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Apollo Lunar Surface Experiments Package

Monthly Progress Review

July 1972

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Contract NAS9-5829

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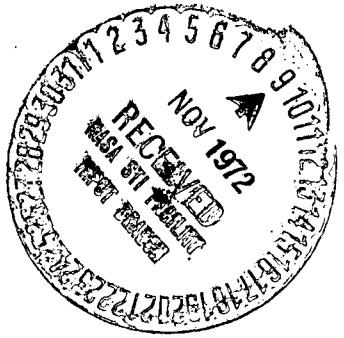

Approved:

Program Director

Prepared for

NASA/Manned Spacecraft Center

by

Bendix Aerospace Systems Division

80 pp.

ALSEP MONTHLY PROGRESS REPORT

July 1972

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SECTION I

ALSEP PROGRAM STATUS AND PROGRESS SUMMARY

Apollo 17 (Array E)

Qual Subpackage 1 qualification-level tests are complete except for (1) post vibration functional tests and (2) LSPE RFI immunity test that are scheduled for completion in August. Qual Subpackage 2 qualification-level tests are complete except for completion of the fit checks associated with Subpackage 1.

The QAR for both Subpackages 1 and 2 of the Qualification system is scheduled for 5-6 September 1972.

Final thermal vacuum Open Door IST of the Flight system was completed 14 July, and the system was subsequently removed from the chamber. DR AC 5535 was generated during the thermal vacuum Lunar Morning IST, when no command verification word was received for octal command 135. Receiver SN-15 replaced receiver SN-18 in the DSS, and troubleshooting of SN-18 revealed a recurring, temperature-sensitive loss of signal strength in the B-submodule of the receiver. A review of test data showed that Uplink B did not recognize the command signal and the command receiver "received power level" telemetry dropped 6 db in signal strength at the time of command transmission. Receiver SN-18 is being returned to the vendor for failure isolation.

With Receiver SN-15 installed, the Flight Central Station successfully completed verification testing. On 31 July, this Central Station was installed in the 4-x8-ft. chamber for thermal vacuum test.

The Flight LSG experiment was delivered for noise performance test to the University of Maryland on 17 July, and was returned to BxA on 25 July. LMS was sent to Langley Research Center for calibration on 18 July, and LEAM was delivered for calibrating to Goddard on 19 July.

Incorporation of cable strain relief and final stowage of Flight Subpackages 1 and 2 are scheduled for accomplishment in August.

The CARR for Flight Subpackages 1 and 2 is scheduled for 7-8 September 1972.

LSP - All but one axis of design limit vibration and all shock tests have been completed on the Qualification system. Thermal vacuum testing of the Flight unit was completed without anomaly.

Although deliveries of the new direct drive timers are lagging, assembly of explosive packages (EPs) is progressing. Timers will be installed at top assembly level. The first of the new timers has been completed and placed in acceptance test.

All Qual explosive package baseplate assemblies (8552) have been completed, and four Flight units are complete.

Beat rate, amplitude, and long timer time-out testing have been completed on the first EP engineering model.

Five receiving antennas were completed and consigned to Bonded Stores, and remaining units are ready for test. The Flight transmitting antenna was completed and is ready for acceptance vibration test.

Engineering tests of the AGC noise problem were completed. Ground straps (to eliminate AGC coupling noise) have been incorporated on geophone cables at the C/S bulkhead of both Qual and Flight units.

LEAM - The Flight experiment successfully completed thermal vacuum tests. A decision was made subsequently to retain the multilayer board presently installed in the Flight experiment. All legs of the Flight LEAM passed a special bonding verification test.

Cause of a Qual model squib telemetry signal anomaly is attributed to an intermittent welded connection in one of the squib circuit relay leads, following completion of failure analysis.

LMS - Thermal vacuum testing of the Flight experiment was completed at BxA without anomaly. Sensitivity and electron multiplier tube gain tests were completed on the Flight LMS at Langley Research Center. As a result of the gain test (gain was: 1×10^7 @ 2600 VDC; should have been: 2×10^7), a decision ultimately will be made to: (1) use the experiment as is, (2) change out the analyzer, or (3) change the voltage to the EM tubes to increase their gain.

The Qual experiment completed design limit vibration, shock, and MIST tests without a problem.

Pre-Integration Acceptance (PIA) test of the LMS prototype was started and during operation in the cyclic emission mode, the oscillation problem (previously reported in May and June) reoccurred. Trouble-shooting verified that the problem is in the new multi-mode emission control card and it has since been shipped to UTD for fault isolation and repair.

LSG - The Flight experiment successfully completed the acceptance test program without incurring a single DR. Performance in thermal vacuum test verified long and short term thermal control stability specification requirements and demonstrated design goal achievement. T/V testing also demonstrated that large electrical power margins are provided for lunar operation (i.e., approximately 95% for lunar noon and 35% for lunar night).

At the University of Maryland, where the Flight experiment was shipped after T/V testing, noise performance testing was successfully completed. Upon return to BxA, the experiment passed the post noise and performance PIA test.

The Qual experiment fulfilled Subpackage 1 Design Limit Shock test requirements and moved into Design Limit Vibration testing.

HFE - The Flight experiment performed satisfactorily in thermal vacuum tests with the Array E system that were completed in July.

Troubleshooting of the Qual experiment's astromate connector confirmed the fault diagnosis reported last month. Potting material was found around several pins of the Schjeldahl connector; when cleaned and retested, this astromate unit performed satisfactorily.

ALSEPs on the Moon

All four ALSEP systems operating on the moon are being monitored on an intermittent basis at Mission Control Center. This support includes: (1) three hours of monitoring each day during lunar day and (2) three hours every other day during lunar night plus extended periods during lunar sunrise and sunset. Complete downlink transmissions from each ALSEP are recorded continuously at receiving stations to facilitate subsequent off-line data analysis.

A total of 1993 days (5.47 years) of lunar operation has been logged by the ALSEP systems 12, 14, 15 and 16, and a total of 32,473 commands carried out.

The lunar eclipse of 26 July produced no unpredicted results, and the four ALSEPs experienced no new problems during July.

The newest ALSEP, Array D, completed 101 days of scientific monitoring at the close of the month. Some 1731 commands were processed from Mission Control Center. Downlink signal strength was steady. RTG power output averaged 70.2 watts. The ASE of Apollo 16 ALSEP was operated in "listening mode" for 30 minutes every Friday.

Internal
Memorandum

Bendix Aerospace Systems Division

Ann Arbor, Michigan

Date 4 August 1972 Letter No. 9703B-107

To T. W. Fenske

From V. J. Jansen

Subject ALSEP Array E System Qualification Model, July Status Report

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2.0 Summary of Array E Systems Qualification Model Status and Progress

The SP I design limit vibration test was completed on 3 August, thus completing the design limit mechanical testing.

The Qual Model SP I qualification tests are complete except for post vibration functional tests and also the LSPE RFI immunity test. These test are scheduled for completion during August.

The Qual Model SP II qualification tests are complete except for completion of the fit checks associated with SP I.

The QAR for SP I and SP II is scheduled for 5-6 September 1972.

2.1 Array E System Qualification Model Discussion

The Qualification tests completed during this reporting period are as follows:

		Comp Date
A.	Subpackage I	
	SP I Shock	7 July
	SP I Design Limit Vibration	3 August
B.	Subpackage II	
	RTG Shorting Plug Functional	7 July
	LEAM PIA	3 July
	Antenna Aiming Mech., HCA funct.	19 July

The SP II Qualification tests are complete except for completion of fit checks associated with SP I.

The SP I design limit vibration test was started on 13 July with the Y axes being the first axes of vibration. DR AC 5686 was written on 13 July to document an anomaly that occurred at 30 Hz in the Z axes as indicated by the input accelerometer data. A cursory inspection of the sunshield, without removal of experiments, caused the sunshield in the area of the LSG inserts to be suspect.

The LSG Qual Model and also the LSG mounting bracket were removed to facilitate inspection of the sunshield in the suspect areas. Inspection, by means of tap test did not reveal any structural damage.

On 18 August the LSG Mass simulator was installed on SP I and SP I revibrated successfully from 24 Hz to 35 Hz up sweep and from 35 Hz down.

The LSG Qual Model was on 20 July restowed on SP I for completion of the vibration test.

The vibration of SP I was restarted on the Z axes on 20 July. An O. T. condition occurred at 56 Hz during the last environment (sine) of the last (X) axes. The sunshield was removed from SP I per DR AC 5686 on 21 July. DR AC 6003 was written against the sunshield and the sunshield was subjected to X-ray and ultrasonic inspection.

The following events were completed on SP I during the time the sunshield was inspected per DR AC 6003.

		Comp date
a.	Modified MIST per DR AC 5686	25 July
b.	LSPE Noise Baseline Test per DR AC 5317	26 July
c.	Incorporate LSPE Shield Ground Mod per CRN 71006 & 71008	26 July
d.	LSPE Noise Verification Test per DR AC 5317	27 July

Extensive ultrasonic tests and X-ray inspections. per DR AC 6003, revealed no evidence of structural damage to the sunshield caused by vibration. DR AC 5686 was dispositioned to restow SP I, complete the X axes sine vibration from 50 Hz down and submit a request for waiver to delete the 50-100 Hz sinusoidal test requirement for ALSEP. This disposition was based on extensive troubleshooting that failed to find the cause of vibration control out-of-tolerance condition and the information from NASA/MSC that ALSEP will not experience sinusoidal excitation above 50 Hz during the APOLLO flight.

The design limit vibration test was completed on 3 August.

Plans for August include:

1. SP I MIST and Antenna Radiated Power
2. SP I Boydbolt Verification
3. SP I and SP II Fit Check
4. LMS PIA
5. LSG PIA
6. LSPE Exp. Pks. RFI Immunity Test
7. LMS Proto PIA
8. LMS Proto Shock
9. LMS Proto EMI
10. LMS Proto Thermal Vacuum

The QAR for SP I and SP II is scheduled for 5-6 September.

VJJ/kf

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

Internal
Memorandum

Bendix Aerospace Systems Division

Date 2 August 1972 Letter No. 9703-721 Ann Arbor, Michigan

To T. W. Fenske

From R. Christian

Subject ALSEP Array E Flight Model, July Status Report

SUMMARY OF ARRAY E FLIGHT MODEL STATUS AND PROGRESS

Deployment of the Flight System into the thermal vacuum chamber began 27 June. The initial open door IST commenced 29 June and final open door IST and system removal from chamber was completed on 14 July.

The LSG experiment was delivered to the University of Maryland for Noise Performance testing on 17 July and was returned to Bendix on 25 July. LMS was sent to Langley Research Center for calibration on 18 July and LEAM was delivered to Goddard on 19 July.

Plans for August include incorporation of strain relief and completion of SP I and SP II final stow.

The CARR for SP I and SP II is scheduled 7 and 8 September 1972.

DISCUSSION

The initial T/V open door IST, which began on 29 June, was completed on 1 July. Chamber pumpdown began the same date.

