

Apollo 10

LAUNCH - LOI
CHECKLIST

PART NO.	S/N
SKB32100079-303	1001

POST-INSERTION CHECKLIST

- Basic Date April 18, 1969
Changed May 3, 1969
- CDR 1 GMBL MTRS (4) - OFF (LMP confirm)
 TVC SERVO PWR (2) - OFF
 MN BUS TIE (2) - OFF (LMP)
 SECS PYRO ARM (2) - SAFE
 SECS LOGIC (2) - OFF
 cb SECS ARM (2) - open
 ELS - MAN (verify)
 CM RCS LOGIC - OFF
 CAB PRESS REL vlv (2) - NORMAL/LATCHED
 PLSS 02 vlv - OFF
 cb FLOAT BAG (3) - open
 cb ELS BAT (2) - open
 cb PL VENT - open
 DIRECT 02 vlv - CLOSED
 ROT CONTR PWR DIRECT - OFF
 EMS FUNC - OFF
- CYI AOS (00:16:29) MONITOR LV TANK PRESS
 ΔP < 36 psid (OXID > FUEL)
 ΔP < 26 psid (FUEL > OXID)
 LOX TK PRESS > 50 psia
 * EMERGENCY CSM/LV SEP pg L/5-3*
- CMP 2 SM RCS HTRS (4) - PRIM
 CM RCS PRPLNT (2) - OFF, tb (2) - bp
 C/W - NORMAL
 BPC JETT KNOB - 180° from BPC JETT

CAUTION
If the BPC JETT Knob can not be positioned 180° away from the BPC JETT position before opening the side hatch, a pin in the plunger may be sheared possibly allowing the pressure seal to be broken. Cabin repressurization may not be possible due to overboard venting around the BPC plunger.

GN2 VLV HNDL - pull
 HATCH GEAR BOX - LATCH (verify)
 ACTR HNDL SELECTOR - Neutral
 STRUT UNLOCK LANYARD (2) - stow
 LMP 3 cb WASTE H2O/URINE DUMP HTRS (2) - close
 FC REACS vlv - NORM
 H2 PURGE LINE HTR - ON

SYS MONITORING & CHECKING

- 1 SM RCS Ck (CMP) pg S/1-1
- 2 CM RCS Ck (CMP) pg S/1-1
- 3 C & W Ck (CMP) pg S/1-17
- 4 CMP to LEB for MN REG Ck pg S/1-6.
- 5 ~~EMER CAB PRESS vlv - BOTH (verify)~~ SUIT CKT RET vlv - OPEN (pulled) (CMP)
 Remove Helmets & Gloves
 cb DIRECT ULLAGE (2) - open (CDR)
- 6 SEC RAD LEAK Ck
 Monitor SEC ACCUM QUANTITY (LMP)
 SEC GLY To RAD vlv - NORM for (30 sec)
 then BYPASS (CMP)

- +20:00 7 ECS Post Insertion Config (CDR)
- GLY RSVR BYPASS vlv - OPEN
 GLY RSVR OUT vlv - CLOSE
 GLY RSVR IN vlv - CLOSE
 ECS RAD FLOW CONT - PWR
 PRIM GLY TO RAD vlv - NORMAL (push)
 LMP note PRIM ACCUM QTY
 ECS RAD HTR - PRIM 1 (LMP)
 ECS RAD TEMP PRIM OUT below PRIM IN
 If outlet temp after 5 min
 above INLET TEMP
 *PRIM GLY TO RAD vlv - *
 * BYPASS (pull)*
 Recheck in 10 min
 ECS RAD tb - gray
 GLY EVAP TEMP IN - AUTO

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L
4-3

- 8 DRINKING WATER SUPPLY vlv - ON
POT H2O HTR - MNA

CYI LOS
(00:23:36)

PCM BIT RATE - LOW
UP TLM CMD - RESET
VHF AM A - SIMPLEX
VHF AM B - off (ctr)

- 9 FC Purge Ck (LMP)
H2/02 PURGE (6) - ON (mom)
Observe Flow rate inc
Reset MA (as req'd)
H2 PURGE LINE HTR - OFF

PRE-TLI SYS VERIFICATION & MONITORING

- 1 EPS Mon Ck (LMP) pg S/2-2
- 2 ECS Mon Ck pg S/2-5
- 3 SPS Monit Ck (LMP) pg S/1-1
- 4 GDC ALIGN (CDR) pg G/1-87 (Record Drift)
BMAG MODE (3) - RATE 2
Install COAS
cb COAS TUNL LTG MNB (Pn1 226) - closed
- 5 UNSTOW SEQ CAMERA BRACKET & ORDEAL (CDR)
- 6 MOUNT ORDEAL BOX & Initialize
- 7 ECS REDUNDANT COMPONENT Ck less MN REG
Ck (LMP) pg S/1-6
- 8 UNSTOW TV CAMERA & ACCESSORIES
- 8A UNSTOW & CONFIGURE CAMERAS (CMP)
Set up Data Acq. Camera/18mm lens/CEX 368
film/mirror
Settings (f11, 250, ∞) 6 fps, .7 mag/
Mount RH Rndz Window ~~_____~~
Electric Hasselblad/80mm lens/
CEX 368 film/Spotmeter (S, 250, focus)
20 frames

SUNSET 9 OPTICS DUST COVER JETT (CMP)
(00:31:33)

TAN AOS
(00:37:01)

10 MCCH - G/N STATUS
Z Torquing Angle _____

TAN LOS
(00:42:35)

11 IMU REFSMMAT Realign Check (P52), (CMP)
If IMU is realigned,
Realign GDC (CDR)

CRO AOS
(00:52:15) OOE
CRO LOS RETICLE BRIGHTNESS - DIM
(00:58:01) Stow Optics Eyepieces

HSK AOS(S) 12 Two-way USB VOICE Ck
(00:59:30) Report Gyro Torquing Angles

HSK LOS
(01:05:00)

SUNRISE
(01:09:02)

HTV AOS
(01:10:00)

HTV LOS
(01:13:00)

US AOS
(01:28:15)

13 SCS ATT Ref Comp Ck
V16 N20E
FDAC SELECT - 1
FDAC SOURCE - ATT SET
ATT SET - GDC
ATT SET dials - null FDAC 1 err needles
Key VERB when nulled(freeze display)

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Record from DSKY:

R , P , Y

Record ATT SET dials:

R , P , Y
FDAI SEL - /

14 Extend Docking Probe

cb DOCK PROBE (2) - close (verify)

PROBE EXTD/REL - EXTD/REL until ~~stop~~

	EXT	RET
FULL EXT	Gray	Gray
FULL RET	bp	bp
PART RET	bp	Gray

*full probe extension*15 COPY TLI, TLI ABORT, & P37 PADS
TLI + 10 min Pitch Angle VAN LOS
(01:49:11)

CYI AOS

(01:50:01) 16 SV UPDATES (MCCH)

17 cb SECS ARM (2) - close
SECS LOGIC (2) - on (up)
MSFN confirm GO for PYRO ARMBasic Date April 18, 1969
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TLI								TB6p
X	:	:	:	X	:	:	:	R
X	X	X	:	X	X	X	:	P
X	X	X	:	X	X	X	:	Y
X	X	X	:	X	X	X	:	BT
								Δ VC'
+				+				VI
X	X	X	:	X	X	X	:	R SEP
X	X	X	:	X	X	X	:	P SEP
X	X	X	:	X	X	X	:	Y SEP

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P27 UPDATE

PURP	V		V		V	
GET	• •		• •		• •	
304 01	INDEX		INDEX		INDEX	
02						
03						
04						
05						
06						
07						
10						
11						
12						
13						
14						
15						
16						
17						
20						
21						
22						
23						
24						
N34	HRS	X X X		X X X		
NAV CHECK	MIN	X X X X		X X X X		
	SEC	X X		X X		
N43	LAT	0		0		
	LONG					
	ALT	+ 0		+ 0		

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CMS 106

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P30 MANEUVER

SET STARS	T L I + 9 0	PURPOSE PROP/GUID
R ALIGN _____	+ 0 0 .	WT N47
P ALIGN _____	0 0 .	P TRIM N48
Y ALIGN _____	0 0 .	Y TRIM
ULLAGE _____	+ 0 0	HRS GETI
	+ 0 0 0	MIN N33
	+ 0 .	SEC
HORIZON/WINDOW _____	X X X	R
	X X X	P
	X X X	Y
	+ . .	H A N44
		H P
	+ . .	ΔVT
	X X X . .	BT
	X . .	ΔVC
P37 FOR TLI + 4	X X X X	SXTS
	+ . 0	SFT
	+ . 0 0	TRN
X . .	X X X	BSS
X <input type="checkbox"/>	X X <input type="checkbox"/>	SPA
X . .	X X <input type="checkbox"/>	SXP
	0 . .	LAT N61
		LONG
	+ . .	RTGO EMS
	+ . .	V10
	: :	GET 0.05G

L/4-8

P30 MANEUVER

SET STARS

R ALIGN _____
 P ALIGN _____
 Y ALIGN _____

ULLAGE _____

HORIZON/WINDOW _____

P37 FOR TLI + 4

X	X	GETI
X	X	ΔVT
X	X	LONG
X	X	GET 400K

T	L	I	+	9	0	PURPOSE
+		/				PROP/GUID
	0	0				WT N47
	0	0				PTRIM N48
+	0	0				Y TRIM
+	0	0	0			HRS GETI
+	0					MIN N33
						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
	O					LAT N61
						LONG
+						RTGO EMS
+						V10
						GET 0.05G

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LAUNCH EMERGENCY PROCEDURES

RAPID HATCH OPENING

- 1 GEAR BOX SEL - UNLATCH (verify)
ACTR HANDLE rel - push or squeeze
- 2 ACTR HANDLE - operate (until hatch is unlatched)
*If hatch fails to open *
* GN2 RATCHET HNDL - operate *
* GN2 VLV HNDL - unlock and *
* push (outboard) *

FIRE IN CM DURING BOOST

- 1 CABIN FAN (2) - OFF (verify)

- 2 Monitor EPS indicators for excessive current.
Immediately remove power from affected bus.
If in abort modes I or II:
Verify suit compressor on good AC bus
If in abort mode III with affected bus Main A(B)
TVC GMBL DRIVE (2) - 2 (1)
AC INV 1 (2) AC BUS 1 (2) - OFF
AC INV 2 (1) AC BUS 1 (2) - on (up)
- 3 CAB PRESS REL vlv (RH) - DUMP
- 4 ABORT using appropriate mode

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CONTAMINATION IN CM

- 1 Don O2 masks and/or PGA's immediately
- 2 Evaluate contamination level (isolate & correct source of contamination if possible) and proceed with one of the following steps:
 - a. Retain O2 masks or remain in suit and accept contamination level in cabin.

CAUTION

If in PGA's, adjust DIRECT O2 to maintain suit to cabin $\Delta P > +2$ in. H₂O

- b. Retain O2 masks and scrub cabin atmosphere through suit loop. If initially suited, establish partially suited or shirtsleeve configuration and don O2 masks.

CAUTION

Change LiOH cartridges after scrub completed.

