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DEPARTMENT OF THE AIR FORCE
WASHINGTON 20330

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OFFICE OF THE SECRETARY

NOV 8 1968

NOTED BY THE
SECRETARY OF
THE AIR FORCE

MEMORANDUM FOR THE SECRETARY OF THE AIR FORCE

SUBJECT: Manned Orbiting Laboratory Monthly Status Report

The attached Status Report on the Manned Orbiting Laboratory (MOL) Program covers activities through October 31, 1968 and is submitted in accordance with the October 17, 1968 memorandum from the Office of the Secretary.

J. Stewart
JAMES FERGUSON
General, USAF
Director, MOL Program

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a/s

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I. PROBLEMS

A. Schedule and Funding Problem Associated with Acquisition of Secure Communications Hardware for MOL

As explained in the September report, \$1.25 million FY 1969 funds was needed to initiate procurement of the Operations and Training Evaluation Center (OTEF) and MOL Mission Control Center secure communications. We have found an alternative which will permit immediate procurement of the engineering design work, using Air Staff FY 1969 funds (\$250K), and without damage to the schedule, slip the hardware buy (\$1M) to FY 1970 monies. The Air Force has agreed to this funding procedure contingent on the approval of FY 1970 funds, by OSD, of the FY 1970 budget request for OTEF requirements.

B. Facility Modifications Funding, SLC-6, Vandenberg AFB

A request for \$2.6M FY 1970 military Construction Program funds has been submitted to accomplish facility requirements which have evolved since the initial design and to correct design deficiencies.

An early release of funds (\$1.145M) has been requested from AFOCE to complete that portion of the work necessary prior to the start of installation and check-out of the Aerospace Ground Equipment (AGE) scheduled for October 1969. It is estimated that this work will require about 6 months to complete, therefore, to allow for the time to design, contract bid and award procedures, funds are required in late 1968. The remainder of the work (\$1.455M) can be accomplished when normal FY 1970 MCP funding is available.

II. CHANGE PAST MONTH

Funds

Funds in the amount of \$140 million were made available to the Systems Office during October. It is anticipated that this funding will carry the program through 31 December 1968. Early in December the release of the remaining funds retained by DDR&E will be requested.

III. CURRENT STATUS

A. Mission Data Adapter Unit (MDAU)

As reported in the March 1968 report the MDAU Raytheon subcontract to General Electric was terminated and awarded to Honeywell Inc., with a substantial cost reduction and a brass-board (first unit)

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delivery date of November 12, 1968. The brass-board acceptance tests were initiated October 30, 1968 with an anticipated delivery date, with spares, of the first week of November 1968.

B. Fuel Cell Competition

Bids have been received from General Electric, Allis Chalmers and Pratt Whitney for the new MOL electrical power generation system (fuel cell). McDonnell Douglas is presently conducting the contractor selection exercise and will report prior to November 15, 1968.

C. IVS Ad Hoc Review Group

Dr. O'Brien's final report on the Image Velocity Sensor Subsystem Review has been received. The Subcontractor System Evaluation, by the Ad Hoc Review Group, resulted in the following conclusions and recommendations:

Conclusions

a. On the basis of information now available, either Goodyear or Hycon could be selected with relatively high confidence of success.

b. There is no reasonable possibility that, by the time a decision must be made, the level of confidence in Itek will be comparable to that in either of the others.

c. There seems to be no immediate benefit to the MOL Program in continuing Itek.

d. The advantage in continuing both of the other contracts for the present are: first, the value of competitive pressure and, second, the possibility that further exploration of some of the engineering factors (e.g., weight, power, vibration, reliability) will show a clear advantage to the MOL Program in one of the approaches.

Recommendations

a. It is recommended that the present phases be completed on all devices, except that further tests be conducted by General Electric only on the Goodyear and Hycon devices, and that the Itek device be sent to the Avionics Laboratory for further study.

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b. It is recommended that the Hycon device be reviewed for correction of the signal drop-out that may be experienced under real scene conditions. Attention should be given to bearing noise vs. life in the Hycon device rotor to insure that the residual 30 Hz mechanical disturbance does not cause any difficulty in the adjacent optical or camera units.

c. It is recommended that both the Goodyear and the Hycon devices be continued even though they both probably will not meet the low modulation-high illuminance corner (Wiener spectrum diagram - Figure 1 attached) of the present tentative specifications.

