

Massachusetts Institute of Technology  
C. S. Draper Laboratory  
Cambridge, Massachusetts

TO: R. Larson  
FROM: B. McCoy  
DATE: 12 February 1971  
SUBJECT: Level 3 Test Reports for Luminary 1E

Simulation Reports for Level 3 testing Luminary 1E and corresponding Development Plans are attached. Some tests were simulated on various Luminary assembly revisions. After each change was implemented (initially or as a fix to the coding) into the assembly a test was simulated for that change on that or a later revision.

Some of the reports were tested in the same simulation.

It should be noted that these tests were unit tests and the simulation was set up thusly. The simulations were not necessarily scrutinized for program performance or interaction with other programs. This type of testing is left for levels 4 and 5.

Not included in this package are reports of PCR 1088, Anomalies L-1D-02, L-1D-12, and ACBs L-26, L37 which are part of the System Test Lab test effort.

Most of the simulations have been sent to R. O. Nobles. Some are still available in house.

PRE-LEVEL 4 TESTING

## PROGRAM DEVELOPMENT STATUS FOR LUMINARY 1E

Date 2/16/71

PCR/ ANOM/ ACB	DESCRIPTION	Responsible Engineer	PRE-LEVEL 4 TESTING						FIXED IN REV
			START			COMPLETED			
			Req	Pred	Act	Req	Pred	Act	
PCR 317.2	Rescaling Nouns Containing Range and Range Rate	Volante/Dunbar		11/16	11/16	12/3	1/20	1/19	195
PCR 319	A-Priori Terrain(ΔH on Downlist)	Albert/Eyles		11/23	12/4	12/3	12/3	12/18	196
PCR 324	PGNCS/AGS RR Data Transfer	Volante/Dunbar		10/22	10/22	12/3	1/20	2/1	195
PCR 333	Change Recognition of ROD Inputs	Millard		11/20	11/20	12/3	1/22	1/18	191
PCR 335	Remove Alignment Option from P63	Albert/Eyles		11/20	11/20	12/3	12/3	12/18	186
PCR 338	Change LPD Scaling to 1.0° In All Directions	Albert/Eyles		11/20	11/20	12/3	12/3	12/18	185
PCR 339	Have P20 F50 72 Display Update	Rosenberg/Dunbar		11/20	11/20	12/3	12/3	12/15	190
PCR 334 Rev 1	Change DSKY Descent/Ascent Nouns	Eyles/Albert/ Berman		11/23	11/23	12/3	12/3	12/20	198
PCR 336 Rev 1	Allow Extended Verbs During P20 Maneuvers	Rosenberg / Dunbar		11/20	11/20	12/3	12/3	12/15	193
PCR 340	LATVAL Polarity Change	Eyles						12/18	182
PCR 341	Landing Radar Reasonability Test	Moore/Albert		11/20	11/20	12/3	12/3	12/18	191
PCR 343	Disapproval of PCR 340	Albert/Eyles		11/23	11/23	12/3	12/3	12/18	190
PCR 347	Mod. to Code Word for PGNCS/AGS Data Transfer	Volante/Dunbar			12/4		1/22	1/28	195
PCR 348	New Target - V Program	White			11/20		12/14	12/15	197

## PROGRAM DEVELOPMENT STATUS FOR LUMINARY 1E

Date 2/16/71

PCR/ ANOM/ ACB	DESCRIPTION	Responsible Engineer	PRE-LEVEL 4 TESTING						FIXED IN REV
			START			COMPLETED			
			Req	Pred	Act	Req	Pred	Act	
CR 1044	Re-design of R53 - R57	Millard		11/23	11/23	12/3	12/3	12/3	194
PCN 1059	Have Major Mode Changes Set Up-a 1/ACCS	Weissman		11/23	11/23	12/3	12/3	1/5	196
PCN 1070	GSOP Change for FDAI Needle Initialization Fix (L-1D-01)	Weissman		11/23	11/23	12/3	12/3	12/1	182
PCR 1066	Display N81 On All Passes in P34/74 and P35/ 75	White		11/19	11/9	12/3	11/20	11/16	185
PCR 1079	ALMCAR on the Telemetry	Albert		11/20	11/20	12/3	12/3	12/15	192
CR 1082.2	Update Fixed Constants for 1971 - 1972 Ephemeris Year	Dunbar		11/20	11/20	12/3	1/22	1/19	186
PCR 1088	Inhibit Program Change During Critical 8.22 Seconds After Coarse Align IMU	Rosenberg/ Edmonds Sys. Test Lab.		11/20	11/20	12/3	1/22	1/22	191
PCR 1091	Priority Display Light on DSKY	Rosenberg/Dunbar		11/20	11/20	12/3	12/3	12/15	193
PCR 1093	Eliminate 481 Day TFPHEM Limitation	Millard		11/20	11/20	12/3	1/22	1/22	192
PCN 1095	Avoid Incomplete Close-out of Manual Rate Command Mode (L-1D-07)			(See Anomaly L-1D-07)					
CR 1097.2	V30, V31 Operator Error Lockout	Rosenberg		11/20	11/20	12/3	12/3	12/15	192
PCR 1100	Delete Setting of NODOFLAG in R47	Rosenberg		11/20	11/20	12/3	12/3	12/15	191
PCR 1107	Backup of Abort bits Chan 30 Bits 1 and 4	Bernikovich			11/19	12/3		12/20	196
PCR 1109	Backup of Off (1) Failures of Auto-Throt. Chan 30 Bit 6.	Albert			11/19	12/3		12/20	196

# PROGRAM DEVELOPMENT STATUS FOR LUMINARY 1E

Date 2/16/71

PCR/ ANOM/ ACB	DESCRIPTION	Responsible Engineer	PRE-LEVEL 4 TESTING						FIXED IN REV
			START			COMPLETED			
			Req	Pred	Act	Req	Pred	Act	
PCR 1110	Backup for Failure of Inertial Data Bit Chan 30 Bit 6	Albert			11/20	12/3		12/28	196
PCR 1111	Backup Failure of Auto-pilot Mode & AGS/ PGNS Select Switch Chan 30 Bits 10, 13, & 14.	Weissman			11/20	12/3		1/15	202
PCR 1117.2	Addition to P00D00 Logic.	Dunbar		11/20	11/20	12/3	1/20	1/19	191
PCR 1121	Replace Acceleration Est. with RCS Inhibit Flags on non-powered Downlist.	Albert/ Weissman		11/23	11/23	12/3	12/3	12/15	196
PCN 1124	Flag Resetting in P00D00 Aborts				(See L-D-15)				193
PCN 1127	Change to Downlist for IMU Pulse	Albert			12/1			12/15	197
PCN 1129	Update Mass Dependent Calculations in 1/ACCS	Weissman			12/1			12/17	203
PCN 1133	Revision to Descent Mass Limits	Weissman			12/18			1/5	205
PCR 1134	Revision of PCR 1111	Weissman			12/18			1/15	202
PCN 1141	Initialize FLRCS in P12	McCoy			2/1			2/8	209

TP 22587-1

## PROGRAM DEVELOPMENT STATUS FOR LUMINARY 1E

Date 2/16/71

PCR/ ANOM/ ACB	DESCRIPTION	Responsible Engineer	PRE-LEVEL 4 TESTING						FIXED IN REV
			START			COMPLETED			
			Req	Pred	Act	Req	Pred	Act	
L-1D-01	"NEEDLER" Initialization Never Takes Place Following DAP Turn-on if IMU Error Counters (CH 12 B06) are Enabled	_____	(See PCN 1070)						184
L-1D-02	Core Set Overflow (31202) Alarm will result from a Bad Return Pulse Torquing.	Sys. Test Lab.		11/20	11/20	12/3	12/3	1/18	184
L-1D-03	Velocity Update During Descent (P63 & 64) Fail the Reasonableness Test Shortly After LR Lock-on.	McCoy	Fixed in Luminary 1D						
L-1D-04	P25 will not control Space craft altitude if range to CSM is greater than 566 N. M.	Volante Dunbar		11/20	10/10	12/3	12/3	11/30	184
L-1D-05	Certain verb routines should not be requested if P20 or P22 is running. (L-34)	Rosenberg/ White		11/23	11/23	12/3	12/3	12/16	181
L-1D-06	"DVTOTAL" incremented twice in one SERVICER Cycle	Adler/Moore		11/23	11/23	12/3	12/3	12/18	184
L-1D-07	Manual rate control mode improper termination (PCR 1095)	Weissman		11/23	11/23	12/3	12/3	12/1	199
L-1D-08	Padload "LRWH" Shares Erasable memory location with RM of P20 (L-34)	Dunbar/Rosenberg		11/20	11/20	12/3	12/3	11/27	181
L-1D-10	Major Mode Changes that Leave the DAP with Improper Data	_____	(See PCN 1059)						196
L-1D-11	W <sub>B</sub> is mis-scaled by a factor of 2	_____	(See PCR 1082.2)						186
L-1D-12	Selection of V41N72 while an RR reposition or remode is in progress results in incorrect operation of V41N72.	System Test Lab.		11/23	11/23	12/3	1/22	1/22	193



