MIT/CSDL PRESENTATION FOR THE

MISSION "J-3" APOLLO 17

FLIGHT SOFTWARE READINESS REVIEW

HELD AT NASA/MSC ON 26 October 1972

CSM PROGRAM

SUMMARY OF COLOSSUS 3 DEVELOPMENT

Establishment of Colossus 3 Assembly	8/ 7/ 69
Release of Artemis in Colossus 2C Configuration	2/ 10/ 70
Release of Artemis in Colossus 2D Configuration	4/ 11/ 70
Release of Artemis in Colossus 2E Configuration	7/ 24/ 70
Release of Artemis in Colossus 3 Configuration	3/ 1/ 71
FACI for Colossus 3 held on	3/ 3/ 71
FSRR for Apollo 15 held on	6/ 17/ 71
FSRR for Apollo 16 held on	3/ 7/ 72
Number of Anomalies Discovered Since Release	18
Date of Last Discovered Anomaly	2/ 11/ 72
Number of Anomalies Discovered During Flight	0
Number of 360/ 75 Hours for Level 6 and EMP Verification	
Apollo 15	286
Apollo 16	259
Apollo 17 (Thru Oct. 15th)	69 (100 est.)
Total	614 (645 est.)
Number of Hybrid Hours for Level 6 and EMP Verification	
Apollo 15	715
Apollo 16	1259
Apollo 17 (Thru Oct. 1st)	451 (500 est.)

SUMMARY OF COLOSSUS DEVELOPMENT (Cont.)

Total	2425 (2475 est.)
Number of STL Hours for Level 6 and EMP Verification	
Apollo 15	189
Apollo 16	10
Apollo 17	5
Total	204

COLOSSUS 3 PERFORMANCE TESTING (APOLLO 15)

Boost Takeover during Polynomials, Apollo 15 Data Pkg, Digital

Normal Boost to Orbit, P52, T6JOB, Apollo 15 Data Pkg, Digital

TLI with P15 Cutoff Apollo 15 Data Pkg, Digital

M=1, CSM Active, dual sensor tracking, Apollo 15 Data Pkg, Digital

M=1, CSM Active, dual sensor tracking, Apollo 15 Data Pkg, Ultra Par

M=1, CSM Active, COAS only tracking, Apollo 15 Data Pkg, Digital

M=1, CSM Active, COAS only tracking, Apollo 15 Data Pkg, Ultra Par

M=1, plus Bailout, CSM Active, dual sensor tracking, Apollo 15 Data Pkg, Digital

Abort, CSM Active, dual sensor tracking, Apollo 14 Data Pkg, Digital

Abort, CSM Active, dual sensor tracking, Apollo 14 Data Pkg, Ultra Par

M=1, plus Bailout, CSM Passive, dual sensor tracking, Apollo 15 Data Pkg, Digital

M=1, Plus Bailout, CSM Passive, dual sensor tracking, Apollo 15 Data Pkg, Ultra Par

COLOSSUS 3 PERFORMANCE TESTING (APOLLO 15) (Cont.)

RTE (EI-30 hours to splash), Apollo 15 Data Pkg.

RTE (Post TEI abort, No Comm., P23, P37/ P40/ P41 after Sphere to Splash), Apollo 15 Data Pkg.

Nominal Lunar Entry, Apollo 15 Data Pkg.

2500 N. M. Lunar Entry, Apollo 15 Data Pkg.

Low Orbit P24 Landmark Tracking

High Orbit P24 Landmark Tracking

LOI—Docked SPS Burn

LOPC—CSM SPS Burn (Preferred Refsmmat)

TEI—CSM SPS Burn

COLOSSUS 3
PERFORMANCE TESTING (APOLLO 16)

Normal Boost to Orbit, P52, Apollo 16 Data Package, Digital

TLI with P15 Cutoff Apollo 16 Data Package, Digital

M = 1, CSM Active, dual sensor tracking, Apollo 16 Data Package, Digital

M = 1, CSM Active, dual sensor tracking, Apollo 16 Data Package, Ultra Par

M = 1, plus Bailout, CSM Active, dual sensor tracking, Apollo 16 Data Package, Digital

M = 1, plus Bailout, CSM Active, dual sensor tracking, Apollo 16 Data Package, Ultra Par

RTE (Post TEI abort, No Comm, P23/P37/P40/P41 after Sphere Crossing to splash, Apollo 16 Data Package

