R. Larson (MSC)

Mission Techniques Memo #30B

TO: Distribution
FROM: Malcolm W. Johnston
DATE: June 20, 1969
SUBJECT: "G" Lunar Surface Phase

1. The Sun, Earth, or Moon option of P57 does not work under some circumstances. See enclosed anomaly LNY #74 for an explanation and work-a-round procedures. (The procedures described on page 10 of the subject Mission Techniques Document avoid the above problems!).

2. What procedures should be used for sighting on large bodies - particularly on a crescent earth?

   Ans. The two points at which the terminator intersects the horizon should be used for these sightings - - two marks on each side, in any sequence!

3. In the event of a "comm" loss, the LM must determine liftoff time based on observations of the CM (when overhead etc.). How should this be done? (See page 21).

   Ans. When the track light goes out, in P22, call P00, then R04 and mark the time at which range rate reverses sign.

4. A technique for loading a new value of RLS into the CMC onboard is described in the enclosed Colossus Memo #180.

5. Enclosed Colossus Memo #182 by W. Ostanek describes some characteristics of the Surf flag.

6. A shock qualification test for the PGNCS is described in the attached note. Additional tests were conducted early this year to simulate docking shock levels of 50 G to 100 G's. No system degradation was noted in any of these tests.

7. On page 6, paragraph 3, the V76 procedure to avoid RCS jet firings should be accompanied by a mode control switch to attitude hold. (It should be in that position already).

8. A V89 (X-axis option) can be used by the CSM, when the surf flag is set, for acquiring the LM prior to ascent (to set up for subsequent manual tracking of the LM during ascent). The previously updated CMC post insertion permanent LM state will not be altered. Use of P20 would result in loss of this post insertion LM state.

9. The following comments summarize MIT's position on the "Notes" appearing in the Mission Techniques document. In most cases, when a GNCS (PGNCS)/MCC-H tolerance is specified, MIT can only indicate the expected contribution of the GNCS (PGNCS) to the total tolerance.

Notes A, B, E, and F

Comment - All O.K.!

Malcolm W. Johnston

Malcolm W. Johnston

MIT/IL SOFTWARE ANOMALY REPORT

SWR REPORT NO: LNY 74

1.1 ORIGINATOR:	1.2 ORGANIZATION:	1.3 DATE:	1.4 ORIGINATOR CONTROL NO.	PROGRAM: LUMINARY
D. Millard	MIT/IL	5/20/69		PROGRAM REVISION: 99

1.5 DESCRIPTION OF ANOMALY: In P57 a bad alignment will result in the following cases:
For alignment technique 2: If the star code is for Sun, Earth or Moon for both sightings.
If first body siglited is a star and the second body is Sun, Earth, or Moon.
For alignment technique 3: If the star code is for Sun, Earth or Moon.

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1.6 DESCRIPTION OF RUN:
Eye ball

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MIT ANALYSIS

2.1 CAUSE:
Erasable conflict when LOCSAM, i.e., LSPOS

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2.2 RECOGNITION:
Bad alignment

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2.3 MISSION EFFECT:
Unknown

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2.4 AVOIDANCE PROCEDURE: For alignment tech. 3: Use Planet code (00) and key in Sun or Earth vec. For alignment tech. 2: If sighting on star and sun or earth, specify Sun or Earth first. (This procedure being verified)

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2.5 RECOVERY PROCEDURE:
Redo alignment

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2.6 PROGRAM CORRECTION:
Re-assign LSPOS erasables

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2.7 RECOMMENDED DISPOSITION (Fix, Work-around, etc):
Fix in next LUM release

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2.8 RECOMMENDED RE-TESTING:
Retest the options cited in 1.5 above.

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2.9 MIT/IL SIGNATURE: James E. Lawrence — 2.10 DATE: 5/20/69

3.1 NASA DIRECTION:

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4.1 CLOSING ACTION TAKEN:
agreed on LUMINARY 1B.
James E. Lawrence

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3.2 NASA/MSC SIGNATURE:	3.3 ORGANIZATION	3.4 DATE:	4.2 SIGNATURE:	4.3 ORGANIZATION	4.4 DATE:

MSC Form 1409 (Rev May 68)

Massachusetts Institute of Technology
Instrumentation La
Cambridge, Massachusetts

COLOSSUS Memo # 180

TO: Distribution
FROM: Steve Copps SC 5/9/69
DATE: May 9, 1969
SUBJECT: Technique for Loading the Landing Site On Board

This memo describes two methods for changing the value of the landing site ($\underline{R}_{LS}$) in the CMC. The first method is to directly load the erasable locations and the second is to use P22 in an unorthodox way so as to load latitude, longitude/2, and altitude.

