IGN - 1 min)
	73+31+15 WENT TO 0 IGN
	73+31+16 " " 1 c/o
	73+31+18 " " 0 TILL END
	OF LBO RUN, IE WORKED
	OK. ALSO SHOWS ARMED
	@ TIG - 1 MIN.
+ 30	JAIL ON
+ 00	Got Fmt 30 p/B of ATVC of MCC4 to look at current prob.
+ 27	Crew asked if Bank B closes
	prematurely in LOI, disregard
	shutting down Bank A at 6 min.
	12 amp increase in current
	that EECOMS saw prior to MCC4
	is possibly explained by opt. 204
	cmc gimbal drive test.

MCC - 4 D1/D2 STATUS
REVERSE LOGIC
EVENT RECORDER 1 = ENG ON/EMS PWR
OFF

D1 = 1 ALL THE TIME
D2 WENT FROM 1 TO 0 73+30+13
D2 WENT FROM 0 TO 1 73+31+17

STRAIGHT LOGIC
LBO RECORDER 0 = ENG ON/EMS PWR
OFF

D1 = 0 ALL THE TIME
D2 WENT FROM 1 TO 0 73+31+15
0 TO 1 73+31+16
1 TO 0 73+31+18

TIG WAS 73+31+14

F₆ DIGENOUR

FLIGHT DIR MISSION LOG		DAY	REV	PG 41
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
78+50	Att man complete (0,0,0)			
78+10	LOI GO.			
78+23	LOS			
78+30	WILL GET RIMP 7 & 9, & 30 ON PLAYBACK.			
78+55+10	AOS - no data yet.			
	WPU 251 247 244 250			
	Hetk 1253			
	LOI BURN REPORT			
	BT 6+38 chart recorder 6+38			
	Burn time			
	0 Residuals			
	0			
	0			
	$\Delta V_c - 4.8$			
	PU 33.25% P.V. VLV IN DEC.			
	OX 33.3 UNB + 25			
	Some P.V. value movement after 6+00.			
	IN INC. FOR 10 sec. after 6+00.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				42
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
79+05	Tape P/B Fmt 7,9 subft 30			
	OX FU			
	XOVER 4+09 4+28			
	Bank A off 6+05			
	Biasing T & W for DOT			
	by 412 lbs 1.30 lbs/sec.			
	20547 <u>412</u> 20135 65.22 <u>1.30</u> 63.92 ←			
	CSM wt. 39800 pass in 100 6 at 79+28			
	Noticed Qd B getting cold			
	HotkP 3754 psia			
	T 56°F			

SPS PROPELLANT USAGE DATA

BURN DESCRIPTION LOT

MISSION APOLLO 15

TCO 77: 28: 26

BANK: SINGLE DUAL

78:31:42.8

S/C WT. START 102522 END

BT : 6:38.2 SEC 398.2

PAD AV 3000.1 RCS AV 0

PAD BT 6+41 SEC 401

IMU AV 3000.1 SPS AV 3000.1

WAVE POS. 200R

Isp

	FUEL	OXIDIZER	PROPELLANT
MOD AT START OF BURN	<u>15539</u>	<u>24870</u>	
CREW READOUT LAST BURN %			
CREW READOUT END OF BURN %	<u>33.25</u>	<u>33.2</u>	
% USED			<u> </u>
PUGS TM LAST BURN %			
PUGS TM END OF BURN %			
% USED			<u> </u>
INPUT AFTER BURN			

	DETERMINED WITH FLOW RATE AND BURN TIME	DETERMINED WITH IMU AV PROP PROGRAM	DETERMINED FROM PUGS CREW READ OUT	DETERMINED FROM PUGS TM READOUT
FUEL USED	<u>10105</u>	<u>10105</u>		
OXID USED	<u>16167</u>	<u>16168</u>		
PROP USED	<u>26277</u>	<u>26273</u>		
FUEL TKND	<u>5474</u>	<u>5434</u>	<u>5337</u>	
OXID TKND	<u>8671</u>	<u>8672</u>	<u>8581</u>	
TKND	<u>14107</u>	<u>14106</u>	<u>12400</u>	
FLOW RATE	<u>65.94</u>	<u>65.94</u>		
MIX RATIO	<u>1.6</u>	<u>1.6</u>		

GMC

Prediction

Status for D1 & D2 for
LOI

	D1	D2
cb SPS Pilot Valve M/A - open	ON	ON
cb SPS Pilot Valve M/B - close	ON	ON
ΔV Thrust A & B - Normal	ON	OFF
Thrust ON CMD	ON	ON
cb SPS Pilot Valve M/A - close	ON	ON
cb SPS Pilot Valve M/B - open	ON	ON
Thrust OFF CMD Present	ON	OFF
cb SPS Pilot Valve M/B - close	ON	ON
ΔV Thrust A & B - Normal	ON	OFF
CB EMS M/A & B open	ON	ON

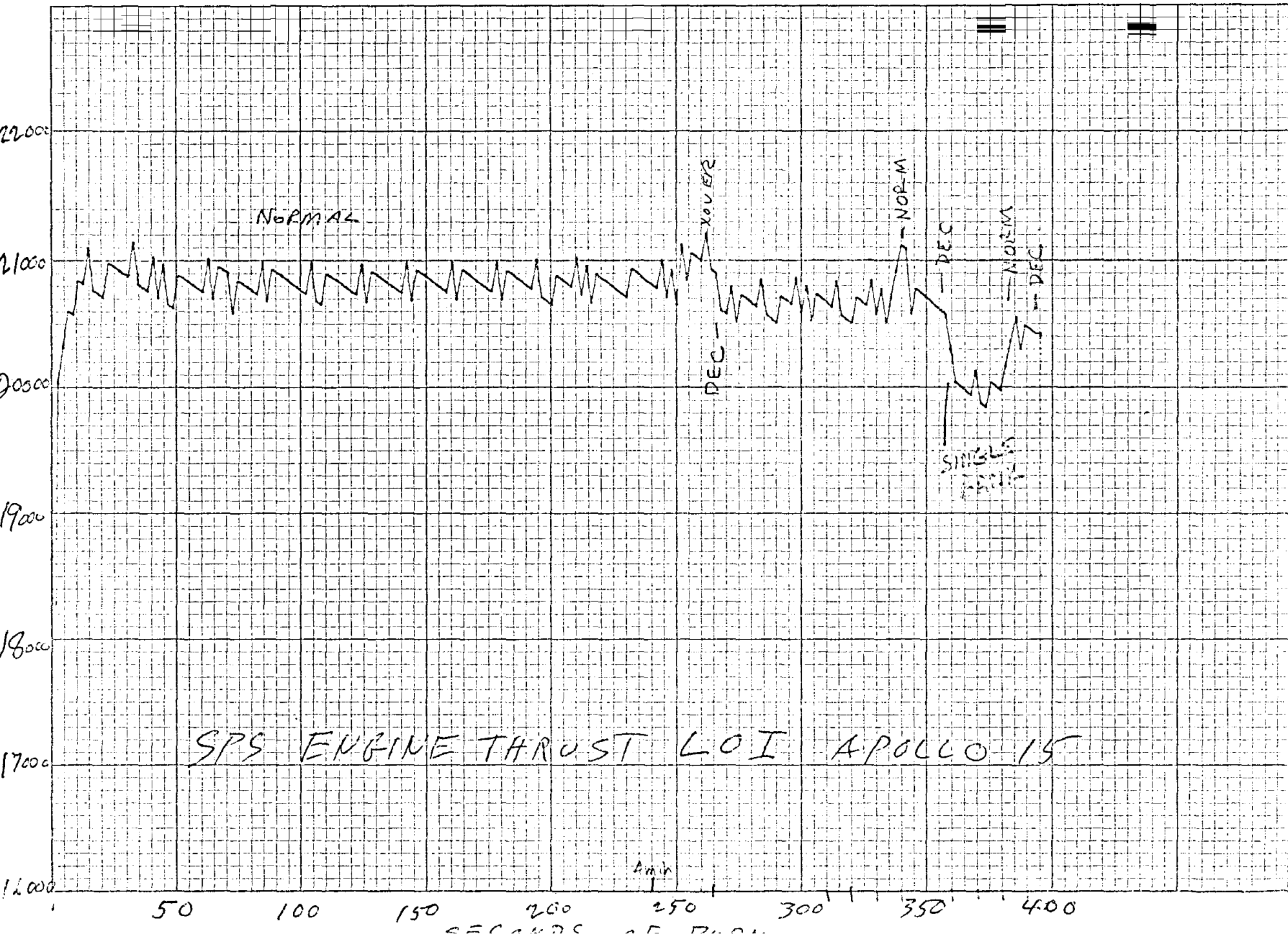
SPS @ LOS prior to LOI

OX TK P	166
OX IN P	167
FU TK P	173
FU IN P	173
Hc TK P	343.8
Hc TK T	69

VLV T 63

N ₂ TK A	2449
N ₂ TK B	2419

RCS	A	B	C	D
	253	250	246	254



FLIGHT DIR MISSION LOG		DAY	REV	PG 43
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
79+48	Requested crew to review P.U. VLV ops during burn			
	No op until Xover.			
	DEC after Xover.			
	5+30 Unbalance started to INC —			
	went to NORM.			
	6+10 to DEC.			
80+04+00	P52 -00018 Torqued -.17 meru -00006 DT=6.8 hrs. -.05 " -00004 -.03 "			
80+20	WPU AT LOS			
	249 246 242 249			
	DOI $\Delta V = 214$			
81+03	AOS - LBK - Trouble locking up. ✓			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				44
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	Thrust Prog. no's agree closely			
	with no's previously given to			
81+20	Batt. Rly bus prob - probably TM.			
	We can firm FID's DOI			
	BT = 24.5 ours 24.8			
	Crew move Sys. Test meter selector			
	switch on 5B and Batt. Rly Bus prob. cleared			
	up.			
	P52			
82+04	+00009 Torqued +0.32 merc			
	-00007 -0.25 "			
	+00000 .00 "			
82+28	LOS			
	WPU 244 244 235 247			

G&N

SPS BURN SUMMARY

BURN LOI

GN SCS

MISSION APOLLO 15TIGTEVENTΔ

CMC TIME

78+31+45.978+38+24.76+38.8DR1 21101BEFORE BURNEND OF BURNΔDR2 01111

ACDU PITCH

0.4359.9-359.5

ACDU YAW

359.90.5359.4

ACDU ROLL

-359.63.3356.3

PACTOFF

1.451.68-0.23

PITCH GMB POS

1.211.79-0.58PACTOFF/GMB POS Δ0.24-0.110.35

OCDU SHAFT DAC

1.191.61-0.42

SODB P Trim

+1.199

YACTOFF

-0.14-0.520.38

YAW GMB POS

-0.06-0.440.38YACTOFF/GMB POS Δ-0.08-0.080

OCDU TRJUNCTION DAC

-0.20-0.630.43

SODB Y Trim

-1.27

LM WEIGHT

36253

CSM WEIGHT

39800

MAX PITCH RT

0.10

MAX YAW RT

0.11

N81 BEFORE BURN

N85 END OF BURN

VG X

-2897.5

VG Y

-0776.4

VG Z

-0044.1V_C2993.9-4.82998.7

P DIFF CLUTCH CURR

-4-4945

Y DIFF CLUTCH CURR

-15-4126

*ESTIMATED GMB MISTRIM

Pitch -0.04
Yaw +0.17

SYSTEM STATUS

GO

ORIGINATOR

*GMB MISTRIM = Gp - GS
 GP = GBL POS BEFORE BURN
 GS = GBL STEADY STATE POS
 AFTER IGN

+0.22 +0.17

MCC DATA REQUEST FORM

① TYPE LE)	VEHICLE (CIRCLE ONE)	③ FORMAT (S) HSD OR THRIFT	④ START/STOP TIME OF DATA CIRCLE ONE: CTE, MET, GMT, GET OTHER (SPECIFY) _____	⑥ CONFIGURATION CIRCLE ONE: CTE, MET, GMT, GET OTHER (SPECIFY) _____				
A. PCM PLAYBACK SPECIFY: DSE, MSFN, MCC	CSM LM IU SDS LCRU S-IV S-II S-IC PLSS	HSD 7/9 FMT-30 Subfr 21 22	DAYS	HOURS	MIN	SEC	⑤ A. MISSION PHASE <u>DOI</u> B. SITE/REVOLUTION _____ C. PCM BIT RATE _____ D. SAMPLE RATE <u>1 5/8</u> E. PLAYBACK BIT RATE _____	A. EVENTS DRIVEN: RTCC CCATS (PCMGS)
B. VOICE PLAYBACK SPECIFY: DSE, MSFN, MCC			82	39	00	B. VOICE LOOP SPECIFY: _____ (VOICE P/B ONLY) e.g. MSTC, CVTS		
C. VOICE DUB SPECIFY: KEYSET/LOOP			82	40	50	C. COLOR EIDOPHOR (TV P/B ONLY)		
D. TELEVISION PLAYBACK						D. PLAYBACK BIT SET/NOT SET		
E. EMOD						E. MEDABLE CHART RECORDERS		
F. THRIFT DELOG SPECIFY: NORM CYCLE/ASAP						F. DEDICATED CHART RECORDER		
G. D/TV DELOG (SPECIFY MSK)						G. LBO CHART RECORDERS		
H. OTHER (SPECIFY) _____						H. PCMGS CHART RECORDERS I. OTHER (SPECIFY) _____		

⑦ ORIGINATOR J. Kamman MCC POSITION BNC PHONE/LOOP _____ CODE _____

GET OF REQUEST 87-1-10

DATA REQUESTED BY 83430 GET

SHORT STATEMENT OF TIME CRITICALITY
(e.g. NEEDED BEFORE DOI FOR MORE SPS ANALYSIS)
(or NEEDED BEFORE TLI FOR A FMR GO/NO-GO)

Need for SPS go in lunar orbit

NUMBER OF COPIES REQUIRED _____ DATA DELIVERED TO _____

FLIGHT DIR MISSION LOG		DAY	REV	PG 45
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	DOI IGN			
	82 + 39 + 48.3			
	on time chart recorder			
	24.0 24.1			
	no trim GEN orbit			
	+ .6 58.4 x 10.0			
	+ .0 FIDO 9.5			
	- .1			
	$\Delta V_c - 4.4$			
	F V 29.25 un 100 INC.			
	Ox 29.55			
	wfu 232 237 229 236			
	Playback			
	Armed Bank B at ~ 2 min.			
	Burn looked good.			
	PUGS is indicating 200 lbs. less			
	than the IMU & V method.			
	were massaging all this now.			
53455425	P52 Torqued			
	+ .005			
	+ .004			
	- .002			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				46
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
84100	Sim Bay jets - X on of B2, D1, P20, 500B			
	CIRC BURN THRUST FOR			
	EFIMP16 = 20280 lbf			
	This is derived by subtracting			
	409 lbs from the predicted CIRC			
	Burn T (C-95) of 20689 lb, thus			
	biasing for Bank B PU Decrease operation			
84+20	228 232 223 232			
	LOS			
	CIRC		Presently	
	EFIMP16		Loaded	
	T = 20280		19989	
	address 1765			
	octal 01606		01571	
	What we think Thrust is now = 20280 ✓			
	What is load		= 19989 ✓	
	$\Delta T = 291$			
	We do not have to update			
	EFIMP16 traced on M.R. 15-14			
	which states 400 lb difference			
	before update.			
	Told FIDO to use 19989 in RTCC			

SPS PROPELLANT USAGE DATA

BURN DESCRIPTION DOIMISSION 20110 15TCO 83:40:14.8BANK: SINGLE ✓ DUAL 82:39:59.2S/C WT. START 76012 END BT : : 246# SEC 24.6PAD AV 213.2 RCS AV 2.2PAD BT SNC 24.5IMU AV 213.2 ^{RSW} SPS AV 216.0VALVE POS. I_{sp}

	FUEL	OXIDIZER	PROPELLANT
MED AT START OF BURN	<u>5434</u>	<u>3672</u>	<u> </u>
CREW READOUT LAST BURN \$			
CREW READOUT END OF BURN \$			
\$ USED			
PUGS TM LAST BURN \$			
PUGS TM END OF BURN \$			
\$ USED			
INPUT AFTER BURN	<u>4812</u>	<u>7678</u>	

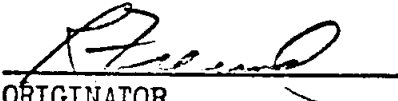
	DETERMINED WITH FLOW RATE AND BURN TIME	DETERMINED WITH IMU ΔV PROP PROGRAM	DETERMINED FROM PUGS CREW READ OUT	DETERMINED FROM PUGS TM READOUT
FUEL USED	<u>1621</u>	<u>622</u>		
OXID USED	<u>994</u>	<u>994</u>		
PROP USED	<u>1615</u>	<u>1616</u>		
FUEL TMRD	<u>483</u>	<u>4812</u>		
OXID TMRD	<u>7678</u>	<u>7678</u>		
— TMRD	<u>12491</u>	<u>12490</u>		
FLOW RATE	<u>65.1</u>	<u>65.1</u>		
MIX RATIO	<u>1.6</u>	<u>1.6</u>		

REFLECTS USING IMU ΔV FOR LOI &
DOI. PUG FOR LOI & DOI SAYS 12400 REM.
RSW 110+56

G&N

SPS BURN SUMMARY

BURN	GN SES	MISSION	
	TIG	TEVENT	Δ
CMC TIME	82+39+48.3	82+40+12.8	24.5 s
DR1 21101	BEFORE BURN	END OF BURN	Δ
DR2 01111			
ACDU PITCH	0.3	0.6	+0.3
ACDU YAW	283.0	283.4	+0.4
ACDU ROLL	347.7	346.8	-0.9
PACTOFF	1.68	1.66	-0.02
PITCH GMB POS	1.70	1.84	0.14
PACTOFF/GMB POS Δ	-0.02	-0.18	-0.16
OCDU SHAFT DAC	1.70	1.61	-0.09
SODB P Trim	1.702	1.706	0
YACTOFF	-0.55	-0.55	0
YAW GMB POS	-0.49	-0.61	-0.12
YACTOFF/GMB POS Δ	-0.06	0.06	0.12
OCDU TRJUNCTION DAC	-0.63	-0.55	0.08
SODB Y Trim	-0.510	-0.558	-0.05
LM WEIGHT	36253		
CSM WEIGHT	39800	38043	1757
MAX PITCH RT	0.1		
MAX YAW RT	-0.21		
N81 BEFORE BURN			
N85 END OF BURN			
VG X	-208.4	+0.6	
VG Y	-48.0	0.0	
VG Z	2.0	-0.1	
V _C	213.9-208.4=5.5	-4.4	1.1
P DIFF CLUTCH CURR	-68	-56	-8
Y DIFF CLUTCH CURR	-28	-53	25
*ESTIMATED GMB MISTRIM	-0.09		
SYSTEM STATUS	0		


 ORIGINATOR

*GMB MISTRIM = Gp - GS
 GP = GBL POS BEFORE BURN
 GS = GBL STEADY STATE POS
 AFTER IGN

MCC DATA REQUEST FORM

TO PROP

①	TYPE E	VEHICLE (CIRCLE ONE)	③ FORMAT(S) HSD OR THRIFT	④ START/STOP TIME OF DATA CIRCLE ONE: CTE, MET, GMT, GET	⑥ CONFIGURATION CIRCLE AS APPROPRIATE
A. PCM PLAYBACK SPECIFY: DSE, MSFN, MCC		<u>CSM</u>	FUT 3570	OTHER (SPECIFY)	A. EVENTS DRIVEN:
B. VOICE PLAYBACK SPECIFY: DSE, MSFN, MCC		LM	✓ 3630	DAYS HOURS MIN SEC	RTCC
C. VOICE DUB SPECIFY: KEYSET/LOOP		IU	✓ 3640		CCATS (PCMGS)
D. TELEVISION PLAYBACK		SDS	✓ 3620		B. VOICE LOOP
E. EMOD		LCRU	✓ 3670		SPECIFY (VOICE P/B ONLY) e.g. MSTC, CVTS
F. THRIFT DELOG SPECIFY: NORM CYCLE/ASAP		S-IV	✓ 3770		C. COLOR EIDOPHOR (TV P/B ONLY)
G. D/TV DELOG (SPECIFY MSK)		S-II	✓ 3700		D. PLAYBACK BIT SET/NOT SET
H. OTHER (SPECIFY)		PLSS	✓ 3650		E. MEDABLE CHART RECORDERS
				⑤	F. DEDICATED CHART RECORDER
				A. MISSION PHASE <u>DOI</u>	G. LBO CHART RECORDERS
				B. SITE/REVOLUTION	H. PCMGS CHART RECORDERS
				C. PCM BIT RATE	I. OTHER (SPECIFY)
				D. SAMPLE RATE <u>1 s/s</u>	
				E. PLAYBACK BIT RATE	

⑦ ORIGINATOR J. Kamman MCC POSITION GNE PHONE/LOOP _____ CODE _____

GET OF REQUEST 82-10

DATA REQUESTED BY 84400 GET

SHORT STATEMENT OF TIME CRITICALITY NEED FOR SPS ANALYSIS
(e.g. NEEDED BEFORE DOI FOR MORE SPS ANALYSIS)
or NEEDED BEFORE TLI FOR A FMR GO/NO-GO

NUMBER OF COPIES REQUIRED 2 DATA DELIVERED TO CSM PROP

FLIGHT DIR MISSION LOG		DAY	REV	PG
				47
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
85+10	AOS			
	229 231 221 233			
85+40	GLYCOL DITTY came up with RAD OUT TEMPS running around 75°F. SPAN coming out with input on how long GEN can run peaked above some TBD Temp. I personally think we won't have a problem with the high temps in that they only peak for ~15 min. and cool down sufficiently in between. PIPA should be no problem if PIPA TEMP stays nom. Some CMC transistors are causing some concern with some MIT people.			
86+08	EMOD DUMP.			
	P20 50DB			
86+14	LOS			
	227 228 223 231			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				48
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
87+04	UPDATED SODB EFFECTIVE ENGINE PERFORMANCE WAS PLACED IN SOD			
87+02	AOS REV 5			
87+10	PASSED TO FIDO CIRC BURN DATA			
	THRUST 20,280 lbs (RESUMES PU DEGRADATION)			
	FLOW RATE 64.5 lbs/sec			
	CMC LOAD REFLECTS → 19,989 lbs.			
	ACCORDING TO MISSION RULE NO UPDATE NECESSARY			
	BACK ROOM IS WORKING ON			
	1. ANNOTATING - LOI & DOI DATA			
	2. WEIGHTS PREDICTION FOR CIRC			
	3. PUGS VS IMM PROP WEIGHT DIFFERENCE			
	4. GEN SETTING UP PAUSE PLANE PLOT			
	RUN EVENT REC. FOR JET FIRINGS FOR P20 OPT 5			
	5. ENG 2 IS WORKING ON CHIT CONCERNING			
	6. PROCEDURES WORKING ON DOI PLAYBACKS FROM GDS. AS CHECK ON HAW DATA.			
	7. SEE CHIT ¹⁰⁹ INPUT FROM BEDG45 CONCERNING GEN CONSTRAINTS FOR HIGH GLYCOL TEMP ^{95° For 5 min} _{75 steady state}			
87+45	CONFIRMED LO CRITICAL LIMITS HRE IN.			
88+06	LOS 226 229 221 231			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				49
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
88+13	LARRY CANIN SUBMITTED CHIT WHICH GIVES OUR POSITION ON TEI - BANK A SHUT-DOWN TIME. OUR CHIT SUGGESTS WHEN NOON 410 TGO IS LESS THAN -4 SEC.			
88+25	PASSED CIRC CONSUMABLES PREDICTION TO RETRO			
88+55	NOS REV 4 227 227 219 229			
89+10	WE HAVE DECIDED TO USE IMU DV METHOD FOR SPS REMAINING. IT SIGNALS CSM CONSUMABLES WEIGHTS STATUS (GREEN SHEET) AND CONSUMABLES STATUS SHEET.			
89+12	SPAN (Phil Shaffer) Looked at P20 OPT 5 JF1 FIRINGS THEY CLAIM FOR REV 5 51 FIRINGS; WHICH THEY SAY IS 3 TIMES EXPECTED. PREDICTIONS CALL FOR 1.5 Hz/REV			
89+54	^{ALSO FLIGHT} PASSED TO RETRO ¹ UPDATED CONSUMABLES STATUS WITH IMU DV PROP METHOD.			
90+01	LOS 229 228 220 233			
90+40	TOLD RETRO ABOUT DIFE IN SPS COUNTING			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				50
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	DUE TO SWITCH FROM PGS TO JMU METHOD.			
	THIS CHANGED HIS PREDICTION FOR SPS QUANTITY			
90+49	AOS	224	230	219 231
	SPAN REPORTS Lunar perigee was 9.1 miles. During			
	night it fell to 7.9 miles. RCS jets are			
	firing in the prograde direction - should increase			
	ALTITUDE.			
91+51	LOS	226	228	220 229
92+10				
92+43	AOS	228	228	219 229
92+48	NOTE → MISSION RULE 16-15-B SAYS			
	WE MUST HAVE 3887 FPS. OUR FIGURES			
	SHOW WE NOW HAVE 3844 FPS (WE			
	ARE BREAKING RED-LINE).			
1441 3824 381-63 382	PROP'S ARE RECOMPUTING SPS ΔV			
	CAPABILITY WITH MORE ACCURATE			
	WEIGHT NUMBERS.			
	KRANZ SAYS HE WILL GIVE UP SOME			
	WEATHER AVOIDANCE.			

(4.5)

FLIGHT DIR MISSION LOG		DAY	REV	PG
				51
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
93+10	FIDO'S & FLT ARE DISCUSSING- DOING DOI TRIM SPS TO GET ORBIT UP. PHIL SHAFFER SAYS MASCONS ARE DRAGGING ORBIT DOWN; HE ALSO SAYS OUR -X JET CONFIGURATION			
	TOTAL $\Delta V = 5.91$			
	(16.5 sec) RCS $\Delta V = 2.55$ } FOR 0.5 SEC SPS BURN AND 11.6 sec			
	SPS $\Delta V = 3.36$ } VILAGE ()			
	CONSUMABLES UPDATE TO CREW			
	TOTAL 76 A 75 B 75 C 76 D 76			
LOS	93+46	229	227	220 232
94+00	KRANZ JUST SAID WE'LL DO THE DOI TRIM WITH RCS.			
94+30	ΔV OF 2.6 FPS USING RCS WILL COST US 22 lbs. OF WPU, I PASS THIS TO FLIGHT.			
94+40	AOS			
	20 SEC BURN COSTS <u>26.6</u> $\Delta V = 3.12$			
	3.2 ft/sec BURN COSTS <u>27.25</u>			
	DOI TRIM WILL BE $\Delta V = 3.1$ FPS BT = 20.4 SEC			
	RCS USED = 27 lbs			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				52
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	95+08 There will be P52 opt 3			
95+00	TV PASS			
95+13	TOLD FLT (KRANZ) THAT WE WILL BE			
	40 FPS DOWN FROM UNDOCK RED-LINE AND			
	WE SHOULD BE ABOVE RED-LINE AFTER			
	TEI EVEN WITH RESCUE.			
	KRANZ SAID OK!			
	95 + 30			
95+24	93+55			
	11+35 hrs			
	XX,XXX			
95+28	P52 NO STARS			
95+41	LOS			
96+30	COEN ON			
	$\begin{matrix} & & & \#PCS \\ 8 & 13 & 9 & 9 = 39 \text{ FOR DUT} \end{matrix}$			
	TRIM			
96+48	$\begin{matrix} .022 & \} & 95+13T & .13 \\ -.032 & \} & 11.29at & -.19 \\ .038 & \} & & .22 \end{matrix}$			
97+08	GAVE RETRO CONSUM EST			
	TO APPLY TO POST CIRC (			

FLIGHT DIR MISSION LOG		DAY	REV	PG 53
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
98+28	ASKING IF HE ALIGNED TO PROPER REFS. USED OPTION 3 VICE OPTION 1. 97+3455 TORQUE T			
98+36	PASSED WT PAD 1MAN 37,679 P -49 Y 1.04 READ UP SIGNS AS BOTH 1 FIDO PLANNING 76 FPS CIRC.			
99+11	315 ISP FOR IMV DV,			
99+17	WENT TO FREE 1.5% 76 02 1.52 1606 1765 01605 20,280 LBS 20,257 ASW 110 GAT 3542/ATUM SEP 10 3542 BWH NH 309 3214 369 680 3922 3894 USING PROPER MANNED CONF G.			

THE FOLLOWING DATA SHOWS HOW
 SPS PROPELLANT REMAINING HAS
 EXCEEDED THE EXISTING MR REDLINE.
 ESSENTIALLY, THE NOMINAL PLANNED
 MISSION VIOLATED THE R/L BY 31 FPS
 AT UNDOCKING. WE ARE PRESENTLY
 BEHIND BY 43 FPS. ~~RE~~ MCC'S
 HAVE SO FAR COST 10.7 FPS ABOVE
 NOMINAL MISSION AND LOI WAS 2 FPS
 MORE THAN PLANNED.

THE R/L OF 3887 CONSISTS OF
 THE FOLLOWING:

R/L	NOM FP	REM. NOW
CIRC 71	68	
LOPC 309	309	
SHAPE/RESCUE 300	^{SHAPE} 64	
TEI(NOM) 3047	3050	
TEC(35 SCS) TEI 160	<u> </u>	
3887	3494	<u>3844</u> (3 IN. CSM)

3844 REMAINING WAS COMPUTED USING PERFORMANCE
 3817 IS AV REMAINING FROM PUGS.

FLIGHT DIR MISSION LOG		DAY	REV	PG
				54
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
99455	REC GUIDO/FLIGHT UPDATE			
	FILMP16 - DID THIS BECAUSE			
	OF RCS PROP CONSUMPTION.			
	WE SHOULD COMPUTE AV			
	REMAINING BASED ON THE			
	PROPER DISTRIBUTION OF			
	CM/LM MEN. I.E. TAKE			
	OUT PROPELLANTS REQ'D SINGLE			
	MAN TO GET WEIGHT AT			
	SHAPE BURN, THEN COMPUTE			
	AV THREE MEN AND ADD			
	AV SINGLE THAT WE TOOK OUT.			
	THUS, WE DID NOT VIOLATE			
	MR REPLINE.			
	REMAINING AV NOW = 3214			
	+ 680			
	3894			
	TZ/L = 3887, AV 3 MEN ALL MAN = 3844			
	17.5 FT/			
100418	DIDN'T GET SEP/UMB.			
	PROBE NOT INSTALLED. 100408			
	RCS			
	16 LB LOS TO AOS.			
	ALLOWED 7 LBS FOR SEP			
	UMBILICAL WAS LOOSE			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				55
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	55.7 @ 100+30			
	2.7500			
	100+35 = 30° P INERTIAL			
100+28	CANCELED P24 THIS PASS.			
	350			
	2.1300			
	USED UNDOCKED DAP TO			
	MANEUVER TO SECOND SEP			
	ATT.			
	ROLL RATE 2 VICE A1 R2 FOR UNDOCK			
100+39	ON CAPT. LATCHES.			
	2.5 SEC - X. SEP			
101+20	SAW FIMP16 GO IN DSKY.			
	FP ALLOT 25# TOTAL			
102+	ON TIME - CIRC			
13	- 0060.9 VGX TRIMMED TO			
	0000.4 VGZ			
	ON SHUTDOWN 00000			
	-11.2 AVC		29.25 FN	
			29.15 OX	
			DEC 50	
	26 # USED FROM LAST AOS			
	22 # ALLOTTED FOR IN F/P			

G&N

SPS BURN SUMMARY

BURN	GN SCS	MISSION	
	TIG	TEVENT	
CMC TIME	101+38+58		Δ 3.77 sec
DR1	BEFORE BURN	END OF BURN	Δ
DR2			
ACDU PITCH			
ACDU YAW			
ACDU ROLL			
PACTOFF			
PITCH GMB POS			
PACTOFF/GMB POS Δ			
OCDU SHAFT DAC			
SODB P Trim	+4.455		
YACTOFF			
YAW GMB POS			
YACTOFF/GMB POS Δ			
OCDU TRUNION DAC			
SODB Y Trim	+1.047		
LM WEIGHT			
CSM WEIGHT	37679		
MAX PITCH RT			
MAX YAW RT			
N81 BEFORE BURN			
N85 END OF BURN			
VG X			
VG Y			
VG Z			
V _C			
P DIFF CLUTCH CURR			
Y DIFF CLUTCH CURR			
*ESTIMATED GMB MISTRIM			
SYSTEM STATUS	GO		
ORIGINATOR	Low bit Rate		
	For the BURN		

*GMB MISTRIM = Gp - GS
 GP = GBL POS BEFORE BURN
 GS = GBL STEADY STATE POS AFTER IGN

FLIGHT DIR MISSION LOG		DAY	REV	PG
				56
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	NO HBE ON TAPE FOR CIRC			
102+51	NUISANCE ALARMS			
102+53	LOS Memo.			
	+ .023 .28			
	- .005 - .06 $\Delta t = 5.42$			
	.009 .11			
LOS				
103+17				
FPA'S	-23	-18	-30	-77 -88
AOS/14	103+17	193	196	184 199 LOS
104+				
104+27	GO FOR PDI			
104+31	CSM SHOULD HAVE GONE TO POO AT IGNITION, DID NOT.			
104+42	ON THE PLAIN @ HADLEY			
	9.5° TILT			
105+11	+ .012 } 105+12 Torque MEMU 0.36			
	- .011 } - .33			
	+ .023 } + .70 2.2 AT			

FLIGHT DIR MISSION LOG		DAY	REV	PG 57
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
105+17	NUISANCE ALARM C77,000U FAIL			
105+20	LOS			
106+06	AOS - WATERGON ON			
	P20			
106+22	LOS - DID NOT CHANGE OMIN'S			
106+35	COMM BACK - HO HAS BEEN READING ALL ALONG			
106+37	DATA LBR			
	4 JET 12 SEC 2 JET 17 SEC LOPC ULLAGES			
106+44	P20 GOING - 3°/MIN.			
107+18	WPU'S 194 195 185 198 — LOS = 772			
	Δ'S BETWEEN NOMINAL F.P. & REDLINE AT THIS TIME ARE			
	57, 68, 45, 68 LBS.			
	GOOD REASON TO GO B/D ULLAGE FOR LOPC			

FLIGHT DIR MISSION LOG	DAY	REV	PG 58
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
107+28	COMMENTS ON UNDOCKING REDLINE - SPS		
	BY R.S. WATSON		
	ΔV REQUIRED AT UNDOCKING IS A FUNCTION		
	OF S/C WT & PROP REMAINING. SEC 3 MR.'S		
	HAS LISTED ONLY ΔV REQD AS REQUESTED		
	BY PETE FRANK ON APOLO 14. SEC. 16		
	HAS ΔV & PERCENT REMAINING. I PASSED		
	OUT COPIES OF THE BREAKDOWN TO ALL		
	PROPS & GNC'S ^{PROVISION} SHOWING ΔV, PERCENT, &		
	TANKED SPS NECESSARY FOR UNDOCKING.		
	THESE NUMBERS WERE WORKED UP TAKING		
	INTO ACCOUNT ALL WEIGHT & CREW TRANSFERS,		
	CONSUMABLES, ETC. THE PROP REQD FOR		
	UNDOCKING IS 12,255 LBS TANKED.		
	AT UNDOCKING WE HAD 12,490 LBS.		
	∴ GO FOR UNDOCKING.		
108+00	GAN WORKING UP VALUE OF EFFECTIVE		
	EFIMP16 ON CIRC		
108+04	AOS		
108+05	HBR 189 195 184 $198^2 =$ 766		
	P20 ATT LOOKS GOOD.		
	WORDEN CALLS P30 AND SETS UP		
	CLOCK COUNTING DOWN TO CAMERA EVENTS.		
	WE WILL SET THIS REGULARLY		
109+00	CMP SOMEWHAT BEHIND FLT PLAN —		

FLIGHT DIR MISSION LOG		DAY	REV	PG
				59
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
109+07	P52 Nos 00000			
	+ 00.015 MERU + .255			
	- 00.004 - .068			
	- 00.014 - .238			
	TORQUED 109+07+00 $\Delta t = 3.9$			
109+12	NO ONBOARD READOUTS ON RCS, EPG DUE TO RUSHED FLT PLAN.			
109+15	RCS ONBOARD 73 71 72 73			
109+16	LOS. LITTLE OR NO DATA NEXT REV — BISTATIC RADAR TEST			
	GOT ~200 FEET OF EVENT RECORDER GOOD HBR DATA FOR SINGLE JET P20 ORSRATE ON REV 16. IF ANYONE WANTS TO GO THRU IT. (108+04 TO 109+16)			
110+03	DATA — LBR REV 17			
	NOTE FOR POST MISSION: SINCE BAY GUYS NEED THEIR OWN LOOP TO PROCEDURES. MODE SYS 1 GETS USED AWFUL LOT.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				60
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
110+24	G-11 SAYS THEY CALCULATED			
	EFIMP16+FOR CIRC ~ 20538✓			
	LOADED 20257✓ 19727			
	$\Delta = 381$			
	OCTAL LOAD WAS CALCULATED AS 01606,			
	GOT PASSED TO GNC AS 01605. 01605			
	WAS UP DATE NUMBER. (COMM BREAKDOWN BETWEEN			
	FREUND & MUSETT)			
	01606 = 20,280 SUPPOSED TO GO IN			
	(01605 = 20257) NOW-LOADED VALUE.			
	GUIDANCE CHECKING LOAD. HE DOESN'T			
	KNOW WHAT WAS LOADED — NOT IN HIS LOG.			
111+03	FAO QUESTIONING WHY P20 OPTION 2			
	STARTED AT 109+50 HAD A WNW OF 340?			
	DON'T KNOW. P20 DATA MUST BE WRONG.			
111+07	GUIDANCE VERIFIES 01605 LOAD.			
111+16	FLT WANTS TO KNOW HOW MUCH DELTA			
	✓ WE CAN COMMIT TO RESCUE AT THIS			
	TIME. RETRO WORKING ON WHAT HE CAN			
	GIVE US FROM TEE (SLOW RETURN).			
112+01	AOS — HGA NOT SET UP RIGHT			
	NOISY DATA — TRYING TO CALL HIM			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				61
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
112+08	V99 ON DSKY			
112+09	V99 GONE — HE MUST HAVE PUT IT UP. WHY, NO ONE WILL KNOW.			
112+19	FROM RETRO			
	REV 74 (NOW T&I)			
	2826 FPS — 1 DAY LATE RETURN			
	PROBABLY OUGHT TO FIND CHEAPEST REV			
	IN NEXT 24 HRS, BASE RESCUE ΔV ON THAT,			
	THEN FIND ANOTHER MINIMUM THE NEXT DAY.			
	THEN WE COULD HAVE A RESCUE ΔV CAPABLE			
	ON A DAILY BASIS. RETRO STILL WORKING...			
113+13	LOS 192 193 194 198			
113+30	JOE IMBETHINE ON CONSOLE			
115+11	LOS			
115+40	PROVIDED FIDO WITH ΔVC READINGS			
	FROM BURNS LOT, DOI, CIRC			
115+57	AOS 190 193 191 195			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				62
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
117+02	PHIL SHAEFER WANTS TO LOAD DEP W/T			
117+02	WITH 40,000 LBS. REASON → WILL MAKE			
117+02	FOR LONGER JET FIRING AND DRIVE ATT			
117+02	ERROR ACROSS PHASE PLANE. RESULT →			
117+02	HOPEFULLY PROVIDE LESS FIRINGS TO SAVE			
117+02	Trajectory.			
116+18	ED GAVELIN (RETRO) GAVE ME A "BARE BONE"			
116+18	TEI LV REQUIREMENT OF 2774 FPS			
116+18	FOR REVS 20-61. THIS NUMBER IS FOR			
116+18	TEI <u>ONLY</u> AND DOES NOT INCLUDE CLIPPING			
116+18	40° INCLINATION, WEATHER AVOIDANCE, ETC.			
116+18	HE SAYS THIS NUMBER MAY CHANGE.			
117+02	LOS	192	193	194
117+30	LOOKS LIKE WE OUGHT TO DO B/D			
117+30	ULLAGE FOR LOPC AND TEI TO			
117+30	BALANCE ROUNDS.			
117+30	W.C. MADE SOME PUGS PLOTS OF 100			
117+30	4-DOT DATA.			
117+55	AOS	191	193	193

FLIGHT DIR MISSION LOG		DAY	REV	PG
				63
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
118+30	JAK ON - CMP asleep			
	TEI ULLAGE - 2 job BD 17 sec.			
	Looking again at SPS redlines			
	f RCS for briefing & my own reeducation.			
	PSZ 01 & 26			
	N 93's ΔT 9.97 hrs.			
119+05+00	- 00028	- 0.187	merU	
	- 00058	- 0.388		
	+ 00012	+ 0.114		
119+07	LOS	192	193	183 198

FLIGHT DIR MISSION LOG		DAY		REV		PG 64	
SITE/ACQ/LOS		FLIGHT EVENTS/HISTORY/BRIEFING					
		WPU					
119+54	AOS	187	193	183	193		
	SPS	TR ⁰ X _{IN}		TR ^{FU} _{IN}			
		180	181	179	178		
		Optics in CMC now. Has been since PS 2 probably.					
120+15	Driving optics manually to zero. Then zeroed. great!						
		LUNAR EVA #1					
121 to 4	Findel's first "GOTCHA" command.						
121+06.	LOS						
		We're looking at going to 3° DB in #20 at 124405 to see if we can get off the DB in the 5° DB case. This is the only method of saving prop if getting off DB that SPAN(MIT) is recommending at this time. See MIT to SPAN memo in log(next page) on this subject.					

