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MOL MONTHLY PROGRESS REPORTS

for

1 July 1968 through 31 July 1968

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MOL PROGRAM
MONTHLY PROGRESS REPORT

1.0 GENERAL

A pro-rata distribution of FY-69 budget of \$515 M was made by the Deputy Director to each of the Associate Contractors, and a program rescheduling meeting with Associate Contractors was called for the week of 15 July. In preparation for this meeting Aerospace defined the Systems Office position on a series of major schedule-critical technical problems. The technical direction (for schedule purposes only) on these subjects was given in the form of a briefing to the associates as the first item on the rescheduled meeting agenda. The meeting was successful in arriving at a consensus baseline FY-69 schedule and hardware flow diagram necessary to meet the budgeted funding.

Attachment I is a comparison of the FY-69 Baseline Schedule launch dates as they relate to the previous FY-68 schedule. To further indicate those major work packages that were delayed to save FY-69 dollars, the comparison for the start of Thermal Testing, Lab Module and Mission Module Component Qualification Testing, and System Qualification Testing (all at GE) are indicated. These delays impact on both McDD-WD and EK and help to provide fiscal dollar relief for all of the associate contractors. Attachment 2 is provided as an aid to understanding the effect of the schedule changes. The attachments provide additional detail of the schedule slips for major items of hardware and for the initiation of important tests.

During the month of July the associate contractors were engaged in preparing their impact statements against the "Project Upgrade" versions of the SP/DR and SAFSL Exhibits. Aerospace provided each associate contractor with technical guidance in preparation of these impact statements which are due for presentation the first week of the next reporting period.

2.0 CUTBACK OF AEROSPACE PERSONNEL

② The program funding limitations which required the program rescheduling necessitated an Aerospace manpower reduction. ^{This is a very serious situation since we believe} The original manpower numbers forecast ^{in ②} were marginal for control of the technical program. Therefore, the reduction to a level of 250 MTS throughout FY-69 will, of necessity, require complete elimination of some tasks and a reduction in scope of others including support of the upcoming contract negotiations. A preliminary list of tasks to be eliminated has been verbally communicated to the Air Force.) These are:

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a. Support for Flights 6 and 7

This activity is in Phase I, with most of the effort centering on design and test planning. This requires backup analysis in technical areas. In addition, CEI and Interface Specifications are being generated and must be reviewed by the Technical Division. Also, test flows and hardware exchange and test schedules are being formulated. Only the area of verification of lower level requirements in CEI's, IFS's, and ICD's and review of new SAFSL's or amendments will be accomplished. Essentially, all analysis will be stopped.

b. Gemini B

Limit support of contract negotiation to technical evaluation of proposals. Eliminate all analyses of operating conditions outside of specification requirements: (a) ascent, (b) orbit, and (c) reentry. Cut back ascent and reentry guidance software effort. There is no effect upon safety, as this is a specification requirement.

c. 

d. Flight Operations Integration of Slow Malfunction Studies

e. Launch Constraints and Range Support Planning

f. Review of Component Qualification Test Report During FY 69

g. Safety Office

Delete integrated safety analysis. Delete Identify-Resolve Interface. In addition to the above, the following represents some of the tasks to be reduced in scope:

(1) Ground Software Compatibility

Mission Module Simulation Equipment/Crew and AVE Development

Mission Planning and Evaluation (TRW) Software

Mission Related Studies/Support of Crew and Ave Development

Command and Control Software

AVE Software

Flight Operations Integration

Software Systems

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(2) Safety Office

Reduce effort on Materials investigation.

(3) Advanced Plans and Requirements

A reduction in the scope of the planning effort will be initiated. In addition, the number of studies accepted will be reduced.

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3.0 TRACKING MIRROR GIMBAL BEARINGS

In order to meet the support requirements of the tracking mirror, large ball bearings are part of the current design. As the mirror was rotated during tracking tests, torque noise was detected and has been traced to the ball bearings. The noise is sufficient to prevent the tracking mirror from tracking targets smoothly and would cause photo smearing. Development is continuing on bearings that will meet all design requirements and produce low torque noise. Currently, both GE and Aerospace have a continuing ball bearing development program in which both the cause of bearing torque noise and methods of reduction are being investigated. The objective of both these programs is to develop and to demonstrate ball bearing, shaft, and hub designs that satisfy all mission requirements and especially the torque noise requirement. One of the larger causes for torque noise is relative misalignment of the four bearings on each axis. To achieve and maintain the required accurate alignment, extremely precise installation of the bearing into the hub and onto the shaft is necessary. Both GE and Aerospace have been working the installation problem, and this month a working group meeting took place at GE in which Aerospace presented its analysis of the GE installation design. The analysis pointed out a number of problems which GE subsequently answered. The most notable new design feature that GE presented consisted of a hardened toothed washer used in conjunction with a soft metal washer. This design provides alignment adjustment during assembly and also has sufficient integrity to maintain this alignment during all ground and flight environments. An alternate solution which may show promise is the selective assembly of commercially available ball bearings, since this procedure has demonstrated some dramatic reductions in ball bearing noise.

