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MOL MONTHLY PROGRESS REPORT

FOR

1 FEBRUARY THRU 28 FEBRUARY
1969

for 

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Systems Engineering Director
Management Systems Office



W. C. Williams
Vice President
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1.0 GENERAL

Over a period of several months the MOL Program has conducted a series of technical sign-off meetings. These meetings are basically intended to clean up the numerous "To be determined" (TBD) and "To be resolved" (TBR) in the various interface specifications. A very productive TSOM was held at MDAC the week of 24 February 1969. Two hundred and twenty seven items were submitted to Systems Office/Aerospace for signoff with 213 actually being approved. Of the 47 items identified prior to the meeting as critical, 44 were signed off.

Considerable progress was made in the Laboratory Module mechanical and thermal areas, the Mission Module mechanical and thermal areas and the AVE software area between GE and EK. Ascent venting, IVS thermal and the light trap problem were all resolved. Action plans were established for all critical problems not completely resolved.

A Critical Design Review (CDR) is a recognized milestone in the "375 series" management system. Evidence of the increasing definition of the program is the forthcoming CDR on the Gemini B AVE which will be held at MDAC-ED starting 17 March 1969. During February review teams were formed and preparations made for this review. Preparation consisted of reviewing the Contractor's stated design solutions for itemized requirements against the source documents of CEI and Interface specifications. Details of agendas and review team coordination procedures were also worked out in association with the counterpart team chiefs of the Air Force Systems Office.

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2.0 LOADS

All required loads, except thrust termination, have been received by the associate contractors from the Martin-Marietta Corporation. Thrust Termination Loads have been received here at SO/Aerospace and are currently being reviewed prior to being transmitted to the contractors.

The latest Subsystem "B" mathematical model has been received at SO/Aerospace. Modes for this model were determined and subsequent loads for launch, stage 1 shutdown and Thrust Termination at 114 seconds were determined. These calculations were performed for the purpose of determining the adequacy of the previously applied 10% factor to the Loads Cycle 4 loads to account for model discrepancies. These loads will be briefed to the contractor at the Technical Review on 21-22 March. The contractor will provide the hardware impact status for the current Loads Cycle 4 loads appearing in SAFSL Exhibit 30012 and will also review hardware impact for the most updated model loads as noted above.

At this writing, in-house cursory review of the loads and hardware design indicates negligible impact on the current hardware design from the Cycle 4 loads + 10% factor.

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3.0 CONTAMINATION

3.1 Plume Contamination

Full scale attitude control thruster plume contamination tests at Marquardt were completed during this report period. No visible contamination was noted on the thruster nozzle when tested at expected operational conditions of temperature, pressure and duty cycle. Contamination was noted, however, when the thruster was conditioned to 20^oF (60^oF is expected minimum) indicating sensitivity to hardware and propellant temperature.

3.2 Outgassing Contamination

Program activities and review of MDAC-WD standard material specifications have highlighted a problem of non-metallic materials used by MDAC-WD in test and flight hardware construction which potentially have unsatisfactory outgassing characteristics in a vacuum environment. As a result, a TWX has been transmitted and discussions held with MDAC-WD personnel identifying that at least one material (RTV 1016 - silicone sealant) will be disapproved for critical use on the MOL Program. MDAC has been requested to: (1) investigate other sealants, (2) identify all materials utilized in LVSS and their outgassing characteristics, (3) define impact and prepare a get-well plan associated with changing sealant and, (4) establish with associate contractors suitable quantitative outgassing requirements.

4.0 ALIGNMENT

GE has selected a baseline AVE alignment system that includes mounting the startrackers to the upper leg of the beryllium tripod and the addition of two low range sensors to this mounting structure; one sensor to monitor tracking mirror misalignment and one to monitor the misalignment between the high range sensor and the startrackers.

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4.0 ALIGNMENT - Continued

Aerospace has three areas of concern with this design that require further work with GE. These are: (1) the possible increase in smear rate due to the hard mounted startrackers, (2) the design of the low range sensor and (3) the weight of the selected system. These must all be answered by GE at or prior to PDR, currently scheduled for late April or early May.

5.0 IMAGE VELOCITY SENSOR (IVS)

Evaluation tests of the Hycon and Goodyear devices have continued. Neither device is, as yet, meeting the system requirements; additional fixes have been identified and are being incorporated. GE and Aerospace are analyzing the test results to date.

A summary meeting is scheduled in conjunction with the March Technical Direction meeting to permit SO, Aerospace and GE management to plan the actions required to complete the vendor evaluation and selection.