D. Congressional Action

Mr Herbert Roback, Staff Administrator, Subcommittee on Military Operations, House Committee on Government Operations, visited the MOL Systems Office and McDonnell Douglas, Huntington Beach. As a follow-up to this trip, he requested a meeting with General Ferguson which took place on October 28. Mr. Roback is obtaining information and views concerning the future of manned space flight and ways to effect a closer DOD/NASA relationship. He also plans to meet with General Stewart and Dr. Flax.

E. Use of Depleted Uranium, in Lieu of Lead, in MOL Test Vehicles

Douglas states that depleted uranium is the most economical and best suited material for use as a mass substitute for such items as O₂ tanks in the flight test vehicles and asked for permission to use it. We have approved the request, but stated that it must clearly and authoritatively be established (e.g. by A. E. C.) that the material is non-radioactive and that it is absolutely non-hazardous. The savings involved amounts to \$70,000.

F. Heavy Lift Helicopter Tests

Test flights were conducted at Patrick AFB, Florida, during the month of August, to determine the suitability of the HH-53 helicopter as a long-range recovery vehicle for MOL Gemini B spacecraft. These first tests were made with land pickups only, the Gemini boilerplates, obtained from NASA and modified to duplicate the mass properties of the Gemini B, and were towed by the HH-53 using various sling configurations. The flights resulted in the determination of a configuration which was stable in both the cruising mode and the aerial refueling mode with an HC-130P tanker. The results were very encouraging, and future tests will be performed to evaluate open-water retrieval capability and crew performance on long duration missions.

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G. Eastman Kodak Study of Possible Future MOL Camera System

The primary purpose of the EK effort is to analyze feasible/reasonable modifications to the present basic optical system/spacecraft combination which would improve resolution as much as possible toward [REDACTED] at 80 nm range). A lesser amount of the EK effort is being expended toward reliability/flexibility, etc., improvements. The final report is to identify and analyze the most promising areas and propose any Phase II technology efforts needed to verify the analyses or prove feasibility.

At this point in the study, the following four areas appear to offer the most promise for improvements in resolution:

1. Higher Optical Quality Factor and Tighter Specs for Appropriate Components: Improvements in mirror and lens quality, alignment, focus, tracking mirror drive, etc., may eventually offer about [REDACTED] resolution improvement.

2. Elliptical Tracking and Newtonian Folding Mirrors: Apparently, a [REDACTED] Tracking Mirror can be fitted into the present bay to increase the effective aperture. The weight penalty would be 200 pounds. Analysis is underway on manufacturing feasibility and the precision drive of a heavier, elliptical Tracking Mirror. Additionally, an elliptical Newtonian Folding Mirror and narrower mounting struts would reduce obstruction from 12 to 8 percent. The combined effect of these changes appears to offer at least [REDACTED] improvement in resolution.

3. Ross Corrector Lens Redesign: A proposed new design would arrange nine Ross Corrector Lens in the present barrel to increase the effective focal length to [REDACTED]. The field of view would reduce proportionately ([REDACTED] feet on the ground). If the new Ross Corrector optics could be made and aligned with the necessary precision, resolution should be improved approximately [REDACTED]

4. Relay Lens/Auxiliary Camera: In a concept something like the present visual take-off from the main optics, the center one-inch of the format would be relayed and magnified through a series of lenses to an auxiliary 70 mm camera. The apparent focal length would be [REDACTED]; the ground image recorded would be [REDACTED] in diameter. The relay diagonal mirror would be withdrawn from the center of the Ross Barrel when the 70 mm camera was not in use. Resolution of the relayed spot should be improved approximately [REDACTED] (simultaneous operation of the main camera might also be possible, although the center portion of the format would be obscured by the relay mirror).

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Eastman Kodak representatives briefed a small group at General Electric October 21, 1968, on the results of their study to date. At this meeting sufficient data was provided to evaluate the impact of the items listed above on the GE systems (i.e., tracking drives, system dynamics etc.). Specifically, the [REDACTED] tracking mirror will impact the GE area of responsibility in the Mission Module forward section. In addition GE is to investigate means of reducing residual smear and compute overall performance predictions with the above improvements.

A briefing of the final results of the EK study is to be provided about November 22, 1968, followed by a report by December 31, 1968. The GE impact data will not be included in the EK report but presented separately approximately December 1, 1968 with a report about January 1, 1969.

H. Contamination

Discussions have been held with Mr. Phil Culbertson, Apollo Applications Program, about Apollo VII window contamination. He has taken steps to:

- a. Arrange to have spacecraft windows shielded/protected following recovery.
- b. Arrange for post-flight analysis of contamination.