Flight Acceptance test events were completed as follows:

1.	Thermal Vacuum Testing		
	a.	Morning IST	4 July
	b.	Noon IST	7 July
	c.	Night IST	10 July
	d.	Open Door IST	14 July
	e.	Removal from Chamber	14 July
2.	RTG Leak		19 July
3.	Shorting Plug Functional		20 July
4.	Antenna VSWR		24 July
5.	Aiming Mechanism Functional		25 July

DR AC 5535 was generated during the thermal vacuum lunar morning IST, when no command verification word was received for octal command 135. A review of the test data showed that the command was not recognized by ALSEP UPLINK B and that command receiver "received power level" telemetry indicated a drop of 6db in signal strength at the time the command

was sent. Serial 18 receiver was replaced with serial 15. Troubleshooting of the discrepant receiver disclosed a repeatable, temperature sensitive loss of signal strength, which exists in the B side of the receiver. The receiver is to be returned to Motorola for failure isolation.

Following installation of serial 15 receiver the flight central station successfully completed verification testing. The station was placed in the 4x 8 chamber on 31 July for thermal vacuum test.

Upon completion of thermal vacuum testing, LMS, LEAM, HFE and the Central Station were photographed by MSC photographers on 17 and 18 July.

The LSG experiment was sent to the University of Maryland for Noise Performance Test on 17 July and was returned to Bendix on 25 July. The incoming PIA test was completed on 28 July.

The LMS experiment was sent to Langley Research Center for calibration on 18 July. LEAM was delivered to Goddard for calibration on 19 July.

Plans for August include:

1. Completion of C/S thermal vacuum testing with serial 15 receiver
2. Strain Relief Incorporation
3. Completion of SP I stow less LMS
4. SPI MIST and Radiated Power Test
5. Completion of SP II stow

The Array E CARR for SP I and SP II is scheduled to be held at Bendix on 7 and 8 September 1972.

R. Christian

R. Christian, Model Manager
ALSEP Array E Flight System

RC/kf

Internal
Memorandum

Bendix Aerospace Systems Division

Date 11 August 1972 Letter No. 9713-617 Ann Arbor, Michigan

To T. Fenske

From D. Fithian

Subject Monthly Report for July 1972

3.0 DATA SUBSYSTEM - ARRAY E

3.1 Accomplishments:

a. Design, drawings and change notices were completed to add a shorting strap to the thermal plate to accommodate grounding of shields in the geophone cable. This change was required to reduce the interference of LSP Transmitted AGC signals with geophone signals. Incorporation of this change was completed on both Qual and Flight Central Station with satisfactory results in performance.

b. A change was processed and incorporated on the Flight Central Station to add potting to the back of microdot connectors on the connector panel. This strain relief was requested as an action item during FTRR.

c. Engineering support was provided to complete the remaining spare component tasks.

The PCU/PDU assembly was completed and the unit placed in Bonded Stores.

Rework of the Spare Shorting Plug (SN13) was completed per CRN 70930A to change the switch lever and change wire size. The unit was retested, subjected to Acceptance Vibration and was placed in Bonded Stores.

All spare components have now been completed and bought off.

3.2 Plans for Next Month

a. Continue engineering support for remaining system level tests.

b. Continue effort to close out remaining DR's.

c. Update drawing lists and clean up outstanding ECN's

3.2 (Cont.)

d. Summarize test program for DCRR input.

e. Prepare for QAR/CARR.

D. Fithian

DF/gmw

Internal
Memorandum

Bendix Aerospace Systems Division

Date 8-4-72 Letter No. 5032-58 Ann Arbor, Michigan

To T. Fenske

From J. McNaughton

Subject ALSEP Structural/Thermal/Crew Engineering July Monthly Progress Report

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4.0 STRUCTURAL/THERMAL/CREW ENGINEERING

4.1 MECHANICAL DESIGN

4.1.1 Flight 6/QSE

a. Preparations were made for the strain relief CDR presentation at MSC 28 July. Review of the design, design status, static and impulse test results, impact on crew procedures, implementation plan and the accumulator design study were included.

b. Flt 6 strain relief design mod kits for LSG, LMS, geophone module, HFE and LEAM have been released. The S/P I mod kit covering the front panel attachment for LMS, LSG and LSPE Antenna, and the Helical Antenna strain relief is scheduled for release 1 August. All of these designs have been tested to or above the required design criteria. This data is documented in the CDR package.

Additional work has been done on a strain accumulator in parallel with the Flight 6 design. It is felt that a workable accumulator can probably be built with stowage being the major constraint.

c. The Flt 6 dust cover designs for S/P II carrier, subpack carrybar sockets, and LSG are in work, and are scheduled for release by 15 August. E2E trainer will use the same dust cover designs.

4.1.2 E2E Trainer

a. The E2E trainer was updated to reflect the following changes to Flt 6/QSE:

- Antenna aiming mechanism settings for Taurus Littrow landing site. (Ref.: CR/N 70901A)
- Relocate carry bar tempilabel (Ref.: CR/N 70916).

b. All detail drawings for the E2E trainer LSPE Antenna redesign were in the release cycle as of 30 June. The assembly drawing in incorporating CR/N have been completed and released.

c. The E2E S/P II lightweight carrier is nearing completion. Design release is scheduled for 2 August. Detail parts not requiring design rework have been released to manufacturing for fabrication.

d. E2E strain relief mod kits for subpacks I and II are in work and are scheduled for release by 7 August.

4.1.3 Miscellaneous Activity

a. Decals peculiar to Array E has been added to the basic decal drawing 2339066 by CR/N. This change was released earlier in July. Mod kits for E2E Subpacks I and II that locate these decals for installation are scheduled for release late in July. Flight 6 mod kits will be released prior to C^2F^2.

b. Detail drawings and associated CR/N's for the LSPE geophone connector grounding strap have been completed. A simulation of this grounding strap for the E2E trainer will be completed in August.

c. Identification plates for Array E were added to Subpack I and II shipping containers by CR/N.

d. The attachment hole in the antenna cable reel handling socket was increased to .076 ± .005 diameter to provide adequate clearance for the 180 DOR tufbraid lanyard. (Ref. CF^2 DR 5048, item 3).

e. The "ON" and "SHORT" decals were added to the Flt 6 and E2E trainer shorting plugs in place of the painted nomenclature. This change was authorized by an FTRR Chit reference no. 699.

4.2 STRESS/DYNAMICS (ARRAY E)

4.2.1 UHT Modification

It has been previously recommended that the UHT be strengthened by adding a gusset at the handle-shaft interface. Such a modification will increase the UHT strength, at that point, by 166%. By

comparison, the addition of a #8-32 CRES screw through the handle into the shaft will increase UHT strength by only 7%. Hence, the recommendation was made to use the gusset rather than the screw.

4.2.2 LSPE Antenna Handle

An analysis was made to determine the feasibility of handling the LSPE transport frames by one of the explosive package handles. Using a handling load factor of three, under lunar gravity conditions, it was found that margins of safety were negative for the handle screws and lug. It is recommended that the transport frames be supported by the transport frame handles, only. The explosive package handles should not be used for other than their intended purpose.

4.2.3 Cable Strain Relief Impulse Test

The nominal impulse was determined by ribbon cable strain gage measurements taken during the suited astronaut-cable entanglement tests conducted during the month of June in the Crew Engineering Lab. The purpose of the second impulse test was to duplicate the nominal impulse for two pull angles (zero and ninety degrees relative to the subpackage face to which the cable is attached) and two temperatures (ambient and +10°F).

Various engineering parameters (displacements, accelerations, and strains) were monitored and recorded during these tests. This information will be used to determine the distribution of impulse energy within the system. The impulsive load capability of all other strain relief designs can then be determined analytically.

The test article was a wooden mock-up of subpack #1 equal to the flight model with respect to weight and center of gravity. The subpack was fitted with four teflon foot pads which slide on a smooth aluminum floor plate for purposes of simmulating lunar friction forces. A taped, per strain relief design, three foot length of two inch flat ribbon cable (HFE) was clamped through the strain relief bracket. The central station cable strain relief bracket was attached to the wooden subpack by means of screws and a simulated central station front panel.

The end of the ribbon cable was attached to a 200 lb mass suspended by a flexible cable from the test lab ceiling. The impulse was transmitted to the cable by allowing the pendulum to swing through a measured arc.

Nominal and design limit impulses were applied at 0° and 90° pull angles without failure to cable or strain relief bracket. For the final test the cable temperature was lowered to +10°F, the pendulum impulse energy was set for 35% higher than design limit, and the pull angle was 90°. No failures were detected.

Plans are being made to conduct another test using an astronate connector (wired). Continuity checks will be made on the cable/connector before and after impulse testing.

4.2.4 Qual. SE Subpack 1

Design limit vibration tests have been initiated. All tests have been initiated. All tests have been completed except the x-axis sinusoidal sweep.

An input out-of-tolerance condition was encountered at 30 HZ during the z-axis sinusoidal test (DR-AC-5686). Trouble shooting failed to reveal the cause of the problem. A portion of the test (up to 35 HZ) was re-run using the EEM-LSG in place of the QSE-LSG. Since no input problems were encountered, it was decided to replace the QSE-LSG and re-run up to 50 HZ. Again, the input was within tolerance. The hardware was placed on limited hold and the vibration test continued.

Three random tests were completed without incident. During the final vibration test (x-axis sinusoidal) an input out-of-tolerance occurred from 60-70 HZ. Testing was halted and trouble shooting began.

A suspected sunshield failure proved to be untrue. Tap tests, X-rays, ultrasonic tests, and various other inspections revealed some minor fabrication discrepancies, but no failures. The structural integrity of the sunshield had not been degraded by qualification testing.

All other trouble shooting procedures failed to reveal the source of the input control problem. Further trouble shooting would require perhaps several re-runs of the x-axis sine sweep—the most severe subpack 1 vibration test. This was not recommended since many QSE components are scheduled to be used as flight spares.

Conferences with NASA/MSC personnel revealed that contrary to the Array E vibration specifications, actual ALSEP sinusoidal environment is non-existent above 50 HZ. Hence, BxA was directed to delete the remainder of the x-axis upsweep (70-100 HZ), conduct a partial downsweep from 50 to 5 HZ, and submit a waiver request for deletion of the sinusoidal test requirement from 50 to 100 HZ.

4.2.5 Plans For August

4.2.5.1 Cable Strain Relief

The astromate connector impulse test will be completed. All impulse test data will be analyzed and a test report prepared.

4.2.5.2 Carry Bar Test Report

Cable strain relief and QSE vibration testing has delayed completion of the carry bar test report. This task will be completed during August.

4.2.5.3 Qual. SE

Evaluation of QSE vibration test data will commence if time permits. All such data has been slotted with the exception of the subpack #1 x-axis downsweep.

4.3 MECHANICAL AND CREW SYSTEMS

4.3.1 Array E Flight

a. The Apollo #17 contingency procedures document has been completed and typed. The first draft was reviewed at the 7/21 deployment at KSC by S & AD personnel. Scheduled publication of the preliminary draft will be August 1st. Final copy will be published September 1st after all coments and revisions have been received.

b. Engineering models of the proposed strain reliefs for Central Station, astromate connectors, and experiments have been installed on the E2-D and crew mock-up units. Most of the pull-force testing of these units have been completed and evaluated prior to the July 28th CDR at MSC. Changes in crew deployment parameters with the addition of the strain reliefs are minimal.

c. A detailed drawing of the new astromate strain relief was sent to L. J. Casey, NASA/HQ'S along with a HFE astromate configured to Array D. A Array E HFE astronate was also sent to HQ'S from MSC. Apparently R. Petrone was having a "wrap up" of the Apollo #16 anomalies.

d. Crew personnel participated in the pre-CF^2 (at Ann Arbor) DR close-out meetings with manufacturing and experiments engineering.

e. Stowage volume interfaces have been evaluated with the design group and experiments engineering.

f. A mock-up of the LSPE EP pin restraint has been built, evaluated and reviewed by NASA/MSC personnel prior to incorporation to flight hardware, crew/LEPO go-ahead pending. (B-215)

g. An examination of the LSPE enable/disable switch function within the "new" EP deployment configuration has been reviewed with BxA and MSC personnel. A recommendation to eliminate it or change it in flight position is being investigated

h. A review of the Array E Data Book has been completed. Coments have been submitted to Systems Support.

i. Crew personnel participated in the strain relief CDR at NASA/MSC on July 28th.