FLIGHT DIR MISSION LOG		DAY	REV	PG
				65
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
121+52	AOS - No Data due to att.			
122+04	HBR WPU 188 191 183 194			
123+04	LOS			
	Good thing I just tagged up with FIDO.			
	just found out from FIDO that			
	LOPC AV & shaping AV have			
	gone up as follows:			
	LOPC AV = 348 fps		309	
	shaping = 7.5		60	
	423		369	
			423	
			Increase = $\frac{309}{423} = \boxed{.73}$	
	Note!			
	If the LM lifts off early before			
	we do LOPC, we don't have to			
	do LOPC because it gets absorbed			
	in our 300 cps Rescue reg't.			
124+07	In P20 att. 5° DB			
12A	Turned on TX jets and off-X jets			
	for DIAL LIGHT PHOTOG.			
	V.B.2, D1 for roll.			

6EN

FLIGHT DIRECTOR'S MISSION LOG		DAY	REL
MIT			
SITE ACQ LOS	FLIGHT EVENTS HISTORY BRIEFING		
119:50	To : SPAN FROM: MIT SUBJECT: POSSIBLE METHODS OF REDUCING RCS USAGE IN THE CSM. We can suggest three methods of reducing RCS fuel usage: 1. Change the deadband from 5° to 3° - This might possibly change drive the spacecraft at a different rate and one that would be less coupled in the three axis. There is no data to suggest ^{whether} that this would have any effect. 2. Modify Mass an Inertia - This is not recommended at this time because the effort would probably be to fire on both sides of the db as opposed to only one, which it is now doing. 3. Disable 2 adjacent quads in R03 (with corresponding jet config changes) - This would require a modification to the RCS and is probably not desirable.		

FLIGHT DIR MISSION LOG		DAY	REV	PG
				66
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
125+00	Panel 2 MET stopped at 124+47+37. Crew reset OK apparently but some confusion on this.			
125+01	LOS			
125+47	AOS			
	P20 +X FWD 5°DB.			
	Good thing we didn't go to 3°DB			
	this rev because we would have been			
	saying that 3° was keeping us			
	off the PB. I'm looking for			
	a period of time in P20 -X FWD			
	5° just like the rest period			
	where we can test the 3°DB			
	Theory, Can't find any before			
	the next rest.			
126+43+00	P52 Torquing			
	+00050	Δt=7.63	.437	meru
	-00007		.061	
	+00011		.096	

FLIGHT DIR MISSION LOG		DAY	REV	PG
				67
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
127+50	WATSON ON - AOS			
128+06	P20 ATT RIGHT ON			
128+58	LOS 185 188 177 194			
129+45	AOS 185, 188, 177, 190 INFORMED OSO THAT +X JETS WERE ON ~ 124+24. I AM WONDERING IF THEY CAN REALLY SEE ANYTHING. IT WOULD BE NICE TO TAKE ALL PITCH OUT OF QUAD A. G&N WILL CHECK THIRIFT TO PIN DOWN TIMES.			
130+02	ONBOARD RCS 71, 69, 70, 71 ✓			
130+13	G&N FINALLY FOUND TIG, TEVERT FROM CIRC, TIG 101+38+58.19 <u>39+01.86</u> $\Delta t = 3.67 \text{ SEC}$ SCP EQN GIVES 3.96 SEC -XOFF (ENABLED FOR UV PHOTO)			
130+32	+X ON ~ 124+24 TO ~ 125+02 (LOS) BACK TO NORMAL NEXT AOS. <u>ESTIMATE</u>			

CSM
PROP

SPS PLANNING FOR LM RESCUE

LM LIFTOFF PRIOR TO LOPC

present ΔV (1man)	3855	TANKED PROP REMAINING 12233
LM Rescue (1man)	300	
Post LM Rescue (3man)	3518	11131
TEI	3047	
post TEI (no shaping)	469	1638

Shaping was deleted due to the unknowns after Rescue is performed but may be considered if above $3047 + 160$ (mcc's for 30 sec TEI). Also a one day slower return could be considered to buy Shaping if TEI ΔV increases.

LM LIFTOFF AFTER LOPC

Present ΔV (1man)	3855	TANKED PROP REMAINING 12233
LOPC	348	
Post LOPC	3546	10980
LM Rescue	300	
Post LM Rescue	3247	9934
TEI	3047	
post TEI (no shaping)	194	901

Shaping could only be considered here if TEI ΔV was reduced by the one day longer return.

GNC / JAK
get 127+00

I SPS PLANNING - NOM.

		TANKED PROP REMAINING
present AV (1 man)	3855	12233
LOPC	348	
post LOPC	3546	10980
shaping (3 man)	75	
post shaping	3498	10715
TEI	3047	
post TEI	446	1539

GNC/NAK
Get 127100

TEI SPS BANK A CUTOFF RATIONALE (10 sec early verses 5)

Cutting off 5 sec early on Bank A retains redundant banks to within RCS AV capability. This means that Bank B shuts down for some reason with A and the engine cannot be restarted.

Cutting off 10 sec early allows the EMC to compute single bank(B) thrust for a more accurate auto shutdown on Bank B.

Since cutting off at 5 sec. hypothesize a double failure, cutting off at 10 sec is recommended to allow an accurate EMC cutoff.

GNC/JAK
6/127+00

QUAD C USAGE FROM 140+20 - 173+30 hrs

PREDICTION

D

CSM SYSTEMS

TIME	ACTIVITY	QUAD C PROP REQ
		145
140+20	MANUV TO SIM ATT	0.2
147+10	MANUV TO SIM ATT	0.1
149+00	MANUV FOR SCIENCE PHOTO	0.2
149+15	" " " "	0.1
149+50	COLL DEADBAND	0.2
149+55	ATT HOLD PHOTO (0.5 DB)	0.6
153+00	MANUV TO SIM ATT	0.1
153+20	COL DEADBAND	0.1
153+30	ATT HOLD PHOTO (0.5 DB)	0.1
153+50	COL DEADBAND	0.1
153+55	ATT HOLD PHOTO (0.5 DB)	0.1
162+30	MANUV TO SIM ATT	0.1
162+50	ATT HOLD PHOTO (0.5 DB)	0.5
164+41	P 52	0.1
164+50	MANUV TO P.C. ATT	0.2
164+51	ATT HOLD	0.4
165+13	ULLAGE PL	4.4
165+14	DAMPING	0.3
165+40	MR OUTAGE	2.5
167+00	MANUV FOR SCIENCE PHOTO	0.1
167+15	" " " "	0.2
172+45	BACKUP MANUV LM MCC 1	0.9
173+00	BACKUP LM MCC 2	0.5

CSM SYSTEMS

<u>TIME</u>	<u>ACTIVITY</u>	<u>QUADC</u> <u>PROP</u> <u>REQ 1K=</u>
173+00	FINAL REND ALLOT	7.0
173+10	MAINTAIN EORE SIGHT	2.1
173+15	PITCH FOR SPS INSPECT	1.6
173+30	CSM ACTIVITY DOCKING	6.0

PROP FOR
WE HAVE OMITTED A THE
ATT HOLD IN 5° DB.

OPR 5

4

AS-100

0

/

7

L=2

UPDATE RATE

30 SEC

WPU TOTAL

POINTS

128

LIVE DATA

00:11:46.66

ERRORX=XL

0.000

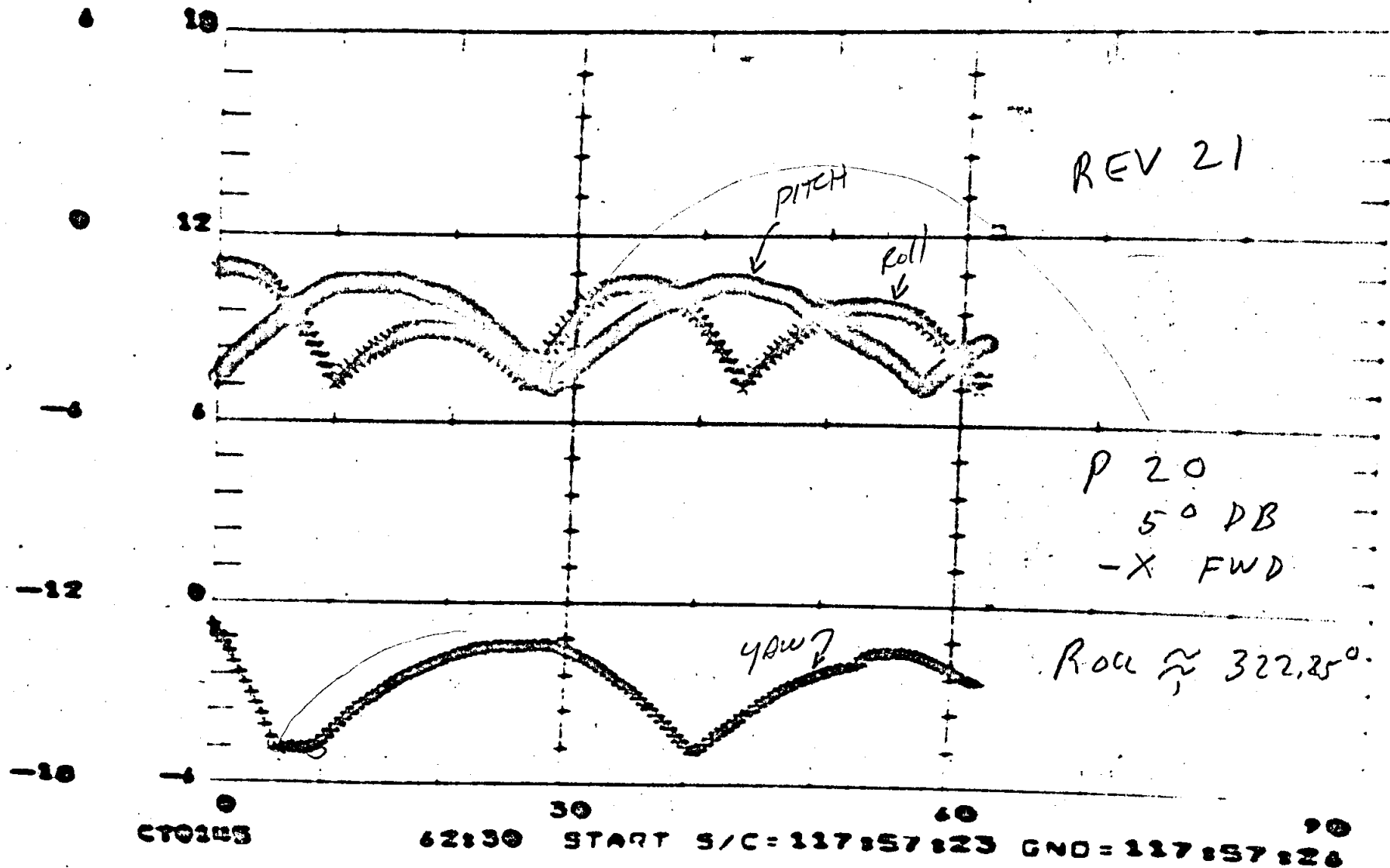
ERRORY=OL

0.000

ERRORZ=+R

0.000

=A



OPR 1

7

A2-MO

0

YR

7

1

UPDATE RATE

30 SEC

MPU TOTAL POINTS

UP-25
125

LIVE DATA

00000000
MADONN

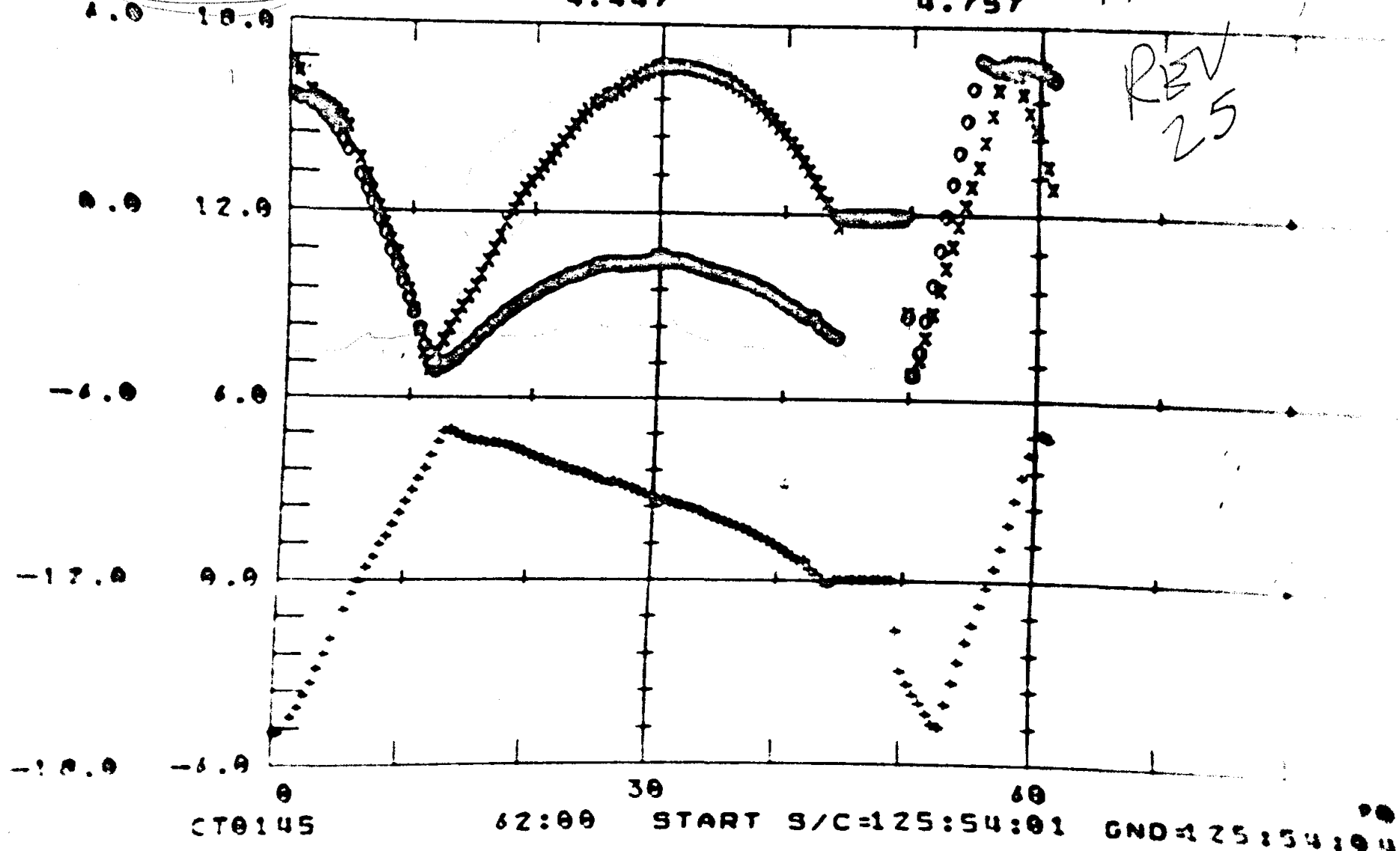
ERRORX=XL
0.956

ERRORY=OL
4.449

ERRORZ=OR
4.797

+X FWD

REV
25



DAY 3

1

HR 2

MIN 3

0

SEC 3

$$\frac{21035}{66.7}$$

66.7

66.7

18/8/20

1. ~~Temp~~ SKIN

5

$$114 + 00$$

18

1179
1178
1175
1174

OPR 5

4

AS-00

0

7

7 1

-10

PULSE RATE

19 SEC

WPU TO

UP-25

POINTS 100

LIVE DATA



-10000

ERROR1=XL

-3.296

ERROR1=OL

-3.252

ERROR2=+R

4.867

10.0

12.0

14.0

16.0

18.0

CT0145

D4

A3

Rev 26
+X FWD
5.0 DB

50

10:50

START S/C=127:50:01 GND=127:50:01

JPR 5

4

AS-20

0

8

7

1

NO. 100 JP-25

SEC POINTS 126

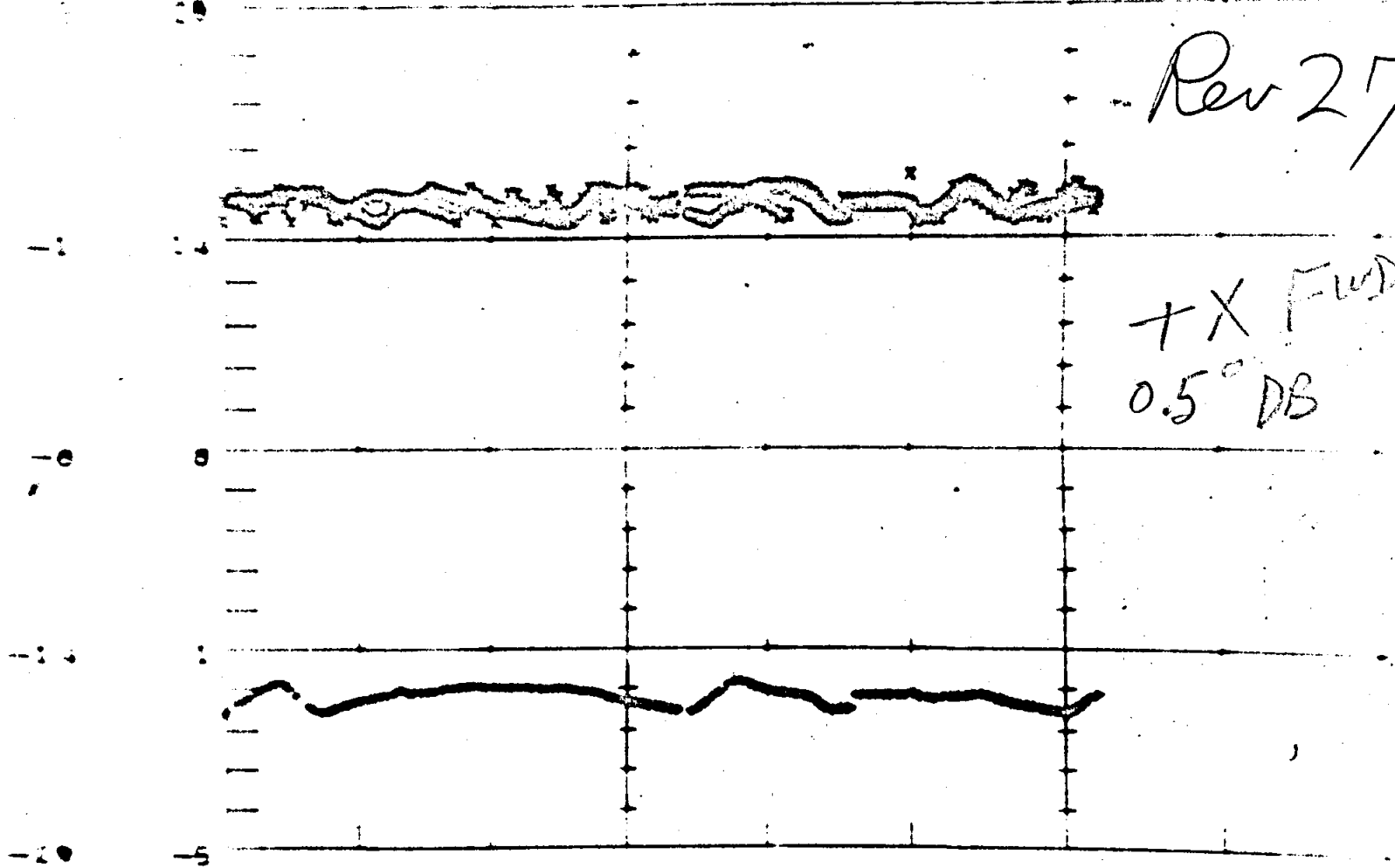
LIVE DATA

ERROR1 = 9.154

ERROR2 = 9.055

Rev 27

+X FWD
0.5° DB



C

12:45

12:30

30

START S/C=12:48:07

GND=12:48:10

OPR 1

A3-MO

0

8

7

UPDATE RATE 36 SEC

APU TOTAL UP-25
POINTS 140

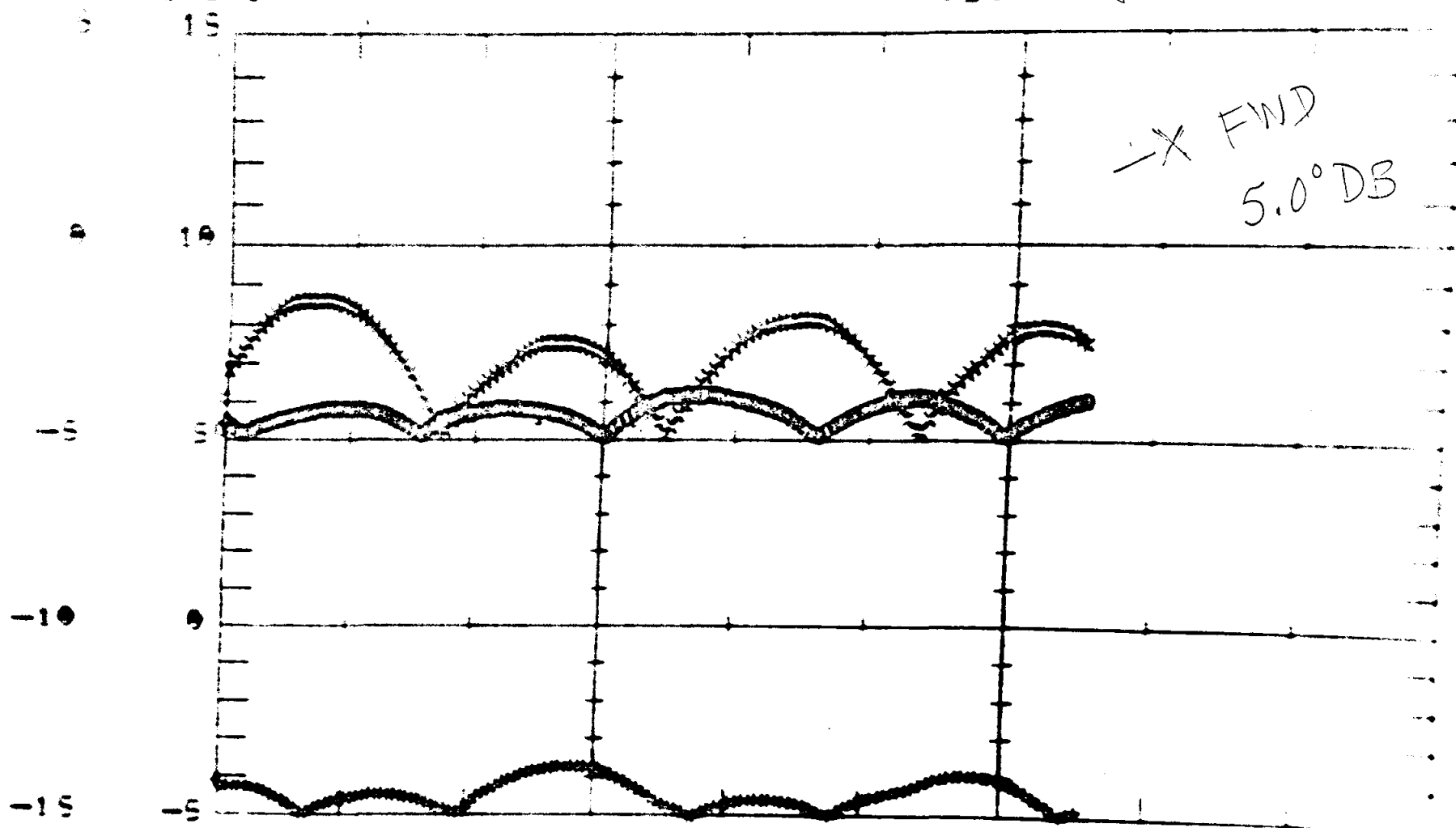
LIVE DATA

ERROR1=XL
-2.371

ERROR1=OL
-4.919

ERROR2=+R
-4.856

REV 30



CT0145 65:29 39 START S/C=135:39:02 GND=135:39:05 60 90

W 0

1

HRU

6

MIN

5

SEC 4

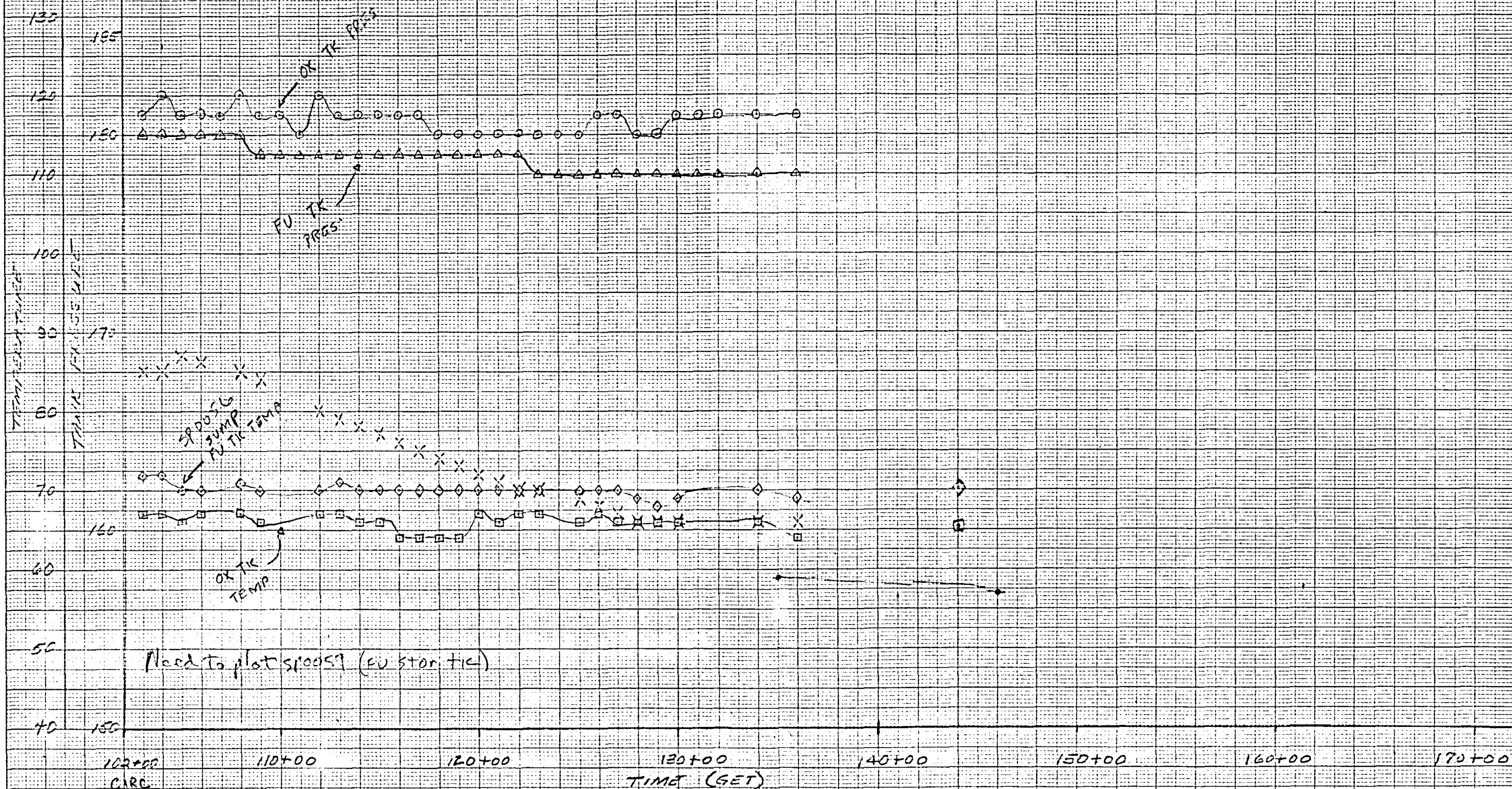
APOLLO 15

SPS PRESS AND TEMPS

VS
GET

- OX TK PRESS - SP0003
- △ FU TK PRESS - SP0006
- OX TK TEMP - SP0055
- ◇ ^{SUMP} FU TK TEMP - SP0056
- × ENG 4V - SP0045
- FU STORTK TEMP - SP0057

OX INFP = 180
FU INFP = 181



FLIGHT DIR MISSION LOG		DAY	REV	PG
				68
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
130+35	PSZ			
	.00001 NOS		MERD	
	N93 +.016		+1.269	
	-.005		-.084	
	-.017 AT 3.967 -1.286			
	TORQUED AT 130+38+00			
	*DROVE TRUNNION TO 16° MANUALLY			
	BEFORE ZEROING - GOOD HEAT.			
130+56	LOS - NO VOICE OR DATA NEXT REV			
	BI-STATIC RANGEZ, NEXT REV WILL			
	BE ASLEEP.			
131+41	NOS - LBR			
	P20 0.5° DB			
	186 188 180 191 - P's IN MED			
132+00	OBSO CATS LEAVING AT WHAT THEY			
	CAN DO IF WE VALD 90° (+X S/C IN			
	NORTH-SOUTH DIRECTION) AND USE ROLL			
	JETS TO GIVE ORB RATE.			
133+54	JOE DEATKINE ON			
134+48	LOS			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				69
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	N85 +0.6			
	ACC 8.59% .069%			
	ETDECAY 0.640			
	CHL 570.3 msec			
	ΔE 67.7 msec			
135+38	AOS 185 176 176 171			
	16.6 2.73			
	LOPC ULLAGE IS B/D			
	BT = 17 SEC ULLAGE ΔV = 2.79 FPS			
135+49	TOLD OSO NO PLAN TO CHANGE			
	FLT PLAN EXCEPT B/D ULLAGE LOPC			
NOTE :	ETDECAY - FROM THE BURN DATA WE THINK			
	THAT ENGINE THRUST DECAY CHANGED FROM			
	LOI TO DOI			
	LOADED ETDECAY $\rightarrow$ 0.640 SEC			
	CALC ETDECAY (DOI) $\rightarrow$ 0.570 SEC			
	Δ ETDECAY $\rightarrow$ 0.0697 SEC WHICH			
	IS ABOVE OUR MISSION RULE VALUE (0.053 SEC)			
	ALSO LOI HAD NO RESIDUALS WHICH MEAN			
	ETDECAY NUMBER WAS PERFECT, BUT			
	REMEMBER THAT CREW PLAYED WITH PU			
	VALVE AFTER TGO - 4 sec. I DO NOT KNOW			
	IF LOI GIVES US A GOOD ACCOUNT OF			
	ETDECAY OR NOT.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				70
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	LOPC DOES NOT REQUIRE HN X TRIM; Y ONLY.			
	THEREFORE DECAY CONSTANT MAY NOT BE			
	IMPORTANT ^{FOR LOPC} WE MIGHT WAIT ON UPDATE UNTIL			
	AFTER LOPC AND SEE IF WE NEED TO UPDATE			
	TEI. ANY SUGGESTIONS? I SAY WAIT			
	UNTIL AFTER LOPC!			
	JOE D.			
	128			
136+49	TOLD RETRO PREDICTED POST TEI RCS			
	ΔV WILL BE 128 FPS.			
136+51	LOS 186 187 178 170			
137+18	PHIL SHAFER WANTS TO UPDATE			
	WT IN DAP (+10,000 lbs) AT 147:10			
	FOR 3 HRS. THIS IS TO DEVELOP			
	SOME BASELINE DATA ON TECHNIQUES			
	TO IMPROVE TRAILING WHEN IN			
	WIDE DB SIM EAY OPS.			
137+37	AOS 186 187 178 170			
138+31	GEN HAS RESIDUALS FROM APOLLO 14			
	LOI +0.3, 0.0 DOT +0.6, 0.0			
	LOPC +0.6, 0.3, 0.3			

[illegible]

OPP 1

7

AS-100

0

8

7

1

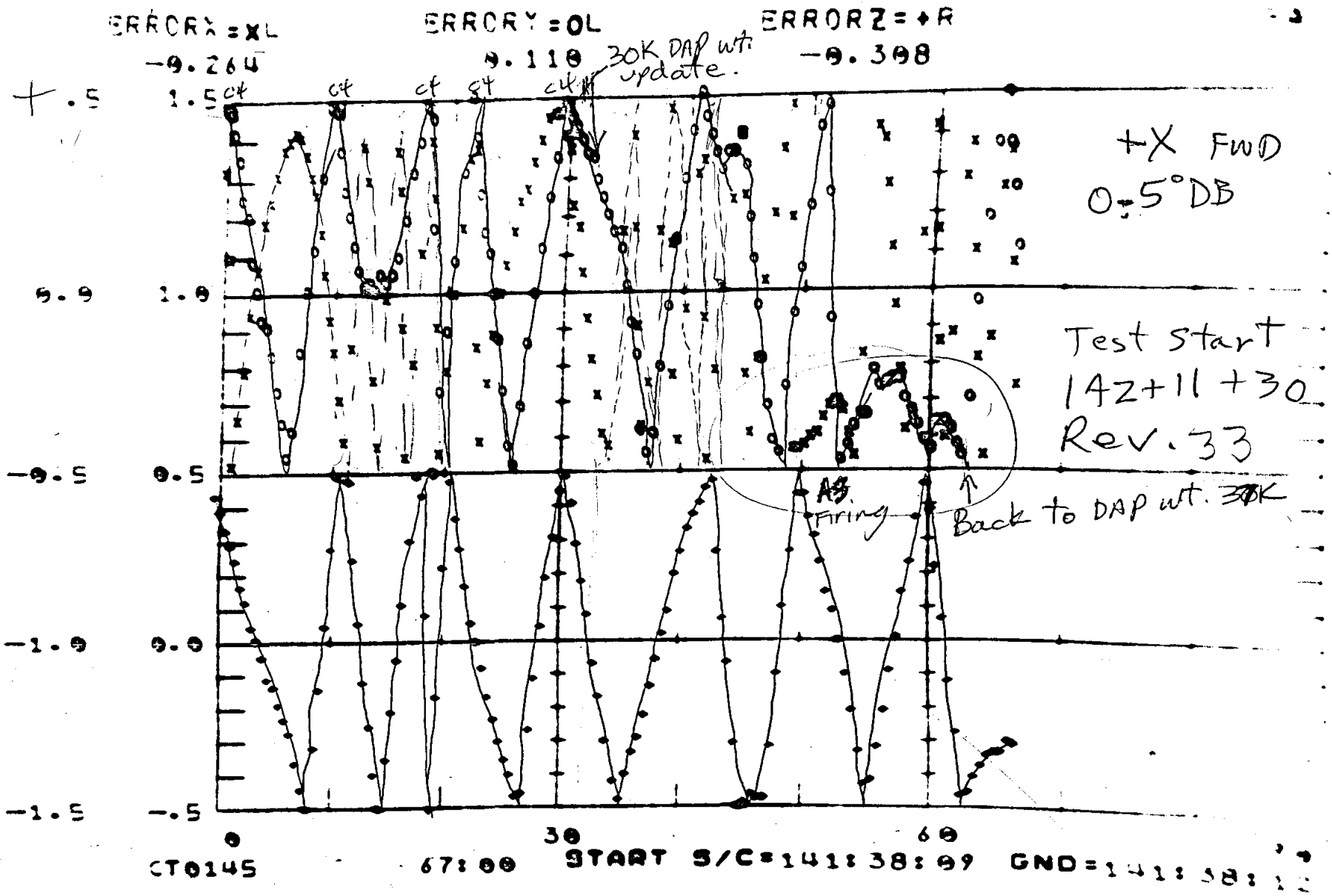
L2139
UPDATE RATE

34 SEC

APU TOTAL UP-25
POINTS 135

LIVE DATA

3659



NAV 0

1

NR 1

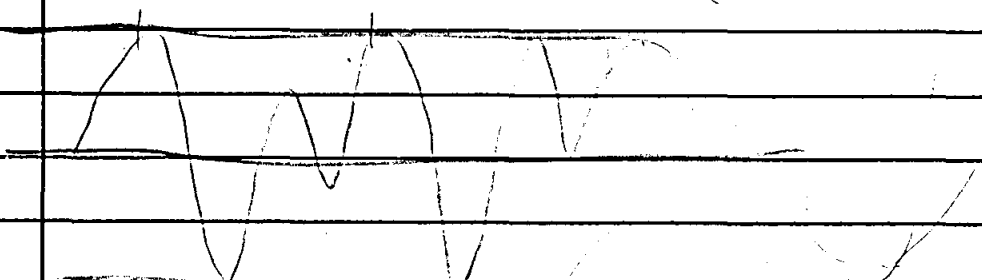
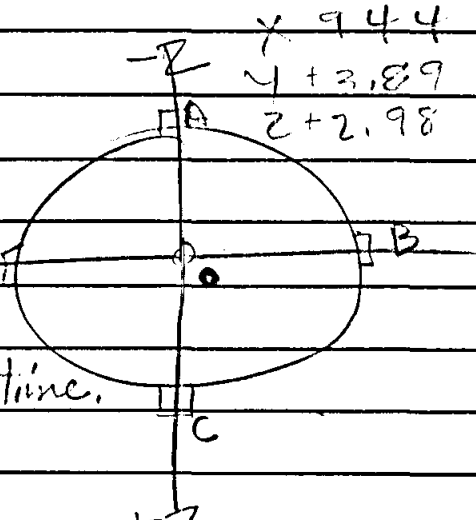
2

1

8

SEC 2

1

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
141+38	AOS - need P52 to req. 2s			
	4min latc			
	P52 01/06 ST			
	N93 - 00004 140+49+00			
	- 00050			
	+ 00041			
	CMC wt. 37276			
	Recommending reducing DAP wt.			
	to 30K to re			
				
142+11+30	DAP wt. 30K			
	Special Test to			
	see if we can			
	increase time between DB's by			
	reducing jet firing time.			
				
142+37	Reloaded real day into 37276.			
	(over for test results)			

FLIGHT DIR MISSION LOG	DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
	-X. 5°DB with 30K wt.		
	Pitch - starting to hang up on		
	minus DB. Didn't get a big hump though.		
	Maybe a lower wt like 25K		
	would help more (see plot)		
	Yaw - decreased deadbanding.		
	O		
	Roll - increased deadbanding.		
	I believe we increased the jet firings		
	in this mode so we didn't achieve what		
142+45	LOS Phil Shaffer wanted		
	Lunar EVA #2 in progress.		
	Front steering now works on rover.		
143+31	AOS, 185 123 176 190		
	P20 .5 (25° BKWD OBLIQUE att)		
	Noticed SPS Fu TK press. cycling		
	between 176 and 178 (only 1 PCM at).		
	According to SDB predictions, Tank		
	press only supposed to drop 0.8 psi		
	f. so far has dropped 4 psi which		
	should invoke M.R. 16-20. Have initiated		
	SPAN action regarding this.		
	See C-208.		
144+25	P20 +8 FWD		
144+43	LOS		

Candidate P52's to Delete

GET	P52's	RECOMMENDED DELETIONS IF DESIRED
		DELETED
148	OPT 3	
152+30	OPT 3	
162	OPT 3 ←	✓
164	OPT 3	
	OPT 1 LOPC	
166	OPT 1 LIFT OFF	
170	OPT 3	
174+30	OPT 3 ←	← DOCKING ✓
190	OPT 3	← LM JETT
198	OPT 3 ←	✓
202	OPT 3	
212	OPT 3 ←	✓
219	OPT 3	
	OPT 1 TEI	
221+30	OPT 3	
226	OPT 3	
	OPT 1 PTC	
236	OPT 3	
251	OPT 3	
263	OPT 3	
267+30	OPT 3 ←	✓
272	OPT 3	
291	OPT 3	
	OPT 1 ENTRY	
293	OPT 3	

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
145+28	AOS 181 184 173 191			
	Deleting P52 at 148+20. Doing photos instead. Don't need it anyway, infact about half of the lunar orbit P52's could be deleted with the platform running as excellant as it is.			
	In P20 40°N. OBLIQUE PHOTO ATT. 5°DB			
146+17	V49 to DeepSpaceMens.			
	299, 213, 065			
146+40	LOS			
	Possibility that mass spec. boom may be jettisoned prior to LOPC. There is some prob. verifying retract.			

