

~~SECRET~~

Handle via BYEMAN/COMINT
Control Systems JOINTLY



AUG 11 1966



MEMORANDUM FOR DIRECTOR, DEFENSE RESEARCH AND ENGINEERING

SUBJECT: Engineering Development Phase of MOL Program

Attached are copies of recent correspondence addressing the current approval status of the MOL Program. These memoranda are forwarded for your information at Dr. Brown's direction.

HARRY L. EVANS
Major General, USAF
Vice Director, MOL Program

2 Atchs

1. Memo, SAF to Gen Schriever,
Aug 20, 1966 (BYE-52636-66)
Series A, Copy #1.
2. Memo, Gen Schriever to SAF,
July 20, 1966 (BYE 21181-66)
Series A, Copy #1 w/1 Atch:
MOL Prog Plan & Fund Reqmts
(BYE 21157-66, Copy #9). *not in RF*

DORIAN

Page 1 of 1 page
Copy 3 of 4 copies
SAFSL BYE 21215-66

39
38

Handle via BYEMAN/COMINT
Control Systems JOINTLY

~~SECRET~~

EXCLUDED FROM AUTOMATIC REGRADING;
DOD DIR. 5200.10 DOES NOT APPLY

DEPARTMENT OF THE AIR FORCE
WASHINGTON

Handle via ~~BYEMAN~~
Control System

~~SECRET~~

OFFICE OF THE SECRETARY

August 20, 1966

MEMORANDUM FOR DIRECTOR, MANNED ORBITING LABORATORY (MOL)
PROGRAM

SUBJECT: Authorization to Proceed with the Engineering
Development Phase of the MOL Program

- References: (a) Secretary of the Air Force Memorandum for
the Director, MOL dated August 26, 1965,
Subject: Authorization to Proceed with
MOL Program.
- (b) Memorandum for the Secretary of the Air
Force from Director, MOL dated July 20,
1966, Subject: MOL Program Plan and
Funding Requirements.

I have been informed that you have reached the final stages of negotiating the contracts for full-scale development of the Manned Orbiting Laboratory (MOL) Program. Prior to authorizing full-scale development, I would like to review the total program cost and fiscal year funding requirements in the light of these negotiated contracts.

In order to protect the development lead time you are authorized to obligate FY 1966 and FY 1967 MOL program funds released to you at a rate not to exceed your recommendation in reference (b), which provides an option up to January 1, 1967 to limit requirements for FY 1967 funds to \$208 million. This authorization will apply only until program approval for full-scale development and, in any event, will not apply beyond January 1, 1967.

Every possible effort should be made to hold FY 67 MOL funding to the minimum consistent with meeting the schedule and primary objective for the first manned flight. In particular, you are requested to review the program plan and schedule to identify any items for which initiation of development can

Handle via ~~BYEMAN~~
Control System

~~SECRET~~

Copy-- / Copies
Page-- 2 Pages.

WORKING PAPERS
Control No. BYE 52036-06

DORIAN

Series A Cy 3

~~SECRET~~

Handle via BYEMAN
Control System

be deferred without affecting this primary objective and
schedule date and to report to me on such items at the time
of review of the negotiated contract costs.

Harold Brown

2 Attachments

- (a) Sec/AF Memo for Dir., MOL
dtd Aug. 26, 1965, Subj:
Authorization to Proceed
with MOL Program.
- (b) Memo for Sec/AF fr Dir., MOL
dtd July 20, 1966, Subj:
MOL Program Plan and Funding
Requirements.