4.3.2 Array E Trainer

a. New shockmounts have been installed on the second E2-E Trainer LSPE Transport Frame and shipped back to KSC in preparation for the July 21st Deployment.

b. Modification of the Aiming Mechanism Foam Packing, to permit preset coordinates of Taurus Littrow has been completed and shipped back to KSC.

c. Training Analysis Reports (TAR's) for the first four E2-E deployments have been closed out through the cognizant engineers and the engineering group supervisor. The letter of transmittal (Fenske/Gerke) has been signed and delivered.

d. The LMS breakseal cap has been delivered to KSC prior to the July 21st deployment.

e. The Spare HFE emplacement tool is being used for deployments while the broken E2-E tool is being repaired.

f. Mod kits (updating) for future deployments:

Hardware	Design Complete	Fab/Assy Complete	Update
Explosive Packages (Russell Ant. Installation)	7/21	8/25	(Del. to KSC-8/27
LEAM Carrier (LW)	7/28	8/27	8/29
Dust Covers	7/28	8/25	9/6
Strain Reliefs	7/28	8/24	8/26
Decals	6/29	7/28	(Del. Est. to KSC-8/10

g. The prime crew deployment on the 21st went quite well with most of the anomalies being procedural. Preliminary (pre-debriefing) comments were as follows: (see BxP. O. 5399)

1. SP II handling tool pull pin was difficult to remove (sticking).

2. Carry Bar extension arrows were worn excessively.

3. Stowage pins were not available for transport frames.

4. LSPE GM (right front) boyd bolt hung up (threads were re-engaged-CW).

5. LSPE GM flag stowage brackets on dust cover broke loose.

6. LSPE GM was emplaced on surface incorrectly for geohp deployment (GM stowage drawing-Top Assy-may be incorrect).

7. LSPE Ant. cable reel appeared to be difficult to deploy (hung up).

8. The neck on the Sunshield center boyd bolt broke loose.

9. HFE center radiation shield tore off of the cable.

10. HFE Electronics fell off of the UHT during offload from the Subpallet.

11. Last section (near Crow's foot) of the emplacement tool would not lock in place when extended.

h. Assembly of four flight type ceramic LMS breakseals for crew training has begun at BxA. Completion is expected 7/31/72.

i. Decals for both flight and trainer have been received in house. Final release of decal mod kits and decal installation has been held up pending official word from NASA/MSC of landing date and time so that shadow and sun alignment angles may be calculated for decal placement.

4.3.3 Crew Engineering Laboratory

Continued support of the installation and testing of the new strain relief designs. Engineering models of the proposed strain reliefs have been installed on the E2-D Trainer and Crew Mock ups and pull-force testing has been performed during the past month in preparation for the CDR at MSC on July 28th.

4.3.4 Weight Status

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

Subpack #1 -	133.71 lbs
Subpack #2 -	99.03 lbs
SEQ Total -	232.74 lbs
ACA -	54.28 lbs
ALSEP Total -	287.02 lbs

The monthly weight estimate report has been completed/updated and will be sent to J. Chandler/J. Bryant, NASA/MSC.

TABLE 1

ALSEP ARRAY E WEIGHT ESTIMATE

SUBPACKAGE #1		SUBPACKAGE #2		ACA	
C/S and LSP/CSE	41.88	Pallet Assy	13.47*	Fuel Capsule	15.25*
Primary Structure	9.65*	Structure Carrier	7.14*	Fuel Cask	25.07*
Sunshield Assy	9.28*	Shield Assy/RTG Cable	1.88*	Thermal Shield	
Support Structure, LSG	1.60	RTG & Cable	28.15*	Structure Assy	
Rear Shield	1.90*	Shorting Plug	1.36*	Band Assy	13.96
TC Curtains	2.00	ALSEP Tools	3.27*	Astronaut Protect.	
Handling Assy	0.48*	Aiming Mechanism	1.91*		
PDM	.72*	Aim. Mech. Box	1.92*	ACA Total	54.28*
Sunshield Extenders	0.90	Carry Bar	2.78		
Antenna & Cable	1.30	HFE Subpallet	6.74*		
Antenna Mast	1.13*	HFE Probes & Electronics	11.90*		
LSG/Cable	27.90*	LEAM/Cable & Spool	16.31*		
LSP/Geo/Ant/Cable	12.20*	Miscellaneous/Fasteners	1.70		
LMS/Cable	20.37*	Misc. Dust Covers	.50		
Miscellaneous/Fasteners	2.00				
Misc. Dust Covers	.40	SP #2 Total	99.03		
S/P #1 Total	133.71				
S/P #2 Total	99.03				
SEQ Bay Total	232.74				
ACA Total	54.28*				
ARRAY E TOTAL	287.02				

The present weight estimate of the Explosive Package Transport Module (Stowed in SEQ #3) is 42.4 lbs.

4.4 ENGINEERING LIAISON

4.4.1 Array E Mechanical

a. Qual S/P I.

The MIST on S/P I (QUAL), less the LSP geophone & transmitting Antenna, was completed on 7/1/72. The full stowage of S/P I in readiness for the D. L. Vibration test, was completed on 7/5/72. The Shock test on the Qual S/P I was completed on 7/7/72, and the 'Y' axis D. L. vibration completed on 7/13/72. During the performance of the Z axis vibration on 7/14/72 two DR's (AC 5685 & AC 5686) were generated against the Sub-package (LSG inserts). The resolution of the DR problems was not discovered during a Vibration test performed with the LSG Mass simulator. The Qual LSG was then restowed, and 0-50 Hz sweep vibration test performed successfully on 7/19/72. During the performance of the return D. L. (Sin X axis) vibration test, the LSG mounting problem re-occurred, and DR 6003 generated against the Sunshield. The Sunshield was sent out, for X-Ray examination on 7/22/72, and for ultrasonic examination on 7/25/72. The DR AC 6003 was closed on 7/31/72, dependent on a waiver from MSC.

b. Flight S/P I.

The Thermal Vacuum test was completed on 7/14/72, and S/P I removed from the chamber, for MSC photographs. The photographs of Reflective & Thermal surfaces on various ALSEP components, were completed on 7/18/72.

The FLT Sunshield was sent out for X-Ray examination on a suspect DR (AC 5770), together with the Qual Sunshield.

Swap-out of the C/S Receiver & LSP cable was completed on 7/28/72 and the incorporation of a new ground strap from the thermal plate to the LSP connector, was also completed 7/28/72.

The following DR's were dispositioned as shown:

1. DR 5666 against the S/P I dust cover, was dispositioned 7/10 - to incorporate the dust cover velcro attachment per CRN 70952.

2. DR 5678 against the S/P I paint, was dispositioned 7/14 - rework touch-up to be performed during final stowage.

3. DR 5679 against the Retaining pin for the Helical antenna cable stowage bracket, was dispositioned 7/20 - limited hold thru antenna VSWR test.

c. Qual S/P II.

The Qual, timing Mech & Shorting Plug (S/N 11) post vibration Functional tests were completed 7/5/72.

The timing mechanism Hot & Cold functional test was completed on 7/17/72 & the touch-up rework on the timing mech. per DR 5551 was completed on 7/27/72 & the DR 5551 closed on 8/1/72.

d. Flight S/P II.

The Thermal Vacuum test was completed on 7/14/72, and the S/P II experiments removed from the chamber, for MSC photographs on 7/17/72.

The following Tests & Meetings were completed as shown:

1. The RTG Leak test was completed on 7/19/72.

2. The Array E restowage after CF^2 procedure (TP 2368958) was approved on 7/19/72.

3. The post T/V Functional test on the Shorting Plug was completed on 7/20/72.

4. The post Thermal Vacuum test meeting was held on 7/20/72.

5. The Timing Mech. Hot & Cold Functional test was completed on 7/25/72.

The FLT RTG was mounted on S/P II with the Flight bolts, on 7/24/72.

An AER (577A) was generated on 7/26/72, in order to stow the QUAL LEAM, for dust cover evaluation per DR 5049 (Item 1).

The following DR's were dispositioned as shown:

1. DR 5676 against the Shorting Plug paint was dispositioned 7/19, touch-up after Electrical functional test.

2. DR 5049 (Item 1) against the LEAM dust cover, was dispositioned 7/13 - trouble shoot using the Qual LEAM.

3. DR 5049 (Item 2) against the LEAM astro-mate bracket, was dispositioned 7/17 - trouble shoot with new pull-pin & bushing.

4. DR 5049 (Item 3) against the Shorting Plug release assy, was dispositioned 7/13 - trouble shoot with flight hardware.

5. DR 5049 (Item 5) against the carrybar contingency release, was dispositioned 7/10 - rework per DR. Rework was completed on 7/19/72.

6. DR 5049 (Item 6) against the HFE astro-mate, was dispositioned 7/13 - trouble shoot using H. F. sub-pallet.

e. Flight Spares

The flight spare Shorting Plug (S/N 12) was reworked per CRNS 70929, 70930, 70953 & 70974, and the DR 5548 closed 7/3/72. The post D. L. vibration functional test on the spare Shorting Plug, was completed on 7/5/72.

f. Trainer Spares

The following DR's against the Spares, were dispositioned as shown:

1. DR AC 5772 against the curtain support assy, was dispositioned 7/26 - USE AS 15.

2. DR AC 5750 against the spare LSG indicator gear shaft, was dispositioned 7/26 - USE AS 15.

3. DR AC5902 against the timing Mech. Foam, was dispositioned 7/26 - Return to Vendor.

4.4.2 Procedures

The review of the 'Apollo 17 ALSEP (Array E) Restowage after CF^2 test at KSC' (TCP 2368958), was completed 7/6/72.