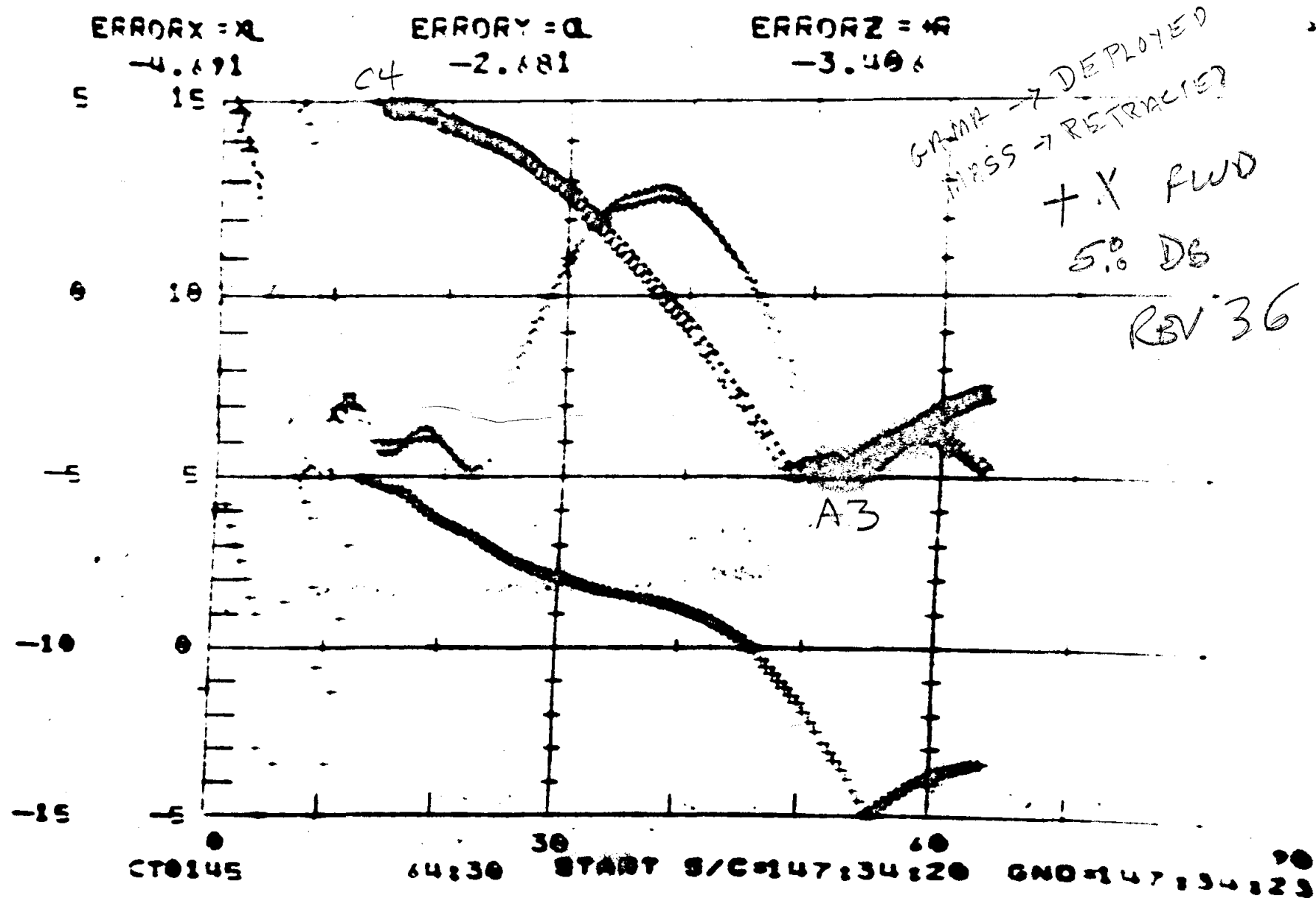
FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
147+30	AOS			
	AI says att. man. from the Gegatsheir att. to PZO was squarely thru gimbal lock if he had to man. around it manually. FNO checking. No prob. with platform. The man. probably stopped at the MGA 75° protection point. Probably used some extra prop. here.			
	PZO +X FWD 5°DB			
148+39	LOS			
149	Just prior to sleep we may go +X FWD instead of -X FWD.			
149+18	Just got word from SPAN on this. The THERMAL people don't like +X fwd. They say SMRCs will get too cold.			
	With -X FWD we've got 2 options to test to see if we can reduce jet firings:			
	1. change DAP wt - increase to 1.5 - 1.8 times present wt,			
	2. change DAP DB to 3.°			

OPR L

AS-20 0 8

7 1

UPDATE RATE 30 SEC CPU TOTAL 50-25 POINTS 130 LIVE DATA



DAY 0

1

NNI

NNI

3

SEC 1

6

GNC - 13 143 + 31 Vancouver
MAX. RESCUE AV

5/4 NT

PRESENT

5/4 NT

37267

FU REM 4715

OX " 7518

LOPC 348' sec

36004

FU REM 4226

OX REM 6735

RESCUE 650 sec

FU REM 3361

OX REM 5351

ended up 565 fps
at 167 + 00
before ascent
JAK

33755

+ 335
34090

TEI 2774

25919

FU REM 218.

OX REM 541

864

- 415

USABLE 449 left ~160 FPS

Qnd - you have 1000' / sec for
Combined LOPC + Rescue you
can trade off 1 for the other.
if they are done within reasonable
time of each other.

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
149+30	AOS WATSON ON			
150+25	TALKED WITH FLT ABOUT DB'S, WT'S ETC. P20 5° DB IS THE BEST THING WE CAN DO FOR QUAD C AS IT DOES NOT USE ANY C4(-P). PHIL SHAFER WANTS TO REDUCE TOTAL NUMBER OF FIRINGS ON ONE SIDE OF DB, DOES NOT CARE ABOUT DURATION. CHANGING (INCREASING) DAP WTS COULD POSSIBLY MAKE P & Y CYCLE FROM -DB TO ALMOST GRAZE TH + DB, BUT NOT FIRE JETS. ROLL WOULD BE ACTIVE BUT NO SWERT ON USAGE, UNLESS SHAFER CAN FORCE US TO DO THIS, WE SHOULD STAY WHERE WE ARE. FLT AGREES.			
150+37	LOS			
150+44	NO MASS SPEC FOR TONIGHT'S SLEEP PERIOD. BOOM WILL BE RETRACTED - MAY AFFECT P20 DB.			
150+57	FLT PLAN NOT BEING UPDATED. THIS MAKES FOR HARD TIME ANALYZING DATA IF YOU DON'T KNOW WHAT GRSU WAS DOING			
151+01	PVT CHECK OF 'FU TKT & PRESS PROVES 1=1 FOR PERFECT GAS.			

PREMISSION, SHAFER
STATS (PA-71-S-11)

6/1/71
THAT WE MIGHT TRY THIS POST
DAP WOULD CALCULATE LONGER PULSE.

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
151+25	AOS			
	P30 CLOCK CAUSING ERRONEOUS RATES,			
	ATT ERRORS BECAUSE OF STATE VECTOR			
	INTEGRATION ROUTINES & P20. GUIDANCE			
	HAS FIX. THIS CAUSES EXTRA FIRINGS, ATT. ERRORS			
	FOR CAMERAS ETC, (NOTE 151+47, 152+02)			
	FIX IS!			
	WHILE USING P30 RETURN TO P20			
	AT LEAST EVERY 30 MINUTES. STAY IN			
	P20 UNTIL CAPTR ACTY LIGHT GOES			
	OUT (N30 SEC). P30 MAY THEN BE			
	RESELECTED. DO NOT INPUT TIG TIMES			
	MORE THAN 30 MIN IN FUTURE.			
	T. GARNAN			
152+25	LOS — GOING TO P20 ATT.			
	(N X FWD 5° for sleep)			
153+23	AOS —			
153+33	PS2 DATA			
	NOS +00001		MERW	
	N93 + 0.028		+ .156	
	- 0.031		- .173	
	+ 0.000		, 000	
	Δt 11.95			
	TORQUED 152:46:00			

We have observed that the use of the P-30 for long periods of time is degrading the P-20 attitude calculations during narrow deadband camera activity. If you wish to use P-30 during camera

and is causing a slight increase in RCS usage.

If you want to use P-30 we recommend the following procedures:

1. Release P-20 (i.e. release P-30) once every 30 minutes and allow the computer to integrate its state vector forward (takes about 30 sec.)

2. Do not input a T19 time of more than 30 minutes in the future, while in narrow deadband.

New Guidelines for P20 Operation

Option 5 of the CMC Universal Pointing Program (P20) is being used on Apollo 15 for local vertical tracking of the moon for the SIM Bay experiments. The program controls vehicle attitude by passing rate information to the RCS DAP once each 4-to-5 seconds. Attitude error is corrected by computing a rate that will null 20% of the error over one cycle (assuming 4 seconds per cycle) in addition to the rate required to maintain the desired control (e.g., local vertical). However, if the attitude error is over 10° , the 4 second cycles cease and an R60 maneuver is requested to bring the vehicle back in line. Deadband for the DAP is supplied from N79. The noun's deadband value is written into the DAP deadband at the beginning of each cycle. This deadband control and the peculiarities of P20 rate computations lead to several operational constraints for maintaining tight pointing accuracies and avoiding unnecessary jet firings.

The rate computations require use of the orbital integration routine which allows only one user at a time on a first-come-first-served basis with others forced to wait. If P20 (the rate computation) is forced to wait, it does not take into account the waiting time when it does finally execute. That is, it computes rates for where the vehicle was when it first tried to integrate, rather than for where it is now. During the wait, the vehicle CDU's continue to be driven at the last computed rate which is probably essentially correct. However, the delayed P20 cycle comes up with a false error (it wants the CSM to be back where it was at the start of the delay) and therefore derives an erroneous error correction rate (to remove 20% of the error over the next 4 seconds).

Users of integration that can delay P20 include periodic integration (integrates both vectors - unless SURFFLAG set - if they are more than about 25 minutes old in lunar 60 n.m. orbit), V83 (range, range rate, theta - integrates both, theta used often), V85 (like V83), V82 (integrates one vector), P21 and P29 (callable over P20), and V90 (out-of-plane display - integrates both vectors to input time). Periodic integration keeps the vectors from getting more than about 25 minutes old. However, the ground can, and does uplink vectors with timetags in the future. Hence the ΔT over which (e.g.) V83 must integrate can vary - and thus can the delay to P20. Likewise, time to integrate to is an input to P21 and thus the ΔT is variable by crew input.

The results of delaying P20 assuming 1 second per minute integration time, and a 4-second cycle and a 60 n.m. orbit are:

- a. Single vector over ΔT minutes: 4 seconds of incorrect rate drive following the integration leading up to a pointing error of about $\Delta T/100$ degrees which is brought back to near zero over the next 40 seconds.

b. Two vectors over ΔT minutes each: " ΔT seconds" of incorrect rate drive (during the seconds vector integration) leading up to an error of about $(\Delta T/20)^2$ degrees which is brought back to near zero over the next 40 seconds (unless that error is over 10° in which case R60 is requested following the second vector integration).

Note that two vector periodic integration of 20 minutes ΔT gives 1 degree error. Using exact computations, this is the $.9^\circ$ quoted by MIT in their study on this subject. Note that a simple V83 (which integrates both vectors to current time) on vectors only half a rev (60 min.) in the future can cause a peak 9 degrees error ($(60/20)^2 = 3^2$).

Out of this discussion many sets of operational constraints (guidelines) can be derived. The set I propose is as follows during P20 operation:

a. Do not execute extended verbs and programs which use integration with other than current time inputs.

b. Do not uplink state vectors timetagged more than 30 minutes away from current time.

c. During camera operation (tight control required):

(1) Set SURFFLAG (V44E) to prevent two vector integration by Periodic Integration.

(2) Do not uplink vectors (additionally, this prevents the mild transient resulting from a new ephemeris).

(3) Do not execute verbs or programs that integrate both vectors (e.g. V83, V85).

(4) Do not perform P52 alignments (not related, requires going to FREE mode and the subsequent return to AUTO causes a mild transient).

Note that these constraints can be broken under given circumstances and hence should be used as guidelines for normal activity where further analysis is not done or technical advice is not available.

Deadband related operational constraints are as follows (during P20):

a. PRO on N46 in R03 (V48) causes N46 deadband to be used by the DAP for up to 4 seconds (i.e. until next P20 cycle) and hence may cause unnecessary firings.

b. V46 (to RCS DAP load) causes the same as above plus zero commanded rate and attitude error - corrected at the next P20 cycle but may have caused unnecessary firings.

c. Some savings of fuel can be realized if deadband collapsing by loading N79 "on-the-fly" is done in the FREE mode, since the resultant switch to AUTO will center the deadband around current attitude and cause P20 to initiate the 20% in 4 seconds type correction.

Although not expected, it should also be pointed out that simply selecting P31 through 36 will terminate options 1, 2, and 5 of P20; and V96 kills all options. To round out this note (being redundant Mr. Shaffer's memo), the following were also discussed at the June 1 Data Priority meeting:

a. The P20 N78 load will most likely not be the 90° and 52.25° that is being used during simulations (pad measurements are refining Sim Bay reference position).

b. Pointing analyses have assumed a P52 each three revs. An attempt is being made to conform to this during wake hours in the Flight Plan.

c. The ground will uplink a new vector if known downtrack error exceeds a maximum of 30,000 feet.

d. An attempt is being made to add performance of a P52 simultaneously with stellar camera observation for post-flight calibration.

e. REFSMMAT is not on the P20 downlist. The agreed upon procedure for ground observance of REFSMMAT when required is: FREE mode, select P52 for 20 seconds, return to P20, then return to AUTO.

f. If gravity gradients are as expected, then a 3° deadband may actually use less fuel than 5° during P20. Following rendezvous this theory may be investigated during what would be 5° operation.



John R. Garman



JCS, Jr.

USING W = 64.5 155+06 GET JEB

PRESENT

S/C WT 37212

FU REM 4715

OX REM 7518

LOPC ³²¹ ΔV 348

WT
START 37212 END 35942

FU REM 4488 FU REM 4227
OX REM 721 OX REM 6737

RESCUE ΔV 565

START 35942 END 34651

FU REQ 769

OX $\checkmark$ 1234

FU REM 345

OX REM 5506

CRCWT +335
EQUAD

POS - 335
POS - 20 ULLAGE

TEC ΔV 2774

START 34641 END 26345

FU REQ 3195
OX $\checkmark$ 5111
8306

FU REM 293
OX REM 533

2774

140

565

3499

140

2774

348

3282

TEC ΔV 160

START 26345 END 25918

FU REQ 164

OX $\checkmark$ 263

FU REM 129*

OX REM 270*

* UNUSABLE

FLIGHT DIR MISSION LOG	DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
153+54	RCS ONBOARDS		
	70 68 69 70		
	68.8 67.5 68.7 70.4 P/T		
154+28	LOS UP 4 LBS TOTAL WPU FOR REV 39		
155+06	LATEST RESCUE ΔV 565. TEI = 2774 STILL OK.		
155+20	AOS OKAY		
156+25	LOS USED 5 LBS TOTAL ^{WPU} FOR REV 40		
	(5° DB)		
	REV 39 ERRORS PLOT SHOWED +PITCH		
	DB REACHED ONCE (-P C4 FIRED). MIGHT		
	HAPPEN MORE WITH NARROWER DB		
	<u>*NOTE FOR LOPC*</u>		
	TRIM Y AXIS TO .2 FPS. I SEEM TO		
	REMEMBER A BOONE NOTE SAYING		
	WORDEN WILL ROLL LEFT OR RIGHT & TRIM		
	WITH -Z JETS. BEST VERIFY WITH BOONE		
	THIS PROCEDURE AS WE DON'T WANT TO		
	TRIM Y WITH A-C QUADS.		
157+20	AOS OKAY.		
	USING SODB 2 SEC POINT DATA FOR		
	LOPC VALUES SINGLE BORE, DEC.		
	SINCE 45'S PREDICTION FOR PU NORMINAL		
	WAS ONLY 10LB DIFFERENT IN THRUST, RIGHT		
	ON W.		

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	∴ USING T = 20175 (PU DECREASE)			
	$\dot{\omega} = 64.1$			
158+16				
	5 LBS / FPS Y & Z X LATION - TRIM 4 JET 12 = 16 LBS 2 JET 17 = 13 LBS			
158+57	JOE DEATKINE ON CONSOLE			
	LOPC 165+11+45			
159+16	AOS 181 181 172 185			
160+27	LOS 181 181 173 190			
	165+09 LOPC REV AOS TIME 165+09			
161+13	181 181 174 185			
162+08	WORDEN IS AWAKE!			
162+11	GAVE CREW F/P & R/E RCS UPDATES, /			
	what were they? Please record no's.			
	VAR			

MISSION NOTES

L- CO=

-ET 162 + 18

LOPC RESIDUALS

TRIM V_{gy} TO 0.2 FPSIF $-V_{gy}$ ROLL 90° CCW AND USE $-Z$ THRUSTERSIF $+V_{gy}$ ROLL 90° CW AND USE $-Z$ THRUSTERS

REASON: LOW QUAD C RCS

ALSO ~~OTHER~~✓ No (the)
// GNC

OXID FLOW VALVE - DECR.

6 Deviations
in LOT

RECOMMENDED LOT PROCEDURE

FROM GNC'S

Read up
@ 59:00
601

G
5-1

LOT

cb SPS PILOT VLVS(2)-OPEN(VER)
PS GP 5(2)-CLOSE(VER)
cb EMS FUNC. - OFF(VER)
cb EMS MNA,B(2)-CLOSE

Prethrust Program Complete
Verify SIM PWR DOWN (Nominal)
configuration, pg. S/1-40
CMC & ISS - on
Cycle CRYO FANS
SCS - OPERATING
TEST C/W LAMPS
Perform EMS ΔV TEST & NULL
BIAS CHECK, pg G/2-5
Set ΔVC
EMS FUNC - ΔV
SPS GAUGING - AC1
PUG MODE - NORMAL
OXID FLOW vlv - PRI
BMAG MODE (3) - RATE 2
CMC MODE - FREE
AUTO RCS SELECT(16)-as req'd
LOAD DAP (check roll jets)
ROT CONTR PWR NORM (2) - AC/DC
Set DET
V37E 00E
SC CONT - CMC/AUTO

CM

7/14/71
5/24/71
DATE

1

MNVR TO PAD BURN ATT
V49E

2

PERFORM BORESIGHT & SXT STAR CHECK
V41 N91E

3

V37E 40E
(TFI available via N40, N45 or N35)

4

F 50 18 REQUEST MNVR TO FDAI RPY ANGLES (.01°)
(AUTO) BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO
PRO

5

06 18 AUTO MNVR TO FDAI RPY ANGLES (.01°)

OXIDIZER FLOW VALVE -
LEAVE IN DECREASE

THRUSTING (PAD 15)

6
5-2

6 F 50 18

REQUEST TRIM MINVR TO FDAI RPY ANGLES
ALIGN S/C ROLL (.01°)
GDC ALIGN

TVC CHECK & PREP

cb STAB CONT SYS (all) - close (Pnl 8)
cb SPS (12) - close 10
SET ΔVC (verify)
EMS FUNC - ΔV (verify)
MAN ATT (3) - RATE CMD

ATT DB - MIN
RATE - LOW
TRANS CONT PWR - ON
SCS TVC (2) - RATE CMD
LVCG - LM/CSM or CSM
TVC GMBL DRIVE P&Y - AUTO

+54:00m
(-06:00)

IN BUS TIE (2) - ON
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
ROT CONTR PWR NORMAL (2) - AC
ROT CONT PWR DIRECT (2) - OFF
BMAG MODE (3) - ATT1/RATE 2
SC CONT - SCS
RHC #2 - ARMED

55:00m
(-05:00)

PRIMARY TVC CHECK

GMBL ROT P1-Y1-START/ON (LMP Confirm)
Verify TRIM CONTROL & SET
Verify MTVC
IF SCS: SCS TVC (2) - AUTO
SC CONT - CMC (SCS)
THC - CW
Verify NO MTVC

SEC TVC CHECK

GMBL ROT P2-Y2-START/ON (LMP Confirm)
SET GPI TRIM
Verify MTVC
THC NEUTRAL
Verify NO MTVC

DATE 3/22/71

G
5-3

(TRIM) Verify GPI returns to 0,0(CMC) or trim (SCS)
ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
BMAG MODE (3) - RATE 2
PRO
BMAG MODE (3) - ATT1/RATE 2
ENTR

7 F 50 25 00204 GMBL TEST OPTION
(ACCEPT) SC CONT - CMC (verify)
PRO

Monitor GPI Response:
00,02,-02,00,02,-02,00, Trim

*TEST FAIL: *
*SC CONT - SCS *
SCS TVC(2) - AUTO

(REJECT) ENTR

8 06 40 TFI, VG, ΔVM (min-sec,.1fps)
PROG ALARM - TIG Slipped
*V5N9E 01703 *
*KEY RLSE TO 8 *

FDAI SCALE - 5/5

RATE - HIGH
UPDATE DET
SPS He vlvs (2) - AUTO (verify)
Check N2 A and N2 B

CD SPS PILOT VLV MNB - CLOSE

58:00
(-02:00)

* ΔV THRUST B - NORMAL

ΔV THRUST A(B) - NORMAL

THC - ARMED

RHC (2) - ARMED

TAPE RCDR - HBR/RCD/FWD/CMD RESET

59:25
(-00:35)

DSKY BLANKS

DATE 5/24/71

1 REV
52+51

G
5-4

59:30 (AVE G ON)
(-00:30) EMS MODE - NORMAL

06 40 TFI, VG, ΔVM (min-sec, .1fps)
CHECK PIPA BIAS <2fps for 5 sec

59:XX
(-00:XX) ULLAGE

- *If no ULLAGE:
- * DIR ULLAGE PB - PUSH*
- * Control Att with RHC*

MONITOR ΔVM (R3) COUNTING UP

59:55
(-00:05)

F 99 40 ENG ON ENABLE REQUEST
(AUTO IGN) PRO AT TFI >0 Sec
(BYPASS IGN) ENTR to 11 (Perform switching in 10)
EXIT - V37E 00E

9 00:00 IGN *IF SCS: THRUST PB - PUSH*

06 40 TFC, VG, ΔVM (min-sec, .1fps, .1fps)

- *F 97 40 SPS Thrust fail*
- *ΔV THRUST B(A) NORMAL*
- * (RESTART) PRO to IGN *
- * (RECYCLE) ENTR to TIG-05sec*

cb SPS PILOT VLV MNA-CL

SPS THRUST Lt - ON

ΔV THRUST B(A) NORMAL

IF SCS: +X & THRUST PB - PUSH

MONITOR THRUSTING

Pc 95-105 psia

EMS COUNTING DOWN

SPS INJ VLVS (4) - OPEN

SPS He vlvs tb-gray

SPS FUEL/OXID PRESS - 170-195 psia

PUGS - BALANCED

06:00 cb SPS PILOT VLV MNA - OPEN

DISCONTINUE PU VALVE OPERATION

DATE 3/22/71

G
5-5

XX:XX ECO

10 F 16 40 TFC (STATIC), VG, Δ VM (min-sec,.1fps)

Δ V THRUST A&B - OFF

VERIFY THRUST OFF

SPS INJ VLVS (4) - CLOSED

SPS He vlvs tb (2) - bp

GMBL MTRS (4) - OFF (LMP Confirm)

TVC SERVO PWR 1&2 - OFF

MN BUS TIE (2) - OFF

(PRO

11 F 16 85 VG XYZ (CM) (.1fps)

NULL RESIDUALS

RECORD Δ V COUNTER & RESIDUALS Δ VC

EMS FUNC - OFF

VGX

EMS MODE - STEY

VGY

RHC & THC - LOCKED

VGZ

ATT DB - MAX

TRANS CONT PWR - OFF

ROT CONTR PWR DIRECT (2) - OFF

BMAG MODE (3) - RATE 2 ✓

cb DIRECT ULLAGE (2) - open ✓

cb SPS P1 & Y1 - open ✓

PCM BIT RATE - LOW

MAP CAMR ON - OFF (except lunar orb.)

PAN CAMR PWR - OFF

SM/AC PWR - OFF (except lunar orb.)

PRO (If MINKEY, To Sequencer 3X.2)

12 F 37 V82E

13 F 16 44 HA,HP,TFF (.1nm,min-sec)

PRO

14 F 37 00E

MARK your cue and recording!

DATE 5/24/71

PROP CONS

SPS BURN PROCEDURES

FORM LOI AS FOLLOWS:

- a) CB SPS PILOT VALV ANNA - CLOSE @ -2 MIN.
- b) AV THROST A B E - NORMAL after PRO
at TIC - 5 SEC.
- c) CB SPS PILOT VALV ANNA - CLOSE @ +3 SEC.
- d) ~~FOR~~ O/U IGN CLAR. ANNA PILOT CB.
- e) C/A SPS PILOT VALV ANNA - OPEN @ 06:00.

2) MCC - 4. & DOI - Use same procedures except do Bank B burn only: 12
do not clear test A pilot e/hob avthrust A.

Handwritten note on left margin:
this was
run
on
11/11/77
by
GNC
and
DOI
at
11:00
hrs
on
11/11/77
by
GNC
and
DOI
at
11:00
hrs

3) C/A of Plane changes Use same
procedures except do single Bank B burn
at TIC - 5 SEC. AV THROST A B E - NORMAL @ TIC - 5 SEC.
If IGNITION occurs prematurely during
one Rev.

4) TEI - Same as LOI except will have
a new Bank A off Time.

PRO & Following

GNC & GNC

11/11/77

GOOD FOR
LOPC, RESCUE BURNS,
+
SHAPING

FOR SPS SOLO MANEUVERS
(LOPC, TPI?)

F-K1

SPS BURN

7/1/71

8 PLY
SHIM

CMC, ISS & SCS - on

GMBL TRIM

EMS FUNC - OFF VER

cb EMS MNA, B(2) - CLOSE

Cycle CRYO FANS

EPS GP 5(2) - CLOSE (VER)

EMS ΔV CK, Set ΔV, EMS FUNC - ΔV

P

SPS PILOT VLVS (2) - OPEN (VER)

SIM PWR DN (NOMINAL, for SPS)

Y

BMAG (3) - RATE 2

AUTO RCS SELECT - as req

LOAD DAP, RHC PWR NORM (2) - AC/DC

Set DET, SC CONT - CMC/AUTO

MNVR to PAD BURN ATT: V62E, V49E

HOOK
VELCRO

CUT OUT
THIS PART

BORESIGHT & SXT STAR CHECK, V41 N91E
P40 to F 50 18, Align SC ROLL, GDC ALIGN

cb STAB CONT (Pn1 8) & SPS (2) - close

MAN ATT (3) - RATE CMD

ATT DB - MIN, RATE - LOW, THC PWR - on

SCS TVC (2) - RATE CMD

ΔVCG - LM/CSM or (CSM)

TVC GMBL DR P & Y - AUTO

MN BUS TIE (2) - on.

HBR/RCD/FWD/CMD RESET

TVC SERVO PWR 1 - AC1/MNA, 2 - AC2/MNB

RHC PWR NORM (2) AC, DIRECT (2) - OFF

BMAG (3) - 1/2

SC CONT - SCS, RHC 2 - ARMED

PRIMARY TVC CHECK

GMBL MOT PT & Y1 - START

Verify trim control & set, Verify MTVC

If SCS: SCS TVC (2) - AUTO

SC CONT - CMC(SCS), THC - CW, Verify NO MTVC

SEC TVC CHECK

GMBL MOT P2 & Y2 - START

Set GPI trim, Verify MTVC

THC neutral, Verify NO MTVC

Verify GPI returns to 0,0 (CMC) or trim (SCS)

RHC PWR NORM(2)-AC/DC

DIRECT (2) - MNA/MNB

BMAG (3) - RATE 2

PRO

BMAG (3) - 1/2

ENTR

HOOK
VELCRO

54:00
(-06:00)

55:00
(-05:00)

HOOK
VELCRO

(TRIM)

HOOK
VELCRO

HOOK
VELCRO

LOCATION

MDC-1 covering ABORT
and LV light panel

SPS BURN CONTINUED

7/1/71

B-K1

8 PLY
SHIM

F 50 25 GMBL TEST OPTION

(ACCEPT) PRO

06 40 FDAI SCALE - 5/5

RATE - HIGH, IF SCS: After IGN

Update DET, SPS He VLV (2) - AUTO ✓, Ck N2A & N2B

*ΔV THRUST (B) - NORM cb SPS PILOT VLV HNB-CLOSE

HOOK
VELCRO

58:00

(-02:00)

59:30

(-00:30)

59:XX

(-00:XX)

THC & RHC (2) - ARMED

EMS - NORM

CM PIPA BIAS < 2 fps for 5 sec

*ULLAGE

F 99 40 (-00:05) ENG ON ENABLE REQUEST

00:00 *IGN *If SCS: THRUST PB - PUSH

~~00:03 ΔV THRUST (2) - NORMAL~~

00:XX ECO

HOOK
VELCRO

F 16 40

F 16 85

ΔV THRUST (2) - OFF

Null residuals

Record ΔV counter & residuals

GMBL MOT (4) - OFF

TVC SERVO PWR 1 & 2 - OFF

MIN BUS TIE (2) - OFF

EMS FUNC - OFF, MODE - STBY

THC PWR - OFF, RHC PWR DIRECT (2) - OFF

cb DIRECT ULLAGE (2) - open

cb SPS P1 & Y1 - open

BMAG MODE (3) - RATE 2

PCM BIT RATE - LOW

HOOK
VELCRO

cb SPS PILOT VLV HNB-OPEN

cb EMS MN A, B(2)-OPEN

HOOK
VELCRO

THRUST FAIL ROUTINE

EXIT	9740	E	0640	9940	E	1685
RECYCLE	9740	E	0640	9940	P	0640
ERR NEEDLES	9740	P	0640			

G&N Relginition

F 97 40
ENTR
F 99 40
ΔV THRUST
✓GMBL TRIM
ULLAGE
PRO for IGN

HOOK
VELCRO

SCS Relginition

Check ATT
BMAGS
TVC (2) - AUTO
SC CONT - SCS
EMS - ΔV/NORM
ΔV THRUST
ULLAGE & THRUST

DP 10/1/3

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
163+45	SURPRISE !!!			
	THE PU VALVE IS IN "NORM" PER THE CREW. IT MUST HAVE BEEN THAT WAY SINCE LOI. WE TOLD CREW TO LEAVE IT THERE FOR LOPC.			
	THIS MEANS THAT CIRC & LOPC THRUST/FLOW RATE PASSED TO FIDO WAS WRONG. I DON'T KNOW BUT I THINK WE TRY TO READ THINGS INTO SOME OF OUR BURN DATA THAT CAN BE VERY MISLEADING. WHEN IN DOUBT ABOUT POSITION OF PU VALVE, ASK THE CREW.			
	J. Parin			
163+51	WE SURE HAD "FLAP" ON PU VALVE. I THINK WE SHOULD HAVE CAME TO THAT CONCLUSION FROM CIRC DATA; AFTER ALL IT WAS 287 lbs HIGHER!			
164+16	P52 0 00050 ^{merc} 1.6 TORQUE → 164+18+12 - 00017 -57 MARK TIME 164+17+04 +00005 +0.16 ΔT 1.98 hrs ≈ 2 hrs			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	OPT 1 TORQUING			
	BE SURE TO HCK CRZ BEFORE TORQ			
	164+22 APPROXIMATE			
	PASSED FIDO PU NORMAL - THRUST			
164+23				
	DPP 10.111			
	TRIMS 01111			
	P TRIMS 0.33			
	Y Trims 1.07			
	N85			
	0.2			
	0.2 NO TRIM REQUIRED			
	0.5			
	TRV 165:11+50			
	IMU $\Delta V =$ X 330.3			
	Y 11.2			
	Z 10.1			
	BT = 18.2 SEC FROM BURN (chart recorder)			
	TIC - NORMAL			
	EMS TIC BT 18 sec			
	$\Delta VC - 10.6$			
	FUEL 26.4%			
	OX 26.2%			
	METER DEC 25			

SPS PROPELLANT USAGE DATA

BURN DESCRIPTION: LO RCMISSION: APOLLO 15TIME: 165:11:50.3BANK: SINGLE B

DUAL

165:11:32.1S/C WT. START 37200 END 36004BT : 182 SEC 18.2PAD AV 330.9RCS AV 2.0PAD BT SEC 18.06IMU AV 330.644SPS AV 327.844VALVE POS. NOP

Isp

2 JET (BD) 17 SEC ACC, DAD .164 (SEC. 150)

	FUEL	OXIDIZER	PROPELLANT
MED AT START OF BURN	<u>4715</u>	<u>7518</u>	<u>12233</u>
CREW READOUT LAST BURN %			
CREW READOUT END OF BURN %	<u>26.4</u>	<u>26.2</u>	
% USED			
PUGS TM LAST BURN %			
PUGS TM END OF BURN %	<u>26.11</u>	<u>26.17</u>	
% USED			
INPUT AFTER BURN	<u>4257</u>	<u>6778</u>	<u>11035</u>

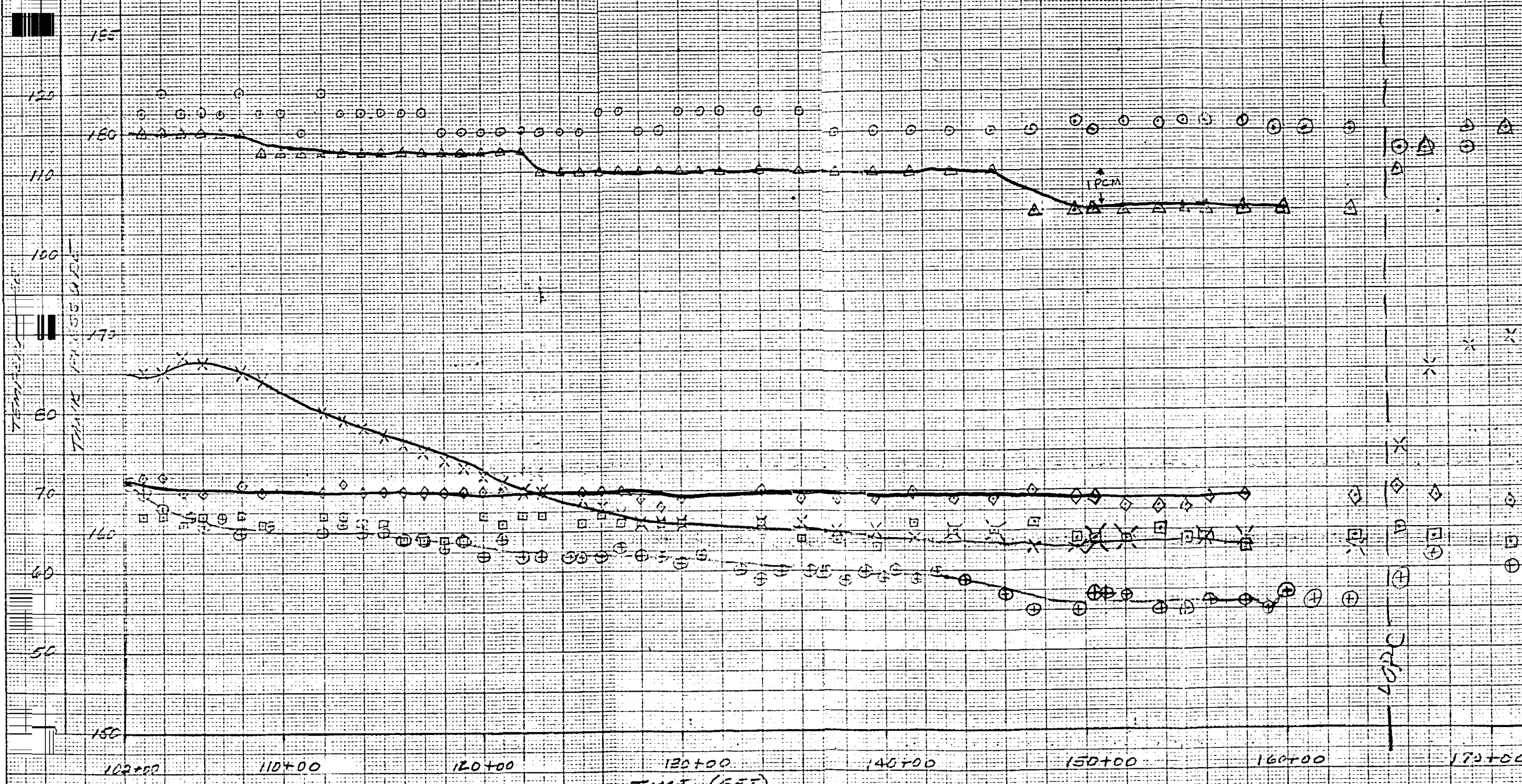
	DETERMINED WITH FLOW RATE AND BURN TIME	DETERMINED WITH IMU AV PROP PROGRAM	DETERMINED FROM PUGS CREW READ OUT	DETERMINED FROM PUGS TM READOUT
FUEL USED		<u>458</u>		
OXID USED		<u>740</u>		
PROP USED		<u>1198</u>		
FUEL TKND		<u>4257</u>	<u>4295</u>	<u>4251</u>
TKND		<u>6778</u>	<u>6858</u>	<u>6851</u>
TKND		<u>11035</u>	<u>11153</u>	<u>11102</u>
FLOW RATE		<u>65.033</u>		
MIX RATIO		<u>1.614</u>		

A.P. THRUST VALVE 20391 WITH FLOW RT 64183
ACCELERATION AT END OF BURN 18.127

SPS PRESS AND TEMPS

VS.
GET

- OX TK PRESS - SP0003
- △ EN TK PRESS - SP0006
- OX TK TEMP - SP0055
- ◇ EN TK TEMP - SP0056
- × ENG VLV - SP0045
- ⊕ EN STB TEMP - SP0059
- T/C



FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	REPORTED BURN TIME <u>18.2 sec</u> from recorders			
165131	WEIGHTS TAB IS UPDATED			
	ΔV UNDK 3544 FPS			
	THRUST LOPC = <u>20391</u> HEWLETT PACKARD			
165141	Reported to Flight burn was nominal			
165150	RCS JETS CONFIGURED FOR SIMBAY O.K.			
166107	P52 OPTIMIZ +00125 <u>166109 TORQUE TIME</u> - 00810 - 00730			
166108	DURING COARSE ALIGN TSWW NO DET WITE + IMU FAIL LITE. I DON'T UNDERSTAND IMU FAIL INDICATION. IT SHOULD BE INHIBITED SEE DELCO BOOK PAGE HW-76			
166122	LOS			
167119	AOS			

FLIGHT DIR MISSION LOG		DAY	REV	PG
				36363
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
168+00	JAK on (0845)			
	FIDO want SPS AV capability after			
	Norm. Rendez of LM Transfer. Retro			
	says wt will increase 363 over			
	what we have now.			
	now 35997			
	+ 366			
	(461lb) 36363			
	minus KC 30			
	water — 76			
	(301lb) 36287 lbs.			
	SPS AV = 3512 fps available			
	after Rendez/Docking & transfer.			
169+06	AOS - looks good - Im Moulton pt att.			
	All jets enabled at AOS.			
169+15	Going back to P20 pointing (LDMKTRK)			
	Have 400 fps available for RESCUE			
	and still retain nom. mission			
	shaping (64 fps) and TEI (3047). No			
	reserves for 30 SCS.			
169+28	P24			
169+31	Rendez Radar Xponder on.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	use 35995 CSM at for			
	Rescue planning			
169+56+07	Lost Data			
170+17+30	Got data back at 225 16 190			
	LBR - seems to be no problem			
	onboard. Had some kind of TIM			
	prob. but I don't think Warden			
	knew it. When we got voice back			
	he asked if we got the gyro torquing			
	miles but we didn't have data.			
	Need gyro torq. & time at AOS			
170+12	LOS			
171+04	AOS - LBR			
	voice reported:			
	..006	Torqued	- .101	meru
	- .017	170+06	- .287	"
	- .017	AT = 3.95 hrs.	- .287	"
171+13	Maneuvering to 170 ab (180, 42, 0)			
	LBR			
	WPU 174 168 164 172			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
171+37	LM LIFTOFF			
171+46	VHF range, 127 mi.			
	Falcon 42x9 orbit			
172+16	LOS 171 166 165 174			
172+82	AOS - no HGA yet.			
	170 165 164 171			
	Wrong att. to see LM on TV at 189,289,0.			
	V49			
173+19	Man to SIM Bay att 312, 248, 0			
	Loaded 11103, 2°/s rate			
	This will hose some extra prop.			
173+24	V49 to docking att. 189,289,0			
	2°/s			
	11102			
173+30-50	Go for pro arm - closing in			
	for docking.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
173+36	Capture CMC Mode - Free			
173+36+30	Harddock ~ 28160 RCS used			
	165 151 157 154			
	SCS Control - max DB, LO Rate, BD Roll			
	Limit cycle - on.			
	CSM 35900			
173+40	CMC cont. 61101			
	11111 Using BD Roll now			
	Before docking had CMC alarm			
	21502 - "Illegal Flooding Display"			
	GIDO looking into this. Only affects			
	Rend2 (P79) programs.			
	CM MISC +153 lbs. Retro updating 0874.			
	SM MISC - 160 "			
	CMA - 11 "			
	Current wt 3633.6 lb.			
	AV 3505 fps (on 0690 TV)			
174+15	LOS 160 152 154 155			

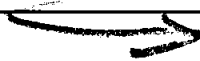
FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
175+00	AOS - P52 gy. torq. angles from Buckside C.			
	CM misc change to 180 due to more rocks.			
	CSM wt. = 36370 for DAP			
	P20 .5° +X FW (142, 6, 0)			
	jets on = -X, A1, C2 for SIM BAY.			
	No P52 at 174+30 as scheduled.			
	Next P52 scheduled at 190+00			
	We're hung up on +P DB due to LM water boiler venting			
	Continually firing C4 jet.			
	Water might be screwing up Mapping Camera run at this time.			
175+25	Out of P20 and in P00. Had him go back to P20.			
	Total			
	WPU ΔFLT -4 -18 -14 -20 46			
	LM jett. att.			
	014, 038, 344 177+20+33 LM jett.			
	177+25+33 CM SEP BURN			
175+55	Man to LM jett. att. V49			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	ULLAGE TIMES for TEI planning 2 jet 15 sec. 4 jet 12 sec. ← told Retro to use this for future planning.			
176+05	LM closed out.			
176+12	LOS 163 151 147 150			
176+40	COEN ON WILL FLI -X TONIGHT & OPERATE MASS SPECTROMETER.			
177+04	WILL DELAY 10-15 MINS TO PUT PLUGS IN SUITS. FIDO SAYS WILL AFFECT LDG. PT.			
17765	- MC&W - H ₂ O ₂ BIG DISCUSSION ON WHETHER LEG'S ARE ON & WHAT PLUGS HE'S TALKING ABOUT.			
LM/CMA	AP TOO HIGH NOW VENTING ANOTHER POUND. SOMETHING LEAKING. GOING TO MONITOR AP FOR AWHILE LM CABIN HOLDING.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
177+36	TOLD TO PULL R/D ROLL JETS FOR AWHILE. IN SCS 4 th jet.			
177+54	TOLD FLIGHT TO WIDEN SCS DB, BUT CAN'T BECAUSE LM IS IN 5° DB. CONTROL NOW SEEING ERRORS < 1°.			
177+55	BOTH HATCHES CLEAN AND CLOSED AND LOCKED. STILL FULLY SUITED.			
	1.3 $\dot{r}$ COMING UP			
	REMINDED HIM THAT LM IS STILL IN 5° DB.			
178+09	MCEN #1 O2 FLO.			
178+10	LOS.			
178+21	JB LEFT - ONE OF HIS KIDS IN HOSPITAL. PLAN TO DO LM JETT NEXT PASS.			
	179 19 03 NEW PLANNED JET.			