Copy-- 1 of 3 Copies
Page 2 of 2 Pages.
Control No. BYA 52630-66

Handle via BYEMAN
Control System

~~SECRET~~

DORIAN

Series A of 3

~~SECRET~~

Handle via BYEMAN/COMINT
Control Systems JOINTLY

DEPARTMENT OF THE AIR FORCE
WASHINGTON

OFFICE OF THE SECRETARY

JUL 20 1966

MEMORANDUM FOR THE SECRETARY OF THE AIR FORCE

SUBJECT: Manned Orbiting Laboratory Program Plan and Funding Requirements

REFERENCE: Memorandum for the Secretary of Defense, subject: Proposed MOL Program dated June 28, 1965

The Secretary of the Air Force memorandum of June 28, 1965 proposed a Manned Orbiting Laboratory (MOL) Program which would demonstrate an optical reconnaissance system promising ground resolutions of [REDACTED]. The memorandum requested specific approval to enter the Definition Phase of the MOL Program, and this authority was directed by Presidential announcement on August 25, 1965. This memorandum presents a summary description of a MOL Program which has evolved from the Definition Phase studies conducted since August of last year and specifically requests a level of funding to support the technical baseline and schedule for that program. Attached to this memorandum are documents which you may need to help you and the Director, Defense Research and Engineering in assessing the need for the funding requirements stated. It is recommended that you seek approval of the MOL Program schedule and concept as described in this document which will cost, for development, approximately \$1.75 billion over the next five fiscal years.

I believe that a program which adheres to the primary criterion of a minimum cost program and which best balances the date of the first manned flight with an orderly progression of the development program would require new obligating authority in the RDT&E appropriation for FY 1967 of \$253.9 million. Neither the program total nor the FY 1967 funding requirement quoted include allowances for contingencies, negotiations, advanced studies and technology. The DoD budget apportions \$178.4 million for MOL in FY 1967 which can be applied to the new obligating authority requirement of \$253.9 million, leaving a funding deficit of \$75.5 million.

Page 1 of 10 pages
Copy 3 of 4 copies
SAF-SL BYE 21181-66

EXCLUDED FROM AUTOMATIC REGRADING;
DOD DIR 5200.10 DOES NOT APPLY

~~SECRET~~

3
Handle via BYEMAN/COMINT
Control Systems JOINTLY

~~SECRET~~

CONTROL SYSTEM S JOINTLY
BYEMAN/COMINT

In addition to the above-stated requirements, there are below-the-line items which include funding requirements in two basic categories; those which will increase the basic mission capability of the MOL system and those which support the development of new missions. In both categories there are items which when funded in FY 1967 and subsequent years would greatly enhance the health and future of the MOL Program. Therefore, I would like to solicit your support for reprogramming \$13.9 million in FY 1967 to initiate these advanced studies and technology tasks.

Program Scope

The attached tabs point out in summary detail that our recommendations are based upon the results of Contract Definition effort which has been underway for the past ten months. The initial objective of the MOL Program remains the development and early demonstration of an operationally useful high resolution optical reconnaissance system capable of achieving [REDACTED] of ground resolution or better. In meeting this objective, consideration will be given to extending on-orbit lifetime, and to incorporating on a timely basis advanced optical sensors capable of affording resolutions on the ground [REDACTED]

[REDACTED] The system will provide the option of operating in either a manned or an unmanned mode. The MOL Development Program as now recommended will support an operational program which can use both manned and unmanned versions of the system in whatever manner is most consistent with individual mission requirements, and the international situation that may exist at the time.

The development and demonstration of other military mission applications of MOL such as SIGINT and Ocean Surveillance remain as secondary objectives. Provisions for the introduction of these missions, both in the form of supporting experiments and full-scale demonstrations, will be considered in vehicle design, insuring that the initial objective is not compromised.

Accommodation of DoD and NASA scientific and technological experiments is a tertiary objective. We hope to pursue an experiment program of significance and value throughout the MOL Program, but without interference to principal military objectives. Although a broad spectrum of experimentation is encouraged, priority will be shown to those which support the investigation of the utility of military manned space flight.

