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MANNED SPACECRAFT CENTER
HOUSTON, TEXAS 77058

IN REPLY REFER TO: 70-FS55-207

MEMORANDUM TO: See list attached

FROM : FS/Chief, Flight Support Division

SUBJECT : Minutes of the LUMINARY 1D (Apollo 14) Flight Software Readiness Review (FSRR)

1. The LUMINARY 1D FSRR was held on Tuesday, December 8, 1970, at 1 p.m. in building 2, room 520. Enclosure 1 is a reconstructed and hopefully complete list of attendees.

2. Mr. T. G. Price introduced the meeting with a brief description of the agenda to be followed. The agenda is listed in Enclosure 2.

3. Mr. J. R. Garman of Flight Support Division presented the status of the erasable load. The erasable load for Apollo 14 was published on October 9, 1970, and only small changes are expected to be published prior to the FRT (December 10, 1970) and prior to launch (January 8, 1971). Also, the powered descent ignition parameters may require change because of the intent to use four-jet ullage for PDI.

4. Mr. R. Larson of MIT/SDL then presented a synopsis of the development of the LUMINARY 1D program and the results of the level 6 testing. Several questions arose during the presentation of the level 6 testing. A discussion of these questions follows.

a. The MIT/SDL level 6 descent runs showed higher than nominal velocities at entry to P66. Grumman Aircraft Corporation (GAC) also indicated that they had seen the same results during FMES/FCI testing. Since the FSRR, an error has been found in the erasable load that evidently contributed to this effect. The FMES/FCI people have made a descent run with the correct constant and the run now looks nominal. MIT/SDL is continuing the investigation to determine whether there may be other causes for the discrepancy.

b. The APS impulse burns showed a VGZ residual of about -4 or -5fps for all cases. This is consistent with results on the FMES/FCI facility at GAC and the LMS facility at Kennedy Space Center (KSC). It was decided that this fact should be pointed out to the crew at the program note review.

c. During the presentation, MIT/SDL stated that they had received no data for the CSI (P32), CDH (P33), TPI (P34) RTCC compatibility testing.

Subsequent contact with RTCC personnel revealed no requirement to run that test case.

5. Mr. R. O. Nobles of Mission Planning and Analysis Division then presented the results of the independent verification panel review. Mr. Nobles stated that the only problems found in the LUMINARY program were insignificant and that the program was believed to be flight worthy. All special notes reported by the panel will be covered by a program note and/or a program or GSOP fix.

6. Then Mr. S. Greene of GAC discussed the results of the FMES/FCI simulator mission verification testing. Mr. Greene briefly discussed the FMES/FCI functional flow, the scope of testing, the number of PCR's verified, and then gave a status of the simulator discrepancy reports (SDR's). A discussion of the open SDR's follows.

a. SDR-114 - A hardware restart when trying to enter P00 via V37E00E returned program control to the flashing V50N18 attitude maneuver request. Investigation of this problem showed that the V37E00E was preceeded by a V37E85E (operator error). Program note 2.2.9 states that when a new program selection is made via V37, the key release light will remain on during R00 and that no further keyboard activity should be attempted until the key release light goes off and the new major mode lights are displayed. The restart did not directly cause the V50N18 phenomenon. The program note will remain for all missions and the Flight Software Branch believes that constitutes closure of the SDR.

b. SDR-116 - During one of the 169 descent runs, a tape meter oscillation was observed. This was a one-time occurrence but the SDR will remain open pending further GAC investigation. There is no mission effect.

c. SDR-117 - While performing R31 (rendezvous parameter display), the DSKY display was frozen by pressing the DSKY "3" key. The number displayed in R3 (THETA) was 56.89° instead of the 303.11° that was displayed before and after the "3" key was pressed. This happened because after the angle is computed, it is subtracted from 360°, i.e., if the DSKY is "frozen" between the computation of the angle and the subtraction from 360°, then the DSKY will display the complement of the correct display. This effect will be documented as a program note for all missions and will be closed by this action.

d. SDR-118 - During a test of the docked light LM/CM vehicle configuration, jet firings were recorded while the vehicle had zero attitude errors and small attitude rates. The SDR suggests that this problem was the result of simulator system problems, but closure will await further GAC investigation.

e. SDR-119 - This SDR involves V06N49 RR reasonability failures during PGNS RR updating. Since the FSRR, MIT/SDL has made additional runs with state vector and RR errors that show nominal performance but result in

V06N49 alarms for about the first 10 marks. This is considered to be normal program operation. The reason for GAC's observing V06N49's with zero state vector and RR errors is not understood but seem to be linked to IMU errors since the runs were made with otherwise errorless conditions. The SDR will remain open until there is a more comprehensive explanation of the cause for the V06N49 alarms.

f. SDR-120 - This SDR reports the observance of a gradual vehicle yaw attitude command during and near the end of P64. The SDR will remain open pending further GAC evaluation.

g. SDR-121 - During a PGNS lunar surface run, P22 failed to terminate automatically when range to CSM exceeded 400n.m. Anomaly report L-1D-17 has been written and this condition will be corrected in LUMINARY 1E. A program note will be issued for Apollo 14.

h. SDR-122 - Since ΔV_{CDH} components are computed after ΔV_{CSI} components in P72, when P76 is selected after P72, the N33 display will be TIG of CSI but the N84 display will be ΔV_{CDH}. This will be documented as a program note for all missions and this action will constitute closure.

In conclusion, Mr. Greene stated that a successful nominal or abort LM-8 mission can be flown using LUMINARY 178.

7. Mr. Larson then discussed the outstanding anomalies written against the LUMINARY 1D program. He stated that none of the anomalies is critical and that workarounds are available for all of them.

8. The last speaker was Mr. B. Suchocki of Flight Crew Support Division/ KSC who stated that the crew has flown many training flights on the LMS simulator and that they are ready to fly the Apollo 14 mission.

9. Copies of all the slides presented at the FSRR are available from the LUMINARY Program Engineer, Mr. Price, at extension 2308, so to lighten the reproduction work, these slides are not enclosed here. Also, any questions concerning the FSRR should be directed to Mr. Price.

Lynwood C. Dunseith

Enclosures 2

cc:
(See list attached)

FS55:TGPrice:jvm

ATTENDEES

B. Suchocki	KSC
G. Heffron	Bellcomm
B. McCoy	MIT/SDL
R. Larson	MIT/SDL
C. Tillman	GAC
S. Greene	GAC
J. Norton	TRW
R. Nativi	TRW
D. McClendon	TRW
O. Cerbins	TRW
C. Hackler	EG
H. Shelton	EG
S. Sjoberg	FA
H. Tindall	FA
W. Presley	FC
G. Renick	FC
R. Savely	FM
R. Nobles	FM
J. Alphin	FM
T. Price	FS
J. Garman	FS
J. Williams	FS

Enclosure 1

LUMINARY FLIGHT SOFTWARE READINESS REVIEW
Tuesday December 8, 1970
Rm. 520, Bldg. 2
AGENDA

1:00 p.m.	Introduction	T Price, FS5
1:05 p.m.	Erasable Load Status	J Martin, FS5
1:15 p.m.	Level 6 Test Results	R. Larson, MIT/SDL
2:15 p.m.	Independent Verification Panel Report	R Nobles, MPAD
2:45 p.m.	FMES/FCI Test Results	S. Greene, GAC
3:15 p.m.	Outstanding Anomalies	R. Larson, MIT/SDL
3:30 p.m.	Crew Training Status	B. Suchocki, KSC

Enclosure 2