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Date 2/16/71

PCR/ ANOM/ ACB	DESCRIPTION	Responsible Engineer	PRE-LEVEL 4 TESTING						FIXED IN REV
			START			COMPLETED			
			Req	Pred	Act	Req	Pred	Act	
L-1D-14	Set Flagword 5 Bit 12 for Impulsive Burns	Adler/Moore		11/23	11/23	12/3	12/3	12/15	190
L-1D-15	Reset RNDVZFLG (P25FLAG) in P00D00 Sequence.(PCN 1124)	Rosenberg/ Dunbar		11/20	11/20	12/3	1/22	1/19	193
L-1D-16	Fixed Memory Constant VINJNOM is 5509.3 fps instead of 5509.5 fps	Volante			12/10			1/12	201
L-1D-17	Flashing V37 which Terminate P22 when the Range is greater than 400 N.M and the Range-Rate is Positive may not occur.	Volante			12/10			1/17	208
L-1D-18	R21 & R24 do not clear Designate Flag when it finds the LOS outside Mode II limits in P22	Volante			12/10			1/17	208
L-1D-19	Restarts in P20/25 may erroneously display V50N16 on DSKY	Volante			12/30			1/17	208
L-1D-20	Erroneous clearing of REINTFLG by BAILOUT Logic				1/6			1/14	205
L-1D-21	An RR antenna reposition initiated by R25 just after starting P20 or P22 can cause P20/P22 to loop	McCoy			2/1			2/12	209
L-1D-23	A yaw transient of about 5 degrees at the end of P64 can occur.	Albert			2/1			2/12	209
L-1D-25	Exiting P63, P40 or P42 with a V37 between AVEGON time of auto-ullage initiate may not kill the waitlist call to initiate ullage.	Moore			1/23			1/26	209

TP 22597-1

## PROGRAM DEVELOPMENT STATUS FOR LUMINARY 1E

Date 2/16/71

PCR/ ANOM/ ACB	DESCRIPTION	Responsible Engineer	PRE-LEVEL 4 TESTING						FIXED IN REV
			START			COMPLETED			
			Req	Pred	Act	Req	Pred	Act	
L-26	Insert check for coarse align before attempting gyro torquing	Sys. Test Lab. Rosenberg		11/23	11/23	12/3	12/3	1/15	185
L-28	Remove LRPOS initialization from P63	Albert		11/23	11/23	12/3	12/7	12/18	184
L-29	Change two lines of coding at locations MOONSPOT & MOONSPOT + 1	Moore/Albert		11/23	11/23	12/3	12/3	12/18	190
L-30	In SERVICER, move the tag MOONSPOT to the "TC TMPTOSPT" instruction	Moore/Albert		11/23	11/23	12/3	12/3	12/18	190
L-31	Set a list of labels = to each location that is in the Downlink lists	Rosenberg		11/20	11/20	12/3	12/3	12/15	184
L-32	Put a list in the Downlink Log Section using the new instruction "CHECKS ="	Rosenberg		11/20	11/20	12/3	12/3	12/15	184
L-33	Load the "trap" of the DAP state estimator with a value that is 1 bit off from the GSOP value	Weissman		11/23	11/23	12/3	12/3	10/23	196
L-34	Erasable Clean-up (L-1D-05, L-1D-06)	Rosenberg		11/23	11/23	12/3	12/14	12/16	191
L-35	Change coding in LLGE to store triple precision in OLDPIPAX	Albert		11/20	11/20	12/3	12/7	12/18	184
L-36	Define a tag TMP DV = GDT/2 for use by S34/35.5	White		11/16	11/16	12/3	12/3	11/18	184
L-37	Make bad return from IMUSTALL in 1/ GYRO continue instead of go to END OF JOB.	Rosenberg/STL		11/23	11/23	12/3	12/3	1/18	185
L-38	Rearrange clearing of flags in V56; Change cpde at TRMTRAK1 to interpretive	Rosenberg/ Dunbar		11/20	11/20	12/3	1/20	1/19	190



## PROGRAM DEVELOPMENT STATUS FOR LUMINARY 1F

Date 2/16/71

PCR/ ANOM/ ACB	DESCRIPTION	Responsible Engineer	PRE-LEVEL 4 TESTING						FIXED IN REV
			START			COMPLETED			
			Req	Pred	Act	Req	Pred	Act	
L-39	Change a CADR to an ADRES following a TC TWIDDLE in RADSAMP.	Dunbar/ Rosenberg		11/20	11/20	2/3	12/3	12/15	182
L-40	Make Room in Bank 10 to implement PCR 339	S. Rosenberg				CANCELLED			186
L-41	Avoid reading the GTS Drive bits in order to determine whether or not the engine gimbals are being driven	P. Weissman		11/23	11/23	12/3	12/3	1/6	196
L-42	Append a(+/-) N to relative addresses	D. Densmore				CANCELLED			
L-43	Enable the redesignation trap at the time of the PROCEED to V06N64 instead of at start of P64	D. Eyles		11/23			12/7	12/18	196
L-44	Make T5ADR Single precision since it always goes to F16 in E6	D. Densmore				CANCELLED			
L-45	Clear INTYPFLG prior to INTEGRUS call in P21 recycle option	S. Rosenberg		12/3				12/15	196
L-46	Delete INHINT before WAITLIST call in AOTMARK	D. Densmore		12/10				12/18	200
L-47	Re-code the P-axis minimum impulse routine more efficiently	P. Weissman		12/11				1/6	202

# SIMULATION REPORT

Test # E1

NAME: Virginia Dunbar

DATE: 19 January 1971

PROGRAM/REV: Lum. 195

PCR/~~XXXX/ANOM/XXX~~: 317.2

PURPOSE: Rescaling N78 containing range and range rate and N49

MISSION PHASE: Rendezvous

PROGRAMS USED: P20

TEST DESCRIPTION: Entered V16 N78 shortly after beginning P20.

Received N49 in this run.

RESULTS: Scaling of range and range rate is correct for N78 and N49.

# SIMULATION REPORT

Test # E2

NAME: S. Albert

DATE: 18 December 1970

PROGRAM/REV: LUM 202

PCR/~~XXXXXXXXXX~~: 319

PURPOSE: See below.

MISSION PHASE: Landing

PROGRAMS USED: P63, P64

TEST DESCRIPTION: True  $\Delta H$  on downlist: Dump DELTAH and TRUDELH after terrain model and compare with words 2 & 3 of Desc/Asc downlist. Observe DELTAH and TRUDELH after terrain model is turned off by entry to P66.

RESULTS: The values in words 3 & 4 of the downlist compared exactly to those for the same time periods in the AGC edit. When the terrain model is discontinued at P66 entry, DELTAH and TRUDELH are identical.

# SIMULATION REPORT

Test # 82

NAME: P. Volante

DATE: 7 February 1971

PROGRAM/REV: Luminary

PCR/~~ACE/ANOMALY~~: 324, 347

PURPOSE: Verify AGS RR data transfer during Rendezvous Navigation

MISSION PHASE: Rendezvous

PROGRAMS USED: P20, P34

## TEST DESCRIPTION:

See attached Luminary Memo #200

## RESULTS:

All tests performed as expected, with the timing of AGS code setting/resetting and the data transfers all operating normally.

Massachusetts Institute of Technology  
C. S. Draper Laboratory  
Cambridge, Massachusetts

LUMINARY Memo #200

To: Distribution  
From: V. Dunbar, P. Volante  
Date: 22 February 1971  
Subject: Implementation and Testing of PCR 324, PGNCS/AGS RR  
Data Transfer

PCR 324 specifies that Rendezvous Radar mark data (range, range-rate, trunnion and shaft angles) be transferred to the AGS via the Rendezvous/Pre-Thrust downlist when P20 is operating. A special code word was added to the downlist to indicate to the AGS when good RR data has been placed on the downlist, and whether the range scale is high or low.

This is accomplished by setting the appropriate code word whenever RR mark data has been successfully read and is being stored into the downlink registers. (The mark data is buffered until a complete set is available, then it is stored in the downlink registers with interrupts inhibited.) The coding to effect this change was put in the LRS22.1 subroutine of R22, which does the radar reads to obtain the mark data. The code word is reset by R65, the Fine Preferred Tracking Attitude Routine. R65 is called by all paths through R22 such that the timing constraints for setting and resetting the code word specified in the PCR are met. (Although this required a further change which is discussed below). It is also reset by Verb 56, by R21 (This is necessary because R21 zeroes the registers containing the trunnion and shaft angles on the downlink) by a Fresh Start, and by a hardware or a software restart.

The settings of the code word are:

57776 - Accept data, high range scale  
17776 - Accept data, low range scale  
20000 - Do not accept data.



The additional coding changes made in order to implement the PCR were:

- a. A two-second delay was added to R22 in the path where the No Update Flag is set or the Update Flag is reset, in order to meet the requirement that the code word be in the set configuration for at least two seconds.
- b. A check is made so that the AGS code word is not placed in the set configuration within 50 seconds of a previous setting. This is done by subtracting the mark time when the AGS code word was last set from the current mark time. If the difference is greater than 50 seconds, the code word is placed in the set configuration, otherwise it is not.