I. Host-Tenant Agreement

A meeting with two Hq Air Rescue and Recovery Service (ARRS) representatives and a MOL Program Office representative was hosted at Albrook AFB, Canal Zone by the [REDACTED] on October 2-4, 1968. The conferees drafted an informal Host-Tenant Agreement in the form of a memorandum for the record to define logistical and command requirements during the periods the MOL Recovery Force shares facilities on Easter Island with Detachment 517, a subordinate element of the 1158th Technical Operations Squadron. The memorandum is now under review by HQ ARRS. Recovery Force communications on the Island were also discussed with the 1978th Communications Group (AFCG). The MOL Program Office has levied the requirement for the development of this communications plan upon the DOD Manager for Manned Space Flight Support (DDMS) with subsequent implementation by Air Force Communications Service (AFCS).

J. NASA/DOD Economy Study

During the week of 14 October, Secretary Clifford talked with President Johnson and the NASA/DOD economy studies were discussed. As

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a result of this conversation, Mr. Clifford caused a series of exchanges to take place between himself, Dr. Foster, and Dr. Paine of NASA. The purpose of these exchanges, apparently in compliance with Presidential instructions, was to revitalize the most promising of the studies with the view of affecting some near-term economies. The areas selected for continued emphasis were the following six:

- o Space Environment
- o Geodetic Satellite
- o Propulsion
- o MOL/AAP
- o ETR/KSC
- o Launch Vehicle Study

At the present, Dr. Paine had indicated his willingness to commit NASA to the further examination of these six areas. Work is in progress within DOD under the leadership of DDR&E to further define the additional study efforts. As far as the manned space flight effort, NASA is going to be asked to accomplish an analysis of the MOL data, and in-depth comparison, by NASA, between the MOL hardware and the AAP hardware showing comparative costs, schedules, technical trade-offs, and a re-evaluation of the merit and priority of proposed AAP missions and experiments. Similarly, the Air Force will be tasked to examine variations and compromises to MOL Program content which are designed to decrease overall program costs and facilitate the early achievement of a coordinated NASA/DOD program.

K. Bureau of the Budget Visit

On October 1 and 2 Mr. Richard Stubbing (BoB) and Mr. Howard Barfield (DDR&E) completed their planned travel itinerary with visits to Eastman Kodak and General Electric.

L. Program Review Council Meeting (PRC)

The PRC was held in the MOL Systems Office on October 24, 1968. Principals in attendance were:

<u>Air Force</u>	<u>DDR&E</u>
Dr. Flax	Mr. Palley
General Stewart	
General Bleymaier	<u>Aerospace</u>
General Martin	
General Berg	Dr. B. P. Leonard
Dr. Yarymovych	Mr. Walter Williams
Mr. Hubbard	

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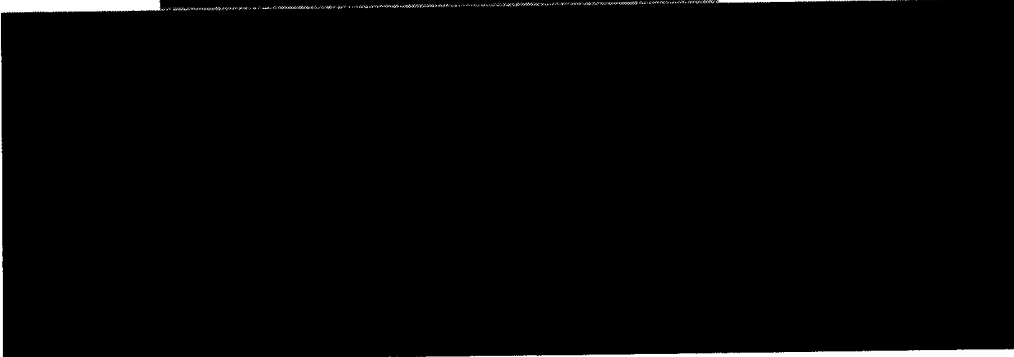
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M. 



N. Study on Very High Resolution Photography

The Program Office has been participating in the OSD study of the intelligence value of photography in the MOL resolution class. An ad hoc group chaired by Mr. Nevin Palley of ODDR&E has been meeting regularly on this subject since September 3. The DIA staff, with extensive support from the military services, has been a major contributor. Although the findings are far from complete as yet, it can be predicted with some assurance that the report from the group will be favorable to the MOL and that the case for very high resolution photography will gain much strength from the addition of a large number of specific intelligence problems to the list of those for which MOL can provide valuable information.

IV. FORECAST FOR FUTURE

A. SAB Meeting

The MOL Program Office has been requested and will provide a discussion on the current status and forecasted bioastronautics and life support/environment system technology to the Life Support Subcommittee at the Fall General meeting of the USAF Scientific Advisory Board meeting on November 13-15. The Foreign Technology Directorate, Headquarters Aerospace Medical Division, Brooks AFB, will provide comparative discussion of Soviet progress in the same areas.

