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# Apollo Lunar Surface Experiments Package

## Monthly Progress Review

August 1972

BSR-3428

Contract NAS9-5829

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Approved:



Program Director

Prepared for

**NASA/Manned Spacecraft Center**

by



**Aerospace  
Systems Division**

# ALSEP MONTHLY PROGRESS REPORT

September 1972

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## SECTION I

### ALSEP PROGRAM STATUS AND PROGRESS SUMMARY

#### Apollo 17 (Array E)

Qualification system tests are complete, except for LSP Qual 3 hardware. Qual testing of Subpackages 1 and 2 reached completion when the LSP RFI immunity test was conducted 24 August. Fit checks on these two subpackages were completed the following day. Qualification tests of the LMS dual energy mode module were concluded as part of the LMS Prototype thermal vacuum testing.

The QAR for Subpackages 1 and 2 of the Qualification system has been rescheduled for 20-21 September 1972.

The Flight system Data Processor, PCU and PDU components were reworked and retested during August, and the Central Station verification test was successfully completed on 30 August. The LEAM electrical integration test was concluded the same day.

Final stowage of Subpackages 1 (less LMS) and 2 is scheduled for early September. The CARR for Flight Subpackages 1 and 2 is scheduled for 18-20 September 1972.

The strain relief modification kits for the E2E Trainer, Subpackages 1 and 2, were released in August.

LSP - Assembly and test of eight Qual model Explosive Packages (EPs) and four prototype EPs were completed. These units were installed in a thermal vacuum chamber in preparation for direct drive timer time-out testing scheduled for early in September. The four prototype EPs will be used in field test.

The Qual model EP immunity test with the Central Station was conducted successfully. No EMI phenomena were recorded and the coded signal achieved proper firing. The Central Station was operated in LSP mode, with the LSP transmitter on, and an EP was remotely energized. A special test of the geophone cable ground straps demonstrated that AGC coupling noise had been eliminated.

Flight model geophones were tested successfully following replacement of EPON support rings by Geotech.

LEAM - The Flight experiment was readied in late August for stowage on the Flight Subpackage 2 after the tasks listed below were accomplished:

- Calibration was completed
- Dust covers were stowed and PIA performed
- System integration test was completed.

All DRs on the Qualification model have been closed.

LMS - Absolute calibration on the low and mid-mass ranges of the Flight experiment was completed.

Additional sensitivity and electron multiplier tube gain tests were conducted on the Flight LMS. Gain losses were again recorded. But because backfill operations had occurred (and consensus of opinion held that gain loss is caused by backfilling and/or storage of the analyzer with Krypton), the decision was made to conduct gain checks again in September before replacing the analyzer.

The Qual experiment successfully completed its final PIA.

The oscillation problem in the multi-mode emission control card of the LMS prototype was isolated to the noise pickup in the filament regulator input. Capacitor C6 was changed to increase the filtering; and the card was successfully tested at UTD, returned to BxA and reinstalled.

LSG - Pre-flight and stowage activities -- including soldering of connections, final electrical checks, and driving screws to pre-flight positions -- were completed on the Flight experiment. Flat cable strain relief for the experiment was installed on Flight Subpackage 1.

The Qual experiment successfully completed design limit vibration test and the subsequent MIST aboard Subpackage 1. Upon completion of post design limit shock and vibration test, the Qual experiment had successfully endured the entire system Qualification test program without incurring a single DR.

HFE - Flight experiment probes were stowed, thermal paint of the electronics package was touched-up, and flat cable restraint structures were installed.

#### ALSEPs on the Moon

All four ALSEP systems operating on the moon are being monitored on an intermittent basis at Mission Control Center. A total of 2117 days (5.80 years) of lunar operation has been logged by the ALSEP systems 12, 14, 15 and 16, and a total of 34,051 commands have been executed.

During the period of 3-7 August, three major solar flares were observed by instruments at all ALSEP stations.

### ALSEPs on the Moon (Continued)

The only change in experiment performance during August occurred with the Solar Wind Spectrometer (SWS) of the Apollo 15 ALSEP which exhibited abnormally high power consumption on 17 August and also produced electrical interference that caused erratic output from the Passive Seismic Experiment. The SWS subsequently was commanded to standby to await a decision about its operation in the future.

The newest ALSEP, Array D of Apollo 16, completed 132 days of scientific monitoring at the close of the month. Some 2240 commands were processed from Mission Control Center. Downlink signal strength continues steady. RTG power output averaged 70.4 watts.

Internal  
Memorandum



Aerospace  
Systems Division

Date 7 September 1972 Letter No. 9703B-109

Ann Arbor, Michigan

To T.W. Fenske

From V. Jansen

Subject ALSEP Array E System Qualification Model, August Status Report

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2.0 Summary of Array E Systems Qualification Model Status & Progress

The LSPE RFI Immunity test was completed on 24 August, thus completing the Qualification tests of Subpackage I and Subpackage II. The remaining fit checks on SP I and SP II were completed on 25 August 1972.

The LMS Proto T/V test was completed on 31 August, thus completing the Qualification tests of the LMS dual energy mode module.

This completes the Array E Qualification tests except for LSPE Qual III hardware.

The QAR for SP I and SP II is scheduled to be held at BxA on 20, 21 September 1972.

2.1 Array E System Qual Model Discussion

The Qualification tests of SP I and SP II are complete.

Tests completed during this reporting period are as follows:

a.	SP I MIST and Radiated Power	Comp.	8 Aug.
b.	SP I Boydbolt Verification	Comp.	8 Aug.
c.	LMS PIA	Comp.	11 Aug.
d.	LSG PIA	Comp.	10 Aug.
e.	LSPE RFI Immunity Test	Comp.	24 Aug.
f.	SP I and SP II Fit Checks	Comp.	25 Aug.
g.	LMS Proto PIA	Comp.	15 Aug.
h.	LMS Proto Shock	Comp.	16 Aug.
i.	LMS Proto EMI	Comp.	18 Aug.
j.	LMS Proto T/V	Comp.	31 Aug.
k.	LSPE Special Noise Test (This test not a formal qual test.	Comp.	31 Aug.

4

DR AC 5880 was written on 8 August, during the post design limit MIST and Radiated Power test to document an anomaly whereby the Digital Data Processor when commanded into the X side would switch back into the Y side. The problem was isolated to pinched wires in the DDP which were repaired per DR AC 5884, and also damaged insulation on a wire on the PDU which was repaired per DR AC 5883.

The DDP and the PDU were reinstalled and the C/S verified per DR AC 5880.

During C/S verification, DR AC 5879 was written to document a receiver anomaly. Receiver SN17 was removed from the C/S and sent to Motorola for failure investigation per DR AC 5887.

Receiver SN 14, the Motorola qual model was installed in the C/S for the LSPE RFI immunity test.

DR AC 6299 was written against SP I on 25 August and dispositioned to remove receiver SN 14 from the C/S for disassembly and inspection.

Receiver SN 12 was installed on the C/S for the LSPE special noise test which was completed on 31 August. This test is not a formal qualification test.

The QAR for SP I and SP II will be held at BxA on 20-21 September 1972.

  
V.J. Jansen, Model Manager  
Array E Qual System

Internal  
Memorandum



Date 6 September 1972 Letter No. 9706-100

Ann Arbor, Michigan

To T. W. Fenske

From R. Christian

Subject ALSEP Array E Flight Model, August Status Report

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SUMMARY OF ARRAY E FLIGHT MODEL STATUS AND PROGRESS

The Flight Central Station completed thermal vacuum testing following installation of serial 15 command receiver.

The Data Processor, PCU and PDU were reworked and retested during the month of August and a Central Station verification test was successfully completed on 30 August. Also completed on 30 August was a LEAM Electrical Integration Test.

Plans for September include completion of final stow of SP II and SP I less LMS.

The CARR for SP I and SP II is scheduled for 18-20 September 1972.

DISCUSSION

Following installation of serial 15 receiver the Flight Central Station completed verification testing and was placed in the 4 X 8 chamber on 31 July for thermal vacuum test. Thermal vacuum tests were successfully completed 7 August.

A design modification for the data processor was incorporated, which involved the addition of H-Film along the edge of the mother board at the base of DP. A hot, cold, ambient test was performed followed by an operating vibration test before reassembly of the data processor on the thermal plate.

Suspect DRs were written to enable examination of the PDU and PCU assemblies for possible pinched wires. CRNs were issued that called for the addition of extra rubber to be installed around the strain relief clamps of both the PCU and PDU. Following PCU retest on 18 August and PDU on 19 August the assemblies were reinstalled on the thermal plate.

Upon receipt of the decision to continue SP I build up with serial 15 receiver, the station was built to a closed bag configuration and subjected to a Verification Test, which was completed 30 August.



A pretest meeting was held 30 August to determine readiness to perform stowage of SP I and experiments for shipment to KSC. Stow of the sunshield to the primary structure; front, rear end and side curtains; rear shield; and LSG experiment was completed 1 September.

The MIST and Radiated Power Test began 5 September and was successfully completed 6 September.


The LSPE transmitting Antenna Assembly successfully completed vibration test on 18 August.

The following SP II items were stowed:

- a) Carrier Subpallet
- b) Antenna Aiming Mechanism
- c) RTG Cable & Shorting Plug
- d) HFE Experiment to HFE Subpallet

Plans for September include completion of SP II and SP I stow (less LMS) and preparation for shipment to KSC.

The CARR for SP I and SP II is scheduled for 18-20 September 1972.



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R. Christian, Model Manager  
ALSEP Array E Flight System

RC/man

Internal  
Memorandum



Date: 14 September 1972 Letter No.: 9713-626

Ann Arbor, Michigan

To: T. Fenske

From: D. Fithian

Subject: Monthly Report for August 1972

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3.0 DATA SUBSYSTEM

3.1 Accomplishments

- a. Receivers SN17 and 18 were removed from Qual and Flight Model Systems respectively and returned to Motorola for failure analysis and rework. Preliminary analysis of the SN17 failure indicated that poor grounding of the B side converter module was the cause of Qual System Uplink sensitivity loss. The grounding problem was apparently caused by excessive use of lock-tite on mounting screws. Per direction by MSC, SN17 receiver will not be returned to an assembled flight spare status. Troubleshooting will however be performed to an extent sufficient to close out the failure report.

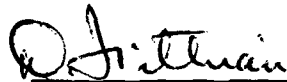
The loss of sensitivity in SN18 was determined to be caused by poor grounding of the input power splittler. New power splitters were assembled and tested and the unit is being rebuilt. SN 18 will be completely retested through operating vibration and Thermal Vacuum and will be redelivered as the flight spare.

- b. As a result of a data processor failure in the Qual Model a design change was implemented to eliminate wire damage in the area of the motherboard edge. H-film insulation was added along the edge of the motherboard. The wires passing under the motherboard were redressed to avoid bunching so that they would not be compressed in this area. These changes were made effective on both flight and spare models.
- c. Following rework of the flight data processor the unit was subjected to full acceptance testing including Hot, Cold and Ambient Functional tests. During these tests it was noted that certain analog channels on one side were out of tolerance. The problem was traced to the sequencer board and this board was replaced with the respective assembly from the flight spare. Re-test of the assembly was successful and the unit was returned for assembly into the flight system.

- d. The PCU and PDU flight units were removed from the C/S and submitted for a visual inspection for pinched wires in the area of the connector/motherboard clamp. Although no damage was evident, a change was incorporated to increase the damping pad thickness in the clamp area to avoid potential wire compression. This was added because of some compression in wires noted during a post vibration inspection of the Qual model. Following the rework, the PCU and PDU were subjected to an ambient functional test and were then replaced on the flight Central Station.
- e. The Data Processor, PCU and PDU flight spares were removed from Bonded Stores and submitted to Manufacturing for incorporation of the above changes.
- f. Final drawing lists for the Data Subsystem were updated and released.
- g. Processing of DR dispositions was continued in an effort to complete close out of all data subsystem DR's.

### 3.2 Plans for Next Month

- a. Complete spare component rework and test.
- b. Prepare for and support CARR/QAR.

  
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D. Fithian, Manager  
ALSEP Engineering

DF/gmw

Internal  
Memorandum



Aerospace  
Systems Division

Date 9/7/72

Letter No. 5032-104

Ann Arbor, Michigan

To T. Fenske

From J. McNaughton

Subject ALSEP Structural/Thermal/Crew August Monthly Progress Report

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4.0 STRUCTURAL/THERMAL/CREW ENGINEERING

4.1 MECHANICAL DESIGN

- a. The S/P II Mod Kit for the E2E trainer strain reliefs was released 4 August. The E2E S/P I strain relief mod kit was completed and released 9 August.
- b. The E2E trainer lightweight pallet was completed and released 3 August.
- c. The HFE astromate design has been modified to add a stronger retaining spring (Ref: DR 5049). This change was released 9 August.
- d. The LEAM astromate bracket release problem (ref: CF<sup>2</sup> DR AC5049, item 2) has been resolved. CR/N's have been issued to add stronger springs and to remove material and teflon coat in area of minor interference. Effectivity is for Flt 6, QSE & E2E.
- e. E2E Subpack II Decal Mod Kit was completed and released 3 August. The Flt 6 drawing is complete but will be held for release at a later date, because of pending changes.
- f. A change was made to Subpack I top assy (2348700) to use longer screws for the LSG support structure attachment to the sunshield. The new screws (MS35308-307) are 1/8 inch longer, and ensure proper engagement with the mating inserts locking feature.
- g. The addition of the UHT gusset has been cancelled at the request of MSC. All CR/N's covering this change for Flight 6 & E2E were withdrawn.
- h. The drawing trees have been updated to reflect the latest configurations of Subpacks I & II. These drawing trees are required for the Flight 6 data package. They are currently being processed at the Data Center. Release of these drawing trees is scheduled for 11 September.
- i. Simulation of the LSPE grounding strap for the E2E trainer is in check. Release of this change was accomplished 8 August.