Nominal Lunar Entry, Apollo 16 Data Package

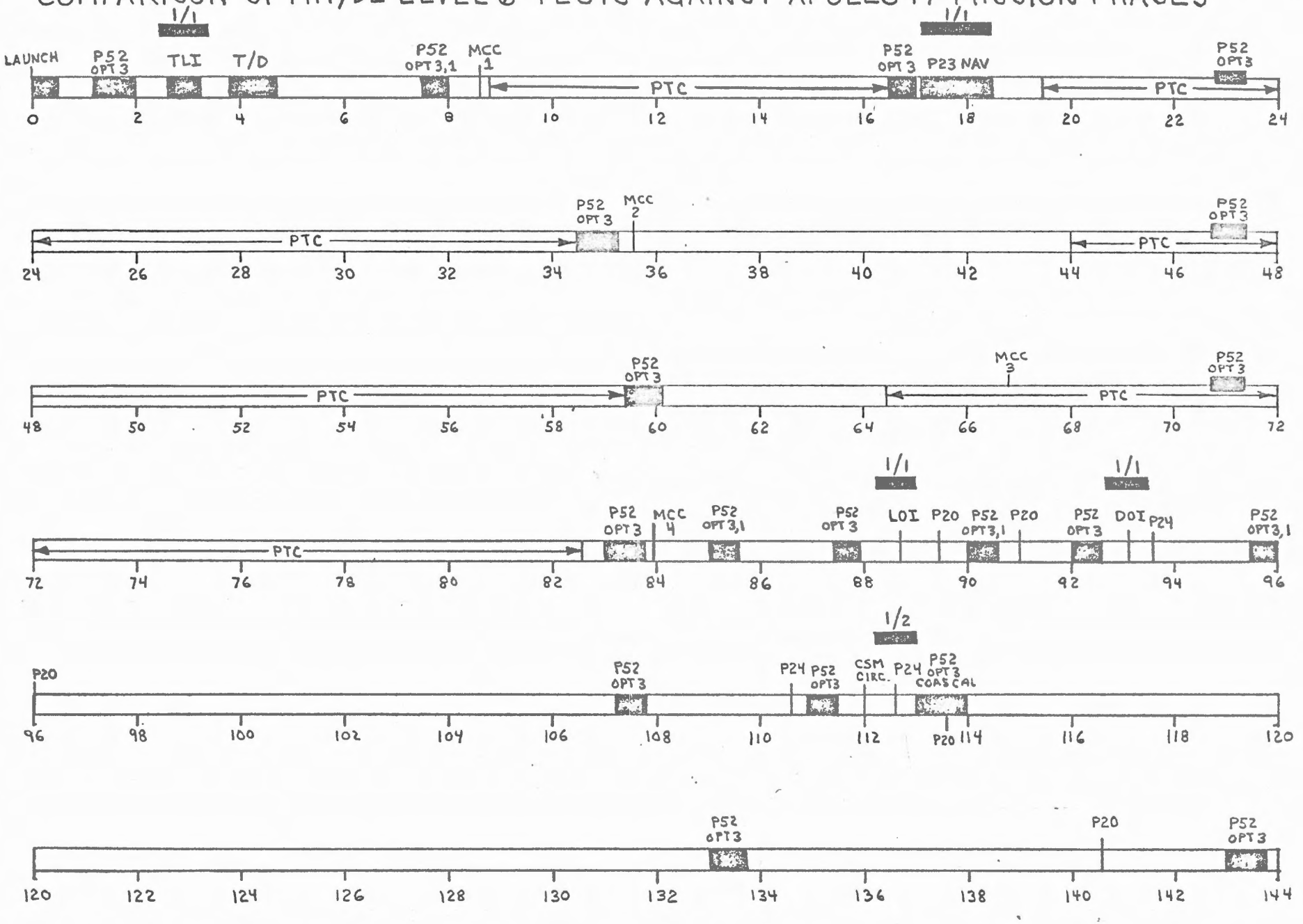
Low Orbit P24 Landmark Tracking

LOI-Docked SPS Burn

TEI-CSM SPS Burn

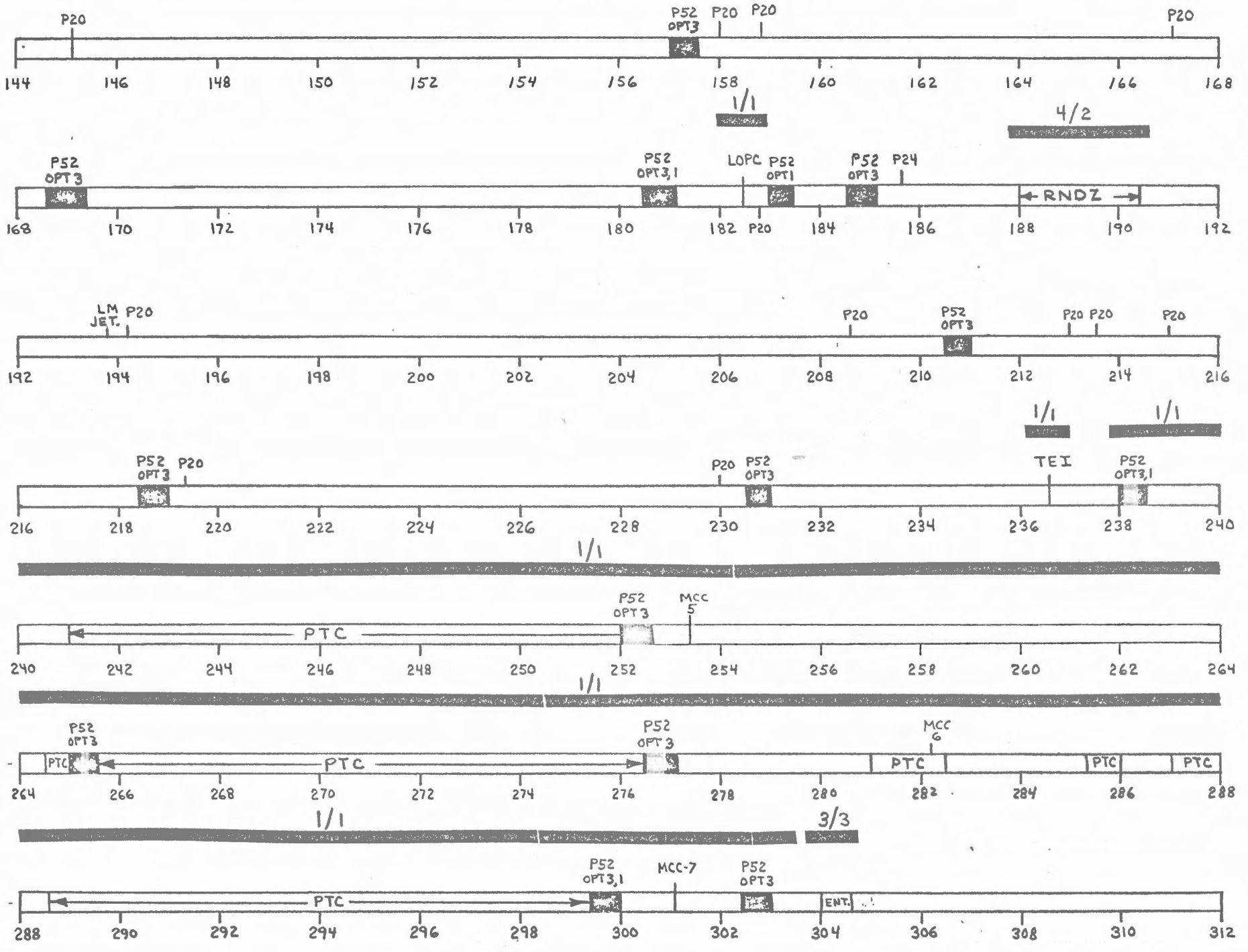
DOI-CSM SPS Burn

COMPARISON OF MIT/DL LEVEL 6 TESTS AGAINST APOLLO 17 MISSION PHASES



X/y WHERE X = DIGITAL & Y = HYBRID

COMPARISON OF MIT/DL LEVEL 6 TESTS AGAINST APOLLO 17 MISSION PHASES (CONT.)



COLOSSUS 3 PERFORMANCE TESTING (APOLLO 17)

TLI with P15 Cutoff Apollo 17 Data Package, Digital

M=1, CSM Active, dual sensor tracking, Apollo 17 Data Package, Digital

M=1, CSM Active, dual sensor tracking, Apollo 17 Data Package, Ultra Par

M=1, plus Bailout, CSM Active, dual sensor tracking, Apollo 17 Data Package, Digital

M=1, plus Bailout, CSM Active, dual sensor tracking, Apollo 17 Data Package, Ultra Par

RTE (Post TEI abort, No Comm, P52/ P20/ P23/ P37/ P40/ P41 after Sphere Crossing to splash, Apollo 17 Data Package

Nominal Lunar Entry, Apollo 17 Data Package

Short Range Entry

Low Orbit P24 Landmark Tracking

LOI-Docked SPS Burn

TEI-CSM SPS Burn

DOI-CSM SPS Burn

Orbital Plane Change with 45^{0} Platform

RTCC Testing

E-LOAD DIFFERENCE

Level 6 performance tests used E-load J3KSTA with exceptions as noted below

ERASABLE	REASON FOR CHANGE
FLAGWRD 1	N0D0P01 Flagbit set to 1
FLAGWRD 8	CMOONFLG, LMOONFLG, SURFFLAG modified as required
FLAGWRD 3	REFSMFLG modified as required
TEPHEM	Lift off value
REFSMMAT	Align to mission timeline
IMU Comp.	for 1σ errors
DAPDATR 1	
DAPDATR 2	
RMAX	for rendezvous
VMAX	for rendezvous
ETDECAY	for powered flight
PACTOFF	via V48
YACTOFF	via V48
CSMMASS	via V48 and P40
LAT (SPL)	For entry
LNG (SPL)	For entry

J3 DECEMBER LAUNCH LEVEL 6 TEST RESULTS SUMMARY

ENTRY	$\Delta\gamma_{EI}$ act. -pred.	$\Delta V_{I,EI}$ act. -pred	ΔR_{EMSALT} act. -pred.	Δ SPLASH
NOMINAL	0.029 deg	7.1 fps	1 nm	1.1 nm
SHORT RANGE	0.029 deg	6.8 fps	2 nm	1.3 nm

RATE-AIDED OPTICS

LOS RATE ERROR

Low Altitude Pass
(57.6 × 10.9 nm)

.66 deg/ sec

BURNS	VG Residual FPS	Cutoff Error FPS	Δ Apogee NM	Δ Perigee NM
LOI	0.15	3.82	0.40	0.03
DOI	0.06	0.60	-0.04	-0.30
TEI	0.92	1.07	0.00	0.00
LOPC	0.52	0.21	-0.13	0.09

RTE

MCC5 = 6.2 fps

MCC6 = 2.1 fps

MCC7 = 0.4 fps

γ_{EI} = -6.837

$\Delta\gamma_{EI}$ = 0.246 deg

$V_{I,EI}$ = 36081.8 fps

$\Delta V_{I,EI}$ = 12.4 fps

ΔR_{EMSALT} = 2 NM

$\Delta SPLASH_{NM}$ = 42.4 NM

COLOSSUS 3 MISSION PROCEDURAL TESTING (APOLLO 15)

P15 Test

P23 Test (Outbound)

P23 Test (Inbound)

P37 RTE (Outbound)

P37 RTE (Inbound)

LOI

DOI

P22 Landmark Tracking

P24 Landmark Tracking

Rendezvous

a. M=1
b. CFP

Multiple CSI

Universal Tracking

TEI

Entry (Nominal, 1800 NM, High Inclination)