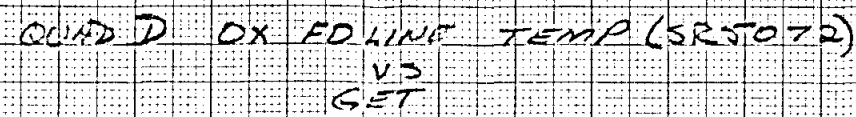
FLIGHT DIR MISSION LOG		DAY	REV	PG							
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING										
178+56	1.1° OUT IN ROLL										
AOS											
	AP OFF SCALE HIGH										
	DID TUNNEL VENT ALL THE WAY										
	AROUND BACKSIDE.										
	TOTAL 8# USED ON BACKSIDE										
	PROBABLY REALLY 4#.										
179+04	3.5 PSI										
	179+30 PLANNED JET.										
	TOLD HIM TO TURN ON										
	RCS DIR & DID SO.										
	ARMED RCS DIR. 2										
179+30	EM. AWAY CLEAN										
	<table border="0"> <tr> <td>+</td> <td>.7</td> <td rowspan="3">} P41 PRE BURN</td> </tr> <tr> <td>+</td> <td>.1</td> </tr> <tr> <td>-</td> <td>.7</td> </tr> </table>				+	.7	} P41 PRE BURN	+	.1	-	.7
+	.7	} P41 PRE BURN									
+	.1										
-	.7										
	TOLD HIM TO HOLD BURN.										

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
179+44	TOLD HIM TO GO TO ATT.			
	PRINT AT LM & GO AFT 1 FT/SEC			
	1 FT/SEC = 3 SEC			
179+47	NOW IN FRONT OF LM.			
	II TELLING HIM 2 FT/SEC			
	POSIGRADE			
179+49+0639	8° PITCH 343.9 Y 21.6 R			
	DID -X FOR 2 FPS.			
	SEP MANEUVER SAID WAS			
	IN LOCAL VERTICAL. BEF.			
LOS	-75AOS			
	-14 -20 -29 -27 = -90AOS			
	NOW -90 ON FP Δ			
	CONFIG. JETS FOR SIM BAY			
	PRIOR TO LOS.			
	FIDO DOESN'T KNOW WHAT			
	SHAPE TURN WILL BE, COMPUTING			
	BASED ON TRACK SINCE WE DID			
	2 FPS SEP.			
180+58	NO AOS CALLING CSM IN THE			
AOS	BLIND, NO DOWNLINK AT ALL			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
180+59	AOS-NET NOT ABLE TO LOCK-UP.			
181+15	AOS			
181+16	CDU TRUN. SHOWING .003° (MODIFIED ZERO)			
	REMINDING HIM TO TURN			
	OFF OPTICS POWER			
181+19	GOODNIGHT.			
181+35+10	T/M GLITCH TRIPPED HE P/T			
	RATIO B CORRUPTED.			
181+56	NO INDICATIONS THAT HE HAS			
	STARTED TO POWER UP EXPERIMENTS			
	OR EXTEND BOOMS.			
LOS				
182+23	4 JET 12 SEC RECOMMENDED			
	TO FIDO FOR SHAPE BURN			
	20175 } FIDO HAD FOR			
	64.1 } P/C - PU DECREASE			
	$\frac{LORCM - 20391}{LUPCP - 20575} (20,595) = 20,410 \text{ OUR}$			
	65.4			
182+32	 OUR PREDICTION FOR			
	SHAPE - PU NORMAL - TO FIDO			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	NOTE: QUAD C IS CLOSEST TO SECONDARY TANK X OVER. PROPS CHECKING TO SEE IF WILL OCCUR PRE OR POST TEST ASSUMING NOM. USAGE.			
AOS/54 182+53	15 CALLED - ASKED IF IT WAS TIME TO GET UP YET. OPTICS OFF AT AOS RIO'S ONBOARD: 63 58 60 58 QUAD A B C D TIM 61.7 56.5 57.2 57.7 CONFIGURED FOR BISTATIC RADAR TEST. TRUNNION -0.000 AT AOS.			
182+55	JUST SAYS HE HAS EXTENDED MASS SPEC. PROP SAYS QUADS B & C WILL HIT 119# LBS DURING TEST ULLAGE, SAYS D WILL BE @ 122. TOLD FLIGHT WILL HAVE A RECOMMENDATION PRE TEST. PADS ABOVE 119# FOR SHAPE ULLAGE 6# QUAD B, 4# QUAD C -			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
183+15	CALLED CREW - DON'T HAVE			
	MASS SPEC ON, OF ION			
	SOURCE ON.			
	TRUNNION O SPEC IS FROM			
	-1.006 TO -1.007° / FREQUENCY			
183+30	Joc D. ON CONSOLE			
184+02	LOS			
184+50	KRAZ GAVE US JOB OF DESCRIBING			
	QUAD D TEMP FOR +X CRB			
	RATE. WERE CHECKING TIMES			
	GET 125+30 - 131+00			
	WE AGREE WITH GARY'S THRUST			
	NUMBER FOR SHAPING BURN → 20,410			
	I WANT TO DO THE UPDATE 65.4			
	SINCE IT'LL BE OUR BIG CHANCE			
	TO CHECK OUR METHODS FOR			
	CALCULATING THRUST,			
	WE GAVE KRAZ A "MAYBE" FOR			
	OPENNING THE RCS SEC FUEL VALVE			
	WE WILL HAVE JACK WALSH TO CHECK			
	NUMBERS AND SEE IF THEY AGREE.			



Quad D Temp Research

$$+X \text{ FWD TEMP CHANGE RATE} = -1.5^{\circ}\text{F/HR}$$

$$-X \text{ FWD TEMP CHANGE RATE} = +2^{\circ}\text{F/HR}$$

$$201:30 - 211:30 \quad -X \text{ FWD} = +20^{\circ} \quad +X \text{ FWD} = -15^{\circ}\text{F}$$

$$212:00 - 215:30 \quad +X \text{ FWD} = -5^{\circ}$$

$$217:10 - 219:10 \quad +X \text{ FWD} = -3^{\circ}$$

$$219:30 - 221:00 \quad +X \text{ FWD} = -2^{\circ}$$

$$\text{NOM FLT PLAN NET CHANGE} = +10^{\circ}$$

$$\text{REVISED } +X \text{ FWD FLT PLAN NET CHANGE} = -25^{\circ}$$

$$\text{ASSUME TEMP AT } 201:30 = 53^{\circ}$$

TEMP AT 221:00 :

$$\text{NOM FLT PLAN} = 63^{\circ}$$

$$\text{REV FLT PLAN} = 38^{\circ}$$

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
184+50	AOS	153	143	140 144
186+00	LOS	153	143	136 143
				10.2° IN
				-5
	THERE IS A PLAN (KRANZ'S) TO GO			
	+X FWD AT GET 201+30 TO PROVIDE			
	SOME MASS SPEC DATA.			
186+48	AOS			
	THRUST 20,410 = 1613g			
186+58	JONES ROACH SAYS STOP WORK			
	ON +X FWD, CAUSE THEY DON'T			
	PLAN TO DO IT ANYMORE.			
187+16	FIDO REPORTS SHAPPING WILL BE ABOUT			
	$\Delta V = 60 \text{ FPS}$			
187+42	KRANZ HAS POINTED OUT THAT CREWS			
	SLEEP HEART RATE "BLEEPS" EVERYTIME			
	OUR JETS FIRE. WIZ CONFIRMED THIS			
	ON CH TV 11 MSK 1712			
187+50	PASSED TO FIDO THRUST 20,410, FLOW-RATE			
	64.5			

FLIGHT DIR MISSION LOG		DAY		REV		PG	
SITE/ACQ/LOS		FLIGHT EVENTS/HISTORY/BRIEFING					
188+46		AOS	132	141	136	144	
189+53		LOS	152	141	137	143	
190+45		WATSON ON		AOS		OKAY	
		151, 141, 138, 141					
		VW VALVES:					
		CROSSOVER VALUE IS NOW 123 LB					
		+0, -48 DUE TO NEW 30 NUMBERS					
		(NOT IN SODE) (99 ÷ 24)					
		PRE TEST ULLAGE:					
		134, 122, 120, 124					
194+52		LOS		151, 141, 138, 141			
192+43		AOS		151, 141, 138, 141			
		CREW AWAKE					
		MAY SHIFT PS2 FROM 197+50 TO					
		~196+00					
		+X FWD ~ 192+52					
192+55		MIN/R TO +X FWD.					
193+16		AT +X FWD					
193+35		HANGING UP ON -P, +Y DB. DUE TO					
		BECOM WATER DUMP					

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS		FLIGHT EVENTS/HISTORY/BRIEFING		
		∴ S/C SHOULD HIT -P, +Y DB.		
193+40	IN "FREE" — APPARENTLY FOR P52			
193+46	P52, OPTICS POWER OFF			
193+47	OPTICS POWER ON.			
	NOS		MERU	
	N93 + 00018		+.050	
	- 00081		-.227	
	- 00003		-.008	
	TORPED 193+52+00		$\Delta t = 23.77$	
193+56	LOS			
	SHAPE THRUST		20410 $\dot{W} = 65.4$	
	LOADED		20257	
			$\Delta = 153$ LBS	
	I SAY LEAVE IT.			
	PROP SAYS DIFFERENCE IN RESIDUALS			
	IS .32 FPS (J. WALSH).			
194+43	WALSH'S SHORT BURN CARD HAD $V_E = I_{SP} g$.			
	VE IN LOADING LIST DIFFERENT. CHANGING CARD #			

FLIGHT DIR MISSION LOG		DAY	REV	PG
			60	
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
194+45	AOS 149 140 137 141 - REV 60			
	~ 4 LBS USED REV 59			
195+38	MNVR TO GEEBINSCHEN			
195+47	AT ATT. 257,032, 169			
	P 4 R			
195+52	LOS 149 140 136 141			
196+40	AOS 149 138 133 143 REV 61			
	~ 4 LBS USED REV 60			
	+ X FWD P20 5° DB			
196+50	WAIT TO DO A PAID CANN PASS THIS			
	REV .5° DB - NO PROBLEM.			
196+56	WAIT TO FREE, LOADED 5° DB, N79			
197+01	DID IT AGAIN			
197+07	FINALLY LOADED .5°, NOT IN FREE.			
197+43	WILL STAY IN .5° DB. TILL 201+30			
197+52	LOS 150 138 137 140			
	WE ESTIMATE 40 FIRINGS /HR ROLL			
	16 P & 4			
	~ 71 TOTAL /HR = ~.4 LB /HR THEORETICAL			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
198 +40	AOS REV 62 RATTY DATA			
	LUPUS 151 141 135 140			
	EBCOMS SAW AC2 GLITCH MAYBE N			
	196+42 — 196+52.			
	196+			
	43,49,51,52 SUBFMT 17 NEEDED			
	FOR ATVC PARAMETERS			
	REQUEST FOR PLAYBACK IN			
199+10	GUIDO JUST PUT IN NEW STATE VECTOR.			
	SHIFTED ATT $\sim .3^\circ$			
199+46	Noticed another AC2 glitch.			
	199+24, 46			
199+51	LOS WPT 148 141 134 140			
	Got Fmt 30 subfmt 17			
200+36	AOS 148 141 133 140			
	GO.			
	Chasing AC2, Bus B glitches. Getting			
	DELOG (EISCHE) of all of our Fmts on THREAT.			
201+22	Some Miss Spec. boom problem.			
	Laser altimeter doesn't work any more.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
201+40	V49 To -X FWD 5°DB.			
	323, 343, 000			
202+34	AOS -X FWD 5°DB Mass ^{beam} Speed OUT			
	P52 Back-side alignment			
202+48	Time to final N93 .007 202 00 30 .057 new -.047 AT = 8.14 hrs -.385 " -.005 -.041 "			
~203+19+30	MCW - Hi 0, FLOW			
203+28	EMOD in progress			
203+35	Crew rest period begins			
203+47	LOS 149 141 136 142			
	No onboard readouts tonight.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
204+34	AOS 149 141 135 140			
	Wrote up a fresh P40 procedure and passing it out. The only change is the Bank-A off at ECO-10sec but the old LOI procedure was so garbaged up....			
	GfN looked over THRIFT FISCHE at 199+23+57 and 199+31+53 to investigate two ACZ/MnB glitches for the EEComs. Could find no shift in data or anything that would indicate a prob. in our systems.			
205+38	LOS			
	Gave copies of TEI P40 procedure to FLT, Capcom, FAO, SPAN. GfN			
	Made agreement with Retro to do Weights/Consum Prediction for Shipping and TEI at 213+00 (previous agreement 214+00)			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
206+30	AOS - okay.			
	Did some figuring for Post TEI			
	SM RCS capabilities:			
	105 fps with Nom TEC usage			
	118 fps with Minimal TEC usage.			
	If you want my vote for opening the			
	VW valves, I am before shaping			
	because we don't want the crew			
	to have worry about opening them			
	while doing the screwy trim rules (roll left,			
	roll right) in the FLT PLAN just to			
	get a dubious data point on			
	prim. Fu tank depletion.			
207+22	NOTE HERE			
	Boone says Shape $\Delta V = 64.8 \text{ FPS}$			
207+33	NEIL SAYS BASE UPDATE DECISION			
	ON WHETHER OR NOT CALCULATION			
	SHOWS WE WILL GET RESIDUAL			
	GREATER OR EQUAL TO 0.2 FPS			
	DICK FREUND IS DOING THE CALCULATION.			
	RESULT $\rightarrow$ 0.3 FPS OVERBURN - SO UPDATE			
207+10	PROP REPORTS SEC FUEL CROSS-OVER			
	CONTINUED $\rightarrow$			

Gave to FIDO
+ GUIDANCE

MISSION NOTES

CET 209+07

EFIMP 16

CET 209+05

YND

ADDRESS

OCTAL

THRUST

1765

016176

2.0410000000 04LBF

4 YND

We didn't round
off our number

no Neutron
/ GNC

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
207+10				
	WPU	QUAD	CROSS-OVER	MISSION EVENT
	143	A	252+00	PTC
	136	B	223+41	TEI ULLAGE
	128	C	221+25	SHAPE ULLAGE
	138	D	223+14	TEI ULLAGE
	SPS ΔV POST TEI = 415			
208+38	FOR WINDLER'S BRIEFING I SAID:			
	1. WE <u>WILL</u> UPDATE THRUST CONSTRAINT.			
	THE FOLLOWING AGREE WITH THIS:			
	SHAFFER, DEATKINE, CANIN, COEN,			
	NEIL (AS PER RESIDUAL RULE)			
	2. RECOMMENDED ^{your spelling sticks!} OPENNING VW VALVES			
	PRIOR TO SHAPING ULLAGE			
	WINDLER WANTS TO KNOW HOW MUCH ^{SPS TK} PRESS.			
	LOSS WE CAN TAKE AND STILL DO TEI.			
209+07	GAVE GUIDANCE THE RETRACTION UPDATE			
	NUMBER. $01.614g = 20,410 \text{ RF}$			
209+26	PASSED TO RETRO CONSUMABLES STATUS			
	RECEIVED UPDATE TO FLT/PLAN; PUT IT IN			
	FLT PLAN.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
209+45	PER FLT REQUEST, PROP			
	DETERMINED THAT WE CAN LOSE			
	10 PSI IN SPS TANK PRESS			
	(ASSUME LIQUID LOSS) AND STILL			
	HAVE DOM TEI (3047 FPS).			
	CAPABILITY.			
210+27	AOS			
210+48	SAW "FUNNY" ON PENSE PLANE. ROLL			
	SHOT ACROSS PLOT. 0.066°/sec			
	WE HAVE REQUESTED DELOG. SEE PLOT			
211+30	FENDELL BROKE THE TV CAMERA			
211+47	FENDELL'S GOT IT WORKING AGAIN? NOPE			
	IT'S STILL BROKE NO DOWNLINK			
212+10	PASSED WEIGHTS PREDICTIONS FOR			
	SHAPING & TEI TO RETED			
	GUIDANCE HAS UPDATED EFIMP16			
	AT 211:30 WITH S.V. LOAD.			
212+20	AOS			
212+30	(new ^{read} _{0.01} ^{down} OF P52 OPT3			
P62	0.029 211 52 40			
	- 0.025 TORQUE TIME 211+52+00			

OPR 1

7

AS-20

0

8

1

2

1

L2139

UPDATE RATE

30 SEC

NPV TOTAL UP

127²⁵

LIVE DATA

1190600
-3K02M

ERRORX=XL

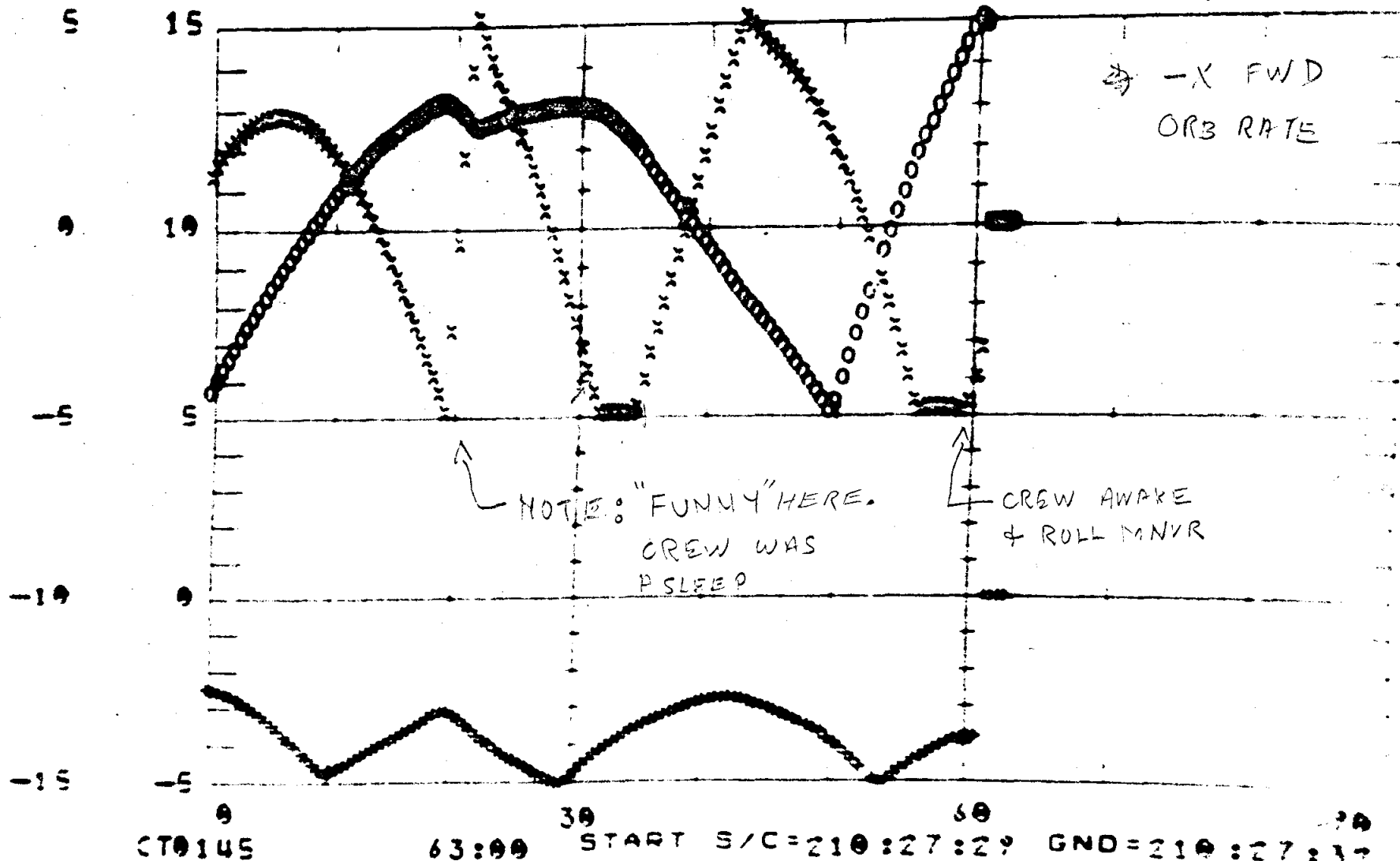
0.000

ERRORY=OL

0.000

ERRORZ=+R

0.000



0

4

HRU

9

MIN U

4

SEC 5

5

$$\begin{array}{r} 33 \\ 5 \\ \hline 165 \end{array}$$

$$\begin{array}{r} 109 \\ 302 \\ 109 \\ \hline .283 \end{array}$$

FLIGHT DIR MISSION LOG	DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING		
213+37	LOS BE SURE TO REMIND FLT THAT WE WANT VW VALVE OPEN BEFORE SHAPING BURN.		
214+59	DIGENOVH ^{wow!} IS TWICKING UP PITCH RESOLVER MEDS.		
215+17	GAVE FIDO TEST THRUST 20,673 FLOWRATE 65.62 PASSED CONSUMABLES UPDATE TO RETRO		
215+30	WATSON ON - REV 70 KRAJZ WANTS TO OPEN VW'S NOW. I PERSONALLY WOULD LIKE TO KIND A 30 QUAD BUT HE WON. WILL OPEN ALL VW VALVES NEXT PASS.		
	REVIEWED CUE CARD FOR SHAPE. OKAY. NOMINAL SPS BURN EXCEPT SINGLE BANK, CB'S (PILOT VLV B, DV B ON AT TIG - 2 MIN.)		
216+21	AOS - REV 71 NO DATA		
216+28	DATA FINALLY CAPCOM TOLD CREW TO OPEN SAC FUEL VLV'S.		
216+34	CREW SAYS VW'S ARE OPEN. (2-3 HRS.)		
216+36	OPTICS IN CMC MODE - BEEN THIS WAY A WHILE. TOLD FET TO GO TO ZERO.		

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
216+29	OPTICS ZEROED.			
217+21	SENT MARKED UP PAO CLIST TO GIN, PRO?			
217+24	PROP TRYING TO DETERMINE P.U. VALVE POSITIONS FOR TEI PREDICTION. WOOD NOT AVAILABLE AT THIS TIME.			
217+33	LOS.			
	SHAPE ^{TIG} 221+20+49 REV 73 66 FPS			
	10 MINS PRIOR LOS			
	JETT ' 222+39+44			
	SLIPPING SHAPE TO JUST AFTER ADS NEXT			
	REV MENUS PROBABLY SLIP TEI ONE REV			
	TEI INC. 50FPS 1REV SUP, 95FPS 2REV SUP			
	<u>TEI OPTIONS</u>			
	REDUCE INC, RETARGET, ETC.			
218+11	TEI THRUST ESTIMATE BASED ON FOLLOWING:			
	START BACK B — FROM GALLENES.			
	A ON AT TIG + 4 SEC (20673, 65.63)			
	A OFF AT TGO - 10 SEC			
	PU VALVE IN DECREASE 99.5 SEC.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
218+16	BASED ON OBSERVED DATA CREW RELEASES			
	THC ~ 3/4 SEC AFTER TIG. SHORT BURN			
	LOGIC ASSUMES 2 SEC +X AFTER TIG.			
	CAN CAUSE ~.3 FPS UNDER-BURN			
218+20	AOS - REV 72			
	WE SHOULD VERIFY RCS TB= AFTER SUB-			
	SAT SETT - UPDATE FLT PLAN			
	RCS ΔV AFTER TEI: DAP 99			
	SCS 94			
218+49	LOOKING AT OPDEAL FOR POSSIBLE HELP TO			
	BECOMS AC 2 / MNB FUNNIES			
	AC 2 - 2 AMPS }			
	MNB - 12 AMPS } GLITCH			
	ADDED EMS CB's TO P GS-5 ON TEI			
	BURN C/L.			
219+26	P52 OPTION 3			
	+ 00001	N05	MERU	
	+ 00018	N93's	+.16	
	- 00027		-.2	
	- 00039		-.08	
	TORQUED 219+28 AT 7.6			
	P52 OPTION 1			
	NUS 00000, N93 - 00474, +00308, +00+33			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
219+32	LOS — WILL REVIEW			
220+06	3.48 BT FROM PROP. FIDO SAYS ~ SAME			
	3.44 BT FROM FIDO			
220+18	AOS — PASSED TO FLIGHT THAT WE WILL			
	REALLY BE OUTSIDE OUR MISSION RULE LIMIT			
	AT SHAPE TIME ON PIPAS.			
	.0022 .003 .001 ERROR AFTER 100 SEC NOW			
	WE HAVE BEEN SEEING $X = .031 \pm .002$ (.028 LOAD)			
	$Y = 0 \pm .004$ (-.003 LOAD)			
	$Z = -.006 \pm .001$ (-.0079 LOAD)			
	.033			
	— .028			
	.005 ERROR MAX $(3 \text{ sec} + 30)(.005) = .165 \text{ FPS ERROR X}$			
220+35	SHAPE PAD UP			
220+46	CREW READ-BACK TET PROCEEDURE CORRECT			
	VERIFIED SINGLE PANK B FOR SHAPE			
220+52	LITTLE BIT OF WATER COMING OUT OF			
	BLUES ^{PU} HOSE. NO PROBLEM.			
221+00	P30			
221+03	ALL JETS ON			
221+05	ATT. 355, 198, 10			
221+11	P40			

RECOMMENDED ~~SHAPE~~ PROCEDURE

GNC
217+14

G
5-1

P40 SPS THRUSTING

cb SPS PILOT VLVS(2)

OPEN (VER)

cb EPS GP5(2)-

CLOSE (VER)

EMS FUNC-OFF (VER)

cb EMS MN A, B (2)-CLOSE

Prethrust Program Complete
Verify SIM PWR DOWN (Nominal)
configuration, pg. S/1-35-40

CMC & ISS - on

Cycle CRYO FANS

SCS - OPERATING

TEST C/W LAMPS

Perform EMS ΔV TEST & NULL

BIAS CHECK, pg G/2-5

Set ΔVC

EMS FUNC - ΔV

SPS GAUGING - AC1

PUG MODE - NORMAL

OXID FLOW vlv - PRI

BMAG MODE (3) - RATE 2

CMC MODE - FREE

AUTO RCS SELECT(16)-as req'd

LOAD DAP (check roll jets)

ROT CONTR PWR NORM (2) - AC/DC

Set DET

V37E 00E

SC CONT - CMC/AUTO

MNVR TO PAD BURN ATT

V49E

PERFORM BORESIGHT & SXT STAR CHECK

V41 N91E

V37E 40E

(TFI available via N40, N45 or N35)

4 F 50 18 REQUEST MNVR TO FDAI RPY ANGLES (.01°)

(AUTO) BMAG MODE (3) - RATE 2

SC CONT - CMC/AUTO

PRO

5 06 18 AUTO MNVR TO FDAI RPY ANGLES (.01°)

THRUSTING (P40's)

DATE 5/24/77 7/14/77

THRUSTING (P40's)

G
5-2

6 F 50 18 REQUEST TRIM MNVR TO FDAI RPY ANGLES
ALIGN S/C ROLL (.01°)
GDC ALIGN

TVC CHECK & PREP

cb STAB CONT SYS (all) - close (Pnl 8)
cb SPS (~~5~~) - close 10
SET ΔVC (verify)
EMS FUNC - EV (verify)
✓MAN ATT (3) - RATE CMD

✓ATT DB - MIN
✓RATE - LOW
TRANS CONT PWR - ON
SCS TVC (2) - RATE CMD
✓ΔVCG - LM/CSM or CSM
TVC GMBL DRIVE P&Y - AUTO

+54:00m
(-06:00)

MN BUS TIE (2) - ON
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
ROT CONTR PWR NORMAL (2) - AC
ROT CONT PWR DIRECT (2) - OFF
BMAG MODE (3) - ATT1/RATE 2
SC CONT - SCS
RHC #2 - ARMED

55:00m
(-05:00)

PRIMARY TVC CHECK

GMBL MOT P1-Y1-START/ON (LMP Confirm)
Verify TRIM CONTROL & SET
Verify MTVC
IF SCS: SCS TVC (2) - AUTO
SC CONT - CMC (SCS)
THC - CW
Verify NO MTVC

SEC TVC CHECK

GMBL MOT P2-Y2-START/ON (LMP Confirm)
SET GPI TRIM
Verify MTVC
THC NEUTRAL
Verify NO MTVC

DATE 3/22/71

G
5-3

Verify GPI returns to 0,0(CMC) or trim
(SCS)

(TRIM) ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
BMAG MODE (3) - RATE 2
PRO
BMAG MODE (3) - ATT1/RATE 2
ENTR

7 F 50 25 00204 GMBL TEST OPTION
(ACCEPT) SC CONT - CMC (verify)
PRO

Monitor GPI Response:
00,02,-02,00,02,-02,00, Trim

*TEST FAIL: *
*SC CONT - SCS *
SCS TVC(2) - AUTO

(REJECT) ENTR

8 06 40 TFI, VG, ΔVM (min-sec,.1fps)
PROG ALARM - TIG Slipped
*V5N9E 01703 *
*KEY RLSE TO 8 *

FDAI SCALE - 5/5

RATE - HIGH
UPDATE DET
SPS He vlvs (2) - AUTO (verify)
Check N2 A and N2 B

58:00
(-02:00) ← ~~cb SPS PILOT VLV MN B - CLOSE~~
~~ΔV THRUST X(B) - NORMAL~~ ΔV THRUST B - NORMAL
THC - ARMED
RHC (2) - ARMED
TAPE RCDR - HBR/RCD/FWD/CMD RESET

59:25
(-00:35) DSKY BLANKS

DATE 5/24/71

DATE

G
5-4

59:30 (AVE G ON)
(-00:30) EMS MODE - NORMAL

06 40 TFI, VG, ΔVM (min-sec, .1fps)
CHECK PIPA BIAS <2fps for 5 sec

59:XX ULLAGE
(-00:XX)

*If no ULLAGE: *
* DIR ULLAGE PB - PUSH*
* Control Att with RHC*

MONITOR ΔVM (R3) COUNTING UP

59:55
(-00:05)

F 99 40 ENG ON ENABLE REQUEST
(AUTO IGN) PRO AT TFI >0 Sec
(BYPASS IGN) ENTR to 11 (Perform switching in 10)
EXIT - V37E 00E

~~AV THRUST A/B (=) Normal~~

9 00:00 IGN *IF SCS: THRUST PB - PUSH*

06 40 TFC, VG, ΔVM (min-sec, .1fps, .1fps)

*F 97 40 SPS Thrust fail *
~~*AV THRUST B(A) - NORMAL *~~
*(RESTART) PRO to IGN *
(RECYCLE) ENTR to TIG-05sec

DATE

~~cb SPS PILOT VLV~~
~~00:05~~

05
00:05

SPS THRUST Lt - ON

~~*AV THRUST B(A) - NORMAL~~

IF SCS: +X & THRUST PB - PUSH

MONITOR THRUSTING

Pc 95-105 psia

EMS COUNTING DOWN

SPS INJ VLVS (4) - OPEN

SPS He vlvs tb-gray

SPS FUEL/OXID PRESS - 170-195 psia

PUGS - BALANCED

DATE 3/22/71

~~cb SPS PILOT~~
~~cb SPS PILOT~~
~~-CLOSE~~

~~F 99 10sec cb SPS PILOT VLV MVA OPEN~~

G
5-5

XX:XX ECO

10 F 16 40 TFC (STATIC), VG, ΔVM (min-sec,.1fps)
ΔV THRUST A&B - OFF
VERIFY THRUST OFF
SPS INJ VLVS (4) - CLOSED
SPS He vlvs tb (2) - bp
GMBL MTRS (4) - OFF (LMP Confirm)
TVC SERVO PWR 1&2 - OFF
MN BUS TIE (2) - OFF

PRO

11 F 16 85 VG XYZ (CM) (.1fps)

NULL RESIDUALS

RECORD ΔV COUNTER & RESIDUALS ΔVC

EMS FUNC - OFF

EMS MODE - STBY

RHC & THC - LOCKED

ATT DB - MAX

TRANS CONT PWR - OFF

ROT CONTR PWR DIRECT (2) - OFF

BMAG MODE (3) - RATE 2

cb DIRECT ULLAGE (2) - open

cb SPS P1 & Y1 - open

PCM BIT RATE - LOW

MAP CAMR ON - OFF (except lunar orb.)

PAN CAMR PWR - OFF

SM/AC PWR - OFF (except lunar orb.)

PRO (If MINKEY, To Sequencer 3X.2)

cb SPS PILOT VLV MNB-
cb EMS MN A,B (2) OPEN

DATE 5/24/77

12 F 37 V82E

13 F 16 44 HA,HP,TFF (.1nm,min-sec)

PRO

14 F 37 00E

PROP CONS

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
221+16	SERVO POWER ON			
221+18	GIMBAL DRIVE TEST COMPLETE			
	GOOD TRIMS			
221+19	≈ 2 MIN. ΔV THRUST B-ON			
221+20	AVE G			
	3.77 SEC FROM CCATS			
	BURN REPORT			
	ON TIME 3 SEC			
	ΔV_{gx} +1.1 RESIDUAL			
	TRIMMED TO .1, -.2, -.2			
	ΔV_{cy} -11.0			
	PUGS 26.40 PU			
	26.25 OX			
	≈ 1.0°/SEC RATES AT IGN - SOME MIS-TRIM			
	P52	N93	MERU	
	+ 00021		+.717	
	+ 00004		+.136	
	+ 00024		+.82	
	TOR 221+28		Δt 1.95	
221+30	LOS			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	HOW TO GET 1.1 PPS UNDERBURN:			
	OX TK PRESS DOWN 2 PSI = -112 LBS			
	FU TK PRESS DOWN 2 PSI = -56 LBS			
	-168 LBS THRUST			
	-168 LBS $\rightarrow$ ~.3 FPS ERROR UNDERBURN			
	THC OFF AT TIG $\rightarrow$ 2 SEC X .316 FPS ² = .632			
	.3 + .6 = .9 FPS UNDERBURN			
	RESIDUAL = 1.1 UNDER.			
221+30	WTS TAB UPDATED.			
	GARMAID SAYS IF THC IS IN			
	AT TIG, CMC FREEZE +X CMDS FOR			
	2 SECONDS, THEREFORE IN SHORT BURN			
	YOU WILL ALWAYS GET 2 SEC OF ULLAGE ^(IF +X AT TIG)			
	LOGIC CHECKS AT TIG - 5 SEC FOR THC +X			
	TO DETERMINE WHETHER TO USE IT IN COMP.			
222+16	AOS 140, 128, 121, 133			
222+25	RATES GOOD & LOW FOR SUBSAT SET			
	NO NEED TO GO SINGLE SET CONFIG.			
	TO GET RATES DOWN TO .05°/SEC			
222+28	GOT NO RECORDER D LBO BECAUSE			
	IT WKE BROKE. REPATCHED A $\rightarrow$ D FOR TBI			

G&N

GNC

SPS BURN SUMMARY

BURN SHAPE

GN SCS

MISSION APOLLO 15TIGTEVENTΔ

CMC TIME

221+20+47.23221+20+50.653.42DR1 11102BEFORE BURNEND OF BURNΔDR2 11111

ACDU PITCH

355.33354.281.05

ACDU YAW

198.05198.050.0

ACDU ROLL

10.539.800.73

PACTOFF

0.640.570.07

PITCH GMB POS

1.520.540.98PACTOFF/GMB POS Δ-0.880.03-0.91

OCDU SHAFT DAC

0.600.430.17

SODB P Trim

0.630.570.06

YACTOFF

0.970.880.09

YAW GMB POS

0.570.99-0.42YACTOFF/GMB POS Δ0.40-0.110.51

OCDU TRUNION DAC

0.920.830.09

SODB Y Trim

0.980.880.10

LM WEIGHT

CSM WEIGHT

3617135900271

MAX PITCH RT

+1

MAX YAW RT

-1

N81 BEFORE BURN

N85 END OF BURN

VG X

+17.0+1.1

VG Y

-00.0-0.1

VG Z

-64.2-0.2V_C54.8-11.466.2

P DIFF CLUTCH CURR

-4-6864.0

Y DIFF CLUTCH CURR

-2-2220.0

*ESTIMATED GMB MISTRIM

SYSTEM STATUS

ORIGINATOR

*GMB MISTRIM = G_p - G_s
 GP = GBL POS BEFORE BURN
 GS = GBL STEADY STATE POS
 AFTER IGN

SPS BURN PROCEDURES

1) Perform LOI AS FOLLOWS:

- a) CB SPS PILOT VALV ANNA - CLOSE @ -2 MIN.
- b) AV THROST A & B - NORMAL after PRO
at T16 - 5 SEC.
- c) CB SPS PILOT VALV ANNA - CLOSE @ +3 SEC.
- d) ~~For~~ O/R IGN CLARE ANNA PILOT CB.
- e) ~~C/A~~ SPS PILOT VALV ANNA - OPEN @ 06:00.

2) MCC-4 & DOI - Use same procedures
except do Bank B burn only: i.e.
do not close ann A pilot c/h or AV THROST A.

*This was
normal
burn
pro*
3) CIRCUM of Plane changes Use same
procedures except do single Bank B burn
and AV THROST B - NORMAL @ T16 - 2 MIN.
If IGNITION occurs prematurely during
one REV.

4) T&I - Same as LOI except would have
a new Bank A Off Time.

PRO @ Following

GNC J. Coen

10/1/72

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
222+29	CONFIGURED SINGLE JET, LEFT E2 ON.			
	OKAY (A/C ROLL)			
222+31	GO FOR JET			
222+33	V49 DRIFTING IN ATT - GO TO AUTO, FREE			
	AT LAUNCH TIME.			
222+39	SUB SAT JBTT - BACK TO FREE			
222+40	AUTO			
	PRE { +.0044, -.0022, +.0049 JBT { 0.15, 0.121, -.022			
222+56	MC & W CHECK			
223+01	MNVR TO TET ATT. 0,0,0			
223+10	OPTICS STILL IN CMC. OPTICS ARE			
	AGAINST TRUNION+STOP			
223+18	REQUESTING CREW DRIVE TRUN < 10°, E570.			
223+25	LOS			

G&N
SPS BURN SUMMARY

BURN T.E.I

GN SCS

MISSION APOLLO 15

TIG

TEVENT

Δ

CMC TIME

223+48+45.05

223+51+05.95

00+02+20.9

DR1 11102

BEFORE BURN

END OF BURN

Δ

DR2 11111

ACDU PITCH

359.10

359.47

- 0.37

ACDU YAW

0.60

1.70

- 1.10

ACDU ROLL

359.88

4.77

- 4.89

PACTOFF

0.57

0.62

- 0.05

PITCH GMB POS

0.59

0.76

- 0.17

PACTOFF/GMB POS Δ

- 0.02

- 0.14

+ 0.12

OCDU SHAFT DAC

0.51

0.60

- 0.09

SODB P Trim

+ 0.57

+ 0.633

- 0.063

YACTOFF

0.88

- 0.55

1.43

YAW GMB POS

0.82

- 0.44

1.26

YACTOFF/GMB POS Δ

0.06

- 0.11

0.17

OCDU TRUNION DAC

0.83

- 0.63

1.46

SODB Y Trim

+ 0.88

- 0.439

1.319

LM WEIGHT

CSM WEIGHT

35768

26182

9586

MAX PITCH RT

0.42

MAX YAW RT

- 1.63

N31 BEFORE BURN

N35 END OF BURN

VG X

+ 2945.2

- 0.3

VG Y

- 761.3

0.6

VG Z

- 171.4

0.2

V_C

3028.5

- 16.7

3011.8

P DIFF CLUTCH CURR

- 4

- 56

52

Y DIFF CLUTCH CURR

4

- 66

70

*ESTIMATED GMB MISTRIM

P - 0.13
Y - 0.08

SYSTEM STATUS

Go

ORIGINATOR

*GMB MISTRIM = G_p - G_s
GP = GBL POS BEFORE BURN
GS = GBL STEADY STATE POS
AFTER IGN .12 P
.74 Y

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
224+20	Checking for AC Roll jets. Have AC/Roll in DAP 1110Z, 1111			
224+21	Turned on AC roll jet and was maneuvering back to Mapping Cam. att. (127, 270, 30). Were out 9° in roll. 0.5° PB Apparently he had BD roll on.			
225+00	Tape P/B of TET. No Fmt 30. Got Fmt 7 & 9 but the CCATS events P/B bit was not set. so we're going to do it all over again. HS Fmt # 30 - MAD only 1 line. for use. also has other HS Fmt # 7-9 from 30's site.			
225+26	Maneuvering to Lun. Surf Photo att. 004, 147, 007 Got to 75° in yaw. CMC killed man. at 75°. Told him to take over manually at 60° but crew was busy. He manually maneuvered to att.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
225+59	V49 to P52 all. - 303, 148, 7			
	P5 Opt. 3			
226+11	N93 Torqued			
	-00015 $\Delta T = 4.71$ hrs - .212 meru			
	-00027 - .382			
	+00004 +.057			
226+14	Opt. 1 to PTC REFSMANT			
	Torqued.			
226+19	V49 to X-Ray pointing AT.			
	(327, 143, 55)			
227+44	AT PTC all. 327, 090, 000			
	Quad Don, A3, C4. He did			
	not have BD Roll in DAP.			
	Did DAP change to R1 11101			
	then later did R2 01111 after			
	we told him to do it. After			
	this, Roll was not deadbanding.			
	Drifted off 8° in Roll to 321.			
	He started PTC manually. Start			
	up was no good so damped rates			
	and started over from square 1.			

RECOMMENDED TEI PROCEDURE

*only change from the
LoI procedure.