- j. The LEAM carrier dust cover for Flight 6 and E2E trainer was released 18 August.
- k. Miscellaneous DR's from CF<sup>2</sup> and other DR's that had not been closed out were processed. Plans are to have near 100% close out of mechanical design DR's by 5 September 1972.
- l. The LSG dust cover drawings for Flight 6 and E2E were completed and released on 30 August.
- m. The HFE dust cover was reworked to relieve a minor interference at the HFE electronics cable strain relief.

#### 4.2 STRESS/DYNAMICS

##### 4.2.1 Cable Strain Relief

- a. The impulse test data evaluation has been completed. In general, 50% of the available energy is dissipated by friction forces between the subpack and the ground, 20% is dissipated within the ribbon cable, and 30% remains with the pendulum. The test report has been written and will be published next month.
- b. Impulse testing of the astromate connector assembly has been completed. The worst case impulse was applied to the cable at zero and ninety degree pull angles. No significant hardware damage was detected. Continuity checks on the ribbon cable - astromate assembly showed no changes due to testing.
- c. Proof tests were conducted on all other cable strain relief assemblies. The maximum (worst case) impulse was applied to the cables at zero and ninety degree pull angles. Continuity tests were conducted on each cable before and after each impulse. All items passed successfully except the LMS cable-to-experiment strain relief and the LSPE transmitting antenna cable-to-C/S strain relief.

The LMS failure was due to insufficient edging tape on the cable. The LMS ribbon cable taping will be changed to conform with all other flat cable taping requirements and the test will be repeated.

The antenna cable problem is simply a matter of exceeding the strength of the cable. The strain relief device functioned quite well.

- d. The LSPE transmitting antenna cable (C/S interface) was impulse tested using the defined nominal impulse. The test resulted in a cable failure. Present plans are to conduct both static and dynamic tests to determine the maximum static and impulsive load capabilities of the cable. Static tests have been performed in the past with the result that the insulation began to yield at 45 lb. During the next test, failure will be determined by means of electrical continuity checks.

#### 4.2.2 Central Station Grounding Strap

The grounding strap and eight wire attachment has been modeled for computer analysis to determine response levels and natural frequencies. The lowest natural frequency was calculated at 193 Hz. The maximum stress level was found to be 12,000 psi, well below the strength capabilities of both the strap and the wires.

Since the grounding strap was added after qualification testing, it is necessary to provide rationale to justify using such hardware for flight. The high margins of safety demonstrated by the dynamic analysis provides such rationale. (See BxA letter no. 72-210-321).

#### 4.2.3 QSE-Subpack #1

The X-axis downsweep from 50 to 5 Hz was completed with no subsequent difficulties. This completes the QSE vibration testing, unless the request for waiver to delete the 50-100 Hz sinusoidal test requirement is rejected. All response data has been plotted and will be evaluated as soon as possible. A "quick look" at the data indicates it to be in good agreement with the response data from the EEM tests.

A final disposition was written for DR AC 5686 which emphasizes the following:

1. The suspected sunshield failure was shown by various tests to be untrue (see BxA letter no. 72-210-298).
2. Trouble shooting has not revealed the cause of the out-of-tolerance input condition.
3. Further trouble-shooting would require perhaps several re-runs of the X-axis sine sweep which would jeopardize those QSE components to be used as flight spares.
4. Deletion of the 50-100 Hz sine test requirement per NASA/MSC direction (waiver request submitted).

#### 4.2.4 QSE PDU/PCU

In anticipation of a requirement to run a component level vibration test for the PDU/PCU, a design limit, X-axis sinusoidal sweep test was defined based upon EEM and QSE vibration response data.

#### 4.2.5 RTG Cable Stowage Clips

Assistance was rendered concerning Discrepancy Report AC-5049, which was written during the CFF test, partially against the RTG cable clips. Trouble-shooting determined that the seven clips (flight model) detached from the cable reel at normal pull forces ranging from 7.25 to 10.75 lbs. These values are not excessive relative to astronaut capabilities. However, the low mechanical advantage obtained when grasping the UHT at the handle could make unreeling of the RTG cable difficult. It was recommended that, as with previous CF<sup>2</sup> tests and ALSEP lunar deployments, the astronaut grasp the UHT near the center of the shaft when attempting to detach the clips.

#### 4.2.6 LSPE Geophone Flag

Stress analysis of the flag assembly demonstrated a positive margin of safety for a thirty pound astronaut applied load. Although sufficient for lunar conditions, the strength of the flags was apparently exceeded during training exercises.

#### 4.2.7 LSPE Transport Frame Vibration Tests

- a. The proto test data indicated that maximum deflections (transport frame relative to support) exceeded the rated static deflection of the isolators. The isolators are rated at 0.1875 in while maximum deflections reached 0.250 during sinusoidal testing. The underside edge of the frame probably collides with the clevis bracket which supports the isolator. It was recommended that the frame be machined in the vicinity of the clevis to increase the clearance to a value in excess of 0.250 in.
- b. The proto transport frame, with four operational BWC timers mounted within two of the eight EP's, was subjected to design limit vibration testing. These tests were witnessed - no difficulties of any kind were observed.

There was some concern prior to the test about the condition of proto isolators. The proto transport frames have previously been subjected to several design limit vibration tests. An inspection of the isolators revealed no apparent signs of fatigue. A comparison of recent response data with that from the first test showed no significant changes in dynamic characteristics. It was concluded that the isolators were in good condition.

#### 4.2.8 Plans for September

During the next month the following tasks will be completed:

- a. Carry bar test report.
- b. QSE design limit vibration test report.
- c. LMS cable impulse test (re-test after re-work).
- d. Static and dynamic testing of LSPE transmitting antenna cable to determine load capacity.

#### 4.3 MECHANICAL & CREW SYSTEMS

##### 4.3.1 Array E Flight

- a. A deployment sequence and list of constraints has been prepared for the LSPE explosive packages (from LRV). This information has been reviewed by LSPE engineering and forwarded, in outline form, to MSC for review.
- b. The increased strength of the UHT by the addition of a gusset was released via ECP (NASA disapproved the change).
- c. Action items from the Strain Relief CDR have been completed with crew personnel supporting the impulse test on the astromate connector and also experiment strain reliefs with the CE mockup.
- d. The modified LSPE RF cable reel was sent to NASA/MSD for crew review prior to CRN implementation to Flt & Trainer. An additional radius was requested after crew review and implemented.
- e. The CE mockup of the LMS was prepared for delivery to NASA/KSC with four ceramic seals and holders. Additional technical support should not be required.
- f. A review of the CEI specification for Flt Model #6 has been completed. Comments have been submitted to F. Warren.
- g. Preliminary Apollo 17 Contingency Procedure has been published and distributed for review and comments. BxA comments are still being received. All inputs must be received by Sept. 8 in order that the final copy may be published prior to the BxA/NASA review meeting scheduled to be held mid-September at MSD.



- h. The flight decal mod kit will be delayed pending NASA direction concerning the exact sun angle offset during the Apollo 17 ALSEP deployment.

#### 4.3.2 Array E Trainer

- a. The eleven TAR's from the 7/21 deployment have been closed through engineering and experiment PE's.
- b. Current CRN's were forwarded to BxA KSC trainer personnel to keep them informed of the configuration changes in the trainer.
- c. A schedule of E2-E updating was published for CPD planning.
- d. The minutes of the most recent Lunar Surface Operations and Planning Meeting (42nd) was reviewed and comments forwarded to NASA/CPD.
- e. The E2-E Deployment (Prime Crew, Shirtsleeve) on 8/22 went very well. Comments were as follows:

(Action Items CR 5032-81)

- 1. The crew was concerned about the thermal problems if any for the EP's when dust is thrown out from the LRV wheels after EP deployment from the seat.
- 2. Two windings of the geophone module cable remained in the reel after deployment. CPD asked if that was a problem.
- 3. The PI for LMS repeated his request to have the LMP ensure that the cable exits directly to C/S and not loop around the experiment.
- f. D. Bland, NASA/CPD requested to have the LSPE RF cable reel modified to increase the radius at the exit points of the cable.
- g. D. Bland, NASA/CPD requested permission to have D. Castille measure the torque resistance on the shorting switch handle (Flight hardware). This request is in response to TAR 3 Dev. #5.
- h. Impulse testing for the Array E/E2-E HFE Strain Relief was conducted on 8/21 and 8/22. The astromate connector was subjected to impulsive energy at least equal to the "astronaut kick" criteria without mechanical or electrical failure.

- i. Installation of all E2-E Trainer strain relief mods has been completed. A back-up crew deployment (suited) took place 8/31/72 after incorporation of the mods and reports by field personnel indicate acceptance by NASA-CPD and the crew. Both CPD and the crew have expressed strong concern over strain relief screws projecting near crew handling areas and direction to provide protection is expected by LEPO.
- j. Installation of the E2-E, LSPE antenna mods has been started on the six explosive packages in house. The remaining two packages and the transmitting antenna will be retained at KSC until delivery of the six modified packages.

#### 4.3.3 Crew Engineering Laboratory

- a. Continued support was provided for the installation and testing of engineering model strain reliefs.
- b. Crew personnel completed installing the E2-E strain reliefs and decals on the trainer at KSC prior to the deployment on 8/31.
- c. Refurbishment of the LMS crew engineering model for use in four Apollo 17 crew training exercises was completed. This unit is to be used with the four ceramic breakseals provided by BxA.
- d. A mockup of the modified LSPE remote antenna cable reel was prepared for demonstration to NASA-CPD personnel.
- e. Crew personnel provided support to systems engineering for the flight system test of (suspected) LSPE transmitter noise levels.

#### 4.3.4 Array E Weight Status

The weight status for Array E is summarized below. Details are shown in Table 1.

Subpack #1	137.11 lbs
Subpac k #2	<u>99.83 lbs</u>
SEQ Total	236.94 lbs
ACA	<u>54.28 lbs</u>
ALSEP Total	291.22 lbs

Actual weights are shown for the ALSEP cask assy (ACA) and most of the hardware listed under Subpackage #2. Actual weights are also shown listed under Subpackage #1 with the balance of the items either estimated from equipment on previous arrays or calculated from drawings.

Also shown are subpackage #1 and #2 weights from mass properties test data. These weights, however, do not include the new dust covers or strain reliefs.

TABLE 1  
ALSEP ARRAY E WEIGHT ESTIMATE

<u>SUBPACKAGE #1</u>		<u>SUBPACKAGE #2</u>	<u>ACA</u>
C/S and LSP/CSE	42.22*	Pallet Assy.	13.47*
Primary Structure/PDM	10.28*	Structure Carrier	7.14*
Sunshield Assy.	9.59*	Shield Assy/RTG Cable	1.88*
Support Structure, LSG	1.37*	RTG & Cable	28.15*
Rear Shield	1.78*	Shorting Plug	1.36*
TC Curtains	2.00	ALSEP Tools	3.27*
Handling Assy.	0.48	Aiming Mechanism	1.91*
Subpackage Dust Cover	.25	Aim. Mech. Box	1.92*
Sunshield Extenders	0.90	Carry Bar	2.78
Antenna & Cable	1.30	HFE Subpallet	6.74*
Antenna Mast/Support Struc.	1.40	HFE Probes & Electronics	11.90*
LSG/Cable	28.09*	LEAM/Cable & Spool	16.31*
LSP/Geo/Ant/Cable	11.93*	Miscellaneous/Fasteners	2.00
LMS/Cable	21.42*	Dust Covers	.50
Miscellaneous/Fasteners	3.00	Strain Reliefs	.50
Dust Covers	.40	SP #2 Total	99.83
Strain Reliefs	.70		
S/P #1 Total (136.33**)	137.11		(98.90**)
S/P #2 Total	99.83		
SEQ Bay Total	236.94		
ACA Total	54.28*		
ARRAY E TOTAL	291.22 (291.61)		

The present weight of the Explosive  
Package Transport Module (Stowed  
in SEQ #3) is 41.24 lbs.\*

\* Actual Weight  
\*\* Mass Properties Test Data  
(not including Dust Covers or Strain Reliefs)

#### 1.4 ENGINEERING LIAISON

##### 1.4.1 Array E Mechanical

###### a. Qual S/P I

Upon return of the Qual sunshield from ultrasonic testing, the sunshield LSG mounting inserts were examined for bolt clearance per DR 6003, and the DR closed 7/31/72.

The stowage of the Qual S/P I was started 7/31, and was finally completed on 8/2/72, in readiness for design limit vibration. The 50 Hz - 5 Hz vibration was completed on 8/3/72.

Following design limit vibration, the qual S/P I was routed to the ALSEP systems lab for performance of the MIST. During the MIST a data processor short occurred necessitating the dis-assembly of the Qual C/S on 8/9 for trouble shooting. (suspect DR was generated against the flight S/P I on 8/11).

The suspect DR against the data processor was closed and the S/P I re-assembled for the RFI immunity test. The S/P I RFI immunity test was completed on 8/24. During the final qual S/P I fit checks (with S/P II) DR AC 5890 was generated against the carrybar.

Upon completion of the RFI immunity test a suspect DR (AC6299) was generated against the command receiver (8/25). In order to resolve this DR S/P I was dis-assembled to the open clamshell configuration on 8/25 and the command receiver (S/N 14) removed from the C/S. The command receiver (S/N 12) was installed in C/S and the S/P I re-stowed to the deployed configuration on 8/28, in readiness for the GEOPHONE noise test. The S/P I GEO noise test was completed successfully on 8/31/72.

The fit checks on S/P I, with S/P II, was completed 8/28.