6.0 ELECTRICAL POWER SYSTEM

6.1 NASA/Air Force-Aerospace Fuel Cell Coordination Meeting

The Aerospace minutes of the NASA/Air Force-Aerospace Fuel Cell Coordination Meeting held 31 January 1969 have been transmitted to NASA-MSD via the MOL SO. As agreed at that meeting, NASA has exchanged their minutes which have been reviewed. Coordination on areas of common benefit for both the MOL and AAP fuel cell programs will continue.

6.2 LMSE Specification Review for EPC

A review for technical adequacy of the MDAC-WD LMSE specification for the new EPS technical baseline was accomplished

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6.2 LMSE Specification Review for EPC - Continued

and documented. All changes due to incorporation of the Allis-Chalmers matrix fuel cell have not been incorporated in the MDAC-WD specification. It was recommended that the design freeze date for the EPS portion of the LMSE be deferred until after the incorporation of Engineering Change Proposal 0374 and the McDonnell-Douglas Electrical Power System Preliminary Design Review.

6.3 Fuel Cell Gas Supply

A recommendation was prepared for transmittal to the Air Force to approve a baseline change in storage of fuel cell gases. The original concept of K-bottle storage on level 14 of the Mobil Service Tower could be improved by maintaining supplies in tube-type trailers in the gas storage area and the LH₂ holding area. There is an advantage in cost, safety, logistics, operations, facility compatibility and maintenance of purity standards.

7.0 OPTICS

The latest optical Performance Prediction Report has been reviewed. The data shows that the predicted optical performance is generally within the requirements of the System Objectives or the Contract. However, some parts of the report required clarification. All comments received were reviewed with the contractor and appropriate actions have been taken to obtain necessary clarification in the next issue. Of significance, EK was asked to expand in detail on the means of accomplishing ████████ Optical Quality Factor, and on resolution vs. vibration effects.

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7.2 Resolution Computation

A meeting was held at GE to discuss the problem of statistically estimating resolution in the presence of vibration induced by the various sources such as an ACTS firing or Tracking Mirror slew. Two analytical approaches were discussed at the meeting. Both the contractors and Aerospace accepted actions to obtain data necessary for either approach and to evaluate the relative merits of each approach. A meeting will be scheduled near the end of April to establish the approach to be used and to exchange input data. It is expected a first cut analysis will be completed by June.

7.3 Optical System Improvement Studies

During the month of February, a review of study final documentation provided by EKC was initiated. The documentation pertains to the optical system improvement study conducted at EKC from July-November 1968. Representatives of the Advanced Plans and Requirements Office and MPSS Offices of the MOL SO and the optical support group will participate in the study review. The review is scheduled for completion in mid-March.

8.0 TRACKING MIRROR DRIVE AND ATS DRIVE STABILITY

Considerable progress has been made towards identifying the interface parameters required by GE to finalize the tracking mirror drive stability analysis. An action plan was agreed to at TSOM #9 between GE, EK and DAC to define the required data and prepare the necessary interface paper.

8.1 ATS Drive Stability and Jitter

As reported last month, the ATS drive stability problem has been resolved. However, GE has included only the servo noise effects and has ignored the effects of vibration originating from GE and other associates' equipment.

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9.0 TEST HOLD DURING INTEGRATED TESTING
(CLOCK-STOP)

The on-board computer software has been implemented in such a way that it is not possible to command the DAC AGE (ASTEG) and GE AGE (CITE) to "Hold" during the execution of a given test sequence. This could lead to problems in integrated testing of the LM and MM. Solutions to this problem are complicated due to the timing, synchronization and interrelationship of all the AVE electronic subsystems. An Aerospace study of alternatives indicates possible simple solutions. Contractor recommendations are expected next month.

10.0 WIDE BAND VOCODER ELIMINATION STUDY

A study has been completed which shows the feasibility of eliminating the vocoder in the Secure Voice Communications System. The approach recommended eliminates the need for complex GVCS equipment at each remote tracking station. This equipment is replaced by a simplified voice converter at the STC. The 2,400 bps lines between the RTS's and the STC are replaced by 48 KBps lines.

The combined changes provide a significant improvement in voice link quality, performance, and intelligibility. A briefing was prepared which explains the technical details of this approach, cost savings possible, management considerations and necessary implementation actions.

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11.0 ELECTRO EXPLOSIVE DEVICE SURVIVABILITY

A review was made of contractor requirements for providing Electro Explosive Device (EED) survivability in the RF environment at the VAFB launch pad. Recommendations were made that survivability must be demonstrated by actual launch pad tests rather than by analysis.

12.0 INTEGRATED CIRCUIT SCREENING

At Aerospace request MDAC has developed a high reliability program for screening and testing to identify faulty integrated circuits. The contractor proposed plan is satisfactory from the viewpoint of screening defective units; however, no contingency plan for procurement has been developed in the event of large scale failures. Aerospace is continuing to explore the problem with MDAC-WD.