G
5-1

GNC
204400

P40 SPS THRUSTING

cb SPS PILOT VLVS(2)
OPEN(VER)
cb EPS GPS(2)-
CLOSE(VER)
EMS FUNC - OFF(VER)
cb. EMS MN A, B(2) - CLOSE

Prethrust Program Complete
Verify SIM PWR DOWN (Nominal)
configuration, pg. S/1-39-40

CMC & ISS - on
Cycle CRYO FANS
SCS - OPERATING
TEST C/W LAMPS

Perform EMS LV TEST & NULL
BIAS CHECK, pg G/2-5

Set ΔVC
EMS FUNC - ΔV
SPS GAUGING - AC1
PUG MODE - NORMAL
OXID FLOW vlv - PRI
BMAG MODE (3) - RATE 2
CMC MODE - FREE
AUTO RCS SELECT(16)-as req'd
LOAD DAP (check roll jets)
ROT CONTR PWR NORM (2) - AC/DC
Set DET

V37E 00E
SC CONT - CMC/AUTO

MNVR TO PAD BURN ATT
V49E

PERFORM BORESIGHT & SXT STAR CHECK
V41 N91E

V37E 40E
(TFI available via N40, N45 or N35)

4 F 50 18 REQUEST MNVR TO FDAI RPY ANGLES (.01°)
(AUTO) BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO
PRO

5 06 18 AUTO MNVR TO FDAI RPY ANGLES (.01°)

THRUSTING (P40's)

DATE 5/24/77 7/14/77

THRUSTING (P40's)

6 F 50 18

REQUEST TRIM MNVR TO FDAI RPY ANGLES
ALIGN S/C ROLL (.01°)
GDC ALIGN

TVC CHECK & PREP

cb STAB CONT SYS (all) - close (Pnl 8)
cb SPS (X) - close 10
SET AVC (verify)
ENS FUNC - LV (verify)
MAN ATT (3) - RATE CMD

ATT DB - MIN
RATE - LOW
TRANS CONT PWR - ON
SCS TVC (2) - RATE CMD
AVCG - LIMP or CSM
TVC CMBL DRIVE P&Y - AUTO

+54:00m
(-06:00)

MN BUS TIE (2) - ON
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
ROT CONTR PWR NORMAL (2) - AC
ROT CONT PWR DIRECT (2) - OFF
BMAG MODE (3) - ATT1/RATE 2
SC CONT - SCS
RUC #2 - ARMED

55:00m
(-05:00)

PRIMARY TVC CHECK

GMBL NOT P1-Y1-START/ON (LMP Confirm)
Verify TRIM CONTROL & SET
Verify MTVC
IF SCS: SCS TVC (2) - AUTO
SC CONT - CMC (SCS)
THC - CM
Verify NO MTVC

SEC TVC CHECK

GMBL NOT P2-Y2-START/ON (LMP Confirm)
SET GPI TRIM
Verify MTVC
THC NEUTRAL
Verify NO MTVC

DATE 3/22/71

G
5-3

Verify GPI returns to 0,0(CMC) or trim
(SCS)

(TRIM) ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
BMAG MODE (3) - RATE 2
PRO
BMAG MODE (3) - ATT1/RATE 2
ENTR

7 F 50 25 00204 GMBL TEST OPTION
(ACCEPT) SC CONT - CMC (verify)
PRO

Monitor GPI Response:
00,02,-02,00,02,-02,00, Trim

*TEST FAIL: *
*SC CONT - SCS *
SCS TVC(2) - AUTO

(REJECT) ENTR

8 06 40 TFI, VG, ΔVM (min-sec,.1fps)
PROG ALARM - TIG Slipped
*V5H9E 01703 *
*KEY RLSE TO 8 *

FDAI SCALE - 5/5

RATE - HIGH
UPDATE DET
SPS He vlvs (2) - AUTO (verify)
Check N2 A and N2 B

58:00
(-02:00) ← ~~cb SPS PILOT VLV MNB - CLOSE~~
~~AV THRUST X(2) NORMAL~~
THC - ARMED
RHC (2) - ARMED
TAPE RCDR - HBR/RCD/FWD/CMD RESET

59:25
(-00:35) DSKY BLANKS

DATE 5/24/71



G
5-4

59:30 (AVE G ON)
(-00:30) EMS MODE - NORMAL

06 40 TFI, VG, ΔVM (min-sec, .1fps)
CHECK PIPA BIAS <2fps for 5 sec

59:XX
(-00:XX) ULLAGE

*If no ULLAGE: *
* DIR ULLAGE PB - PUSH*
* Control Att with RHC*

MONITOR ΔVM (R3) COUNTING UP

59:55
(-00:05)

F 99 40 ENG ON ENABLE REQUEST
(AUTO IGN) PRO AT TFI >0 Sec
(BYPASS IGN) ENTR to 11 (Perform switching in 10)
EXIT - V37E 00E

ΔV THRUST A & B (2) - Normal

9 00:00 IGN *IF SCS: THRUST PB - PUSH*

06 40 TFC, VG, ΔVM (min-sec, .1fps, .1fps)

*F 97 40 SPS Thrust fail *
~~*ΔV THRUST B(A) - NORMAL *~~
*(RESTART) PRO to IGN *
(RECYCLE) ENTR to TIG-05sec

cb SPS PILOT VLV
MNA - CLOSE

cb SPS PILOT
VLV MNA -
CLOSE

DATE

05
00:03

SPS THRUST Lt - ON
→ ~~ΔV THRUST B(A) - NORMAL~~
IF SCS: +X & THRUST PB - PUSH
MONITOR THRUSTING
Pc 95-105 psia
EMS COUNTING DOWN
SPS INJ VLVS (4) - OPEN
SPS He vlvs tb-gray
SPS FUEL/OXID PRESS - 170-195 psia
PUGS - BALANCED

3/22/71
DATE

*

ECO-10sec cb SPS PILOT VLV MNA - OPEN :

G
5-5

XX:XX ECO

10 F 16 40 TFC (STATIC), VG, ΔVM (min-sec,.1fps)
ΔV THRUST A&B - OFF
VERIFY THRUST OFF
SPS INJ VLVS (4) - CLOSED
SPS He vlvs tb (2) - bp
GMBL ITRS (4) - OFF (LMP Confirm)
TVC SERVO PWR 1&2 - OFF
MN BUS TIE (2) - OFF
PRO

11 F 16 85 VG XYZ (CM) (.1fps)
NULL RESIDUALS
RECORD ΔV COUNTER & RESIDUALS ΔVC _____
EMS FUNC - OFF VGX _____
EMS MODE - STBY VGY _____
RHC & THC - LOCKED VGZ _____
ATT DB - MAX
TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT (2) - OFF
BMAG MODE (3) - RATE 2
cb DIRECT ULLAGE (2) - open
cb SPS P1 & Y1 - open
PCM BIT RATE - LOW
MAP CAMR ON - OFF (except lunar orb.)
PAN CAMR PWR - OFF
SM/AC PWR - OFF (except lunar orb.)
PRO (If MINKEY, To Sequencer 3X.2)

cb SPS PILOT VLV MNB-
OPEN

DATE 5/24/71

12 F 37 V82E

13 F 16 44 HA,HP,TFF (.1nm,min-sec)

PRO

14 F 37 00E

PROP CONS

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	There is something about changing the DAP			
	when you're out of the deadband that			
	jet won't fire. We're researching.			
228+16	PTC start up. Only got			
Note!	238% in Roll. I can't			
Booms	guarantee this PTC. Looks like			
are	the two booms out are having			
out.	a big effect on stability. ✓			
	Am getting a THRIFT DE LOG			
	of this entire period of			
	PTC confusion from 227+44 to 228+20.			
	We need some super detective work			
	on it especially why we didn't			
	appear to deadband in Roll after			
	reloading the DAP.			
	Crew trying to go to sleep now			
	but OSO keeps coming up with			
	some new input relative to mapping			
	camera retract, etc. FLIGHT starting			
	to come unglued.			
	Looks like we're go on PTC at			
	least for the 8 hour sleep.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
730409	SPAN/MCN wrote CX-327 about			
	max. maneuver rate with booms			
	extended? and "is it go to extend			
	booms with jets enabled?"			
	Reference 50DB para 3.3-1.1,			
	Item 3.3.1.6 - 2nd paragraph about			
	deactivation of control system <u>before</u>			
	boom extension.			
	Onboard R/O's back at sleep start			
	were 56% 55% 54% 55%			
	The DAP load at the start			
	of every PTC just before the			
	TCM GEC checklist callout is			
	wrong. is (11111) (x1111)			
	should be (11101) (01111)			

PTC Startup @ 227+45

~~SN/C~~

Roll control problem occurred during auto maneuver
to PTC attitude

R = 327

P = 90

Y = 0

Roll drifted thru 327 @ 227+44+02

Configuration @ 227+49+30 roll error = -5°
DAP = AC Roll; jet select = BD roll; ADB = 5°

227+45+30 Crew performed V48 and changed DR1
to 11101 but did ~~not~~ Key PRO

227+45+43 V37E00E and DR1 went to 11111
due to track flag = 0, and max DB Flag = 1

227+59+02 Crew redid V48 and set DR1 = 11101
no change to DR2 DR2 = 11111

227+48+38 V16N20E to monitor gimbal angles
Roll still drifting

227+49+02 V22N46E 01111E to change DR2
to BD roll. This will not work since a ~~different~~
erascable is used to specify roll control in the DAP
V48E must be performed to change that erascable.
DR2 was 01111 at this time with DAP AC roll.

227+55+45 P20 selected N79 = -0.3752, .51

Roll control still not established

227+59+04 P20 completed and -0.4°/s commanded
in roll, configuration still wrong

227+59+16 CMC mode Free; roll error zeroed

227+59+18 V37E20E P20 restarted, command rate
zeroed

227+59+38 CMC mode-Auto

227+59+42 P20 executed with commanded
rate = $-0.4^\circ/s$ (still no control)

227+59+57 CMC mode Free ; roll error persisted

228+00+02 V48 performed which configured
DAP to BD roll - still in free mode

228+01+10 CMC mode-Auto with $-0.4^\circ/s$
commanded and roll spinup started

~~228+01+26~~ (13) - Roll jet firings occurred

228+01+36 V37 EOE killed commanded
rate and returned to $0.5^\circ ADB$

(16) + Roll jet firings occurred
Crew then did V49 maneuver to PTC
attitude, damped rates and did a
proper PTC start.

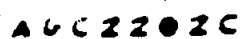
Ref

71

73.375

二、

20



- 1.340

START 5/C-220:16:02

END-220 114 103

OPR 1

7

A3-00

0

8

7

1

L7140

UPDATE RATE

49 SEC

PTC UP-25

POINTS 1/2

LIVE DATA

ANT 0 VS 1

A6C2291C:XR

CF9460=OL

3.932

37.667

100

20

50

10

0

0

-50

-10

-100

-20

-25

-0

0

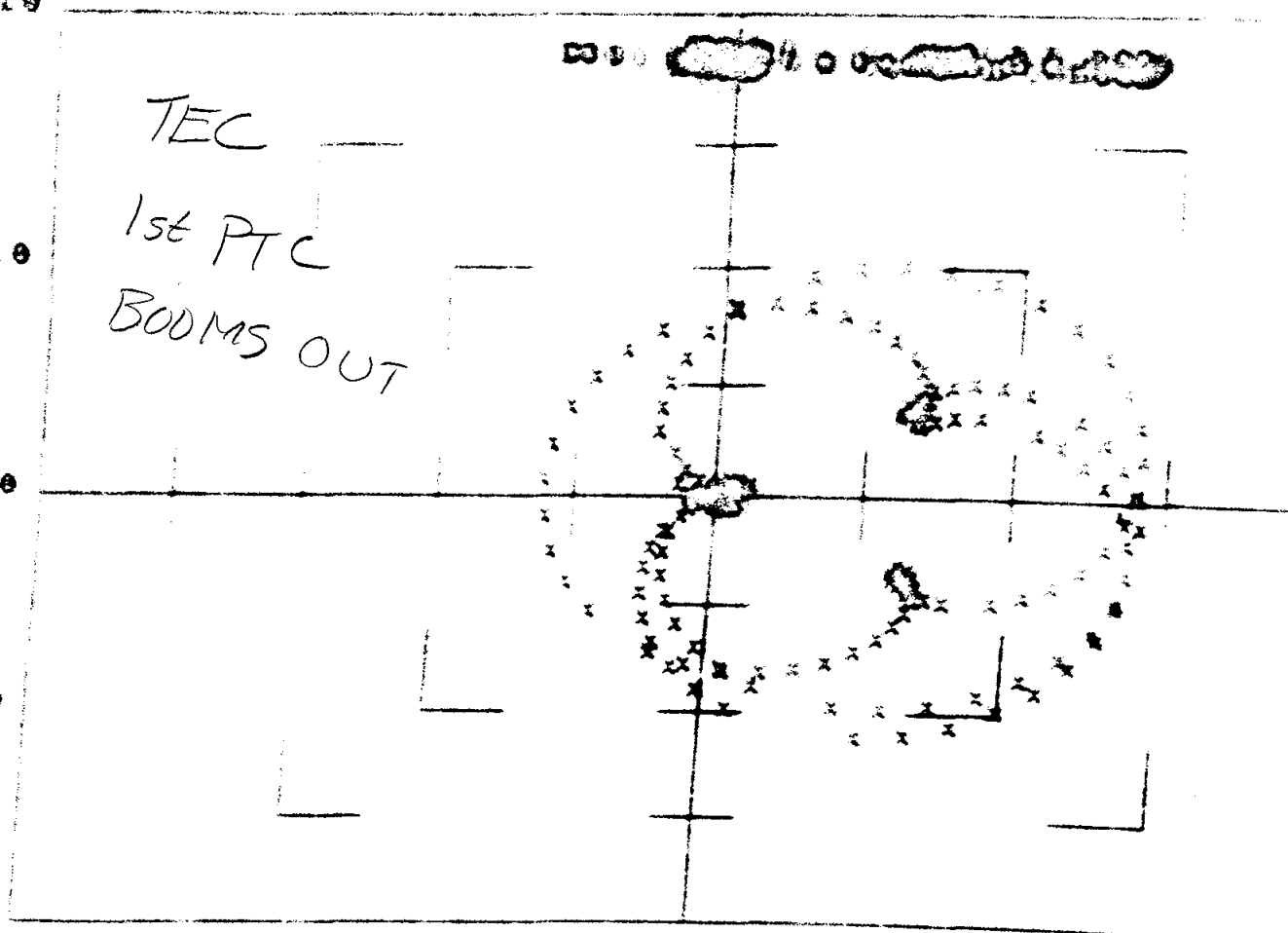
A6C2202C

7.207

START S/C=230:07:27

GND=230:07:25

TEC
1st PTC
BOOMS OUT



0

5

HRU

6

MIN 3

3

SEC 1

5

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
231425	JOE ON CONSOLE			
	MCC 5 → 238+48			
232+10	PASSED MCC5 PREDICTED WT & UP-TO-DATE CONSUMABLES STATUS TO RETRO. ALSO TOLD RETRO THAT MCC5 SHOULD BE 2-JET B/D TRANSLATION.			
232+46	HAD M&D REPLACE BURNED OUT BULBS IN JET B4 LITE & QUAD B OK LITE			
234+06	RECEIVED FLIGHT PLAN AND CONSOLE CVA PROCEDURE UPDATE → SEE CHITS C-316			
234+28	WINDLER DOESN'T WANT TO UPDATE FLIGHT PLAN WITH ATT DB-MIN, RATE-LO LIMIT CYCLE-ON & DAP R2 20017 CHANGE. I HAD TO GO ALONG WITH HIM. HIS COMPLAINT IS THAT TOO MUCH IS BEING READ UP; THEREFORE CHANGE ONLY THAT WHICH IS REALLY NECESSARY!			
235+37	GAVE CAPCOM & FLT CONSUMABLES UPDATE A3 40 3% 1 1 114			

FLIGHT DIR MISSION LOG		DAY	REV	PG
		10	35	
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
235+39	RECEIVED CHIT 331 ABOUT FLIPPING CAMERA WHICH WILL NOT PERFORM. THEY RECOMMENDED INITIATING A2 + R1			
235+57	PLACED SOME DAP LOAD CHANGES IN FLT PLAN. THEY WERE READ UP TO CREW AT THIS TIME. SEE CHANGES IN FLT PLAN FOR 247:28, 248:00, 251+04, 251:17, 252+00			
236+06	RETRO ASKED RT FOR 10FPS MCC-7 ANS. → 2 jet - 46 sec 4 jet - 23 sec			
236P2	P52 GET 236+25+30 TORQUE TIME			
	¹¹⁷³ +00019 0.12 menu Δ 10.2 hrs -00031 -0.20 +00027 0.18			
236+34	GAMMA BOOM IS RETRACTED NOW.			
236+38	WNV R TO OFFICE CUL ART			
236+41	NO MCC5 ONLY DIFPS. WE WILL PROBABLY DO MCC7			
236+44	RE OFFICE CUL ART.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
237+	LOOKING INTO EVA CONSTRAINTS			
	FAD SAYS SUN LOOK LS ARE			
	$\theta = 145^\circ$ $\phi = 314.5^\circ$ 310-360 CONSTRAINT			
238+14	-R -P -S -Y A ₂ A ₄ B ₇ B ₄ MUST INHIBIT TO KEEP FROM DAMAGING MAPPING CAMERA CASSETT NO PROBLEM → EVA UV PHOTO → WE HAVE PROBLEM CORONA WINDOW → PROBLEM (BUT They'll do it in Free)			
238+31	FAD SAYS CORONA WINDOW CAL. WILL BE IN FREE & UV PHOTO WILL BE AFTER EVA.			
238+45	MASS SPEC ROOM HAS TROUBLE COMING IN.			
238+48	CAPCOM TOLD CREW TO LEAVE OFF A ₂ , A ₄ , B ₇ , B ₄ CREW SAYS OK.			
	COM ON			
	-P C4 > +P C3			
	-Y D4 > +Y D3			
	1.9% FROM CAPE - MEASURED			
	ROLL BMAG PRIET.			
	HAVE 2 80# TO PLAY WITH IN 10			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
240+59+30	START MAN TO EVA ACT			
	352, 63, 50			
241+17	10 SCS FOR EVA.			
241+42	Suits OK			
	$ \begin{array}{r} 10 \text{ min} = 600 \text{ PUL/HR} \\ \cdot 0055 \\ \hline 600 \\ 3,3000 \text{ \# / HR} \end{array} $			
241+50	$ \begin{array}{r} 15 \text{ min} = 900 \text{ PUL/HR} = 5 \text{ \# / HR} \end{array} $			
242+00	HNDL IN LATCH			
	HATCH OPEN			
242+06	GETTING T/V SIG.			
	MAPPING CAM ALL THE WAY			
	OUT.			
	JET FIRINGS SETTLED DOWN			
	AFTER AL LEFT HATCH AND			
	WENT EXTERNAL.			
242+10	IN FOOT RESTRAINT			
242+14	PAN CAM INSIDE.			

MAY 27, 1971

Note of Interest

Subject: CSM EVA Attitude Control for RCS Auto Coil Fail - OFF

1. The following procedure will provide attitude control of the S/C in the event of a failure of the Auto SMRCS thruster coil and not violate the RCS thruster constraints.

2. Assumptions:

a. The S/C is configured as per check ^{list} ~~bit~~ for nominal CSM EVA with the following thruster configuration:

ALL QD A - OFF

ALL QD B - OFF

D1 and D2 - OFF

b. The remaining 6 jets "ON" will provide single jet/axis control.

c. Jet D1 can be used if required (no constraint).

3. The S/C switch configuration changes are listed for each jet ~~fail~~ ^{OFF} case.

FAILED
JET

CORRECTIVE
ACTION

C1

AUTO RCS SEL D1 - MNA/MTB

RATE - LOW

SC-CONT - SCS

BMAG MODES (3) - ATT 1/2

LIMIT CYCLE - ON

C2

RHC PWR NORM 2 - OFF

SCS 2 CONTR/DIRECT MNA CB70 - OPEN

ROT CONTR PWR DIR 2 - MNA/MTB

SM RCS PRPLNT QDA - CLOSE

NOTE: At this point it is necessary to vent engine feedlines in Quad A.

USE RHC 2 IN DIRECT MODE ONLY FOR MINUS ROLL ROTATION.

JET
FAILED

FOR
SIM DAY
CONFIG

CORRECTIVE
ACTION

C3

OUT NOW *

RHC PWR NORM 2 - OFF
SCS 2 CONTR/DIRECT MNA CB70-OPEN
ROT CONTR PWR DIR 2 - MNA/MNB
USE RHC 2 IN DIRECT MODE ONLY
FOR PLUS PITCH ROTATION

C4 AND A4

OUT NOW *

RHC PWR NORM 2 - OFF
SCS 2 CONTR/DIRECT MNB CBT⁷¹ - OPEN
ROT CONTR PWR DIR 2 - MNA/MNB
USE RHC 2 IN DIRECT MODE ONLY
FOR MINUS PITCH ROTATION

D3

OUT NOW *

RHC PWR NORM 2 - OFF
SCS 2 CONTR/DIRECT MNB CB71 - OPEN
ROT CONTR PWR DIR 2 - MNA/MNB
USE RHC 2 IN DIRECT MODE ONLY
FOR PLUS YAW ROTATION

D4 AND B3

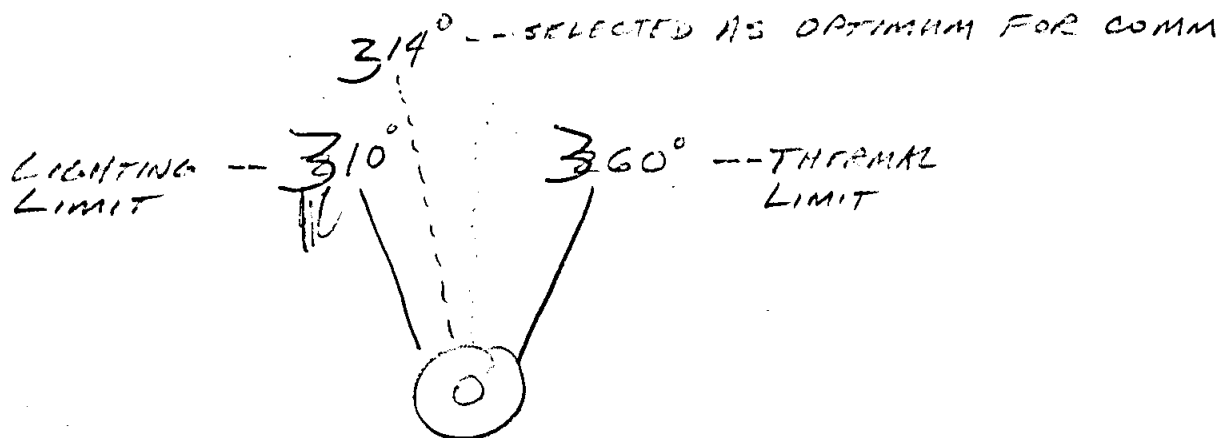
OUT NOW *

RHC PWR NORM 2 - OFF
SCS 2 CONTR/DIRECT MNA CB70-OPEN
ROT CONTR PWR DIR 2 - MNA/MNB
USE RHC 2 IN DIRECT MODE ONLY
FOR MINUS YAW ROTATION

4. In the C1 fail case the mode of auto control is SCS. In the C2 fail case, it is necessary to disable quad A with prop iso valves to prevent A2 thruster fire when using the RHC in direct mode for minus roll control while the CMC is in control of all other axis and plus roll. In the C3, C4, D3 and D4 fail cases, the CMC is in control of all axis while the RHC direct mode is used for the failed jet only.

Frank DiGenova
FRANK DIGENOVA

$\phi \neq$ FOR EVA ATT HOLD



CREW SELECTED SCS ATT HOLD TO
GIVE BETTER CONTROL IN EVENT
FAILED ON JETT

BMAG DRIFT IS SUCH THAT COULD BRST
LIGHTING LIMIT

CHOICE

GEN ATT HOLD WOULD BE GOOD @ 214

335° WOULD KEEP HS IN THE MIDDLE ON
SCS

HL

V49 TO ORIG
ATT & RECASE

NASA's Captain Video

THE stunning telecasts from Apollo 15's landing site involved an army of technicians, a worldwide network of tracking stations and a remarkable new \$582,000 color camera developed by RCA. Yet if any single person can be credited with the success of the lunar sound-and-light show, he is a quiet, cherubic-looking NASA engineer named Edward T. Fendell, 39, who clearly ranks as the space agency's own Captain Video.

It was Fendell's responsibility to control the moon rover's camera during the astronauts' lunar explorations. Sitting at his large, 15-button console in Houston, Fendell operated the RCA camera from a quarter of a million miles away. With a push of the appropriate button, he could swing it across

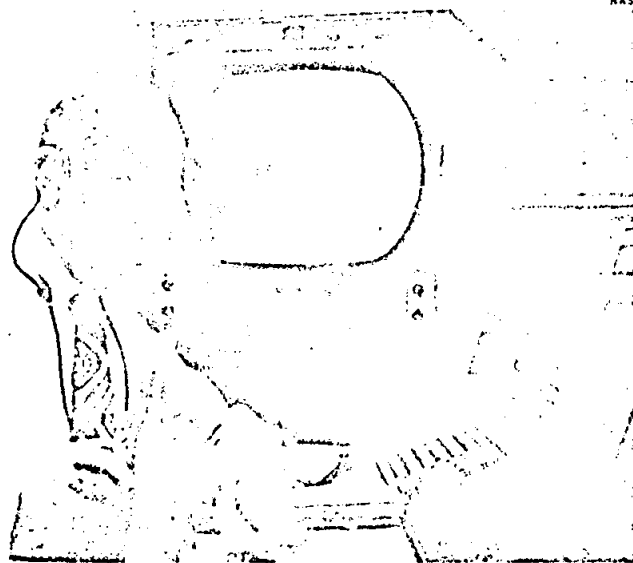
the mountain-ringed horizon, raise it up to focus on a peak or lower it to peer down Hadley Rille. He could zoom in on the astronauts for a closeup or even adjust the lens opening to compensate for the moon's harsh lighting conditions.

For all the technological help at his disposal, the job was unusually tricky. Because radio signals travel at the speed of light—186,000 miles per second—Fendell's commands took 1.8 seconds to reach the camera. Another three seconds elapsed before the image arrived back in Houston (the extra time was needed to convert the signals into a standard TV picture). Thus, before he or his assistant, Al Pennington, 27, saw the camera's response to their commands, a total of nearly five full seconds had gone by.

Mastering such sluggish, long-distance photography required painstaking months of rehearsal during which electronic time delays were built into the system's circuitry to simulate the moon's distance. Perhaps just as difficult was the need to satisfy the conflicting demands of two masters: scientists and the public. NASA's geologists were primarily interested in terrain and rocks, while NASA's public relations men and the television networks wanted to focus on the astronauts themselves for a maximum amount of time. NASA worked out a compromise to appease both scientific inquiry and public curiosity.

At the beginning of every stop along the rover's route (there were no telecasts while the car was moving because its high-gain antenna could not be kept aligned with the earth), Fendell's "shooting script" called for what was dubbed a "WAP," or wide-angle panorama. The camera slowly swept in a full circle around the horizon, enabling the scientists in Mission Control's science support room to take a series of overlapping Polaroid snapshots off their TV monitor, quickly study them for any oddity and then request Fendell to zoom in on it. Such a closeup was called a "NATO," or narrow-angle target of opportunity. While the scientists pored over their pictures, Fendell adroitly mixed his WAPs and NATOs with numerous shots of the moon walkers.

An electronics engineer with no previous TV experience, Fendell faced his toughest challenge at the end of the lunar visit. Left behind on the moon along with the rover, the remote-controlled camera was scheduled to give the world its first pictures of a lunar lift-off taken from the moon's surface. Because of the nagging time lags, Fendell could not afford to look at the TV monitor himself. He had to go completely by the clock. At exactly T-minus-zero, Fendell had to begin tilting the camera upward. Thus, by the time his command reached the moon, the camera would—he hoped—follow *Falcon's* ascent stage until it drifted off the tube. Then, in order to bring it back into sight, Fendell would have to press another button precisely two seconds after lift-off, ordering the camera to pull back to a wide-angle view. Noting NASA's—and the public's—keen interest in watching the lunar lift-off, Fendell conceded that "if we don't see it, I'd better get out of town."



FENDELL AT CONSOLE IN MISSION CONTROL

OPR 2

A3-20

0

8

7 1

L2139

NPU TOTAL

-25

UPDATE RATE

30

SEC

POINTS

120

LIVE DATA

GN R ERR

GN P ERR

GN Y ERR

AGC8300C=XL

BAXSATERRK1=OL

OGANGLERRK2=+R

105.161

-59.930

-9.437

3.0 1.0

2.0 0.0

1.0 -1.0

0.0 -2.0

-1.0 -3.0

TIME2TIME1

59:30

START

S/C=241:59:37

GND=241:59:30

G/N ERRORS
5/R-GUTTER SCS

.05 R. $\frac{1}{4}$
0.13 P. $\frac{1}{4}$
53. B. $\frac{1}{4}$

Frank D. says words
need to be modified
to $\sim 0.3^\circ/\text{hr.}$ for
3 axis.

Joe D.