A series of tests have been defined to demonstrate the proper functioning of the data transfer and to examine the timing of the code word setting/resetting. They are:

1. Nominal case - normal state vector updating cycle.
2. Data good lost during RR read.
3. No Update Flag set, i.e. V95E keyed in to prevent state vector updating.
4. Update Flag not set, i.e. a PRO or V32E response to the V16N45 display to get a solution in a P3X/P7X targetting program.
5. Track Flag not set, i.e. a thrusting program (or any other except targetting) program selected.
6. RR Antenna  $> 30^{\circ}$  from +Z-axis (This forces a call to R61).

7. Transition from high to low range scale.

- a. During a read,
- b. Not during a read.

8. Restarts occurring

- a. During read,
- b. After read complete.

9. RR CDU Fail during read.

# SIMULATION REPORT

Test # E3

NAME: Don Millard

DATE: 19 January 1971

PROGRAM/REV: Lum. 202, 209 PCR/~~AXE/ANOMALY~~:333

PURPOSE: Verify backup sighting mark capability during inflight IMU alignments (P52).

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION: A digital simulation of the inflight alignment program P52 was made using the REFSMMAT option. The lunar surface sighting technique was selected to perform the fine align star sightings and the ROD switch was activated to perform the cursor and spiral marks.

RESULTS: The sighting data test NOUN 05 = .00. The final alignment accuracy was less than .01 degrees on each axis.

# SIMULATION REPORT

Test # E4

NAME: Bruce McCoy

DATE: 28 January 1971

PROGRAM/REV: Lum. 209 PCR/~~ACB/ANOMALY~~: 333

PURPOSE: Test ROD function.

MISSION PHASE: Landing

PROGRAMS USED: P66

TEST DESCRIPTION: ROD activity during P66

- a. +5 ROD clicks
- b. -5 ROD clicks

RESULTS: Performance as expected.

- a.  $\Delta \dot{H}$  5 fps upward
- b.  $\Delta \dot{H}$  5 fps downward

# SIMULATION REPORT

Test # E5

NAME: Sharon Albert

DATE: 20 December 1970

PROGRAM/REV: Lum. 202

PCR/~~XXX/ANOMXXX~~: 334 Rev. 1

PURPOSE: Verify correct change to landing & ascent displays.

MISSION PHASE: Landing & Ascent

PROGRAMS USED: P63/P63, P70

## TEST DESCRIPTION:

- 1) Landing: Do V57 on N63 display when R1  $\neq$  99999.  
Wait 10 and do V58, then V57 again.  
Call up V68 via V16.
- 2) Ascent: Observe N94 display.  
Call up N77 via V16.

## RESULTS:

- 1) V57 stopped the N63 display from flashing. N58 caused it to flash again, and the 2nd V57 again stopped the flashing. After 36 k' a data good signal was received and R1 changed from 99999. Due to Astronaut deck error, V57 was done too early (he saw "N63" with the R1 from N62 at ignition). However, a live astronaut would know better so it was not necessary to rerun the test for this.
- 2) After the abort button is pushed & P70 begins, N94 appears on the DSKY. The alt. rate and alt. in R2 & R3 are consistent with the previous N63 display & with the ensuing ENVSUM printouts. Both N85 and N77 are called via V16 and it is seen that  $\Delta VG_x$  in R1 of N85 is of the same magnitude as R1 of N94, and similarly, for  $\Delta VG_y$  (R2 of N85 & N77). At cutoff in P70, a flashing V16 N94 came up, as expected.



# SIMULATION REPORT

Test # E6

NAME: Sharon Albert

DATE: 18 December 1970

PROGRAM/REV: Lum. 202

PCR/~~XXX/XXXXXXX~~: 335

PURPOSE: See below.

MISSION PHASE: Landing

PROGRAMS USED: P63, P64

TEST DESCRIPTION: Remove alignment option from P63: Trace to see that program does not go to R51 P63; eyeball test to see that V50 N25 does not come up on DSKY.

RESULTS: The V50 N25 did not come up on the DSKY in P63.

# SIMULATION REPORT

Test # E7

NAME: Sumner Rosenberg

DATE: 15 December 1971

PROGRAM/REV: Lum. 195/207/ PCR/~~ACB/ANOMALXX~~ 336  
208

PURPOSE: Allow ext. verbs during P20 maneuvers.

MISSION PHASE:

PROGRAMS USED: P20, P40

TEST DESCRIPTION: Go thru R60 in P20 (also keyboard active during V50 N18 flash). See that V06 N18 does not come up. Cause restart during auto maneuver, V37 during maneuver; ext. verbs, keyboard monitors, etc. Also run P40 R60 with same activity. Rerun on 207 with patches, and then on 208..

RESULTS: OK as tested.  
Restart caused the maneuver to terminate and V50 N18 returned to DSKY.

# SIMULATION REPORT

Test #E8

NAME: Sharon Albert

DATE: 18 December 1970

PROGRAM/REV: Lum. 202

PCR/~~ACB/ANOMALY~~ 338

PURPOSE: See below.

MISSION PHASE: Landing

PROGRAMS USED: P63, P64

TEST DESCRIPTION: Change LPD scaling to  $1^0$  in all directions: Trace 1 line at +AZ and -EL to verify magnitude of AZEACH and ELEACH.

RESULTS: At +AZ a "CA 00436<sub>8</sub>" was done. At -EL, 77341 was brought into A.  $00436_8 = -(77341_8) = .01746_{10} = 1^0$ . Scaling changed correctly.

# SIMULATION REPORT

Test # E9

NAME: Sumner Rosenberg

DATE: 15 December 1970

PROGRAM/REV: Lum. 195

PCR/~~ACB/ANOMALY~~: 339

PURPOSE: Flashing V50 N72 monitor in R21.

MISSION PHASE:

PROGRAMS USED: P20

## TEST DESCRIPTION:

See that flashing V50 N72 monitor now comes up in R21.

Tested on Hybrid.

## RESULTS:

OK as tested. R1 and R2 of N72 were changing as vehicle moved in the attitude deadband.

# SIMULATION REPORT

Test # E10

NAME: P. Volante

DATE: 17 January 1971

PROGRAM/REV: Lum. 200

PCR/~~ACB/ANOMALXX~~ 339

PURPOSE: Verify updating of FL V50 N72 in P20.

MISSION PHASE: Rendezvous

PROGRAMS USED: P20

## TEST DESCRIPTION:

Select P20 - after RR lock-on, observe V50 N72 to see that trunnion and shaft angles are changing.

RESULTS: Test performed as expected.



# SIMULATION REPORT

Test # E11

NAME: Sharon Albert

DATE: 18 December 1970

PROGRAM/REV: Lum. 202

PCR/~~XXXXXX~~: 340/343

PURPOSE: See below.

MISSION PHASE: Landing

PROGRAMS USED: P63, P64

TEST DESCRIPTION: See that LATVEL polarity has been restored to old values. Trace LAD coding to see that coding has been changed from "CS's" back to "CA's".

RESULTS: Trace showed that coding had been restored to previous version.

# SIMULATION REPORT

Test #E12

NAME: Dave Moore

DATE: 18 December 1970

PROGRAM/REV: Lum. 200      PCR/~~XXX/XXXXXX~~: 341

PURPOSE: Change slope in LR Reasonability test to 1/4 (from 1/8).

MISSION PHASE: Lunar Landing

PROGRAMS USED: P63-P64 (R12 - Servicer)

TEST DESCRIPTION: Trace interpretive coding where the equ to go to find  
if  $\Delta H$  too large is

$DMPAC = (ABS(DELTAH) - (DQFIX + HCALC/4)) \quad 2(22)$

Since  $HCALC/4 = [(HCALC) \ 2 \ (24)] \ 2(22)$  the slope number is  
1/4 now.

RESULTS: The values observed showed the equation to be true and  
faithful to the coding. This PCR test is complete.

# SIMULATION REPORT

Test # E13

NAME: Pat White

DATE: 15 December 1970

PROGRAM/REV: Lum. 199/208      PCR/~~ACB/ANOMALY~~: 348

PURPOSE: Level 3 test

MISSION PHASE: Luminary 1E

PROGRAMS USED: P00, P30, P41, V96, P77

TEST DESCRIPTION: Use P30 to set up TIG and  $\Delta V$  for P41. Do maneuver in P41, then stop integration (V96) after first V16N85 display (not flashing). Perform burn manually, then use P77 to update LEM state vectors. Used P77 edit to verify update of LEM state vectors. Reran on 208 (level 4 test).

RESULTS: Very good.

# SIMULATION REPORT

Test # E14

NAME: Donald Millard

DATE: 19 January 1971

PROGRAM/REV: Lum. 208

PCR/~~AKB/ANOMAXXX~~ 1044

PURPOSE: Verify that X and Y sighting marks can be performed in any sequence during inflight alignments.

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION: A digital simulation of the following program sequence was performed using different X and Y marking sequences.

P51

P52 OPTION 4

P52 OPTION 3

RESULTS: The number of star vectors computed and averaged was consistent with the number of completed mark pairs. The alignment accuracy resulting from each program was less than .01 degrees on each axis.