4.5 THERMAL DESIGN

4.5.1 All Flights

Flight data listing and computer plots completed as of 7/31/72 are:

	LUNATIONS COMPLETED			
FLIGHT	DATA LISTING		COMPUTER PLOTS	
	DAY	NIGHT	DAY	NIGHT
1	30	29	20	20
4	15	14	5	5
A-2	9	8	8	8
A	1	1	1	-

4.5.2 Array E

4.5.2.1 General

a. All action items generated during the June 14-15 and June 29-30 thermal review meetings requiring disposition by 7/31/72 have been closed out including action item #750 due 8/1/72 on the LEAM Qual T/V test correlation.

b. Qual acceptance T/V DAS plots have been completed. HK data is in process of being reduced and plotted. Test results have been surveyed and presented in memo 5032-24. Central station test temperatures and power data are:

CENTRAL STATION

QUALIFICATION T/V TEST TEMPERATURE RESULTS

HK	Function	Design Limit Noon (°F)	Acceptance Noon (°F)	Acceptance Night (°F)
4	Plate Temp #1	130	103	11
15	Bottom Temp	216	177	-168
16	Rcvr Case Temp	130	-	28
18	Xmtr A Hot Spot	-	-	41
19	Xmtr A Case Temp	-	-	37
25	LSP Elect Temp	138	110	33
27	Sunshield Top Temp	82	60	-215
28	Plate Temp #2	133	106	19
31	Xmtr B Hot Spot	147	127	-
32	Xmtr B Case Temp	150	125	-
33	DP Base Temp	137	108	33
34	DP Int. Temp	141	112	40
42	Sunshield Under Temp	78	60	-215
43	Plate Temp #3	131	103	13
48	CD Temp B	-	105	-
49	CD Temp A	132	-	29
58	Plate Temp #4	145	117	27
59	Left Struct Temp	181	152	-162
60	Inner Bag Temp	143	112	20
61	PC#1 APM Temp	136	109	39
62	PDU A Temp	138	106	39
63	PDU B Temp	138	110	39
64	PC#2 APM Temp	-	-	-
71	Plate Temp #5	137	109	22
72	Outer Bag Temp	190	158	-104
77	PC#1 Reg Temp	139	112	56
78	PC#2 Reg Temp	off	off	off
87	RT Struct Temp	180	156	-173
88	PDM Temp	248	216	-166

NOTES: (1) Average Thermal Plate Temperatures
Design Limit Noon: 135°F Allowable Acceptance Noon: 108°F Temp.
Acceptance Night: 18°F Swing = 0 to 135°F (AL 240000)

(2) PDM Panel Design Limit Temperature
= 248°F Maximum Allowable PDM Temperature
=350°F (AL 240000)

T/V Qualification Test Power Data.

Measurement	Symbol	Channel	Design Limit Noon	Accept. Noon	Accept. Night
PCU Input Current, Amps	AE-04	HK5	4.57	4.57	4.57
PC#1 Input Voltage	AE-03	HK8	16.28	16.23	16.28
Reserve Power, Watts	AE-24	HK30	33.20	34.00	23.00
RTG Output Power, Watts	-	HK5xHK8	74.40	74.17	74.40
Converter Input Pwr, Watts	-	RTG-RP	41.2	40.17	51.4

c. Flight acceptanct T/V test has been monitored and the DAS data has been reduced. The HK data will be processed when the qual HK data is reduced.

d. A brief study was made to determine the thermal effect if the APM system was inadvertently turned off by a spurious command. Average thermal plate temperatures for the APM on and off are 105°F and 193°F respectively during lunar noon.

If the 21 watt commandable dump were activated during lunar day, C15 internal dissipation could be reduced when the APM was spuriously turned off. The temperature penalty with the APM on is 5°F during lunar noon (an increase from 105 to 110°F). However, with the APM off, the C/S internal power dissipation can be reduced by 20 watts and the thermal plate temperature will be reduced by 30°F to 113°F. The PDM panel temperatures for all cases are well within the maximum allowable temperature of 350°F.

4.5.2.2 LMS

a. Action item #742 requesting the non operating temperature for 100% dust coverage of the experiment with dust cover on has been closed out per Bx P.O. -5345-72-970-5725.

b. The flight acceptance T/V test results for the radiation plate are 112°F and -110°F for lunar noon and night respectively. The predicted temperatures were 109°F and -9°F. The small variance between the test results and the predicted temperatures is due to the use of an analyzer simulator. The analyzer power was dissipated in the detached simulator instead of at the analyzer section. This additional power when dissipated in the analyzer will increase the radiator plate by 7°F.

c. Thermal report on the LMS T/V testing to date and the analytic correlation of these tests has been started. This report is due for release by 8/21/72.

4.5.2.3 LSPE

a. Action item #748 requesting LSP explosive package temperature vs. sun angle specifically for the Taurus Littrow site (20.2° r latitude) for both clean and 100% degraded surface conditions has been dispositioned by Bx P.O. 5353-72-970-5733. The data generated for this action item reveals that the peak temperature for the clean surface condition is 167°F at 68° solar angle and 177°F at 68° solar angle for the 100% dust degraded condition. This study also revealed that the solar angle where the LSP explosive package experiences its peak temperature is a function of deployment latitude.

b. Final report on the LSPE T/V acceptance testing and the analytic correlation of these tests has been started. The report is due for release by 8/21/72.

c. Effort on CCP #381, LSPE Explosive package LRV deployment, is in progress. The necessary data from MSC has been received.

4.5.2.4 LSG

a. Action item #744 from the ALSEP thermal design review June 15, 1972, requesting BxA to prepare a test plan, schedule and cost to evaluate the thermal performance of the LSG insulation bag has been formally closed out by Bx P.O. 5345-72-970-5725.

b. Action item #749 generated by MSC at the June 28-29, 1972 ALSEP Array E Thermal Design Review, to provide cost to test the LSG qual model in the 4' x 8' chamber with radiator insulated to determine thermal conductivity and heat leak of the LSG for day and night conditions has been formally closed by Bx P.O. 5371-72-970-5751.

c. Action item #751, from the June 28-29, 1972 ALSEP Array E Thermal Design Review, requiring BxA to provide information as to the short term requirement will be determined on the lunar surface has been formally closed by Bx P.O. 5365-72-970-5745.

d. The final thermal report on the LSG T/V test program and the analytic correlation of these tests has been initiated. The report is due for release by 8/21/72.

a. The Flight T/V Acceptance Test Results Are:

Temperature	Spec.	Day	Night
1. Sensor	50 ±2°C	50.415	50.412
2. Heater Box	50 ±2°C	50.418	50.418
3. Instrument Hsg	50 ±2°C	49.951	49.893
4. Radiator		39.93	N.A.
5. Short Term Drift	≤ 0.001°C	.0005	.0005
6. Thermal Equilb	≤ 0.002°C	.0008	.0015
7. Long Term Drift	≤ 0.1°C ≤ 0.01°C(goal)	0.003	0.003
8. Transition	≤ 0.1°C	.0025	.0025
9. Δ T (HB-IH)	0.5 ± 0.1°C	0.468	0.525
10. Δ T (S-R)	≤ 1.25 Δ T of ETM	10.49	N.A.
Power			
1. Heater Box		0.24	0.249
2. Instrument Hsg		1.304	4.886
3. Electronics		1.6	1.6
4. Total	9.2 W	3.144	6.735
5. Power Margin	None required	1.54	2.45

4.5.2.5 LEAM

a. IR-radiometer settings were determined for the Flight Acceptance test to simulate experiment temperatures on the lunar surface during lunar noon conditions. A number of sensitivity parameters were derived to accomplish this task using results of the thermal math model and computer studies.

b. In response to the Action Item #750 arising from the ALSEP Thermal Design Review Meeting held at MSC, June 28-30, 1972 the correlated results of the Qual thermal/vac test have been presented in memo 5032-19. Using actual chamber conditions, experiment powers and solar flux levels, the temperatures shown in the attached table were obtained. A comparison with the test data reveals that good correlation was achieved in all cases involving the internal structure, electronics, radiator and sensor components. The greatest differences occurred for the fiberglass compartment. This component is heavily insulated from other parts of the experiment and reflect differences in chamber positioning, views of IR arrays, local lunar surface and cold wall variations. This action item has been formally closed out by Bx P.O. 5371-72-970-5751.

c. The final Thermal report on the LEAM T/V acceptance tests and the analytic correlation of these tests has been started. This report is due for release by 8/31/72.

4.5.2.6 HFE

a. A brief study was conducted to determine the HFE cable temperature profile during the early deployment period of ALSEP. A 21 mode thermal math model was established and the HFE cable temperature at the cable/strain relief interface will be slightly above 35° at a deployment sun angle of 17 degrees. Since, the cable may exit the LM Scientific Equipment Bay between 20 and 160°F, the temperature envelope of 20 to 160°F can be used to bracket the HFE initial temperature during deployment.

4.5.3 Plans for August.

a. Flights 1, 4, A-2 and D: continue to catalog and process flight data.

b. Array E

1. LSPE - continue effort on CCP 381
   LSPE explosive package LRV deployment.

2. Close out remaining action items from the June 14-15 and June 29-30 ALSEP thermal review meetings.

3. Complete flight T/V acceptance test correlation and release thermal reports.

J. McNaughton

Approved by: D. Fithian

b. The Flight Acceptance Test Results & Lunar Predictions Are:

		Mode I		Mode II		Mode III		Survival
		Night	Noon	Night	Noon	Night	Noon	(Night)
Flight	Power	10.26w	3.89w	10.46w	4.15w	10.46w	4.55w	4.31w
	Temp	20.1°C	53.0°C	***	***	***	***	***
Lunar Predictions	Power	10.26w	3.89w	10.46w	4.15w	10.46w	4.55w	4.31
	Temp	15°C	53°C	16.2°C	55.5°C	16.2°C	59.5°C	-50°C

***Not Tested.

		Mode I (watts)		Mode II (watts)		Mode III (watts)		Survival (watts)
		Night	Noon	Night	Noon	Night	Noon	Night
Flight (SN07)	Probe Heater OFF	10.26	3.89	10.46	4.15	10.46	4.55*	4.31
	Probe Heater ON	-	-	10.63	4.33	11.23	5.36*	-

*Non-Operational Mode

Internal
Memorandum

Bendix Aerospace Systems Division

Date 11 August 1972 Letter No. 9713-618

To T. Fenske

From D. Fithian

Subject July Monthly for System Engineering

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:

SP I Modified Integrated System Test
Stow of SP I for DL Vibration and Shock
SP I Shock
SP I Design Limit Vibration
Fastener Verification
SP I Modified Integrated System Test
Troubleshooting Related to Vibration Anomaly
LSP AGC Noise Test
Re-Stow of SP I

The first listed MIST was performed with the subpackage partically stowed to provide a baseline for functional performance prior to design limit mechanical tests. During this test the LSP radiated power was measured and the geophone performance was checked just prior to the completion of the stow sequences. There were no Qual hardware discrepancies in this test.

The SP I Shock test was performed before the vibration test because of a conflict of facilities. There were no discrepancies during the Shock test.

The Design Limit Vibration test was stopped during the second (Z) axis sine test because of resonant peak. It appeared as if the sunshield inserts holding the LSG had loosened. Mechanical troubleshooting on the sunshield was performed to define the problem. This troubleshooting failed to show any failure. The vibration test was continued successfully using the LSG mass simulator and then the test (one axis) was repeated successfully with the Qual model LSG mounted.

A second anomaly occurred during the third (X) axis sine test when a significant resonance was noted. The experiments were removed from the sunshield via the fastener verification procedure and the sunshield was subjected to X-ray examination to try to locate a failure.

The results of the sunshield tests failed to show a failure of any structural support member but some local filler Voids were found between the doubler and skin and in some of the filled LSG insert areas. Agreement was reached with MSC to waive the 50 to 100 Hz vibration requirement and to complete the final X axis downsweep from 50 to 5 Hz.

While the sunshield was being checked, an abbreviated MIST was performed to verify that there was no change in functional performance as a result of the resonance response.

A second system test was performed during this period to evaluate a change in the grounding scheme of the geophone cables. The change was initiated to reduce geophone channel noise produced by interference from LSP AGC pulses. This noise was first noticed during the Qual T/V test and documented on DR AC 5317. The test consisted of setting up the Central Station and LSP components to establish a baseline of coupled noise, incorporating the design change and re-measuring the coupled noise. The results showed a 3 db reduction in coupled noise which is satisfactory for proper performance.

5.1.2 Plans for Next Month

a. Complete design limit vibration

b. Perform the complete MIST and radiated power tests

c. Perform an LSP explosive package RF immunity test

d. Prepare for the QAR.