The following DR's were closed as shown:

1. DR AC 5046 against the curtain clips was closed on 8/14/72.
2. DR AC 6003 against the qual sunshield C/CA closed on 8/15/72.
3. DR AC 6061 against the LSG boydbolts was closed on 8/25/72.

## b. Flight S/P I

After C/S receiver replacement and the thermal plate groundstrap installation, the C/S was built to the closed clamshell configuration on 7/29/72 in readiness for C/S verification. The C/S verification test was completed on 7/31/72 and the central station was installed in the (4 x 8) chamber (8/2/72) for central station T/V testing, the completion of which was on 8/7/72.

The S/P I stowage to the deployed configuration was completed on 8/9/72 in order to trouble shoot DR AC 5048 (Item 1).

With the S/P I stowed to the deployed configuration, the DR AC 5048 (Item 1) was reworked on 8/9 and the DR item closed on 8/12/72.

S/P I was dis-assembled on 8/14, per the suspect DR AC 6173 on the data processor, in order to resolve the problem.

DR AC 6173 was dispositioned and the C/S thermal bag was installed on 8/28, and the subpackage stowed to the closed clamshell configuration on 8/28/72. The S/P I was routed to the test lab for a C/S verification test, which was completed on 8/30/72. The full stowage of S/P I was started on 8/31/72.

The S/P I strain relief mod-kit was installed on the subpackage on 8/16. The strain relief mod-kit for the LMS, LSG & LSP (GEO) are in manufacture.

Installation of the LSG strain relief mod kit was completed on 8/25/72.

The following DR's were closed or dispositioned as shown:

1. DR AC 5048 (Item 8) against the sunshield build-up was dispositioned and closed on 8/9/72.
2. DR AC 5770 against suspect sunshield inserts was closed on 8/7/72.
3. DR AC 5679 against the helical antenna cable reel pin was further dispositioned on 8/7/72 - verify stowage during the performance of DR AC 5048 (Item 3).
4. DR AC 6104 against the stainless steel bracket for the LSP (GEO) strain relief was closed on 8/14/72.
5. DR AC 5666 against the S/P I dust cover was reworked per CRN 70952 on 8/9, and the DR closed on 8/16/72.

6. DR AC 5770 against the sunshield and DR C/CA was closed on 8/15/72.
7. DR AC 5974 - suspect sunshield insert installation - C/CA closed 8/23.
8. DR AC 5666 against the S/P I dust cover - C/CA closed 8/23.
9. DR AC 6199 against the LSP (GEO) mod kit strain relief hole was closed on 8/23.
10. DR AC 6173 - suspect DR against the flight data processor was closed on 8/29/72.

c. Qual S/P II

Aiming Mech rework per DR 5551 was completed 7/27/72, and DR 5551, was closed on 8/1/72.

DR AC 5746 against the shorting plug level was closed on 8/16, use as is and route to Bonded Stores. (This lever will not be installed on the Qual shorting plug).

Rework of the Qual LEAM astromate bracket per CRN's 71068, 71071, 71072 and 71073, was completed 8/17/72.

DR AC 5890 against the carrybar contingency fitting was dispositioned 8/21, and the rework completed 8/24. (DR closed 8/24).

Removal of the Qual RTG from S/P II was completed 8/28/72, and the RTG routed to GFE Bonded Stores. AER 597 was generated on 8/28/72 in order to measure the locking and unlocking torque on the shorting plug (Qual) 'T' handle, and was completed on 8/30.

d. Flight S/P II

DR 5049 LEAM dust cover trouble shooting was accomplished utilizing the Qual LEAM with DVT components on 8/3/72.

DR 5049 (Item 2) astromate (LEAM) was dispositioned on 8/7/72 to rework the astromate bracket during final stowage.

Stowage of the aiming mechanism on S/P II was completed on 8/11/72.

Rework of the flight LEAM astromate bracket per DR AC 5049 (Item 2), was completed on 8/17/72.

Incorporation of the LEAM & HFE strain relief mod kits were completed on 8/23/72.

The aiming mech & the carrier assy was removed from S/P II (8/26) in order to incorporate the carrier dust cover mounting brackets per CRN 71118. The rework per CRN 71118 was completed on 8/28, and the carrier re-stowed together with the aiming mech & shorting plug on 8/29/72. The HFE was stowed on the HF subpallet on 8/29/72.

The carrier dust cover was in manufacture on 8/31/72.

The following DR's were reworked, dispositioned, or closed as shown:

1. DR AC 5543 against the antenna aiming mechanism for paint touch-up rework was closed 8/10/72.
2. Repaint & decal incorporation on the shorting plug, per DR AC 5676, was completed on 8/7, and the DR closed on 8/10/72.
3. DR 5049 (Item 1) against the LEAM dust cover was further dispositioned on 8/7 - stow dust cover per CRN 71070 & fit check with the LEAM.
4. DR 5049 (Item 6) against the heat flow astromate was further dispositioned on 8/9 to rework astromate bracket per CRN's 71087, 71088, 71089 & 71090.
5. DR 5049 (Item 5) against the carrybar contingency release was closed on 7/28/72.
6. DR AC 5049 (Item 4) against the RTG cable deployment force was closed on 8/15.
7. DR AC 5051 against the LSP x-mitting antenna socket, on the HF subpallet, was dispositioned on 8/11 & 8/16 with trouble shooting steps.
8. DR AC 5049 (Item 3) against the shorting plug release bar was further dispositioned 8/17/72 to perform rework steps.
9. AC 5049 (Item 3) against the shorting plug retaining bar was closed on 8/28/72.
10. AC 5049 (Item 6) against the HF astromate mounting bracket was closed on 8/29/72.

## e. Flight, Trainer &amp; Spares

Both DR's AC 6095 & AC 5926 against decals were dispositioned on 8/8, USE AS IS and closed.

The following trainer spares DR's were closed as shown:

1. DR AC 6056 against the handling socket for the carrier was closed 8/23/72.
2. DR AC 5902 against the aiming mech packing foam was closed on 8/22/72.

The DR AC 6055 against the UHT heads (replacement parts for the trainer) was closed on 8/18/72.

The trainer spare aiming mech packing foam was reworked on 8/28 per CRN's 70907 & 70968 and into bond cure on 8/31/72.

The trainer strain relief mod kits were completed on 8/28/72.

The trainer UHT's were being worked on 8/31 to replace the HEX heads. The following trainer DR's were closed as shown:

1. DR AC 5772 against the trainer curtain support assy was closed on 7/26/72.
2. DR AC 5750 against the trainer LSG indicator gear was closed on 7/26/72.
3. DR AC 5205 against the trainer pin assy was closed on 6/27/72.
4. DR AC 5559 against the trainer pin release assy was closed on 6/27/72.

## 4.5 THERMAL DESIGN

## 4.5.1 Flights 1, 4, A-2 and D

Flight data listing and computer plots completed as of 8/31/72 are:



Flight	Lunations Completed			
	Data Listing		Computer Plots	
	Day	Night	Day	Night
Apollo 12	30	29	20	20
Apollo 14	15	14	5	5
Apollo 15	9	8	8	8
Apollo 16	2	2	1	-

#### 4.5.2 Array E

##### 4.5.2.1 General

- a. Qual acceptance T/V HK data has been reduced and plotted.
- b. Thermal support was provided to manufacturing to provide more generality to MP-64. The present MP-64 refers to only GEB fiberglass substrates. The original substrate study by IITRI includes G-10 and G-11 fiberglass substrates. This information was provided to manufacturing for incorporation to the MP.
- c. Flight acceptance T/V HK data has been reduced and plotted. Test results have been summarized and presented in memo 5032-43 Rev. A. Central Station test temperatures results are:

# CENTRAL STATION

## FLIGHT ACCEPTANCE TEST TEMPERATURE RESULTS

HK	Function	Acceptance Noon (°F)	Acceptance Night (°F)
4	Plate Temp #1	100	15
15	Bottom Temp	192	-184
16	Rcvr Case Temp	107	22
18	Xmtr A Hot Spot	118	42
19	Xmtr A Case Temp	116	42
25	LSP Elect Temp	104	23
27	Sunshield Top Temp	40	-228
28	Plate Temp #2	103	23
31	Xmtr B Hot Spot	-	-
32	Xmtr B Case Temp	-	-
33	DP Base Temp	104	23
34	DP Int. Temp	111	30
42	Sunshield Under Temp	40	-228
43	Plate Temp #3	100	15
48	CD Temp B	102	-
49	CD Temp A	-	20
58	Plate Temp #4	111	28
59	Left Struct Temp	156	-180
60	Inner Bag Temp	110	15
61	PC#1 APM Temp	109	29
62	PDU A Temp	112	33
63	PDU B Temp	111	32
64	PC#2 APM Temp	-	-
71	Plate Temp #5	107	25
72	Outer Bag Temp	165	-120
77	PC#1 Reg Temp	117	50
78	PC#2 Reg Temp	-	-
87	RT Struct Temp	166	-180
88	PDM Temp	228	-185

NOTES: (1) Average Thermal Plate Temperatures  
Acceptance Noon: 104°F Allowable  
Acceptance Night: 21°F Temperature  
Swing = 0 to 135°F  
(AL 240000)

(2) PDM Panel Flight Acceptance Noon Temperature = 228°F.  
Maximum Allowable PDM Temperature = 350°F (AL240000)

Central Station Test Power Results and comparison with  
the Qual Acceptance Test Results are:

Central Station Qual/Flight  
Thermal Performance Comparison

Measurement	Symbol	Channel	Qual. Accept. Noon	Flight Accept. Noon	Qual. Accept. Night	Flight Accept. Night
PCU Input Current, Amps	AE-04	HK 5	4.57	4.55	4.57	4.55
PC #1 Input Voltage	AE-03	HK 8	16.23	16.19	16.28	16.26
Reserve Power, Watts	AE-22	HK 30	34.00	35.60	23.00	20.8
RTG Output Power, Watts	-	HK5 x HK8	74.17	73.66	74.40	73.98
Converter Input Power, Watts	-	RTG-RP	40.17	38.06	51.40	53.18
Thermal Plate Avg. Temp., °F	-	-	108	104	18	21
PDM Temp., °F	AT-11	88	228	216	-166	-185

#### 4.5.2.2 Central Station

- a. Work on the final thermal report is in progress. The report will summarize central station thermal analysis, thermal vacuum testing and flight predictions. Flight predictions will include the effects of the mountainous lunar terrain. The report will be released by mid-September.
- b. The thermal affects on the central station thermal performance due to the Taurus-Littrow mountainous terrain has been determined. A study showed that the terrain will affect the central station thermal performance. Results of the study will be published by 1 Sept. 1972. The impact of this effect will be assessed and recommendations made by mid-September.

#### 4.5.2.3 LMS

- a. Effort on the final thermal report on the LMS T/V qual and flight acceptance tests and thermal model correlation of the test results continued and will be completed in Sept. The report has been typed and is undergoing review.
- b. A review of the requalification test procedure of the LMS in the 4' x 8' chamber was made and the instrumentation used was discussed with T. Fox, R. Klein and C. Kern.
- c. The requalification test of the analyzer redesign has been completed. No thermal anomalies were reported. The results of this test will be summarized by mid-Sept.
- d. The predicted nominal temperature profile for Taurus-Littrow deployment site has been input to the mission support personnel per memo 5032-72. Superimposed on the profile are the probable temperature excursions about the nominal due to the annual solar variation, and surface degradation effects.

#### 4.5.2.4 LSPE

- a. Thermal support was provided to MSC (R. Murdock) and NOL for the explosive package temperature cycling test to be performed by NOL. This effort included the recommendation of using one temperature chamber and modifying to hasten the temperature rates of change. The modification was to use LN<sub>2</sub> instead of a cooling fluid and additional heaters.
- b. The final thermal report on the LSPE T/V test results and thermal model has been typed and is in proof reading stage.

- c. Due to the test discrepancy reports generated during the NOL/NWL thermal cycling test of the qual HE packages and the cracks in the explosive charges found in the radiographic inspection following the test, a visual inspection of the HE packages was made at NOL, 8/17 and 8/18. The inspection concluded that:
1. Three HE charges were cracked along longitudinal, radial and traverse planes.
  2. Various degrees of foam discoloration were observed on several packages.
  3. In four of the packages there were varying degrees of foam sagging which in one case allowed some movement of the charge.
  4. There was evidence of condensed water on three of the case bottoms.
  5. Two of the charges in the more severely degraded foam casings, were .012 and .015 inches out of tolerance in the direction of the base plate.
  6. Two outer cases appeared to have discrepancies in the nickel plating on the bottom of the case. These discrepancies could not be interpreted as cracks but possibly layering in the plating or fiberglass case and will not be considered further.

Tests have been conducted to determine at what point during the NOL HE qual tests the foam collapsed. The BxA tests duplicated the NOL test extremes with observations periodically of the foam for degradation.

The results of these tests have shown that the foam will discolor and degrade at approximately 300°F. This implies that the temperature sensor used in the NWL/NOL thermal tests was in error since the maximum temperature recorded was +252°F.

#### 4.5.2.5 LSG

- a. The insulation system heat leaks for the qual T/V acceptance test have been determined as 1.03W for lunar night and 0.81 W for lunar day.
- b. The insulation system heat leaks for the flight acceptance T/V test have been determined. These are 0.984W during lunar night and 0.89W during lunar day conditions.

- c. The thermal conductance between the heater box and instrument housing for the qual and flight models were determined previously from the ADL sensor package thermal control tests as 0.323 w/oc and 0.338 w/oc respectively. The thermal conductance of the ETM has been computed from the ADL sensor package thermal control test as 0.10 w/oc using the least square polynomial approximation. This value deviates from the qual and flight values since the temperature difference between the heater box and instrument housing was substantially greater than the requirement of  $0.5 \pm 0.1^{\circ}\text{F}$ .
- d. The LSG final thermal report is tentatively set for the last week in Sept.