DAY 0

5

HR 1

6

MIN 3

3

SEC 3

1

2

0

A2-MO

0

8

YR

7

1

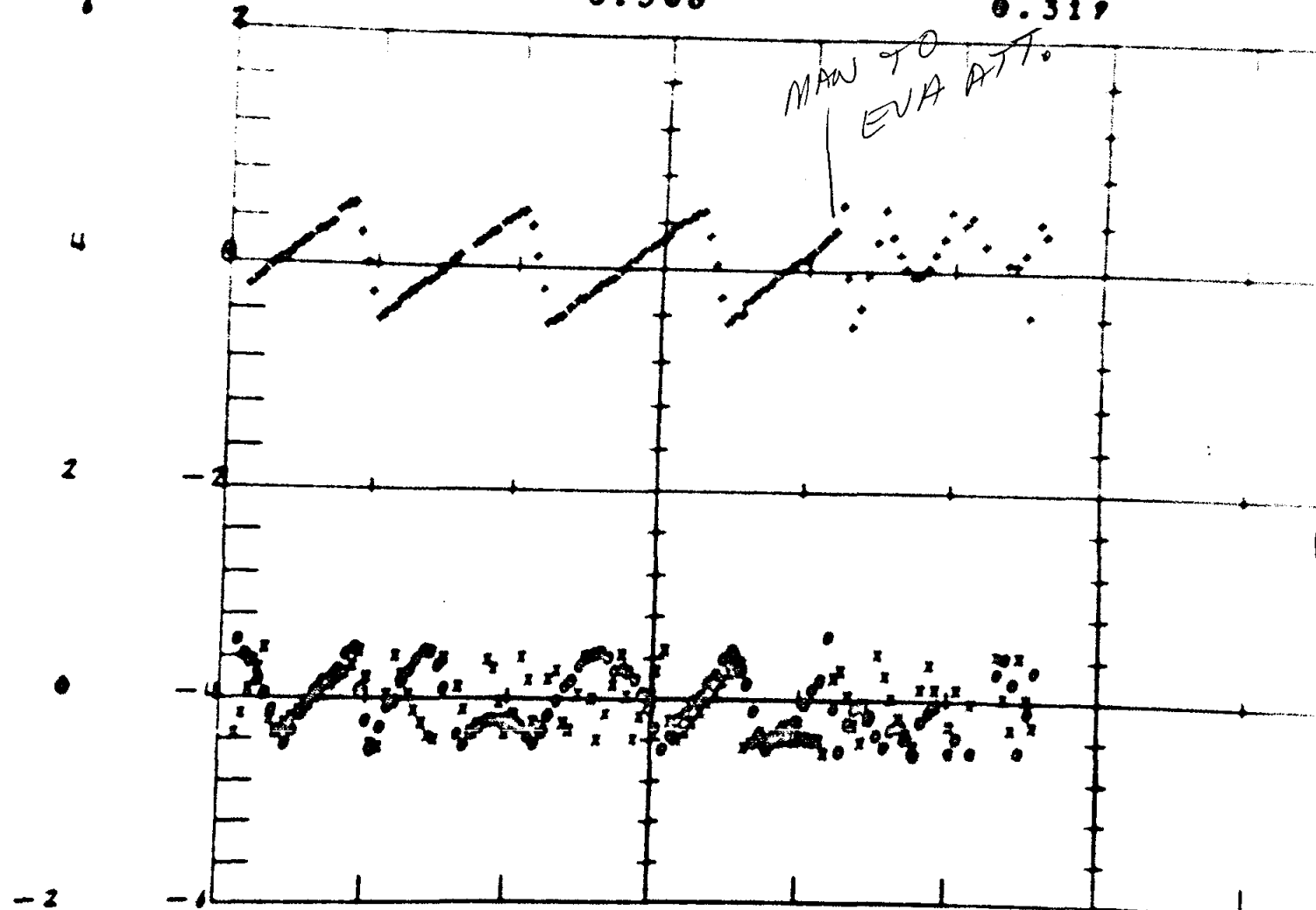
DATE
GN R ERR
ERRORX L
-0.231

30SEC MPU TOTAL
POINTS
GN P ERR
ERRORFO L
0.300

U-25
111

LIVE DATA
GN Y ERR
ERRORF R
0.317

00000000
NSR00L



TIME TIME 1

55:36

30

START

S/C=240:17:47

GND=240:17:40

AY 0

5

HR 1

4

MIN 4

8

SEC 0

2

OPR 2

A3-MQ

0

8

7 1

1119

WPU TOTAL

U-25

UPDATE RATE

39 SEC

POINTS

55

LIVE DATA

GN R ERR

GN P ERR

GN Y ERR

AGC8390C=X L

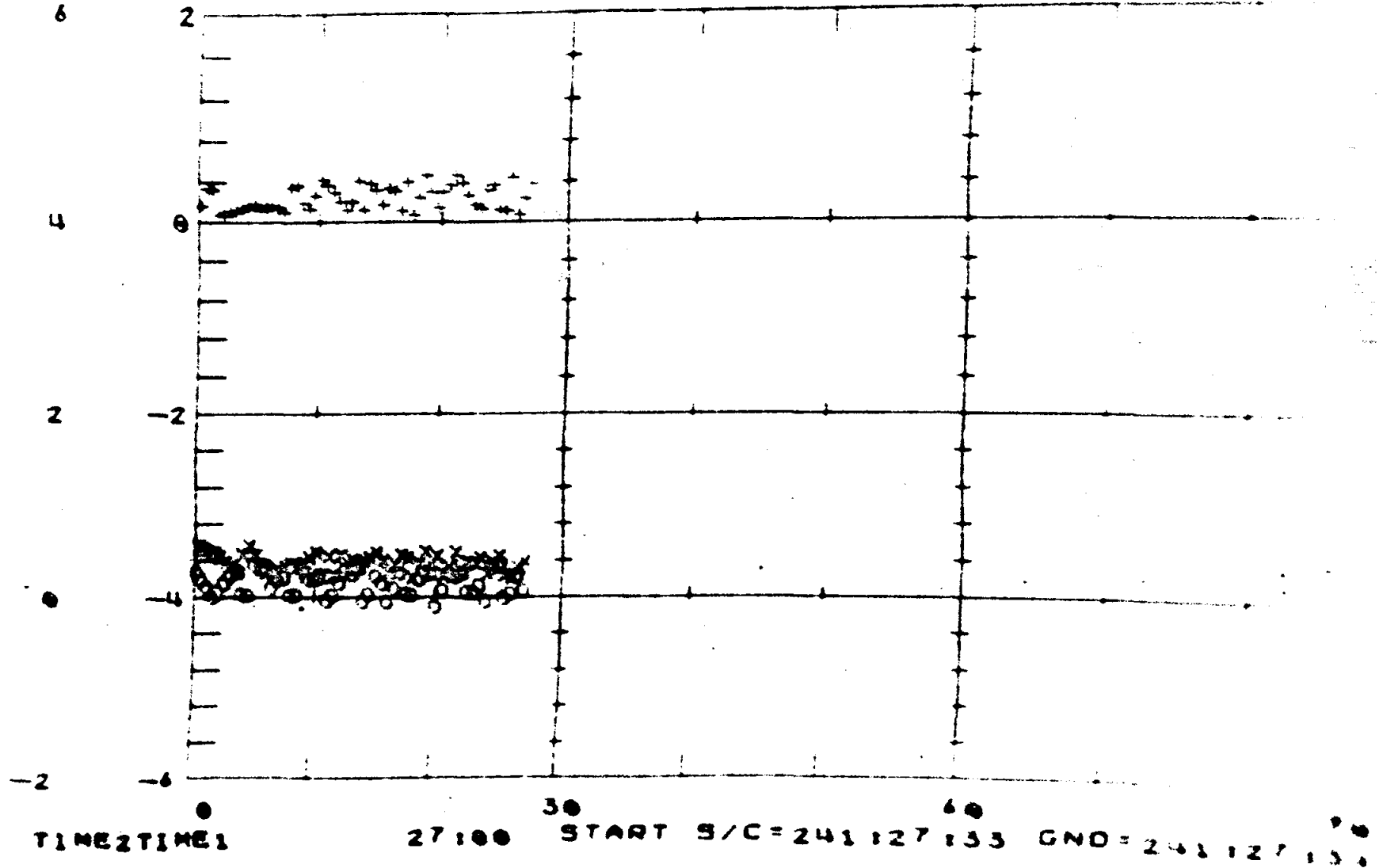
BAXSATERRK1=0 L

OGANGLERRK2=+R

9.352

9.944

9.396



DAY 0

5

HR 1

5

MIN

8

SEC 4

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
242+15	REST BREAK.			
	COVER JAMMED ON MASS SPEC.			
	NOW CHANGED AND FOUND.			
	MASS SPEC FULLY RETRACTED			
	& COVER NOT FULLY CLOSED.			
	CAN SEE GUIDEPINS			
242+27	CABIN COMING UP.			
242+30	TV			
242+51	WENT TO CMC TO MANUEVER			
	TO			
	MAP CMC IS ONLY EXTENDED			
	3/4" AND THEY ^{SPAR} STILL WANT			
	AZ & BI INHIBITED.			
243+25	GRIFF TOLD CREW TO			
	DISABLE AZ & BI.			
	& VERIFIED VIA T/M.			
244+00	RETRO HAS CONFIGURED EQ4			
	WITH MISC. AS RESULT OF			
	EVA THROWN AWAY.			
	210, 242, 322			
245+43	ASKING CREW EVA QUESTIONS.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	TRYING TO TELL ACQ/MAP			
	CAMERA JAMMED.			
245+50	ATT ERRORS CALIBING - ASSUME RECS			
	DOING A GDC ALIGN.			
247+20	NAK on - Reviewing night activities			
	1. Two PTC startups			
	a. 1st-use FLR PLAN procedure.			
	Boom retraction			
247+50	UV photo att (210, 242, 322)			
247+56	V49 start to PTC att. (203, 90, 00)			
248+01	1st retraction of mass spec boom			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
248+15	PTC spinup $-.245^\circ/\text{s}$ -good startup.			
	Gamma out 15', mass out 20'.			
	24 min. for 360° rev.			
248+22	Mass retract to 15'.			
	I Roll rate $= -.250^\circ/\text{s}$			
248+41	Mass retract to 10'			
	I Roll rate $= -.254^\circ/\text{s}$			
249+02	Mass retract to 5'			
	I Roll rate $= -.257$			
249+30	Mass spec. Boom deploying.			
	3+25 min to deploy "fully", 25'			
	Roll R $= -.244$			
250+00	MCC7 = 1.7 fps . No MCC 6.			
250+50	Told flt we'd like to use a			
	N79 of $-.42^\circ/\text{s}$ for the next			
	PTC spin up. Should get a			
	much more stable spin with			
	both booms out.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
251+00	P 52			
	+0000 8 $\Delta T=14.58$ +0365 more			
	-00067 - .3063 "			
	+00034 + .1554 "			
	Should use A3, C4, B3, D4 &			
	B2, D1 for roll			
	to come out of PTC.			
251+12+15	Stopped PTC using $\uparrow$			
	V49 to optics cal att. (66,152,350)			
251+21	V49 to P23 att. (84,141,330)			
	Good P23's			
251+45	PGM Cant. Alarm 116 - optics ^{zero} switch			
	altered before 15 sec. zero time			
	elapsed. He was zeroing			
	optics & moved suu apparently no sweat.			
251+50	Optics Pwr off.			
251+51	V49 to PTC att. (085,090,000)			
251+56	Hold att. for PTC, Qual D. & A3, C4			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
251+57+30	Doing Gamma ray boom deploy now so we don't have any boom perturbations after our spin up.			
	BZ, PZ			
252+05+30	Spin up for PTC. Roll R = -.265 Loaded -.42% in N79. Looks good.			
252+22	pre-sleep cklist 56% 50% 48% 52%			
252+25+38	Config. for sleep early-arranging!			
	Had N2O cycling on DSKY & we don't want the DSKY relays cycling all night. OKay he went to P00-we're in good shape now. Did not tell him to kill N2O in P20. He was just looking at his roll rate I think.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
255+00	UP 42 is now configured to plot CM RCS press & temp.			
255+31	JOE ON CONSOLE			
	UP 24 HE MANF PRESS (2) → 9 HRS			
	UP 42 HE TK PRESS TEMPS → 9 HRS			
255+45	UP'S CONFIGURED OK			
	AE, RE			
257+53	DISCOVERED THAT 1st digit of CONSOLE CLOCK WILL NOT SHOW "1" (its blank).			
	Entry Checklist Review :			
OK	Pg E 1-4 / step 33 : If sys test meter malfunctioned; perform pre-heat for 20 min (not if temps are "90" at EI-6 hr readout). DAK			
OK	Pg E 1-6 / step 38 : add SPS PILOT VLVS (2) - OPEN (VER)			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
016	Pg E 2-2 / Step 6 : add (VERIFY)			
	to SIMPCS SEC PRPLOT FUEL PRESS(4)-OPEN			
	Pg E 2-6 / Step 21 : add			
	cb EMS (2) - OPEN			
259+47	OX T2 PCT OFF SCALE HIGH IN HOUSE			
	R/S REPORTS 1 PCM COUNT.			
	WE ARE NOT GETTING ^{SMS} BROADCAST TO			
	BLDN45 NETWORK WORKING ON IT.			
259+56	HSK is output full scale OX T2 PCT			
	WHEN DI IS 1 PCM COUNT.			
260+19	* LONGEST APOLLO MISSION *			
	* GEMINI 7 WAS LONGEST of all.			
261+35	CONSUMABLES UPDATE			
	38 42 39 32 38			
261+39	JETS CONFIGURED OK GOING TO X-RAY			
	ATT. 226.0 0.0 550.0			
	STOPPED PTC			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
262+30	PASSED WTS PREDICTION TO RETRO FOR C-IT 2.72158			
	P52			
	-00017 ^{MFRU} -0.09 TORQUE 262+57+00			
	-00074 -0.41 TIME Δ AT 12.0			
	+00021 +0.12			
263+08	CREW READ DOWN ^{JOINT} 38 42 32 39 38 3.1 32 23 48 50 40			
263+17	OPTICS CHL HIT. 66, 152, 550			
263+30	WATSON ON			
	PROP DATA			
	1 SEC 4 JET = .426 FPS			
	SPS MIN IMPULSE:			
	4 JET 14 SEC ULLAGE = 5.85 FPS			
	0.5 FPS SPS = 11.2 FPS			
	$\Delta V = 17.05$ FPS MIN			
264+00	SPAU CHIT C-354 - THERMAL CONSTRAINTS ON PHOTO ATTS - WILL SET UP "UP 3" SR 5076, 75, 5015, 16 LIMIT 126°. C&D H5TK TEMP, C&D F0TK TEMP.			
264+05	CREW REPORTED GLITCH WHEN STARTING V49 - LOOKS LIKE HE LOADED N/20			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	INSTEAD OF N22 FOR MNVR.			
	GOT FDAI OUT OF SYNC WITH			
	PLATFORM. GETTING D/TV P.B.			
	DID V40 N20 E. EVERYTHING OKAY.			
264+20	OPTICS IN CMC STILL. ZEROED. OKAY			
264+25	PLAY BACK CONFIRMS LOADED N20			
	VIG N22. GETTING THRIFT FOR RECORD			
264+33	GO FOR PTC. -0.42 LOADED FOR RATE			
	JITS RIGHT			
264+35	RATES $\sim -0.43^\circ/\text{sec}$ IN ROLL			
	BOOMS ARE BOTH OUT.			
	MORE ON GLITCH — CREW SAID THEY			
	WERE LOADING N22 (REALLY N20) R3			
	WHEN GLITCH OCCURRED. THEY SAW $\sim 1^\circ/\text{sec}$			
	RATE IN PITCH, WENT SCS CONTROL, SLOWED			
	RATE, BACK TO CMC, RATES OKAY			
264+47	FROM EVENT RECORDER — 2 FIRINGS			
	IN ROLL PROBABLY. CHART SHOWS 400 MS			
	PULSE WHICH IS AT LEAST 2 FIRINGS. CREW			
	DID PROCEDURE EXACTLY BY THE CLIST.			
	WENT TO FREE ALMOST IMMED. AFTER PRO.			
	(0.5 SEC FROM RECORDER)			
264+53	UPDATE FROM GEN — APPEARS WE GOT 1 FIRING.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	SECOND FIRING SHOULD OCCUR ~ 3.44			
	SEC. LATER (MIT DATA) BUT WE WENT			
	TO FREE AS PTC C/L AND GOT NO SECOND			
	FIRING. 1st FIRST FIRING WAS BETWEEN			
	200-400 MSEC IN LENGTH. PTC GATE			
	~ 430 MS THEORETICAL FOR .43%/SEC RATE			
	IT WOULD BE NICE TO HAVE A RED			
	LIGHT THAT WOULD ILLUMINATE WHEN			
	THE ISS ATT'S AND ACNU'S DIFFER BY			
	SOME MED VALUE. COMMENTS?			
266+12	GEN SPOKE WITH JOE TURNBULL - MIT ABOUT			
	HIGH POLL RATE ON THIS PTC. HAD NO EXPLANATION			
	EXCEPT MIGHT BE SECOND FIRING. HE WILL			
	THINK ABOUT IT THOUGH.			
266+36	TURNBULL NOW SAYS ~ 80-90 MS			
	TOTAL FOR .43% RATE.			
	$T = I \times R \Rightarrow \sim 100 \text{ MS}$. $\therefore$ PROBABLY GOT			
	TWO FIRINGS WITHIN ~ .5 SEC.			
267+14	CREW READING DOWN STORAGE DATA			
	PTC HOUSING IN IT ABOUT 7° HALF			
	CONE AHEAD			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
267+28	BOOM 113 (GAMMA RAY) ROLL RATE = -455%/s			
	PTC DOWNWENT BASE STABLE.			
267+32	PS2			
	N05 00000	FLGRU		
	N93's - 00005	- 0.072		
	- 00006	- 0.086		
	+ 00019	+ 0.27		
	Toward 267+36 +00	$\Delta t = 4.65$		
267+39	STOP PTC - V49 TO THERMAL ATT			
	SIMBAY JET CONFIG.			
267+49	AT THERMAL ATT			
268+27	STARTED MANUEVER TO UV PHOTO ATT.			
268+32	IN ATTITUDE			
	STOWED HI GAIN - NOW HAVE			
	HBR ON OMNIS.			
268+35	CMC-FREE			
	GIVING CREW FP UPDATES			
268+48	MANV. TO ECLIPSE PHOTO ATT.			
269+05	CMC-FREE FOR LUNAR ECLIPSE			
269+11	PITCH ERROR - 3.5°			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
269+30	AUTO - PHOTOS FINISHED.			
269+48	CONTINUATION PHOTO C/L IN FLT PLAN.			
	NOISY DATA - SITE HAS LOWER SIGNAL			
	STRENGTH THAN PREVIOUS ONE.			
269+52	P52 FOR SEXTANT PHOTO TEST.			
269+55	GOING LBR FOR BETTER DATA			
270+00	HBR			
270+15	AT TV ATT			
270+24	TV PRESS CONF.			
	OPTICS STILL IN CMC - P52 AT			
	271+40			
270+57	FEED FOR LUNAR PHOTOS.			
271+18	AUTO TO CONT. PHOTO ATT			
271+24	AT CONT PHOTO ATT.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
271+30	JAK ON			
	IN Contam. Photo ill. (14, 15, 16)			
	WPU 122 112 91 113			
271+54+30	P52			
	+000 29 $\Delta T = 4.316$ +.448 mem			
	-000 18 -.278 "			
	+000 1 +.015 "			
272+03	Dumping water/urine for contam. photos.			
272+13	Crew report that EMS entry ck was fine (check was performed about 2 hrs previous).			
	SPAN says to watch the following			
	temp. for fract. mech. limits			
	<u>Quad D</u> LIMIT			
	OX FDLNT SR 5072 126°			
	FUTK SURF T SR 5076 126			
	<u>SPS</u>			
	FUSUMPTKT SP 0056 ?			
	SPAN (45) is going to call the			
	shots on this line.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
273+14	P23 att. (66, 152, 350)			
274+10	V49 to XRAY pt att (306, 82, 30)			
274+45	V49 to next xray att (196, 346, 012)			
	CM RCS INT. TEMPS			
275+15	Systems Test Meter R/O's			
	5C 4.2 ^{VDC}	34°F ← CSM SYS HDBK		
	5D 3.9	28°F Rule is "if 3.9 volts (28°F)		
	6A 4.1	32°F or greater, emit preheat.		
	6B 4.2	34°F		
	6C 5.0	50°F		
	6D 4.5	40°F		
	5D is Ring 2 + Yaw jet.			
	Using the onboard-display meas.			
	cal. curve for 5D which is			
	CR2116T, 3.9 VDC = 29°F,			
	We expect the temps to increase			
	rather than decrease from the			
	point on to EI.			

FLIGHT DIR MISSION LOG		DAY		REV		PG	
SITE/ACQ/LOS		FLIGHT EVENTS/HISTORY/BRIEFING					
		Here's a CM RCS Temp Cal. Curve Summary					
systest pos.		Jet	Axis	Ring	VPC @ 2.8°F	Meas. No.	
5C		24	-P	2	3.90	CR2110T	
5D		25	+Y	2	3.83	CR2116T	
6A		12	-R	1	3.88	CR2114T	
6B		14	-P	1	3.85	CR2100T	
6C		16	-Y	1	3.82	CR2103T	
6D		21	+R	2	3.86	CR2119T	
		Obviously the crew can't read					
		to a hundreth so no preheat					
		req'd if $\geq 3.9V$					
276+22		V49 to P23 AM.					
276+50		Getting thrift delay of PTC spinny					
		from earlier today at 264+35					
		for G & N analysis of $-.43^\circ/s$ Roll					
		rate.					

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
277+19	V49 to PTC out (087,090,000)			
277+29+27	PTC start. Doesn't look too great, Left N20 on dslcy again tonight B2, D2 still on - okay now off.			
277+44	Called him & told him not to cycle the dslcy on V16N20 all night. DSKY is cleared. Sleep start.			
	PTC Roll rate $-.262$ Loops not too tight on this one but should be okay.			
278+44	JOE ON CONSOLE			

PTC Start 264 + 33

264 + 32 + 36 Crew reconfigured jet selects
for -Roll only

264 + 32 + 46 Vehicle reached the -0.5° dead-
band and attempted to fire the +Roll jets
which were disabled. The rate filter anti-
cipates new rates from the jet firings ~~and~~^{by}
incorporating jet firings into ADOT estimation.
Erroneous Roll ADOT occurred at this time.

264 + 33 + 24 P20 (2) was completed; Roll
ADOT was $+0.2\%$ at this time due to
the disabled +Roll jets. A rate command
of $WBODY = -0.42\%$ was entered in the
CMC for the desired PTC rate. The DAP
Commands jet firings based on rate error
(EDOT). EDOT at this time was:

$$\begin{aligned} EDOT &= ADOT - WBODY \\ &= 0.2\% - (-0.42\%) = 0.62\% \end{aligned}$$

Since the jet firing will produce 72%
of the rate commanded the resulting
rate (produced by the -Roll jets to
counteract the $+0.62\%$ rate error)
was -0.45% . The Actual roll rate
at this time was in the order of
 -0.01 to -0.02% before the spin up. The
 -0.4% PTC rate was due to the disabling
of the +Roll jets before spinup *Ref*.

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
282+00	FELT (WINDLER) ASKED WHY DON'T WE TIGHTEN UP OUR CONTRITE CRITICAL LIMITS DURING THE SLEEP PERIOD, ESPECIALLY SINCE WE ARE NOT PARTICULARLY ALERT OURSELVES DURING THE GRAVEYARD SILENCE. HE WAS MAINLY REFERRING TO SLEEP LENSES. I TOLD HIM ABOUT ALL THE EYES WE HAVE ON THE OPER CUM LITTS, AND ABOUT FAST/SLOW LEAR PHILOSOPHY, ETC. HE WOULD LIKE US TO GO AWAY AND THINK ABOUT IT FOR ABOUT 16. I AGREE. WE SHOULD RE-EXAMINE OUR CRIT LIMIT PHILOSOPHY. S. Carlin			
283+07	WE ARE TRYING TO PICK THE RIGHT WAKEUP MUSIC. SO FAR HAWAIIAN MUSIC HAS THE INSIDE TRACK			
	RETRO SENS MCC 7 TIME IS 291+57			
284+02	CHANGING TO TEC SCALE FOR WPU THRIFT			
	PHOTS			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
284+22	PASSED TO RETRO WTS PREDICT FOR MCC-7			
	CSM CONSUMABLES UPDATE 41, 36, 30, 37 TOT 36			
	FLT-			
	WANTS TO GO COUPLED TO NV PHOTO ATT. AND GO FREE.			
287+23	TOLD RETRO 4-JET TRANS $\Delta V = 5.6 \text{ FT/S}$			
287+34	WATSON ON			
	ADDG2 TO ENTRY $\pm 1/2$ E 1-G PNL 8 SPS PHOT V/LVS MIN/MAX (2) - OPEN (1/2)			
287+48	DISCUSSION ABOUT ROOMS BEING OUT AT SM SEP. SPAN SAYS NO PROBLEM, I'M NOT SURE MYSELF. IF ROOMS ARE OUT, WE MIGHT THINK ABOUT A/C ONLY FOR JET. (C-370)			
287+48	LOOKING AT SITUATION IF B-D PROP ISO'S CLOSE AT CM/SM SEP: P SEC - LAUNCH - BP D PRIM & SEC ~ GET 1HR - BP			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
	SLA SEP - B SEC, D PRIN & SEC - SP			
288+10	TALKED ON WHAT LOPUS WERE AT VN'S			
	OPEN (2.14+30) & EQUAL USAGE FROM EACH			
	TV SINCE THEN WE SHOULD HAVE			
	31 22 8 23 BEEN IN PAIN TH			
	AT CM/SM SEP +48 -0 LBS. (1 LBS)			
	IF SECONDARY TKS CLOSE). USE ~10 LBS			
	PER QUA FOR SEP.			
288+24	TALKED TO RETRO, FIDO, CAPCOM ABOUT			
	2 OR 4 JGT MCC. FIDO & RETRO WOULD			
	RATHER SET HIM HIT IT ON THE MONEY			
	RATHER THAN BOUNCE AROUND TRYING			
	TO HIT .2 FPS LIMIT, 2 JGT ACC .23,			
	4 JGT ACC = .46 FPS ² . 2 JGT SEEMS			
	BETTER.			
288+45	RETRO & FIDO CALC MCC 7 BT ~25.4 sec.			
	WE GET 24.2. SOME FLAP ABOUT BT'S.			
	5.6 FPS MCC 7 PLANNED.			
288+46	SC 4.5 ALL GO-NO PREHEAT			
	SD 4.4 SPAN/45 CONCURS.			
	GA 4.4			
	GB 4.4			
	GC 4.6			
	GD 4.5			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
288+54	SOME FLAP ABOUT HAVING B1			
	THROUSTER ENABLED DUE TO MAP			
	CALL GN2 BOTTLE. DSO SAYS B1			
	IS BETTER THAN AZ, TOLD HIM			
	WE'RE IN R/D ROLL, AZ OFF.			
	THROW BOTTLE HBR SL122, MK 134S			
228+58	PS2 NOS 00000			
	TORQUED 288+58+00			
	MERU			
	L17.05 - .078			
	- .340			
	+ .215			
289+05	PROP CALCULATED ~ 189 LBS EFFECTIVE			
	2.5% THROUST BASED ON ACCEL.			
289+10	P23'S IN WORK.			
289+29	NO DSKY CONDITION LIGHT TEST			
	WILL BE DONE FOR ENTRY			

APOLLO 15 STATUS REPORT
August 7, 1971

GET: 288:13

THERMAL

All temperatures are nominal.

DISPLAYS AND CONTROLS

Performance is nominal.

INSTRUMENTATION

Performance is nominal.

POWER DISTRIBUTION AND SEQUENCING

Performance is nominal.

COMMUNICATIONS

System performance has been nominal.

CREW SYSTEMS

The potable water tank transducer decreased to 88.8 percent and is constant. All water appears to be going to the waste water tank which is at 88.8 percent. All other parameters are normal.

ENTRANCE AND CONTROL

Status is normal.

PROPULSION AND POWER

SPS: All parameters are nominal

CSM RCS: System pressures and temperatures are nominal. All data was nominal during the past 24-hour period. SM RCS propellant remaining is as follows:

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>Total</u>
Actual Remaining (Wpu)	: 123	111	89	111	434
Planned Remaining (Flight Plan):	116	114	112	119	461
Redline (Flight Plan)	: 10	9	10	10	39
*Delta from Planned	: +7	-3	-23	-8	-27
*Delta from Redlines	: +113	+102	+79	+101	+395

*(+ indicates excess; - indicates shortage)

The CM RCS injector temperature check indicated all injectors were well above the 28°F limit except 5D (the plus yaw thruster in system 2), which was getting close to the 28°F limit. If all temperatures, including 5D, are above the redline at 288:37 GET, an engine preheat will not be required. The propellant used during the past 24 hours is as follows: total - 26 lbs, A - 8 lbs, B - 5 lbs, C - 7 lbs, and D - 6 lbs.

Fuel Cells: Performance is nominal.

Cryogenics: Performance of both the hydrogen and oxygen systems is nominal. A comparison of actual quantities remaining to predicted values is as follows:

<u>Oxygen</u>	<u>Actual</u>	<u>Predicted</u>	<u>Error</u>
Tank 1	140	142	-2
Tank 2	144	147	-3
Tank 3	120	119	+1
TOTAL	404	408	-4

<u>Hydrogen</u>	<u>Actual</u>	<u>Predicted</u>	<u>Error</u>
Tank 1	7.48	9.05	-1.57
Tank 2	6.81	6.05	+ .76
Tank 3	8.26	7.30	+ .96
TOTAL	22.55	22.40	+ .15

Batteries: Batt A: AH 0.79 AH Remaining 39.206
 Batt B: AH^o 2.11 AH Remaining 37.89
 Batt C: AH^o_{out} 2.11 AH Remaining 37.89
 Total AH Remaining 115.04

SIM BAY EXPERIMENTS

The gamma ray, X-ray, alpha particle, and mass spectrometers have been on during the preceding rest period and performed nominally. These experiments were turned off and the SIM bay powered down per the flight plan during the GET 288:00 to 288:20 time period. The mass spectrometer boom retention is presumed to have been successful at GET 288:18 since no comments were made by the crew.

J. E. Meacham
 GET 288:38
RB/Kohn
 289:17

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
290+03	CMC Free for UV photos.			
290+10	V49 to Moon Photo alt. (002333, con)			
290+14	FREE			
290+33	Suggested tape over SPS+THRUST lite when EMS cb pushed in so that he won't flip up the EMS light filter and forget to flip it back down for 0.05g.			
	Use Fmt 30 submt 21 for MCK 7			
290+56	P52 alt. opt. 3 in SCS, Alt 1 Rate 2. - now back to CMC alt. (81, 36, 54)			
	N93 Torquedr 291+01			
	- 00016 $\Delta T = 1.05$ hr - 1.01 meru			
	- 00019 - 1.20 "			
	+ 00003 + 0.19 "			
	P52			
	Opt. 1 to entry refs mmat			
	course aligned & fine align.			
	Small gyro targ. & can fine			
	Targ. Time = 291+04			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
291+10	V49 to MCC7 att (180,311,000)			
291+18	MCC7W ck.			
291+23	CMC self ck - The DSKY cond lite test has been deleted from entry ck list & should be deleted from all subsequent ck list except when powering up after GfN down. DELETED FROM C/L.			
291+26	Honeysuckle shipping vs ratty data. ALC fu manf oscillating with some others. Switched to CRO and data solid.			
291+36	Dir RCS 2 on			
291+55	Need key release, and enter to get 'N 85 up. TFB - 1430 went A#1 Rate 2.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
291+56+148	MCC 7 +-X			
	Burn Start/VS			
	BT = 21 sec		BT = 22.35 (chart + recorder).	
	NBS.			
	- .1		EMS	
	0		5.6 f/s 30 sec. before	
	- .1		6.0 " at IGN	
	AV _c + .8 f/s		.8 " at c/o	
			5.2 measured	
			5.6	
			+ .4 off CMC,	
	± 0.7 quoted accuracy.			
291 59	V49 - optics cal. 200. (660, 235, 330)			
292+57	Seq. Logic ck.			
293+21+00	P52		ΔT = 2.28	
	N93 +00006		+ .175 merr	
	- 00010		- .292	
	+ 00005		+ .146	
293+24	V49 to 0, 267, 0 Horiz. CK att.			
	3XT star ck.			
	Gamma = -6.50°			
293+30	Optics Swr - off			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
293+35	EMS ENTRY CK good.			
293+51	CK point.			
	GNC Crit. Limits #4			
	CM RCS			
	Pre-press			
	1	2		
	HeP 4121	4025		
	Manf 98	88		
	T 64	63		
	Expected after root -550 3571 -600 3425			
	-M RCS			
	Pressurization			
	3435	3446		
	298-300	293		
	60	57		
	a bit high			
	COULDN'T HEAR CM SETS			
	FIRE.			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	CMRCS CH F C FLIGHT/EVENTS/HISTORY/BRIEFING			
294+10	Run 2 ck good on solid in			
	"1" 1 " "			
	Crew could not hear jets			
	fire and asked if we			
	could verify jets.			
	Had crew use accel cmd			
	and go back cm transfer			
	and ck all thrusters again			
	verifying rates (DTR-Rate 2)			
	Note 1 Recorders in back			
	were recording EECOM			
	junk. Should have been			
	configured to rates although			
	we probably couldn't see			
	Min. Imp firings of CMRCS			
	on rate 2 data anyways			
294+37	P61			

FLIGHT DIR MISSION LOG		DAY	REV	PG
SITE/ACQ/LOS	FLIGHT EVENTS/HISTORY/BRIEFING			
294+40:30	SCS - Rate cmd,			
	yawing to 315°			
294+44	Sep.			
294+46	P 63			
	Entry att.			
	294+59+13			
EI-2	lost data from Guam			
294+57	regained from AR1A-2			
	looks good.			
EI-19				
294+59+12	Still in SCS Min. Imp.			
	P att. 14.6			

c. Crew tapped panel in area of ΔV THRUST switches; light and TM came back on.

d. Operated ΔV THRUST B switch - no change in light or TM.

e. Operated ΔV THRUST A switch - held in center (between NORMAL and OFF). Light out, TM D1 - ON, TM D2 - OUT.

Placed to NORMAL. Light ON, TM D1 - ON, TM D2 - ON.

Placed to OFF. Light OUT, TM D1 - OUT, TM D2 - OUT.

CONCLUSION:

- (1) No problem in the bank B circuits.
- (2) Short is intermittent and mechanical shock can probably induce or remove the problem.
- (3) Short is probably in the bank A circuit.
- (4) Assume that the short can be on either side of the bank A propellant control pilot valve solenoids.

6. The flight article ΔV THRUST A switch went through a series of pre-flight acceptance tests, including vibration (see attachment 3). The switch was xrayed. Based on xray data, there are some suspect strands of wire (internal wiring is 30 strand, 34 gauge braided) which may be causing a short-to-ground on the wiper side of the switch.

7. CONCLUSIONS:

Based on the crew tests and switch data, it is believed that the anomaly is the result of a short in the ΔV THRUST A switch. This short may be on either side of the bank A pilot valve solenoids. Only an SPS burn test can determine which side.

8. IMPACT:

a. Hard short on upstream side of bank A pilot valve solenoids - Bank A will not operate.

b. Hard or soft short on downstream side of bank A pilot valve solenoids - Bank A will fire when the ΔV THRUST A switch is placed to the NORMAL position.

9. NR is presently conducting tests at Downey to duplicate the problem.

10. Testing indicates that if the short is caused by up to 3 strands of 34 gauge wire on the high side of the solenoid, they can burn out without popping circuit breakers and result in clearing the short.

11. It is proposed that a test to determine the location of the short be run on MCC-2. Attachment 2 details the test.

12. If the MCC-2 test proves that the short is downstream of the SPS pilot valve solenoids, subsequent dual bank burns should be performed starting on bank B and bringing on bank A after ignition and turning off prior to cutoff. Bank A should be controlled with both the ΔV THRUST A switch and the SPS PILOT VLVS A-MNA circuit breaker. Single bank burns should all be performed using Bank B. LQI should be performed using single bank for the last 40 seconds of the burn to get some solid single bank thrust data. DOI and LOPC should be done single rather than dual bank.

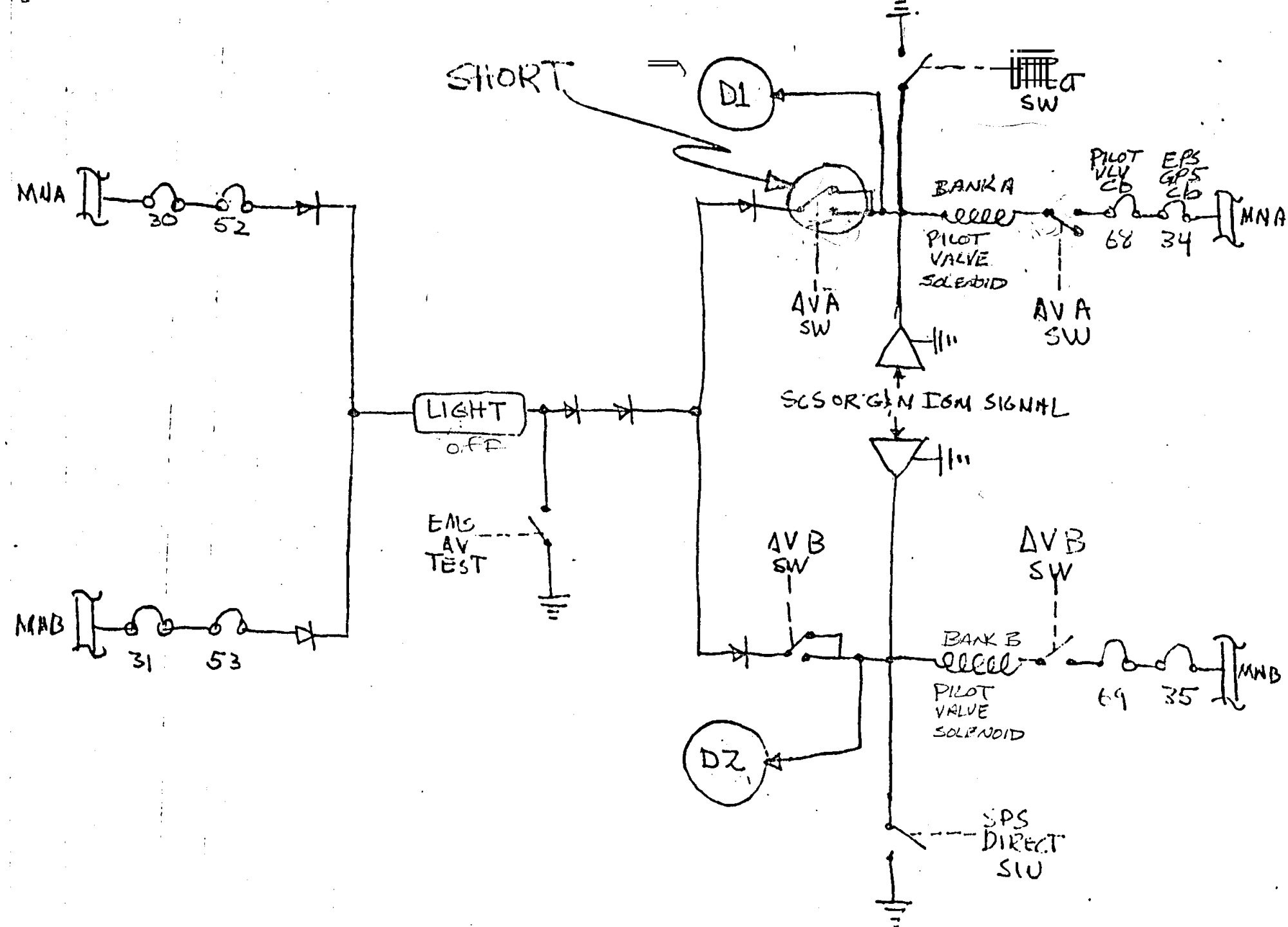
13. If the MCC-2 test proves that the short is upstream of the SPS pilot valve solenoids, bank A is failed. Recommend no lunar landing.

14. It should be pointed out that if the short is migratory (i.e., a floating solder ball), it may move from the downstream to upstream side of the pilot valve solenoid.

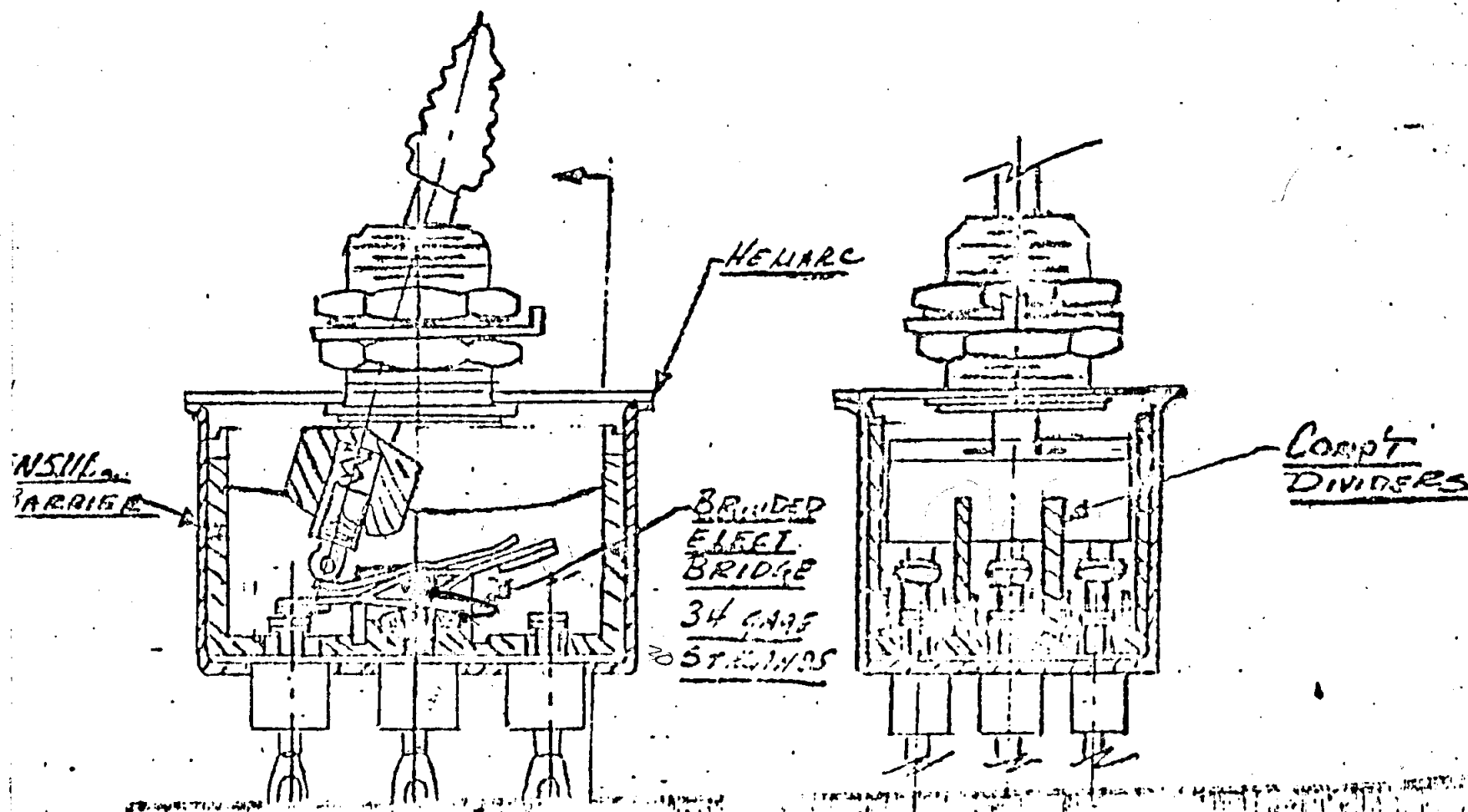
Prepared by:

J. DeAtkine

L. Canin/GNC



ME 357-0102-1301



A hand-drawn sketch of a wire braid assembly. The central component is a cylindrical braid with a label "TP248" on its side. To the left, a rectangular block is labeled "CTR. Post". Below the braid, a rectangular block is labeled "WIRE BRAID". To the right, a rectangular block is labeled "FIXED TAIL". Above the braid, two labels "TERM #3" and "TERM #6" are connected by lines to the braid's structure. The sketch is drawn with simple lines and some shading to indicate the braid's texture.

34 9.985
STRANDS

TERM #6

FIXED

THIS VIEW
WAS UNCLEAR
ON XRAY

ME 452-0102-1301

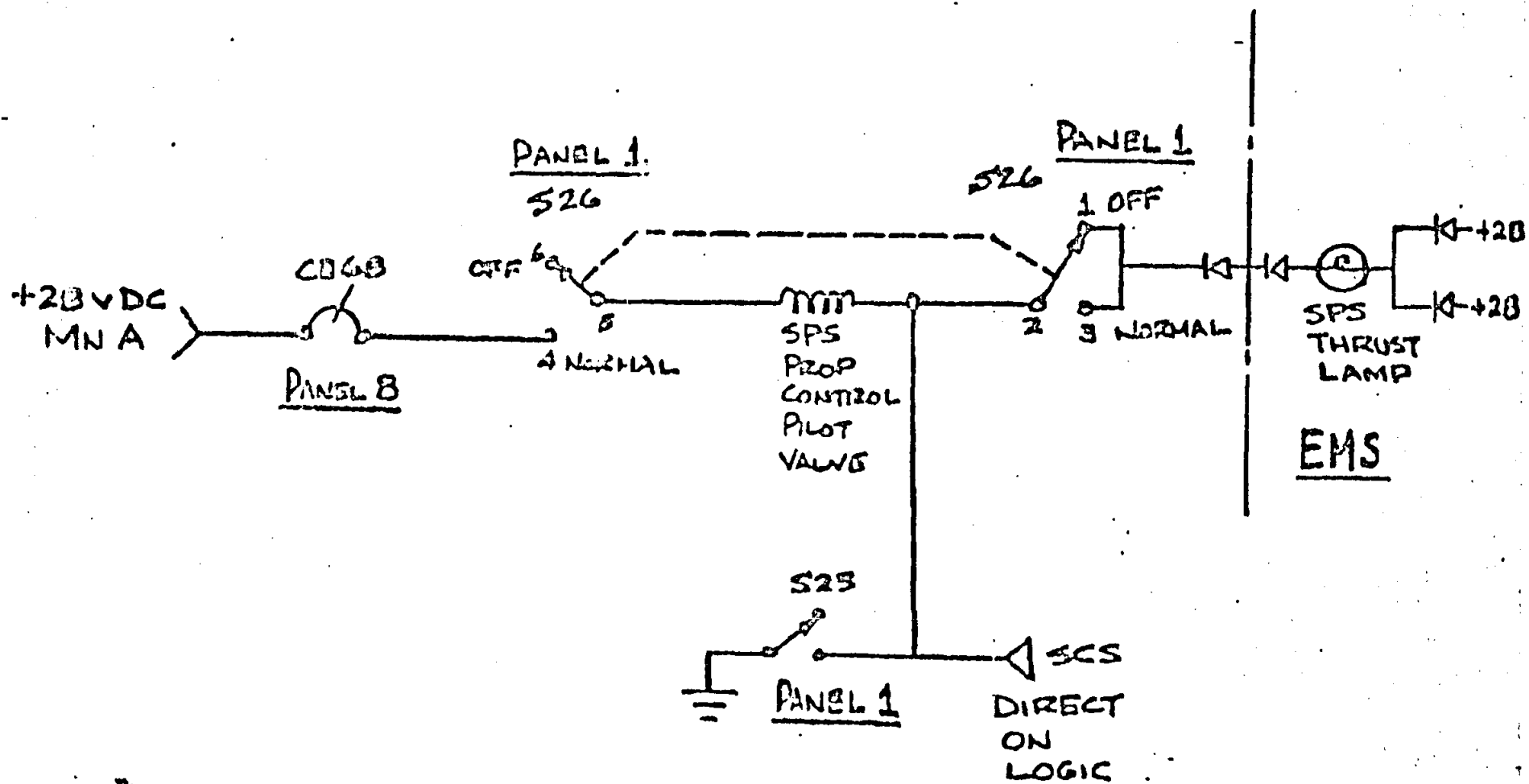
5-26

SN 057758218262

X 214 Date 10/23/58

CONTROL No. CB 276

SPS SCHEMATIC



SIG Part No. 12452-0102
NAA Serial No. 0517582/2202
Part Name: Toggle Switch
QPS Specification: QAS 752 Rev. 1M

NAA Part No. 12452-0102-
NAA Purchase Order: 12452-0102
Customer Spec: LSP-250-802A
NAA Spec: 12-452-0102, Rev. 1M 12-452-0102 Rev. FPD1B 2+3

The following inspection must be performed in accordance with QAS 752 in the order shown below:

ORDER OF INSPEC	QAS PARA. #	CHARACTERISTIC	SPECIFICATION LIST(S)	ACTUAL VALUE	RESP. NO.	✓ = ACCEPT. REJ. NO. = REJ.	DATE
1	3.2	Visual Inspection	N/A	N/A	(CSP)	✓	8-8-68
2	3.3	Depth	1.450 mm	N/A	(CSP)	✓	"
3	3.3	Length	1.350 mm	N/A	(CSP)	✓	"
4	3.3	Center Line Coincident	0.020 mm	N/A	(CSP)	✓	"
5	3.3	Width - "A" Dia.	1.365 mm	N/A	(CSP)	✓	"
6	2.3	All Switches	501 - 439 in	N/A	(CSP)	✓	"
7	2.3	Height of Toggle	1.050 - 1.070	N/A	(CSP)	✓	"
8	3.3	Height of Toggle Lock Cap	1.550 - max.	N/A	(CSP)	✓	"
9	3.3	Thread 15/32 - 32NS-2A		N/A	(CSP)	✓	"
10	3.3	Thread 5/8-7/8 NFE-2A	N/A	N/A	(CSP)	✓	"
11	3.4	Weight	.15 Pounds max.	lbs.	(CSP)	NOT IN SAMPLE	"
12	3.5	Continuity	N/A	N/A	(CSP)	NOT IN SAMPLE	"
13	3.6.1	Operating Force	1-8 lbs.	N/A	(CSP)	NOT IN SAMPLE	"
14	3.6.2	Angular Position	17° ± 4° (0° ± 4°)	N/A	(CSP)	NOT IN SAMPLE	"
15	3.6.3	Locking Lever Release Force	2.75 ± 0.500 lbs.	N/A	(CSP)	✓	"
16	3.7	Dielectric	0.5 MA 800 VMS	N/A	(CSP)	✓	"
17	3.8	Insulation Resistance	100 VDC, 100 megohm	N/A	(CSP)	✓	"
18	3.9	Vibration	See Ref. Para.	N/A	(CSP)	✓	"
19	3.10	Leakage	1 x 10 ⁻⁴ cu/sec.	N/A	(CSP)	✓	"
20	3.11	Contact Resistance	See below	See below	(CSP)	✓	"
21	3.12.1	Visual	N/A	N/A	(CSP)	✓	"
22	3.12.2	Cleanliness	N/A	N/A	(CSP)	✓	"
23	3.1	Operating Limit	N/A	N/A	(CSP)	✓	"

Contact Resistance 2 MV 15
* Contact Resistance 17 Amp Type Switch
Amp Type Switch

CONTACT IDENTITY											
1st Reading	6	6	5	5	5	6					
2nd Reading	5	6	5	5	5	6					
3rd Reading	6	6	5	5	5	6					

114. STD. 114. STD 3'0
SINE VOLT 100.00
CONTACT CHANGE

SPS THRUST LIGHT ANOMALY

CONDITION

CYCLING S26 SYS A SW CAUSES LIGHT
TO CHANGE STATE, CYCLING S59 SYS B
SW CAUSES NO CHANGE TO LIGHT STATE

LIGHT FLICKERS AS S26 CROSSES THROUGH
CENTER

X-RAY - NO PARTICULATE COULD BE OBSERVED,
PARTICLE SIZE TO SHORT. CENTER POST TO
CASE WOULD HAVE TO BE LARGE ENOUGH TO BE
OBVIOUS IN X-RAY

CONCLUSION

PROBLEM IN SYS A COULD BE HIGH OR LOW SIDE
SHORT.

MOST PROBABLE LOCATION OF SHORT IS CENTER
POLE (TERM. 2 OR 5) TO GROUND

MOST LIKELY CONDITION WOULD BE WIRE FROM
CENTER POST TO CASE AT OUTER TERMINAL SHELL

BASED UPON ABOVE AND POTENTIAL IMPACT ON MISSION, ISOLATION OF THE SHORT ON THE HIGH OR LOW
SIDE OF THE BANK "A" PILOT VALVE SHOULD BE ACCOMPLISHED. IF SHORT IS ON THE LOW SIDE, BANK "A"
CAN BE OPERATED MANUALLY. IF SHORT IS ON THE HIGH SIDE, TEST OFFERS POSSIBILITY OF FUSING
SHORT OPEN.

PROCEDURE FOR LOCATION OF SHORT

CB 68 OPEN

Δ V THURST A — NORMAL

TAP PANEL TO RECREATE LAMP ON

- CLOSE CB 68 —
1. IF ENGINE IGNITES OPEN CB 68 IMMEDIATELY
 2. IF NO IGNITION — OPEN CB 68 in 3 SECONDS

w/p47 on!