In the first method the astronaut would load locations 2025_8 through 2032_8 (Colossus 2 and 2A) (via V21 N01) with the desired numbers which may have been called over from the LM. The equivalent locations in the LGC are 2022_8 through 2027_8 (Luminary 1 and 1A).

In the second method the CMP may have gotten the data in engineering units. In this case he may load it as follows:

1. He must first record the contents of three erasable locations which are used in the W-matrix to weight the measurement. After recording them they must be set to zero. These locations are 2004_8 (WORBPOS), 2005_8 (WORBVEL), and 2006_8 (S22WSUBL).
2. Turn on P22 and at V05N70 load 10000 (known landmark whose coordinates are not stored) and PROCEED.
3. Load the new landing site data into V06N89 and PROCEED.
4. At V51 flash press MARK and then PROCEED (it makes no difference where the optics are pointing).

5. PROCEED through V05N71 R2 = 10000 and V06N89 (containing the new landing site coordinates).

6. PROCEED on V06N49. The ΔR and ΔV data will be zero because of step 1.

7. PROCEED on V06N89 (containing the new landing site coordinates). This will have the effect of storing the new landing site in $\underline{R}_{LS}$.

8. Replace the old values back into locations 2004, 2005, and 2006 (recorded in step 1).

To verify that this procedure has had the desired effect he may select option 4 of P52 and observe that the display of the landing site (V06N89) is correct.

Massachusetts Institute of Technology
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Cambridge, Massachusetts

COLOSSUS Memo # 182

TO: Distribution

FROM: W. Ostanek

DATE: May 21, 1969

SUBJECT: Notes on the Lunar Surface Flag (SURFFLAG) in Colossus 2A

1. SURFFLAG is set by keying in V44E and reset by keying in V45E.

2. Any extrapolation, using orbital integration, of the LM state vector when SURFFLAG is set results merely in the conversion of the landing site (RLS) to inertial coordinates of position and velocity at the desired (input) time.

3. When SURFFLAG is set:

    a. In P00 and in AVETOMID, the LM state vector is not integrated nor are the "permanent" LM state vector registers changed.

    b. In R31, base state vectors are not used for LM extrapolations.

    c. In P21, first computation for N43 on LM state vector is valid, re-cycles are not meaningful and may result in alarm 430.

    d. In P20, selection of P20 and mark processing cause the interial state vector to be written into the permanent LM state vector register.

LM Qualification Shock Environment

Shock. Shock tests shall be performed as follows using MIL-STD-810, Method 516.1 as a guide. Unless otherwise specified the shock level tolerance shall be +10 per cent and time duration tolerance +10 per cent. In the event that the shock test is conducted utilizing a vibration exciter and the tolerance limits specified above cannot be met, these limits may be broadened to account for the exciter dynamics; however, overshoot shall not exceed 75 per cent of the peak g value. Shock will be performed in the same configuration as vibration, except dummies may be substituted for airborne components for earth landing shock.

LM Lunar Landing and Flight Shock. The LM equipment shall be exposed to one shock along each plus and minus direction of each of three orthogonal axes (6 shocks). Shocks shall be:

a. Magnitude: 10g minimum
b. Duration: 15 to 20 millisecond
c. Shape: Terminal Peak Sawtooth
d. Condition: Operating

The LM equipment is considered qualified based on test results.

LM Qualification Test Information

Test Item	Test Report	Test Responsibility	Contact	Test Phase
LM Inertial Subsystem plus AC/NB, GAEC/NB, AOT and CCRD	TR's 1511-1, -2, -3, and -4 April 28, 1967	ACED	A. Wachholz	Vibration and shock
LM G&N Interconnect Harness Group	TR 1511-15 March 31, 1967	ACED	"	Vibration and shock
LM SCA	TR 1511-14 11 Oct. 1967	ACED	"	Vibration ahd Shock, ground temperature, acceleration, humidity
LM AOT and CCRD	KIC-AR-FR-1000 15 Feb. 1967	KIC	J. Fabroni	All Qualification Environments
Block II/LM Computer and DSKY	AQRT-SS-2	Raytheon	D. Claybrook	All qualification environments
Qual. Test Summary Report	7 Nov. 1967			All test block II and LM