# SIMULATION REPORT

Test # E15

NAME: Donald Millard

DATE: 19 January 1971

PROGRAM/REV: Lum. 202, 209 PCR/~~REFSMMAT~~: 1044

PURPOSE: Verify backup sighting mark capability during inflight IMU alignments (P52).

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION: A digital simulation of the inflight alignment program P52 was made using the REFSMMAT option. The lunar surface sighting technique was selected to perform the fine align star sightings and the ROD switch was activated to perform the cursor and spiral marks.

RESULTS: The sighting data test NOUN 05 = .00. The final alignment accuracy was less than .01 degrees on each axis.



# SIMULATION REPORT

Test # E16

NAME: Donald Millard

DATE: 19 January 1971

PROGRAM/REV: Lum. 202

PCR/~~AXE/ANOMALY~~: 1044

PURPOSE: Show that the cursor and spiral measurements taken during lunar surface alignments can be taken in the order spiral and cursor.

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION: A digital simulation of the lunar surface alignment program P57 was made when the star sighting measurements were taken in the order Spiral and Cursor. A time delay of 20 minutes was allowed between Spiral and Cursor marks.

## RESULTS:

The sighting data test NOUN 05 = 00. The final alignment accuracy was within .02 degrees on each axis.

# SIMULATION REPORT

Test # E17

NAME: Craig Work

DATE: 5 January 1971

PROGRAM/REV: Lum. 178 with ~~NON/ACC/ANNON/ACC~~ PCN 1059  
change cards (test 15)

PURPOSE: Verify that V37 no longer deletes executions of 1/ACCS.

MISSION PHASE: LM PGNC

PROGRAMS USED: P00, R03, P63

TEST DESCRIPTION: Astronaut does P00, R03, enters P63. When V99 flashes prior to IGNITION, Descent Engine Arm is turned off. Response to flashing V97 is V 34 E, response to V57 is 00 E. This ends part A.

In part B, R03 specifies CSM-docked configuration. Another R03 immediately re-specifies LM-alone, but the response to V06 N47 is V37 E 00E.

RESULTS: In each case, Lum 178 deleted the 1/ACCS execution which would update the DAP, TEST15 retained the 1/ACCS execution.

In part A, LUM 178 retained the powered flight deadband after the failed ignition attempt, but TEST15 returned to the pre-burn deadband, (0.3°). In part B, LUM 178 retained 1JACC values for docked case, but TEST15 recomputed them for LM-alone.

# SIMULATION REPORT

Test # E18

NAME: Pat White

DATE: 16 November 1970

PROGRAM/REV: Lum. 185

PCR/~~XXXXXX~~ 1066

PURPOSE: Display N81 during all passes of P34, P35, P74 and P75. Eliminate N59 display in above programs - but leave calculations for N59 call.

MISSION PHASE: Level 3 Luminary 1E

PROGRAMS USED: P34

## TEST DESCRIPTION:

P34 test with recycle at first Noun 45, proceed at second Noun 45. Noun 59 call to prove that calculations are still performed.

Tests of P35, P74 and P75 since the changes made were all within a subroutine used by these programs as well as P34.

1

## RESULTS:

N81 displays at both passes.

N59 not displayed on either pass - but was available upon call.

# SIMULATION REPORT

Test # E19

NAME: Craig Work

DATE: 1 December 1970

PROGRAM/REV: Lum. 178 with ~~XXXXXXXXXXXX~~: PCN 1070  
change cards (TEST 15)

PURPOSE: Verify correct re-initialization of FDAI needles after DAP "off".

MISSION PHASE: LM active, any phase

PROGRAMS USED: N/A

TEST DESCRIPTION: DAP is turned on and initialized. Mode Select Switch is turned to "off" for 5 sec., then back to "Auto". The FDAI Attitude Error computation initialization is "CLOCK"ed to verify that the initialization is triggered by this sequence of events. In particular, the IMU error counter is re-initialized.

## RESULTS:

Completely satisfactory, 16 October 1970.

TEST15 exactly duplicates LUM 178 (LUM 1D) in this coding. A single patch exactly represents the coding change, now implemented in LUM 185.

# SIMULATION REPORT

Test # E20

NAME: Sharon Albert

DATE: 15 December 1970

PROGRAM/REV: Lum. 197 PCR/ACB/ANOMALY: 1079

PURPOSE:

MISSION PHASE: NA

PROGRAMS USED: All callable via V37

## TEST DESCRIPTION:

This is a standard downlink test which runs thru the sequence of V37-callable programs so that a complete downlist is sent for each one. An ELOAD is done to give arbitrary value ALMCADR, +1. Successive downlists were checked to see that the proper locations were loaded.

## RESULTS:

All values appeared correctly on the downlists to which they had been assigned.

# SIMULATION REPORT

Test # E21.

NAME: Virginia Dunbar

DATE: 19 January 1971

PROGRAM/REV: Lum. 195 PCR/~~ACEXANOMAXXX~~ 1082

PURPOSE: To test ephemeris constants for 1971-1972.

MISSION PHASE: Rendezvous

PROGRAMS USED: P20-R05

TEST DESCRIPTION: Ran R05 to test alignment.

RESULTS: Run and edit indicate good results.

# SIMULATION REPORT

Test # E22

NAME: Sumner Rosenberg

DATE: 15 December 1970

PROGRAM/REV: Lum. 195 PCR/~~XXXXXX~~ 1091

PURPOSE: Priority display light on DSKY.

MISSION PHASE:

PROGRAMS USED: P20, P34

TEST DESCRIPTION: Turn on P20, then P34, make DSKY busy and have a PRIO. display come up. See if PRIO light is lit.

Also do extended verbs during P20, restart when light is on, should turn it off (momentarily).

RESULTS: OK as tested.

# SIMULATION REPORT

Test # E23

NAME: Virginia Dunbar

DATE: 19 January 1971

PROGRAM/REV: Lum. 195/208 PCR/~~ACB/ANOMALY~~ 1091

PURPOSE: To test turning on of DSKY light for priority display - P20 running.

MISSION PHASE: Rendezvous

PROGRAMS USED: P20, R05

## TEST DESCRIPTION:

195: Ran P20 and selected R05 - Trace setting of key release light in connection with priority displays.

208: V21 N01E 1035E 40001: sets priority lamp error reset: stays on, V36E: goes out.

RESULTS: DSKY light performs in accordance with PCR 1091.



# SIMULATION REPORT

Test # 83

NAME: D. Millard

DATE: 7 December 1970

PROGRAM/REV: Lum. 195 PCR/~~ACE/ANOMALY~~: 1093

PURPOSE: Verify that TEPHEM is not constrained to a particular ephemeris year.

MISSION PHASE: All

PROGRAMS USED: P52

## TEST DESCRIPTION:

A digital simulation was run of the inflight alignment programs P51 and P52. The star selection and solar ephemeris routine were exercised using an environment ephemeris files for the period 1972-1973.

## RESULTS:

The sighting errors were less than .01 deg.

The final alignment errors were

OG = .004 IG = .013 MG = .007

The error in AGC computed SUN vector was  $.025^{\circ}$ .

# SIMULATION REPORT

Test # E24

NAME: Craig Work

DATE: 1 December 1970

PROGRAM/REV: Lum. 178 with ~~PCN/AEB/ANOM/XXX~~ PCN 1095  
change cards (TEST15)

PURPOSE:

MISSION PHASE: Powered flight, LM

PROGRAMS USED: P63

TEST DESCRIPTION: In P63, a manual yaw is performed with X-axis override inhibited, then a manual roll is executed (pitch would show the same result). The ACA is returned to detent, and the Mode Select switch is moved from ATTITUDE HOLD to AUTO before the DAP manual mode is closed out (0.5 sec). Auto guidance maneuvers back, but a large, rapid spurious yaw occurs when X-axis override is re-enabled (P66).

RESULTS: The spurious yaw appears in LUM 178, but not in TEST15 001. The correction was coded into TEST15 001 and works satisfactorily. Plots and simulation printouts, edits were sent to R. Nobles.

# SIMULATION REPORT

Test # E25

NAME: Sumner Rosenberg

DATE: 15 December 1970

PROGRAM/REV: Lum. 195 PCR/~~ACE/ANOMALY~~ 1097.2

PURPOSE: N26/PRI w/o does not allow V30, V31

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION: Load N26/PRI w/ 00000. Then do V30 N26, see that OP ERROR comes up. Then load N26/PRI w/ meaningful values, see that V30 N26 is allowed.

RESULTS: OK as tested.

# SIMULATION REPORT

Test # E26

NAME: Sumner Rosenberg

DATE: 15 December 1970

PROGRAM/REV: Lum. 195 PCR/~~ACB, ANOMALY~~ 1100

PURPOSE: Delete setting of NODOFLAG in R47.

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION: Do V47 -.cause restart. Try V37E XXE, see that no alarms come up. Also do V37 w/o restart, see that no alarms come up.

RESULTS: OK as tested.

# SIMULATION REPORT

Test # E27

NAME: Craig Work

DATE: 15 January 1971

PROGRAM/REV: Lum. 1E PCR/~~XXXX/XXXX/XXXX~~ 1134, 1111

PURPOSE: Backup GUID CTRL switch; provide "No Control" DSKY light.

MISSION PHASE: LGC active.