- c. Retain PGA's or don PGA's
Verify suit integrity (visually)
Perform Cabin Dump
Perform Cabin Repress

CONTAMINATION IN SUIT

- 1 SUIT COMPR 2 - AC1
- 2 SUIT COMPR 1 - OFF
- 3 DIRECT O2 vlv - OPEN for 1 minute
then CLOSE

If condition persists:

- 4 SUIT COMPR 2 - OFF
- 5 DIRECT O2 vlv - CLOSE
- 6 Doff helmet
- 7 Don emergency O2 masks

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LET FAILS TO JETTISON

LEGS CUT/NO MOTOR FIRE (pyro audible)

LES MOTOR FIRE PB - push

NO RESPONSE to ABORT SYS TWR JETT switches

cb SECS ARM (2) - close (verify)

cb SECS LOGIC (2) - close (verify)

cb EDS (3) - close (verify)

SECS LOGIC (2) - on (up) (verify)

SECS PYRO ARM (2) - on (up) (verify)

EDS PWR - on (up) (verify)

ABORT SYS TWR JETT (2) - on (up) (verify)

NO TWR JETT - continue to orbit

EMERGENCY CSM/LV SEPARATION

COASTING

LV XLUNAR - SAFE

cb SECS ARM (2) - close

SECS LOGIC (2) - ON

SECS PYRO ARM (2) - ARM

ROT CONTR PWR DIRECT (2) - MNA/MNB

SC CONT - SCS

BMAG MODE (3) - ATT 1/RATE 2

SCS TVC SERVO PWR 1 - AC1/MNA

2 - AC2/MNB

(Continue through thrusting)

THRUSTING (TLI)

00:00 TRANS CONTR - CCW (4 Sec)

MN BUS TIE (2) - ON

GMBL MTRS (4) - ON (LMP Confirm)

00:04 TRANS CONTR - NEUTRAL & +X

ΔV THRUST A - NORMAL

THRUST ON PB - PUSH

TRANS CONTR +X - RELEASE

ΔV THRUST (2) - OFF when clear

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FIRE/SMOKE IN CM (CREW SUITED)

WARNING: CM water must not be used to extinguish fire

- 1 CAB FAN (2) - OFF (verify)
- 2 Monitor EPS for excessive current and remove power from affected bus
- 3 Verify suit compressor on good AC bus
- 4 Use fire extinguisher as appropriate

FIRE IS OUT

- 5 Remove smoke from cabin per "Contamination in CM" procedures before removing helmets

FIRE PERSISTS - DUMP CABIN

- 6 Verify:
 - SUIT CKT RET vlv - CLOSE (push)
 - EMER CAB PRESS vlv - OFF
 - PLSS 02 vlv - OFF
- 7 Visually check suit integrity
- 8 CAB PRESS REL (RH) - DUMP to 3.0 psia
then to BOOST ENTRY
REMARK: Provides controlled cabin dump until suit circuit pressure is verified
- 9 Verify Suit pressure > 3.5 psia
- 10 CAB PRESS REL (RH) - DUMP
and/or CAB PRESS DUMP vlv - OPEN
- 11 CAB PRESS ind 0.0 psia for 6 min
- 12 CAB PRESS REL (RH) - NORMAL
- 13 CAB PRESS DUMP vlv - CLOSE
- 14 Do not repress cabin until fire source is removed

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FIRE/SMOKE IN CM (CREW UNSUITED)

- 1 CAB FAN (2) - OFF (verify)
- 2 SUIT COMPR (2) - OFF
- 3 Monitor EPS for excessive current and remove power from affected bus
- 4 Don emergency O2 masks
- 5 Use fire extinguishers as appropriate

FIRE IS OUT

- 6 Remove smoke from cabin per "Contamination in CM" procedure before removing O2 masks

FIRE PERSISTS - DON SUITS and DUMP CABIN

- 7 Don PGA's except helmets and verify O2 connectors (Use O2 masks as long as possible)
- 8 DIRECT O2 vlv - OPEN
REMARK: Purges suit circuit of smoke and fumes
- 9 Don helmet
- 10 SUIT FLOW vlv (3) - SUIT FULL FLOW
- 11 SUIT COMPR 1 (2) - AC1 (AC2)
- 12 DIRECT O2 vlv - CLOSE
- 13 EMER CAB PRESS vlv - OFF
- 14 Visually check suit integrity
- 15 CAB PRESS REL (RH) - DUMP to 3.0 psia
then to BOOST ENTRY

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- 16 Verify Suit pressure holding >3.5 psia
- 17 CAB PRESS REL (RH) - DUMP
and/or CAB PRESS DUMP vlv - OPEN
- 18 CAB PRESS ind 0.0 psia for 6 min.
- 19 CAB PRESS REL (RH) - NORMAL
- 20 CAB PRESS DUMP vlv - CLOSE
- 21 Do not repress cabin until fire source is removed

FIRE/SMOKE IN CM DURING ENTRY

- 1 CABIN FAN (2) - OFF (verify)
- 2 Monitor EPS indicators for excessive current.
Immediately remove power from affected bus.
- 3 ROT CONTR PWR DIRECT (2) - MNA/MNB
& maintain attitude if required.
- 4 If affected bus is:
MNA
AC INV 1 AC BUS 1 - OFF
AC INV 2 AC BUS 1 - on (up)
Set up for CM/RCS sys 2
AUTO RCS SEL A/C ROLL (4) - OFF
AUTO RCS SEL CM 1(6) - OFF
AUTO RCS SEL CM 2(6) - MNB
RCS dump is fuel rich
- MNB:
AC INV 2 AC BUS 2 - OFF
AC INV 1 AC BUS 2 - on (up)
RCS dump is oxidizer rich
- 5 CAB PRESS REL vlv (RH) - DUMP
- 6 Continue ENTRY

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LAUNCH EMERGENCY POWERDOWN(MN BUS Voltage <26.0, no short verified
Powerdown until MN BUS voltage >26.5 vdc)

	Amps
02 HTRS (2) - off (ctr)	11.00
If GET > 2 min	
EDS AUTO - OFF	
2 ENG OUT - OFF	
LV RATES - OFF	
cb MNA BAT C - close	
cb MNB BAT C - close	
S BD PWR AMP - off (ctr)	3.53
FC PUMPS (3) - OFF	12.20
H2 HTRS (2) - off (ctr)	1.44
LIGHTS (min req'd)	
TAPE RCDR FWD - off (ctr)	1.82
VHF AM B - off (ctr)	1.00
*GMBL MTRS P2, Y2 - OFF	10.00
IMU PWR ON (STBY)	5.70
CMC MODE - FREE	
G&N IMU PWR - OFF	
CMC to STBY	2.00
V48E	
F 04 46, load 0 in left digit R1	
PRO,PRO,PRO,V46E	
V37E 06E	
F 50 25 00062 CMC PWR DN	
PRO, hold until STBY lt on	
G&N PWR - OFF	1.50
ECS GLY PUMP 1 - OFF	2.77
cb ECS RAD CONT/HTR (2) - open	2.69
PWR SCE - off (ctr)	0.65
TELECOM GRP 1&2 - OFF	2.20
cb INSTR ESS MNA&B - open	4.70

*Crew Option

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BUS LOST RECONFIGURATION

A. Loss of MN BUS A

EDS AUTO - OFF
FC 2 - MNB only
FC 1 (MNA&B) - off (ctr)
cb MNB BAT C - closed
cb MNA BAT BUS A - open
INV 3 - MNB, AC1
SCS TVC PITCH & YAW - RATE CMD

FDAI SEL - 2
TVC GMBL DRIVE PITCH & YAW - 2
BMAG MODE (3) - RATE 2

RHC PWR DIR (2) - MNB
AUTO RCS PITCH, YAW, & B/D ROLL (12) - MNB
Insertion Checklist

FC 1 - MNB (if req'd to maintain MNB voltage)
SUIT H2O ACCUM - AUTO 2
RAD FLOW AUTO CONT - 2

B. Loss of MN BUS B

EDS AUTO - OFF
FC 2 - MNA only
FC 3 (MNA&B) - off (ctr)
cb MNA BAT C - closed
cb MNB BAT BUS B - open
INV 3 - MNA, AC2

TVC GMBL DRIVE PITCH & YAW - 1
RHC PWR DIR 1 - MNA
AUTO RCS PITCH, YAW, & B/D ROLL (12) - MNA

Insertion Checklist

FC 3 - MNA (if req'd to maintain MNA voltage)
ECS RAD HTR - PRIM 2

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C. Loss of BAT BUS A

EDS AUTO - OFF

cb MNA BAT C - closed

TVC GMBL DRIVE PITCH & YAW - 2 (if bus lost prior to GMBL MTR turn on)

AUTO RCS PITCH, YAW, & B/D ROLL (12) - MNB

Insertion Checklist

After attempting to restore bus

MN BUS TIE BAT B/C - on (up)

cb MNA BAT C - open

cb MNA BAT BUS A - open

cb MNB BAT C - open

cb MNB BAT BUS B - open

For subsequent main bus ties

cb MNA BAT C - closed

cb MNB BAT BUS B - closed

cb PYRO A SEQ A - open

ECS RAD HTR - PRIM 2

D. Loss of BAT BUS B

EDS AUTO - OFF

cb MNB BAT C - closed

TVC GMBL DRIVE PITCH & YAW - 1 (if bus lost prior to GMBL MTR turn on)

AUTO RCS PITCH, YAW, & B/D ROLL (12) - MNA

Insertion Checklist

MN BUS TIE BAT A/C - on (up)

cb MNA BAT C - open

cb MNA BAT BUS A - open

cb MNB BAT C - open

cb MNB BAT BUS B - open

For subsequent main bus ties

cb MNB BAT C - closed

cb MNA BAT BUS A - closed

cb PYRO B SEQ B - open

ECS RAD HTR - PRIM 1

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E. Loss of AC BUS 1

AC INV 1 MNA - OFF

SUIT COMPR 2 - AC2

FDAI SEL - 2

BMAG MODE (3) - RATE 2

TVC SERVO PWR 1 - AC2/MNB (loss of φA only)

SCS TVC (P&Y) - RATE CMD

Insertion Checklist

S BD NORM PWR AMP - SEC

FC PUMP 1 - AC2

ECS GLY PUMP - AC2

BMAG 1 PWR - OFF

G&N PWR - AC2

SIG COND/BIAS PWR 1 - AC2

Maintain GLY EVAP TEMP INLET temp above 40°F

ECS RAD FLOW CONT - 2

F. Loss of AC BUS 2

AC INV 2 MNB - OFF

TVC SERVO PWR 2 - AC1/MNA (loss of φA only)

SCS TVC (P&Y) - AUTO

ΔV CG - LM/CSM

Control SPS with trim wheels

S BD NORM XPNDR - PRIM

Insertion Checklist

FC PUMP (2&3) - AC1

BMAG 2 PWR - OFF

FDAI SEL - 1

SIG COND/BIAS PWR 2 - AC1

Activate SEC COOL LOOP

Shut down PRIM EVAP

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LOSS OF TWO FUEL CELLS AT LIFTOFF

Entry Area 3-1

After 2 min EDS AUTO - OFF

1. If loss of FC 1&2, tie BAT C to MNA
2. If loss of FC 2&3, tie BAT C to MNB
3. If loss of FC 1&3, tie BAT C to both MNA&B

Failed FC PUMPS (2) - OFF

At insertion perform insertion checklist plus the following power down. Leave batteries on until power down complete.

Pnl 2

O2 & H2 HTRS (4) - off (ctr)
C/W NORM - ACK

Power down CMC per checklist, leave IMU powered up (Note: No need to realign IMU for 3-1 entry).

Pnl 3

TAPE RCDR FWD - off (ctr)
S BD NORM PWR AMP - off (ctr)
Remaining fuel cell to both Main Busses. Select single inverter operation.

Pnl 5

cb RAD HTR OVLD (2) - open

Pnl 7

LOGIC 2/3 PWR - OFF
FDAI/GPI PWR - OFF
ELEC PWR - OFF
BMAG PWR (2) - ON

Note: If voltage permits leve BMAG PWR in WARMUP after the batteries are off the main bus, if not place BMAG PWR - ON 40 min prior to IMU/GDC align.