COLOSSUS 3
MISSION PROCEDURAL TESTING (APOLLO 16)

1. TLI (P15 Logic Test)
2. Return to Earth Targetting (P37)
   a. Transearth
3. Cislunar Navigation
   a. Translunar
4. SPS Thrusting
   a. LOI
   b. DOI
   c. TEI
5. Landmark Tracking
   a. P24 (High Orbit and Low Orbit)
6. Rendezvous (MINKEY)
   a. CSM Active (M = 1)
   b. CSM Active (CFP from Bailout)
7. Entry
   a. Short Range (1188 nm)
   b. Long Range (1800 nm)
   c. Orbital Plane with High Angle of Inclination

COLOSSUS 3
MISSION PROCEDURAL TESTING (APOLLO 17)

1. TLI (P15 Logic Test)
2. Return to Earth Targetting (P37)
   a. Transearth
3. Cislunar Navigation
   a. Translunar
4. SPS Thrusting
   a. LOI
   b. DOI
   c. TEI
5. Landmark Tracking
   a. P24 (High Orbit and Low Orbit)
6. Rendezvous (MINKEY)
   a. CSM Active (M=1)
   b. CSM Active (CFP from Bailout)
7. Entry
   a. 1188 nm Range
   b. 1500 nm Range
   c. 1800 nm Range
8. Lunar Orbit Plane Change (LOPC)

COLOSSUS 3 SYSTEM TEST LAB TESTING (APOLLO 15)

Prelaunch Initialization, Gyro Compass Digit. Stress

Prelaunch Initialization and Gyro Compass Lab. Test

Nominal Turn On/ Off

Turn On with Failures

Gimbal Lock Protection Test

Cage Test

Error Monitor

Optics Operation Programs Navigation P22, 3

Optics Operation Programs Alignment (P51, 2, 3, 4)

Optics Operation Programs Rendezvous and Pointing (P20, P8x, 9x)

Optics Operation Programs Rate Aided P24

Verb 41 Zero IMU/ CDU

Verb 41 Coarse Align IMU

Verb 42 IMU to Inertial Mode

Verb 43 Load IMU Error Needles

Verb 55 Align Time

SYSTEM TEST LAB TESTING (APOLLO 15) (Cont.)

Performance Test Digital

Free Fall Bias Compensation

Thrusting and Comp. Test

Gyro Drift and Accelerometer

Polarity and Scaling Test Accelerometer

Alarm Test

Saturn Test

Channel Backup

Sum Uplink

Channel C77 Restart Monitor

EMP Verification

COLOSSUS 3 SYSTEM TEST LAB TESTING (APOLLO 16)

EMP Verification

COLOSSUS 3 SYSTEM TEST LAB TESTING (APOLLO 17)

EMP Verification

STATUS OF ERASABLE MEMORY PROGRAM (EMP) FOR APOLLO 17

	Description	Status
EMP 500	Landmark Tracking With Datalink Failure or Unusable Optics	6
EMP 501	Landmark Tracking With Failed Mark/ Mark Reject Button	6
EMP 502	Software Restarts	6
EMP 503	GDC REFSMMAT Determination	
EMP 504	Backup Optics Variance	6
EMP 505	Mark Taking With Mark Button Failure	6
EMP 506	DSKY Display of VHF Range During P79	6
EMP 508	Landmark Tracking with Frozen Optics	6
EMP 509	Inhibit Gimbal Lock Monitor Downmoding	6
EMP 512	P40/ 41/ 47 Termination During Average G When EMP 509 Is Operating	6
EMP 514	Shortened P23	6
EMP 515	Manual Range Input	6
EMP 517	Convert Optics Shaft and Trunnion Angles to Body Angles	6
EMP 518	Recovery From Restart During Plane-Change Pulse Torquing	6
EMP 520	Entrance Into MINKEY for Post-Plane-Change Pulse Torquing	6
EMP 521	Enter P51/ P53 With IMU-Operate Bit Failed Off	6
EMP 522	SPS Gimbal Drive Test	6
EMP 523	Monitor Jet-On Failure	6

STATUS OF ERASABLE MEMORY PROGRAM (EMP) FOR APOLLO 17 (Cont.)

Description		Status
EMP 525A	Optics Switch Monitor	6
EMP 526	IMU CDU Transient Monitor	5
EMP 527	Monitor Single IMU CDU	5
EMP 528	Monitor Jet-On Failure and Do EMP 526	5

1. Not Started
2. In Work
3. Draft Version Submitted to NASA
4. First Official Version Submitted to NASA
5. Final Version Submitted to NASA
6. NASA Approved/ Flight Qualified

COLOSSUS 3 DOCUMENT REVIEW

I CSM Flight Data File

G and C Checklist	Dated 8/ 30/ 72, received 9/ 18/ 72
Launch Checklist	Dated 9/ 4/ 72, received 9/ 18/ 72
System Data	Dated 8/ 31/ 72, received 9/ 14/ 72
Rescue Book	Dated 9/ 18/ 72, received 9/ 28/ 72
System Checklist	Dated 8/ 21/ 72, received 9/ 13/ 72
Malfunction Procedures	Dated 8/ 7/ 72, received 8/ 29/ 72
CSM Updates	Dated 8/ 7/ 72, received 8/ 14/ 72
Entry	Dated 8/ 28/ 72, received 9/ 18/ 72
Contingency Checklist	Dated 8/ 29/ 72, received 9/ 11/ 72
CSM Cue Cards	Dated 9/ 4/ 72, received 9/ 27/ 72

II Crew Procedures Documents

Apollo Operations Handbook Vol 2	Dated 6/ 16/ 72, received 8/ 14/ 72

Comments to the above listed documents are being transmitted via telecon to NASA/ MSC (CF22, CF34) as they develop.

ANOMALIES EXISTING IN COLOSSUS 3

COM 43	8/ 13/ 70	Entry Overshoot	Program Note (1. 9. 10)
COM 54	2/ 2/ 71	Periodic DOWNRUPT losses during CSM-Alone P40 TVC	Program Note (1. 1. 31)
ART 01	1/ 25/ 71	Do not initiate P31-P36 or P79 while AVEG is running if P20 Rendezvous is not already enabled	Program Note (1. 5. 5)
ART 02	1/ 27/ 71	Incorrect value of NN displayed in N55 in P32 during multiple CSIs if NN is greater than 4	Program Note (1. 5. 8)
ART 03	2/ 2/ 71	Selection of P47 during P20 will destroy N78 and low half or AGEOFW	Program Note (1. 10. 10)
ART 05		CANCELLED	
ART 06	2/ 25/ 71	The HAFLAG, which is used to determine whether the CSI subroutines were called by P31 or P32, is not cleared by P31 until just prior to display of N90	Program Note (1. 5. 7)
ART 07	3/ 9/ 71	If P34, 35, 74 or 75 is selected and is allowed to proceed past the V06N81 final comp display, selection of any other (PRE-TPI) MINKEY Targetting Program will result in incorrect data for the following P76, and incorrect auto-W-Matrix initialization sequencing	Program Note (1. 5. 10)

ANOMALIES EXISTING IN COLOSSUS 3 (continued)

ART 08	3/ 23/ 71	Option 2 of P20 does not operate correctly in ATTHOLD	Program Note (1. 10. 6)
ART 09 Rev 1	3/ 25/ 71	P24 may update landmark pointing using garbage data	Program Note (1. 6. 7)
ART 10	4/ 9/ 71	Selection of P40/41 with P20 running results in P40/41 attitude maneuver with R03 deadband	Program Note (1. 10. 9)
ART 11	5/ 5/ 71	Incorrect landmark updating in P24, when P20 options 1 or 5 is running in the background	Program Note (1. 6. 7)
ART 12 Rev 1	5/ 6/ 71	Option 1 of P20 will not operate correctly for stars (Star Code = 1 - 45) within 10^0 of desired spacecraft vector	Program Note (1. 10. 8)
ART 13 Rev 1	7/ 20/ 71	DEADBAND not centered about present attitude when program requests minimum DEADBAND if HOLDFLAG negative	Program Note (1. 10. 12)
ART 14	9/ 7/ 71	After CMC has stopped an auto-maneuver due to CDUZ exceeding 75^0, any manual maneuver to an attitude with CDUZ still greater than 75^0, putting RHC back in detent causes CMC to drive spacecraft back to its original position	Program Note (1. 3. 6)