#### 4.5.2.6 LEAM

- a. The predicted nominal LEAM internal structure temperature profile has been input to the mission support personnel for inclusion in the Array E data book. Superimposed on the profile are the probable temperature excursion limits that might be encountered due to the annual solar variation and surface degradation.
- b. The release of the final thermal report on the LEAM T/V test results and thermal model correlation of the test results is anticipated during the latter part of September.
- c. Hemispherical emittance measurements have been made on the parylene film since it was anticipated to be substantially different than the normal emittance measurements. The measurements have revealed that the hemispherical emittance values are approximately 2.5 times greater than the normal emittance values.

#### 4.5.2.7 HFE

The predicted nominal and limit temperature profiles for the Array E HFE electronics package (DH-13, 15) has been input to mission support personnel via memo 5032-71.

#### 4.5.3 Plans for September

- a. Apollo 12, 14, 15 & 16  
Cataloging and processing of flight data will continue.
- b. Array E
  - 1. Release final thermal reports on qual and flight T/V acceptance tests.

2. LSPE

- a. Conclude effort and release results of effort on CCP 381, LSPE explosive package LRV deployment.
- b. Complete final report on LSPE DVT T/V test.

3. LMS

Summarize results of the requalification T/V test of the redesigned LMS analyzer redesign.

4. Determine effect of the mountainous terrain at the Taurus-Littrow deployment site on the ALSEP experiments.

  
J. McNaughton

Approved by:   
D. Fithian

Internal  
Memorandum



Date 6 September 1972 Letter No. 9713-625

Ann Arbor, Michigan

To T. Fenske

From D. Fithian

Subject August Monthly for System Engineering

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5.0 SYSTEMS ENGINEERING AND TEST SUPPORT - ARRAY E

5.1 Qualification Model

5.1.1 Accomplishments

Engineering Support was provided during the following system tests and operations:

- Completion of the SPI Design Limit Vibration Test
- SPI Modified Integrated Test
- Troubleshooting Related to the Digital Data Processor Anomaly
- Changeout of the Command Receiver
- LSP Explosive Package RF Immunity Test
- Boydolt Verification Test, SPI
- ALSEP Fit checks
- Central Station Verification Test
- Special Test of LSP Geophone Noise

Following completion of the testing of the qualification sunshield, the subpackage was restowed and the design limit vibration test was completed.

During the last D.L. MIST a Central Station anomaly occurred in which the digital data processor could not be commanded from side Y to X. During troubleshooting and disassembly of the subpackage it was determined that the command became operative when a Boydolt was loosened. This led to a search for a bare wire on the command line.

Within the PCU/PDU it was determined that there was the possibility for wire insulation being damaged but the cause of the command anomaly was not found. The DDP was then inspected and the 5v supply line wire was found pinched with a conductor strand penetrating the insulation. The damage was caused in the area where the wires pass around the mother-board where there is inadequate space for wires to cross. These wires apparently became crossed and pinched in the final assembly of the DDP.



Design changes were incorporated into the PCU/PDU and the DDP to prevent reoccurrence of the failure. The components were checked in acceptance tests and they were re-installed on the thermal plate. The proper system performance was then verified.

During the functional test to verify proper performance, the receiver exhibited gain changes which were similar to those found in the flight model command receiver. The receiver was replaced and the faulty unit sent to Motorola for fault isolation.

The final test in the qualification test sequence was then run. In this test an explosive package receiver output was monitored in a simulated operational environment for 30 minutes to verify that there were no false fire pulses caused by signals other than the LSP transmitted fire pulses. No false fire pulses were detected in the test. This test was performed with the system, including experiments, deployed in the large screen room.

After completion of the qualification test sequence a special test was run to measure the LSP geophone noise with a system configuration as close as possible to the lunar deployed configuration. The qualification model station and a mixture of qualification and DVT experiments were deployed to the full extent on a grassy slope near Plant 2. Of concern was the effect of the transmitted AGC pulses on the geophone output channels. In the qualification thermal vacuum test excess geophone noise was measured for the chamber configuration. The results of the special test demonstrated that there is no induced geophone noise unless the LSP antenna is deployed directly on the geophone cable in an abnormal configuration.

In the configuration planned for lunar deployment there was no geophone noise induced by AGC or "fire" pulses.

#### 5.1.2 Plans for Next Month

- a. Prepare and submit qualification Test Reports
- b. Prepare for the QAR.

## 5.2 Flight Model

### 5.2.1 Accomplishments

C/S Thermal Vacuum test was completed after a second cold cycle to resolve a timer malfunction caused by test cables.

The system was subsequently reopened and PCU/PDU and data processor were removed for inspection. Cold flow caused by wires crossing under the data processor motherboard had not caused a short circuit to the motherboard ground plane as it had in Qual. Insulation required reinforcement for only one wire in DP and two wires in the PCU/PDU.

The wires under clamps and motherboard were carefully redressed and no further problems are expected. Further protection in the form of non-cold flow tape was added between wires and motherboard. PCU and PDU clamps were padded with an additional layer of rubber and less torque was applied to the clamp screws.

Component retest revealed a bad card in the Data Processor which was exchanged with the A7 card from the spare. A hot, cold and ambient test was followed by an operating vib and functional. The station was reassembled and satisfactorily verified. Some time was lost by troubleshooting of receiver failures.

### 5.2.2 Plans for Next Month

Complete Final SPI and II Stow

Complete SPI MIST and Radiated Power

Prepare and Submit Flight Acceptance Test Report

Prepare and Support CARR

## 5.3 System Analysis and Documentation

(a) The calibration tape data for LEAM, LMS, LSG and HFE are available in final form. The tape data for LSPE currently provides operator-selected, three-range decompression of the geophone outputs, for real-time analog display. It has been indicated, however that separate decompression curves have been provided directly to MSC by the LSPE PI.

Should this prove to be the case the data on the tape will be redundant and may not correspond to the PI's data but for the time being it is not proposed to remove it. A final calibration tape will be prepared and issued when this question is resolved.

## 5.3 Continued

(b) All comments upon the draft CEI Specification CP 100020, have been reviewed, and the final version for NASA approval is in typing. The major fault in the draft was the omission of any reference to the stowage and deployment of the LSPE explosive packages.

(c) The test and all but two figures of the System Description are now in final form. The remaining figures will be completed within about two days.

(d) The initial version of the Operation's Plan is about 75% complete. This is now the only major remaining task.

(e) Approximately five man-days were spent in reviewing the SODB and the Specific ALSEP Mission Rules.

5.4 Power Budget

There have been no changes in the power budget since the last report.

5.5 Test Procedures

1. There were two new ALSEP (Type I Documents) test procedures released and transmitted to NASA.
2. There were five ALSEP (Type I Documents) test procedures revised by CRN action and transmitted to NASA.
3. There were five new ALSEP (Type II Documents) released and transmitted to NASA.
4. There were two ALSEP (Type II Documents) test procedures revised by CRN action and transmitted to NASA.

  
D. H. Fithian, Manager  
ALSEP Engineering

DHF/gmw

NOTE: No engineering effort (other than normal mission support) has been expended on the experiments listed below during the current report period:

Suprathermal Ion Detector Experiment/Cold Cathode  
Gauge Experiment

Dust Detector

Solar Wind Spectrometer

Charged Particle Lunar Environment Experiment

Laser Ranging Retro-Reflector Experiment

Lunar Surface Magnetometer

Passive Seismic Experiment

Active Seismic Experiment

Internal  
Memorandum



Aerospace  
Systems Division

Date 13 Sept. 1972 Letter No. 72-982-C354

Ann Arbor, Michigan

To T.W. Fenske

From J. Zimmer

Subject LSPE Monthly Report for August 1972

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A. Accomplishments

1.0 System Tests with LSP

The Explosive Package Immunity Test (Qual) with ALSEP Central Station was completed successfully. In this test an Explosive Package was powered remotely and the Central Station operated in the LSP mode with the LSP transmitter on. The test demonstrated no false firing due to EMI and proper firing only on the coded signal.

A special test was also made to demonstrate that AGC pulses were not present in the LSP data subsequent to the grounding modification. In the test, the Qual Model Central Station with all available experiments were deployed outside Building 2 with the geophone deployed to the triangular array. There was no evidence of AGC pulses except when the LSP transmitter was deployed next to the geophone module with the geophone cables adjacent to the transmitter cable for 30 feet. This is actually an unrealistic test since these components are deployed approximately at an angle of 135°.

2.0 Flight Model Geophones

The Flight model geophones, after repair by Geotch, to replace EPON support rings were tested successfully with ALSEP.

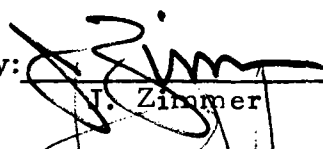
3.0 Explosive Packages

Assembly and test of the 8 Qual model E/P's and the 4 prototype E/P's for field test was completed. These units were placed in the T/V chamber for the timer timeout test over the Labor Day weekend.

Two Engineering Model Packages were shipped to WSTF. One timer failed during thermal vacuum test prior to shipment and was reworked at BWC.

B. Plans for Next Month

1. Complete assembly of BxA Qual Model EP's and start Qual test program.
2. Complete assembly of Flight Model E/P's.
3. Continue field tests of EM, proto and Qual Model E/P's.

Prepared By: 

J. Zimmer

Approved By: 

K. Hsi

cc: K. Hsi  
E. Weeks, MSC  
R. Murdock, MSC  
T. Graves, MSC

Internal  
Memorandum



Date 6 September 1972 | Letter No. LEAM- 214

Ann Arbor, Michigan

To T. Fenske

cc: O. Berg  
B. Reina

From D. Perkins

Subject LEAM Experiment Monthly Progress Report - August 1972

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7.0 LEAM

7.1 Accomplishments

- A. The Flight model calibration was successfully completed.
- B. The Flight model dust covers were stowed and the PIA completed.
- C. A system integration test was performed on the Flight model.
- D. The Flight model was delivered to the system.
- E. The Qual model was reassembled and tested and all discrepancy reports closed.

7.2 Plans for September

- A. Stow Flight model on Subpack II for delivery to KSC.
- B. Prepare for and attend QAR and CARR.

7.3 Problems During August

There were no problems during August.

  
D. Perkins

Approved By:

  
K. Hei

DP:nh

Internal  
Memorandum



Date 11 Sept, 1972 Letter No. LMS-776

Ann Arbor, Michigan

To T.W. Fenske

From D. Cook

Subject LMS Monthly Progress Review Report - August 1972

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This report describes the major accomplishments on the LMS during August including technical problems encountered and their solutions. It also includes work to be accomplished in September.

8.0 LMS

8.1 Accomplishments

8.1.1 Flight Model

- a) The absolute calibration on the low and mid mass ranges of the instrument was completed.
- b) On August 15 the gain of the electron multiplier (EM) tubes was measured again. The high mass EM tube gain held constant at  $1 \times 10^7$  at 2600 VDC but the mid and low mass EM tubes gain dropped to  $3.8 \times 10^7$  and  $1.4 \times 10^7$  at 2600 VDC respectively.

A meeting was held at MSC on August 17 to discuss the gain problem. It was the opinion of the attendees that the gain loss was due to the backfilling and/or storage of the analyzer with Krypton. It was decided to complete the calibration of the ion source temperature sensor and then maintain a vacuum in the analyzer and make periodic gain checks until Sept. 14.

Data presented by Dr. Hoffman and information taken from the UTD critical design review indicates that the lower limit on the EM tube gain is approximately  $6 \times 10^5$ . Nominal gain required is  $1.3 \times 10^6$ .

On August 24 the gain of the tubes was measured and the results were:

EM Tube	Gain at 2600 VDC
Low mass	$1.1 \times 10^7$
Mid mass	$1.8 \times 10^7$
Hi mass	$5.6 \times 10^6$



This was another drop in gain but because another backfill operation had taken place it was decided to wait for the September gain checks before deciding if the analyzer should be changed out or not.

#### 8.1.2 Qual Model

The unit successfully completed its' final PIA. It was also used in the LSPE RFI immunity test and a special system RF radiation test.

#### 8.1.3 Proto Model

- a) The problem in the multi-mode emission control card was traced to noise pickup in the filament regulator input. Capacitor C6 was changed from .1 F to 1.0 F to increase the filtering. The card was tested at UTD, returned to BxA and reinstalled in the unit.
- b) The PIA test was rerun, and the shock, EMI and, T/V tests were all completed successfully.

#### 8.1.4 Ion source filament life test

All tests have been completed and the final report is in preparation.

#### 8.1.5 Miscellaneous

During the impulse test on the experiment cable strain relief, the cable tore due to insufficient reinforcing fiberglass tape at the strain relief. The amount of tape was increased, and the test repeated without any problem.

#### 8.2 Plans for the Month of September

##### 8.2.1 Flight Model

Measure EM tube gain on September 5 and 14 and then decide whether to change out the analyzer or not.

##### 8.2.2 Qual Model

Ship the unit either to LRC for the angle test portion of the absolute calibration test or ship it to KSC for CF<sup>2</sup> test depending on the decision on the flight model.

8.2.3 Proto Model

There are no further tests planned for the unit.