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Pnl 8

AUTO RCS SEL (16) - OFF
cb SCS LOGIC (4) - open

4. Batteries off line
Charge lowest battery
5. 1 hour to SPS ignition
BMAG PWR (2) - WARMUP
- Pressurize CM RCS
6. 10 min to SPS ignition
Power up CMC and SCS and perform IMU/GDC align
7. Perform SPS normal deorbit

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ABORT PROCEDURES

MODE IA ABORT
(00:00 to 00:42) (10K)

- 00:00 TRANS CONTR - CCW then NEUTRAL
 CM/SM SEP (2) - on (up)
- 00:14 ELS - AUTO
 ELS LOGIC - on
 TWR JETT (2) - on (up)
 APEX COVER JETT PB - PUSH
- 00:16 DROGUE DEPLOY PB - PUSH
 CM RCS He DUMP PB - PUSH
 Monitor altimeter
 If <3800 ft - DEPLOY MAINS
 >3800 ft - NO ACTION
- 00:28 If <10,000 ft - DEPLOY MAINS
- GO TO LANDING PHASE AT 10,000 ft pg L/6-7

MODE IB ABORT
(00:42 to 16.5 nm) (1:56)

- 00:00 TRANS CONTR - CCW then NEUTRAL
 CM/SM SEP (both) - ON
- 00:11 CANARD DEPLOY - PUSH
- 00:14 ELS - AUTO
 ELS LOGIC - on (up)
 RCS CMD - ON
- GO TO LANDING PHASE pg L/6-6

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MODE IC ABORT
(16.5 nm to TWR JETT) (01:56 - 03:16)

00:00 TRANS CONTR - CCW then NEUTRAL
 CM/SM SEP (2) - on (up)
 RCS CMD - ON

00:11 CANARDS DEPLOY
 CM RCS PRESS - on (up)
 RCS TRNFR - CM
 RCS IND - CM (1 or 2)

S/C PLATFORM GO/NO GO (Excessive Rates)
 V82E Check HA

HA>32nm & PLAT GO	HA<32nm or PLAT NO GO
TWR JETT sw(2)-on(up)	Estab. +5°/SEC
MAN PITCH - RATE CMD	pitch rate
ENT ATT RO°, P135°, Y0°	EXCESSIVE + PITCH RATES
BMAG (3) - ATT1/RATE 2	
EMS FUNC - ENTRY	*ROLL 90° *
EMS MODE - NORMAL	*USE YAW THRUSTERS TO *
At .05G Lt,	*CONTROL RATE *
.05G sw - on (up)	*ROLL BACK TO HEADS DN*
Fly Max Lift	

θ (.05G) _____
 GET DROGUE _____

LET FAILS To JET - L/5-3

GO TO LANDING PHASE pg L/6-6

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MODE II RCS ABORT

(TWR JETT to MODE III) (03:16 - 09:41)

- 00:00 TRANS CONTR - CCW (4 sec min) & HOLD
No BECO-Reset THC, Req. RSO Shutdown
*Reset & start DET *
- 00:03 *CSM/LV SEP - PUSH*
*RCS CMD - ON *
- 00:05 TRANS CONTR - NEUTRAL THEN +X
- 00:24 TRANS CONTR +X OFF
Entry ATT - ($R=0^\circ$, $P=120^\circ$, $Y=0^\circ$) (Compl by 1:40)
V82E - NOTE TFF
If TFF>2 min, Yaw 45° (LEFT) out-of-plane
BMAG MODE (3) - ATT1/RATE 2
cb MNA&B BAT C (2) - closed
CM/SM SEP - on (up) GET 400K _____
CSM/LM FNL SEP (2) - on (up) _____
CM RCS - PRESS θ (.05G) _____
RCS TRNFR - CM GET DROGUE _____
C&W MODE - CM
EMS FUNC - ENTRY
EMS MODE - NORMAL

Set up Single Ring RCS
At .05G Lt, Sw - on (up)
EMS ROLL - ON
FLy Max. Lift
N62E

GO TO LANDING PHASE pg L/6-6

Basic Date April 18, 1969
Changed _____

MODE III SPS ABORT

(ΔR= -400 NM to INSERTION) (09:41 - 11:53)

- 00:00 TRANS CONTR - CCW (4 Sec Min) & HOLD
 *NO BECO - RESET THC, *
 * LV STAGE sw-SII/SIVB*
 *Reset & start DET *
- 00:03 *CSM/LV SEP - PUSH*
 *RCS CMD - ON *
- 00:05 TRANS CONTR - NEUTRAL THEN +X
 LV IND/GPI sw - GPI
- 00:24 TRANS CONTR +X OFF
 KEY V82E N50E ΔR,HP,TFF (.1nm,min-sec)
 If ΔR>0:
 MNVR to retro att (R=180°,P=194°,Y=0°)
 (Scribe on horiz, BEF, Hds up)
 BMAG MODE (3) - ATT1/RATE2
 RATE - LOW
 EMS MODE - NORMAL GETI
 ΔV THRUST A - NORMAL 6999.9
- 01:30 DIRECT ULLAGE PB - PUSH
- 02:05 THRUST ON PB - PUSH VC
 Burn to VC (ΔR=0) Δtb
 ΔV THRUST (2) - OFF GET 400K
 RATE - HIGH θ (.05G)
 If TFF>2min,Yaw (RT) 45° GET Drogue
 out-of-plane Entry P
 cb MNA&B BAT C(2) - closed R
 CM/SM SEP - on (up) Y
 CSM/LM FNL SEP (2) - on (up)
 CM RCS PRESS - on (up)
 RCS TRANSFER - CM
 C&W MODE - CM
 Mnvr to entry att (R=0°),P=105°,Y=0°)
 (BEF, Hds Dn, Full Lift)
 Note TFF
 EMS MODE - STBY
 EMS FUNC - ENTRY
 EMS MODE - NORMAL

Basic Date _____
Changed _____

CSM

Set up single ring RCS
 .05G Lt., Sw - on (up)
 EMS Roll - on (up)
 .2G Lt., Roll left 55°
 Fly Half Lift

GO TO LANDING PHASE pg L/6-6

MODE IV SPS TO ORBIT

(VI=21,800 HDOT ~+250 Alt ~100 NM to INSERTION)

- Basic Date April 18, 1969
 Changed _____
- 00:00 TRANS CONT - CCW (4 sec min) & HOLD
 *NO BECO-RESET THC, *
 * LV STAGE sw-SII/SIVB*
 *RESET & START DET *
- 00:03 *CSM/LV SEP - PUSH*
 *RCS CMD - ON *
- 00:05 TRANS CONTR - NEUTRAL THEN +X
 LV IND/GPI sw - GPI
- 00:24 TRANS CONTR - +X OFF
 Mnvr to Insertion Att (R=180°, P=356°, Y=0°)
 (Before 01:30)
 (Scribe on horiz, SEF, Hds Dn)
 BMAG (3) - ATT1/RATE2
 RATE - LOW
 EMS MODE - NORMAL
 ΔV THRUST A - NORMAL GETI _____
 01:30 DIRECT ULLAGE PB - PUSH 6999.9
 02:05 THRUST ON PB - PUSH ΔV _____
 Burn to VC (hp>75 nm
 +5 sec BT or HA=200nm
 & +HDOT)
 ΔV THRUST (2) - OFF Δt_b _____
 GMBL MTRS (4) - OFF VC _____

GO TO INSERTION (+11:53) pg L/3-3

LANDING PHASE (30K, DESCENDING)

30K' cb ELS (2) - close
ELS - AUTO
ELS LOGIC - on (up)
24K' Twr jett (auto)
 *TWR JETT (2) - on (up) *
 *CSM/LM FNL SEP(2)-on(up) *
Apex cover jett (auto)
 *APEX COVER JETT PB-PUSH) *
(WAIT 2 SECS)
Drogues deployed (auto)
 DROG DPLY PB-PUSH
If Drogues Fail:
 *ELS - Man *
 *STABILIZE CM *
 5K' MAIN DPLY PB - PUSH
 *ELS - AUTO *

23.5K' Cabin Pressure increasing
 *If not increasing by 17K': *
 *CABIN PRESS REL vlv (RH)-DUMP *

April 18, 1969

Basic Date _____
Changed _____

CSM

Basic Date April 18, 1969
Changed _____

L
6-7

MODE IA

10K'

- Main parachutes deployed
MAIN DEPLOY PB - PUSH (within 1 sec)
VHF ANT - RECY
VHF AM A - SIMPLEX
VHF BCN - ON
RCS DUMP
CABIN PRESS REL vlv (2) - CLOSE
DIRECT O2 vlv - OPEN
CM RCS LOGIC - on (up)
CM PRPLNT - DUMP (burn audible)
MONITOR CM RCS 1&2 for He press decrease
NO BURN or PRESS DECREASE
* USE BOTH RHC's *
*DO NOT FIRE PITCH JETS *
CM PRPLNT - PURGE (to zero He press)
CM RCS He DUMP PB-PUSH
*RHC (both) - 30 secs *
* NO PITCH *
CABIN PRESS REL vlv - BOOST/ENTRY
STRUT LOCKS UNLOCK
cb FLT & PL BAT BUS A,B,&BAT C (3) - close
cb FLT & PLT MNA & B (2) - open
cb ECS RAD HTR OVLD (2) - open
cb SPS P&Y (4) - open
- 3K' CABIN PRESS REL vlv (RH) - DUMP
FLOOD Lts - POST LDG
CM RCS PRPLNT (2) - OFF
ROT CONTR PWR DIRECT - OFF
- 800' CAB PRESS REL vlv - CLOSE (latch off)
MN BUS TIE (2) - OFF
- AFTER LANDING:
cb MAIN REL PYRO (2) - close
MAIN REL - on (up)

GO TO POST LANDING pg E/7-3

CSM 106

TLI 10 MIN ABORT

SECS LOGIC (2) - on (up)
 SECS PYRO ARM (2) - ARM

- 00:00 TRANS CONTR - CCW (4 sec)
 DET RESET (verify)
- 00:03 SIVB/CSM SEP
 LV ENG 1 Lt - out
 * CSM/LV SEP PB - PUSH*
 * RCS CMD - ON *
- 00:05 TRANS CONTR - neutral then +X for
 10 sec
 SIVB/GPI sw - GPI
 *Excessive rates: *
 * ΔV THRUST A - NORMAL *
 * SPS THRUST - DIRECT *
 *When rates damped: *
 * ΔV THRUST (2) - OFF *
 * SPS THRUST - NORMAL *
- 00:14 TRANS CONTR +X - OFF
 V37E OOE
 PITCH UP to LOCAL VERT (+X axis
 toward the earth)
 RATE - LOW
 BMAG MODE (3) - ATT1/RATE 2
 EDS PWR - OFF
 SECS PYRO ARM (2) - SAFE
 SECS LOGIC (2) - OFF
 cb SECS ARM (2) - open
 cb EDS (3) - open
- 01:00 TRANS CONTR -X (8 to 10 sec)
 RATE - HIGH
- MNVR TO RETRO ATT
 R _____ (180°)
 P _____ (199°)
 Y _____ (0°)

Basic Date April 18, 1969
 Changed

CSM 106

RETRO UPDATE

GETI _____

θ .05G

ΔV _____

GET DROGUE

VC _____

ENTRY P

Δtb _____

R

GET 400K _____

Y

ALIGN HORIZ ON RET +1° MK
GMBL CHECK (Time Permitting)

MN BUS TIE (2) - ON

GMBL MTRS (4) - ON (LMP Confirm)

cb SPS P2, Y2 - open

RATE - LOW

EMS MODE - STBY

EMS FUNC - ΔV SET/VHF RNG

SET ΔV from chart

EMS FUNC - ΔV

EMS MODE - NORMAL

09:45 ΔV THRUST A - NORMAL
V37E 47E (THRUST MONITOR)

F 16 83 ΔVX,Y,Z (.1 fps)

NOTE: For aborts during 1st min of TLI,
KEY V82E F 16 44 (Ha,Hp,Tff)
Burn until Hp < 19NM.

09:50 TRANS CONTR +X

10:00 THRUST ON PB - PUSH
TRANS CONTR +X - OFF
BURN ΔV req'd
ΔV THRUST (2) - OFF
Report cutoff
cb SPS P2, Y2 - close
GMBL MTRS (4) - OFF (LMP Confirm)
TRANS CONT PWR - OFF
TVC SERVO PWR (2) - OFF
MN BUS TIE (2) - OFF
cb SPS P1&2, Y1&2 - openBasic Date April 18, 1969

Changed _____

CSM 6

Go to ENTRY PREP & SUPERCIRC ENTRY PROCEDURE
If est. time to EI<01:55:00 omit MCC and
enter the SUPERCIRC CKLIST as early as pos-
sible.