ANOMALIES EXISTING IN COLOSSUS 3 (continued)

ART 15	10/ 15/ 71	A restart during the "comp cycle" following a response to V16N45 locks out R61 and R52 until the "comp cycle" is finished	Program Note (1.5.24)
ART 16	1/ 5/ 72	Bypass of first R60 in P79 followed by V58E may wipe out R31. If PRO is entered for 2nd R60, V06N18 may also disappear from DSKY	Program Note (1.5.26)
ART 17	1/ 3/ 72	P79 is not correctly restart protected	Program Note (1.5.27)
ART 18	2/ 11/ 72	It is possible for R22 to process an R23(COAS) generated mark as a sextant mark if a restart occurs after the ENTR response to the V53N45 display, and before the next mark is taken	ProgramNote (1.5.28)

CONCLUSION

BASED ON THE RESULTS OF THE PRECEDING DATA
MIT/CSD LABORATORY RECOMMENDS
THE USE OF COLOSSUS 3
(ARTEMIS 72) FOR APOLLO 17

MIT/CSDL PRESENTATION FOR THE

MISSION "J-3" APOLLO 17

FLIGHT SOFTWARE READINESS REVIEW

HELD AT NASA/MSC ON 26 October 1972

LM PROGRAM

SUMMARY OF LUMINARY 1E DEVELOPMENT

Establishment of a LUMINARY 1E Assembly	9/ 21/ 70
Configuration Control	12/ 23/ 70
Release of LUMINARY 1E for Rope Manufacture	
Rev 210	3/ 22/ 71
FACI Meeting	3/ 3/ 71
FSRR for Apollo 15 held on	6/ 17/ 71
FSRR for Apollo 16 held on	3/ 7/ 72
Number of Anomalies Discovered Since Release	12
Date of Last Discovered Anomaly	11/ 12/ 71
Number of Anomalies Discovered During Flight	0
Number of 360/ 75 Hours for Level 6 and EMP Verification	
Apollo 15	309
Apollo 16	368
Apollo 17 (Thru Oct 15th)	79 (100 est.)
Total	756 (777 est.)
Number of Hybrid Hours for Level 6 and EMP Verification	
Apollo 15	667
Apollo 16	737
Apollo 17 (Thru Oct 1st)	208 (248 est.)
Total	1612 (1652 est.)

SUMMARY OF LUMINARY 1E DEVELOPMENT (Cont.)

Number of STL Hours for Level 6 and EMP Verification

Apollo 15	105
Apollo 16	129
Apollo 17	77
Total	311

LUMINARY 1E PERFORMANCE TESTING (APOLLO 15)

The Initial Conditions listed below apply to all the tests and any special initial conditions will be indicated in the particular test

1) 1σ-IMU, Radar, State Vector Errors
2) Normal Astronaut Interface from Apollo 15 Data File
3) Apollo 15 Operation Trajectory
4) Apollo 15 Erasable Load
5) 71/72 Ephemeris
6) 0 T-LOSS
7) LM-10 Vehicle

LUMINARY 1E PERFORMANCE TESTING (APOLLO 15)

RENDEZVOUS

Short Rendezvous—program sequence P00, P20, P34, P42, P35, P41, P35
P41, P00, P47, P00

Initial Condition: (1) 10% T-Loss during powered flights

ABORTS from DESCENT

Abort at 33Kft. —program sequence: P00, P63, P70, P00, P20, P32.

Abort at 7Kft. —Abort Stage at DPS depletion—Program sequence: P00, P63, P64, P70, P71, P00, P20, P32.

Abort Stage after Touchdown—program sequence: P00, P63, P64, P66, P71, P00, P20, P32.

Initial Conditions: (1) Terrain Profile ($+1^{0}$) errors
(2) 10% T-Loss
(3) CHANBKUP Abort Discrete Set

LUMINARY 1E PERFORMANCE TESTING (APOLLO 15)

LUNAR SURFACE OPERATIONS

Lunar Surface Alignments—program sequence: P68, P00, P12, P57 (Recycle gravity determination) V41N72, P57 (planet and Star), P57 (2 stars), V47, P06, P00, P57 (1 star), V64, V63, P22, V48, P57 (1 star), V47, V48, V82, P12 (to TIG-5), P00.

Inflight Alignments—program sequence: P00, P52 (using P57 sighting), P52 (2 stars), P52 (sun and planet), P00.

Initial Condition: (1) 3σ IMU

Ascent from Lunar Surface—program sequence: P68, P00, P12, P00, P20, P34, P00

Initial Conditions: (1) YAW LM 40° after the pitch maneuver occurs; Targeting for 1 N.M. out-of-plane.

LANDING ON LUNAR SURFACE

Complete Automatic Landing program sequence: P00, P63, P64, P66, P00
NOUN 69: -6865/ 417/ 380 ft at PDI-10
NOUN 69: 653/-608 ft at PDI 5

Initial Conditions: (1) Terrain Profile (+1°) errors
(2) CHANBKUP Abort Discrete Set

Redesignations and Att. —Hold—P66 Landing—program sequence: P00, P63, P64, P66 (at 700 ft.), P00.
NOUN 69: 10K/ 5K ft; ACA None
NOUN 69: 20K/ 20K ft; ACA: 2(-EL), 2(+AZ)

LUMINARY 1E PERFORMANCE TESTING (APOLLO 15) (Cont.)

NOUN 69: none, ACA: 2(+EL), 2(-AZ)

Initial Conditions:
(1) Terrain Profile ($+1^{0}$) errors
(2) NOUN 69: 20K/ 20Kft; 10% T-Loss
(3) CHANBKUP Abort Discrete Set

LUMINARY 1E PERFORMANCE TESTING (APOLLO 15)

SPECIAL TESTS

LM RCS Deorbit Burn—program sequence: P00, P30, V96, P99, P00

Abort Stage after Touchdown—program sequence: P00, P63, P64, P66, P71, P00, P20, P32

Initial Conditions:
(1) Terrain Profile ($+1^0$) errors
(2) 10% T-Loss
(3) CHANBKUP Auto Throttle Discrete Set

Lunar Landing—P66 Landing—Program Sequence: P00, P63, P66, P68, P00

Initial Conditions:
(1) Terrain Profile ($+1^0$) errors
(2) 10% T-Loss
(3) CHANBKUP Auto Throttle Discrete Set

Docked DPS Plane Change Burn—Program Sequence: P00, P30, P40, P00

Initial Conditions:
(1) State Vector, TIG ΔV
(2) CG and Mass

Docked DPS TEI Burn—Program Sequence: P00, P30, P40, P00

Initial Conditions:
(1) State Vector, TIG, ΔV
(2) CG and Mass

LUMINARY 1E PERFORMANCE TESTING (APOLLO 16)

The Initial Conditions listed below apply to all the tests and any special initial conditions will be indicated in the particular test

1) 1σ IMU, Radar State Vector Errors
2) Normal Astronaut Interface from Apollo 16 Data File
3) Apollo 16 Operation Trajectory
4) Apollo 16 Erasable Load
5) 71/ 72 Ephemeris
6) 10% T-LOSS
7) LM-11 Vehicle

LEVEL 6 PERFORMANCE TEST DESCRIPTION FOR LUMINARY 1E (APOLLO 16)

6.1.0 ASCENT & RENDEZVOUS

6.1.1 LM Ascent and LM Active Short Rendezvous-Program Sequence: P57(AT-3), P00, V48, V41N72, P12, V82, V64, P00, V48, P20, V80, P34, V83, N52, N59, V48, P42, V82, P35, V67, V83, P41, V82, P35, V93, P41, V82, P00, P47, P00.