4.0 CONTAMINATION FROM ACTS/PROP ^{OK}

Handwritten: There are two sources of contamination from the ACTS/Prop System; the translation thrusters and the rotation thrusters. The plume of the translation thrusters impinges upon many of the surfaces and sensors during steady-state firings. These surfaces and sensors can be contaminated by materials that exist in the plumes. The plume of the rotation thrusters does not directly impinge upon a significant portion of the vehicle; however, the pulse mode operation can cause contamination to spread outside of the actual plume.

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There are many potential areas on the vehicle where contamination could result in degradation of required performance. The most severe problem areas include thermal coating on the vehicle and the radiators, the viewport, horizon sensor, ^{and} antennas, and ~~the mirror surfaces.~~ The level of degradation due to this contamination has yet to be determined, but should it exceed acceptable levels, fixes will be urgently required. Fixes appear to be feasible for both the translation and the rotation types of contamination. For the translation, or steady-state generation of contamination, reorientation of the thrusters (firing over Gemini B) would eliminate this source of contamination entirely. Preliminary studies have shown the feasibility of this configuration. For the rotational or pulsing type of contamination a change in the thruster orientation does not appear to be feasible. Fences which would intercept the contamination before it could impinge upon any of the critical surfaces appear to be the only feasible solution to the pulsing contamination problem. Two fence configurations are presently being considered. The first utilizes the fence near the thruster and intercepts the contamination at the source. The second utilizes fences in front of the critical area to be protected. At the present time, subscale contamination tests are being conducted at AEDC. Preliminary data from early tests are being evaluated to estimate the levels of degradation. Results of this evaluation should be available in late September.

5.0 LOADS

HERNDON
Recent Aerospace transient analysis for Stage I shutdown based upon loads cycle 4 has indicated that higher than expected lateral loads are present, thus requiring some redesign activity for the birdcage structure. In addition, the EK COA section and GE's TM Bay are impacted. MMC is actually responsible for the official loads; however, recent contact with MMC has indicated good agreement between MMC and Aerospace. Therefore, preliminary investigation as to design fixes, preferably minimal, has been initiated by Aerospace at McDDWD. Since the outer shell is not responding as much as the birdcage structure, an additional tie for Bay 6 in the upper region of the birdcage has been proposed by McDDWD as a minimum fix. Reviews are still in progress by EK and GE, the Mission Module contractors. This minimum fix could reduce the y, z load factors back to the current design capability. Official loads for all transients, i.e., Stage 1 shutdown, liftoff, Stage 2 ignition and Stage 0 thrust termination, are due from MMC by 30 September 1968.

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6.0 IDENTIFICATION AND DEFINITION OF HARDWARE EXCHANGE ITEMS

There are approximately 300 hardware exchange items that represent program "hard points." Prior to the recent rescheduling and the establishment of the FY 1969 baseline schedule, there were 81 items of the 300 in dispute for one reason or another. Either the physical design of the item remained undetermined, or there was a mismatch of the required and availability dates. During the week of meetings with the Associate Contractors on the FY 1969 baseline schedule, all but nine of these items were resolved. Of the nine unresolved items, five required the "using" contractor to conduct a close study of his facility loading to determine the exact quantity of previously identified equipment that would be required. Two of these items are typical of this group. Both EK and GE had to investigate their facilities to determine the most economical space for storage of the mission module doors (which must be removed during assembly and test). The doors may be stored in either a vertical or horizontal position and, while the vertical position requires less storage space, it also requires a different stand design. At the conclusion of the EK and GE studies MACDACWD will be notified of the stand configuration required.