If est. time to EI>01:55:00 anticipate a
MCC. Enter the ENTRY PREP CKLIST at step 9
pg E/1-1

TLI 90 MIN ABORT

TLI+25	Normal CSM/LV Separation- If decision to abort made before TLI+25 min, abort at this time. If abort deci- sion occurs after separation start with V37E OOE. SECS LOGIC (2) - on (up) MSFN Confirm GO for PYRO ARM SECS PYRO ARM (2) - ARM
00:00	TRANS CONTR - CCW (4 sec) DET RESET (verify)
00:03	SIVB/CSM SEP LV ENG 1 Lt - out *CSM/LV SEP PB - PUSH* *RCS CMD - ON *
00:05	TRANS CONTR - neutral then +X for 10 sec SIVB/GPI sw - GPI *Excessive rates: * * ΔV THRUST A - NORMAL * * SPS THRUST - DIRECT * *When rates damped: * * ΔV THRUST (2) - OFF * * SPS THRUST - NORMAL *

Basic Date April 18, 1969
Changed _____

CSM 106

00:14

TRANS CONTR +X - OFF
 V37E OOE
 PITCH UP to LOCAL VERT (+X axis
 toward the earth)
 RATE - LOW
 BMAG MODE (3) - ATT1/RATE 2
 EDS PWR - OFF
 SECS PYRO ARM (2) - SAFE
 SECS LOGIC (2) - OFF
 cb SECS ARM (2) - open
 cb EDS (3) - open

01:00

TRANS CONTR +X (8 to 10 sec)

RATE - HIGH

MNVR TO RETRO ATT
 R _____ (Block Data)
 P _____ (Block Data)
 Y _____ (Block Data)

RETRO UPDATE (NO COMM - use Block Data)
 GETI _____ θ .05G _____

ΔV	GET DROGUE
VC	ENTRY P
Δtb	R
GET 400K	Y

XX:XX

Set DET counting up to GETI
 ALIGN HORIZ ON RET +1° MK
 GMBL CHECK (Time Permitting)
 MN BUS TIE (2) - ON
 GMBL MTRS (4) - ON (LMP Confirm)
 cb SPS P2, Y2 - open
 RATE - LOW
 EMS MODE - STBY
 EMS FUNC - ΔV SET/VHF RNG
 SET ΔV from chart
 EMS FUNC - ΔV
 EMS MODE - NORMAL
 TAPE RCDR - CMD RESET/HBR/RCD/FWD

Basic Date April 18, 1969

Changed

CSM

59:45 ΔV THRUST A - NORMAL
V37E 47E (THRUST MONITOR)

F 16 83 ΔV X, Y, Z (.1 fps)

59:59 THRUST ON PB - PUSH
TRANS CONTR +X - OFF
BURN ΔV req'd
 ΔV THRUST (2) - OFF
Report cutoff
cb SPS P2, Y2 - close
GMBL MTRS (4) - OFF (LMP Confirm)
TRANS CONT PWR - OFF
TVC SERVO PWR (2) - OFF
MN BUS TIE (2) - OFF
cb SPS P1&2, Y1&2 - open

F 37 OOE

Go to ENTRY PREP & SUPERCIRC ENTRY PROCEDURE
Step 9 pg E/1-1

Basic Date April 18, 1969
Changed _____

CSM 106

LOI MODE I ABORT

ABORT - Stop Clock
 ΔV Thrust A/B - OFF
 SPS INJ vlv (4) - CLOSED
 SPS He tb (2) - bp
 GMBL MOTS (4) - OFF (LMP Verify)
 TVC SERVO PWR 1&2 - OFF
 SC CONT - SCS
 PCM BIT RATE - LOW

RECORD DATA AND COMPUTE PAD

F 97 40	Record TFC	<u>59 59</u>	<u>PRIMARY</u>
	Vg	_____	G&N ΔV m _____
	Vm	_____	VcABORT(Chart) _____
	EMS Vc	_____	GET LOI1 _____
	ENTR		Bt Watch + _____
F 99 40			+15:00
Maneuver to LOI1 Attitude			GET TEI ABORT : :
	ENTR		Bt ABORT _____
F 16 85	Record Vx	_____	from Nomogram for Vc
	Vy	_____	ABORT P&Y TRIM(Chart)
	Vz	_____	
PRO			<u>ALTERNATE</u>
F37 V82E			ΔV cLOI1 PAD _____
			EMS Vc(Shutdown) _____
			Vc(Burned) _____
			Vc ABORT(Chart) _____
F 16 44	Record H	_____	
	Hp	_____	
	TFF	_____	
PRO			
F 37 00E			
V66E			

Basic Date April 18, 1969
 Changed

MAN ATT PITCH - ACCEL CMD
SET in GDC THUMBWHEELS - (177.9, 27.9, 1.6)
MAN MNVR To ABORT R,P,Y
CDC ALIGN
CHECK DAP (P&Y TRIM)
EMS FUNC - ΔV SET/VHF RNG
SET ΔVc ABORT

TVC CHECK & PREP

cb STAB CONT SYS (all) - close
cb SPS (12) - close
RATE - LOW (verify)
LIMIT CYCLE - ON
MAN ATT (3) - RATE CMD
BMAG MODE (3) - ATT1/RATE2
ROT CONTR PWR DIR (2) - OFF
SCS TVC (2) - AUTO
TVC GMBL DRIVE P&Y - AUTO
MN BUS TIE (2) - ON (verify)
TVC SERVO PWR 1 - AC1/MNA
TVC SERVO PWR 2 - AC2/MNB
TRANS CONTR PWR - ON
ROT CONTR PWR NORMAL #2 - AC
RHC #2 - ARMED

-5m

PRIMARY TVC CHECK

GMBL MOT P1, Y1 - START/ON (LMP Verify)
THC - CW
Verify NO MTVC

SEC TVC CHECK

GMBL MOT P2, Y2 - START/ON (LMP Verify)
cb SPS P2, Y2 - open
SET GPI TRIM
Verify MTVC
THC - NEUTRAL
Verify GPI Returns To Trim Pos
ROT CONTR PWR NORM (2) - AC/DC
ATT DB - MIN (verify)
ROT CONTR PWR DIR (2) - MNA/B
SPS HE vlv (2) - AUTO, verify tb-bp
LIMIT CYCLE - OFF
FDAI SCALE - 50/15 (verify)

Basic Date April 18, 1969
Changed

CSM 106

-2m EMS MODE - NORMAL
V37E 47E
 ΔV THRUST A(B) - NORMAL
THC - ARMED (verify)
RHC (2) - ARMED
PCM BIT RATE - HIGH

-10s
00 ULLAGE
THRUST ON PB - PUSH
SPS THRUST Lt - on
MONITOR THRUSTING
Pc 95-105 psia
EMS COUNTING DOWN
SPS INJ v1vs (4) - OPEN
SPS HE v1vs tb (2) - gray
SPS FUEL/OXID PRESS - 175 to 195 psi

ECO
 ΔV THRUST (2) - OFF
SPS INJ v1vs (4) - CLOSED
SPS He tb (2) - bp
cb SPS P2, Y2 - close
GMBL MOTS (4) - OFF (LMP Verify)
TVC SERVO PWR 1&2 - OFF
MN BUS TIE (2) - OFF
PCM BIT RATE - LOW
BMAG MODE (3) - RATE 2
F 16 83
RECORD Vx _____
Vy _____
Vz _____

PRO
F37 00E
V66E
EMS ΔV_c _____

April 18, 1969

Basic Date _____
Changed _____

TLI PREPARATION

GET = 1:50 Don Helmets & Gloves
 SUIT CKT RET vlv - CLOSE (push)

XLUNAR - INJECT (verify)
 EDS PWR - on (verify)

CYI LOS EMS AV Test pg G/1-45
 (01:55:23) GDC ALIGN
 SUNSET SECS PYRO ARM (2) - on (up)
 (01:59:41) TRANS CONTROL PWR - ON
 TAN AOS (V) ROT CONTR PWR NORMAL (2) - AC/DC
 (02:09:07) (verify)
 ROT CONTR PWR DIRECT (2) - MNA/MNB
 LV IND/GPI - SII/SIVB (verify)
 LV GULD - IU (verify)
 cb DIRECT ULLAGE (2) - closed
 Set EVENT TIMER to 51:00
 Begin MONITOR For TB6

TAN LOS (02:15:58) V48E 31102,01111
 ARIA AOS KEY V83E
 (_____) SET ORDEAL

(2:23:48) TB 6 - SII SEP Lt on (TIG-9 min, 38 sec)
 SII SEP Lt out (38 sec later)
 51:00 Start DET COUNTING UP
 SC CONT - SCS (verify)
 MONITOR LV TANK PRESS

CRO AOS (02:25:22) AP < 36 psid (OXID > FUEL)
 AP < 26 psid (FUEL > OXID)

Lax TK Press > 50 psia *EMERGENCY CSM/LV SEP pg L/5-3*

Fuel <25.

OX <20

Inhibit SIVB Restart

MER AOS (02:28:49) UP TLM CM - BLOCK (verify)
 UP TLM IU - BLOCK (verify)

57:00 V37E 47E (check bias) Record _____
 (Limit : 9.8 fps/min)
 F 16 83 ΔVX,Y,Z (.1fps)
 ORDEAL - 200/LUNAR
 ORDEAL FDAI 1 - ORB RATE
 FDAI 2 - INERTIAL
 SLEW FDAI to PITCH = 17°
 58:00 N62E
 F 16 62 VI,HDOT,HPAD (fps,fps,.1nm)
 MONITOR VI () at ECO
 TVC SERVO PWR 1 - AC1/MNA
 2 - OFF
 TAPE RCDR - FWD/RCD/HEB/CMD RESET
 EMS MODE - NORMAL
 58:20 CRO LOS
 (02:31:36)
 58:36 SII SEP Lt - ON
 TLI Inhibit Signals will not
 * be honored after 59:42 *
 58:38 SIVB ULLAGE Begins
 59:00 SLEW FDAI to PITCH = 9.0°
 59:42 SII SEP Lt - off (TIG - 18 sec)
 59:52 SIVB FUEL LEAD
 59:55 SIVB ULLAGE discontinues
 Insure FDAI 1 PITCH = 5.0°
 59:59 Start ORDEAL Torquing
 LV ENG 1 Lt - on
 00:00 SIVB IGNITION (: : GETI)
 00:02 LV ENG 1 Lt - off
 PREP
 TLI
 RED AOS
 (02:34:00)
 MER LOS
 (02:35:30)
 SUNRISE MONITOR THRUST & ATTITUDE
 (02:38:00) MONITOR LV TANK PRESS
 SIVB ECO (Lt on) (BEGIN TB7)
 *EMER SIVB CUTOFF AT 6 SEC *
 * PAST BURN TIME IF VI ATTAINED*
 *LV STAGE sw - SII/SIVB *
 *If still no ECO, *
 *THC CCW & NEUTRAL IN 1 SEC *
 (MSFN AOS) UP TLM - ACCEPT
 (02:43:43) [REDACTED]
 KEY VERB (freeze display)

Basic Date May 18, 1969
 Changed May 3, 1969

L
7-3

SIVB ATT HOLD 20 sec & BEGIN VENTING
SIVB MNVR TO ORB RT (HDS DN) (.3°/sec)

Record VI _____

HDOT _____

HPAD _____

KEY RLSE

F 16 62

KEY RLSE

F 16 83

ΔVX,Y,Z

(.1fps)

TVC SERVO PWR 1 - OFF

PCM BIT RATE - LOW

EMS MODE - STBY

EMS FUNC - OFF

SECS PYRO ARM (2) - SAFE

FDAI 1 - INERTIAL

PRO

Report VI _____

ΔVC _____

F 37

OOE *When CMC ACTY Lt - out*
VGSE

CMP To LH Couch

CDR To CTR Couch

02:50:00 Report radiation survey meter
reading and ~~GET~~ GET of reading

Basic Date April 18, 1969
Changed May 1, 1969

CSM 106

TLI 10 MIN ABORTSECS LOGIC (2) - on (up)(verify)
SECS PYRO ARM (2) - ARM

00:00 TRANS CONTR - CCW (4 sec)
DET RESET (verify)

00:03 SIVB/CSM SEP
LV ENG 1 Lt - out
* CSM/LV SEP PB - PUSH*
* RCS CMD - ON *

00:05 TRANS CONTR - neutral then +X for
10 sec

SIVB/GPI sw - GPI

00:14 TRANS CONTR +X - OFF

V37E OOE
PITCH UP to LOCAL VERT (+X axis
toward the earth)
RATE - LOW
BMAG MODE (3) - ATT1/RATE 2
EDS PWR - OFF
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
cb EDS (3) - open

01:00 TRANS CONTR -X (8 to 10 sec)
RATE - HIGH

MNVR TO RETRO ATT
R _____ (180°)
P _____ (██████) 267°
Y _____ (0°)

Basic Date April 18, 1969
Changed May 5, 1969

RETRO UPDATE

GETI _____

θ .05G _____

ΔV _____

GET DROGUE _____

VC _____

ENTRY P _____

Δtb _____

R _____

GET 400K _____

Y _____

ALIGN HORIZ ON RET +1° MK

GMBL CHECK (Time Permitting)

MN BUS TIE (2) - ON

GMBL MTRS (4) - ON (LMP Confirm)

RATE - LOW

EMS MODE - STBY

EMS FUNC - ΔV SET/VHF RNG

SET ΔV from chart

EMS FUNC - ΔV

EMS MODE - NORMAL

09:45 ΔV THRUST A - NORMAL
 V37E 47E (THRUST MONITOR)

F 16 83 ΔVX,Y,Z (.1 fps)

NOTE: For aborts during 1st min of TLI,
 KEY V82E F 16 44 (Ha,Hp,Tff)
 Burn until Hp < 19NM.