6.2.0 ABORT FROM DESCENT

Initial Conditions :

(1) The LM is yawed left 20^0 at PDI -3 mins. The 20^0 yaw is removed at PDI + 3 mins. This maneuver is done in the AUTO mode.
(2) The Auto throttle and ABORT back up discretes are set.
(3) The abort switch is failed ON.
(4) The SLOSH environment model is not simulated.
(5) The environmental FAST IMU is used.
(6) Abort sequence : Switch to ATTHOLD, Full Throttle, ABORT or ABORT STAGE, V22N46EE, Switch to AUTO.
(7) Terrain slope error of -1^0.

6.2.1 Abort at 33K ft. -program sequence: P00, V48, V64, P63, V57, ABORT P70, N76, N77, N85, P00, V64, V82, V83, P20, P32.

6.2.2 Abort at 7K ft. -program sequence: P00, V48, V64, P63, V57, P64, P70, ABORT STAGE, P71, N76, N77, N85, P00, V64, V82, V83, P20, P32.

6.2.3 Abort after Touchdown-program sequence: P00, V48, V64, P63, V57, P64, P66, P71, P00, V64, V82, V83, P20, P32.

6.2.4 Abort after Touchdown-program sequence: Same as 6.2.3 except the SLOSH and detailed IMU models are used.

6.3.0 LUNAR SURFACE OPERATION AND ALIGNMENTS

6.3.1 Lunar Surface Operations-program sequence: P68, P00, P12, P57(AT-3), V47, V41N20, P06, P57(AT-3), V63, P22, P57(AT-3), V47, V48, V82, P12, P00.

6.3.2 Inflight Alignment-program sequence: P00, V06N20, V41N20, V40N20, P51, V06N20, P52, V06N20, V48, V41N72, P52, LPD CAL, COAS CAL, P00.

6.4.0 LUNAR LANDING

Initial Conditions

(1) The LM is yawed left 20^{0} at PDI -3 mins. The 20^{0} yaw is removed at PDI +3 mins. This manuever is done in the Auto-mode.
(2) The AUTO throttle and ABORT back-up discretes are set.
(3) The abort switch is failed ON and the auto throttle failed OFF.
(4) The SLOSH mode is not simulated.
(5) The environmental FAST IMU is stimulated.
(6) Terrain slope error -1^{0}.

6.4.1 Lunar Landing-Auto (Error Free)-program sequence: P00, V48, V64, P63, V57, N68, N92, P64, P66, P68, P00.

6.4.2 Lunar Landing Auto-program sequence: P00, N69, V48, V64, P63, V57, N69, N69, P64, P66, P68, P00.

6.4.3 Lunar Landing-Nominal program sequence: P00, V48, P63, N69, P64, P66, P68, P00. (Offset Landing Site)

6.4.4 Lunar Landing-Nominal-program sequence: P00, V48, P63, N69, P64, P66, P68, P00. (Corrected Landing Site)

6.4.5 Lunar Landing-N69 Red Line-program sequence: P00, V48, V64, P63, P57, N69 P64. P66, P68, P00.

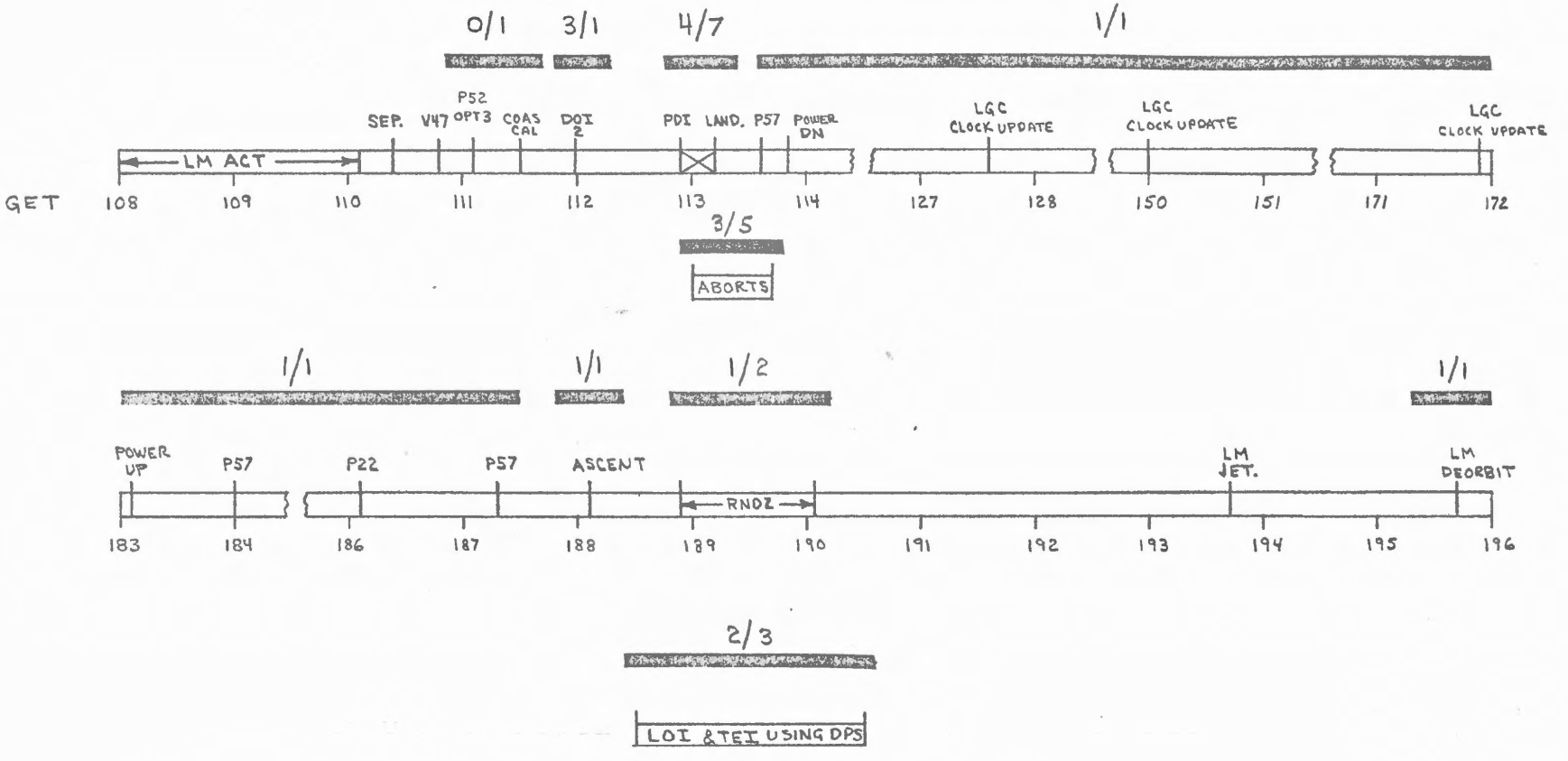
LEVEL 6 PERFORMANCE TEST DESCRIPTION FOR LUMINARY 1E (APOLLO 16)

6.6.0 RTCC COMPATIBILITY TESTS

6.6.1 Uplink Test

COMPARISON OF MIT/DL LEVEL C TESTS AGAINST APOLLO 17 MISSION PHASES

10/72



X/Y WHERE X= DIGITAL & Y = HYBRID

LUMINARY 1E PERFORMANCE TESTING (APOLLO 17)

The Initial Conditions listed below apply to all the tests and any special initial conditions will be indicated in the particular test

1) 1σ IMU, Radar, State Vector Errors
2) Normal Astronaut Interface from Apollo 17 Flight Data File
3) Apollo 17 Operational Trajectory
4) Apollo 17 Erasable Load
5) 71/72 Ephemeris
6) 10% T-LOSS
7) LM-11 Vehicle

LEVEL 6 PERFORMANCE TEST DESCRIPTION FOR LUMINARY 1E (APOLLO 17)

6.1.0 ASCENT & RENDEZVOUS

6.1.1 LM Ascent and LM Active Short Rendezvous-Program Sequence: P57(AT-3), P00, V48, V41N72, P12, V64, V82, P00, V48, P20, V80, P34, V83, N52, N59, V48, P42, V82, P35, V67, V48, V83, P41, V82, P35, V93, P41, V82, P00, V48, P47, P00.