Prepared By: D. Cook  
D. Cook

Approved By: [Signature]  
K. Hsi

DC:nh

cc: K. Hsi  
M. Howard  
Dr. J. Howard, UTD  
J. Sanders, MSC

Internal  
Memorandum



Date 11 Sept. 1972

Letter No. 984-708

Ann Arbor, Michigan

To T.W. Fenske

From R.B. Wallace

Subject Monthly Progress Report - August 1972

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9. LSG

9.1 Accomplishments

1. Completed Qual SP1 Design Limit vibration test and subsequent MIST.
2. Completed Post Design Limit Shock and Vibration test. With completion of this test, the Qual LSG has successfully completed the Qualification test program without any discrepancy reports.
3. Completed Array E LSP Explosive Package RF Immunity Test (used Qual LSG).
4. Completed pre flight and stowage activities for flight including soldering of pre/post amp connections, final electrical checks driving screws to pre flight positions. Completed installation of flat cable strain relief and stowage on SP1.
5. Completed checkout of Helmholtz coil test facility and released MFR measurement, calibration and degaussing procedures.
6. Began preparation for QAR/CARR.
7. Provided inputs to System Support for familiarization course and ALSEP Data Book for Array E.

9.2 Plans for Next Month

1. Complete Qual Noise and Performance test and subsequent PIA.
2. Complete flight MIST and prepare for KSC shipment (install MFR's and provide procedural inputs).

9.2 Plans for Next Month (cont.)

3. Complete preparations for QAR/CARR and support meetings.
4. Complete calibration of MFRs and measurement of post noise and performance test MFRs.
5. Provide inputs to System Support for operations plan and Flight related documents.

9.3 Problem Areas

None

Prepared By:

  
R. Wallace

Approved By:

  
K. Hsi

cc: A. Carraway, MSC  
Dr. Weber, U of Md.  
L. Holguin, MSC

Internal  
Memorandum



Date 11 September 1972 Letter No. 978-13-605

Ann Arbor, Michigan

To T. W. Fenske

From B.D. Smith

Subject HFE Monthly Report - August

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10.0 HFE


10.1 Accomplishments

- A. The Array E Flight HFE probes were stowed, the thermal paint was touched-up on the electronics and cable restraint structures were fitted at each end of the flat cable.
- B. CEI Spec for Flight model 6 was reviewed and the Array E data book was reviewed and updated.
- C. Trainer spare radiation shields and a probe emplacement tool are being produced.
- D. Further impulse testing was performed on a wired HFE astromate connector set (with Flight configuration strain relief) and a Flight representative Central Station panel. The results show a considerable safety margin and nothing failed.
- E. New HFE electronics master drawings were placed on file.
- F. The HFE data from the successful pre-vibration PIA test of 5/23/72 was processed and the results entered in the procedure data summary sheet.

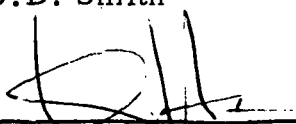
Data reduction continued for all Array E HFE data.

10.2 Plans for Next Month

- A. Complete the data reduction from Array E tests with HFE.
- B. Prepare for and support CARR and QAR.

  
B.D. Smith

Approved:

  
K. Hsi

Internal  
Memorandum



Date 9/5/72

Letter No. 977-1197

Ann Arbor, Michigan

To T. W. Fenske

From R. J. Hostetler

Subject Monthly Progress Report - August, 1972

1. Tests completed during this reporting period are as follows:

ARRAY E - Qualification System

Subpackage No. I Vibration (Design Limit)  
Subpackage No. I Boydbolt Verification  
Subpackage No. I Mist  
Subpackage No. I Radiated Power  
LMS Post-Vibration PIA  
LGS Post-Vibration PIA  
Central Station Verification (Rerun per DRAC5880)  
Central Station Verification (Rerun per DRAC-5879)  
LSPE RFI Immunity  
RFI Field Test  
Fit Checks of Subpackages I & II

ARRAY E - Flight System

Central Station Thermal Vacuum Test  
LSG Modified PIA (Per AER584)  
LSP Antenna Pre-Vibration Functional  
LSP Antenna Vibration (Acceptance)  
Data Processor Operating Vibration  
Data Processor Modified Functional  
LEAM PIA (Post-Calibration)  
Central Station Verification and LEAM EIT

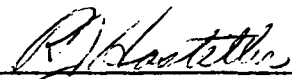
ARRAY E - Engineering and Proto Models

Proto LMS PIA Functional  
Proto LMS Shock  
Proto LMS EMI  
LSP Engineering Explosive Packages Vibration (Design Limit)  
LSP Engineering Explosive Packages Shock  
LSP Engineering Explosive Packages Thermal Vacuum  
Proto LMS Thermal Vacuum  
LSP Proto Explosive Packages Vibration (Design Limit)

Monthly Progress Report - August, Cont.

ARRAY E - LSP Qualification Explosive Packages

Mass Properties Determination (NOL Units)  
Vibration - Acceptance (NOL Units)

  
\_\_\_\_\_  
R. J. Hostetler, Group Supervisor  
ALSEP Systems Test

  
\_\_\_\_\_  
M. G. O'Mara, Manager  
ALSEP Quality Test

RJH/m

Internal  
Memorandum



Date 6 September 1972 Letter No. 975-2779

Ann Arbor, Michigan

To T. Fenske

From B. J. Rusky

Subject August System Support Monthly Report

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Apollo 16 ALSEP Mission Support

As of 31 August, the Apollo 16 ALSEP had completed 132 days of lunar operations. The downlink signal strength remains steady. The power output of the RTG is 70.4 watts and 2240 commands have been transmitted from Mission Control Center.

In the period from 3 August to 7 August, three major solar flares were observed by instruments at all of the ALSEP stations. Because of the scientific value of continuous data during this period, the special "listening mode" operation of the two Active Seismic Experiments, scheduled on 4 August, was cancelled.

Apollo 12, 14 and 15 ALSEP Mission Support

All ALSEP systems operating on the moon are being monitored continuously by the network receiving stations and on an intermittent schedule at Mission Control Center. The cumulative total, including the Apollo 16 ALSEP, is 2117 days of lunar operation (5.80 years). A total of 34,051 commands have been executed.

The only change in performance during August was in the Solar Wind Spectrometer of the Apollo 15 ALSEP. On 30 June, it suddenly showed an increase in power consumption with a simultaneous loss of output data. Except for brief periods of trouble-shooting, it has been commanded to standby since 30 June. On 17 August, it was commanded on and produced data (with the same abnormal power consumption) but caused some type of electrical interference which resulted in erratic output from the Passive Seismic Experiment. The Spectrometer was then commanded to standby pending a final decision regarding future operations.



Apollo 17 ALSEP Documents and Training

Based on review by Bendix and MSC, changes are being incorporated in the Array E Data Book (MP-07). Final publication and contractual delivery to MSC is expected in early September.

A preliminary copy of the Array E Mission Rules, prepared by MSC Flight Control has been received and is being reviewed at Bendix. The review comments will be supplied to MSC/LEPO around 15 September in order to obtain mutual agreement before the Mission Rules Meeting which is scheduled at MSC on 13 November.

The Array E Training Course Handout is in publication for use during a five-day course presentation at MSC (11 to 15 September) and a two-day briefing at GSFC (21 and 22 September).

ALSEP Anomaly Report Summary

The current MSC/R&QA Open Problem List reflects 34 open items from prelaunch hardware testing. Of these, 12 are in process at Bendix and 22 are at MSC for close-out action. There are no open items from lunar operations on either the MSC/R&QA Open Problem List or the ASPO Problem and Discrepancy List.

KSC Operations/Field Support

The EPTM flight transport frames were shipped to BxA, Ann Arbor on 3 August.

The Apollo 17 ALSEP Cask Assembly was installed on LM-12 on 8 August for the LM-12 C<sup>2</sup>F<sup>2</sup>, and the back-up crew performed the operation on 9 August without cutting the shear wires. The Apollo 17 prime crew performed the cash tilt operation during the C<sup>2</sup>F<sup>2</sup> on 11 August, and astronauts Schmidt and Cernan were satisfied with the operation. A minor problem was discovered after the ACA was removed from LM-12 when an inspection revealed one strain gage connector separated from the upper circumferential band. The discrepancy was satisfactorily reworked on 20 August by repairing the wires and covering the wires and connector with gage kote to hold them in place until the flight cask is installed and the bands tensioned. This installation is scheduled to be completed by 15 September.

All GSE required to support Apollo 17 ALSEP is currently being calibrated at KSC and scheduled for completion by 15 September.

Initial shipment of consumables for supporting Apollo 17 ALSEP was received on 30 August and stored in the bond room.

Grumman document TCP KL-10040-LM-12 was reviewed and comments submitted to Grumman on 31 August.

BxA KSC personnel supported the final restowage of the subpackage in Ann Arbor. Final restow is scheduled to be completed by 11 September.

The following Type I KSC procedures were approved by NASA/KSC during August:

<u>TCP No.</u>	<u>Title</u>
2368938	Assembly of Operational EP's and Installation in LM-12
2368975	Array E STS Operational Procedure
2368933	E&SA Test Set Calibration
2368959	Cal. Test Procedure for Array E Data Unit
2368931	LSPE Ordnance Housing & Charge Assy R&I

The following Array E KSC procedures were released during August:

<u>TCP No.</u>	<u>Title</u>
2365344D	CF <sup>2</sup> Test of Apollo 17 ALSEP (Array E)
2368909A	Array E SP#1 Receiving Inspection
2368932B	E&SA Test Set Checkout
2368933A	E&SA Test Set Calibration
2368934A	EPTM Receiving Inspection
2368958B	Apollo 17 (Array E) Restowage after CF <sup>2</sup>

The Monthly Spares Status Report was revised and submitted to NASA on 15 August.

Level "A" SML was updated and submitted to NASA on 31 August 1972.

Logistics personnel continued their effort pertaining to closeout action. Specific major activities included the following:

- a. Five major flight level A spares and the CPLEE residuals were screened, declared excess, and submitted to NASA for disposition.

Specific major spare activities included the following:

Level "A" Spares - Two line items consisting of twenty-three pieces were delivered to KSC by DD-250. In addition, sixteen consumable items were delivered to KSC.

E2E Trainer Spares - Twenty-two line items consisting of three hundred eight pieces were delivered to KSC by DD-250.

GSE Spares - Twenty Pen Headers for the E&SA test set were delivered to KSC by DD-250.

The following represents the present status of ALSEP Array E Level A Spares:

- a. Helical Antenna (SN 15) and Antenna Cable Assembly (SN15) have been delivered by DD-250.
- b. Antenna Aiming Mechanism was cancelled.
- c. Diplexer Filter (SN 14) and Diplexer Switch (SN 14) have been delivered by DD-250.
- d. Transmitter (SN 47 - Teledyne) has been delivered by DD-250.
- e. Build-up and testing of the Command Decoder (SN 13), Data Processor/Multiplexer (SN 14), PCU (SN 13), and PDU (SN 15) were completed in June. However, since these components were not subjected to operating vibration and thermal vac as directed by NASA, these components have been placed "on hold" pending further direction from NASA.
- f. The RTG Shorting Plug SN 13 was designated as flight, and SN 12 was redesignated as the flight spare. SN 12 has been placed "on hold" pending further direction from NASA since it has not been subjected to operating vibration and thermal vac.
- g. Command Receiver (SN 18) is currently being reworked at Motorola and is scheduled to be delivered as a flight spare by 30 September 1972.

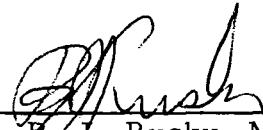
Safety

The Crew/Mission Operations Hazard Analysis was completed in draft form and submitted for review. Review and publication is scheduled for mid-September.

The LSPE Field Test Safety Plan was reviewed in conjunction with an evaluation of deployment changes for the Explosive Packages and discussed at the field test readiness review at MSC.

The LSPE Final Safety Report is complete in draft form. Review and publication is scheduled for September.

Routine system safety activities were continued as scheduled.



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B. J. Rusky, Manager  
ALSEP System Support

BJR/mgk

Internal  
Memorandum



Aerospace  
Systems Division

Date 6 September 1972 Letter No. 9721-2936

Ann Arbor, Michigan

To T. W. Fenske

From S. J. Ellison

Subject August 1972 Monthly Progress Report, ALSEP Reliability

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1. GENERAL

This report is organized to review Array E Experiments in Section 2, Array E System and Central Station in Section 3, Array E in Section 4, and to provide FIAR status in Section 5.

2. ARRAY E EXPERIMENTS

2.1 LSP Experiment

(a) LSPE Geophones (qual Model)

FIAR AA-EH-00E35 was closed 7/25/72. During Qual Design Limit Lunar Noon T/V, LSPE Geophone Module was 320°F (should be below 292°F). Reason for the excessive temperature was the test thermal bag over the geophone was too large. All four geophones were sent to Geotech for examination and all showed dimensional changes and cracking of epon support rings. The support rings were replaced and the geophones re-tested including a soak at 250°F. The geophones have been returned to BxA for Design Limit Vibration testing.

(b) LSPE Geophones (Flight model)

FIAR AA-EH-00E48 was issued 8/7/72. Geotech performed engineering evaluation tests at hot and cold temperatures on ASE spare geophones. These tests showed that the support rings deform at hot temperatures and they crack at cold temperatures (-250°F). The flight geophones were examined and two of the four standoffs were replaced because of cracks.

- (c) FIAR AA-EH-00E38 - During Qual MIST system level testing the LSP antenna cable shield appeared to be broken loose from connector P-155B. The outer shield (braid) solder joint to the connector was found to be not securely soldered to the connector shell. All qual OSM connectors (using RG188 cable) were repaired by re-soldering. All flight OSM connectors have been replaced with a revised and improved MP 62 procedure which allows additional braid area to be soldered directly to the connector shell. FIAR E38 was closed by LSPO 8/17/72.