INDICATIONS

CASE	IGNITION	LIGHT RESPONSE		CURRENT RESPONSE	COMMENT
		CB 68 CLOSED	CB 68 OPENED		
I	YES	ON	ON	≈ Δ 2 AMPS	Low side hard short - have manual back-up
II	YES	ON	OFF or DIM	≈ Δ 2 AMPS - but decreases	Same as Case I, failure magnitude reduced
III	NO	ON	ON	High Current	Hard high side short — loss of Bank A
IV	NO	OFF	OFF	Little or No transient	High or low side soft short - could have burned away. Try to recreate failure
V	NO	OFF	— OFF	Transient	Momentary high side soft short could have burned away. Try to recreate failure

PAGE INDICA__ S

<u>LIGHT RESPONSE</u>			
<u>CASE</u>	<u>IGNITION</u>	<u>CB 68 CLOSED</u>	<u>CB 68 OPENED</u>
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
41	41	41	41
42	42	42	42
43	43	43	43
44	44	44	44
45	45	45	45
46	46	46	46
47	47	47	47
48	48	48	48
49	49	49	49
50	50	50	50
51	51	51	51
52	52	52	52
53	53	53	53
54	54	54	54
55	55	55	55
56	56	56	56
57	57	57	57
58	58	58	58
59	59	59	59
60	60	60	60
61	61	61	61
62	62	62	62
63	63	63	63
64	64	64	64
65	65	65	65
66	66	66	66
67	67	67	67
68	68	68	68
69	69	69	69
70	70	70	70
71	71	71	71
72	72	72	72
73	73	73	73
74	74	74	74
75	75	75	75
76	76	76	76
77	77	77	77
78	78	78	78
79	79	79	79
80	80	80	80
81	81	81	81
82	82	82	82
83	83	83	83
84	84	84	84
85	85	85	85
86	86	86	86
87	87	87	87
88	88	88	88
89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

VI	-	NO	OFF	ON	Continuous Current
----	---	----	-----	----	-----------------------

COMMENT

Continuous, high side soft
short. Could use Bank if
assume no degradation of
failure.

NOTE: OBSERVE CURRENT CHANGES ON
SC 2113C
SC 2114 C

THIS WILL PROBABLY HAVE TO BE DONE
AT MSFN STATION AT FULL SAMPLE RATE
WITH "O" APERTURE READOUT.

SPECIAL TEST 7-26-71

9

- SINGLE WIRE BRAID STRAND TO SWITCH CASE SHORT WAS SIMULATED ON A TEST SAMPLE (ME 452-0102-1301).
- RESISTANCE OF SHORT VARIED FROM 0.5 TO 3.0 OHMS WITH TAPPING THE SWITCH.
- APPLICATION OF 28VDC THROUGH ONE OHM RESISTOR RESULTED IN BURNING THE SHORT OPEN IMMEDIATELY.

1 - strand 50-100 msec TO BURN OUT
3 - strand burn out before C.B. pops

1 single strand 50-100 msec

OPR 2

A3-MO

0 8

7 1

L2713J

CSM GNC PRIMARY TAB

0683 2

GMTA12:20:44:22

SITE GWM08H

GETA 0295:10:22

CTE 0295:10:20

CMC 0295:10:21

CMCB 0295:10:21

GETC 0295:10:21

CMC AT 000.260

ISS F ALIGN M

OPT ZERO D

CMC AUTO E

ID ENT

VERB NOUN PRGM

16 67 67

REG 1 -00006

REG 2 +02613

REG 3 -15812

ENT DAP

RATE DB

.5 .5

VEH ACC 32.00

VG X M

VG Y M

VG Z M

PIPX D

PIPY D

PIPZ D

PIPT 129.6

TEV

TIG

WPU CALC

LBS

-359

HE P/T

PCT

3.1

PKG T

°F

-7

HE TK P

PSIA

10

HE TK T

°F

39

HE MN P

PSIA

136

FU MN P

PSIA

1

OX MN P

PSIA

177

CM-RCS

SYS 1

SYS 2

SPS

HE TK P

PSIA

430

HE MN P

PSIA

220

HE TK T

°F

-80

PITCH

YAW

ROLL

ISS ATT

74.8

328.1

94.4

ACDU

76.0

329.8

198.4

FCDU

181.8

1.2

1.6

CMC

-0.0

-0.0

-21.6

SCS

-0.0

-0.0

-5.00

ENT

-2.1

-10.4

12.6

G/N

-6.3

-0.4

2.7

SCS

4.00

-2.50

5.00

GMB CMD

D

D

OCCDU DC

0.08

0.02

SPS GMB

0.28

0.49

DAT TVC

-2.01

3.64

DMN TVC

0.00

0.02

DIF CUR

3

4

HE TK T °F

15

OX FDLN °F

-5

FU FDLN °F

-3

OX LN 1 °F

FU LN 1 °F

EG VLV °F

182

N2 TA PSI

49

N2 TB PSI

1006

OX T1 PCT

4.35

OX T2 PCT

0.00

FU T1 PCT

0.00

FU T2 PCT

5.71

AY 0

4K

MIN 4

4

SEC

0PR2

A3-MO

0 8

7 1

L2713J

CSM GNC PRIMARY TAB

0583

GMTA12:20:33:14			SITE GWN08H							
GETA 0294:59:14					QUADA	QUADB	QUADC	QUADD		
CTE 0294:59:12			WPU CALC	LBS	-017	-251	203	-513		
CMC 0294:59:11			HE P/T	PCT	3.1	-0.6	1.3	-0.2		
CMCB 0294:59:11			PKG T	'F	-8	-1	-8	-8		
GETC 0294:59:11			HE TK P	PSIA	32	-159	-231	-87		
CMC AT 000.259			HE TK T	'F	39	40	36	33		
ISS F ALIGN			HE MN P	PSIA	155	165	160	15		
OPT ZERO			FU MN P	PSIA	-1	-7	-11	-9		
CMC SCS			OX MN P	PSIA	129	130	3	117		
ID ENT			CM-RCS		SYS 1	SYS 2	SPS			
VERB NOUN PRGM			HE TK P	PSIA	3487	3404	OX TK PSI	-2		
06 64 63			HE MN P	PSIA	298	293	OX IN PSI	-17		
REG 1 +00001			HE TK T	'F	55	55	EG CH PSI	-2		
REG 2 +36156			PITCH		YAW	ROLL	FU TK PSI	-7		
REG 3 -11534			ISS ATT	146.0	358.4	0.9	FU IN PSI	59		
ENT DAP			ACDU	145.9	358.2	1.0	HE TK PSI	2059		
RATE DB			FCDU	181.8	1.2	1.6				
.5 .5			ERR CMC	8.0	2.8	-1.3	HE TK T 'F	-23		
VEH ACC			SCS	-5.0	-2.9	0.3	OX FDLN 'F	-5		
VG X			ENT	0.2	0.1	0.0	FU FDLN 'F	-3		
VG Y			RATE	-0.0	0.0	0.0	OX LN 1 'F			
VG Z			SCS	-0.1	0.1	0.1	FU LN 1 'F			
PIPX							EG VLV 'F	183		
PIPY							N2 TA PSI	29		
PIPZ							N2 TB PSI	304		
PIPT							OX T1 PCT	0.00		
TEV							OX T2 PCT	0.00		
TIG							FU T1 PCT	0.00		
							FU T2 PCT	0.00		

0002

A3-00

0 8

7 1

L2713J

CSM GNC PRIMARY TAB

0683 2

GMTA12:20:31:06

SITE GWM08H

GETA 0294:57:06

QUADA

QUADB

QUADC

QUADD

CTE 0294:57:04

WPU CALC LBS

-017

-282

293

-013

CMC 0294:57:05

HE P/T PCT

3.1

-0.6

1.3

-0.2

CMCB 0294:57:05

PKG T °F

-8

-1

-8

-8

GETC 0294:57:05

HE TK P PSIA

32

-159

-231

-07

CMC AT 000.259

HE TK T °F

39

40

36

33

ISS F ALIGN

HE MN P PSIA

155

165

156

15

OPT ZERO

FU MN P PSIA

-1

-7

-11

-9

CMC SCS

OX MN P PSIA

129

129

3

121

ID ENT

CM-RCS

SYS 1

SYS 2

SPS

VERB NOUN PRGM

HE TK P PSIA

3487

3425

OX TK PSI

-2

06 64 63

HE MN P PSIA

298

293

OX IN PSI

-17

REG 1 +00000

HE TK T °F

55

55

EG CH PSI

-2

REG 2 +35574

PITCH

YAW

ROLL

FU TK PSI

-7

REG 3 -18951

ISS ATT 154.4

356.9

0.2

FU IN PSI

50

ENT DAP

ACDU 154.3

356.9

0.4

HE TK PSI

2017

RATE DB

FCDU 181.8

1.2

1.6

HE TK T °F

-26

.5 .5

ERR

CMC 5.5

4.3

-1.2

OX FDLN °F

-5

VEH ACC 0.03

SCS -5.00

-4.4

0.3

FU FDLN °F

-3

VG X

M

ENT 0.0

0.0

0.0

OX LN 1 °F

VG Y

M

RATE

G/N 0.0

0.0

0.0

FU LN 1 °F

VG Z

M

SCS -0.0

-0.0

-0.0

EG VLV °F

183

PIPX

D

GMB CMD

D

D

N2 TA PSI

47

PIPY

D

OCCU DC

0.08

0.02

N2 TB PSI

304

PIPZ

D

SPS GMB

0.41

0.40

OX T1 PCT

0.00

PIPT 129.7

DAT TVC

-0.04

0.03

OX T2 PCT

0.00

TEV

DMN TVC

-0.18

0.11

-0.09

FU T1 PCT

0.00

SIG

DIF CUR

3

-2

FU T2 PCT

0.00

0

HR

MIN 3

1

SEC 0

OPR 2

A3-110

0 8

7 1

L2713J

CSM GNC PRIMARY TAB

06838

GMTA12:20:28:36

SITE GWM08H

GETA 0294:54:35

QUADA

QUADB

QUADC

QUADD

CTE 0294:54:34

WPU CALC LBS

-948

-341

979

-432

CMC 0294:54:29

HE P/T PCT

3.1

-9.6

1.3

-4.1

CMCB 0294:54:29

PKG T °F

-8

-1

-8

-8

GETC 0294:54:29

HE TK P PSIA

32

-159

-231

-87

CMC AT 000.023

HE TK T °F

39

40

36

33

ISS F ALIGN M

HE MN P PSIA

155

165

154

17

OPT ZERO D

FU MN P PSIA

-1

-7

-11

-9

CMC SCS E

OX MN P PSIA

133

126

3

119

ID ENT

CM-RCS

SYS 1

SYS 2

SPS

VERB NOUN PRGM

HE TK P PSIA

3487

3425

OX TK PSI

-3

06 64 63

HE MN P PSIA

298

293

OX IN PSI

-17

REG 1 +00000

HE TK T °F

55

55

EG CH PSI

-2

REG 2 +34513

PITCH

YAW

ROLL

FU TK PSI

-7

REG 3 -26856

ISS ATT 155.2

358.0

2.7

FU IN PSI

57

ENT DAP

ACDU 155.2

357.9

3.0

HE TK PSI

1974

RATE DB

FCDU 181.8

1.2

1.6

HE TK T °F

-22

.5 .5

CMC 11.0

2.0

-2.7

OX FDLN °F

-5

VEH ACC 0.07

SCS -5.00

-2.1

0.7

FU FDLN °F

-3

VG X H

ENT -0.1

0.0

0.0

OX LN 1 °F

-3

VG Y H

G/N 0.0

0.0

0.0

FU LN 1 °F

-3

VG Z H

SCS -0.2

-0.0

-0.0

EG VLV °F

183

PIPX D

GMB CMD

0.08

0.06

0.0

N2 TA PSI

49

PIPY D

OCDU DC

0.08

0.06

0.0

N2 TB PSI

595

PIPZ D

SPS GMB

0.41

0.40

0.0

OX T1 PCT

9.99

PIPT 129.6

DAT TVC

0.04

0.03

0.0

OX T2 PCT

9.99

TEV

DMN TVC

-0.18

0.11

-0.18

FU T1 PCT

9.99

TIG

DIF CUR

-4

-2

0.0

FU T2 PCT

9.99

AY 0

4K

M

Y

SEC 4

OPR 1

A3-00

0 8

7 1

L2156

UPDATE RATE

20

P/T R & RPU A-B UP-42

SEC

POINTS 171

LIVE DATA

0671 0671

GND=00M

HE TR P 81

HE TR P 82

HE TR T 81

HE TR T 82

CR0001 = XR

CR0002 = OR

CR0003 = XL

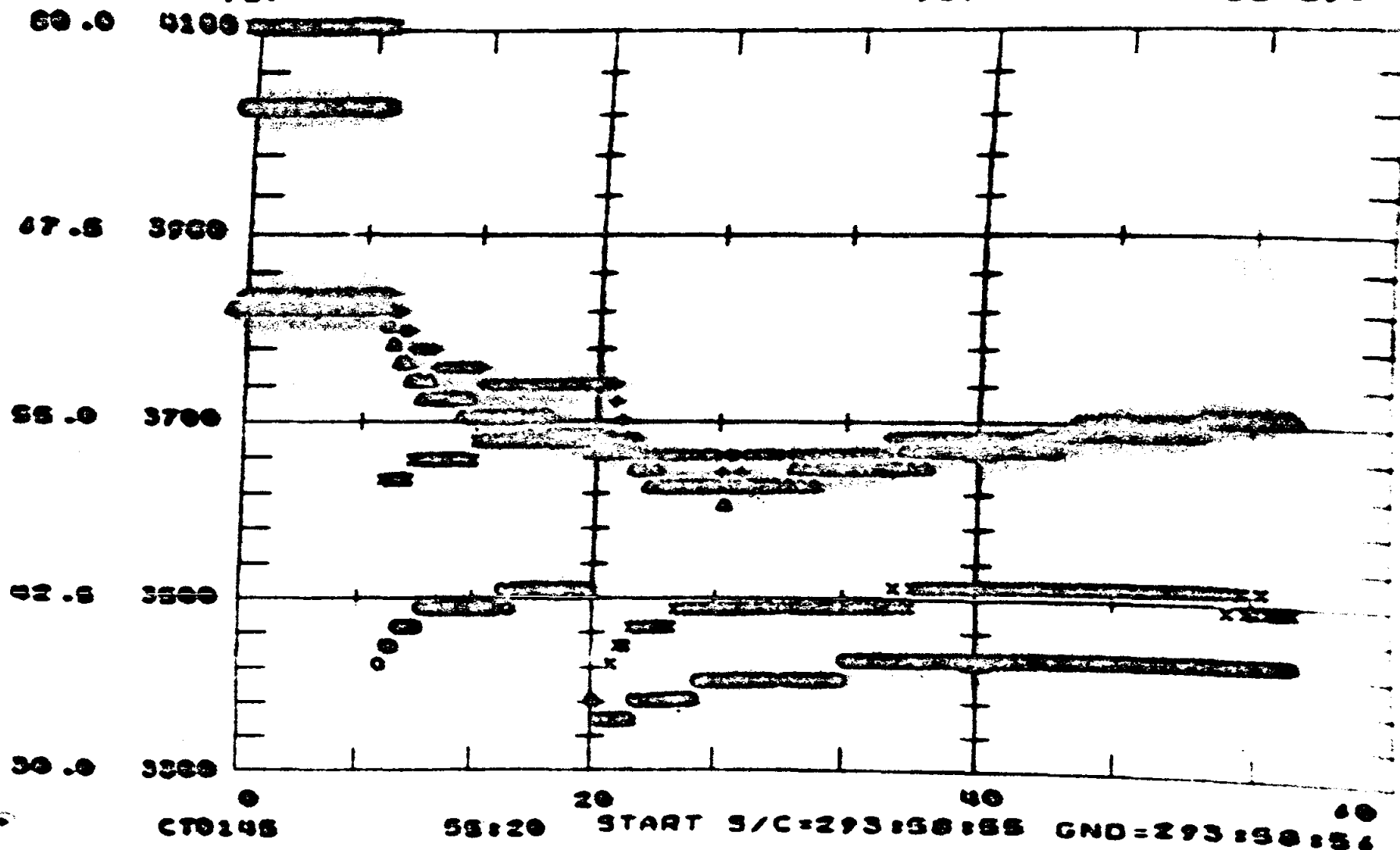
CR0004 = ML

5406.956

3424.931

54.917

55.296



IV 0

4K.

M

Y

SEC 4

8

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS/GET)	REQUEST ORGANIZATION	RESPONSE ORGANIZATION	CONTROL NUMBER		
12:15	45	FOD	C19		
ACTION REQD BY (TIME):		REQUESTER			
SUBJECT:		SHORT IN ENGINE CIRCUIT			APPROVAL
Attached is the procedure to be used to isolate short in the SPS Engine Control Circuit.				TEAM LDR	
				TIME	
				CON SR REP	
				TIME	
				ME MANAGER	
				TIME 13:14	
				SPAN MGR	
				TIME 13:27	
RESPONSE:		CONCURRENCE			
Have reviewed your procedure and have included it for the most part in Attachment 12 of the enclosed report. The report is being reviewed the anomaly and steps occurred. Been presently scheduled 7-28-30 GET				FOD REP	
				TIME 22:29	
				SPAN MGR	
				TIME 22:33	
				TEAM LDR	
				TIME	
				CON SR REP	
				TIME	
RESPONDER		SPAN MANAGER			
ME MANAGER		SPAN MANAGER			
TIME		TIME			

I. Procedure to determine location of short upstream or downstream of solenoid:

1. Open CB pilot valve A.
2. Close ΔV thrust A.
3. Get light to come on by rapping or cycling ΔV thrust A switch (but end up in ΔV thrust "on").
4. Close CB pilot valve A.
5. Immediately pull out CB pilot valve A when engine starts.
6. If engine does not start within about 3 seconds, pull out CB pilot valve A. The short is upstream of solenoid valve provided light still on.
7. Following step 5, i.e., engine starts and is stopped with breaker, if light still on the short is downstream of solenoid.

II. Procedure to show if short burned clear:

1. If light goes out then try to get light to come on by tapping or cycling ΔV thrust switch. If light can't be made to return the short was burned clear.

7/27/71, 0500 CDT

SPS IGNITION CIRCUIT ANOMALY

1. GET 3 + 25. Crew reports SPS THRUST light is ON. Telemetry measurements CH3604X and CH3605X confirms a short-to-ground in either SPS solenoid driver #1 or #2 circuitry. Telemetry records show that the short occurred at GET 01+48+41 for 9 seconds. Problem is either in SPS bank A or B. Arming either bank with ΔV THRUST switches may result in SPS ignition.
2. Crew was advised to pull both SPS pilot valve circuit breakers. They did so and system was safed,
3. GET 4 + 34. Crew verified that the EMS MODE switch was in STBY and EMS FUNCTION switch was in OFF. This verified that an improper EMS switch configuration was not cause of problem.
4. GET 5 + 50. Crew performed following tests:
 - a. EMS ΔV test - The THRUST light got brighter. This would indicate that the short is not in the EMS ΔV test circuit. Also may indicate a high resistance short.
 - b. Crew cycled the SPS THRUST DIRECT ON switch. No change indicated on light or on telemetry. This results in no conclusive evidence of the location of the short circuit.
5. GET 9 + 35. Crew performed following tests:
 - a. Operated ΔV THRUST A switch - light out, TM of D1 & D2 out. When switch placed back to off, the light and TM remained off.
 - b. Operated ΔV THRUST B switch - No change in light or TM. Switch placed back to off.

c. Crew tapped panel in area of ΔV THRUST switches; light and TM came back on.

d. Operated ΔV THRUST B switch - no change in light or TM.

e. Operated ΔV THRUST A switch - held in center (between NORMAL and OFF). Light out, TM D1 - ON, TM D2 - OUT.

Placed to NORMAL. Light ON, TM D1 - ON, TM D2 - ON.

Placed to OFF. Light OUT, TM D1 - OUT, TM D2 - OUT.

CONCLUSION:

- (1) No problem in the bank B circuits.
- (2) Short is intermittent and mechanical shock can probably induce or remove the problem.
- (3) Short is probably in the bank A circuit.
- (4) Assume that the short can be on either side of the bank A propellant control pilot valve solenoids.

6. The flight article ΔV THRUST A switch went through a series of pre-flight acceptance tests, including vibration (see attachment 3). The switch was xrayed. Based on xray data, there are some suspect strands of wire (internal wiring is 30 strand, 34 gauge braided) which may be causing a short-to-ground on the wiper side of the switch.

7. CONCLUSIONS:

Based on the crew tests and switch data, it is believed that the anomaly is the result of a short in the ΔV THRUST A switch. This short may be on either side of the bank A pilot valve solenoids. Only an SPS burn test can determine which side.

8. IMPACT:

a. Hard short on upstream side of bank A pilot valve solenoids - Bank A will not operate.

b. Hard or soft short on downstream side of bank A pilot valve solenoids - Bank A will fire when the ΔV THRUST A switch is placed to the NORMAL position.

9. NR is presently conducting tests at Downey to duplicate the problem.

10. Testing indicates that if the short is caused by up to 3 strands of 34 gauge wire on the high side of the solenoid, they can burn out without popping circuit breakers and result in clearing the short.

11. It is proposed that a test to determine the location of the short be run on MCC-2. Attachment 2 details the test.

12. If the MCC-2 test proves that the short is downstream of the SPS pilot valve solenoids, subsequent dual bank burns should be performed starting on bank B and bringing on bank A after ignition and turning off prior to cutoff. Bank A should be controlled with both the ΔV THRUST A switch and the SPS PILOT VLVS A-MNA circuit breaker. Single bank burns should all be performed using Bank B. LQI should be performed using single bank for the last 40 seconds of the burn to get some solid single bank thrust data. DOI and LOPC should be done single rather than dual bank.

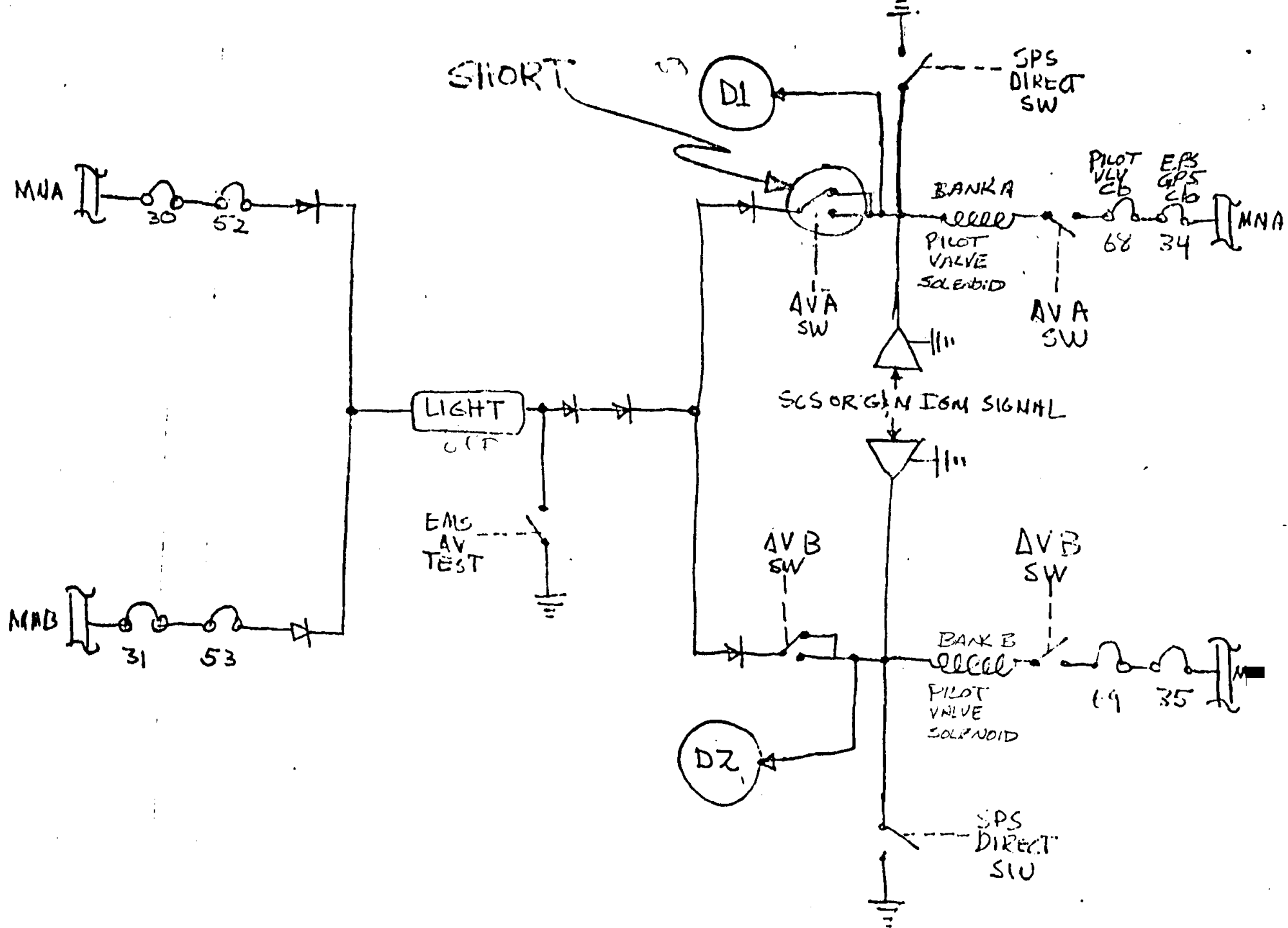
13. If the MCC-2 test proves that the short is upstream of the SPS pilot valve solenoids, bank A is failed. Recommend no lunar landing.

14. It should be pointed out that if the short is migratory (i.e., a floating solder ball), it may move from the downstream to upstream side of the pilot valve solenoid.

Prepared by:

J. DeAtkine

L. Canin/GNC



BH 12+00GET

Attachment 2

MCC-2 BURN PROCEDURE

1. Set up for SCS burn.
2. SPS PILOT VLVS A - MNA cb - OPEN.
3. SPS PILOT VLVS B - MNB cb - OPEN.
4. ΔV THRUST A - NORMAL.
5. Get THRUST light on by rapping panel or cycling ΔV THRUST A switch.
If light does not come on, terminate test. Place ΔV THRUST switch to OFF. Consider doing a bank A G & N burn.

6. SPS PILOT VLVS A - MNA cb - CLOSE.
7. After ignition, open SPS PILOT VLVS A - MNA cb.

NOTE: Burn should not exceed 1 second duration.

8. If engine does not start within about 3 seconds, open SPS PILOT VLVS A - MNA cb. The short is upstream of the SPS pilot solenoid valves.
9. If engine starts, short is downstream of the SPS pilot solenoids.

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T- MINUS /GET)	REQUEST ORGANIZATION	RESPONSE ORGANIZATION	CONTROL NUMBER		
23+50	45	FOD	C-26		
ACTION REQD BY (TIME):		REQUESTER			
SUBJECT:		APPROVAL			
MCC-2 Burn Procedure					
See attachment with comments -		TEAM LDR			
		26/01/01			
		TIME 23:48			
Note we are depending on the ground provided by the sheet to start the engine - Therefore to start downstream could possibly not start the engine depending the resistance thru the sheet. It takes about 14V to pull in the solenoid - a sheet of ground 100m or higher downstream will not pull in solenoid!!		CON SR REP,			
		J.M. Baylin			
		TIME 23:44			
		ME MANAGER			
		J.M.			
		TIME :			
		SPAN MGR			
		R. Kohn			
		TIME 24:02			
Since there is a speed change the sheet will burn clear upstream & possibly downstream we would like to know this - therefore after the burn must try to get light engine if light goes out.					
RESPONSE:		CONCURRENCE			
		FOD REP			
The updated crew checklist for the MCC-2 burn will be submitted to include position of the plane first. Also after cut-off the crew will start to cut the 17th back as by running at top speed.		TIME :			
		SPAN MGR			
		R. Kohn			
		TIME 24:30			
		TEAM LDR			
		A. M. M. / M. J.			
		TIME 25:01			
		CON SR REP			
		J.M.			
		TIME 25:02			
RESPONDER					
ME MANAGER		SPAN MANAGER			
J.E. McCall		R. Kohn			
TIME 25:03		TIME 25:39			

MCC-2 BURN PROCEDURE

1. Set up for SCS burn.
2. SPS PILOT VLVS A - MNA cb - OPEN.
3. SPS PILOT VLVS B - MNB cb - OPEN.
4. ΔV THRUST A - NORMAL.
5. Get THRUST light on by rapping panel or cycling ΔV THRUST A switch.

If light does not come on, terminate test. Place ΔV THRUST switch to OFF. Consider doing a bank A G & N burn.

6. SPS PILOT VLVS A - MNA cb - CLOSE.
7. After ignition, open SPS PILOT VLVS A - MNA cb.

NOTE: Burn should not exceed 1 second duration.

8. If engine does not start within about 3 seconds, open SPS PILOT VLVS A - MNA cb. The short is upstream of the SPS pilot solenoid valves.
9. If engine starts, short is downstream of the SPS pilot solenoids.

Note. Only provided the light stays on !!!

You must do procedure II to ascertain whether a short cleared by powering thru CB Pilot Valve A if the light goes out.

If light goes out and it can be made to come on then you should proceed accordingly. However if the light cannot be made to come on we feel the short had been burned clear and you now have two systems.

Note: - Add to procedure II of C19 - "push on panel to get the light to go off or on prior to tapping. - reason is to ascertain if the problem is out side the switch in the wiring

GNC

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS/GET) 21+54	REQUEST ORGANIZATION GNC	RESPONSE ORGANIZATION 45	CONTROL NUMBER C-24		
ACTION REQD BY (TIME): ASAP			REQUESTER A. WEICH		
SUBJECT:		APPROVAL			
IT IS REQUESTED THAT AURAL SPACECRAFT CIRCUITRY BE TESTED TO DETERMINE WHETHER A SHORT ON THE HIGH (+) SIDE OF PROPULSANT CONTROL PILOT VALVE SOLENOIDS WILL CAUSE A VISIBLY LOWER ILLUMINATION OF THE EMS SPS THRUST LIGHT THAN THE ILLUMINATION RESULTING FROM HAVING THE SPS THRUST SW. IN "DIRECT ON". ΔV THRUST SWS SHOULD REMAIN OPEN FOR THIS EVALUATION.					FOD REP [Signature]
					TIME
					SPAN MGR [Signature]
					TIME 21:59
RESPONSE:		CONCUR			
1. TESTING WAS NOT ACCOMPLISHED IN S/C. IT WAS DONE AT ANTOGETICS USING AN EMS & SIMULATED SPS SOLENOID VALVE DRIVER CKTS. 2. PURPOSE OF TEST WAS TO DETERMINE THE MINIMUM VOLTAGE LEVEL AT WHICH A CHANGE IN INTENSITY LEVEL IS DISCERNABLE. 3. RESULTS INDICATE THAT A VOLTAGE DROP OF 0.3V ON THE GROUND SIDE OF THE LIGHT WAS ADEQUATE TO CAUSE CHANGE OF INTENSITY. THE VOLTAGE DROP THE VOLTAGE DROP THAT WOULD OCCUR ACROSS THE SOLENOID, IS APPROX. 0.4 VOLTS. 4. DURING THE TEST, 5 SUBJECTS WERE USED AND THE FILTER WAS PLACED IN FRONT OF THE LIGHT.					TEAM LDR [Signature] TIME 30:37
					CON SR REP [Signature] TIME 30:40
					ME MGR [Signature] TIME 30:42
					SPAN MGR [Signature] TIME 31:38
RESPONDER					
FOD REP [Signature] TIME 31:41		[Signature] 31:43		SPAN MANAGER [Signature] TIME 31:42	

SMEAR # C-17

4V THRUST SWITCH (S26 P1)
ME 452-0102-1301 S/N 057758218262

THE SWITCH IS CONSTRUCTED IN SUCH A MANNER THAT CONTAMINANTS CAN ^{IN SOME AREAS} MIGRATE FROM ONE SECTION TO ANOTHER.

THIS TYPE OF SWITCH (1301) HAS EXPERIENCED NINE (9) RECORDED FAILURES PREVIOUSLY. SEVEN (7) WERE CAUSED BY HIGH CONTACT RESISTANCE & TWO (2) WERE CAUSED BY LOW DIELECTRIC STRENGTH FROM CASE TO CONTACT. ONLY ONE (1) FAILURE OCCURRED ON A S/C (CSM 102) AT DWNY. THE OTHERS OCCURRED DURING ATP AT T1.

The suspect switch is believed to be shorted to ground as the wiper wire strap that connects the center feed-through post to the wiper. A strand ^{from} strap is believed to be grounded in the hollow part of the feed-through wall (switch case) and this strand will not migrate to other poles. The wiper post that is believed to be grounded is on the return side (downstream) of the solenoid.

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS/GET) 39+20		REQUEST ORGANIZATION FOD		RESPONSE ORGANIZATION 45	
				CONTROL NUMBER C-48	
ACTION REQD BY (TIME):				REQUESTER SPAN/GUC	
SUBJECT:		SPS Burn Plan			APPROVAL
Attached is present plan for BANK-USERE FOR SPS BURN STARTS. A/C Response-Req'd				FOD REP [Signature] TIME 29:20	
				SPAN MGR [Signature] TIME 29:25	
RESPONSE:		CONCUR			
[Signature]				TEAM LDR	
				TIME :	
				CON SR REP	
				TIME :	
				ME MGR [Signature] TIME 29:50	
				SPAN MGR [Signature] TIME 30:00	
RESPONDER					
FOD REP		SPAN MANAGER [Signature]			

~~SPAN~~
SPAN

SPS BURN PLAN

LOI - Bank B, then Bank A 5 sec
after Ign and Bank A off
at Ign + 6 min

DOI - Bank B only

CIRC - Bank B only

PCI - Bank B only

Shaping - Bank B only

TEI - Bank B, then Bank A 5 sec
after Ign. and Bank A
off at cutoff - 5 sec.

GNC / J. Kamman
Get 38+00

[illegible]

USS BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS/GET) 31 +00		REQUEST ORGANIZATION FOD		RESPONSE ORGANIZATION BLDG 45	
				CONTROL NUMBER C-35	
ACTION REQD BY (TIME): 55+00 GET REQUESTER ENC/COR					
SUBJECT:		ENCLOSED FOR YOUR REVIEW AND COMMENTS ARE OUR RECOMMENDED LOI THRUSTING PROCEDURES.			APPROVAL FOO REP [Signature] TIME 31 : 11 SPAN MGR [Signature] TIME :
RESPONSE:					CONCUR TEAM LDR TIME : CON SR REP TIME : ME MGR TIME : SPAN MGR TIME :
		Delete STEP ON PAGE 5-4 TO DISCONTINUE USE OF P.V. VALVE AT 06:00			
		The P.V. VALVE SHOULD BE CYCLED AS REQUIRED TO MAINTAIN PROPELLANT UNBALANCE WITHIN NORMAL LIMITS I.E. IF THE PUES DISPLAY DATA INDICATES USE OF THE VALVE IT SHOULD BE CYCLED AS REQUIRED THROUGHOUT THE BURN.			
RESPONDER		SPAN MANAGER			
FOD REP		SPAN MANAGER			
TIME :		TIME :			

G
5-1

cb SPS PILOT VLVS(2)-OPEN(VER) P40 SPS THRUSTING
 cb EPS GP 5(2)-CLOSE(VER) Pretrust Program Complete
 configuration, pg. S/1-~~39~~ 40
 CMC & ISS - on
 Cycle CRYO FANS
 SCS - OPERATING
 TEST C/W LAMPS
 Perform EMS ΔV TEST & NULL
 BIAS CHECK, pg G/2-5
 Set ΔVC
 EMS FUNC - ΔV
 SPS GAUGING - AC1
 PUG MODE - NORMAL
 OXID FLOW vlv - PRI
 BMAG MODE (3) - RATE 2
 CMC MODE - FREE
 AUTO RCS SELECT(16)-as req'd
 LOAD DAP (check roll jets)
 ROT CONTR PWR NORM (2) - AC/DC
 Set DET
 V37E 00E
 SC CONT - CMC/AUTO

 7/14/71
 5/24/71

DATE

- 1 MNVR TO PAD BURN ATT
V49E
- 2 PERFORM BORESIGHT & SXT STAR CHECK
V41 N9TE
- 3 V37E 40E
(TFI available via N40, N45 or N35)
- 4 F 50 18 REQUEST MNVR TO FDAI RPY ANGLES (.01°)
(AUTO) BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO
PRO
- 5 06 18 AUTO MNVR TO FDAI RPY ANGLES (.01°)

THRUSTING (P40'S)

THRUSTING (P40's)

G
5-2

6 F 50 18 REQUEST TRIM MINVR TO FDAI RPY ANGLES
ALIGN S/C ROLL (.01°)
GDC ALIGN

TVC CHECK & PREP

cb STAB CONT SYS (all) - close (Pnl 8)
cb SPS (X) - close 10
SET ΔVC (verify)
EMS FUNC - ΔV (verify)
MAN ATT (3) - RATE CMD

ATT DB - MIN
RATE - LOW
TRANS CONT PWR - ON
SCS TVC (2) - RATE CMD
LVCG - LM/CSM or CSM
TVC GMBL DRIVE P&Y - AUTO

+54:00m
(-06:00)

IN BUS TIE (2) - ON
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
ROT CONTR PWR NORMAL (2) - AC
ROT CONT PWR DIRECT (2) - OFF
BMAG MODE (3) - ATT1/RATE 2
SC CONT - SCS
RHC #2 - ARMED

55:00m
(-05:00)

PRIMARY TVC CHECK

GMBL MOT P1-Y1-START/ON (LMP Confirm)
Verify TRIM CONTROL & SET
Verify MTVC
IF SCS: SCS TVC (2) - AUTO
SC CONT - CMC (SCS)
THC - CW
Verify NO MTVC

SEC TVC CHECK

GMBL MOT P2-Y2-START/ON (LMP Confirm)
SET GPI TRIM
Verify MTVC
THC NEUTRAL
Verify NO MTVC

DATE 3/22/71

G
5-3

(TRIM) Verify GPI returns to 0,0(CMC) or trim
(SCS)
ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
BMAG MODE (3) - RATE 2
PRO
BMAG MODE (3) - ATT1/RATE 2
ENTR

7 F 50 25 00204 GMBL TEST OPTION
(ACCEPT) SC CONT - CMC (verify)
PRO

Monitor GPI Response:
00,02,-02,00,02,-02,00, Trim

*TEST FAIL: *
*SC CONT - SCS *
SCS TVC(2) - AUTO

(REJECT) ENTR

8 06 40 TFI, VG, ΔVM (min-sec,.1fps)
PROG ALARM - TIG Slipped
*V5N9E 01703 *
*KEY RLSE TO 8 *

FDAI SCALE - 5/5

RATE - HIGH
UPDATE DET
SPS He vlvs (2) - AUTO (verify)
Check N2 A and N2 B

58:00
(-02:00) ← CD SPS PILOT VLV MNB - CLOSE
REV 52+51
~~AV THRUST A(b) - NORMAL~~
THC - ARMED
RHC (2) - ARMED
TAPE RCDR - HBR/RCD/FWD/CMD RESET

59:25
(-00:35) DSKY BLANKS

DATE 5/24/71

G
5-4

59:30 (AVE G ON)
(-00:30) EMS MODE - NORMAL

06 40 TFI, VG, ΔVM (min-sec, .1fps)
CHECK PIPA BIAS <2fps for 5 sec

59:XX
(-00:XX) ULLAGE

*If no ULLAGE: *
* DIR ULLAGE PB - PUSH*
* Control Att with RHC*

MONITOR ΔVM (R3) COUNTING UP

59:55
(-00:05)

F 99 40 ENG ON ENABLE REQUEST
(AUTO IGN) PRO AT TFI >0 Sec
(BYPASS IGN) ENTR to 11 (Perform switching in 10)
EXIT - V37E 00E

REV 52+51
ΔV THRUST A & B (2) - NORM

9 00:00 IGN *IF SCS: THRUST PB - PUSH*

06 40 TFC, VG, ΔVM (min-sec, .1fps, .1fps)

REV 52.51

cb SPS PILOT
VLV MNA-CLOSE

*F 97 40 SPS Thrust fail *
*ΔV THRUST B(A) NORMAL *
*(RESTART) PRO to IGN *
(RECYCLE) ENTR to TIG-05sec

cb SPS PILOT VLV MNA-CLOSE

00:03

SPS THRUST Lt - ON

ΔV THRUST B(A) NORMAL

IF SCS: +X & THRUST PB - PUSH

MONITOR THRUSTING

Pc 95-105 psia

EMS COUNTING DOWN

SPS INJ VLVS (4) - OPEN

SPS He vlvs tb-gray

SPS FUEL/OXID PRESS - 170-195 psia

PUGS - BALANCED

DATE 3/22/71

06:00 cb SPS PILOT VLV-MNA-OPEN

DISCONTINUE PU VALVE OPERATION

G
5-5

XX:XX ECO

10 F 16 40 TFC (STATIC), VG, ΔVM (min-sec,.1fps)

ΔV THRUST A&B - OFF

VERIFY THRUST OFF

SPS INJ VLVS (4) - CLOSED

SPS He vlvs tb (2) - bp

GMBL MTRS (4) - OFF (LMP Confirm)

TVC SERVO PWR 1&2 - OFF

MN BUS TIE (2) - OFF

PRO

11 F 16 85 VG XYZ (CM) (.1fps)

NULL RESIDUALS

RECORD ΔV COUNTER & RESIDUALS ΔVC

EMS FUNC - OFF

VGX

EMS MODE - STBY

VGY

RHC & THC - LOCKED

VGZ

ATT DB - MAX

TRANS CONT PWR - OFF

ROT CONTR PWR DIRECT (2) - OFF

BMAG MODE (3) - RATE 2

cb DIRECT ULLAGE (2) - open

cb SPS P1 & Y1 - open

PCM BIT RATE - LOW

MAP CAMR ON - OFF (except lunar orb.)

PAN CAMR PWR - OFF

SM/AC PWR - OFF (except lunar orb.)