Another typical example of a configuration and scheduling problem involves the question of multiple use of test hardware. The original FY 1968 baseline schedule utilized one mission module forward section for both the thermal test program and engineering test development program at EK. This multi-usage was originally thought to present cost advantages; however, when all the requirements had been determined, what was originally thought to be a normal rework had grown to become a complete refurbishment. Aerospace recommended that a new MMFS structure be reinstated in the program for use in engineering tests. This recommendation will save costs to the program by (a) eliminating extensive refurbishment, (b) allowing GE to utilize a lower level of manpower to accomplish major modification to the forward section installations, and (c) the engineering development test program will not be paced by the closing of a thermal test program. The Air Force Systems Office agreed with this recommendation, and guidance has been provided to the Associate Contractors. The remaining schedule incompatibilities and hardware definition problems are expected to be resolved early in the next reporting period.

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7.0 CDRL LISTS AND FORM 9 CONTENT

As a part of Project UPGRADE Aerospace wrote completely new SAFSL exhibits and rewrote numerous SAFSL exhibits already incorporated in the program contractual structure. Some of these new and reworked SAFSL exhibits require the contractors to compile, write, and present a variety of technical reports. The quantity, format, and content of these reports are formalized in CDRL Lists and Forms 9.

During July, Aerospace MTS devoted considerable effort to compiling CDRL Lists and to defining the content of required reports (Form 9). One major task was the compilation of a document titled "Project Upgrade SOW & CDRL Changes for Engineering and Design Oriented Integrated Tasks at System Level." This document presented proposed Forms 9, 1423 Lists, and Statements of Work Changes to cover a variety of across-the-board integration tasks. For a complete discussion of the entire effort, reference is made to document BIF-107-50116-68 which presents the total Form 9 CDRL status.

8.0 FLIGHT 6 & 7 ACTIVITIES

Fact finding for Phase I activities was initiated during July, and negotiations are planned for completion in September.

The schedule for the Flight 6 & 7 unmanned effort was adjusted in line with the general rescheduling of the MOL program. Major milestones were slipped approximately two months.

Timely completion of action items and the exchange of technical information is being hampered by the low emphasis given the unmanned effort by the associate contractors. They evidently feel the unmanned flights will shortly be removed from the MOL program. Attempts are being made by both the SO and Aerospace to stress the importance of this activity by devoting increased attention to interface resolution.

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FY 68 BASELINE SCHEDULE COMPARISON

TO

FY 69 BASELINE SCHEDULE

FY 68		FY 69		FY 70		FY 71		FY 72		FY 73	
1968		1969		1970		1971		1972		1973	
3	4	1	2	3	4	1	2	3	4	1	2
		3	4	1	2	3	4	1	2	3	4

LAUNCHES

68 BASELINE

69 BASELINE



THERMAL TESTING (START)

68 BASELINE

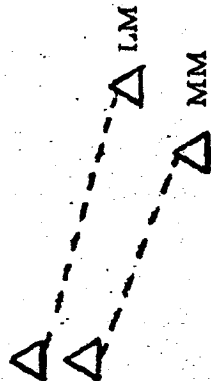
69 BASELINE



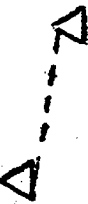
LM & MM COMPONENT QUAL (START)

68 BASELINE

69 BASELINE



SYSTEM QUAL TESTING (START)



68 BASELINE

69 BASELINE

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Attachment 2

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COMPARISON OF JAN 1968 BASELINE TO 6 MO OPTION
AND LMQTV SCHEDULE CHANGES

1968				1969				1970									
J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
I	Δ					I	Δ	I	Δ	I	Δ	I	Δ	I	Δ	I	Δ
						I	Δ										

DAC
EDCTU
DTS
FV 2
FV 3
LMQTV

? EK
STR/DYN
THERMAL
ENG DEV
QUAL
FV 2
FV 3

GE
STR
THERMAL
DEV
QUAL
FV 3
FV 2

I BASELINE (FY 68)
Δ SLIP (FY 69)
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Attachment 3

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MAJOR CHANGES

- o 114E MMFS REINSTATED - 113T REFURBISH DELETED.
- o GE THERMAL TEST (113T) MOVED 14 WEEKS.
- o EK THERMAL TEST MOVED 19 WEEKS.
- o GE COMPLETION OF LM/MM COMPONENT QUALIFICATION TESTING MOVED 6 TO 10 MONTHS.
- o EK QUALIFICATION MODEL TEST FLOW REVERSED TO ALLOW FOR LATER SHIPMENT OF GE FRONT END (5 WEEKS).
- o GE's 113D DYNAMIC TEST MOVED 12 WEEKS.
- o REVISED FLOW FOR PAYLOAD CONSOLES.
- o FV 2 MISSION MODULE TO BE ASSEMBLED AT DAC.

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