5.2 Flight System

5.2.1 Accomplishments

The Flight system thermal vacuum test was completed satisfactorily except that the uplink receiver SN18 showed substantial gain changes (DR 5535). Subsequent to the test the receiver was removed and replaced by SN15. Before SN15 was installed a special thermal vacuum

test was run proving that the SN18 problem was not a function of the design.

A number of items that were pending a necessity to open the Flight station were resolved at the time that the receiver was removed. The rear of the small microdot connectors were encapsulated, the LSP coaxial transmitter cable was replaced, the LSP ground strap was incorporated and all Deutsh connector pins on Central Station and Shorting Plug were pushed tested at 10 lbs.

A final decision was made to leave the slugging circuit in the station and to leave the APM commands connected. The operations plan draft was revised with the necessary contingency action.

All but two action items were completed and several DR's were closed in preparation for CARR.

5.2.2 Plans for Next Month

Stow and checkout Flight system for shipment.

Close out remaining action items and DR's.

5.3 System Analysis and Documentation

a. ATM 1105 was completed and reviewed. However, the Flight EMI test results had become available, and it was decided to extensively revise and update the ATM, nearer to the form of a final summary of Array E EMI results. This has been done, and the revised document is being reviewed.

b. A preliminary, complete Array E calibration tape has been supplied to NASA. It is "preliminary" because the precise values of some data for LEAM, LMS and LSG are not yet available; the values currently on the tape may be slightly in error. The need for editorial modifications has also been noted. A final tape will be produced when all the necessary information is available.

   Earlier in this period there had been some troubleshooting of the first complete tape, plus an extensive rework of the receiver data, necessitated by the substitution of SN 15 for SN 18.

c. The CEI Specification is in review; several in-house comments have been received. A revised version should be issued for approval in about one week.

d. The major revision of the System Description has been completed, and only relatively minor editing and correction tasks remain. This final version will be ready for distribution within two weeks.

e. Work on the Operations Plan has been proceeding; completion of this document by the end of August appears possible. A major innovation, compared with earlier documents, is the extensive use of flow diagrams for defining setting-up and contingency procedures.

f. About three man-days has been spent with the Mission Support Group in discussion proposed mission rules for ALSEP.

g. Work on anomalies this period has included the following:

1. participation in the interpretation of the SN18 receiver temperature-sensitive loss of gain.

2. establishing the mechanism of the spurious ripple-off lock-out and "LSPE Standby" following a PC changeover.

3. analysis of the effects upon the system of an ALSER concerning the TTL 54 medium power chips.

4. examination of the possible causes of incorrect experiment status telemetry via the LSPE MUX.

Recommendations were made regarding lunar operational procedures to minimize the effects (particularly thermal effects) of the observed spurious behavior of the flight system.

5.4 Power Budget

There have been two minor changes in the power budget:

a. reduction of transmitter power, by 0.5 watts, to 8.0 watts

b. increase ofthe minimum LSG operate power, by 0.45 watts, to 3.20 watts.

The overall effect of these changes is small.

The thermal/vacuum test results have established the general validity of the power budget, particularly for lunar day operation. There are some discrepancies at night, attributable to the use by the experiments of less than the maximum available heater power.

5.5 Test Procedure Status

There were eight new ALSEP (Type I Documents) test procedures released and transmitted to NASA.

There were three ALSEP (Type I Documents) test procedures revised by CRN action and transmitted to NASA.

Three new ALSEP (Type II Documents) test procedures were released and transmitted to NASA.

Four ALSEP (Type II Documents) test procedure were revised by CRN action and transmitted to NASA.

There was one new ALSEP test procedure Experimentally Released (Non-Standard Release).

Notice has been received that eleven ALSEP (Type I Documents) have been reviewed and approved by NASA.

Five Final Test Reports have been written and submitted for approval and one of these has been approved.

D. Fithian, Engineering Manager

DF/gmw

TABLE 5-1
ARRAY E POWER SUMMARY

1.	Data Subsystem	Day (watts)	Night (watts)
	Receiver	0.90	0.90
	Command Decoder	0.65	0.65
	Data Processor	2.30	2.30
	Transmitter (Teledyne)	8.00	8.00
	Diplexer Switch	0.10	0.10
	Harness Losses	0.30	0.35
	PDU (Relay Control)**	0.08	0.08
	TOTALS	12.33	12.38

2.	System	Day (watts)	Night (watts)
	Data Subsystem	12.33	12.38
	LSG	3.20	8.75
	LMS	10.48	11.2*+
	LEAM	3.16	6.60
	HFE	3.90	10.70
	LSPE	6.97	5.30
	TOTAL PCU LOAD	40.04	54.93
	PCU/PDU Power Routing Losses	7.64	8.48
	Minimum Reserve Power	2.00	2.00
	TOTAL POWER REQUIRED	49.68	65.41
	RTG Power (EOM)	72.00	72.00
	Reserve Power Available	22.32	6.59

+ Includes backup heater. If performance is nominal this heater will not be used and night power will be the same as day power. In that case Total Power required will be 67.45 watts.

* Increase .2 watt for multiple mode LMS

** PDU uses up to 4.0 watts (for 20 ms) to implement command.

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

Bendix Aerospace Systems Division

Date 1 August 1972 Letter No. 72-982-C306 Ann Arbor Michigan

To T. Fenske

From B. A. Pilon

Subject LSP Monthly Report for July 1972

6.0 LSPE

6.1 Accomplishments

6.1.1 Explosive Package Assemblies

a. All Qual 8552 baseplate assemblies complete. Four flight units complete.

b. Five receiving antennas complete in bonded stores and the rest ready for test.

c. Five H&CA complete and the rest foamed and ready for painting.

d. Covers complete except for plug modification.

e. Checked out beat rate recorder and amplimeter using EM explosive package.

f. Performed beat rate and amplitude check and long timer time-out on first EM explosive package.

g. Completed final drafts of timer test and reset procedures.

h. First of timers completed and in acceptance testing.

6.1.2 Antennas, Transmitting - The Flight model antenna is completed and ready for acceptance vibration testing.

6.1.3 WSTF Field Testing - Opened up test facility and preparing equipment for prototype tests. First dome instrumented and ready for checkout.

6.1.4 Completed engineering tests of AGC noise problem and recommended incorporation of ground strap on geophone lines. Ground straps incorporated successfully on qual and flight units.

6.1.5 Geophones (ASE) sent to Geotech for temperature cycling and functional tests.

6.1.6 System Tests

a. Qual system completed all but one axis of design limit vibration and all of shock test.

b. Flight unit completed thermal vacuum tests with no DR's.

6.2 Problems

The timers are late for delivery. Explosive packages are being prepared for timers and all lower assembly WO/OS being closed out. Timers will be installed at top assembly level (2334705).

6.3 Future Plans

6.3.1 Complete proto and EM explosive package assemblies, test and detonate.

6.3.2 Complete NOL Qual explosive packages and deliver to NOL for design limit testing.

6.3.3 Complete BxA Qual explosive packages and start Qual testing.

6.3.4 Complete Flight explosive packages and start acceptance testing.

6.3.5 Support remainder of Qual and Flight system testing.

B. A. Pilon

Approved:

K. Hsi

Internal
Memorandum

Bendix Aerospace Systems Division

Ann Arbor, Michigan

Date 31 July 1972 Letter No. LEAM-211

To T. Fenske

cc: K. Hsi
O. Berg
B. Reina

From D. Perkins

Subject LEAM Experiment Monthly Progress Report - July 1972

7.0 LEAM

7.1 Accomplishments

A. The Flight Model thermal vacuum tests were completed successfully.

B. The open circuit in the Qual Model power line, found subsequent to vibration and shock tests, was traced to a broken wire at a terminal on the power supply. Failure Report AA-EH-00E41 indicates that there is no design problem with the wire harness, but that the wire was installed with insufficient strain relief.

C. The squib circuit relay in the Qual Model was analyzed to determine if it could cause the squib telemetry signal anomaly. Failure Report AA-EH-00E32 indicates that no failure could be found in the relay and no failure history exists. We conclude that the cause of failure was probably an intermittent welded connection at one of the relay leads.

D. The decision was made to retain the presently installed multilayer board in the Flight LEAM experiment.

E. The Flight Model was delivered to Goddard for calibration. Calibration is proceeding satisfactorily.

F. A test was performed on the Flight Model legs to verify the integrity of the bonds. All four legs passed the test.

7.2 Plans for August

A. Complete the Flight Model calibration.

B. Close discrepancy reports on the Qual Model.

C. Receive a decision from MSC on refurbishment and calibration of the Qual Model to prepare it as a Flight Spare unit.

7.3 Problems During July

There were no significant problems during July.

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Approved by: H. K. Hsi

D. Perkins

Internal
Memorandum

Bendix Aerospace Systems Division

Date 11 August 1972 Letter No. LMS-771 Ann Arbor, Michigan

To T. W. Fenske

From D. Cook

Subject LMS Monthly Progress Review Report - July 1972

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

8.0 LMS

8.1 Accomplishments

8.1.1. The following tasks were compiled onthe Flight Model.

a. The thermal/vacuum test without any problems.

b. Shipped the unit to Langley Research Center (LRC) and completed the sensitivity test and electron multiplier (EM) tube gain test. The gain test revealed that the gain of the high mass tube is 1×10^7 at 2600 VDC. It should be 2×10^7. A decision was made to run the absolute calibration test on the low and mid mass ranges and about the middle of August measure the gain of the high mass tube again. Based on the results of the gain test a decision will be made to either: (1) use the experiment as is, (2) change out the analyzer, (3) change the voltage to the EM tubes to increase their gain.

c. An engineering model of the experiment cable strain relief bracket was tested. The cable was pulled at a force of 30 lbs without any damage.

8.1.2 As part of subpack I the following tasks were completed on the Qual Model, without any problems. The design limit vibration and shock test and a MIST.

8.1.3 Prototype Model

a. Completed the final wiring and assembly.

b. Started the Pre-Integration Acceptance Test (PIA) and during operation in the cyclic emission mode the oscillation problem, as reported in May and June, reoccurred. Troubleshooting was conducted to verify that the problem is in the multi-mode emission control card. The card was sent to UTD for fault isolation and repair.

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D

8.1.4 Ion source filament life test:

a. The 50,000 cycle test has been completed on all ten filaments with no problems.

b. The 96 hour test at 5% above nominal load has been completed on four filaments without any problems. The test on the fifth filament is within 12 hours from being completed.

c. The maximum load test on five filaments has been completed without any problems.

8.2 Plans for the Month of August

8.2.1 Flight Model

a. Complete the calibration on the low and mid mass ranges.

b. Re-measure the gain of the high mass EM tube and select one of the three alternate plans and start work on the selected plan.

8.2.2 Qual Model

a. Conduct the PIA test.

b. As part of the ALSEP Qual Model, conduct an RF immunity test on the LSPE explosive packages.

c. Ship unit to LRC for calibration tests.

8.2.3 Prototype Model

a. Complete the PIA test and conduct the shock, EMI and T/V tests.

8.2.4 Ion source filament life tests:

a. Complete 96 hour test.

b. Complete the test report.

8.2.5 Miscellaneous:

a. Prepare for QAR and CARR.