Page 2 of 10 pages
Copy 7 of 4 copies
SAF-SL BYE 21181-66

BYEMAN
Handle via BYEMAN/COMINT
Control System S JOINTLY

~~SECRET~~

~~SECRET~~

Handle via BYEMAN/COMINT
Control Systems JOINTLY

Five basic elements comprise the MOL vehicle system. These major system segments and the associate contractors responsible for their development are:

1. Laboratory Vehicle and System Integrator - Douglas Aircraft Company.
2. Mission Module and Data Recovery System - General Electric Company.
3. Mission Payload - Eastman Kodak Company.
4. Gemini B - McDonnell Aircraft Corporation.
5. Launch Vehicle - Martin Marietta Corporation, Aerojet General, AC Electronics Division and United Technology Center.

Approximately \$90 million has been expended during the past ten months of Phase I Definition. These funds have been applied to the engineering definition of the major system segments, the engineering and hardware for the Heat Shield Qualification (HSQ) flight from ETR later this year, and in the case of Eastman Kodak extended to hardware development, procurement of long lead items and construction of industrial facilities associated with the acquisition of the DORIAN payload. During the MOL Definition Phase, contractors' roles and responsibilities were established and delineated for mission system hardware. These functions are discussed in detail in TAB A to this memorandum.

The associate contractors have submitted their cost estimates for Phase II Development based on latest program guidance and direction on hardware definition and schedules. The contractor proposals, based on an earlier definition of the program baseline, have received thorough in-house review and evaluation by the Air Force and the results constitute the definition of the current system baseline. Schedules and costs are documented in considerable detail in TAB B to this memorandum. The contractors' estimates submitted on the baseline will serve as a departure point for Phase II contract negotiations to commence during the latter part of this month. With the exception of those contracts written for the DORIAN effort and those elements which directly interface with the acquisition of the sensor payload, it is our intent that contract funds for RDT&E will be dispersed under incentive type contract arrangements. Realization of this goal will give incentive type contracts which approximate over 70 percent of total program costs.

Page 3 of 10 pages
Copy 7 of 4 copies
SAF-SL BYE 21181-66

~~SECRET~~
Handle via BYEMAN/COMINT
Control Systems JOINTLY

~~SECRET~~

~~SECRET~~

Handle via BYEMAN/COMINT
Control Systems JOINTLY

A number of very important technical decisions and changes in program content and concept have occurred during the past ten months of Phase I Definition. The program proposed in late June 1965 consisted of seven launches, two unmanned and five manned, from the Western Test Range. The two unmanned development launches were scheduled for early test of system hardware exclusive of optical sensor equipment which was identified as the critical pacing item in the original schedule that projected a first manned flight of late 1968. This original planning date was structured to provide the desired mission capability at the earliest possible date, and was based on initiation of Phase II engineering development at the beginning of calendar year 1966. On this planning date, the total cost of the development program was estimated at \$1.5 billion. This original estimate was based entirely on the primary reconnaissance mission of the MOL. It did not include funds for experiments nor for any effort related to additional missions such as SIGINT or Ocean Surveillance in which the Navy has expressed considerable interest but which have not yet been approved by the Department of Defense.

A more realistic appraisal of development lead times completed during the definition phase studies on the DORIAN payload made it necessary to revise the phasing of development schedules for all major segments of the program. Our current estimate is that first manned flight with DORIAN optics cannot occur prior to December 1969. This is to be accomplished using the DORIAN Compatibility Model with the possibility of using high quality optics. The results of this schedule revision plus program impact from the budget limitation placed on the MOL Program for FY 1967 made it necessary to reorient the Phase I contract schedules and to adjust contractors' level of effort during the last quarter of FY 1966 and throughout FY 1967. This required extending the system definition studies on the Laboratory and Mission Modules with Douglas and General Electric and the Gemini B spacecraft with McDonnell through August 1966. Phase II activities will be underway by September 1, 1966 at a pace and level of effort which is balanced with the other segments of the program. Concurrently, we have proceeded, paced only by technical limitations, with the engineering design, the procurement of long lead items and the industrial facilitization required for the development and acquisition of the optical sensor package. We also have implemented on a controlled schedule, a moderate level of effort for continuing the development of the Titan III seven-segment solid rocket motors and the necessary modifications to the core Stage I engine to meet MOL requirements.