6.2.0 ABORT FROM DESCENT

Initial Conditions:

(1) The LM is yawed left 70^0 at PDI -3 mins. 50^0 yaw is removed at PDI+4 mins. This maneuver is done in the AUTO mode.
(2) The Auto throttle and ABORT back up discretes are set.
(3) The abort switch is failed ON.
(4) The SLOSH environment model is not simulated.
(5) The environmental FAST IMU is used.
(6) Abort sequence: Switch to ATTHOLD, Full Throttle, ABORT or ABORT STAGE, V22N46EE, Switch to AUTO.
(7) Terrain slope error of -1^0.

6.2.1 Abort at 33K ft.—program sequence: P00, V48, V64, P63, V57, ABORT P70, N76, N77, N85, P00, V64, V82, V83, P20, P32.

6.2.2 Abort at 7K ft.—program sequence: P00, V48, V64, P63, V57, P64, P70, ABORT STAGE, P71, N76, N77, N85, P00, V64, V82, V83, P20, P32.

6.2.3 Abort after Touchdown—program sequence: P00, V48, V64, P63, V57, P64, P66, ABORT, P71, P00, V64, V82, V83, P20, P32.

LEVEL 6 PERFORMANCE TEST DESCRIPTION FOR LUMINARY 1E (APOLLO 17)

6.3.0 LUNAR SURFACE OPERATION AND ALIGNMENTS

6.3.1 Lunar Surface Operations—program sequence: P68, P00, P12, P57(AT-3) V47, V41N20, P06, P57(AT-3), V63, P22, P57(AT-3), V47, V48, V82 P12, P00.

6.4.0 LUNAR LANDING

Initial Conditions

(1) The LM is yawed left 70^0 at PDI -3 mins. 50^0 yaw is removed at PDI+4 mins. This maneuver is done in the Auto-mode.

(2) The AUTO throttle and ABORT back-up discretes are set.

(3) The abort switch is failed ON and the auto throttle failed OFF.

(4) The SLOSH mode is not simulated.

(5) The environmental FAST IMU is simulated

(6) Terrain slope error -1^0.

6.4.1 Lunar Landing-Auto (Error Free)-program sequence: P00, V48, V64, P63, V57, N68, N92, P64, P66, P68, P00.

6.4.2 Lunar Landing Auto-program sequence: P00, N69, V48, V64, P63, V57, N69, N69, P64, P66, P68, P00.

6.4.3 Lunar Landing-Nominal program sequence: P00, N69, V48, V64, P63, V57, N69, N69, P64, P66, P68, P00.

6.4.4 Lunar Landing-Nominal-program sequence: P00, V48, P63, N69, P64, P66, P68, P00. (Offset Landing Site)

6.5.0 RTCC COMPATIBILITY TESTS

6.6.0 SPECIAL TESTS

Initial Conditions

(1) The slosh mode is not simulated

(2) The environmental FAST IMU is simulated

6.6.1A DOI 2 (Error Free)—program sequence: P00, V48, V82, P30, P41, V82, V64, V48, P27, P63.

6.6.1B DOI 2 (1σ Errors)—program sequence: P00, V48, V82, P30, P41, V82, V64, V48, P27, P63.

6.6.1C DOI 2 (1σ Errors-Reversed)—program sequence: P00, V48, V82, P30, P41, V82, V64, V48, P27, P63.

6.6.3 TEI Using DPS—program sequence: P00, V48, V82, P30, P40, V82.

6.6.4 LOI Using DPS—program sequence: P00, V48, V82, P30, P40, V82.

LUMINARY 1E

MISSION PROCEDURAL TESTING
(APOLLO 15)

In all of the following, the initial conditions were taken from Apollo 16 (Mission J-2) Operational Trajectory Simulator Data Package. The procedures were taken from the Apollo 16 LM Timeline Book (December 17, 1971), the Lunar Surface Checklist (December 21, 1971) and the LM Data Card Book (December 16, 1971). All verification runs performed with and without T-Loss.

1.0.0 DEORBITS using erasable burn program.

1.0.1 Earth orbit deorbit with full DPS stage from Earth orbit prior to TLI. Program flow: P30-P99

1.0.2 Lunar orbit deorbit with post docking weight APS stage. Program flow: P30-P99

2.0.0 INFLIGHT ALIGNMENTS

2.0.1 P52 fine alignment prior to PDI. This test simulates the IMU alignment at 102:50 and the P63 Ignition Algorithm Test. Included in the IMU alignment is a P52 Opt 3 spiral/cursor alignment without torquing, a P52 Opt 3 Mark X/ Mark Y alignment with torquing and a COAS calibration. Program flow: P52-P63.

LUMINARY 1E MISSION PROCEDURAL TESTING (APOLLO 15)

3.0.0	LUNAR LANDINGS. All of the landing simulations start from PDI - 5 min and terminate post P68. Program flow: P63-P64-P66-P68
3.0.1	Nominal auto landing with no perturbations.
3.0.2	Nominal landing utilizing ROD and/or manual throttle with mode control in both ATT HOLD and AUTO
3.0.3	Auto landing with V21 N69 at PDI+ 2 min and V22N69 at PDI+ 5 min.
3.0.4	Auto landing with ACA redesignations
3.0.5	Auto landing with V68 (terminate lunar terrain model) prior to V57
3.0.6	Landing with V68, V21 and V22 N69, ACA redesignations and ROD and/or manual throttle

3.1.0 ABORTS from LUNAR LANDING. All abort simulations start from PDI-5 min and terminate after Rendezvous Radar lock on and P32 calculation of next apsidal crossing. All abort testing done with bit 1 of CHANBKUP set.

3.1.1 Abort from 33,000 ft. Program flow: P63-P70-P20-P32

3.1.2 Abort from 7,000 ft. Abort stage at DPS full depletion. Program flow: P63-P64-P70-P71-P20-P32

3.1.3 Abort stage at 7,000 ft. Program flow: P63-P64-P71-P20-P32

3.1.4 Abort stage from surface. Program flow: P63-P64-P66-P71-P20-P32.

3.2.0 LUNAR SURFACE ACTIVITIES

3.2.1 P57 Testing. This test simulates the alignments that are made prior to LGC powerdown and includes a P57 opt 3 technique 1 alignment and 2 P57 opt 3 technique 2 alignments. (A P57 opt 4 technique 3 alignment is included in the ascent test 4.0.1).
Program flow: P57-P00-P57

3.2.2 P22 Testing. This test simulates the P22 tracking scheduled.
Program Flow: P68-P22-P00

4.0.0 ASCENT

4.0.1 Nominal ascent thru insertion. Includes a P57 opt 4 technique 3 normally done prior to ascent. Program flow: P68-P57-P12-P00

4.1.0 DIRECT RENDEZVOUS

4.1.1 Ascent thru rendezvous. Simulation starts prior to ascent and include a P57 opt 4 technique 3 done prior to ascent. Program flow: P68-P57-P12-P00-P20-P34-P42-P35-P41-P35-P41-P00

4.1.2 Post insertion thru rendezvous. Simulation starts insertion+1 min. Program flow: P20-P34-P42-P35-P41-P35-P41-P00

4.2.0 COELLIPTIC SEQUENCE RENDEZVOUS

4.2.1 Abort or abort stage at PDI+7 min. thru rendezvous. It was necessary to start this simulation from an abort case as a nominal bailout pad was not provided. A P52 opt 3 alignment is included in this simulation. Program flow: P63-P71-P00-P52-P20-P32-P41-P33-P30-P41-P33-P42-P34-P41-P35-P41-P35-P41-P00

5.0.0	DOCKED DPS BURN. All simulations start in lunar orbit and simulate the TEI burn. Program flow: P30-P40-P00
5.0.1	Full CSM, full LM
5.0.2	Partial CSM (post LOI weight), full LM
5.0.3	Empty CSM, full LM

LUMINARY 1E MISSION PROCEDURAL TESTING (APOLLO 16)

In all of the following, the initial conditions were taken from Apollo 16 (Mission J-2) Operational Trajectory Simulator Data Package. The procedures were taken from the Apollo 16 LM Timeline Book (December 17, 1971), the Lunar Surface Checklist (December 21, 1971) and the LM Data Card Book (December 16, 1971). All verification runs performed with and without T-Loss.