PROGRAMS USED: LUMINARY 202

TEST DESCRIPTION: This test was described and evaluated as a level 3 test in a simulation report which was dated 7 Jan. 1971. A flaw in the environment simulation prevented the run from testing the DAP control after the AGS-to-PGNCS control transfer during a P40 burn. With a successful rollback, that aspect has been simulated and the test qualifies for level 4.

RESULTS: Our simulation exerts no control at all during the AGS period, but the DAP recovered control immediately on return to PGNCs, and the burn terminated with V16 N85 residuals of (0, .4, 0) fps.

# SIMULATION REPORT

Test #E28

NAME: Walter Bernikowich

DATE: 23 December 1970

PROGRAM/REV: Lum. 202 PCR/~~ACB/ANOMALY~~ 1107

PURPOSE: LEV. 3 TEST

MISSION PHASE: APS Abort Stage from Descent

PROGRAMS USED: P00, R03, R05, P63, P71, P00

## TEST DESCRIPTION:

1. Use V11N1 to show CHANBKUP is zero.
2. Change CHANBKUP to 11g via V21N1.
3. Monitor CHANBKUP via V11N1 to show the update was inserted into the proper location.
4. Run Basic Traces on P71NOW? thru P71A +1, and P71 thru P71A +1. Dump CHANBKUP in P63 and P71.
5. Turn on Ch. 30 Bit 4 (0) at T = 391482.144.  
Observe Ch. 30 Bit 4 ignored - no abort, still in P63.
6. Request APS Abort via V37E71E and perform manually DPS ENGINE shutdown, DPS Staging, and APS ignition. Observe P71 program. Monitor descent to orbit injection.

~~RESULTS~~

RESULTS: All parts of test completed satisfactorily.

Ran ITRACE on INJTARG thru STORPARM and DUMPed FLAGWRD9 at UPTHROT - thereby verified J1, K1 abort target selection.

# SIMULATION REPORT

Test # E29

NAME: Walter Bernikowich

DATE: 24 December 1970

PROGRAM/REV: Lum. 202 PCR/~~ASR/AXOMALXX~~ 1107

PURPOSE: Level 3 Test

MISSION PHASE: DPS Aborts from Descent

PROGRAMS USED: P00, R03, R05, P63, P70, P00

## TEST DESCRIPTION:

1. Use V11N1 to show CHANBKUP is zero.
2. Change CHANBKUP to 11<sub>g</sub> via V21N1.
3. Monitor CHANBKUP via V11N1 to show the update was inserted into the proper location.
4. Run Basic Traces on P71NOW? thru P71A +1, and P70 thru P71A +1. Dump CHANBKUP in P63 and P70.
5. Turn on Ch. 30 Bit 1 (0) at T = 391479.00. Observe Ch. 30 Bit 1 ignored - no abort occurs.
6. Push the ABORT button - action ignored; no abort.
7. Request abort via V37E70E. Observe DPS Abort and monitor the ascent to orbit insertion.

~~RESULTS~~

RESULTS: All parts of test completed satisfactorily.

Ran ITRACE on INJTARG thru STORPARM; DUMPed FLAGWRD9 at UPTHROT - verified J1, K1 abort target selection.

# SIMULATION REPORT

Test # E30  
E31

NAME: Sharon Albert

DATE: 20 December 1970

PROGRAM/REV: Lum. 202 PCR/~~XXXXXXXXXXXX~~ 1107  
1109

PURPOSE: Test CHANBKUP logic.

MISSION PHASE: Landing, Ascent

PROGRAMS USED: P63, 64, 66, P70

TEST DESCRIPTION: V61 was patched so that it wrote into Chan 30, setting it to 36321: Auto throttle Failure (Bit 5) and P71 Abort Stage Signal received (Bit 4). V62 was patched to write 36310 into Chan 30: P70 abort signal has been produced (Bit 1). Immediately after doing V62 E the Astronaut pushes ABORTSTG. The downlink edit was run for the interval when the Astronaut keyed in V61 and V62 to see that Chan 30 did change.

RESULTS: Setting of BIT 5 in Chan 30 did not produce Auto Throttle Failure. Setting of BITS 1, 4 did not trigger their respective aborts. An abort with the ascent stage was done when the Astronaut pushed ABORTSTG; instead of the descent stage abort - whose bit had concurrently been set thru V62. CHANBKUP is working as expected in avoiding the consequences of a bit failure in CHAN 30.



# SIMULATION REPORT

Test # E32

NAME: Sharon Albert

DATE: 28 December 1970

PROGRAM/REV: Lum. 202      PCR/ACB/ANOMALY: 1110

PURPOSE: Test CHANBKUP logic.

MISSION PHASE: Landing

PROGRAMS USED: P63, P64, P66

TEST DESCRIPTION: Astronaut does DISPLAY INTERTIAL DATA OFF  
(to set Chan 30 Bit 6), and then ON again 10 seconds later.

RESULTS: R10 edit showed no effects from inbit setting and resetting.

# SIMULATION REPORT

Test # E33

NAME: Virginia Dunbar

DATE: 19 January 1971

PROGRAM/REV: Lum. 203 PCR/ACB/ANOMALY: 1117.2

PURPOSE: To show POODOO perform's BAILOUT logic when extended verb active, POODOO logic when no extended verb.

MISSION PHASE: Rendezvous

PROGRAMS USED: P20, R31

TEST DESCRIPTION: Select P20, select R31. Transfer control to POODOO, P20 still running, R31 lost no flashing V37. Transfer control to POODOO. At this point flashing V37, answer by reselecting P20.

RESULTS: Results are consistent with desired change.

# SIMULATION REPORT

Test # E34

NAME: Sharon Albert

DATE: 15 December 1970

PROGRAM/REV: Lum. 197

PCR/ACB/ANOMALY: 1121

PURPOSE:

MISSION PHASE: NA

PROGRAMS USED: All calleable via V37.

TEST DESCRIPTION: This is a standard downlink test which runs thru the sequence of V37-calleable programs so that a complete downlist is sent for each one. An ELOAD is done to give arbitrary value to CH5MASK, CH6MASK. Successive downlists were checked to see that the proper locations were loaded.

RESULTS: Values appeared correctly on the downlists to which it had been assigned.

## SIMULATION REPORT

Test # E35

NAME: Bruce McCoy

DATE: December 1970

PROGRAM/REV: Lum. 208

PCR/~~ACB/ANOMALXX~~ 1122

PURPOSE: Verify operation of "No Control" light.

MISSION PHASE: All

PROGRAMS USED: P00

## TEST DESCRIPTION:

Verify: ACTIONLamp (initially off)

Attitude Hold

OFF

V76E

ON

Error reset

ON

Auto

OFF

Modecont: off

ON

Modecont: Attitude Hold

ON

V36E

OFF/ON-15SEC/OFF

V76E

ON

V69E

OFF/ON

~~RESULTS~~

V37E00E

ON

V77E

OFF

V35E

ON/OFF

V69E

ON/OFF

RESULTS: All lamp conditions verified.

# SIMULATION REPORT

Test # E36

NAME: Virginia Dunbar

DATE: 19 January 1971

PROGRAM/REV: Lum. 202 PCR/~~XXXXXXXXXXXX~~ 1124

PURPOSE: Show P20 reselectable after POODOO.

MISSION PHASE: Rendezvous

PROGRAMS USED: P20, P30

TEST DESCRIPTION: Select P20, select P30 after V06N81, transfer control to POODOO. When V37 flashed, P20 is reselected. P20 continues to run, P30 is lost.

RESULTS: The results are consistent with change requested by PCR.

SIMULATION REPORT

Test # E37

NAME: Bruce McCoy

DATE: 25 January 1971

PROGRAM/REV: Lum. 208

PCR/~~ACE/ANOMALY~~ 1127

PURPOSE: Test CHANBKUP implementation in R03.

MISSION PHASE: All

PROGRAMS USED: N/A

TEST DESCRIPTION:

3748

Preload CHANBKUP = 77777

V48E

V06N46 display

R2 = 77777

V22E

V1N1E 374E

R1 = 00000

V21E 52525E Key Release

V06N46

RESULTS:

R2 = 52525E

Consistent with PCR requirements.

## SIMULATION REPORT

Test # E38

NAME: Sharon Albert

DATE: 15 December 1970

PROGRAM/REV: Lum. 197

PCR/ACB/ANOMALY: 1127

PURPOSE:

MISSION PHASE: NA

PROGRAMS USED: All calleable via V37.

TEST DESCRIPTION: This is a standard downlink test which runs thru the sequence of V37-calleable programs so that a complete downlist is sent for each one. An ELOAD is done to give arbitrary value to CHANBKUP. Successive downlists were checked to see that the proper location was loaded.

RESULTS: Value appeared correctly on the downlists to which it had been assigned.

# SIMULATION REPORT

Test # E39

NAME: Craig Work

DATE: 17 December 1970

PROGRAM/REV: Lum. 202 PCR/~~ACE/ANOMALY~~ 1129

PURPOSE: Verify correctness of new 1/ACCS constants for APOLLO 15.

MISSION PHASE: Descent LM.