PRO (If MINKEY, To Sequencer 3X.2)

DATE 5/24/71

-b SPS PILOT VLV MNB-OPEN →

12 F 37 V82E

13 F 16 44 HA,HP,TFF (.1nm,min-sec)

PRO

14 F 37 OOE

PROP CONS

CAUTION: Verify EMS FUNC sw - OFF
before closing EMS cb's Panel 8
(As per CCL pg E 1-3)

G
5-1

P40 SPS THRUSTING

Prethrust Program Complete
Verify SIM PWR DOWN (Nominal)
configuration, pg. S/1-29/C

CMC & ISS - on

Cycle CRYO FANS

SCS - OPERATING

TEST C/W LAMPS

Perform EMS ΔV TEST & NULL

BIAS CHECK, pg G/2-5

Set ΔV C

EMS FUNC - ΔV

SPS GAUGING - AC1

PUG MODE - NORMAL

OXID FLOW vlv - PRI

BMAG MODE (3) - RATE 2

CMC MODE - FREE

AUTO PCS SELECT(16)-as req'd

LOAD DAP (check roll jets)

ROT CONTR PWR NORM (2) - AC/DC

Set DET

V37E 00E

SC CONT - CMC/AUTO

MNVR TO PAD BURN ATT

V49E

PERFORM BOPESIGHT & SXT STAR CHECK

V41 N9TE

V37E 40E

(TFI available via N40, N45 or N35)

4 F 50 18 REQUEST MNVR TO FDAI RPY ANGLES (.01°)
(AUTO) BMAG MODE (3) - RATE 2

SC CONT - CMC/AUTO

PRO

5 06 18 AUTO MNVR TO FDAI RPY ANGLES (.01°)

THRUSTING (P40's)

6
5-2

6 F 50 18

REQUEST TRIM MNVR TO FDAI RPY ANGLES
ALIGN S/C ROLL (.01°)
GDC ALIGN

TVC CHECK & PREP

CB SPS PILOT VLV-A
(A) - OPEN

~~CB~~ STAB CONT SYS (all) - close (Pnl 8)
~~CB~~ SPS ~~(all)~~ - close

SET ΔV (verify)
EMS FUNC - ΔV (verify)
MAN ATT (3) - RATE CMD

ATT DB - MIN
RATE - LOW
TRANS CONT FWR - ON
SCS TVC (2) - RATE CMD
LVCG - LM/CSM or CSM
TVC GMBL DRIVE P&Y - AUTO

+54:00m
(-06:00)

MN BUS TIE (2) - ON
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
ROT CONTR PWR NORMAL (2) - AC
ROT CONTR PWR DIRECT (2) - OFF
BNAG MODE (3) - ATT1/RATE 2
SC CONT - SCS
RHC #2 - ARMED

55:00m
(-05:00)

PRIMARY TVC CHECK

GMBL MOT P1-Y1-START/ON (LMP Confir
Verify TRIM CONTROL & SET
Verify MTVC

IF SCS: SCS TVC (2) - AUTO
SC CONT - CMC (SCS)
THC - CW
Verify NO MTVC

SEC TVC CHECK

GMBL MOT P2-Y2-START/ON (LMP Confir
SET GPI TRIM
Verify MTVC
THC NEUTRAL
Verify NO MTVC

G
5-3

Verify GPI returns to 0,0(CMC) or trim
(SCS)
ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
(TRIM) BMAG MODE (3) - RATE 2
PRO
BMAG MODE (3) - ATT1/RATE 2
ENTR

7 F 50 25 00204 GMBL TEST OPTION
(ACCEPT) SC CONT - CMC (verify)
PRO

Monitor GPI Response:
00,02,-02,00,02,-02,00, Trim

*TEST FAIL: *
*SC CONT - SCS *
SCS TVC(2) - AUTO

(REJECT) ENTR

8 06 40 TFI, VG, ΔVM (min-sec,.1fcs
PROG ALARM - TIG Slipped
*V5N9E 01703 *
*KEY RLSE TO 8 *

FDAI SCALE - 5/5

RATE - HIGH
UPDATE DET
SPS He vlv (2) - AUTO (verify)
Check N2 A and N2 B

58:00
(-02:00)

~~ANTHUS T A - NORMAL (verify)~~
~~ANTHUS T A - NORMAL~~
THC - ARMED
RHC (2) - ARMED
TAPE RCD - HBR/RCD/FWD/CMD RESET

59:25
(-00:35)

DSKY BLANKS
~~ANTHUS T A - NORMAL~~

DATE 5/24/71

G
5-4

59:30 (AVE G ON)
(-00:30) EMS MODE - NORMAL
~~AV THRUST B~~ **≠ NORMAL**
06 40 TFI, VG, ΔVM (min-sec, .1fps)
CHECK PIPA BIAS <2fps for 5 sec

59:XX ULLAGE
(-00:XX)

*If no ULLAGE: *
* DIR ULLAGE PB - PUSH*
* Control Att with RHC*

MONITOR ΔVM (R3) COUNTING UP

59:55
(-00:05)
F 99 40 ENG ON ENABLE REQUEST
(AUTO IGN) PRO AT TFI >0 Sec
(BYPASS IGN) ENTR to 11 (Perform switching in 11)
EXIT - V37E 00E

9 00:00 IGN *IF SCS: THRUST PB - PUSH*

06 40 TFC, VG, ΔVM (min-sec, .1fps, .1fps)

*F 97 40 SPS Thrust fail *
*ΔV THRUST B(A)-NORMAL *
*(RESTART) PRO to IGN *
(RECYCLE) ENTR to TIG-05sec

DATE

00:03

~~SPS THRUST Lt ON~~

~~ΔV THRUST B(A) - NORMAL~~

IF SCS: +X & THRUST PB - PUSH

MONITOR THRUSTING

Pc 95-105 psia

EMS COUNTING DOWN

SPS INJ VLVS (4) - OPEN

SPS He vlvs tb-gray

SPS FUEL/OXID PRESS - 170-195 psia

PUGS - BALANCED

~~ECO-00:40~~

ECO-00:40 cb SPS pilot vlv A - open.

G
5-5

XX:XX ECO

10 F 16 40 TFC (STATIC), VG, Δ VM (min-sec,.1fps)
 Δ V THRUST ~~DB~~ - OFF
VERIFY THRUST OFF
SPS INJ VLVS (4) - CLOSED
SPS He vlvs tb (2) - bp
GMBL MTRS (4) - OFF (LMP Confirm)
TVC SERVO PWR 1&2 - OFF
MN BUS TIE (2) - OFF
PRO

11 F 16 85 VG XYZ (CM) (.1fps)
NULL RESIDUALS
RECORD Δ V COUNTER & RESIDUALS Δ VC
EMS FUNC - OFF VGX _____
EMS MODE - STBY VGY _____
~~W~~RHC & THC - LOCKED VGZ _____
ATT DB - MAX
TRANS CONT PWR - OFF
ROT CONTR PWR DIRECT (2) - OFF
BMAG MODE (3) - RATE 2
cb DIRECT ULLAGE (2) - open
cb SPS P1 & Y1 - open
PCM BIT RATE - LOW
MAP CAMR ON - OFF (except lunar orb.)
PAN CAMR PWR - OFF
SM/AC PWR - OFF (except lunar orb.,
PRO (If MINKEY, To Sequencer 3X.2)

DATE 5/24/71

12 F 37 V82E

13 F 16 44 HA,HP,TFF (.1mm,min-sec)

PRO

14 F 37 00E

cb EMS (2) - open.

PROP CONS

GNC

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS/GET) 53+21	REQUEST ORGANIZATION	RESPONSE ORGANIZATION FOD	CONTROL NUMBER C-63		
ACTION REQD BY (TIME):			REQUESTER		
SUBJECT: REFERENCE SMEAR C-35		APPROVAL			
FINAL UPDATE TO LOI THRUST		FOD REP		TIME 53:24	
PROCEDURE IS ATTACHED NEW		SPAN MGR		TIME 53:25	
ENTRIES ARE IDENTIFIED AS					
50+51. B45 RECOMMENDATIONS					
IN C-35 WERE DISPOSITIONED AS FOLLOWS:					
A. - INCORPORATED					
B. - INTENT INCORPORATED. ACTUAL ENTRY IS AT T-5 SEC					
C. - NOT ADDED TO PROCEDURE. WILL BE FOLLOWED IN REAL TIME BASED WPN SITUATION AT TIME.					
RESPONSE:	D. DO NOT CONCUR. WILL NOT OPERATE		CONCUR		
	P.U. VALVE FOR LAST PART		TEAM LDR		
	OF BURN IN ORDER TO GET		TIME 54:58		
	GOOD DATA ON ENGINE		CON SR REP		
	PERFORMANCE ON SINGLE BANK		TIME 56:59		
	FOR LATER LUNAR ORBIT		ME MGR		
	BURNS.		TIME 57:00		
			SPAN MGR		
			TIME 58:30		
RESPONDER					
FOD REP		SPAN MANAGER			
TIME		TIME 58:30			

RECOMMENDED LOT PROCEDURE

FROM GNC'S

G
5-1

cb SPS PILOT VLVS(2)-OPEN(VER)
cb EPS GP 5(2)-CLOSE(VER)

P40 SPS THRUSTING

Pretmst Program Complete
Verify SIM PWR DOWN (Nominal)
configuration, pg. S/1-39

CMC & ISS - on
Cycle CRYO FANS
SCS - OPERATING

TEST C/W LAMPS

Perform EMS ΔV TEST & NULL
BIAS CHECK, pg G/2-5

Set ΔVC
EMS FUNC - ΔV
SPS GAUGING - AC1
PUG MODE - NORMAL

OXID FLOW vlv - PRI
BMAG MODE (3) - RATE 2
CMC MODE - FREE

AUTO RCS SELECT(16)-as req'd
LOAD DAP (check roll jets)

ROT CONTR PWR NORM (2) - AC/DC
Set DET

V37E 00E

SC CONT - CMC/AUTO

MNVR TO PAD BURN ATT
V49E

PERFORM BORESIGHT & SXT STAR CHECK
V41 N91E

V37E 40E
(TFI available via N40, N45 or N35)

4 F 50 18 REQUEST MNVR TO FDAI RPY ANGLES (.01°)
(AUTO) BMAG MODE (3) - RATE 2
SC CONT - CMC/AUTO
PRO

5 06 18 AUTO MNVR TO FDAI RPY ANGLES (.01°)

7/14/71
5/24/71
DATE

THRUSTING (P40'S)

G
5-2

6 F 50 18 REQUEST TRIM MINVR TO FDAI RPY ANGLES
ALIGN S/C ROLL (.01°)
GDC ALIGN

TVC CHECK & PREP

cb STAB CONT SYS (all) - close (Pnl 8)
cb SPS (X) - close 10
SET ΔVC (verify)
EMS FUNC - ΔV (verify)
MAN ATT (3) - RATE CMD

ATT DB - MIN
RATE - LOW
TRANS CONT PWR - ON
SCS TVC (2) - RATE CMD
LVCG - LM/CSM or CSM
TVC GMBL DRIVE P&Y - AUTO

+54:00m
(-06:00)

IN BUS TIE (2) - ON
TVC SERVO PWR #1 - AC1/MNA
TVC SERVO PWR #2 - AC2/MNB
ROT CONTR PWR NORMAL (2) - AC
ROT CONT PWR DIRECT (2) - OFF
BMAG MODE (3) - ATT1/RATE 2
SC CONT - SCS
RHC #2 - ARMED

55:00m
(-05:00)

PRIMARY TVC CHECK

GMBL ROT P1-Y1-START/ON (LMP Confirm)
Verify TRIM CONTROL & SET
Verify MTVC
IF SCS: SCS TVC (2) - AUTO
SC CONT - CMC (SCS)
THC - CW
Verify NO MTVC

SEC TVC CHECK

GMBL ROT P2-Y2-START/ON (LMP Confirm)
SET GPI TRIM
Verify MTVC
THC NEUTRAL
Verify NO MTVC

DATE 3/22/71

G
5-3

(TRIM) Verify GPI returns to 0,0(CMC) or trim (SCS)
ROT CONT PWR NORM (2) - AC/DC
ROT CONT PWR DIRECT (2) - MNA/MNB
BMAG MODE (3) - RATE 2
PRO
BMAG MODE (3) - ATT1/RATE 2
ENTR

7 F 50 25 00204 GMBL TEST OPTION
(ACCEPT) SC CONT - CMC (verify)
PRO

Monitor GPI Response:
00,02,-02,00,02,-02,00, Trim

*TEST FAIL: *
*SC CONT - SCS *
SCS TVC(2) - AUTO

(REJECT) ENTR

8 06 40 TFI, VG, ΔVM (min-sec,.1fps)
PROG ALARM - TIG Slipped
*V5N9E 01703 *
*KEY RLSE TO 8 *

FDAI SCALE - 5/5

RATE - HIGH
UPDATE DET
SPS He vlvs (2) - AUTO (verify)
Check N2 A and N2 B

58:00
(-02:00)

CD SPS PILOT VLV MNB - CLOSE

AV THRUST A(B) - NORMAL

THC - ARMED

RHC (2) - ARMED

TAPE RCDR - HBR/RCD/FWD/CMD RESET

REV
52+51

59:25
(-00:35)

DSKY BLANKS

DATE 5/24/71

G
5-4

59:30 (AVE G ON)
(-00:30) EMS MODE - NORMAL

06 40 TFI, VG, ΔVM (min-sec, .1fps)
CHECK PIPA BIAS <2fps for 5 sec

59:XX ULLAGE
(-00:XX)

*If no ULLAGE:
* DIR ULLAGE PB - PUSH*
* Control Att with RHC*

MONITOR ΔVM (R3) COUNTING UP

59:55
(-00:05)

F 99 40 ENG ON ENABLE REQUEST
(AUTO IGN) PRO AT TFI >0 Sec
(BYPASS IGN) ENTR to 11 (Perform switching in 10)
EXIT - V37E 00E

9 00:00 IGN *IF SCS: THRUST PB - PUSH*

06 40 TFC, VG, ΔVM (min-sec, .1fps, .1fps)

F 97 40 SPS Thrust fail
V THRUST B(A) NORMAL
* (RESTART) PRO to IGN *
* (RECYCLE) ENTR to TIG-05sec*

cb SPS PILOT VLV MNA-CLCS

00:03

SPS THRUST Lt - ON
V THRUST B(A) NORMAL
IF SCS: +X & THRUST PB - PUSH

MONITOR THRUSTING

Pc 95-105 psia

EMS COUNTING DOWN

SPS INJ VLVS (4) - OPEN

SPS He vlvs tb-gray

SPS FUEL/OXID PRESS - 170-195 psia

PUGS - BALANCED

DATE 3/22/71

06:00 cb SPS PILOT VLV-MNA-OPEN
DISCONTINUE PU VALVE OPERATION

G
5-5

XX:XX ECO

10 F 16 40 TFC (STATIC), VG, Δ VM (min-sec,.1fps)

Δ V THRUST A&B - OFF

VERIFY THRUST OFF

SPS INJ VLVS (4) - CLOSED

SPS He vlvs tb (2) - bp

GMBL MTRS (4) - OFF (LMP Confirm)

TVC SERVO PWR 1&2 - OFF

MN BUS TIE (2) - OFF

PRO

11 F 16 85 VG XYZ (CM) (.1fps)

NULL RESIDUALS

RECORD Δ V COUNTER & RESIDUALS Δ VC

EMS FUNC - OFF

VGX

EMS MODE - STBY

VGY

RHC & THC - LOCKED

VGZ

ATT DB - MAX

TRANS CONT PWR - OFF

ROT CONTR PWR DIRECT (2) - OFF

BMAG MODE (3) - RATE 2

cb DIRECT ULLAGE (2) - open

cb SPS P1 & Y1 - open

PCM BIT RATE - LOW

MAP CAMR ON - OFF (except lunar orb.)

PAN CAMR PWR - OFF

SM/AC PWR - OFF (except lunar orb.)

PRO (If MINKEY, To Sequencer 3X.2)

DATE 5/24/71

12 F 37 V82E

13 F 16 44 HA,HP,TFF (.1nm,min-sec)

PRO

14 F 37 00E

PROP CONS

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T- MINUS /GET) 55:49	REQUEST ORGANIZATION MER	RESPONSE ORGANIZATION INFO ONLY	CONTROL NUMBER C-67		
ACTION REQD BY (TIME): INFO ONLY			REQUESTER		
SUBJECT: RESULTS OF CSM 114		APPROVAL			
TESTS ON PANEL 100 NUMERICS / INTEGRAL LIGHTING TRANSFORMERS WITH PANEL 226 CB 33 OPEN		TEAM LDR <i>[Signature]</i>			
		TIME 56:06			
		CON SR REP <i>[Signature]</i>			
		TIME 56:20			
		ME MANAGER <i>[Signature]</i>			
		TIME 56:24			
		SPAN MGR			
		TIME :			
RESPONSE:		CONCURRENCE			
		FOD REP			
		TIME :			
		SPAN MGR			
		TIME :			
		TEAM LDR			
		TIME :			
		CON SR REP			
		TIME :			
RESPONDER					
ME MANAGER				SPAN MANAGER	
TIME :				TIME :	

CSM 114 TESTS ON PANEL 100 NUMERICS/INTEGRAL TRANSFORMERS WITH
PANEL 226 CB33 OPEN

With CB33 on Panel 226 open, a current path exists to the primaries of the T2 and T3 transformers through a 1/8 amp. fuse and 1.27K resistor. This limited primary current provides sufficient secondary current to illuminate some lights. This capability was checked on CSM 114. The following are the results of these tests:

General Conditions: 1. Normal cabin ambient lighting.
2. CB33 open.

Test 1: Both integral and numerics full on.

Integral (T2) - Pnl EL's not readable.

Numerics (T3) - Pnl 306 MET readable, DSKY alarm indicator
lt (NO APT), bright.

Test 2: Integral full dim with numerics full on.

Integral - EL's not readable.

Numerics - Pnl 306 EL's readable, MET readable, DSKY alarm lt
bright.

Test 3: Integral full on with numerics full dim.

Integral - Pnl EL's readable.

Numerics - Pnl 306, MET and DSKY lt not readable.

The above tests shows that the sufficient lighting could be available if the LEB DSKY alarm lts are desired by turning on the numerics control full on with the integral on full dim. This assumes that a short circuit does not exist on the primaries of either T2 or T3 or the secondary of T3; also, that the 1/8 amp. fuse had not blown when CB33 opened. With CB33 open, this procedure does not pose any safety hazard since the maximum primary and secondary current is limited by the 1/8 amp. fuse and 1.27K resistor.

As a simple check, the CSM 112 crew can be requested to view the Pnl 306 MET and the integral lights on panel 100. The crew should also be requested to report the positions of T2 and T3.

CB 33

115V/5V

30 LITES

DELAY

5V AC
400 ~LEB LIGHTS
NUMERICS

OFF T3 CT

MISSION
TIMER

PNL 306

115VAC
VARIABLE
400 ~SWITCHES CANNOT BE
OPENED BECAUSE OF
MECHANICAL STOPOFF T2 BRT
LEB LIGHTS
INTEGRAL

PNL 1 EMS

SCROLL RST

DSKY
PUSHBUTTON LITESNOW
VERB
BURE
PBO
CLEAR
RST
KEY BEL

19 ELECTRO-LUMINESCENT PANELS

+
0
1
2
3
4
5
6
7
8
9YELLOW LAMP
WHITE LAMP
5VDC
22 ~
5VDC

ALARM INDICATOR LIGHTS

DSKY

PNL 122

GPN

INDICATOR

CONTROL

15 ELECTRO
PANELS(QUICK
ILLUMINATION)

EL PANELS

PNL 100

PNL 10

PNL 225

PNL 226

PNL 101

PNL 306

DET

B

* T3 (LEB LIGHTS NUMERICS)
ALSO CONTROLS NUMERIC LIGHTS
INTENSITY ON DSKY. CONTROL
PROVIDED FROM POTENTIOMETER
ON T3 - POWER IS INTERNAL TO
DSKY.

GNC

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS/GET)	REQUEST ORGANIZATION	RESPONSE ORGANIZATION	CONTROL NUMBER		
55+09	FOD	45	C-66		
ACTION REQD BY (TIME):		REQUESTER			
60+00:00		GNC			
SUBJECT: OPTICS ZERO PROBLEM Re. P23				APPROVAL	
With reference to the optics zero problem and the note per GET 47:50 Flight Plan UPDATE re; OPTICS zero when trunion angle > 100				FOD REP	
1. If the trunion angle is $< 10^\circ$ will the Trunion zero drive rate be low enough to prevent the prism from being jarred out of calibration by hitting the stops?				TIME 55:57	
2. Should the optics be manually zeroed for all future OPTICS OPERATIONS before using the OPTICS Zero switch?				SPAN MGR	
3. When Turning OPTICS POWER ON/OFF should the optics zero/off switch be in the off position with the optics mode switch in Manual?				Full	
* 4. What if trunion operation is disrupted?				TIME 56:02	
RESPONSE:				CONCUR	
1. DRIVE RATE MAY BE HIGH ENOUGH TO ALLOW HITTING THE SOFT STOP, HOWEVER, EVEN HITTING THE HARD STOP SHOULD NOT CAUSE THE MIRROR TO MOVE RELATIVE TO THE RESOLVER.				TEAM LDR	
2. NO DESIGN CONSTRAINTS REQUIRE MANUAL ZEROING BEFORE SELECTING ZERO OPTICS.				13 Jan 61	
3. SAME AS #2				TIME 57:47	
RECOMMEND PERFORMING ANOTHER OPTICS CALIBRATION BEFORE MCC-4				CON SR REP	
FOD's FAO working up FLT Plan change to action - Full 6575				E. H. H. H.	
RESPONDER				TIME 57:58	
FOD REP				ME MGR	
Full				D. L. Jones	
TIME 62:00				TIME 58:01	
SPAN MANAGER				SPAN MGR	
R. L. Hubicki				Full	
TIME 63:15				TIME 59:47	

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS/GET)	REQUEST ORGANIZATION	RESPONSE ORGANIZATION	CONTROL NUMBER		
61 + 00	FOD	45	C-75		
ACTION REQD BY (TIME):		REQUESTER			
INFO		GNC			
SUBJECT:	CB 33 Panel 226				APPROVAL
Enclosed is a detail listing of functions lost with CB 33 on panel 226 opened. (Considered to be 95% correct)					FOD REP
					R. J. Moore
					TIME 61:00
					SPAN MGR
					R. K. K.
					TIME 61:03
INFO					
					CONCUR
					TEAM LDR
					TIME :
					CON SR REP
					TIME :
					ME MGR
					TIME :
					SPAN MGR
					TIME :
					RESPONDER
FOD REP		SPAN MANAGER			
TIME :		TIME :			

SPAN

LIGHTING LOST AS RESULT
of popped cb 33 (LEB 226).
(LIGHTING-NUMERICS/INTEGRAL LEB AC2)

1. EMS scroll Lite
2. EMS RST Lite
3. Electroluminescent Lites on:
 - a. LIGHTING CONTROL PNL 100 (LEB)
 - b. Comm. PNL 10 (RHEB)
 - c. cb PNL 225 (RHEB)
 - d. cb PNL 226 (RHEB)
 - e. Mission & Event Timer PNL 306 (LHFEB)
 - f. System Test Motor PNL 101 (LEB)
 - g. Optics PNL 122 (LEB)
4. NAV DSKY KEYBOARD PNL 140 (LEB)
5. NAV DSKY ANNUNCIATOR PNL 140 (LEB)
6. Optics ANNUNCIATOR PNL 122 (LEB)
7. Mission Timer Counters PNL 306 (LHFEB)

GNC

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS/GET)	REQUEST ORGANIZATION	RESPONSE ORGANIZATION	CONTROL NUMBER		
72:35	PA	MPAD	C-87		
ACTION REQD BY (TIME): 73:00		REQUESTER McDUIRT			
SUBJECT:	SPS End of Mission Margin APPROVAL				
Please provide expected				FOD REP	MPB/Bricks
SPS end of mission margins				TIME	72:38
FOR NOMINAL END LM				SPAN MGR	RB/Wh
Rescue.				TIME	72:37
(45 INFO)					
RESPONSE:	CONCUR				
See attached sheets				TEAM LDR	
				TIME	:
				CON SR REP	
				TIME	:
				ME MGR	
Chuck Paces				TIME	:
				SPAN MGR	RB/Wh
				TIME	75:51
RESPONDER	Sam Mayfield				
FOD REP			SPAN MANAGER		
TIME 76:19			RB/Wh		
		TIME 76:20			

APOLLO 15
 NOMINAL MISSION PROFILE
 SPS PROPELLANT SUMMARY

	REQUIRED, lb	REMAINING, lb
CURRENT TOTAL PROPELLANT		40650.3
TRAPPED AND UNAVAILABLE	441.4	40208.9
OUTAGE	22.0	40186.9
UNBALANCE METER	100.0	40086.9
AVAILABLE FOR ΔV		40086.9
REQUIRED FOR ΔV		
MCC-4 (5.4 FPS)	69.2	40017.7
LOI (2996 FPS)	26242.8	13774.9
DOI (207.6 FPS)	1559.2	12215.7
CIRC (70.8 FPS)	277.0	11938.7
LOPC (308.6 FPS)	1130.2	10808.5
SHAPING (64.2 FPS)	243.2	10565.3
TEI (3050 FPS)	9336.8	1228.5
NOMINAL REMAINING		1228.5
DISPERSIONS		
- 3 σ PERFORMANCE	258.0	970.5

* 970.5 $\rightarrow$ 370 FPS E.O.M. ΔV RES.

* ΔV available for weather avoidance

Nominal remaining on current budget includes
TLMC (1228.5 lb)

Nominal remaining on permission budget
did not include TLMC (1379.0 lb).

Including TLMC on permission leaves
1116.8 lb, thus we have gained
111.7 lb (42 FPS E.O.M.).

STVB ΔV deficit (70 FPS gained)
-30 performance (due to MCC-dispersions) has-
dropped 94 lb (36 FPS gained)

Permission E.O.M. ΔV reserves	276 FPS
Current E.O.M. ΔV reserves	<u>370 FPS</u>
	$\Delta = 94$

TOTAL of ΔV reserves gained = 98.

APOLLO 15

MISSION PROFILE ASSUMING LM RESCUE

SPS PROPELLANT SUMMARY

	REQUIRED, lb	REMAINING, lb
CURRENT TOTAL PROPELLANT		40650.3
TRAPPED AND UNAVAILABLE	441.4	40208.9
OUTAGE	22.0	40186.9
UNBALANCE METER	100.0	40086.9
AVAILABLE FOR ΔV		40086.9
REQUIRED FOR ΔV		
MCC-4 (5.4 FPS)	69.2	40017.7
LDI (2996 FPS)	26242.8	13774.9
DOI (207.6 FPS)	1559.2	12215.7
CIRC (70.8 FPS)	277.0	11938.7
LOPC (308.6 FPS)	1130.2	10808.5
LM RESCUE (600 FPS)	2131.3	8677.2
TEI (2700 FPS)	7911.4	765.8
MINAL REMAINING		765.8

* 7658 lb $\rightarrow$ 290 FPS

* Premission budgeting does not consider weather avoidance in LM rescue situations, therefore this could be zero and still have an acceptable mission budget.

GNC

USS BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS/GET) 51+00	REQUEST ORGANIZATION FCD	RESPONSE ORGANIZATION BLDG 45	CONTROL NUMBER 60 C- 52A		
ACTION REQD BY (TIME): 54+00			REQUESTER GNC		
SUBJECT: SPS THRUST VALUES.		APPROVAL			
Also we need SPS THRUST VALUES				FOD REP Blair	
BASED ON USING BANK 8 ONLY FOR				TIME 57:05	
DOI, CIRC, PCL, & SHAPE (REF C-42).				SPAN MGR R. H. Kohn	
ALSO NEED EFFECTIVE THRUST VALUES FOR				TIME 51:11	
LOI & TEI BASED ON PLAN.					
Reference C-52					
Reference C-52					
RESPONSE:		CONCUR			
See ATTACH ATTACHED ANSWER				TEAM LDR [Signature]	
NOTE: TEI TO BE SUPPLIED				TIME 52:12	
AT GET 76:00				CON SR REP [Signature]	
				TIME 52:30	
				ME MGR [Signature]	
				TIME 52:32	
				SPAN MGR [Signature]	
				TIME 53:07	
RESPONDER James A. Wood / [Signature]					
FOD REP Blair		SPAN MANAGER R. H. Kohn			
TIME 53:11		TIME 53:11			

SPAN MISSION EVALUATION ACTION REQUEST (CONTINUATION SHEET)

(PLEASE USE BLACK BALLPOINT PEN)

TIME (T-MINUS/GET)	REQUEST ORGANIZATION	RESPONSE ORGANIZATION	CONTROL NUMBER
40:27	SPAN	45 (SPS)	C-60 C-52

THE FOLLOWING "EFFECTIVE" PERFORMANCE PARAMETERS AND DISPERSIONS (TABLES 11 & 12) ARE RECOMMENDED FOR PREDICTING THE SPS THRUST, ISP, AND TOTAL PROPELLANT FLOWRATE FOR THE LOI, DOI, CIRC, PCI AND SHAPING BURNS. PERFORMANCE PARAMETERS FOR THE TEI BURN WILL BE SUPPLIED BY 7-29-71 (76:00 GET.). FOR THE LOI BURN THE PARAMETERS ARE BASED ON A DUTY CYCLE OF: BANK B IGN., BANK A ON AT IGN. + 5 SEC. AND BANK A OFF AT IGN. + 6 MIN. ALSO, NO PU VALVE OPERATION IS PREDICTED DURING THE LATTER BANK B PORTION OF THE LOI BURN. FOR THE OTHER BURNS THE PU VALVE WAS PREDICTED TO BE IN THE "NORMAL" POSITION.

IT SHOULD BE NOTED THAT TRANSFER VALUES FROM THE SC 112 SODS SECTION FOR SINGLE BANK SHUTDOWN NOW BE USED (TABLE 112-4.5.2, AMENDMENT 65).

IT IS ALSO RECOMMENDED THAT FOR THE TEI BURN, BANK A BE SHUTDOWN AT PREDICTION SHUTDOWN -10 SEC (INSTEAD OF -5 SEC). THE -10 SEC. WILL BETTER ALLOW FOR BURN TIME DISPERSIONS DUE TO CHANGES FROM PREDICTED TANK PRESSURES, PU VALVE OPERATION, ETC. IN PREDICTED SPS PERFORMANCE VALUES.

SINGLE } BEF COVER 19989 20247
 BORE } 63.5 64.3

7/28/71
 GET 50:50

TABLE 11
 EFFECTIVE ENGINE PERFORMANCE FOR MISSION J-1

Burn Effective Parameter	LOI		DOI PU Valve in Primary Normal	CIRC	LOPC	SHAPING PU NORM	TEI
	Before Crossover	After Crossover					
Thrust - lbf	20607	20715	20497	20644	20497	20540	TO BE SUPPLIED
Specific Impulse sec	315.041	315.1044	314.988	315.0	314.988	315.0	
Total Propellant Flowrate - lbm/sec	65.4057	65.7401	65.072	65.5	65.072	65.21	
Mixture Ratio							

replaced by
 C-95
 at 76+05

TABLE 12
 EFFECTIVE ENGINE PERFORMANCE DISPERSIONS FOR MISSION J-1
 (One Standard Deviation)

Burn Effective Parameter	LOI		DOI PU Valve in Primary Normal	CIRC SHAPING	LOPC	TEI
	Before Crossover	After Crossover				
Thrust - lbf	84	85	102	133	102	85
Specific Impulse sec	0.53	0.53	0.53	0.53	0.53	0.53
Total Propellant Flowrate - lbm/sec	0.25	0.26	0.32	0.41	0.32	0.26
Mixture Ratio	0.014	0.014	0.021	0.028	0.021	0.014

GNC

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS /GET)	REQUEST ORGANIZATION	RESPONSE ORGANIZATION	CONTROL NUMBER		
76:02	SPS	FOD	C-95		
ACTION REQD BY (TIME):			REQUESTER		
SUBJECT: SPS THRUST DATA			APPROVAL		
REFERENCE C-52 & C-60 UPDATED SPS THRUST ISP & FLOWRATE DATA ATTACHED. TEI NOW INCLUDED.			TEAM LDR CRH TIME 76:02		
			CON SR REP C/M/P TIME 76:18		
			ME MANAGER JW TIME 76:20		
			SPAN MGR RKH TIME 76:52		
RESPONSE: Success NAR - File - SPS 5500			CONCURRENCE		
FOD acknowledges - Thamy			FOD REP MBracks TIME 77:02		
			SPAN MGR RKH TIME 77:07		
			TEAM LDR C/M/P TIME 77:56		
			CON SR REP J. H. Jaykin TIME 77:54		
RESPONDER					
ME MANAGER M. Schelley TIME 78:04				SPAN MANAGER RKH TIME 78:28	

TABLE 11

EFFECTIVE ENGINE PERFORMANCE FOR MISSION J-1

76:02:10

Effective Parameter \ Burn	LOI		DOI PU Valve in Primary Normal	CIRC	LOPC	SHAPING PU NORM	TEI
	Before Crossover	After Crossover					
Thrust - lbf	20607	20722	20547 -412 20135 DEC	20689 -409 20280	20575	20595	20673
Specific Impulse sec	315.064	315.104	315.019	315.040	314.946	314.913	315.017
Total Propellant Flowrate - lbm/sec	65.4057	65.7033	65.2245 1.30 63.92 DEC	65.6691 -1.2 64.46	65.330	65.3977	65.6261

TABLE 12

EFFECTIVE ENGINE PERFORMANCE DISPERSIONS FOR MISSION J-1
(One Standard Deviation)

Effective Parameter \ Burn	LOI		DOI PU Valve in Primary Normal	CIRC AND SHAPING	LOPC	TEI
	Before Crossover	After Crossover				
Thrust - lbf	84	85	102	133	102	85
Specific Impulse sec	0.53	0.53	0.53	0.53	0.53	0.53
Total Propellant Flowrate - lbm/sec	0.25	0.26	0.32	0.41	0.32	0.26
Mixture Ratio	0.014	0.014	0.021	0.028	0.021	0.014

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS /GET)	REQUEST ORGANIZATION	RESPONSE ORGANIZATION	CONTROL NUMBER		
99:34	SPS	FOD	C-125		
ACTION REQD BY (TIME):			REQUESTER		
SUBJECT:			APPROVAL		
SPS PU Valve Position					
Recommend PU Valve be placed in Normal Position For remaining short burns. FOR TEL recommend PU Valve position be to to maintain PU unbalance meter readout within Green band (minimum unbalance). PU Valve is now in decrease position therefore Thrust values will require update if position is place in normal. CFS contains thrust values for PU Valve in Normal Position. <i>John J. J. J.</i>			TEAM LDR		
			<i>A. Dec</i>		
			TIME 00:22		
			CON SR REP		
PU Valve position be to to maintain PU unbalance meter readout within Green band (minimum unbalance). PU Valve is now in decrease position therefore Thrust values will require update if position is place in normal. CFS contains thrust values for PU Valve in Normal Position. <i>John J. J. J.</i>			CON SR REP		
			<i>B. J. J. J.</i>		
			TIME 100:23		
			ME MANAGER		
PU Valve is now in decrease position therefore Thrust values will require update if position is place in normal. CFS contains thrust values for PU Valve in Normal Position. <i>John J. J. J.</i>			ME MANAGER		
			<i>J. J. J.</i>		
			TIME 100:23		
			SPAN MGR		
PU Valve is now in decrease position therefore Thrust values will require update if position is place in normal. CFS contains thrust values for PU Valve in Normal Position. <i>John J. J. J.</i>			SPAN MGR		
			<i>R. J. J.</i>		
			TIME 100:33		
RESPONSE:			CONCURRENCE		
ALL RTCC AND ONBOARD THRUSTS WERE COMPUTED ASSUMING PU VALVE WOULD BE MAINTAINED IN DECREASE UNTIL TEL. CFIMP16 WAS UPDATED @ 101+20 TO BE 20,280 LBS. WE FEEL THAT ANY UNBALANCE ACCUMULATED IN THE SHORT BURNS WILL BE ADEQUATELY CONTROLLED / COMPENSATED FOR DURING TEL <i>John J. J. J.</i> <i>101:30</i> <i>GNC</i>			FOD REP		
			<i>John J. J. J.</i>		
			TIME 107:		
			SPAN MGR		
ALL RTCC AND ONBOARD THRUSTS WERE COMPUTED ASSUMING PU VALVE WOULD BE MAINTAINED IN DECREASE UNTIL TEL. CFIMP16 WAS UPDATED @ 101+20 TO BE 20,280 LBS. WE FEEL THAT ANY UNBALANCE ACCUMULATED IN THE SHORT BURNS WILL BE ADEQUATELY CONTROLLED / COMPENSATED FOR DURING TEL <i>John J. J. J.</i> <i>101:30</i> <i>GNC</i>			SPAN MGR		
			<i>R. J. J.</i>		
			TIME 102:00		
			TEAM LDR		
ALL RTCC AND ONBOARD THRUSTS WERE COMPUTED ASSUMING PU VALVE WOULD BE MAINTAINED IN DECREASE UNTIL TEL. CFIMP16 WAS UPDATED @ 101+20 TO BE 20,280 LBS. WE FEEL THAT ANY UNBALANCE ACCUMULATED IN THE SHORT BURNS WILL BE ADEQUATELY CONTROLLED / COMPENSATED FOR DURING TEL <i>John J. J. J.</i> <i>101:30</i> <i>GNC</i>			TIME :		
			CON SR REP		
			TIME :		
RESPONDER					
ME MANAGER		SPAN MANAGER			
TIME :		TIME :			

13

USE BLACK BALLPOINT PEN		SPAN / MISSION EVALUATION ACTION REQUEST		USE BLACK BALLPOINT PEN	
TIME (T-MINUS/GET)	REQUEST ORGANIZATION	RESPONSE ORGANIZATION	CONTROL NUMBER		
144+29	7CD	Bld G 45	C-208		
ACTION REQD BY (TIME):			REQUESTER GNC		
SUBJECT:		SPS FUEL TANK PRESS. DROP		APPROVAL	
What SPS Fuel Tank pressure decrease do you expect between CIRC burn and LOPE?				FOD REP: Blair	
				TIME 144:30	
So far we've seen 4 PCM counts on 4 psi drop from 180 to 176. It is now cycling between 175-176 PCM counts or from 176.5 to 177.6.				SPAN MGR: Lane	
				TIME 144:33	
SODB prediction on Fuel Tank Pressure shows only a 0.8 psi drop.					
Current Mission Rule (16-20) states that 4 psi drop constitutes a leak.					
RESPONSE:		CONCUR			
The FUEL TANK PRESSURE DROP NOTED SINCE THE CIRC BURN IS THE RESULT OF FUEL STORAGE TANK TEMPERATURE CHANGE. OVER THE SAME TIME PERIOD FUEL STORAGE TANK TEMP HAS DECREASED APPROX. 12°F. THE EXPECTED PRESSURE CHANGE IS APPROX. 1 PSI FOR EVERY 3°F CHANGE.				TEAM LDR: [Signature]	
The ONLY EXPECTED CHANGES IN FUEL AND/OR OX TANK PRESSURE WOULD BE THE RESULT OF TEMP CHANGES. THE SODB PREDICTION OF FUEL TANK PRESSURE WAS BASED ON PREVIOUS FLIGHT HISTORY. IT APPEARS THAT JETTISONING THE BAY 1 DOOR HAS A GREATER EFFECT ON TANK PRESSURE THAN EXPECTED.				TIME 146:40	
MISSION RULE 16-20 IS A VALID RULE; HOWEVER, IT ASSUMES THAT THE APPROPRIATE PRESSURE VS TEMPERATURE CORRECTIONS HAVE BEEN MADE.				CON SR REP: [Signature]	
RESPONDER: Jim Wood SSM - H. Gallman/NE				TIME 146:42	
FOD REP: [Signature]				ME MGR: [Signature]	
TIME 147:07				TIME 146:43	
				SPAN MGR: [Signature]	
				TIME 146:55	
				SPAN MANAGER: [Signature]	
				TIME 147:08	

USE BLACK
BALLPOINT
PEN

SPAN / MISSION EVALUATION ACTION REQUEST

USE BLACK
BALLPOINT
PEN

TIME
(T-MINUS/GET)

REQUEST
ORGANIZATION

RESPONSE
ORGANIZATION

CONTROL
NUMBER

149:05

45

FOD

C-223

ACTION REQD BY (TIME):

REQUESTER

SUBJECT:

It has been noted that the CSM has been hanging

APPROVAL

up on the edge of the 5.0° db in pitch and yaw (- pitch, -yaw) due to gravity gradient. This has caused an increase in RCS propellant usage, above that predicted but not exceeding the RCS redlines. To reduce RCS propellant usage, a method that should be considered is to decrease the db from 5° to 2°. The savings realized from this would be as follows:

TEAM LDR

149:02

CON SR REP

149:05

ME MANAGER

149:05

For a 37493 lb CSM at 60 nm

5° db 0.124 #/hr

2° db 0.084 #/hr

This would result in approximately a 30 percent saving in RCS propellant.

The above data was obtained from an Apollo 15 digital simulation

that was performed at NR using Apollo 15 weights and inertias (reference TL 192-401-71-123) dated July 14, 1971.

SPAN MGR

149:53

RESPONSE:

CONCURRENCE

P20 USAGE RATES ARE ACCEPTABLE AT THIS TIME. IN THE 5° DB QUAD C SHOWS LITTLE IF NO USAGE. WE WILL PROBABLY ADJUST DAF WT TO TRY TO REDUCE THE TOTAL NUMBER OF RCS FIRING FOR DOPPLER REASONS.

FOD REP

149:14

SPAN MGR

150:31

TEAM LDR

150:31

QUESTION: DOES GOING TO 2° DB SHOW USAGE FROM QUAD C (C4, -P) IN P20? IF YES, RECOMMEND STAYING IN 5° DB.

TIME :

CON SR REP

TIME :

ESW/GNK

RESPONDER

ME MANAGER

SPAN MANAGER

TIME :

TIME :