09:50 TRANS CONTR +X

10:00 THRUST ON PB - PUSH
 TRANS CONTR +X - OFF
 BURN ΔV req'd
 ΔV THRUST (2) - OFF
 Report cutoff

GMBL MTRS (4) - OFF (LMP Confirm)

TRANS CONT PWR - OFF
 TVC SERVO PWR (2) - OFF
 MN BUS TIE (2) - OFF
 cb SPS P1&2, Y1&2 - open

PRO

E 37

00E

Go to ENTRY PREP & SUPERCIRC ENTRY PROCEDURE
If est. time to EI<01:55:00 omit MCC and
enter the SUPERCIRC CKLIST as early as pos-
sible.

If est. time to EI>01:55:00 anticipate a
MCC. Enter the ENTRY PREP CKLIST at step 9
pg E/1-1

TLI 90 MIN ABORT

TLI+25	Normal CSM/LV Separation- If decision to abort made before TLI+25 min, abort at this time. If abort deci- sion occurs after separation start with V37E OOE. SECS LOGIC (2) - on (up) MSFN Confirm GO for PYRO ARM SECS PYRO ARM (2) - ARM
00:00	TRANS CONTR - CCW (4 sec)
00:03	DET RESET (verify) SIVB/CSM SEP LV ENG 1 Lt - out *CSM/LV SEP PB - PUSH* *RCS CMD - ON * TRANS CONTR - neutral then +X for 10 sec
00:05	SIVB/GPI sw - GPI

Basic Date April 18, 1969
Changed May 3, 1969

00:14

TRANS CONTR +X - OFF

V37E OOE

PITCH UP to LOCAL VERT (+X axis
toward the earth)

RATE - LOW

BMAG MODE (3) - ATT1/RATE 2

EDS PWR - OFF

SECS PYRO ARM (2) - SAFE

SECS LOGIC (2) - OFF

cb SECS ARM (2) - open

cb EDS (3) - open

01:00

TRANS CONTR ~~-X~~ (8 to 10 sec)

RATE - HIGH

MNVR TO RETRO ATT

R _____ (Block Data)

P _____ (Block Data)

Y _____ (Block Data)

RETRO UPDATE (NO COMM - use Block Data)

GETI _____ θ .05G _____

ΔV _____

GET DROGUE _____

VC _____

ENTRY P _____

Δtb _____

R _____

GET 400K _____

Y _____

XX:XX

Set DET counting up to GETI

ALIGN HORIZ ON RET +1° MK

GMBL CHECK (Time Permitting)

MN BUS TIE (2) - ON

GMBL MTRS (4) - ON (LMP Confirm)

RATE - LOW

EMS MODE - STBY

EMS FUNC - ΔV SET/VHF RNG

SET ΔV from chart

EMS FUNC - ΔV

EMS MODE - NORMAL

TAPE RCDR - CMD RESET/HBR/RCD/FWD

Basic Date — April 18, 1969
 Changed — May 3, 1969

CSM 106

59:45 ΔV THRUST A - NORMAL
V37E 47E (THRUST MONITOR)

F 16 83 $\Delta V X, Y, Z$ (.1 fps)

59:59 THRUST ON PB - PUSH
TRANS CONTR +X - OFF
BURN ΔV req'd
 ΔV THRUST (2) - OFF
Report cutoff

GMBL MTRS (4) - OFF (LMP Confirm)
TRANS CONT PWR - OFF
TVC SERVO PWR (2) - OFF
MN BUS TIE (2) - OFF
cb SPS P1&2, Y1&2 - open

PRO
F 37 00E

Go to ENTRY PREP & SUPERCIRC ENTRY PROCEDURE
Step 9 pg E/1-1

Basic Date April 18, 1969
Changed May 3, 1969

CSM 106

LOI MODE I ABORT

ABORT - Stop Clock
 ΔV Thrust A/B - OFF
 SPS INJ vlv (4) - CLOSED
 SPS He tb (2) - bp
 GMBL MOTS (4) - OFF (LMP Verify)
 TVC SERVO PWR 1&2 - OFF
 SC CONT - SCS
 PCM BIT RATE - LOW
EMS MODE - STBY
 RECORD DATA AND COMPUTE PAD

F 97 40

Record	TFC	59	59	<u>PRIMARY</u>
	Vg			G&N ΔVm
	Vm			VcABORT(Chart)
EMS	Vc			GET LOI1

ENTR

+15:00

F 99 40

Maneuver to LOI1 Attitude

GET 15 min ABORT	:	:
------------------	---	---

ENTR

F 16 85

Record	Vx		
	Vy		
	Vz		

ALTERNATE

ΔVcLOI1 PAD		
EMS Vc(Shutdown)		
Vc(Burned)		
Vc ABORT(Chart)		

PRO

F37 V82E

F 16 44

Record	H		
	Hp		
	TFF		

PRO

F 37 00E

V66E

Basic Date April 18, 1969
 Changed May 3, 1969

CSM 106

MAN ATT PITCH - ACCEL CMD
SET in GDC THUMBWHEELS - (176.8, 68.0, 6.2)
MAN MNVR To ABORT R,P,Y
GDC ALIGN
CHECK DAP (P&Y TRIM)
EMS FUNC - ΔV SET/VHF RNG
SET ΔVc ABORT
EMS FUNC - ΔV

TVC CHECK & PREP

cb STAB CONT SYS (all) - close
cb SPS (12) - close
RATE - LOW (verify)
LIMIT CYCLE - ON
MAN ATT (3) - RATE CMD
BMAG MODE (3) - ATT1/RATE2
ROT CONTR PWR DIR (2) - OFF
SCS TVC (2) - AUTO
TVC GMBL DRIVE P&Y - AUTO
MN BUS TIE (2) - ON (verify)
TVC SERVO PWR 1 - AC1/MNA
TVC SERVO PWR 2 - AC2/MNB
TRANS CONTR PWR - ON
ROT CONTR PWR NORMAL #2 - AC
RHC #2 - ARMED

- 5 m

PRIMARY TVC CHECK

GMBL MOT P1, Y1 - START/ON (LMP Verify)
THC - CW
Verify NO MTVC

SEC TVC CHECK

GMBL MOT P2, Y2 - START/ON (LMP Verify)
SET GPI TRIM
Verify MTVC
THC - NEUTRAL
Verify GPI Returns To Trim Pos
ROT CONT PWR NORM (2) - AC/DC
ATT DB - MIN (verify)
ROT CONTR PWR DIR (2) - MNA/B
SPS HE vlv (2) - AUTO, verify tb-bp
LIMIT CYCLE - OFF
FDAI SCALE - 50/15 (verify)

Basic Date April 18, 1969
Changed May 1, 1969

CSM 106

L
8-8

-2m

EMS MODE - NORMAL
V37E 47E
 ΔV THRUST A(B) - NORMAL
THC - ARMED (verify)
RHC (2) - ARMED

-10s

00

PCM BIT RATE - HIGH

ULLAGE

THRUST ON PB - PUSH

SPS THRUST Lt - on

MONITOR THRUSTING

Pc 95-105 psia

EMS COUNTING DOWN

SPS INJ v1vs (4) - OPEN

SPS HE v1vs tb (2) - gray

SPS FUEL/OXID PRESS - 175 to 195 psi

ECO

ΔV THRUST (2) - OFF

SPS INJ v1vs (4) - CLOSED

SPS He tb (2) - bp

GMBL MOTS (4) - OFF (LMP Verify)

TVC SERVO PWR 1&2 - OFF

MN BUS TIE (2) - OFF

PCM BIT RATE - LOW

BMAG MODE (3) - RATE 2

F 16 83

RECORD Vx _____

Vy _____

Vz _____

PRO

F37 00E

V66E

EMS ΔV_c _____

Basic Date April 18, 1969
Changed May 3, 1969

CSM 106

TLI BACKUP GUIDANCE PROCEDURES

TB5

KEY V46E

GUIDANCE - CMC

ORDEAL ALT = 200 NM

EARTH/LUNAR = LUNAR

SET THUMBWHEELS

R = 180°, P = 116°, Y = 0° (1st OPP)

R = 180°, P = 115°, Y = 0° (2nd OPP)

SELECT FDAI #1

FDAI SOURCE - ATT SET / IMU

MANEUVER LV TO THUMBWHEELS ATT

(ZERO NEEDLES)

KEY V16 N20E (DSKY R2 = 116.00°)

NULL LV RATES

ORDEAL FDAI #1 - ORB RATE

ORDEAL MODE - FAST/HOLD

SLEW FDAI #1 TO P = 0°

INSURE R2 = 116.00°

TB6

S-II SEP LT - ON

51:00

S-II SEP LT - OFF

START DET COUNTING UP FROM 51:00

57:00

INSURE FDAI #1 P = 0° & R2 = 116.00°

57:40

ORDEAL MODE - OPERATE/SLOW

(STARTS ORDEAL TORQUING)

MANEUVER LV TO

P = 0°, Y = +3.5° AND MAINTAIN UNTIL BURN COMP

58:00

KEY V37E 47E

N20E

58:36

S-II SEP LT - ON

58:38

LV ULLAGE START

59:42

S-II SEP LT - OFF (IGN - 18 SEC)

59:50

N62E

59:52

SIVB FUEL LEAD

59:55

LV ULLAGE TERMINATES

59:59

ENG #1 LT - ON

00:00

IGNITION

00:02

ENG #1 LT - OFF

FLY P = 0°, Y = 3.5°

05:44(1st) CUTOFF ON PAD VI THC - CCW FOR 1 SEC & RESET

05:29(2nd)

Basic Date ~~April 18, 1969~~
Changed ~~May 9, 1969~~

CS 706

CSM/SLA SEPARATION THRU WITHDRAWAL

1 PRE SEPARATION

SC CONT - CMC/FREE
COAS PWR - ON
AUTO RCS SEL (16) - MNA/MNB
TVC SERVO PWR 1 - AC1/MNA
TVC SERVO PWR 2 - OFF
cb DOCK PROBE (2) - close (verify)
WASTE STOW vlv - CLOSE
DIRECT 02 vlv - OPEN till CAB PRESS
ind - ~5.7 psia, then CLOSE

(02:54:00) SIVB MNVRS to SEP ATT and goes inertial

BMAG MODE (3) - RATE 2

MAN ATT (3) - MIN IMP

ATT DB - MIN

RATE - LOW

~~SC CONT - SCS~~ cb SECS ARM (2) - close (verify)

cb SECS LOGIC (2) - closed (verify)

RCS CMD - ON

Check RCS (all quads) (audible)

SC CONT - CMC/FREE

MAN ATT (3) - RATE CMD

(03:00:00) SECS LOGIC (2) - on (up) (verify)

MSFN confirm GO for PYRO ARM, SIVB

venting stopped, and GO for T&D

V48E 11102, 01111

V46E

V66E

V16N20E _____, _____, _____

_____, +180.0, +/-

V16N22E _____, _____, _____

EMS FUNC - ΔV SET/VHF RNG

Slew ΔV ind to -100.0

V62E

TAPE RCDR - CMD RESET/HBR

Basic Date — April 18, 1969
Changed — April 3, 1969

CSM 106

2 SEPARATION

V37E 47E

SECS PYRO ARM (2) - on (up)

EMS FUNC - ΔV

EMS MODE - NORMAL

SC CONT - CMC/AUTO

DET START

THC - +X (audible)