PROGRAMS USED: 1/ACCS

TEST DESCRIPTION: The new constants proposed in PCR 1129 were patched into LUM 202. 1/ACCS was exercised for masses going from 36694 lbm to 14762 lbm, at about 4 steps per 1000 lbm. The hinge-pin to c. g. outputs and the 1JACCS from 1/ACCS were dumped and listed. Then the actual X coordinates for the c. g. and the actual principal inertia implied by the 1/ACCS outputs were calculated and printed for comparison with the SODB APOLLO 15 data.

RESULTS: Largest disagreement between implicit values and SODB was 1.4%. The SODB inertia values are guaranteed only to a 10% accuracy, so the fit is excellent.



# SIMULATION REPORT

Test # E40

NAME: Craig Work

DATE: 5 January 1971

PROGRAM/REV: Lum. 203, 205      PCR/ACB/ANOMALY: PCR 1129  
PCN 1133

PURPOSE: Verify proper utilization of new mass limits.

MISSION PHASE: LM PGNCs

PROGRAMS USED: NA

TEST DESCRIPTION: 1/ACCS was exercised on LUM 203, producing the same values generated when new constants were patched into LUM 202, verifying the constants assembled into 203. Then new mass limits were patched into 203, and same run was executed. Then 1/ACCS was again exercised, this time on LUM 205, generating the same values seen in the preceding run. Digital Simulation Job #s B104886, B105624, B102839.

RESULTS: 1/ACCS constants and the new mass limits are correctly used in LUM 205.

Proper use of lower limit on LM descent mass in R03 was verified by Peter Weissman, in a hybrid run on LUM 205.

## SIMULATION REPORT

Test # E41

NAME: Craig Work

DATE: 7 January 1971

PROGRAM/REV: Lum. 203, 205 PCR/~~ACC/ANOMALY~~ 1129, 1133

PURPOSE: Verify new mass limits and 1/ACCS constants for LUM 1E.

MISSION PHASE: Descent LM

PROGRAMS USED: N/A

TEST DESCRIPTION: Run on LUM 203 generated L, PVT-CG and 1JACC values. The C.G. X-coordinates and the inertias implied by those 1JACC and L, PVT-CG values agreed excellently with the SODB data over the nominal range of masses (max disagreement less than 1.4%). Run on LUM 205, combined with Peter Weissman's hybrid run on LUM 2 showed the new mass limits to be used properly in R03 and in 1/ACCS.

RESULTS: The PCRs are correctly implemented. This simulation report combines, supercedes, and obsoletes the report of 17 December 1970 on PCR 1129 and the report of 5 January 1971 on PCRs 1129 and 1133.

# SIMULATION REPORT

Test #E42

NAME: Craig Work

DATE: 7 January 1971

PROGRAM/REV: Lum. 202 PCR/~~AOB/ANOMALY~~: 1134

PURPOSE: Backup GUID CNTRL switch; provide "No Control" DSKY light.

MISSION PHASE: LGC active.

PROGRAMS USED: N/A

TEST DESCRIPTION: Full descent LM P40 burn. P-axis minimum impulse activity, then switch GUID CNTRL from PGNCS to AGS then switch back. P30, P40, ignition, throttle-up to full thrust. Switch GUID CNTRL from PGNCS to AGS, then switch back. The DSKY "No Control" light was requested on by the DAP when the Mode Select Switch was "OFF" and also when the minimum impulse mode prevailed. The "No Control" light was requested off during the rest of the run, including the AGS periods. The DAP continued to run during the AGS periods and re-initialized immediately after the transfers from AGS to PGNCS. FINDCDUW continued to issue guidance commands during the powered flight AGS period.

RESULTS: All aspects of PCR 1134 were successfully tested.

# SIMULATION REPORT

Test # E79

NAME: Bruce McCoy

DATE: 12 February 1971

PROGRAM/REV: Lum. 209

~~XXX~~/ANOMALY:

PURPOSE: Test resetting of FLRCS flag in P12.

MISSION PHASE: Ascent from Lunar Surface

PROGRAMS USED: P12

## TEST DESCRIPTION:

Set flag prior to calling P12. Itrace clearing of this flag.

## RESULTS:

Flag was cleared and ascent into orbit was successful.

# SIMULATION REPORT

Test # E43

NAME: Craig Work

DATE: 1 December 1970

PROGRAM/REV: Lum. 178 with ~~PERXCE~~/ANOMALY: L-1D-01  
change cards (TEST15)

PURPOSE:

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION: See Test #E19

RESULTS:

# SIMULATION REPORT

Test # E44

NAME: Virginia Dunbar

DATE: 30 November 1970

PROGRAM/REV: Lum. 184 ~~PERXAE~~/ANOMALY: L-1D-04

PURPOSE: To demonstrate correction in range check during P25 operation.

MISSION PHASE: Rendezvous

PROGRAMS USED: P25

TEST DESCRIPTION: Ran P25 with a trace of the area which checks setting of rendezvous flag during range check in LPS20.1.

RESULTS: Range check in P25 is performed as specified.

# SIMULATION REPORT

Test # E45

NAME: David Moore

DATE: 18 December 1970

PROGRAM/REV: Lum. 200 ~~REXX/XXX~~/ANOMALY: L-1D-06

PURPOSE: DVTOTAL incremented twice in 1 Servicer recycle.

MISSION PHASE: Lunar Landing

PROGRAMS USED: P63-P64 (Servicer-R12)

TEST DESCRIPTION: Trace coding where DVTEMP is kept for DVTOTAL in case of restarts. Cause restarts both before Restart location (TC QUICKFLAG) and after the restart location. Note whether DVTOTAL incremented after restarts.

RESULTS: DVTEMP put back into DVTOTAL after restarts; both before and after restart location.  
This anomaly test complete.

# SIMULATION REPORT

Test # E46

NAME: Craig Work

DATE: 1 December 1970

PROGRAM/REV: Lum. 178 with ~~PERXACE~~/ANOMALY: L-1D-07  
changes (TEST15)

PURPOSE:

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION: See Test.#E24

RESULTS:



# SIMULATION REPORT

Test #

NAME: P. Volante

DATE: 17 January 1971

PROGRAM/REV: Lum. 194 ~~PER/XXX~~/ANOMALY: L-1D-08

PURPOSE: Verify anomaly repair.

MISSION PHASE: Rendezvous

PROGRAMS USED: P20

## TEST DESCRIPTION:

Run P20 in No Update Mode - V95 keyed in. Check erasable LRWH1 in E-memory dump at end of run.

## RESULTS:

LRWH1 is unchanged at end of run from pad-load value - anomaly repair is verified.

# SIMULATION REPORT

Test # E47

NAME: Craig Work

DATE: 5 January 1971

PROGRAM/REV: Lum. 178 with ~~PER/ACP~~ ANOMALY: L-1D-10  
change cards (TEST 15)

PURPOSE:

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION: See Test #E17

RESULTS:

# SIMULATION REPORT

Test # E48

NAME: David H. Moore

DATE: 15 December 1970

PROGRAM/REV: Lum. 200 ~~XXXXXX~~ ANOMALY: L-1D-14

PURPOSE: Set Flagword 5 Bit 12 for impulsive burn.

MISSION PHASE: APS Impulse Burn

PROGRAMS USED: P30-P42

## TEST DESCRIPTION:

Use APS impulse burn targets as for SPECAPS (level 6 1D).  
Trace NOTHRBIT (Flag 5 Bit 12) to see if set for this  
impulsive burn.  
Digital test run for above description.

## RESULTS:

Flag 5 Bit 12 seen to be set for this impulse burn thru direct  
LGC coding trace.  
The Level 3 test for L-1D-14 is completed.

# SIMULATION REPORT

Test # E49

NAME: Virginia Dunbar

DATE: 19 January 1971

PROGRAM/REV: Lum. 202 ~~PER/XXX~~/ANOMALY: L-1D-15

PURPOSE:

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION: See Test #E36

RESULTS:

SIMULATION REPORT

Test # E50

NAME: Bruce McCoy

DATE: 12 January 1971

PROGRAM/REV: Lum. 207 ~~PCP/ACE~~ ANOMALY: L-1D-16

PURPOSE: Check proper loading of "VINJNOM"

MISSION PHASE: Ascent targetting

PROGRAMS USED: P12

TEST DESCRIPTION:

Observe R1 of N76 to be +5509.5 fps

RESULTS:

R1 was +5509.5 fps

# SIMULATION REPORT

Test # E51

NAME: Pete Volante

DATE: 17 January 1971

PROGRAM/REV: Lum. 208

~~PER/ASE~~/ANOMALY: L-1D-17

PURPOSE: Verify Anomaly Repair

MISSION PHASE: Lunar Surface

PROGRAMS USED: P22

TEST DESCRIPTION: Select P22 with range > 400 N.M. - observe V16N54 display, RR predesignate, lock-on and tracking, and look for flashing V37 after CSM leaves Mode II limits.

RESULTS: All phases of test worked properly except V37 flash does not occur - due to incorrect anomaly repair.

# SIMULATION REPORT

Test # E52

NAME: Pete Volante

DATE: 17 January 1971

PROGRAM/REV: Lum. 208 ~~PER/XXX~~/ANOMALY: L-1D-18

PURPOSE: Verify repair of Anomaly L-1D-18.