Prepared By: D Cook
D. Cook

Approved By: K. Hsi
K. Hsi

DC:nh

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

Internal
Memorandum

Bendix Aerospace Systems Division

Date 2 August 1972 Letter No. 72-984-705 Ann Arbor, Michigan

To T. W. Fenske

From R. B. Wallace

Subject Monthly Report - July 1972

9. LSG

9.1 Accomplishments

1. Successfully completed Flight T/V. Verified long and short term thermal control stability specification requirements, as well as design goals, were achieved. The T/V test also demonstrated that large electrical power margins are provided for lunar operation (i.e., approximately 95% for lunar noon and 35% for lunar night).

2. With the completion of the T/V test noted in item 1, the LSG Flight model has successfully completed the acceptance test program without any discrepancy reports (DRs).

3. The Flight model noise and performance test was successfully completed by the PI at the University of Maryland. The cultural noise problem (e.g., noise from cars, construction work) noted in the previous reports was solved by the PI by performing the tests at a quiet site located away from the University of Maryland Campus.

4. Returned Flight LSG to BxA and successfully completed the post Noise and Performance PIA.

5. Completed Qual Subpack 1 Design Limit Shock Test. Design limit vibration test is in progress.

6. Completed fabrication and checkout of the MFR Calibration fixture and initiated calibration of the MFR's.

9.2 Plans for Next Month

1. Complete Qual SP-1 Design Limit Vibration Test.

2. Complete Qual MIST and subsequent LSG PIA.

3. Complete preliminary stowing of Flight LSG including soldering the pre/post amp connections, final electrical checks and driving the screws to the Pre-Flight position.

4. Provide LSG engineering support for the Qual Noise and Performance Test at University of Maryland.

5. Complete checkout of Helmholtz /degaussing coil test facility.

6. Prepare for QAR/CARR.

9.3 Problem Areas

None.

R. B. Wallace

R. B. Wallace

Approved by:

H. K. Hsi

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

Internal
Memorandum

Bendix Aerospace Systems Division

Date 2 August 1972 Letter No. 978-13-604 Ann Arbor, Michigan

To T. W. Fenske

From B. D. Smith

Subject HFE Monthly Report - July

10. HFE

10.1 Accomplishments

A. The Array E Flight HFE was satisfactorily tested with the system at thermal-vacuum from 1 through 14 July.

B. HFE SN-7 test data reduction continued. Preliminary computer analysis indicates that the instrument is performing well.

C. CF^2 restow procedure 2368958 and LSP Explosive Package RF immunity test procedure 2365395 were reviewed and approved.

D. Troubleshooting was performed to confirm the HFE fault diagnosis resulting from system qual model testing. Potting material was found around a number of pins in the Schjeldahl receptacle of the HFE astromate connector, which was then cleaned and retested; the faults had cleared. The connector is not flightworthy but it can be used with HFE SN-2 for general system testing. FIAR AA EH-00E28 was finally issued on 20 July 1972.

E. The HFE cable restraint mod kit (2363769) and piecepart drawings were released on 14 July 1972. The cable restraint configuration was impulse tested under simulated worst case conditions, which included tests at the coldest temperatures predicted from a lunar surface thermal model.

F. HFE SN-3 electronics package was assembled and is now held in the BxA residual store.

10.2 Plans for Next Month

Reduce and analyze HFE flight and qual models data.

B. D. Smith

Approved by: H. K. Hsi

Internal
Memorandum

Bendix Aerospace Systems Division

Date 4 August 1972 Letter No. 72-977-817 Ann Arbor, Michigan

To T. W. Fenske

From R. J. Hostetler

Subject Monthly Progress Report - July 1972

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

Array E - Qualification System

Subpackage I MIST
LEAM PIA - Post Vibration
Shorting Plug Post Vibration Functional
Antenna Aiming Mechanism Post Vibration Ambient Functional
Subpackage I Shock
Antenna Aiming Mechanism Hot-Cold-Ambient Functional
Subpackage I Boydbolt Verification (Run per DR)
Subpackage I MIST (Modified per DR)
LSPE Baseline Noise Test
Subpackage I/LSPE Noise Verification Test

Array E - Flight System

System Thermal Vacuum Test
Photographing Experiments (Supporting NASA)
RTG Leak Check
Shorting Plug Functional
Antenna VSWR
LSPE Baseline Noise Test
Antenna Aiming Mechanism Hot-Cold-Ambient Functional
Subpackage I/LSPE Noise Verification Test
LSG PIA
Receiver Thermal Vacuum

Level A Spares

Shorting Plug Acceptance Vibration
Shorting Plug Post Vibration Functional
Receiver Thermal Vacuum

R. J. Hostetler, Group Supervisor
ALSEP Systems Test

M. G. O'Mara, Manager
ALSEP Quality/Test

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Internal
Memorandum

Bendix Aerospace Systems Division

Ann Arbor, Michigan

Date 7 August 1972 Letter No. 975-2731

To T. Fenske

From B. J. Rusky

Subject July System Support Monthly Progress Report

Apollo 16 ALSEP Mission Support

As of 31 July, the Apollo 16 ALSEP had completed 101 days of lunar operations. The downlink signal strength was steady. Power output of the RTG was 70.2 watts and 1731 commands had been transmitted from Mission Control Center.

On 26 July there was a lunar eclipse (the sixth experienced by Apollo 12 ALSEP) with no unexpected results. The Apollo 16 Active Seismic Experiment was operated for 30 minutes every Friday in the "listening mode."

Apollo 12, 14 and 15 ALSEP Mission Support

All ALSEP systems operating on the moon are monitored on an intermittent schedule at Mission Control Center. Including the Apollo 16 ALSEP, a total of 1993 days (5.47 years) of lunar operation has been logged and a total of 32,473 commands executed. No new problems were encountered this month.

Apollo 17 Document Preparation

The first draft of the Array E Data Book (MP-07) was completed and submitted on 13 July for review by both BxA and MSC. A review meeting at MSC is scheduled for early August.

Inputs to MSC for Mission Rules have been collected by BxA and will be submitted in early August.

ALSEP Anomaly Report Summary

The current MSC/R&QA Open Problem List reflects twelve (12) open items from Array E prelaunch hardware testing. All ALSEP lunar operations problems on the ASPO Apollo 16 Problem and Discrepancy List have been closed.

KSC Operations/Field Support

The EPTM flight transport modules were fit checked to the LRV on 6 July and used by the Apollo 17 prime crew during the LRV CF^2 on 11 July. Both operations were satisfactory.

The lightweight ACA was assembled and is ready to support the LM-12 C^2F^2 now scheduled for 9-10 August.

The Rustrak magnetic recorder was packaged and shipped to Ames Research Center on 24 July, and the probes associated with the recorder were air mailed to Palmer Dyal.

Grumman documents (TCP K-10034-LM-12 and TCP KL-0007-LM-12) were received for BxA review on 27 July. Review of the documents which pertain to the LM-12 C^2F^2 and the Apollo 17 CDDT, recycle, and countdown respectively will be completed in August.

Based on an industrial security inspection conducted on 28 June, a satisfactory rating was assigned to the BxA/KSC Operations on 5 July 1972.

The following Array E KSC procedures were released during July:

TCP No.	Title
2368931	LSP Ordnance (H&C's) Receiving Inspection
2368936	EPTM/LRV Pallet Fitcheck
2368959	Apollo 17 ALSEP (Array E) Restowage after CF^2 Test

"Apollo 17 ALSEP CF^2 Test" (TCP 2365344) was revised to incorporate appropriate changes and crew comments resulting from the Ann Arbor deployment.

Preliminary copy of "GMIL/ALSEP Interface Test" (TCP 2368907) was submitted to MSC and KSC for review on 21 July.

The Monthly Spares Status Report was revised and submitted to NASA on 15 July 1972.

Level "A" SML is currently being updated and is expected to be released on 15 August.

Logistics personnel have initiated closeout action as directed by NASA. Action consisted of declaring as excess Level "A" and "B" spares no longer required, coordinating screening with other ALSEP departments, and submitting final listings to NASA for disposition.

The following items were screened, declared excess, and submitted to NASA for disposition.

a. Eighteen major Level "A" Spares and fifty-seven line items consisting of one hundred fifty-four Level B spares pertaining to the Philco/Ford Receiver/Transmitters.

b. Various PSE non-flight hardware, test equipment, tools, and fixtures.

c. Various listings of flight residual hardware from Geotech pertaining to the Active Seismic Detection System.

The following items are currently being screened by other ALSEP departments:

a. Fifty-three line items consisting of one hundred thirty-nine Level "B" spares pertaining to the ASE Sensor Simulator.

b. Nine major flight Level "A" spares.

c. One hundred sixty-five line items consisting of four hundred fifty-nine flight Level "B" spares pertaining to the PSE.

Specific major spare activities included the following:

E2E Trainer Spares - Twenty-seven line items consisting of seventy-four pieces were delivered to KSC (Crew Training).

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

a. Helical Antenna (SN 15) and Antenna Cable Assembly (SN 15) 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 15) was designated the flight receiver. Receiver SN 18 has now been designated the flight spare and has been returned to Motorola for repair.

ATM 1103, Handling, Packaging, Transportation and Storage of ALSEP Array E Flight Hardware and Support Equipment has been released. This report outlines the methods utilized to achieve the ALSEP Array E requirements related to preservation, packaging, handling, storing and shipping.

The Crew/Mission Operations Hazard Analysis previously scheduled for completion in July will be completed in August in order to include changes in the method of deployment of LSP Explosive Packages.

Assistance was provided to the MSC Safety Office in determining the hazard level should the LRV strike a deployed explosive package. Collision was determined not to be a safety hazard. It would result, however, in an inability to detonate the package.

The LSP Final Safety Report is in preparation and will be released in September. The report is a summary presentation of the inherent safety characteristics of the LSP Experiment to demonstrate that it is a safe experiment to deploy on the lunar surface.

Routine system safety activities, including review of test procedures, monitoring of test operations and review of NASA/MSC bulletins were conducted as scheduled.

for B. J. Rusky, Manager
ALSEP System Support

BJR/jma

Internal
Memorandum

Bendix Aerospace Systems Division

Date 4 August 1972 Letter No. 9721-2911 Ann Arbor, Michigan

To T. W. Fenske

From S. J. Ellison

Subject July 1972 Monthly Progress Report, ALSEP Reliability

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) FIAR AA-EH-00E34 was initiated in June which indicated that geophone lines were picking up AGC RF transmitter pulses and that the excess noise was an EMI design problem and not a result of the qual T/V test or test set up. Final issue of this FIAR indicated a final decision to ground the geophone cable at the central station. This is sufficient to fix the EMI problem.

(b) 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. Engineering tests at cold and hot temperatures on ASE spare geophones are being conducted by Geotech. Preliminary information shows that the support rings do deform at hot temperatures but the cracking may be due to cold temperatures (-250°F).

(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 are

being replaced with a revised and improved MP 62 procedure which allows additional braid area to be soldered directly to the connector shell. Final FIAR E38 was issued during July.

(d) LSPE Timers

The engineering test program on the LSPE timers with the exception of four (4) day run out tests at ambient temperature and atmospheric pressure on B51 were completed in this reporting period. Engineering timers B & S 51 were the first two engineering timers subjected to 4 day run outs at Dayton T. Brown over the 4th of July weekend. Neither timer attained its proper timer out function at the conclusion of the 4 day thermal/vac tests. Observations were noted on removal of both timers from the thermal vacuum chamber that both drums had rotated around to the proper slot orientation for arming the S/A timer and firing the T/B timer, but neither the trip lever assembly pin, nor the follower assembly pin fell thru the slot. Further trouble-shooting revealed the cause of each timer failure to be as follows:

(1) B51 - The microswitch plungers were exerting excessive force against the trip lever lock assembly, which prevented the trip lever from actuating, thus precluding the firing pin from firing. The corrective action for this problem was to devise a special gap tool used during final assembly to provide proper clearance between the microswitch plungers and the trip lever lock.