(d) LSPE Timers

During the August reporting, extensive timer problems appeared and were reported to NASA/MSC via FIAR. With the exception of three of these FIAR's, the final analysis has been prepared for NASA review on 5/6 September 1972. These FIAR's are summarized below:

Prototype, LSPE Timer Status

<u>Timer</u>	<u>Exp. Pack</u>	<u>Problem</u>	<u>FIAR No.</u>
S-64	4	Gross Leak	E-56
S-65	7	Gross Leak	E-56
B-65	7	Timer Run Out O.T.	E-66
B-66	2	Timer Stopped @ 6 hrs.	E-62

(d) LSPE Timers

NOL-QUAL, LSPE Timer Status

<u>Timer</u>	<u>Exp. Pack.</u>	<u>Problem</u>	<u>FIAR No.</u>
<u>S-56</u>	<u>22</u>	<u>7 Min. O. H. L.</u>	E-52
S-61	23	6 Min. O. H. L.	
B-56	22	13 Min. O. H. L.	E-58
S-59	21	Amplitude O. H. L. Arming Pin Retraction Failure	E-46
B-59	21	Amplitude O. H. L.	E-45
S-54	24		
S-60	27	Arming Pin Did Not	E-51
S-57	28	Retract	
B-60	27	Micro-Switch Mis-Set	E-60
B-57	28	<u>6 Min. U. L. L.</u> Stopped at 75 Hrs.	<u>E-64</u> E-53
B-61	23	<u>Amplitude O. H. L.</u> 10 Minutes O. H. L.	<u>E-47</u> E-59
B-58	26	Failed To Start	E-55
S-55	25	Did Not Go From-Safe to Arm	E-73

(d) LSPE Timers

BxA - QUAL, LSPE Timer Status

<u>Timer</u>	<u>Exp. Pack.</u>	<u>Problem</u>	<u>FIAR No.</u>
S-69	31	Timer Running With Pull Pin Gross Leak	E-63 E-56
B-69	31	4 Min. O. H. L.	E-69
B-72	30	2 Min. U. L. L.	E-69

FLIGHT, LSPE Timer Status

<u>Timer</u>	<u>Exp. Pack.</u>	<u>Problem</u>	<u>FIAR No.</u>
B-55	41	<u>Stopped @ 10 Hrs.</u> Stopped @ 77 Hrs.	<u>E-44</u> E-57
B-76	42	Pull Pin 1.2 #O. H. L. 6 Min. U. L. L. Micro-Switch Contact Resistance O. T. Failed Leak Test	E-72
B-54	44	Micro-Switch Contact Resistance O. T. 5 Min. U. L. L.	E-50
S-77	48	Arm Pin Did Not Retract	E-70
B-77	48	Micro-Switch Miswired	E-71



(d) LSPE Timers

FLIGHT Spare, LSPE Timer Status

<u>Timer</u>	<u>Exp. Pack.</u>	<u>Problem</u>	<u>FIAR No.</u>
S-76	-	Stopped @ 12 Hrs.	E-68
S-73	-	Broken Hour Wheel	E-67
S-74	-	Arm Pin Did Not Retract	E-70
<u>B-67</u> B-78	-	<u>1 Min. U. L. L.</u> 15 Min. U. L. L.	E-69

(e) LSP Antenna

Late in the LSP program it became apparent that the collapsible antenna manufactured by Miller would not be suitable for use in the LSP experiment, so a plan to certify a new antenna from Russell Industries was presented at the antenna meeting held at NASA/MSC, 2 May 1972. These minutes describe the tests to be performed by engineering and reliability. The tests performed were:

- ..plating and material confirmation
- ..materials compatibility
- ..plating adherence
- ..antenna pull tests

These tests have been performed, and it has been concluded that the Russell antenna is suitable for the LSP experiment. A final report on the "Evaluation of Russell Antenna" has been prepared and published in the form of an internal memorandum: 9721-2909.

(e) LSP Antenna

A sample of eight (8) Russell antennae selected randomly from bonded stores were submitted to a lot qualification test program. The antenna design successfully completed all the lot qualification tests. The results of this program are documented in an internal memorandum: 9721-2908.

2.2 LEAM Experiment

There are no FIAR's nor problems of reliability concern at this time.

2.3 LSG Experiment

LSG flight model has successfully completed noise performance tests at the University of Maryland. There are no FIAR's nor problems of reliability concern at this time.

2.4 LMS Experiment

- (a) Prototype tests - qual of multi-mode emission control electronics (Ref. FIAR AA-EH-00E42) - An additional oscillation type problem in the ion source filament supply occurred following the vibration test for the cyclic mode only. An "oscillation" which tends to shut off the filament voltage at about a 100 HZ rate occurred at room temperature. The problem appeared following a final assembly step where the filament supply leads are cut short in order to make a final connection to the instrument filaments. Previous testing was done with the supply attached thru 24 inch leads to the simulator or thru the same 24 inch leads to the instrument filaments.

Initial troubleshooting indicated that the prototype instrument filaments were higher resistance (lower filament current) than flight type and that the prototype power supply had been adjusted for filament currents similar to flight current values. Also, the prototype filaments were of a different configuration. There is a tendency toward "oscillation" due to changes in filament loading.

#### 2.4 LMS Experiment

- (a) The prototype was returned to UTD and new flight type filaments were installed. The filament current for 250 microamps emission was adjusted by controlling the filament weld position to provide filament current as close as possible to those on the flight model.

Upon returning to BxA, the oscillations were still present. The new emission control electronics was returned to UTD for detailed circuit probing and troubleshooting.

Preliminary results from UTD indicate that the power supply "oscillation" problems are probably due to noise getting into the emission control reference circuit. During the fixed mode the emission level is 250 microamps and during the cyclic mode this is reduced to 100 microamps. The "oscillation" occurs only in the cyclic mode where the reference circuit is much more susceptible to noise.

A relatively minor prototype fix is required in that C6 in the reference circuit needs to be changed from 0.1 to 1.0 microfarad.

Also, the flight model may require a check of the noise leaking into its reference circuit and if necessary a change in C6. So far, the flight model has never "oscillated". However, the filament leads are still 24 inches. The final assembly where the leads are trimmed is to be done at Langley. A decision on the necessity of opening up LMS to make noise measurements will be made in early September.

- (b) LMS Ion Source Filament Tests - The tests and status are:
- (1) 10 filaments at 50,000 cycles each. Each cycle to be approximately 0.5 second on and 1.5 second off. Completed without failures.

(b) LMS Ion Source Filament Tests

- (2) 5 filaments powered continuously at 5% over nominal current for 96 hours each. (4 completed, one more to go)
- (3) 5 filaments powered continuously at full power for 8 hours each. Full power is the maximum output of the emission control (none completed).

- (c) Qual Cover Assembly (Breakseal) Problem - (Reference DR #AC5092 and AC5462). An Interim FIAR #AA-EH-00E27 was issued in July. BxA reliability examined this breakseal at UTD in June and the unit showed voids in the weld in 4 places, excessive application of GE-Vac (which is meant to be used to plug small cracks), crazing and cracking of the "coating" of GE-Vac, and evidence of improperly cured GE-Vac. The excess GE-Vac was applied at BxA (uncured) in an attempt to stop the leak and has since cracked due to using too thick an application.

BxA reliability again examined the breakseal in July after cleaning away the GE-Vac. Radial cracks in the ceramic were now visible. This breakseal is considered to be non-repairable.

Also, the flight model breakseal was re-checked for leaks at Langley and found to be leaking. The unit was examined and some small braze voids were noted as well as the GE-Vac that was originally applied was crazed and cracked. This flight breakseal was successfully repaired at LRC by application of additional GE-Vac, followed by temperature cure. At this time, the flight breakseal must be kept with the flight LMS since there is no other flight type breakseal available. A similar test of the FLT spare breakseal (on Qual LMS) will be done at LRC.

#### 2.4 LMS Experiment

- (d) LMS Gain and Calibration at LRC (Langley) - During the end of July, a low gain reading was observed on the flight model LMS high-mass tube at LRC. This tube is being used in the LMS at 2400 volts (proto and qual required nearly 2600 volts) because it supposedly had very high gain at UTD. The flight model tubes have never been turned on at Bendix. This discrepancy is being handled on UTD DR #1320 and no BxA DR on FIAR has been issued yet.

The pre-assembly data for the high-mass tube shown last month was erroneous and the 10 to 0 gain degradation is no longer suspect. Additional data is presently being sought to establish the pre-assembly tube gain for the flight LMS.

#### 2.5 Heat Flow Experiment

There were no new Reliability problem encountered during August.

### 3. ARRAY E CENTRAL STATION AND SYSTEM

#### (a) Action Item Status

- (1) AI #661 (Array E Action Item #EE-7) - BxA to screen all 54L parts in bonded stores to preclude installation of a leaky part in the Qual, Flight or Spare hardware in the event parts replacement is necessary. All parts in stores have been screened per the requirements set forth internal memorandum 9721-2893. There was approximately a 10% fallout. A final report on the results of this screening is being prepared for close out during September.

3. ARRAY E CENTRAL STATION AND SYSTEM cont.

- (2) AI #692 (Array E Action Item #CM-2) - BxA Reliability to update the following documents to include the changes that have been implemented since CDR on Array E: (1) FMECA, (2) SPFS, (3) EE Parts List, (4) Parts Application Analysis, (5) Non-metallic Materials List. These documents are being prepared for presentation and discussion at the CARR on 18/19 September 1972.
- (3) AI #763 (Array E Strain Relief CDR) - BxA Reliability will verify the material capability of ALSEP cables with Scotch 69 and Mystik tape to insure that no long term degradation of the cables will occur. The materials are being reviewed and response to this action item will be accomplished prior to the Array E CARR.
- (b) Qual vs. Flight Differences - The System, Central Station and Experiment Qual vs. Flight hardware parts and design differences have been reviewed and updated in Revision I of the ATM-1054 summary issued 7/10/72. Next issue expected about 9/13/72.
- (c) Array E Pre-PIA Part Failure Trends - Apart from the LSPE timers and the 54L IC's, no part failure trends have been determined to exist based on review of the Monthly Array E Scrap Report and the Monthly Discrepancy Report Computer Summaries.
- (d) Failures - See Section 5.
- (e) ALERTS - ALSEP Reliability investigated nine (9) ALERTS as to applicability.

Reference: Transmittal Letter NB-L-394-72 (20 July 1972)

- |     |                                   |                                                                                                                                                               |
|-----|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (1) | ARC-72-02                         | Transistor, Qual<br>Motorola - MHQ 4002 in Ceramic Dip                                                                                                        |
|     | Problem:                          | Cracks in the ceramic at the point<br>of lead entrance into the package.<br>Caused by clinch/lead cut operation.                                              |
|     | BxA Response:                     | Not used in ALSEP.                                                                                                                                            |
| (2) | KSC-72-04A<br><br>(Revised ALERT) | Fuse (F15A) General<br><br>Pacific                                                                                                                            |
|     | Problem:                          | Open circuit fuse because of corrosion.<br>In use 5 to 6 years and were from a<br>questionable procurement batch.                                             |
|     | BxA Response:                     | Not used in ALSEP                                                                                                                                             |
| (3) | MSFC-A-72-13                      | Foam, Polyurethane<br>Used in packaging/cushioning                                                                                                            |
|     | Problem:                          | Reverted to powdery and/or gummy<br>substance over a 4-7 year period.                                                                                         |
|     | BxA Response:                     | Used in ALSEP -LSPE (Geophone<br>Canisters, Explosive charge.)<br>Not affected by this ALERT because<br>ALSEP storage requirements are less<br>than one year. |

Reference: Transmittal Letter NB-L-394-72 (20 July 1972)

(4)	MSC-72-05	Circuit Breaker Mechanical Products 700 Series
	Problem:	Malfunction because of bent pivot rivets, internal tolerance buildup and case shrinkage.
	BxA Response:	Not used in ALSEP

Reference: Transmittal Letter NB-L-427-72 (9 August 1972)

(5)	D4-A-72-03	Resistor, RE70-Cal-R Inc.
	Problem:	Out-of-tolerance condition caused by improper application of an abrasive tool which reduced the thickness of the resistive element and subsequently opening of the element.
	BxA Response:	Not used in ALSEP.

Reference: Transmittal Letter NB-L-425-72 (9 August 1972)

(6)	MSC-72-07	Cable, Electrical, twisted 3-conductor shielded, Teflon insulated, nylon jacketed, Microdot P/N 202-3938 (1966-67 procurement)
	Problem:	Deformations (KINKS) in the cable. Cold flow of the teflon insulation eventually exposed conductor allowing a short between the wire and the shield to occur.
	BxA Response:	Not used in ALSEP.



Reference: Transmittal Letter NB-L-425-72 (9 August 1972)

- (7) S4-A-72-01 Capacitor, ceramic Aerovox-CKR06  
M39014/02-0298, lot date code 7122C
- see BxA Letter: BxP.O. 5403(SJE)  
and BxP.O. 5272(SJE)

Refence: Transmittal Letter NB-L-444-72 (22 August 1972)

- (8) D5-A-72-01 Capacitor, Sprague 218P Date code  
7047
- Problem: Open circuit during tests. Bond  
between the lead spiral and metal end  
spray was broken causing intermittent  
contact.
- BxA Response: Not used in ALSEP
- (9) MSFC-72-14 Capacitor, Solid Tantalum coming  
(Semcor) Style TS2K, Mfr, in 1965.
- Problem: Solder pellit in the bottom of the case  
had not been flowed to attach the slug  
to the case.
- BxA Response: Not used in ALSEP.