MISSION PHASE: Lunar Surface

PROGRAMS USED: P22

TEST DESCRIPTION: Select P22 and bypass check for data good during R21 so that R21 commands RR antenna into Mode II limits as CSM moves away from landing site. Verify that no RR antenna oscillation occurs after antenna is repositioned.

RESULTS: Test performed as expected.

# SIMULATION REPORT

Test #E53

NAME: Pete Volante

DATE: 17 January 1971

PROGRAM/REV: Lum. 207 ~~PCR/AGP~~ ANOMALY: L-1D-19  
~~XXXXXX~~

PURPOSE: Verify anomaly repair.

MISSION PHASE: Rendezvous

PROGRAMS USED: P20

TEST DESCRIPTION: Nominal P20 run with restarts at various points  
in R22 and R65 - watch for spurious calls to R60.

RESULTS: 9 restarts occurred with no calls to R60 - anomaly repair  
verified.



# SIMULATION REPORT

Test # E81

NAME: B. McCoy

DATE: 8 February 1971

PROGRAM/REV: Lum. 209 ~~PER/ACC~~/ANOMALY: L-1D-21

PURPOSE: Test the coding that removes the RR Error Counter Enable in P22.

MISSION PHASE: Lunar Surface Navigation

PROGRAMS USED: P22

## TEST DESCRIPTION:

All Digital Simulation. (same one which uncovered anomaly)  
Turn on Rendezvous Radar  
When reposition begins, select P22.

## RESULTS:

Verify reposition finishes properly and P22 designates to LOS  
and tracks successfully.

## SIMULATION REPORT

Test # E 80

NAME: Sharon Albert

DATE: 12 February 1971

PROGRAM/REV: Lum. 209 ~~FOR/NOB~~ ANOMALY: L-1D-23

PURPOSE: Verify coding reduces yaw at end of P64 maneuver by observing (1) guidance frame created only during desired time window (2) correct index is always  
MISSION PHASE: selected & frame correctly erected (also after restarts).

Landing

PROGRAMS USED: P63, P64, P66

### TEST DESCRIPTION:

- (1) Simulation done with time windows for guidance frame erection shortened (this involved overriding the erasables TCG1BRAK, TCGFBRAK, TCG1APPR, TC6FAPP2). Coding traces were used to check for guidance frame erection.
- (2) A rollback was done on a simulation with the regular erasables; i. e. guidance frame erection always. Restarts and coding traces were added at appropriate points.

### RESULTS:

By using WCHPHOLD instead of WCHPHASE, selection of wrong criteria for guidance frame erection is avoided.

Corrected indices are reselected after restarts.

# SIMULATION REPORT

Test #E54

NAME: Bruce McCoy

DATE: 26 January 1971

PROGRAM/REV: Lum. 209

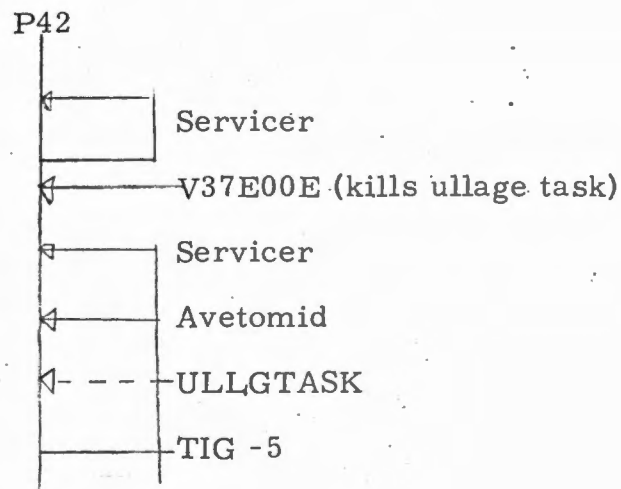
~~FOR/ACE~~ ANOMALY: L-1D-25

PURPOSE: Test that V37 kills ullage task if average G on.

MISSION PHASE: Powered flite

PROGRAMS USED: P40, 42, 63

## TEST DESCRIPTION:



## RESULTS:

Ullage task did not occur even though TIG -5 task did.  
Consider this test verifies anomaly fix.

SIMULATION REPORT

Test # E55

NAME: Sharon Albert

DATE: 18 December 1970

PROGRAM/REV: Lum. 202

PCR/ACB/ANOMALY: L-28

PURPOSE: See below.

MISSION PHASE: Landing

PROGRAMS USED: P63, P64

TEST DESCRIPTION:

Remove LRPOS init. from P63: Trace from P63SPOT4 to see that coding has been deleted.

RESULTS: Deletion was coded correctly.

# SIMULATION REPORT

Test #E56

NAME: David Moore

DATE: 18 December 1970

PROGRAM/REV: Lum. 200 ~~XXX/ACB/ANOMALY~~ L29

PURPOSE: Change 2 lines code at MOONSPOT & MOONSPOT +1; TC DMP

MISSION PHASE: Lunar Landing

PROGRAMS USED: P63-P64 (R12-Servicer)

## TEST DESCRIPTION:

Trace coding where TCDMP; ADRES KPIP1 coding is.  
Make sure KPIP1 gets back low and high order words in to  
make precision good. KPIP1 is a double-precision word, constant,  
to get final value of DVTOTAL for DISPLAYS. The error encountered  
is .3% relative if only high order word is used.

## RESULTS:

Luminary Memo #166 discussed precision problem and  
recommended action described in L29. Coding implemented  
and tested.

This ACB test is complete.

# SIMULATION REPORT

Test # E57

NAME: David Moore

DATE: 18 December 1970

PROGRAM/REV: Lum. 200 ~~PCR/ACB/ANOMALY~~ L30

PURPOSE: Move MOONSPOT to TCTMPTOSPT position.

MISSION PHASE: Lunar Landing

PROGRAMS USED: P63-P64 (Servicer-R12)

## TEST DESCRIPTION:

Put trace on MOONSPOT location in listing; see that instruction is implemented as desired. Look at listing and see MOONSPOT tag in right place.

## RESULTS:

The trace showed a TC TMPTOSPT instruction implemented as desired.

This ACB test is completed.

# SIMULATION REPORT

Test # E58

NAME: Sumner Rosenberg

DATE: 18 December 1970

PROGRAM/REV: Lum. 190 ~~PCR/ACB/ANOMALY~~ L31  
~~XXX/ACB/XXXXXXXX~~

PURPOSE: Downlink = list to reference downlink erasables not referenced directly.

MISSION PHASE:

PROGRAMS USED:

## TEST DESCRIPTION:

Eyeball lists (They have absolutely no effect on AGC code).

## RESULTS:

OK.

# SIMULATION REPORT

Test #E59

NAME: Sumner Rosenberg

DATE: 15 December 1970

PROGRAM/REV: Lum. 190 ~~PCB/ACB/ANOMALXX~~ L32

PURPOSE: Check = list to keep erasables in specific relative locations.

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION:

Eyeball lists.

RESULTS:

OK.

This has no effect on AGC code.



# SIMULATION REPORT

Test #E60

NAME: Craig Work

DATE: 8 January 1971

PROGRAM/REV: Lum. 202 ~~XXX~~/ACB/~~ANOMALXXX~~ L-33

PURPOSE: Verify new TRAP values loaded in FRESH START.

MISSION PHASE: LM active.

PROGRAMS USED: NA

## TEST DESCRIPTION:

After completing test on PCR 1134, the terminal dump of LGC memory was examined to verify that the new value of the TRAP was being used, not the old value.

## RESULTS:

Satisfactory

## SIMULATION REPORT

Test # E61

NAME: Walter Bernikowich

DATE: 30 September 1970

PROGRAM/REV: Lum. 181 ~~ACB/ANOMALXX~~ L-34

PURPOSE: Level 4 test in checking erasable movement

MISSION PHASE: Abort/Abort Stage from Descent (J2K2 Targets).

PROGRAMS USED: P00, P63, P64, P70, P71, P00, P20, P34

### TEST DESCRIPTION:

1. Descent to 7000 feet altitude with V57 used.
2. Lem Abort button pushed.
3. Display N76, N77, N85 in ascent.
4. Abort Stage button pushed upon DPS depletion (V97).
5. Display N76, N77, N85 at various times in the ascent.
6. Monitor N63 and N85 after APS engine cut off.
7. Select P00, then P20, and P34.
8. At UPTHROT dump FLAGWRD9, and ITRACE on INJTARG - verify J2K2 target parameter selection.

### RESULTS:

All parts of test completed satisfactorily.  
Ran with 10% TLOSS, 22 downrupts were lost.  
Obtained and analyzed edits, plots, and the downlink edit.

## SIMULATION REPORT

Test # E62

NAME: Walter Bernikowich

DATE: 17 October 1970

PROGRAM/REV: Lum. 183 ~~PER~~/ACB/~~ANOMALY~~ L-34

PURPOSE: Level 4 Test in checking erasable movement.