CSM/LV SEP PB - PUSH

LV ENG 1 Lt - out

LV TK PRESS ind (4) - 0

THC - +X to 0.8 fps

*NO SEP:

*THC - CCW

*DET - RESET and counting (auto)

LV ENG 1 Lt - out, LV TK PRESS ind - 0

*THC - Neutral at 0.8 fps

*

*

*

*

SM RCS PRPLNT tb (8) - gray

(00:35) THC -X to 0.3 fps

3 TRANSPOSITION

V62E

MAN ATT PITCH & YAW - ACCEL CMD

Pitch up 180° at 2°/sec

MAN ATT PITCH & YAW - RATE CMD

V37E 00E

V49E (SC AUTO MNVR TO DOCKING ATT)

EDS PWR - OFF

cb EDS (3) - open

Hi Gain Ant Activation

cb HGA FLT BUS - close

cb HGA GROUP 2 - close

HGA TRACK - MAN

HGA PWR - on (up)

Slew ant to verify operation

Acquire HGA phaselock: $P = -53^\circ$ $Y = +39^\circ$

For TV operation go to pg S/1-21

When TV operation is completed:

HGA TRACK - MAN

Slew antenna To PITCH = -52°, YAW = 270°

Basic Date April 18, 1969
Channed May 2, 1969

4 DOCKING

PROBE EXTD/REL - RETRACT (tb - gray)

5 CONTACT & CAPTURE

At capture:

PROBE EXTD/RETR tb - bp

(A)(B)

SC CONT - CMC/FREE

Allow probe to damp S/C motions (10 sec)

BMAG MODE (3) - RATE 2 (verify)

When within 2° of docking attitude (min poss)

PROBE RETRACT PRIM - 1

(E)

PROBE EXTD/RETR tb - gray (A-latches 1,5,9:

B-latches 3,7,11)

SECS PYRO ARM (2) - SAFE

SECS LOGIC (2) - OFF

PROBE EXTD/REL - OFF

PROBE RETRACT PRIM - OFF

cb DOCK PROBE (2) - open

PCM BIT RATE - LOW

6 POST DOCKING

RATE - HIGH

TVC SERVO PWR 1 - OFF

COAS PWR - OFF

cb RCS LOGIC (2) - open

EMS MODE - STBY

EMS FUNC - OFF

COUCHES: CDR - 90°, CMP - 0°, LMP - 180°

LM PWR - OFF (verify)

TUNNEL LIGHTS - ON

Basic Date — April 18, 1969
Changed — April 3, 1969

CSM 106

7 CSM/LM PRESSURE EQUALIZATION (Decal)

O2 PRESS IND sw - SURGE TANK

Verify CRYO O2 PRESS 1 ind - 865-935 psia
EMER CAB PRESS sel - OFF (verify)

PLSS 02 vlv - OFF

DIRECT 02 vlv - CLOSE (verify)

TUNL VENT vlv - LM/CM ΔP

LM/CM ΔP ind - +4 psid (pegged)
CRYO 02 PRESS ind - 850 psia

PRESS EQUAL vlv - OPEN

CAB PRESS ind - 4.5 psia

PRESS EQUAL vlv - CLOSE

LM/CM ΔP ind - ~2.4 psid

Monitor LM/CM ΔP ind for 3 min
and verify ΔP stable

PRESS EQUAL vlv - OPEN

CAB PRESS ind - 4.0 psia

REPRESS 02 vlv - OPEN

CAB PRESS ind 5.7 psia

Cycle REPRESS 02 as required
between 4.0 and 5.7 psia limits
until REPRESS 02 PRESS ind
~0.0 psig

REPRESS 02 - CLOSE

CAB PRESS ind > 4.0 psia

*If CAB PRESS ind <4.0 psia *

* PRESS EQUAL vlv - CLOSE *

LM/CM ΔP ind - ~0.0 psid

CAB PRESS ind - 5.0 psia

PLSS 02 vlv - FILL

EMER CAB PRESS sel - BOTH

TUNL VENT vlv - OFF

WASTE STOW vlv - VENT (until cabin purge complete
at ~8 hrs)

Basic Date April 18, 1969
Changed May 3, 1969

8 TUNNEL HATCH REMOVAL (Decal)

PRESS EQUAL vlv - open (CCW) (verify)
ACTR HNDL SEL - unstow, pull to stop, set to U
- push to stop
Verify gearbox disconnect socket - U
ACTR HNDL SEL - stow
- push to stow
Remove hatch, stow

9 DOCKING LATCH VERIFICATION (Decal)

LATCH HNDL - Pull to verify hook engaged
Not engaged - attempt to engage
* before recocking *
LATCH IND Button (red) - flush
Power Bungee Fairing - parallel to +X
(push +X end of Bungee before recocking
if not parallel)
*Unlocked latches: *
* Recock latches *
* *Hook does not release * *
* *AUX REL (yellow) - push* *
* *Cock latch * *
*Release latch - push man release *
GN2 BLEED button (red) - press (10 sec)

10 LM UMBILICAL CONNECTION (Decal)

LM Connector Fairings (2) (orange) - open
LM Umbilical Connectors (2) - install and lock
LM Connector Fairings (2) (orange) - close
SYS TEST - 4D
LM PWR - CSM
SYS TEST ind - 0.5-3.2 volts

11 HATCH INSTALLATION (Decal)

Align hatch in tunnel
ACTR HNDL SEL - unstow, set to L
- push to stop

Verify gearbox disconnect socket - L

- *If latches cannot be closed: *
- * GEARBOX DISCONNECT - 180° CCW (tool B)*
- * AUX LATCH DRIVE - LATCH (113° CW) *
- * Verify hatch latched, remove tool B *

Basic Date April 18, 1969
Changed 3, 1969

CSM 106

ACTR HNDL SEL - stow
- push to stow
PRESS EQUAL vlv - CLOSED (CW)
TUNL VENT - LM/CM ΔP
TUNNEL LIGHTS - OFF

(C)

12 Report Radiation Dosimeter Reading
~~Get Set of Reading~~

13 LM EXTRACTION

LOAD DAP: 21101 V46E
EMS FUNC - ΔV SET/VHF RNG
Slew ΔV ind to -100.0
EMS FUNC - ΔV
EMS MODE - NORMAL

V6 N22 _____, _____, _____

cb SIVB/LM SEP (2) - close (verify)
TVC SERVO PWR 1 - AC1/MNA
SECS LOGIC (2) - on (up)
MSFN Confirm GO for PYRO ARM & Withdrawal
SECS PYRO ARM (2) - on (up)

V66E

V37E 47E

(00:00) SIVB/LM SEP - on (up)

Start DET

(00:05) THC -X for 3 sec

(00:14) CMC MODE - AUTO

V37E 00E

V49E

V62E

SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
TVC SERVO PWR 1 - OFF
cb SIVB/LM SEP (2) - open
EMS MODE - STBY

Go to Thrusting Proc pg G/1-31 for SPS Evasive Mnvr

Basic Date April 18, 1969
Changed May 1, 1969

CS. 06

L/9-7

P30 MANEUVER

Basic Date Nov 18, 1969
 Changed Nov 3, 1969

CSN 106

SET STARS				PURPOSE
R ALIGN	/			PROP/GUID
P ALIGN	+	0 0	.	WT N47
Y ALIGN		0 0	•	P TRIM N48
		+ 0 0		Y TRIM
		+ 0 0 0		HRS GETI
		+ 0	•	MIN N33
				SEC
ULLAGE			•	ΔV_x N81
			•	ΔV_y
			•	ΔV_z
	X X X			R
	X X X			P
	X X X			Y
	+		•	H_A N44
			•	H_P
	+		•	ΔV_T
HORIZON/WINDOW	X X X		•	BT
	X		•	ΔV_C
	X X X X			SXTS
	+		•	SFT
	+		0	TRN
	X X X			BSS
	X X			SPA
	X X X			SXP
OTHER	0		•	LAT N61
			•	LONG
	+		•	RTGO EMS
	+		•	V10
				GET 0.05G

LM INTERFACE

1 IVT TO LM FOR FIRST ENTRY

Couches: CDR - 0°, CMP - 0°, LMP - 180°

TUNL LTS - ON

TUNL VENT vlv - LM/CM ΔP

Verify LM/CM ΔP < 0.2

*LM/CM ΔP > 0.2 *

Equalize CM/TUNL pressure

* (Decal) *

Remove hatch & stow (Decal) (3)

Remove probe & stow (Decal) (4)

Remove drogue & stow (Decal) (5)

Read docking tunnel index angle

Open LM hatch

LMP Transfer to LM (6)

At LM request,

LM PWR - RESET, then OFF

SYS TEST - 4D

SYS TEST ind - 0 volts

Perform comm checks with LM

At LM request

LM PWR - CSM

SYS TEST - 4D

SYS TEST ind - 0.5 - 3.2 volts

LMP Transfer to CSM (6A)

Close LM hatch

Install CM hatch (Decal) (11)

TUNL VENT vlv - LM PRESS

TUNL LTS - OFF

2 IVT TO LM FOR SECOND ENTRY

Couches: CDR- 0°, CMP- 0°, LMP- 180°

Don helmet protective shield (if req'd)

Suit Integrity Ck (if req'd)

TUNL LTS - ON

Basic Date April 18, 1969
Changed May 1969

CSM 106

- TUNL VENT vlv - LM/CM ΔP
Verify LM/CM ΔP <0.2
*LM/CM ΔP >0.2 *
* Equalize CM/TUNL Pressure*
* (Decal) *
- Remove tunnel hatch (Decal) (3)
Verify docking tunnel index angle
Open LM hatch
LMP transfer to LM (6)
At LM request,
 LM PWR - RESET, then OFF
 SYS TEST - 4D
 SYS TEST ind - 0 volts
- CDR transfer to LM (6)
LMP transfer to CSM (6A)
LMP don LCG & PGA
LMP transfer to LM (6)
Remove LM umbilicals (7)
Install drogue (Decal) (8)
Install probe (Decal) (9)
Preload probe (Decal) (10)
LM hatch closed
Verify CSM roll cmd's inhibited
 until LM/CM ΔP \geq 3.5 psid
Cock docking latches (12) (G) (H)
Verify hook is clear of LM ring
 *Hook does not release: *
 * AUX REL (yellow) - push*
 * Cock latch *
- Install tunnel hatch (Decal) (11)
Perform hatch integrity check (Decal) (12)
Remove center couch and stow
Install docking target
DOCKING TARGET - BRIGHT
Receive target alignment verification from LM
Configure side hatch for EVT
 ACTR HANDLE SEL - N (neutral)
 GN2 VLV HANDLE - pull (inboard)
 GN2 PRESS ind - minimum

Basic Date April 18, 1969
Changed May 1, 1969

3 TUNNEL HATCH REMOVAL (Decal)

PRESS EQUAL vlv - open (CCW)

(D)

ACTR HNDL - unstow, pull to stop, set to U

- push to stop

Verify gearbox disconnect socket - U

ACTR HNDL SEL - stow

- push to stow

Remove hatch, stow

4 PROBE REMOVAL (CM Side) (Decal)**A. Translunar Docking:**

Verify EXTEND LATCH engaged indicator

(red) not visible

*EXTEND LATCH not engaged: *

* PRELOAD SEL LEVER - rotate CW (away from*)

* orange stripe) *

* PRELOAD HANDLE - Torque CCW to engage *

* extend latch (red ind. not visible) *

GN2 BLEED button (RED) - press (10 sec)

PRELOAD SEL LEVER - rotate CCW (parallel)
to orange stripe)

PRELOAD HNDL - Torque (CW) unload support beams

B. Lunar Orbit Docking:

PRELOAD SEL LEVER - rotate CW(away from orange stripe)

PRELOAD HNDL - torque CCW to engage EXTEND LATCH (red
indicator not visible)

GN2 BLEED button (red) - press (10 sec)

Basic Date April 18, 1969
Changed April 29, 1969

CSM 10

C. Both TLD & LOD:

PROBE UMBILICALS (2) (yellow) - disconnect and stow
Elec connector covers (2) (yellow) - close
PRELOAD HNDL - position against umbilical connector
PRELOAD SEL LEVER - mid position
INSTALLATION STRUT - unstow, position on tunnel
wall (yellow marks)
CAPTURE LATCH RLSE HNDL LOCK - Rotate CCW to unlock
(orange stripe visible)
RATCHET HNDL - unstow to full extension
- push to first detent (red band)
- push outbd and hold to fold
probe ()
RATCHET HNDL - pull to full extension
- ratchet one stroke only
Restow RATCHET HNDL and INSTALLATION STRUT
CAPTURE LATCH RLSE HNDL - Pull, rotate to unlock
(180° CW) - push to recess