B. MOL Status Briefing for Dr. Hornig

Discussion with Dr. Steininger revealed that Dr. Land's PSAC Panel will not review the MOL Program again before CY 1969 (their last review took place in the Summer of 1967); however, Dr. Hornig expressed a desire to be up-dated on MOL since he assumes it

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will, as usual, be a major budget issue item. Therefore, on the afternoon of November 4, we plan to provide Dr. Hornig with an informal briefing covering the following items:

1. Overall System Status.
2. Camera Status (emphasizing the technically different items).
3. Value of Very High Resolution Study.

V. DUE DATE OF NEXT STATUS REPORT

The next Monthly MOL Program Progress Report will be submitted December 6, 1968.

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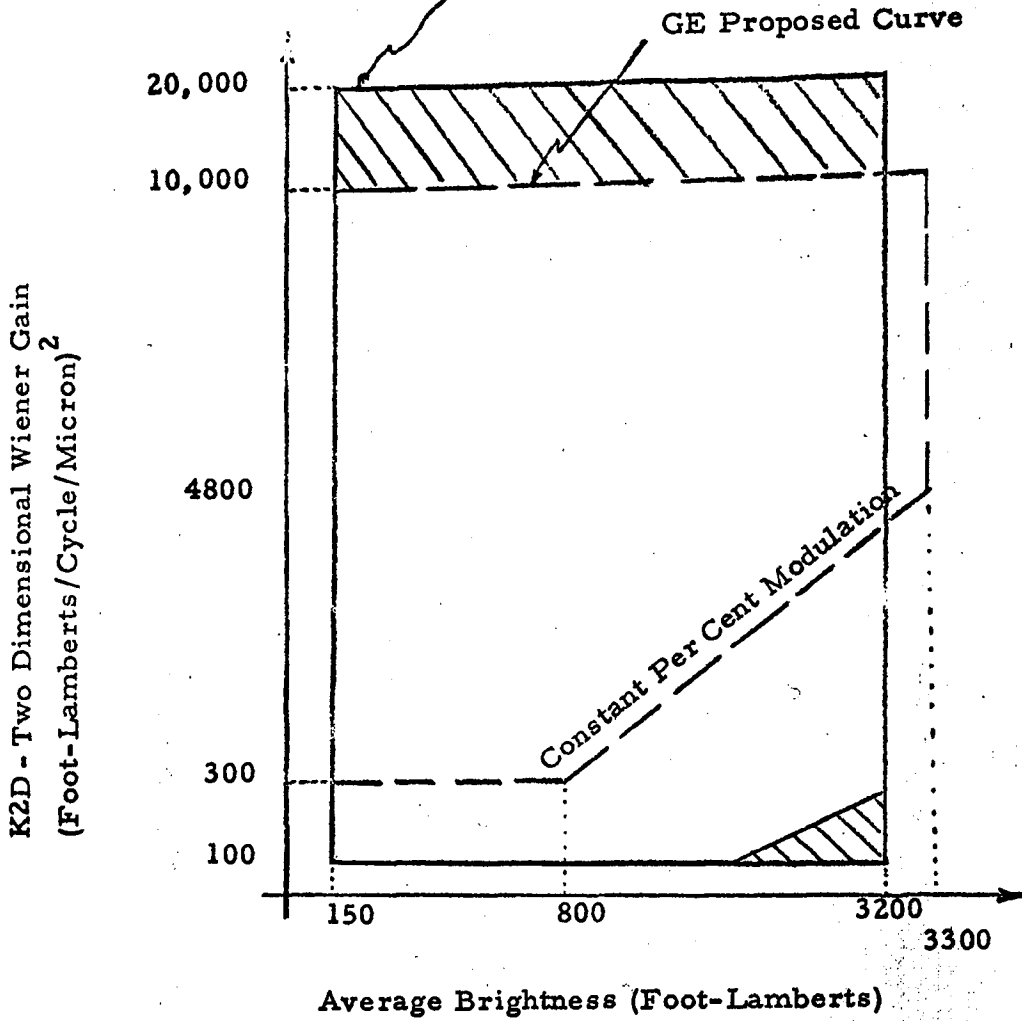
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Preliminary Systems Office Curve to Define
Environment Extremes



Note: All data referenced to tracking mirror input at
80 nm altitude.

Figure 1. IVS Power Spectral Density and Brightness
Operating Regime.

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