MISSION PHASE: Abort/Abort Stage from Descent (J2K2)

PROGRAMS USED: P00, P63, P64, P70, P71, P00, P20, P34

### TEST DESCRIPTION:

1. At 7000 feet altitude, abort (P70).
2. Request DSKY display of N76, N77, N85.
3. Anticipate V97, then Abort Stage (P71).
4. Monitor N76, N77, N85 values.
5. Check injection conditions: N63, N85.
6. Request P00, then select P20, and P34.
7. Dump FLAGWRD9 at UPTHROT and ITRACE on INJTARG - verify that J2K2 parameters were chosen.

### RESULTS:

All parts of test completed satisfactorily.  
Ran with 10% TLOSS, 13 downrupts were lost.  
Analyzed edits, plots, and the downlink edit.

SIMULATION REPORT

Test # E63

NAME: Sumner Rosenberg

DATE: 15 December 1970

PROGRAM/REV: Lum. 178,185 ~~ROK~~/ACB/~~ANOMALY~~ L34

PURPOSE: Redefine in ERAS Log Section those tags defined in other Log Section

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION:

    Eyeball to see that these tags are still occupying the same  
    erasable addresses.

RESULTS:

OK

# SIMULATION REPORT

Test # E64

NAME: Pat White

DATE: 23 November 1970

PROGRAM/REV: Lum. 181 ~~PCR/ACB/ANOMALXXX~~ L-34

PURPOSE: Level 4 test in check of erasable movement.

MISSION PHASE: Luminary 1E

PROGRAMS USED: P00, P25, P52, P20, P72, P76, P75, P73

## TEST DESCRIPTION:

Start of Level 4 CSM active rendezvous test to prove that P76 still operates successfully after erasables were moved. Also check P25.

## RESULTS:

OK. The Rendez edit (as well as the simulation) shows that P76 is operating correctly.

# SIMULATION REPORT

Test # E65

NAME: Pat White

DATE: 16 December 1970

PROGRAM/REV: Lum. 202 ~~PCR~~/ACB/~~ANOMALXX~~ L34

PURPOSE: Test erasable movement

MISSION PHASE: Luminary 1E

PROGRAMS USED: P00, P20, R05, R30, R31, R36, R47, V85

## TEST DESCRIPTION:

Use extended verb 85 and routines R05, R30, R31, R36 and R47 during P20 (range greater than 400 n. m.). Call V16 N54 at beginning and end of test to determine that it is correctly calculated.

## RESULTS:

Reasonable results based upon ENVSUM and R05 edit.

# SIMULATION REPORT

Test # E66

NAME: Pat White

DATE: 14 December 1970

PROGRAM/REV: Lum. 195 ~~PER~~/ACB/~~ANOMXXXX~~ L34

PURPOSE: Test erasable movement

MISSION PHASE: Luminary 1E

PROGRAMS USED: P68, P22, R05, R30, R31, R36, R47, V85

## TEST DESCRIPTION:

P22 with range greater than 400 n.m. was extended verb 85 and routines R05, R30, R31, R36 and R47 to prove that erasable changes have not caused errors. Call V16N54 at beginning and end of test to determine that it is correctly calculated.

## RESULTS:

Reasonable results based upon ENVSUM and R05 edit.

# SIMULATION REPORT

Test # E67

NAME: Donald Millard

DATE: 30 September 1970

PROGRAM/REV: Lum. 181 ~~FOR/ACB/ANOMALY~~: L-34

PURPOSE: Level 4 test to check erasable movement

MISSION PHASE: Lunar Surface Align

PROGRAMS USED: P57

## TEST DESCRIPTION:

## RESULTS:

Test satisfaction



# SIMULATION REPORT

Test # E68

NAME: Virginia Dunbar

DATE: 30 July 1970

PROGRAM/REV: Lum. 181 ~~FOR/ACB/ANOMALY~~ L-34

PURPOSE: Level 4 test to check erasable movement

MISSION PHASE: Lunar Surface Nav & Ascent

PROGRAMS USED: P22, P12

TEST DESCRIPTION:

RESULTS: Test satisfactory

# SIMULATION REPORT

Test # E69

NAME: Sharon Albert

DATE: 30 September 1970

PROGRAM/REV: Lum. 181 ~~PER/ACB/ANOMALY~~ L-34

PURPOSE: Level 4 test to check erasable movement.

MISSION PHASE: Landing

PROGRAMS USED: P63, P64, P66

## TEST DESCRIPTION:

## RESULTS:

Test satisfactory.

# SIMULATION REPORT

Test # E70

NAME: Sharon Albert

DATE: 18 December 1970

PROGRAM/REV: Lum. 202      ~~REX~~/ACB/~~ANOMALXX~~ L-35

PURPOSE: See below.

MISSION PHASE: Landing

PROGRAMS USED: P63, P64

## TEST DESCRIPTION:

ITrace after RE-IN66 to see that coding stores triple precision  
in OLDPIPAX.

## RESULTS:

Itrace showed that a TLOAD was being done into OLDPIPAX.

# SIMULATION REPORT

Test #E71

NAME: Pat White

DATE: 18 November 1970

PROGRAM/REV: Lum. 185 ~~FOR~~/ACB/~~ANOMALYX~~ L36

PURPOSE: Compare TMPOV & DELVLVC

MISSION PHASE: Lum 1E

PROGRAMS USED: P34

## TEST DESCRIPTION:

P34 level 3 test to compare erasable dump for locations  
TMPDV and DELVLVC

## RESULTS:

Identical.

## SIMULATION REPORT

Test # E72 .

NAME: Virginia Dunbar

DATE: 19 January 1971

PROGRAM/REV: Lum. 195 ~~RCR/ACB/ANOMALY~~ L-38

PURPOSE: Flag clean in V56

MISSION PHASE: Rendezvous

PROGRAMS USED: P20

### TEST DESCRIPTION:

Entered V56, when flashing V37 appeared reselected P20.  
Allowed P20 to run until lock-on and radar read complete,  
re-entered V56 and terminated P20.

### RESULTS:

Flag settings at both occurrences of V56 are in accordance  
with desired change.

SIMULATION REPORT

Test #E73

NAME: Sumner Rosenberg

DATE: 15 December 1970

PROGRAM/REV: Lum. 185 . ~~PER~~/ACB/~~ANOMALXX~~ L39

PURPOSE: Change a CADR to an ADRCS following a TC TWIDDLE in RADSAMP

MISSION PHASE:

PROGRAMS USED:

TEST DESCRIPTION: Eyeball.

RESULTS: OK.

# SIMULATION REPORT

Test # E74

NAME: Craig Work

DATE: 6 January 1971

PROGRAM/REV: Lum. 202 ~~PCR/ACB/ANONXXXX~~ L-41

PURPOSE: Verify 1/ACCS coding change.

MISSION PHASE: LM active

PROGRAMS USED: NA

TEST DESCRIPTION: Although the run was primarily used to check out PCR 1134, clocks in the SPSCONT coding show that QACCDOT and RACCDOT values have sign agreement with previous values, as far as this coding is concerned. This works for positive, negative and zero previous values. No reference to the gimbal drive channel is made.

## RESULTS:

Completely satisfactory and correct.

# SIMULATION REPORT

Test #E75

NAME: Sharon Albert

DATE: 18 December 1970

PROGRAM/REV: Lum. 202 ~~PCB/ACB/ANXXXXXX~~ L-43

PURPOSE: See below.

MISSION PHASE: Landing

PROGRAMS USED: P63, P64

## TEST DESCRIPTION:

Delay enabling of redesignator INHINT until PROCEED on V06N64:  
trace at STARTP64 and P64CEED to insure that INHINT coding  
has been moved.

## RESULTS:

Changes were coded correctly.



# SIMULATION REPORT

Test # E76

NAME: Sumner Rosenberg

DATE: 15 December 1970

PROGRAM/REV: Lum. 202 ~~PCR/ACB/ANOMALY~~ L-45

PURPOSE: Clear INTYPFLG prior to INTEGRVS call in P21 recycle option.

MISSION PHASE:

PROGRAMS USED: P21

## TEST DESCRIPTION:

Do V37E 21E, at N43 do V83E,  
at N54, proceed  
Get N43, do V32E.  
See that this procedure has no problems.

## RESULTS:

OK - completed with no alarms, etc.

# SIMULATION REPORT

Test # E77

NAME: Bruce McCoy

DATE: 20 January 1971

PROGRAM/REV: Lum. 208 ~~PCR/ACB/ANOMALY~~ L-46

PURPOSE: Verify INHINT instruction removed.

MISSION PHASE: Alignments

PROGRAMS USED: P52, 57

## TEST DESCRIPTION:

1. Visual inspection of coding in AOTMARK.
2. Any alignment (test of PCR 1044-rev 202).

RESULTS: Verified INHINT was removed correctly.

# SIMULATION REPORT

Test #E78

NAME: Craig Work

DATE: 6 January 1971

PROGRAM/REV: Lum. 202 ~~ROR/ACB/ANOMXXXX~~ L-47

PURPOSE: Verify new P-axis minimum impulse coding.

MISSION PHASE: LM PGNCs

PROGRAMS USED: NA

## TEST DESCRIPTION:

P-axis minimum impulse control was exercised by the astronaut. Response was satisfactory and correct for positive and for negative pulses.

## RESULTS:

Excellent.