*Capture latches will not release: *
* Ratchet probe forward *
* Preload probe until latches release*

Remove PROBE - pull aft to release (25 lbs)

5 DROGUE REMOVAL (Decal)

LOCK LEVER - Pull, rotate 90° CCW
DROGUE - rotate CW, push clear of support
- remove from tunnel

6 CREW TRANSFER TO LM

CDR and LMP Audio Panels:

PWR - OFF
SUIT PWR - OFF
AUDIO CONT - NORM

CDR and LMP SUIT FLOW vlv - OFF

Connect to TRANSFER UMB if desired

Basic Date April 18, 1969
Changed Date April 29, 1969

6A CREW TRANSFER TO CSM

CDR and LMP Audio Panels:

Verify/set PWR - OFF

Verify/set SUIT PWR - OFF

Verify/set AUDIO CONT - NORM

Verify/set CDR and LMP SUIT FLOW vlv - OFF

Connect to TRANSFER UMB if desired

LMP transfer to CSM

7 REMOVE LM UMBILICALS (FINAL)

LM Connector Fairings (2) (orange) - open

Connectors (2) - release and remove

Fairings (2) - close

Pull lanyard on LM end of umbilical

Remove umbilicals from tunnel, stow in F1 or F2

8 INSTALL DROGUE (Decal)

DROGUE - Align Lugs with fittings

- Rotate CCW to stops

LOCK LEVER - Rotate 90° CW to detent

9 INSTALL PROBE (Decal)

CAPTURE LATCH RLSE HNDL - Pull, rotate CCW to cock pos (150°)

Push PROBE into DROGUE

CAPTURE LATCH RLSE HNDL - rotate CCW to LOCK position (do not force)
- push to recess

Verify capture latches engaged (CDR)

INSTALLATION STRUT - unstow, position on tunnel wall (yellow marks)

RATCHET HNDL - unstow to full extension (green band)
- ratchet probe fwd to orange hash mark (K)

Restow RATCHET HNDL and INSTALLATION STRUT

Verify RATCHET PAWL indicator(red) flush with housing

*Ratchet pawl indicator not flush: *

* Hold RATCHET HANDLE full outboard *

* Press Pawl indicator to seat (flush)*

* Release RATCHET HANDLE *

Basic Date April 18, 1969
Changed April 29, 1969

CSM 10

10 PRELOAD PROBE (Decal)

PRELOAD SEL LEVER - rotate CCW (parallel to orange stripe)

PRELOAD HNDL - torque (CW) to release (F)

Verify capture latches engaged (CDR)

PRELOAD HNDL - Push inboard to detent
- pos 45° to support beam

PRELOAD SEL LEVER - mid position

Verify CAPTURE LATCH RLSE HNDL LOCK is locked
(orange stripe not visible)

11 HATCH INSTALLATION (Decal)

Align Hatch in tunnel

ACTR HNDL SEL - unstow, set to L
= push to stop

Verify gearbox disconnect socket - L

*If latches cannot be closed:

GEARBOX DISCONNECT - 180° CCW (tool B)

*AUX LATCH DRIVE = LATCH (113° CW) *

*Verify hatch latched, remove tool B *

***(Cannot remove hatch from LM side)**

ACTR HNDL SEL - stow

- push to stow

PRESS EQUAL vlv - CLOSED (CW)

(c)

B Basic Date April 18, 1969
Changed April 29, 1969

CSM 106

12 HATCH INTEGRITY CHECK (Decal)

Verify LM Hatch Closed, DUMP vlv - AUTO (CDR)

Verify CABIN PRESS ind - 4.7-5.3 psi

TUNL VENT vlv - TUNL VENT for 30 sec

- LM/CM ΔP, check ΔP

- Recycle to TUNL VENT until ΔP>3.5

*Cannot vent tunnel:

* If O2 FLOW ind. increases, open hatch, *

* wipe seal surfaces, close hatch *

* If O2 FLOW ind. does not increase, dump *

* tunnel through LM during reg. check *

* Monitor LM/CM ΔP & flow to ck integrity *

Verify LM/CM ΔP ind constant (+.2) at last value
for 2 min

Verify O2 FLOW ind - no increase

Before Undocking only:

TUNL VENT vlv - LM TUNL VENT for 10 min, then to
LM/CM ΔP

Verify LM/CM ΔP >4.0 (pegged)

TUNL VENT vlv - OFF

TUNNEL LIGHTS - OFF

MALFUNCTION LISTTUNNEL HATCH

A. Positive Indication of No Capture

- THC -X withdraw to formation
flight distance
- PROBE EXTD/REL - EXTD/REL for 5 sec
- RETR
- PROBE EXTD/REL tb (2) - gray (verify)
- Attempt redocking as before

B. One tb does not indicate bp but capture attained

- For retraction, use bottle (1) in system with
gray tb
- If no retraction, use bottle (2) in system with
gray tb
- If no retraction, use bottle (1) in system with
bp tb
- Trouble shoot later before removing probe as
follows:

Basic Date April 18, 1969
Changed May 7, 1969

CSM 15

DOCK PROBE RETRACT (2) - OFF
cb DOCK PROBE (2) - open
Interchange probe umbilical connections
(cut cable retainers if necessary)
Cock docking latches #1 and #7
cb DOCK PROBE (2) - closed
DOCK PROBE EXTD/REL - RETR
If previous bp tb is now gray,
failure is in probe. Interchange
umbilicals again. Only one bottle
is usable to complete mission
If previous bp tb is now bp, failure
is in SC wiring. Two bottles are usable
to complete mission as connected.
Manually release docking latches
#1 and #7

- C. Pressure Equalization Valve Will
Not Close.
- Remove Hatch
- Use Tool B In External Tool Interface For Additional
Leverage
- D. Pressure Equalization Valve Will Not Open For TLD:
- Vent CM
- Perform Tunnel Operations
- Repress CM

For Subsequent IVT

TUNL VENT vlv - LM PRESS
(May require up to 12 hrs
to equalize pressure)

Basic Date April 18, 1969
Changed May 7, 1969

PROBE

- E. Do not get retraction using PRIM-1
 - Initiate retraction using bottles in the following order:
 - PROBE RETRACT SEC-1
 - If no retraction, initiate PROBE RETRACT (2) - 2 simultaneously

- F. Preload Ratchet Will Not Drive To Achieve Proper Preload.
 - Use Tool F To Drive Hex Fitting On Aft End Of Preload Shaft (CW Direction, 30 To 40 lbs On Tool Handle)

DOCKING LATCHES

- G. Cannot Cock Docking Latch By Pulling Handle
 - Depress Aft End Of RH No-Back Pawl While Pulling On Latch Handle.
 - If unsuccessful, Use Tool E to depress LH No-Back Pawl while pulling on Latch Handle

TUNNEL

- H. High O2 Flow While Cocking Docking Latches
 - Re-engage/verify 3 latches ~ 120° apart are engaged
 - Use Tool F to drive hex fitting on aft end of preload shaft 180° CW
 - Torque preload handle CW until load limiter releases
 - Disengage docking latches

Basic Date April 18, 1969
Changed May 7, 1969

SIDE HATCH

- I. Cannot latch side hatch (frozen gearbox)
 - The Following tools are required:
 tool B, tool F, (3) jackscrews
 - Install (3) jackscrews to restrain hatch
 in closed position
 - Use tool B to remove (2) clevis pins
 connecting linkage to gearbox and
 (1) clevis pin from linkage in corner
 above gearbox.
 - Tighten jackscrews to close hatch as far
 as possible
 - Use tool F on flats of latch bellcrank
 to drive latch to over-center closed position
 (Apply tool F to upper latch on hinge
 side to drive the lower and hinge side
 linkage closed. Apply tool F to center
 latch to drive upper linkage closed. Gearbox
 side linkage may not close if gearbox is
 in full open position.
 - Install (2) clevis pins in threaded holes
 in linkage bell cranks at upper gearbox
 side and lower hinge side. (Clevis pins
 installed when approx. half the threads
 are visible).

PROBE

- J. Both tb's not gray after undocking
 - PROBE EXTD/REL - EXTD/REL for 5 sec
 - PROBE EXTD/REL - RETR
 - PROBE EXTD/REL tb (2) - gray (verify)
- K. Pushing ratchet handle outboard does not
 ratchet probe forward
 - Push ratchet handle to first detent (red band)
 - Slowly push ratchet hndl outboard $\sim 25^\circ$ until
 audible click. (If pushed outboard past
 point of click, probe will release).
 - Repeat until orange hash mark is visible.

Basic Date April 18, 1969
Changed May 7, 1969

CSM DOCKING

- 1 cb DOCK PROBE (2) - closed
PROBE RETRACT (2) - OFF (verify)
PROBE EXTD/REL - RETRACT
PROBE EXTD/REL tb (2) - gray (verify)
cb SECS ARM (2) - closed
SECS LOGIC (2) - on (up)
MSFN confirm GO for PYRO ARM
SECS PYRO ARM (2) - ARM
- 2 At Capture: PROBE EXTD/RETR tb-bp (A)
S/C CONT - CMC/FREE
Allow probe to damp S/C motions (10 sec)
When within $\pm 2^\circ$ of docking attitude(min poss)
PROBE RETRACT PRIM - 2
- 3 At Dock Latch: PROBE EXTD/REL tb-gray(5sec)

*PROBE tb-bp and no dock latch cues:
* PROBE RETRACT SEC - 1 *
- 4 After Hard Dock: PROBE EXTD/REL - OFF
- 5 SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
cb DOCK PROBE (2) - open
BMAG MODE (3) - RATE 2
PROBE RETRACT (2) - OFF
EXT RUN/EVA LT - OFF
EXT RNDZ LIGHT - OFF
COAS PWR - OFF
RNDZ XPNDR - OFF
LIMIT CYCLE - ON
ATT DB - MAX
BMAG MODE (3) - ATT 1/RATE 2
S/C CONT - SCS
LOAD DAP: N46: 61102
11111

V46E

Initial Date: April 18, 1969
Changed May 1969

CSM 106

L
10-12

LM JETTISON

- 1 Remove Probe And Drogue, Stow In LM (4) (5)
- 2 CDR and LMP Transfer TO CSM (6A)
- 3 Close LM Hatch
- 4 POO, V49, Load LM Jett attitude
~~FOG 22~~ CMC MODE - AUTO
~~PRO~~ BMAG MODE (3) - RATE 2
PRO To Maneuver
- 5 Install tunnel hatch (Decal) (11)
Perform hatch integrity check (Decal) (12)
- 6 cb SECS ARM (2) - CLOSE
SECS LOGIC (2) - on (up)
Obtain GO from MSFN
SECS PYRO ARM (2) - ARM
- 7 At Jett Attitude:
BMAG MODE (3) - ATT 1/RATE 2
S/C CONT - SCS
Load DAP N46: 11102
- 8 CSM/LM FINAL SEP(2) - ON (.4 fps sep)
SECS PYRO ARM (2) - SAFE
SECS LOGIC (2) - OFF
cb SECS ARM (2) - open
MNVR to SEP Attitude
- 9 Sep: P47
EMS MODE - NORMAL
Sep 4 jet - X 2.0 fps

Basic Date 11 18, 1969
Changed 3, 1969

CSM 106

EARTH ORBIT BLOCK DATA

			X	X			AREA
X	X		X	X	X	X	LAT
X	X	X	X	X	X	X	LONG
							GET I
							ΔV_C
							AREA
X	X		X	X	X	X	LAT
X	X	X	X	X	X	X	LONG
							GET I
							ΔV_C
							AREA
X	X		X	X	X	X	LAT
X	X	X	X	X	X	X	LONG
							GET I
							ΔV_C
							AREA
X	X		X	X	X	X	LAT
X	X	X	X	X	X	X	LONG
							GET I
							ΔV_C
							AREA
X	X		X	X	X	X	LAT
X	X	X	X	X	X	X	LONG
							GET I
							ΔV_C
							AREA
X	X		X	X	X	X	LAT
X	X	X	X	X	X	X	LONG
							GET I
							ΔV_C
							AREA
X	X		X	X	X	X	LAT
X	X	X	X	X	X	X	LONG
							GET I
							ΔV_C
							AREA