In addition to the above schedule adjustments, guidance received from the Panel on Reconnaissance of the President's Science Advisory Committee (PSAC) and the Department of Defense resulted in changes

Page 4 of 10 pages
Copy 3 of 4 copies
SAF-SL BYE 21181-66

Handle via BYEMAN/COMINT
Control Systems JOINTLY

~~SECRET~~

~~SECRET~~

Handle via BYEMAN/COMINT
Control Systems JOINTLY

to the MOL baseline. Specifically, the requirement that the reconnaissance system be designed from the beginning to provide the option to be operable in either a manned or an unmanned mode has been placed in the MOL system specification. Contractors' roles and responsibilities are now aligned to include this dual mode as an integral part of the development program. The program is currently planned with the option that two of the seven scheduled launches can be flown in the automatic (unmanned) mode. As previously proposed, all launches will be made using the seven-segment 120-inch diameter solid rocket motor Titan III with specific improvements on the airframe and liquid rocket engine necessary to meet the MOL payload requirements. The other system segments are as described in TAB B.

The configuration selected for the MOL system to accomplish an early manned demonstration of high resolution optics has followed the primary criterion of a minimum cost program. Existing flight and ground system hardware and capabilities from the DoD and NASA inventories are being used to the fullest possible extent. This optimized selection has been made only after thorough examination during the Definition Phase of the many alternatives and trade-offs of subsystems and components developed and tested in other manned and unmanned space systems. Extended life capability will be achieved through minimum modification of existing systems by means of redundancy, spares, maintainability or product improvement, and a minimum of necessary new subsystems or components should be proposed for development. The Air Force, throughout the Definition Phase, has insisted that the contractors be continuously conscious of cost effectiveness in their design definition. In preparation of this submission, cost reduction items totaling over \$100 million were identified and agreed to by both the Air Force and the contractors and these savings are reflected in the cost estimates detailed in TAB B to this memorandum. It must be emphasized that these cost estimates support the "baseline" requirements of the primary program objective and no contingency funds have been added to allow for uncertainties which normally arise in this type of development. The estimates are based on comprehensive analysis made with contractors who have been selected to do the actual work on the basis of detailed specifications furnished by the Air Force.

In sum, we feel the MOL Program will give us: first, operational intelligence collection at [redacted] resolution or better; second, knowledge of the critical contributions of man to photographic reconnaissance, such as increasing total reconnaissance information content, and of the specific differences, in an engineering sense, between manned and unmanned systems of large size and very high resolution; and third, the optical technology and design for systems which, if manned, can give us resolutions [redacted] and perhaps as good as [redacted].

~~FORN~~

Handle via BYEMAN/COMINT
Control Systems JOINTLY

Page 5 of 10 pages
Copy 7 of 4 copies
SAF-SL BYE 21181-66

~~SECRET~~

To accomplish the primary MOL objective, a development program of seven launches is proposed and the schedule was summarized at the beginning of this memorandum. The first manned launch would take place late in calendar year 1969, and the last development flight early in 1971. The first manned reconnaissance system flight (MOL FLT 3) in December 1969 would be preceded with two unmanned flights in April and July 1969 for the purposes of qualifying the Gemini B Spacecraft, the Titan III uprated booster and orbiting vehicle structures. The last two of the five total reconnaissance payload flights scheduled for October 1970 and January 1971 are planned for operation in the fully automatic unmanned mode. This schedule will provide operationally useful take at the earliest practical date in consideration of system and sensor development and is expected to provide increased quality and quantity of mission data as the flight test program matures.