1.0.0 DEORBITS using erasable burn program.

1.0.1 Earth orbit deorbit with full DPS stage from Earth orbit prior to TLI. Program flow: P30-P99.

1.0.2 Lunar orbit deorbit with post docking weight APS stage. Program flow: P30-P99.

2.0.2 INFLIGHT ALIGNMENTS

2.0.1 P52 fine alignment prior to PDI. This test simulates the IMU alignment at 102:50 and the P63 Ignition Algorithm Test. Included in the IMU alignment is a P52 Opt 3 spiral/cursor alignment without torquing, a P52 Opt 3 Mark X/ Mark Y alignment with torquing and a COAS calibration. Program flow: P52-P63.

LUMINARY 1E MISSION PROCEDURAL TESTING (APOLLO 16)

3.0.0	LUNAR LANDINGS. All of the landing simulations start from PDI -5 min and terminate post P68. Program flow: P63-P64-P66-P68
3.0.1	Nominal auto landing with no perturbations.
3.0.2	Nominal landing utilizing ROD and/or manual throttle with mode control in both ATT HOLD and AUTO
3.0.3	Auto landing with V21 N69 at PDI +2 min and V22N69 at PDI +5 min.
3.0.4	Auto landing with ACA redesignations
3.0.5	Auto landing with V68 (terminate lunar terrain model) prior to V57
3.0.6	Landing with V68, V21 and V22 N69, ACA redesignations and ROD and/or manual throttle.

3.1.0 ABORTS from LUNAR LANDING. All abort simulations start from PDI-5 min and terminate after Rendezvous Radar ock on and P32 calculation of next apsidal crossing. All abort testing done with bit 1 of CHANBKUP set.

3.1

3.1.2 Abort from 7,000 ft. Abort stage at DPS full depletion. Program flow: P63-P64-P70-P71-P20-P32

3.1.3 Abort stage at 7,000 ft. Program flow: P63-P64-P71-P20-P32

3.1.4 Abort stage from surface. Program flow: P63-P64-P66-P71-P20-P32.

3.2.0 LUNAR SURFACE ACTIVITIES

3.2.1 P57 Testing. This test simulates the alignments that are made prior to LGC powerdown and includes a P57 opt 3 technique 1 alignment and 2 P57 opt 3 technique 2 alignments. (A P57 opt 4 technique 3 alignment is included in the ascent test 4.0.1).
Program flow: P57-P00-P57

3.2.2 P22 Testing. This test simulates the P22 tracking scheduled.
Program Flow: P68-P22-P00

4.0.0 ASCENT

4.0.1 Nominal ascent thru insertion. Includes a P57 opt 4 technique 3 normally done prior to ascent. Program flow: P68-P57-P12-P00

4.1.0 Ascent thru rendezvous. Simulation starts prior to ascent and include a P57 opt 4 technique 3 done prior to ascent. Program flow: P68-P57-P00-P20-P34-P42-P35-P41-P35-P41-P00

4.1.2 Post insertion thru rendezvous. Simulation starts insertion +1 min. Program flow: P20-P34-P42-P35-P41-P35-P41-P00

4.2.0 COELLIPTIC SEQUENCE RENDEZVOUS

4.2.1 Abort or abort stage at PDI +7 min. thru rendezvous. It was necessary to start this simulation from an abort case as a nominal bailout pad was not provided. A P52 opt 3 alignment is included in this simulation. Program flow: P63-P71-P00-P52-P20-P32-P41-P33-P30-P41-P33-P42-P34-P41-P35-P41-P35-P41-P00

LUMINARY 1E MISSION PROCEDURAL TESTING (APOLLO 16)

5.0.0	DOCKED DPS BURN. All simulations start in lunar orbit and simulate the TEI burn. Program flow: P30-P40-P00
5.0.1	Full CSM, full LM
5.0.2	Partial CSM (post LOI weight), full LM
5.0.3	Empty CSM, full LM

LUMINARY 1E MISSION PROCEDURAL TESTING (APOLLO 17)

In all of the following, the initial conditions were taken from Apollo 17 (Mission J-3) Operational Trajectory Simulator Data Package. The Procedures were taken from the Apollo 17 LM Timeline Book (September 27, 1972), the Lunar Surface Checklist (September 12, 1972) and the LM Data Card Book (September 11, 1972). All verification runs performed with and without T-Loss

1.0.0	DEORBITS using erasable burn program
1.0.1	Earth orbit deorbit with full DPS stage from Earth orbit prior to TLI. Program flow: P30-P99
1.0.2	Lunar orbit deorbit with post docking weight APS stage. Program flow: P30-P99
2.0.0	INFLIGHT ALIGNMENTS AND DOI-2
2.0.1	P52 fine alignment prior to PDI, DOI-2 burn and P63 ignition algorithm test. Included in the IMU alignment is a P52 opt 3 spiral/cursor alignment without torquing, a P52 opt 3 mark X/ mark Y alignment with torquing and a COAS calibration. Program flow P52-P30-P40-P63

LUMINARY 1E MISSION PROCEDURAL TESTING (APOLLO 17)

3.0.0	LUNAR LANDINGS. All of the landing simulations start from PDI-5 min and terminate post P68. Program flow: P63-P64-P66-P68
3.0.1	Nominal auto landing with no perturbations.
3.0.2	Nominal landing utilizing ROD and/or manual throttle with mode control in both ATT HOLD and AUTO
3.0.3	Auto landing with V21 N69 at PDI+2 min and V22N69 at PDI+5 min.
3.0.4	Auto landing with ACA redesignations
3.0.5	Auto landing with V68 (terminate lunar terrain model) prior to V57
3.0.6	Landing with V68, V21 and V22 N69, ACA redesignations and ROD and/or manual throttle

3.1.0 ABORTS from LUNAR LANDING. All abort simulations start from PDI -5 min and terminate after Rendezvous Radar lock on and P32 calculation of next apsidal crossing. All abort testing done with bit 1 of CHANBKUP set.

3.1.1 Abort from 3,000 ft. Program flow: P63-P70-P20-P32

3.1.2 Abort from 7,000 ft. Abort stage at DPS full depletion. Program flow: P63-P64-P70-P71-P20-P32

3.1.3 Abort stage at 7,000 ft. Program flow: P63-P64-P71-P20-P32.

3.1.4 Abort stage from surface. Program flow: P63-P64-P66-P71-P20-P32.

3.2.0 LUNAR SURFACE ACTIVITIES

3.2.1 P57 Testing. This test simulates the alignments that are made prior to LGC powerdown and includes a P57 opt 3 technique 1 alignment and 2 P57 opt 3 technique 2 alignments. (A P57 opt 4 technique 3 alignment is included in the ascent test 4.0.1).
Program flow: P57-P00-P57

LUMINARY 1E MISSION PROCEDURAL TESTING (APOLLO 17)

4.0.0	ASCENT
4.0.1	Nominal Ascent thru insertion. Includes a P57 opt 4 technique 3 normally done prior to ascent. Program flow: P68-P57-P12-P00
4.1.0	DIRECT RENDEZVOUS
4.1.1	Ascent thru rendezvous. Simulation starts prior to ascent and include a P57 opt 4 technique 3 done prior to ascent. Program flow: P68-P57-P12-P00-P20-P34-P42-P35-P41-P35-P41-P00
4.1.2	Post insertion thru rendezvous. Simulation starts insertion +1 min. Program flow: P20-P34-P42-P35-P41-P35-P41-P00
4.2.0	COELLIPTIC SEQUENCE RENDEZVOUS
4.2.1	Abort or abort stage at PDI +7 min. thru rendezvous. It was necessary to start this simulation from an abort case as a nominal bailout pad was not provided. A P52 opt 3 alignment is included in this simulation. Program flow: P63-P71-P00-P52-P20-P32-P41-P33-P30-P41-P33-P42-P34-P41-P35-P41-P35-P41-P00