(2) S51 - The arming pin cam lock was resting at an angle that caused a permanent set between the cam lock and the arming pin. The corrective action for this failure was a change in material for the arming and safing pins from 416 stainless steel to 440 stainless steel. This problem has been alleviated by the material change.

During the middle of July timers S52, B52, S53 and B53 were subjected to thermal/vacuum testing at Dayton T. Brown test facility. Timers B52 and S53 failed to actuate at the completion of the four day run out. On removal of these units from the T/V chamber it was noted on a BWC DMR that the drum on B52 had stopped after 4 hours of

rotation and the drum on S53 had stopped after 2-1/2 days of rotation. Both timers were returned to BWC for further troubleshooting. The cause of failure for both timers appeared to be caused by locktite getting on the interface gears. This occurred because excessive locktite being applied to the gear cover retaining screws. The MS called out minimum use of locktite, but evidently, this precaution was ignored during assembly. The corrective action for this problem is to insure that excessive amounts of locktite are not used.

During the last week in July, timers S51, B52, and S53 were resubmitted to T/V at Dayton T. Brown. All three timers performed satisfactorily to spec during this four day run out. Timer B51 was run out at ambient temperature and at atmospheric pressure at BWC. Timers S52 and B53 were shipped to BxA for LSP explosive package engineering test during this reporting period.

(f) LSP Antennas

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

(1) The results of the plating and material confirmation test showed that the tubes and wipers are in fact brass and bronze respectively.

(2) The results of the materials compatibility (salt spray) test showed no significant degradation in the antenna characteristics. Visual examination indicated no significant amount of corrosion.

(3) The results of plating adherence test showed that after the Russell antennas were submitted to a vacuum of 2.5×10^{-6} torr and the temperature cycled between -30°F to +320°F for 100 hours, no peeling of plating was noted.

(4) The results of the Russell antenna pull tests showed that it required a maximum force to deploy the antenna of 12 lbs (three 12 lbs readings out of 300 measurements) under the worst test conditions, and a minimum force of 3 to 4 lbs.

The minimum force applied to the antenna when it was fully deployed in order to pull apart the antenna was 28 lbs. and the maximum was 46 lbs with an average of 38.5 lbs. These pull tests were interrupted in order to find a suitable lubricant to replace the one applied by the manufacturer (commercial machine oil). Four lubricants were evaluated with KRYTOX 143 AC choosen by 100 hour thermal-vacuum test as being acceptable. Subsequent to choosing the new lubricant, five antennas were submitted to a new salt spray test. This test resulted in no traces of corrosion on any of the antennas.

2.2 LEAM Experiment

There were 6 FIAR's written during June and July against LEAM. Details of these FIAR's are presented in Section 5 of this report.

Of these 6 FIAR's, three have been closed officially by LSPO and the other three have been closed by BxA, pending approval by LSPO.

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.

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 will 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.

(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.

(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 circuit with no feed back control (none completed).

(c) Qual Cover Assembly (Breakseal) Problem) - (Reference DR #AC 5092 and AC 5462). 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.

(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 initially 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 known data for the high mass tube is shown below but the reason for the gain degradation is not yet known (*means extrapolated value).

	@2400 VDC	@2600 VDC
Gain Requirement by UTD	(N/A)	2.0×10^7
Gain on 12/11/71 @ UTD	2.7×10^7	$1.0 \times 10^{8*}$
Gain on 3/16/72 @ UTD	3.9×10^7	$1.3 \times 10^{8*}$
Gain on 4/5/72 @ UTD	7.2×10^7	$2.0 \times 10^{8*}$
Gain on 7/22/72 @ LRC	4.0×10^6	1.0×10^7
Gain on 7/26/72 @ LRC	5.0×10^6	1.0×10^7

2.5 Heat Flow Experiment

(a) FIAR AA-EH-00E22 - The flight astromate Schjeldahl connector had excess NARMCO adhesive on the male connector which caused open circuits. This FIAR has been closed.

(b) FIAR AA-EH-00E28 - The final FIAR on the qual model Schjeldahl connector was issued. Problem was traced to excess potting compound in the female connector which prevented contact movement during thermal cycling. This (SN-2) HFE was built prior to use of AQD-59 for inspection of these connectors for potting "runs". All flight female connectors have been inspected to AQD-59.

3. ARRAY E CENTRAL STATION AND SYSTEM

a. Action Item Status

(1) AI #659 (Array E QTRR Action Item EE5) - 5V slugging circuit--BxA to provide summary of potential system condition resulting from switchover including required contigency operations, and reliability assessment evaluating impacts to system reliability goals.

Bendix has recommended that the slugging circuit be left in PC 1 and that PC 2 be redesignated prime, circumventing the undesirable characteristics of the slugging circuit. During the flight system thermal vacuum test, the PC 2 to PC 1 switchover were characterized for spurious command generation, only one spurious command was observed: APM OFF. It has been determined that no impact to the system's reliability goals exist. (Ref: letter #9721-2896). Action Item 659 closed per BxP. O. 5368-72-970-5748.

(2) AI #660 (Array E QTRR Action Item EE6) - BxA to revise FIAR E6 to clarify conditions and limitations of slugging circuit following PCU switchover.

Revision C of FIAR E6 was issued 7/28/72, clarifying the corrective action taken to date. (See AI #659 response above.)

Action Item 660 closed per BxP. O. 5373-72-970-5753.

(3) AI #662 (Array E QTRR Action Item EE8) - BxA to generate matrices showing the various central station component combinations exercised during the T/V IST and the post design limit mechanical tests MIST. Reliability to assess the adequacy of the MIST to verify the successful completion of the D. L. mechanical tests.

The MIST procedure has been reviewed and revised so that it adequately assesses the acceptability of the design limit mechanical tests on the Qual sub-pack 1. Reliability memo to D. Fithian #9721-2895 and BxP. O. 5362-72-970-5742 closes out this action item.

(4) 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) SFPS, (3) EEE Parts List, (4) Parts Application Analysis and (5) Nonmetalic Materials List. These data are due 10 working days prior to CARR and will be updated during August 1972.

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.

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 four (4) ALERTS as to applicability:

(1) S4-A-72-01 - Aerovox capacitors, M39014/02-0298, (type CKR06), date lot code 7122C; leads are breaking off at package.

(2) MSFC-A-72-10 - Universal LQ35-2A power supply; voltage polarity reverses when source voltage is interrupted.

(3) MSFC-A-72-11 - Viking Industries connector, VP 5/2BC6; the engagement ends of the socket contacts were spread, resulting in loss of continuity.

(4) MSFC-A-72-12 - Ceramic DIP microcircuits, all manufacturers; cracks between the lead and lid seam have been found on DIP's assembled on conformally-coated PC boards.

Items 2 and 3 above are not used in ALSEP hardware, item 2 is not used in ALSEP test equipment. Reliability has investigated the ALSEP usage of CKRO6 capacitors and found that two (2) are used in the LSG experiment; BxA has asked for further direction from MSC in letter BxP. O. 5372(SJE), 72-970-5752. ALSEP uses two TI SM5401 DIP's in the central station PCU; BxA has asked for further MSC direction in letter BxP. O. 5383(SJE), 72-970-5763.

4. ALSEP ARRAY D

a. Action Item Status - No outstanding Reliability action items.

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. A survey of all previous ATM documents on the subject combined with a current assessment was reviewed with MSC on 5/9/72. The review concluded that improvement of ALSEP cable strain relief was to be implemented rather than modify any cables or connectors electrically. Study and test data as of 5/18/72 were presented to NASA personnel in handout 9721-943 during the Array E FTRR at Bendix. ALSEP cable relief concepts design and test were continued until 6/15/72 at which time a Design/Crew Mockup/PDR was held. Reliability follow up of detailed design has continued.

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.

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.

5. COMPOSITE ALSEP FAILURE REPORT STATUS

a. New Failure Report Items - Six (6) new failure report items were initiated during July 1972 as follows:

(1) FIAR #E38 - LSPE Antenna Cable Shield, Qual

(2) FIAR #E39 - C/S SN-18 Receiver, Flight

(3) FIAR #E40 - LEAM S/N-2, Array E Qual

(4) FIAR #E41 - LEAM S/N-2, Array E Qual

(5) FIAR #E42 - LMS, Array E Proto Filaments

(6) FIAR #E43 - SP #1 Sunshield, Array E, Qual

Additional details of these FIAR's and current status is indicated in the open items and closed item listings below.

b. Open FIAR Items Status

(1) FIAR AA-EH-000E6, Central Station SN-10, Array E Qual

During the C/S verification and calibration test, the ADP did not switch on command; the uplink was not operating. DR #AC 4168. A 5 volt delay module was added. C/S retest of changes on 4/10/72 disclosed new transient

anomalies. DR #AC 5068, 5069, 5071 and 5072. Addition of slugging capacitors in the PC-1 volt output was accomplished and the C/S verification was completed 5/10/72. Other modifications were considered until 6/1/72 when the design change investigations were terminated by NASA and BxA agreement.

Status: Open

Action: (1) TWX and FIAR initiated 2/4/72

(2) Final FIAR was issued 5/12/72

(3) Interim Rev. B FIAR was issued 6/22/72

(4) Final FIAR (Rev. C) issued 7/28/72

(5) BxA awaiting LSPO closeout action.

(2) 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 #AC 5092 and AC 5462. 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 at UTD on 6/28/72 revealed very poor braze joints and improper application(s) of GE-Vac sealant. Additional examination of breakseal after removal of GE-Vac shows radial cracks in ceramic. Unit is probably not repairable.

Status: Open

Action: (1) TWX and FIAR issued 5/17/72

(2) Final FIAR to be issued after leak test of flight breakseal at Langley (approx. 8/11/72).

(3) FIAR AA-EH-00E28, HFE S/N-2, Array E, Qual

During the T/V transition from lunar noon to night, the HFE downlink data was lost. The HFE responded to on/off commands but did not output data. DR #AC 5519. Initial troubleshooting during T/V test and at final open door test has isolated the problem to intermittent condition on the Schjeldahl connector of the HFE astromate assembly at cold conditions. (Also Reference DR #AC 5531). Examination of female connector showed sealant was jamming pins and they could not move to maintain contact during temperature cycling.

Status: Open

Action: (1) TWX and FIAR issued 5/31/72

(2) Interim FIAR issued 7/20/72

(3) Final FIAR issued 7/28/72

(4) BxA awaiting LSPO closeout action.

(4) FIAR AA-EH-00E30, LSPE Transmitter SN-2, Array E, Qual

During second lunar noon thermal-vac test (design limit lunar noon) the qual model LSPE transmitter output power dropped below the specified minimum output level. DR #AC 5524. On the test monitor oscilloscope the transmitter AGC pulses were 4.0 Vpp and should be 4.7 Vpp. During final open door IST, troubleshooting to verify a failure showed that the output monitor voltage was 4.3 Vpp compared to 5.4 Vpp at initial IST. The O/T condition was caused by accidential exchanging of scope test cables external to ALSEP central station. Also, an unsoldered shield was found on an OSM transmitter RF cable connector which caused intermittent output when cable was flexed. The OSM connector was replaced on qual and will be replaced on flight (flight will use revised assembly procedure).