Program Costs

The Phase I program definition efforts have resulted in moderate changes in estimated program costs. The program being submitted by the Air Force and recommended in this paper for funding approval is estimated at \$1.75 billion for the development phase. One of the major objectives of the Phase I effort was to establish a firmer grasp of the anticipated program costs. Part of the increase in our current estimates is due to increased scope received during the definition phase to incorporate the option for both a manned and automatic mode of operation. Initially, the MOL Program was to share the cost of the Titan III AGE at WTR with other users; this construction is now being totally funded within the MOL Program. Part of the increase is due to the need to procure seven new uprated Titan III launch vehicles in lieu of five new vehicles plus modification of two R&D boosters as originally planned. The nine-month schedule delay in the flight test program, due to pacing development of the sensor payload and the inclusion of General Electric as a major participating associate contractor are still other changes which were either unforeseen or not fully understood a year ago. For the most part, the rest is due to more realistic estimating of what it will actually take to accomplish the development tasks and, of course, costs escalation also have contributed to increased estimates. It is difficult to be sure that development costs will not exceed the \$1.75 billion estimate and it must be emphasized again that this is a Program Office estimate based on in-house studies and contractor proposals, and that no contingency funds have been included in this estimate. The next total program cost estimate closer to actual future expenditures will be forthcoming after contract negotiations are complete.

Page 6 of 10 pages
Copy 3 of 4 copies
SAF-SL BYE 21181-66

~~SECRET~~
Handle via BYEMAN/COMINT
Control Systems JOINTLY

~~SECRET~~

~~SECRET~~

Handle via BYEMAN/COMINT
Control Systems JOINTLY

At the present time the \$1.75 billion appears to be a reasonable estimate of the total development cost and \$253.9 million of new obligating authority appears to be the minimum funds required in FY 1967 to meet the schedules and technical objectives of the MOL Program as now defined. Detailed system segment schedules and funding requirements are contained in TAB B of this memorandum. The proposed Fiscal Year RDT&E funding levels which are consistent with MOL Program objectives and schedules are summarized below:

(Dollars in Millions)

<u>FY 1967</u>	<u>FY 1968</u>	<u>FY 1969</u>	<u>FY 1970</u>	<u>FY 1971</u>	<u>TOTAL</u>
328.9	556.8	457.8	289.6	116.1	1749.2

It should be noted that \$75 million of FY 1966 uncommitted funds can be applied to the FY 1967 funds requirement, thus leaving a net new obligating authority requirement of \$253.9 million.

Additional advanced study and technology requirements not included in the above estimates are shown below:

	<u>FY 67</u>	<u>FY 68</u>	<u>FY 69</u>	<u>FY 70</u>	<u>FY 71</u>	<u>TOTAL</u>
Advanced Studies	10.9	10.0	10.0	10.0	10.0	50.9
Advanced Hardware	6.0	11.0	7.8	3.4	1.2	29.4
Ocean Surveillance	3.0	15.6	18.8	20.8	15.6	73.8

The below-the-line requirements identified during the Definition Phase are for the Navy's Ocean Surveillance mission, and other advanced studies and hardware essential to MOL system growth. Included in these advanced studies are several promising developments which were not fully contemplated at the time the MOL Program was approved last August but which now show great promise as a state-of-the-art advancement toward future system applications. They are discussed in detail in TAB C. The advanced hardware requirement represents a mission operation enhancement device which has not yet been incorporated into the MOL baseline.

In addition to the RDT&E funds required as shown, there is a need for \$8.7 million in FY 1967 for facilities at WTR and there may be a need in FY 1968 for an additional \$10.0 million of Military Construction funds. The FY 1968 funds would support the construction and

Handle via BYEMAN/COMINT
Control Systems JOINTLY

~~SECRET~~

~~SECRET~~

Hendon Island / COMINT
Control Systems JOINTLY

facilities for a staging area on Henderson Island for use in recovery operation in case of abort during powered flight, if the survey which is being conducted now proves feasibility of the concept. This staging area for the MOL Program must operationally support approximately 20 aircraft and 375 personnel. Construction must be started with FY 1968 funds to be properly phased with the recommended flight test schedule. Further details on this requirement are given in TAB B.