REMARKS:

EARTH ORBIT BLOCK DATA

E.O.
LOCK

asic Date 5. 24, 1969
changed _____

CONTINGENCY EVA

A CM PREP FOR CONTINGENCY EVA

- 1 PGA Bag Stowed
- 2 EVA Stabilizer Strut installed
- 3 Center Couch removed and stowed under L Couch
- 4 C AND R SUIT FLOW vlv are OFF, VERIFY INTERCONNECTS INSTALLED
- 5 GN2 VLV HANDLE - PULL
- 6 REMOVE PIP PIN, STOW IN R-3
- 7 L and R Couch - 270 degree
- 8 Jack Screws fully opened, tethered, and accessible
- 9 Tool B tethered and accessible
- 10 Unstow CM INGRESS/EGRESS BAR
- 11 SUIT FLOW vlv - CABIN FLOW
- 12 SUIT RETURN vlv - OPEN (pull)
- 13 EMER CAB PRESS SEL - BOTH
- 14 ECS HOSES - RED/RED, BLUE/BLUE

B SYSTEM PREPARATION FOR DEPRESS

- 1 COMM: SIMPLEX A, VERIFY CM/LM COMM
- 2 O2 PRESS IND sw - SURGE TANK
- 3 CRYO TK O2 PRESS 1 IND - 865-935 psi
- 4 Verify REPRESS O2 PRESS - 865-935 psig
- 5 Select Attitude Control Mode and
Maneuver Spacecraft to EVT Attitude
- 6 AUTO RCS SELECT -
UNDOCKED
A/C ROLL - A1, A2 - OFF
PITCH - A3, - OFF
YAW - B3 - OFF
DOCKED
ALL - OFF

C PLSS/OPS COMM CHECK (ON CDR REQUEST)

- 1 VHF AM A - DUPLEX
- 2 Verify VOICE COMM with LMP
(NO SIMUL RCV A&B, SIMP A-CDR,DUP A - LMP)

Basic Date April 18, 1969
Changed 3, 1969

CSM 106

D FINAL SYSTEMS PREP FOR DEPRESS

- 1 Stow loose items
- 2 EXT KNU/EVA LT - on (up) (if req'd)
- 3 EXT RNDZ LT - off (ctr)
- 4 Verify PGA FLOW DIVERTER vlv - HORIZONTAL
- 5 Verify Feedport Cover - Locked
- 6 Don Helmet and Shield
- 7 Don Gloves
- 8 Secure Helmet Stowage Bag
- 9 SUIT RETURN vlv - CLOSE (push)
- 10 EMERG CABIN PRESS SEL - OFF
- 11 Verify helmet,gloves,zipper, and hoses locked

E SUIT CKT INTEGRITY CHECK (Decal)

DIRECT O2 vlv - CLOSE
SUIT PRESS ind - 4.7-5.3 psia
O2 FLOW ind - 0.2-0.4 lb/hr

CAUTION

SUIT TEST vlv should remain
in the PRESS position until
suit circuit pressure is sta-
bilized to preclude seal scarring

If repositioning of SUIT TEST
vlv from PRESS is required
prior to suit pressure and O2
flow stabilization, perform
the following:

- a. O2 DEMAND REG vlv - OFF
- b. Allow 15 sec (min)
stabilization time
- c. Reposition SUIT TEST
vlv - DEPRESS or OFF
as applicable
- d. When suit pressure
stabilized, O2 DEMAND
REG vlv - BOTH

Basic Date April 18, 1969
Changed July 3, 1969

SUIT TEST vlv - PRESS

O2 FLOW ind - 1.0 lb/hr (pegged)

O2 FLOW HI lt - on

M/A - ON, Reset

Cycle SUIT CKT RTN AIR vlv OPEN

and CLOSE at suit press

of 1.5 to 2.0 psig

SUIT PRESS ind - 8.8-9.8 psia

PGA PRESS ind - 4.1-4.5 psig

O2 FLOW HI lt - out

Allow O2 flow to stabilize 15 sec

O2 flow shall remain below

0.8 lb/hr for 30 secs after
stabilization

SUIT TEST vlv - DEPRESS

O2 FLOW ind - 0.2-0.4 lb/hr

SUIT PRESS - slightly > CAB PRESS

SUIT TEST vlv - OFF

O2 DEMAND REG vlv - BOTH (verify)

F CABIN DEPRESS (Decal)

1 Confirm GO for Cabin Depress with CDR

2 Verify CABIN FAN (2) - OFF

3 PLSS O2 vlv - FILL

4 REPRESS O2 vlv - CLOSE

5 Verify CAB PRESS REL vlv (2) - NORMAL
(SAFETY LATCH ON)

6 SIDE HATCH DUMP vlv - OPEN

(O2 FLOW HI Warning Light may come on
prior to Cabin Press Reg Lock-Up)

7 Monitor Cabin Pressure to 3.25 psia

8 At 3.25 psia, SIDE HATCH DUMP vlv - CLOSE

9 Verify O2 FLOW IND - < 0.5 LB/HR

10 Verify Cabin Pressure at 3.25 psia and CM Suit
Circuit Pressure Stable at 3.5-4.0 psia

11 SIDE HATCH DUMP vlv - OPEN

12 CABIN PRESS ind - 0.0 psia

13 SIDE HATCH DUMP vlv - CLOSE

Basic Date April 18, 1969
Changed July 3, 1969

GSM 106

G HATCH OPENING (Decal)

- 1 GN2 VLV HANDLE - PULL (verify)
Gauge reads min
- 2 LOCK PIN RELEASE KNOB - UNLOCK
- 3 Verify Lock Pin Indicator Released
- 4 Verify GEAR BOX SEL - UNLATCH
- 5 Verify ACTR HANDLE SEL - U
- 6 Unstow ACTR HANDLE
- 7 Unlock hatch slowly
- 8 Verify hatch unlocked
- 9 GEAR BOX SEL - LATCH
- 10 ACTR HANDLE SEL - L
- 11 Stow ACTR HANDLE
- 12 Open hatch to the full open position
- 13 CMP give GO for Transfer
- 14 Mark CDR OPS activation & record

H CONTINGENCY INGRESS

- 1 CDR Ingress To LEB
- 2 Secure Position, Manage Lifeline
- 3 CMP Stow CM INGRESS/EGRESS BAR
Before LMP Ingress
- 4 LMP Ingress CM, Center Couch Area
- 5 PLSS FEEDWATER vlv - CLOSED (up)
- 6 Connect R Electrical Umbilical
and verify COMM

Basic Date April 18, 1969
Changed May 3, 1969

I HATCH CLOSING (Decal)

- 1 Close hatch
- 2 Lock Hatch & verify Lock Pin dropped in
- 3 ACTR HANDLE SEL - N
- 4 Stow ACTR HANDLE
- 5 GEAR BOX SEL - LATCH (verify)

J CDR VAC TRANSFER TO CM ECS

If 20 minutes elapsed from initial OPS 02 opening,
connect CDR to ECS

- *Verify SUIT FLOW - OFF *
- *Connect R O2 Umbilicals *
- *PURGE vlv - CLOSE *
- *SUIT FLOW vlv - FULL FLOW, verify flow*
- *OPS 02 SHUTOFF - CLOSE *

K CABIN REPRESS to 3.0 PSIA (Decal)

- 1 REPRESS 02 vlv - OPEN For 10 SEC Then CLOSE (CABIN PRESS APPROX 1.0 PSIA)
- 2 CABIN PRESS ind - MONITOR FOR 30 SEC (Gross Leakage)
- 3 REPRESS 02 vlv - OPEN
- 4 CONTROL SURGE TANK PRESS GREATER THAN 150 PSIA)
- 5 REPRESS 02 - CLOSE
- 6 CABIN PRESS IND - 3.0 PSIA
- 7 DUMP OPS INTO CABIN IF AVAIL

L REPRESS FROM 3.0 PSIA TO 4.8 PSIA If OPS NOT AVAIL

- 1 CABIN REPRESS vlv - OPEN
- 2 MAINTAIN 150 PSIG MIN IN SURGE TK
- 3 CAB PRESS 4.7-5.3 psia
- 4 O2 PRESS IND sw - TK 1
- 5 CAB REPRESS vlv - OFF
- 6 Go to Final Systems Config, Step Q.

M OPS REPRESS

STEPS N, O, P MUST BE ACCOMPLISHED

N CDR CONN TO ECS

- 1 VERIFY R SUIT FLOW - OFF
- 2 CONNECT R O2 UMB
- 3 OPS O2 vlv - CLOSE
- 4 DEPRESS USING PURGE VLV
- 5 SUIT FLOW vlv - FULL FLOW (verify flow)
- 6 PURGE vlv - CLOSE

O LMP CONN TO ECS

- 1 VERIFY C SUIT FLOW - OFF
- 2 PLSS O2 - OFF (up)
- 3 DEPRESSURIZE USING PURGE VLV
- 4 REMOVE OPS O2 HOSE & PURGE VLV
- 5 CONNECT C O2 UMB
- 6 SUIT FLOW vlv - FULL FLOW (verify flow)
- 7 PLSS PUMP - OFF
- 8 FAN - OFF

Basic Date — April 18, 1969
Changed — 3, 1969

CSM 106

P DISCONNECT OPS 02 HOSE AND HOLD

- 1 OPS 02 vlv - OPEN
- 2 CAB PRESS 4.7-5.3 PSIA
- 3 OPS 02 vlv - CLOSE

Q FINAL SYSTEMS CONFIGURATION

- 1 CABIN PRESS ind - 4.7-5.3 psia
- 2 PLSS 02 vlv - FILL
- 3 VERIFY REPRESS 02 INCREASING
- 4 EMER CABIN PRESS SEL - BOTH
- 5 SUIT RET vlv - OPEN (pull)
DOFF Gloves and Temp Stow
DOFF Helmets and EV VISORS and Temp Stow
Verify SURGE TANK PRESS
865-935 psi
02 PRESS IND sw - TK 1
EXT LTS - RUN/EVA - OFF

R PLSS/OPS DOFFING

- 1 OPS -
Verify Antenna Stowed
Verify OPS 02 Shutoff vlv - CLOSE
Stow OPS 02 Hose
Remove OPS Straps from PGA

2 PLSS/OPS -

- Stow PLSS Antenna
- Remove RCU from PGA
- Disconnect O2 and H2O Hoses
- DOFF PLSS
- Hold PLSS in Position for Restowage

WARNING

Before Disconnecting RCU from PLSS,

- Verify
- PUMP - OFF (down)
- FAN - OFF
- MODE SEL - POS 3

Basic Date April 18, 1969
Changed April 3, 1969

CSM 106

3 Disconnect RCU and Stow in Helmet Stowage Bag
Stow O2 Plugs in PGA
Stow PLSS O2 and H2O Hoses
Stow PLSS COMM Umbilical
Secure OPS O2 Actuator
Stow OPS O2 Hose
Temp Stow PLSS/OPS and OPS

S PREP FOR EQUIPMENT JETTISON

1 COMM CARRIER Donned
2 O2 Hoses Connected to PGA
3 Protective Plugs Installed In Left
 PGA O2 Connectors
4 Stow Loose Items
5 Prepare all Equipment to Be Jettisoned
 and Secure -
 PLSS/OPS
 OPS
 EV VISORS (2)
 Place RCU, PURGE vlv (2), OPS/PGA Straps,
 CM ECS Interconnects, Lifeline and Waist
 Tethers in Helmet Stow Bag

T PREP FOR DEPRESS: GO TO-(A)-AND COMPLETE REQ'D STEPS

U EQUIPMENT JETTISON

Jettison Equipment -
 PLSS/OPS, Helmet Stowage Bag,
 OPS
 EV VISORS (2)

V FINAL CABIN CONFIGURATION

1 Reinstall Center Couch
2 Reinstall PGA Stowage Bag
3 Remove EVA Stabilizer Strut
4 Restow Tool B and Jack Screws
5 Install Hatch Pip Pin

Basic Date April 18, 1969
Changed 3, 1969

CSM 100