5.0.0	DOCKED DPS BURN. All simulations start in lunar orbit and simulate the TEI burn. Program flow: P30-P40-P00
5.0.1	Full CSM, full LM
5.0.2	Partial CSM (post LOI weight), full LM
5.0.3	Empty CSM, full LM

LUMINARY 1E SYSTEM TEST LAB TESTING (APOLLO 15)

Extended Verbs

IMU Operational Program

IMU Performance Test

P57 Changes (PCR 1044)

Radar Changes

IRIG Torque

Sum Uplink

Channel 77 Restart Monitor

Input Channel Backup (PCR's 1107, 1109, 1110, 1111)

PGNS-AGS Data Transfer (PCR 324)

Super Key Release Light (PCR 1091)

P52 Changes (PCR 1044)

Check for coarse align before attempting gyro torquing

LUMINARY 1E SYSTEM TEST LAB TESTING (APOLLO 16)

EMP Verification

LUMINARY 1E SYSTEM TEST LAB TESTING (APOLLO 17)

EMP Verification

LM ERASABLE PROCEDURES

EMPs

EMP-99	Guided RCS Translational Maneuver
EMP-100A (Rev. 1)	Backup For Failed DSKY Key Using ENG GMBL Switch
EMP-100B	Backup For Failed DSKY Using MODE SEL Switch
EMP-101 (Rev. 1)	P47 With DAP Driving GTS
EMP-102	Software Restart
EMP-103A	Descent With Failed CDUs
EMP-103B	Descent With Failed CDUX
EMP-106	Increment AOT Detent Position
EMP-107	For Display Of Raw LRH and $\dot{H}$ On the DSKY
EMP-108	Zero a Runaway IMU CDU and Prevent Coarse Align
EMP-109	P20 Operation With Failed RRCDUs
EMP-111	CDU Transient Monitor

LM ERASABLE PROCEDURES (Cont.)

OTHER LEPs

LEP-004	State Vector Readout for Transfer to CMC
LEP-005	V36 (Fresh Start) Recovery
LEP-006	General Systems Checkout
LEP-007	LGC Thruster Inhibit/ Re-enable
LEP-008	Crew Defined Docked Deadband
LEP-009	LPD Bias Load/ Alternate Bias Load
LEP-010	RMAX/ VMAX Loading to Force all N49s
LEP-012	Read Fixed-Memory (V27)
LEP-101	LGC Operation With the IMU Cage Discrete Failed On
LEP-102	LGC Operation With ISS Turn-on Discrete Failed
LEP-103	LGC Operation With IMU Operate Discrete Failed Off
LEP-105	Rapid IMU Realign
LEP-112	PIPA Bias Measurement and Loading
LEP-113	Enable V40 N20E in Apparent Gimbal Lock

LM ERASABLE PROCEDURES (Cont.)

OTHER LEPs

LEP-114	Onboard Computations of NBD X, Y, Z
LEP-202	Radar Bias Determination/ Initialization
LEP-203	RR CDU Failure Work-around

ANOMALIES EXISTING IN LUMINARY 1E
(REVISION 210)

ANOMALY	DESCRIPTION	DISPOSITION
L-1D-22 (1/ 18/ 71)	A hardware or software restart during a RR TURNON sequence may result in an incorrect setting of the mode flag (ANTENFLG)	Program Note (2.2.6)
L-1D-24 (1/ 14/ 71)	P70 or P71 selection prior to P12 leaves P12 with at least 3 flags abnormally set	Program Note (2.4.7)
L-1E-01 (4/ 13/ 71)	If P22 is selected when range to CSM is > 400 NM and closing, then V37 will not flash when ranges < 400 NM and range rate is positive	Program Note (2.6.2)
L-1E-02 Rev 1 (4/ 13/ 71)	Exiting P63, P40, or P42 with a V37 approximately 50 microseconds before ullage on will result in ullage coming on and not being terminated, with Average-G integration not running	Program Note (2.1.27)
L-1E-03 (4/ 13/ 71)	A V34E response to the flashing V06N60 display in P66 may result in a 31502 bailout alarm	Program Note (2.9.5)
L-1E-04 (4/ 12/ 71)	P22 Lunar Surface Navigation initialized the W-Matrix when the mark counter is zero, instead of checking the RENDFLAG. Hence, W-Matrix is initialized each time P22 is selected.	Program Note (2.6.3)

ANOMALIES EXISTING IN LUMINARY 1E
(REVISION 210)

ANOMALY	DESCRIPTION	DISPOSITION
L-1E-05 Rev 1 (4/ 13/ 71)	If an engine fail occurs in P70 or P71, and an ENTER response is made to the FLV97, N63 will be displayed with FLV99, instead of N94, N94 will be restored at TIG after the V99 display is answered.	Program Note (2.4.6)
L-1E-06 (4/ 9/ 71)	A V78 (LR Spurious Test Routine) during P63 N62 display prior to AVG-G results in Program Alarm 31201 and clobbers the LM Velocity Vector	Program Note (2.1.11)
L-1E-07 (4/ 9/ 71)	An inadvertent PROCEED on the V16N80 display in P20 caused the program to get lost	Program Note (2.5.8)
L-1E-08 (4/ 14/ 71)	DAP interrupt could occur in the middle of the ZATTEROR zeroing sequence or STOPRATE	No Further Action
L-1E-09 (5/ 12/ 71)	Unintentional software interlock between V97 and the ascent guidance engine-off control logic and conflict in use of TTOGO cell between CLOCKJOB and the ascent guidance equations	Program Note (2.4.9)
L-1E-10 (8/ 20/ 71)	A restart during P32, P33, P34, P35 and P72, P73, P74, P75 when P20 is attempting to re-acquire RR Lock-on can result in abnormal program behavior	Program Note (2.5.14)

ANOMALIES EXISTING IN LUMINARY 1E
(REVISION 210)

ANOMALY	DESCRIPTION	DISPOSITION
L-1E-11 (11/ 9/ 71)	Restart during P20 or P22 when verb 37 is flashing because the REFSMMAT flag is clear or the IMU is off results in DSKY lockout.	Program Note (2.5.15)
L-1E-12 (11/ 12/ 71)	Restart during R04 will cause subsequent selection of R77 to result in OPERATOR ERROR unless a major mode change (V37) has been performed.	Program Note (2.2.9)

LUMINARY 1E DOCUMENT REVIEW

I. LM Flight Data File

LM Timeline Book, dated 9/ 27/ 72, received 10/ 16/ 72.

LM Data Card Book, dated 9/ 11/ 72, received 9/ 26/ 72.

LM System Activation Checklist, dated 9/ 11/ 72, received 9/ 26/ 72.

LM G&N Dictionary, dated 6/ 15/ 72, received 9/ 6/ 72.

Cue Cards, Basic dated 9/ 14/ 72, received 9/ 26/ 72.

LM Contingency Checklist, dated 8/ 31/ 72, received 9/ 11/ 72.

LM Lunar Surface Checklist, dated 9/ 12/ 72, received 9/ 28/ 72.

LM Systems Data, dated 8/ 28/ 72, received 9/ 14/ 72.

LM Malfunction Procedure, dated 7/ 12/ 72, received 7/ 27/ 72.

II. Crew Procedures Documents

Apollo Operation Handbook Vol. 2 dated 6/ 16/ 72, received 7/ 18/ 72.

Rendezvous Procedures, dated 3/ 16/ 72, received 3/ 30/ 72.

Comments to the above listed documents are being transmitted via telecon to NASA/MSC (CF22, CF34) as they develop.

CONCLUSION

BASED ON THE RESULTS OF THE APOLLO 17 TESTING
MIT/ CSD LABORATORY RECOMMENDS
THE USE OF LUMINARY 1E
(Rev 210) FOR MISSION "J-3"