Funding Philosophy and Approach

The foregoing figures represent the best current Air Force estimate of the funds required to accomplish MOL development on present schedules. These estimates were developed purely on the basis of projected rates of effort and planned, normal assumption of fiscal liabilities of MOL contractors. The figures herein presented do not, therefore, necessarily correspond with or reflect the funding distribution that can reasonably be anticipated now from DoD. The FY 1967 requirement of \$253.9 million, for example, is substantially higher than the \$178.4 million presently apportioned to MOL. If, as now seems probable, the Congress fails to appropriate additional FY 1967 funds for MOL, I propose, and ask your concurrence and support in, the following general approach.

With the program funds presently available, I would propose to proceed at the NOA rate of \$253.9 million until January 1, 1967 with the engineering development phase on the schedule and toward the objectives previously indicated herein. In so doing, I will exploit all lawful measures to minimize FY 1967 obligations and to defer FY 1967 funds requirement to FY 1968. During this trial period, SAF-SL will track on a monthly basis actual and forecast obligations of FY 1967 funds and at no time will obligations, which will be based on contractors' minimum commitments, exceed funds available to the Director, MOL.

By January 1967 we will reassess our program requirement and provide you with:

- a. A current evaluation of the progress being made toward meeting approved program schedules and objectives, and a recommendation as to whether that schedule should be adjusted.

Page 8 of 10 pages
Copy 3 of 4 copies
SAF-SL BYE 21181-66

~~SECRET~~

Hendon Island / COMINT

Control Systems JOINTLY

~~SECRET~~

~~SECRET~~

Handle via ~~BYEMAN~~/COMINT
Control Systems JOINTLY

b. An estimate of program funds required to complete the FY 1967 program based on the recommendation of (a) above.

If, in spite of all preventive measures, it is clear at that time that additional obligating authority is required to maintain program schedules and scope, I will initiate a request for such new authority.

Conclusions

In summary, the definition phase of the MOL Program has been conscientiously undertaken during the past ten months by the Air Force and the contractors. Unquestionably, it has yielded valuable results. The program as now defined and recommended for funding approval will satisfy the national need for high resolution satellite reconnaissance photography at [redacted] resolution or better. Technically, the feasibility of the MOL Program has been affirmed by the Phase I study; the areas considered to include technical risk have been studied in detail, and as a result we have much more confidence in our performance predictions. The schedules which have evolved from our Phase I analyses of development lead times provide the best balance of orderly progression for system development and first manned flight in late 1969 with fiscal year budgeting. The critical system segments of the program as now defined are paced only by technical limitations and our ability to accurately forecast their magnitude and frequency. Our estimate of total program costs, while moderately higher than our original proposal, is judged to be reasonable in consideration of changes which have occurred in program content and scope during the past year.

Actions Requested

The following specified approvals for the MOL Program are requested:

- a. Concur in principle in the selected program schedule and scope.
- b. Concur with the funding philosophy and approach as specified above.
- c. Reflect total RDT&E program estimate for the development program by readjusting the MOL Program total to \$1.75 billion and the

DORIAN

Page 9 of 10 pages
Copy 3 of 4 copies
SAF-SL BYE 21181-66

Handle via ~~BYEMAN~~/COMINT
Control Systems JOINTLY

~~SECRET~~

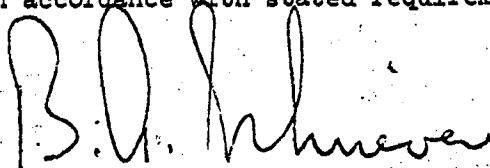
~~SECRET~~

Handle via DORIAN/COMINT
Control Systems JOINTLY

follow-on fiscal year budget ceilings in the Five-Year Force Structure
and Financial Plan as follows:

FY 68	\$556.8*
FY 69	457.8
FY 70	289.6
FY 71	116.1

*Anticipates FY 1967 funding in accordance with stated requirements.



B. A. SCHRIEVER
General, USAF
Director, MOL Program

3 Atchs
TABS A, B and C

DORIAN

Handle via DORIAN/COMINT
Control Systems JOINTLY

~~SECRET~~