4. ALSEP ARRAY D

- (a) Action Item Status - No outstanding Reliability action item.
- (b) Cable Strain Relief - ALSEP Reliability investigated connectors and cables considered as possible replacements for flat conductor cable which was accidentally torn during Apollo 16 deployment. Possible corrective actions have been reviewed with NASA/MSC, and it was concluded that improvement of ALSEP cable strain relief was preferred to modification of cables and/or connectors electrically. Reliability has reviewed and approved all cable strain relief modifications for Array E.
- (c) ASE Pitch Sensor Anomaly - As a result of failure of the ASE pitch sensor after the 3rd grenade launch from the Apollo 16 mortar box. ALSEP Reliability investigation was initiated on 5/30/72 and implemented as follows:
  - (1) Identify potential causes of the pitch sensor failure mode.
  - (2) Examinations of photos from Lunar Surface by Reliability.
  - (3) Review FMEA analysis on pitch and roll sensors and associated circuits by Reliability.
  - (4) Review BxA assembly and KSC installation records by reliability with support from Systems Support.
  - (5) Identify most likely causes.

After FMEA and KSC installation record reviews which did not disclose any most likely conclusions, the Apollo 16 telemetry apparently provided in-scale data for both the pitch and roll sensors on 6/16/72. However, the transient nature of the readings which have not reappeared since the 6/16 measurements leads to the conclusion that the data may be readings of malfunction voltages and not true pitch measurements.

(c) ASE Pitch Sensor Anomaly cont.

The investigation was ended with conclusions that the pitch sensor failed with high mortar shocks probably contributing to the failures. Apollo 14 will not likely see such high shocks which were believed to be due to the pallet configuration shock levels which are expected to be higher on Apollo 16. A final report was written which summarized the analysis performed and conclusion reached (internal memorandum 9721-2916, dated 8 August 1972.)

5. COMPOSITE ALSEP FAILURE REPORT STATUS

(a) New Failure Report Items - Twenty-nine (29) new failure report items were initiated during July 1972 as follows:

(1)	FIAR #E44 - LSPE Timer,	Proto
(2)	FIAR #E45 - LSPE Timer,	Proto
(3)	FIAR #E46 - LSPE Timer,	Proto
(4)	FIAR #E47 - LSPE Timer,	Proto
(5)	FIAR #E48 - LSPE Geophones,	Flight
(6)	FIAR #E49 - Data Processor, S/N2,	Qual
(7)	FIAR #E50 - LSPE Timer,	Proto/Qual
(8)	FIAR #E51 - LSPE Timer,	Proto/Qual
(9)	FIAR #E52 - LSPE Timer,	Proto/Qual
(10)	FIAR #E53 - LSPE Timer,	Proto/Qual
(11)	FIAR #E54 - LSP Antenna Assy,	Proto
(12)	FIAR #E55 - LSPE Tim r,	Proto/Qual
(13)	FIAR #E56 - LSPE Timer,	Proto/Qual
(14)	FIAR #E57 - LSPE Timer,	Proto/Qual
(15)	FIAR #E58 - LSPE Timer,	Proto/Qual
(16)	FIAR #E59 - LSPE Timer,	Proto/Qual
(17)	FIAR #E60 - LSP EPA,	Qual
(18)	FIAR #E61 - Command RCVR, S/N17,	Qual
(19)	FIAR #E62 - LSPE Timer,	Proto/Qual
(20)	FIAR #E63 - LSPE Timer,	Proto/Qual

5. COMPOSITE ALSEP FAILURE REPORT STATUS

(a)

(21)	FIAR #E64 - LSPE Timer,	Proto/Qual
(22)	FIAR #E65 - Data Processor, S/N15,	Flight
(23)	FIAR #E66 - LSPE Timer,	Proto/Qual/Flight
(24)	FIAR #E67 - LSPE Timer,	Proto/Qual/Flight
(25)	FIAR #E68 - LSPE Timer,	Proto/Qual/Flight
(26)	FIAR #E69 - LSPE Timer,	Proto/Qual/Flight
(27)	FIAR #E70 - LSPE Timer,	Proto/Qual/Flight
(28)	FIAR #E71 - LSPE Timer,	Proto/Qual/Flight
(29)	FIAR #E72 - LSPE Timer,	Proto/Qual/Flight

(b) Closed Failure Report Items - Failure report items were closed during the month of August as follows:

(1)	FIAR #E6 - Central Station, S/n-10	Qual
(2)	FIAR #E28 - HFE, S/N-2,	Qual
(3)	FIAR #E30 - LSPE XMTR, S/N-2,	Qual
(4)	FIAR #E31 - LEAM S/N-2,	Qual
(5)	FIAR #E32 - LEAM S/N-2,	Qual
(6)	FIAR #E33 - S/P I (connector),	Flight
(7)	FIAR #E34 - LSPE (cable shields),	Qual
(8)	FIAR #E38 - LSPE (cable shields),	Qual

(c) Open FIARS

(1) FIAR AA-EH-00E27, LMS S/N-5, Array E, Qual

During pumpdown/backfill on the S/N-2 LMS Qual Model, the experiment could not obtain required backfill pressure. DR #AC5092 and AC5462. The cover assembly including breakseal was suspect of leaking and was replaced. The breakseal (cover assy) was sent to UTD for analysis and possible repair. UTD analysis received on 6/15/72 was rejected by BxA. BxA Reliability microscope 70 power examination of breakseal after removal of GE-VAC shows radial cracks in ceramic. Unit is not repairable.; Flight breakseal also leaked during test at Langley but was repaired with GE-VAC. Examination showed cracks in the original application of GE-VAC.

Status: Open

Action: (1) TWX and FIAR issued 5/17/72  
(2) Interim FIAR issued 7/25/72  
(3) Final FIAR to be issued after leak test of flight spare breakseal (on qual model LMS) at Langley (approximately 9/14/72).

(2) FIAR AA-EH-00E39, C/S Uplink, Array E, Flight

During the lunar morning IST in the flight system thermal vacuum test, no command verification work was received for octal command 135. DR #AC5535. The downlink housekeeping data indicated an apparent loss of 6 db in the received signal strength. The problem was localized to the S/N-18 receiver which was replaced by S/N-15, after ensuring that S/N-15 had no similar problem. At Motorola, the problem was isolated to the front end of the receiver. Grounding of the RF power splitter was intermittent vs. temperature causing 5-7 db degradation in input RF level. Problem was determined to be on S/N-17 & 18 but not S/N-15.

(2) FIAR AA-EH-00E39, C/S Uplink, Array E, Flight cont.

Status: Open

- Action:
- (1) TWX and FIAR issued 7/5/72
  - (2) Interim FIAR issued 7/28/72
  - (3) Final FIAR issued 9/1/72
  - (4) Awaiting LSPO Closeout

(3) FIAR AA-EH-00E41, LEAM, S/N-2, Array E, Qual

During pre-integration acceptance test performed on the LEAM Qual Model hardware, it was found that there was not continuity from pin 3 to pins 10, 22, 24, 27 on P90 of the astomate connector. DR #AC5866. This connection is wired inside the LEAM experiment electronics. The discontinuity was found to be a broken (redundant) power wire which appeared to have insufficient stress relief.

Status: Open

- Action:
- (1) TWX and FIAR issued 7/7/72
  - (2) Final FIAR issued 7/17/72
  - (3) BxA awaiting LSPO closeout action.

(4) FIAR AA-EH-00E42, LMS, Array E, Proto (Qual MMECB)

Following Prototype Vibration Test, the filament power supply HK reads low. DR #AC5537. Indication was that the Qual Multimode Emission Control Board was causing filament power supply oscillation due to low filament current (filament resistance too high). Proto LMS was returned to UTD to replace proto filaments with flight type filament showed oscillation problem is still present. The multi-mode emission control electronics was returned to UTD for further troubleshooting on DR #AC5873. Preliminary results at UTD show that noise in the reference circuit is most likely causing a marginal condition which will cause oscillation in the cyclic mode when the filament leads are trimmed from 24" to 6" during final assembly. Fix on proto was to change C6 in the reference circuit from .1 to 1.0 microfarad to remove noise. Flight model may require measurement of noise level and possible replacement of C6. Present test results on FLT model indicate no oscillation problem.

Status: Open

Action (1) TWX and FIAR issued 7/14/72

(2) Final FIAR to be issued following decision on necessity of flight model capacitor change. Approx. 9/11/72.

(5) FIAR AA-EH-00E43, S/N#1, Sunshield, Array E, Qual

During the sub-pack 1 qual design limit vibration test, the sunshield honeycomb core to insert bond apparently failed near the LSG mounting inserts. DR #AC5686. The sunshield has been determined to be structurally sound, the sub-package has been reassembled and returned test. The qual design limit vibration test has been completed; a waiver is being submitted for x-axis sine vibration between 50 and 100 HZ per BxA MSC agreement.

(5) FIAR AA-EH-00E43, S/N#1, Sunshield, Array E, Qual (cont.)

Status: Open

Action: (1) TWX and FIAR initiated 7/21/72  
(2) Final FIAR to be scheduled after receipt of test report from outside lab that evaluated the sunshield. (Approx. 9/15/72).

(6) FIAR AA-EH-00E44, LSPE Timer, Array E, Proto

During ATP four day run-out at BWC, timer B-55 drum stopped after about 13 hours. DR #AC5161. Troubleshooting is in progress.

Status: Open

Action: (1) TWX and FIAR issued 8/3/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action

(7) FIAR AA-EH-00E45, LSPE Timers, Array E, Proto

During ATP four day run-out at BWC, timer B-59 had watch amplitudes which exceeded the ATP maximum level of 1-1/4 turns when pull pin was removed. DR #AC5157. The ATP was continued as part of troubleshooting plan. Preliminary information from BWC indicates amplitude settles down after some backlash is taken up during run-time.



(7) FIAR AA-EH-00E45, LSPE Timers, Array E, Proto (cont.)

Status: Open

Action: (1) TWX and FIAR issued 8/3/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action

(8) FIAR AA-EH-00E46, LSPE Timers, Array E, Proto

During ATP four day run-out at BWC, timer S-59 had watch amplitudes which exceeded the ATP maximum level of 1-1/4 turns when pull pin was removed. DR #AC5156. The ATP was continued as part of troubleshooting plan. Preliminary information from BWC indicates amplitude settles down after some backlash is taken up during run-time.

Status: Open

Action: (1) TWX and FIAR issued 8/3/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action.

(9) FIAR AA-EH-00E47, LSPE Timers, Array E, Proto

During ATP four day run-out at BWC, timer B-61 had watch amplitudes which exceeded the ATP maximum level of 1-1/4 turns when pull pin was removed. DR #AC5158. The ATP was continued as part of troubleshooting plan. Preliminary information from BWC indicates amplitudes settles down after some backlash is taken up during run-time.

(9) FIAR AA-EH-00E47, LSPE Timers, Array E, Proto cont.

Status: Open

- Action: (1) TWX and FIAR issued 8/3/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPE close out action.

(10) FIAR AA-EH-00E48, LSPE Geophones, Array E, Flight

Special engineering tests were run on ASE spare geophones at Geotech to determine if the insulates standoff which supports the transducer could be cracked by cold temperature. Cracks were observed due to +250°F to -125°F exposure. Since the flight geophones were exposed to -250°F during system T/V test, a "suspect DR" (DR #AC4059) was issued. The flight geophones were examined (with NASA MSC present) by removing only the bottom cover. Two of the four insulated standoffs were severely cracked and the other two were undamaged. The cracked standoffs were replaced as corrective action for flight. The four qual model geophones needed no corrective action since their standoffs were replaced following exposure to +320°F during qual T/V. (Reference FIAR AA-EH-00E35).

Status: Open

- Action: (1) TWX and final FIAR issued 8/7/72  
(2) BxA awaiting LSPO closeout action.

(11) FIAR AA-EH-00E49, Data Processor, S/N-14, Array E, Qual

During the post design limit vibration MIST, the central station house-keeping channel HK 70 read 000, it should have been 160-220. DR #AC5880. This indicated that DDP Y was on, when DDP X should have been on. Troubleshooting indicated a short on the +5V line to DPX, visual examinations of the central station wiring harness and the interface connector to motherboard wiring in both the DPU and DDP revealed that the DDP X, +5V line in the DDP was pinched and had shorted the ground plane of the motherboard.

(11) FIAR AA-EH-00E49, Data Processor, S/N-14, Array E, Qual cont.

Status: Open

Action: (1) TWX and FIAR initiated 8/9/72  
(2) Final FIAR scheduled for 9/8/72

(12) FIAR AA-EH-00E50, LSPE Timer, Array E, Proto/Qual

During ATP four day run-out at BWC, microswitch contact resistance for timer B-54 was out-of-tolerance (O.T.). DR #AC5164.

Status: Open

Action: (1) TWX and FIAR issued 8/10/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPD close-out action.

(13) FIAR AA-EH-00E51, LSPE Timers, Array E, Proto/Qual

During ATP four day run-out at BWC, the arm pin failed to retract on three (3) timers. These are S-60, S-64, and S-57. DR #AC5165, 5168, 5169.

Status: Open

Action: (1) TWX and FIAR issued 8/10/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action

(14) FIAR AA-EH-00E52, LSPE Timers, Array E, Proto/Qual

During ATP four day run-out at BWC, the "arm" time delay period for S-56 was 7 minutes over high limit (O.H.L.). Also, the "arm" delay period for S-61 was 6 minutes O.H.L. DR #AC5170, 5173.

Status: Open

Action: (1) TWX and FIAR issued 8/10/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action.

(15) FIAR AA-EH-00E53, LSPE Timer, Array E, Proto/Qual

During ATP four day run-out as BWC, the watch in timer B-57 stopped after about 75 hours run time. DR #AC5167.

Status: Open

Action: (1) TWX and FIAR issued 8/10/72  
(2) Final FIAR to be issued 9/1/72  
(3) BxA awaiting LSPO close-out action

(16) FIAR AA-EH-00E54, LSP Antenna Assy, 2348320, Array E, Proto

During acceptance test per TP 2368949 A paragraph 6.3.3, the second grip ring pulls free before the 5th top section deploys. DR #AC5875.