Status: Open

Action: (1) TWX and FIAR issued 6/9/72

(2) Final FIAR issued 6/23/72

(3) Rev. A Final FIAR issued 7/18/72 per MSC request

(4) BxA awaiting LSPO closeout action.

(5) FIAR AA-EH-00E31, LEAM S/N-2, Array E, Qual

During inspection of the LEAM experiment and after T/V testing (TP 2365581 event 1D-4), a bonded joint on a leg (near the flat cable connector) was broken. DR #AC 5539. A pull test was conducted on the flight model after thermal vacuum testing to verify adequate bonding.

Status: Open

Action: (1) TWX and FIAR issued 6/9/72

(2) Interim FIAR issued 6/22/72

(3) Final FIAR was issued on 7/25/72

(4) BxA awaiting LSPO closeout action.

(6) FIAR AA-EH-00E32, LEAM S/N-2, Array E, Qual

During T/V test per TP 2365581 paragraph 6.6.6.4, HK 83-02 was 235, should be 000-013 after LEAM sensor cover release CMD .114. DR #AC 5518. Problem has been isolated to a relay that did not fire one of the squibs. Examination of the relay indicated that problem was not internal to the relay and was probably a poor connection of the relay to circuit, a newly installed relay tests correctly in the circuit.

Status: Open

Action: (1) TWX an d FIAR issued 6/9/72

(2) Final FIAR issued on 7/25/72

(3) BxA awaiting LSPO closeout action.

(7) FIAR AA-EH-00E33, Sub Pack I (and LMS), Array E, Flight

During MIST, HK-40 (LMS data) read all zeros. DR #AC 5545. Troubleshooting indicated that both central station and LMS were operating properly and that the LMS/Central Station Schjeldahl connector contained contaminate(s) that were probably responsible for the HK-40 dropout. Subsequent to cleaning the connector, the problem has not returned to EMI and T/V testing.

Status: Open

Action: (1) TWX and FIAR issued 6/12/72

(2) Final FIAR issued 6/22/72

(3) Revision A FIAR issued 7/12/72 per MSC request.

(4) BxA awaiting LSPO closeout action.

(8) FIAR AA-EH-00E34, LSPE, Array E, Qual Model

During qual T/V test, LSPE, science data noise level was out-of-tolerance during a special test when geophones were disconnected from geophone cables. DR #AC 5317. Excess noise was in synchronization with LSPE transmitter AGC RF pulses. Subsequent troubleshooting at WSTF on prototype LSPE (with transmitting antenna used) indicated that geophone lines were picking up AGC RF pulses and that the excess noise was an EMI design problem and not a result of the qual T/V test or test setup. A design improvement (EMI fix) study is in progress. Further troubleshooting of qual LSPE hardware is not planned since problem is not related to thermal vacuum. Evaluation of filtering and grounding shows either will control the EMI problem. The geophone shields will be grounded at the central station on both qual and flight.

Status: Open

Action: (1) TWX and FIAR issued 6/16/72

(2) Final FIAR issued 7/13/72

(3) BxA awaiting LSPO closeout action.

(9) FIAR AA-EH-00E38, LSPE, Qual

During qual MIST system level test the LSPE antenna cable shield appeared to be broken loose from connector P-155B (OSM 521-3). DR #AC 5865. The outer shield (braid) solder joint to connector was defective. Solder joints were repaired by resoldering of connectors on both ends of cable even though only one was found defective.

Status: Open

Action: (1) TWX and FIAR issued 7/3/72

(2) Final FIAR issued 7/6/72

(3) BxA awaiting LSPO closeout action.

(10) FIAR AA-EH-00E39, S/N-18 Receiver, Array E, Flight

During the lunar morning IST in the flight system thermal vacuum test, no command verification word was received for octal command 135. DR #AC 5535. The downlink housekeeping data indicated an apparent loss of 6 db in the received signal strength. At this time it appears as if the problem lines in the front end of the command receiver, probably in the rf power splitter or the LO chain.

Status: Open

Action: (1) TWX and FIAR issued 7/5/72

(2) Interim FIAR issued 7/28/72

(3) Final FIAR will be scheduled following failure isolation at Motorola, G. E. D. in late August.

(11) 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 astromate connector. DR #AC 5866. 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.

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

Following Prototype Vibration Test, the filament power supply HK reads low. Indication was that the Qual Multi-mode Emission Control Board was causing filament power supply oscillation due to low filament current (filament resistance too high). DR #AC 5537. Proto LMS returned to UTD to replace proto filaments with flight type filaments. Subsequent proto testing with flight type filament showed oscillation program still exists. Emission control electronics were returned to UTD for detailed troubleshooting.

Status: Open

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

(2) Final FIAR to be issued 8/16/72 after return of prototype emission control board from UTD.

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

During the sub-pack 1 qual design limit vibration test, the sunshield honeycomb core to insert bond has apparently failed near the LSG mounting inserts. DR #AC 5686. The sunshield has been determined to be structurally sound; the sub-pack #1 has been reassembled and returned to test.

Status: Open

Action: (1) TWX and FIAR initiated 7/21/72

(2) Final FIAR to be issued 8/11/72

c. FIAR Items Closed During July 1972

(1) FIAR AA-EH-00E15, LSPE EPA S/N-10 Prototype

During WSTF field test, the S/N-10 prototype Explosive Package Assembly (EPA) failed to detonate on schedule. DR #AC 5023. Additional testing on the proto receiver (EPA SN-10) has been performed at WSTF to evaluate receiver sensitivity for local conditions similar to those at time of scheduled detonation. This retest eliminated the receiver as cause of failure. Failure was caused by improper setting of one of the two timers.

Status: Closed

Action: (1) TWX and FIAR issued 4/13/72

(2) Final FIAR issued 6/16/72

(3) Closed per LSPO letter dated 7/25/72.

(2) FIAR AA-EH-00E26, C/S S/N-11 (Fuse), Array E, Flight 6

During PC/DP/Central Station verification test only PDR 2 responded following PDU 1 and PDR 2 commands. DR #AC 5301. The fuse in the PDR 1 line was blown due to a pinched wire in cable for PDR 1.

Status: Closed

Action: (1) TWX and FIAR issued 5/17/72

(2) Final FIAR issued 5/25/72

(3) Final Rev. A issued 6/22/72

(4) Closed per LSPO letter dated 7/25/72.

(3) FIAR AA-EH-00E29, LEAM S/N-3, Array E, Flight

During LEAM functional (TP 2365512) the flight model exhibited a noise condition. DR #AC 5530. The problem was due to manufacturing error in the mixture of the electrical conductive epoxy (Eccobond solder) to bond a common ground wire to the outer shield of the LEAM cover.

Status: Closed

Action: (1) TWX and FIAR issued 6/9/72

(2) Final FIAR issued on 6/19/72

(3) Closed per LSPO letter dated 7/25/72.

(4) FIAR AA-EH-00E35, LSPE, Array E, Qual Model

During Qual Design Limit Lunar Noon T/V test, the LSPE geophone model temperature was 320°F (should be below 290°F). DR #AC 5521. Reason for excess temperature was a test thermal bag over geophones which was too large. MSC and BxA had agreed to allow excess temperature in order to continue test and bring surrounding area up to qualification

temperatures. After T/V test, one geophone was disassembled and visually examined by Teledyne Geotech engineers and it was found that a support ring (made of epoxy) had decreased in diameter such that the transducer was no longer properly secured. All four qual geophones have been reworked and retested by Geotech prior to design limit vibration tests.

Status: Closed

Action: (1) TWX and FIAR issued 6/16/72

(2) Final FIAR issued 6/23/72

(3) Closed per LSPO letter dated 7/25/72.

(5) FIAR AA-EH-00E36, RTG Mod 24, Array E, Flight

During a Generator Assembly functional test, the temperature indicator R3-3 for the RTG hot frame gave erratic readings that appeared unreasonably high. DR #AC 5074 and AC 5544. A general waiver, RTG-1 dated 11/6/70, has been granted for all failed RTG sensors; the NASA has elected not to pursue additional analysis or corrective action.

Status: Closed

Action: (1) FIAR issued 6/22/72

(2) Closed per LSPO letter dated 7/25/72

(6) FIAR AA-EH-00E37, LEAM S/N-3, Array E, Flight

During initial setup and preparation for EMI test the LEAM experiment showed excessive noise hits. DR #AC 5547. Proper ground of the thermal bag corrects the condition.

Status: Closed

Action: (1) TWX and FIAR issued 6/22/72

(2) Final FIAR issued on 7/3/72

(3) Closed per LSPO letter dated 7/27/72.

(7) FIAR AA-EH-00E40, LEAM S/N-2, Array E, Qual

During pre-integration acceptance test performed on the LEAM Qual Model hardware, it was found that the print-out of east and west sensor did not conform with the data of sheet 2 per TP 2365512 (noise). DR #AC 5868. Problem is the same as for flight LEAM in FIAR E37. Proper rounding corrects the problem.

Status: Closed

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

(2) Final FIAR issued 7/13/72

(3) Closed per LSPO letter dated 7/27/72.

S. J. Ellison, Manager
ALSEP Reliability

SJE:b:8056

Internal
Memorandum

Bendix Aerospace Systems Division

Date 2 August 1972 Letter No. 72-210-301 Ann Arbor, Michigan

To T.W. Fenske

From L. Deck

Subject ALSEP Configuration Management - July Monthly Progress Review Input

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ALSEP CHANGE ACTIVITY STATUS

The ALSEP Change Control Board has approved 58 changes for the period of 1 June thru 30 June for a total of 9201 changes for the period beginning the last week of November 1966 thru 31 July 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 7-31-72.

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 7-31-72.

RFC's Open	5
RFC's Closed	9

L. Deck

L. Deck
Configuration Management Office

LD:bg

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ALSEP ARRAY E QTRR RFC STATUS SUMMARY

RFC NO.	DESCRIPTION	Review Board Action	Date of Completion	Responsible Personnel	Status C-Closed O-Open	Remarks/Documentation
STC 1	Remove "D" handles prior to design limit testing	Disappvd.	5-16-72			Array E will be qualified with "D" handles
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	CRN 70892
EE 1	Screen all 54L flatpacks in bonded stores to preclude use of leaky parts	Appvd.	5-16-72	D. Fithian	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 FTRR/FACI STATUS SUMMARY

RFC NO.	DESCRIPTION	Review Board Action	Date of Completion	Responsible Personnel	Status C-Closed O-Open	Remarks/Documentation
LSG C1	KSC test procedure and hardware required if LSG requires degausing 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/flt. 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. Fithian	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. Hostetler	O	

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ALSEP ARRAY E FTRR/FACI STATUS SUMMARY

RFC NO.	DESCRIPTION	Review Board Action	Date of Completion	Responsible Personnel	Status C-Closed O-Open	Remarks/Documentation
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 CF_2	Appvd.	5-18-72	L. Lewis	O	
LSPE 2	All flt. explosive pkgs. should be operated by the C/S 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 FTRR/FACI STATUS SUMMARY

RFC NO.	DESCRIPTION	Review Board Action	Date of Completion	Responsible Personnel	Status C-Closed O-Open	Remarks/Documentation
ST 2	Reinstate evaluation of ant. aiming mech. at hi & low temp. in flt. acceptance test	Appvd.	5-19-72	D. Fithian	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. Fithian	C	BxPO 5358-72-970-5738