13.0 ADVANCED DATA SYSTEM

The first draft of the MOL Flight Support Plan was published 28 February as the result of the efforts of Aerospace, Contractor, and Air Force study groups totaling over 120 engineers. Review, revision and approval is planned for March, with the first Contractor briefing scheduled for 18 March.

14.0 SOFTWARE STATUS

14.1 AVE Software

GE and MDAC/IBM reported the results of their one-month analysis of the AVE software timing problem (i. e., 137% of capacity). A briefing to Air Force/Aerospace management was prepared and given which summarized these results and recommended a course of action to resolve the problem. The above resulted in direction to GE to implement software solutions which will result in an 81 m. s. worst case timing cycle.

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14.1 AVE Software - Continued

A letter requesting contractor action to manage and report core and timing as a critical system resource was prepared and coordinated through all offices.

Major efforts have been devoted to a review of AVE software testing and validation. Particular subjects for discussion were scientific validation, interpretive computer simulation, quantizing software functional requirements, and the fidelity, visibility, and availability of the simulator.

Other activities in support of testing are listed below:

- a. The Category I Test Plan for the MDAC "On-Board set" computer programs was received. A review was initiated for meetings with MDAC during the next reporting period.
- b. The Test Integration Committee was supported with Hardware Test Route Analysis. A briefing was prepared, which is to be given during the next reporting period, on the software development and test flow with particular emphasis on the critical paths for hardware/software interface verification.
- c. The weekly GE Segment Office hardware-software interface meetings were supported. Of particular concern with the test and operational software development status for DSS-1 and the documentation plan for this software. Discussions will continue into the next reporting period with a meeting with GE planned for 24 March 1969.

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14.2 Ground Software

Aerospace efforts in the ground software area have been primarily concerned with the STC 6600 re-direction effort and the resulting impact on all ground software (including the orbit program).

15.0 OPERATIONS INTEGRATION

On 19 February a meeting was held at MDAC-WD to discuss the BATMAN/MX09 computer program interface. BATMAN provides an automatic Flight Vehicle Time Line. MX09 provides an automatic OV Mission Power Time Line. BATMAN is supposed to drive MX09 which in turn provides power profiles for BATMAN use. The interface providing BATMAN output to MX09 is incomplete in the area of Mission Module equipment modeling. MDAC-WD just recently recognized this internal problem, and it was flagged by Aerospace during recent fact-finding on the contract re-negotiation. MDAC-WD wants about 3800 man hours to correct the problem. Systems Office/Aerospace position is that the problem does exist; MDAC-WD proposed solution is reasonable; but it is within scope of the BATMAN/MX09 work statement and that additional charges should not be allowed.

16.0 SAFETY

MDAC-WD's MOL Space Simulation Laboratory System Manrating Analysis report was reviewed. A meeting was convened at Huntington Beach on 24 February 1969 to obtain additional

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16.0 SAFETY - Continued

information on MDAC-WD's position regarding specific criteria for manned chamber testing. Safety Office recommendations with respect to the adequacy of safety requirements are being formulated.

MDAC-ED's ECP 111R for the replacement and accounting of nonmetallic materials in accordance with criteria specified in SAFSL Exhibit 10010 was reviewed. Safety Office comments were presented to the Aerospace MAC Office at a meeting on 28 February 1969. Approval of the ECP has been deferred pending the submittal of additional information by MDAC-ED.

Meetings were held with MDAC-WD for the purpose of completing "Fact finding" of CCN 125 which established the upgraded materials flammability program. Meetings were also held at which MDAC-WD outlined their plans for full scale materials flammability verification testing.

17.0 [REDACTED]

A Technical Advisory Group was convened to review proposals for [REDACTED] ground software. Members include Program Office and ESO personnel. The final evaluation report is to be presented on 13 March.

18.0 ADVANCED PLANS

18.1 Wide-Band Data Systems Review

The study of suitable wide-band data systems continued. Particular emphasis was placed on investigating satellite programs scheduled for the 1972-75 time period which could be used as relay stations. Support Division analytical studies on the limiting capacity of digital and analog data links also continued through the month.

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18.2 National Launch Vehicle Studies

The MOL Advanced Plans and Requirements Office participated in planning sessions with representatives of the Aerospace Vehicle System Office and industry. These meetings resulted in an exchange of views relating to manned military space requirements on launch vehicle developments of the next decade. The mechanics for continuing discussions during the coming months were established.

18.3 National Space Planning Goals

Agreement was obtained between the MOL SO, PO and DDR&E on the necessity of MOL Advanced Plans and Requirements Office involvement in NASA, DOD and industry studies pertaining to the next generation of manned space systems.

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