Status: Open

Action: (1) TWX and FIAR initiated 8/16/72  
(2) Final FIAR issued 8/30/72.  
(3) BxA awaiting LSPO closeout action.

(17) FIAR AA-EH-00E55, LSP Timer, Array E, Proto/Qual

During acceptance test timer B-58, failed to start upon pull pin removal during ATP. DR #AC3618.

Status: Open

Action: (1) TWX and FIAR initiated 8/16/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action

(18) FIAR AA-EH-00E56, LSP Timer, Array E, Proto/Qual

During acceptance test at subcontractor facility (BWC), three timers SN S-64, S-69 and S-65 all exhibited gross leak conditions. DR #AC 5179, 5181 and 5180.

Status: Open

Action: (1) TWX and FIAR initiated 8/16/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action.

(19) FIAR AA-EH-00E57, LSP Timer, Array E, Proto/Qual

During ATP at BWC, battery timers B-55 stopped at 77 hours. Time out should be 90 hours. DR #AC5184.

Status: Open

Action: (1) TWX and FIAR initiated 8/16/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action.

(20) FIAR AA-EH-00E58, LSP Timer, Array E, Proto/Qual

During acceptance test at subcontractor facility (BWC), timer S-56 firing time was 13 minutes over high limit (O. H. L.). The limits are  $\pm 27$  minutes from nominal. DR #AC5163.

Status: Open

Action: (1) TWX and FIAR initiated 8/16/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action.

(21) FIAR AA-EH-00E59, LSP Timer, Array E, Proto/Qual

During acceptance test at subcontractor facility BWC, timer S-56 firing time was 10 minutes over high limit. The limits are  $\pm 27$  minutes from nominal. DR #AC5166.

Status: Open

Action: (1) TWX and FIAR initiated 8/16/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action.

(22) FIAR AA-EH-00E60, LSP EPA, Array E, Qual

During explosive package assy S/N 27, first functional test at BxA, battery timer redundant switches are both in "ARM" (common to N. C.) position and should be in "SAFE" (common N. O.) position. The microswitch buttons are apparently not pushed in as they should be in the "SAFE" position. DR #AC6203.

Status: Open

Action: (1) TWX and FIAR initiated 8/16/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action.

(23) FIAR AA-EH-00E61, Command RCVR, S/N 17, Array E, Qual

During the central station verification test following the hardware repairs required in FIAR AA-EH-00E49, side B of the redundant command receiver exhibited clipping and excessive noise in the audio output; CVW were lost and the telemetry data indicated an approximate 7 db signal strength loss. DR #AC5887. This problem is similar to that observed in the S/N 18 flight RCVR. The discrepant unit was returned to Motorola G.E.D. (vendor) for fault isolation and repair. Problem was partly due to intermittent coupler ground (as per FIAR E-39). Plus a probable loose solder joint in RF converter B.

Status: Open

Action: (1) TWX and FIAR initiated 8/17/72  
(2) Interim FIAR issued 9/1/72  
(3) Final FIAR to be scheduled following RF converter fault isolation at Motorola; estimated for 9/15/72.

(24) FIAR AA-EH-00E62, LSPE Timer, S/N B-66, Array E, Proto/Qual

During acceptance testing at Bulova Watch Company, timer B-66 stopped running after 6 hours; it should have been 90 hours. The hour gear appears to be damaged. DR #AC5153.

Status: Open

Action: (1) TWX and FIAR initiated 8/18/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action.

(25) FIAR AA-EH-00E63, LSPE Timer, S/N S-69, Array E, Proto/Qual

During acceptance testing at Bulova Watch Company, timer S-69 was found to be running with the pull pin inserted. It appears to have been caused by operator error. DR #AC5182.

Status: Open

Action: (1) TWX and FIAR initiated 8/18/72  
(2) Final FIAR issued 9/1/72  
(3) BxA awaiting LSPO close-out action

(26) FIAR AA-EH-00E64, LSPE Timer, S/N B-57, Array E, Proto/Qual

During acceptance testing at BWC, timer B-57 fired (timed out) at six (6) minutes under the low limit. This problem appears to have been caused by a tolerance stack up. DR #AC5186.

Status: Open

Action: (1) TWX and FIAR initiated 8/18/72  
(2) Final FIAR issued 9/1/72.

(27) FIAR AA-EH-00E65, Data Processor, Array E, Flight

During the retest of S/N15 data processor following incorporation of CRN 70114, 12 HK channels appeared to be faulty. The problem was isolated to the sequencer board and finally to chips U17. Another fault appeared; every twelfth channel was erratic. This problem was isolated to a faulty chip U20. Chips U17 and U20 are being replaced, and the board will be retested to verify proper operation. The sequencer board from the spare data processor has been put in the flight unit.



(27) FIAR AA-EH-00E65, Data Processor, Array E, Flight cont.

Status: Open

Action: (1) INTERIM FIAR issued 9/3/72  
(2) Final FIAR to be issued 9/15/72.

(28) FIAR AA-EH-00E66, LSPE Timer, S/N B65, Array E, Proto/Qual/Flt

During ATP test at BWC, timer B65 fired 34 minutes early from nominal (7 minutes O/T). DR #AC5187.

Status: Open

Action: (1) TWX and FIAR initiated 8/30/72  
(2) Final FIAR scheduled 9/5/72

(29) FIAR AA-EH-00E67, LSPE Timer, S/N ST3, Array E, Proto/Qual/Flt

During ATP test at BWC, timer S73 could not be reset after 4 days time out. DR #AC5185.

Status: Open

Action: (1) TWX and FIAR initiated 8/30/72  
(2) Final FIAR Scheduled 9/5/72

(30) FIAR AA-EH-00E68, LSPE Timer, S/N S76, Array E, Qual/Proto/Flt

During ATP test at BWC, timer S76 stopped operating after approximately 12 hours during timing run. DR #AC5193.

Status: Open

Action: (1) TWX and FIAR initiated 8/30/72  
(2) Final FIAR scheduled 9/5/72

- (31) FIAR AA-EH-00E69, LSPE Timer, S/N B72, B67, B69 and B78,  
Proto/Qual/Flt.

During ATP four days run out at BWC, the firing pin time delay period for these timers were as follows:

B72 - 2 minutes under low limit  
B67 - 1 minute under low limit  
B69 - 4 minutes under low limit  
B78 - 15 minutes under low limit

DRAC 5190, 5188, 5274, and 5194.

Status: Open

Action: (1) TWX and FIAR initiated 8/30/72  
(2) Final FIAR scheduled 9/5/72

- (32) FIAR AA-EH-00E70 LSPE Timer S/N, S77 and S74, Array E,  
Proto/Qual/Flt

During ATP four day run out at BWC, the arm pins failed to retract on these two timers. DR #AC5191 and 5192.

Status: Open

Action: (1) TWX and FIAR initiated 8/30/72  
(2) Final FIAR scheduled 9/5/72

- (33) FIAR AA-EH-00E71 LSPE, Timer S/N B77, Array E, Proto/Qual/Flt

During ATP testing at BWC it was reported that microswitch in wrong position. I. E. open contact was closed and closed contact is open. DR #AC5275.

Status: Open

Action: (1) TWX and FIAR initiated 8/30/72  
(2) Final FIAR scheduled 9/5/72.

(34) FIAR AA-EH-00E72, LSPE, Timer S/N B76, Array E, Proto/Qual/Flt.

During ATP at BWC the following anomalies were reported on this timer:

- 1 - Pull pin force O. T.
- 2 - unit exhibited gross leak
- 3 - microswitch resistance O. T.
- 4 - unit timed out 6 minutes under low limit.

DRAC 5183.

Status: Open

Action: (1) TWX and FIAR initiated 8/30/72  
(2) Final FIAR scheduled 9/5/72.

SJE/Inf

copies:

P. Curry  
T. Fenske  
ALSEP Managers



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S. J. Ellison, Manager  
ALSEP Reliability

Internal  
Memorandum



Aerospace  
Systems Division

Date 5 September 1972 Letter No. 72-210-332

Ann Arbor, Michigan

To T.W. Fenske

From L. Deck

Subject ALSEP Configuration Management - August Monthly Progress Review  
Input

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ALSEP CHANGE ACTIVITY STATUS

The ALSEP Change Control Board has approved 100 changes for the period of 1 August thru 31 August for a total of 9301 changes for the period beginning the last week of November 1966 thru 31 August 1972.

ALSEP ARRAY E QTRR CHIT ITEM STATUS

Total Chits Generated	5
Total Chits Approved	3
Total Chits Disapproved	1
Total Chits Withdrawn	1

The following is the status of the three (3) approved chits as of 8-31-72.

RFC's Open	2
RFC's Closed	1

ALSEP ARRAY E FTRR/FACI CHIT ITEM STATUS

Total Chits Generated	20
Total Chits Approved	13
Total Chits Disapproved	5
Total Chits Deferred	1
Total Chits Withdrawn	1

The following is the status of the thirteen (13) approved and one (1) deferred chits as of 8-31-72.

RFC's Open	5
RFC's Closed	9

  
\_\_\_\_\_  
L. Deck  
Configuration Management Office

LD:bg

# ALSEP ARRAY E QTRR RFC STATUS SUMMARY

RFC NO.	DESCRIPTION	Review Board Action	Date of Completion	Responsible Personnel	Status		Remarks/Documentation
					C-Closed	O-Open	
STC 1	Remove "D" handles prior to design limit testing	Disappvd.	5-16-72				Array E will be qualified with "D" handles CRN 70892
STC 2	Array E qual should be updated to reflect the Apollo 17 landing site prior to design limit testing	Appvd.	5-16-72	J. McNaughton	C		
EE 1	Screen all 54L flatpacks in bonded stores to preclude use of leaky parts	Appvd.	5-16-72	D. Fitchman	O		
LMS 1	Request LMS breakseal be removed rather than broken	Withdrawn	5-16-72				
LSPE 2	Modify MIST to uncage geophones and verify amplifier TPA output	Appvd.	5-16-72	L. Lewis	O		

# ALSEP ARRAY E FTTR/FACI STATUS SUMMARY

RFC NO.	DESCRIPTION	Review Board Action	Date of Completion	Responsible Personnel	Status		Remarks/Documentation
					C-Closed	O-Open	
LSG C1	KSC test procedure and hardware required if LSG requires degaussing at KSC	Disappvd.	5-18-72				
ST 1	Remove "D" handles from carry bar no longer a crew requirement	Appvd.	5-19-72	J. McNaughton	C		CRN 70894, CRN 70900, CCO #364
ST 2	Aiming mechanism should be preset to new Apollo 17 landing site	Appvd.	5-19-72	J. McNaughton	C		CRN 70892, 70901 and 70907, CCO #363
ST 3	Add dust cover to protect LSG sunshield gear mechanism	Disappvd.	5-19-72				
ST 4	Revise color of geophone cables for crew visibility	Deferred	5-19-72	J. McNaughton	O		Pending prime crew deployment
ST 5	Assess impact of change for qual/fit. curtain clip difference prior to qual design limit vib.	Disappvd.	5-19-72				
ST 6	Change Array E shorting plug switch nomenclature	Appvd.	5-19-72	J. McNaughton	C		CRN 71011
EE 6	Conduct backup design effort to correct the possibility of ripple off or spurious command during PCU switch-over	Appvd.	5-19-72	D. Flithian	C		CCO #365
ST 1	Perform UHT fit checks prior to or during final stow of Sub pkg. I & II	Appvd.	5-19-72	R. Hostettler	O		

ALSEP ARRAY E FTRR/FACI STATUS SUMMARY

RFC NO.	DESCRIPTION	Review Board Action	Date of Completion	Responsible Personnel	Status		Remarks/Documentation
					C-Closed	O-Open	
LEAM 1	Switchout of multilayer board	Disappvd.	5-18-72				MSC to provide direction
LMS 1	Request special test to determine margin of safety against oscillation of emission control circuit	Disappvd.	5-18-72				Replaced by two action items
LMS 2	Revise plan to allow connection and potting of analyzer leads at LRC	Appvd.	5-18-72	L. Duesterberg	C		BxPO 5328-72-970-5708
LMS 3	LMS HV lockout should be accomplished at KSC after all tests are complete	Appvd.	5-18-72	L. Duesterberg	O		
LSPE 1	Timer time out of all timers at KSC Flt. crew pulling the pins during CF2	Appvd.	5-18-72	L. Lewis	O		
LSPE 2	All flt. explosive pgs. should be operated by the C/g electronics prior to shipment to KSC	Appvd.	5-18-72	L. Lewis	C		CCO #368
LSPE 3	Grenade receivers should be tested end to end with C/S xmitter and fire each grenade with VSB uplink at KSC	Appvd.	5-18-72	L. Lewis	O		
LSPE 4	E&SA test set requires change to shut off local oscillator and RF output for KSC test of LSP grenades during SIT	Appvd.	5-18-72	L. Lewis	C		CCO #369

# ALSEP ARRAY E FTTR/FACI STATUS SUMMARY

RFC NO.	DESCRIPTION	Review Board Action	Date of Completion	Responsible Personnel	Status		Remarks/Documentation
					O	Closed	
ST 2	Reinstate evaluation of ant. aiming mech. at hi & low temp. in flt. acceptance test	Appvd.	5-19-72	D. Fishman	C		BxPO 5360-72-970-5470
ST 3	Flt. LSP E&SA's exp. pkg. should be tested at BxA against C/S transmitters prior to shipment to KSC	Withdrawn	5-19-72				
ST 4	Uplink monitor on C/S should be operable for KSC SIT and procedures and cable provided to verify Goddard uplink	Appvd.	5-19-72	D. Fishman	C		BxPO 5358-72-970-5738