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JUN 20 1966

MEMORANDUM FOR THE ASSISTANT SECRETARY OF THE AIR FORCE (RESEARCH
AND DEVELOPMENT)

SUBJECT: MOL Launch Complex at the Western Test Range

A number of changes in the MOL Program has occurred since the design criteria of the ILC was laid down some months ago. The sum of these changes justified, in my opinion, a re-examination of that ILC design. The changes to which I refer are outlined as follows.

The original concept for the ILC was to provide an Initial Launch Capability which could at some future date be expanded into an ITL capability which would then support a family of Titan III-booster military payloads. Presumably, the rationale was predicated upon launch rates for MOL and other currently undefined Titan III-booster space programs approaching 40 to 60 launches per year. As a result of this rationale, there are certain capabilities designed into the ILC which are not now needed and would never be used unless the ITL philosophy is adopted some time in the future. Based on our current best estimates, there is no space program other than MOL firmly planning to use the ILC. The launch rate for MOL for planning purposes has been specified at not to exceed six per year. It is my understanding that in the 1972-1975 time period a MOL launch rate of approximately twelve per year using on-pad build-up techniques is possible from the ILC. Hence, I can foresee no requirement based on prospective launch rates to convert to the ITL concept. Also, the recent activities associated with the Florida Congressional Delegation regarding the MOL launch site emphasized the point that the ETR Titan III ITL complex has an appreciable flexibility in launch rates, but not much versatility as regards payload and booster configurations. This further substantiates the position that we should not spend significant sums to maintain the option to expand into an ITL capability.

In addition, we have received firm indications that the MOL Program should provide for capability improvements. This direction, plus our own studies of improving cost effectiveness and providing for growth in the MOL Program, all point to the eventual need for increased payload in both weight and diameter. The present ILC design is primarily for the 7-segment, 220-inch SRM and a 10 foot core with capability of economic growth to a 3-segment, 156-inch SRM and a 10 foot core.

On April 5, 1966, the Titan III SPO gave a briefing on the subject of the enlarged Titan III for MOL which shows a possible incremental growth to approximately 80,000 pounds orbital payload.

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General Schriever and I feel that the enlarged Titan III version should not be developed or incorporated in the MOL flight program as now conceived. However, we believe there is a significant advantage to the Air Force to incorporate in the Vandenberg MOL launch complex this growth potential at this time. While elimination of the IITL concept will result in some cost reductions, the combined effect of these two design concept changes has been estimated to be an increase of \$3.5 million in military construction funds. Approximately \$13 million plus considerable down time of the launch complex would be required to incorporate these changes if accomplished subsequent to initial construction. The additional \$3.5 million military construction funds, which would be used for short lead time items, could be in the FY-68 budget request.

Martin Company, working in close cooperation with the architect-engineer, has developed design criteria and conceptual documents for a redesign of the MOL launch complex based on the following ground rules:

- a. The MOL launch complex design should not preclude the use of the complex by any member of the current Titan III family.
- b. The facility should be primarily designed for the 7-segment, 120-inch 10 foot core with the capability of growing to a 3-segment, 156-inch solid rocket motor with 16 foot core with minimum change to the facility.
- c. The concept of on-pad build-up should be retained and there is no requirement to maintain the option of proceeding to an IITL capability unless that option can be provided at essentially zero cost.
- d. Consideration should be given in conjunction with SAF-SLP to sizing the launch control center and other support facilities in such manner as to permit the support of a second launch pad using on-pad build-up concept for either MOL or programs using Titan III-D or III-C having launch rates not to exceed 12 to 15 launches per year.
- e. Redesign of the facility must be accomplished on a schedule not to delay the proposed MOL launch schedule.

We are proceeding with a redesign to accomplish the foregoing. Redesign should be completed in November 1966, and construction can start in January 1967. This is compatible with the current MOL launch schedule.

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

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DEPARTMENT OF THE AIR FORCE
WASHINGTON

OFFICE OF THE SECRETARY

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22 Jun 66

MEMORANDUM FOR 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 a manned 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 best balances the date of the first manned flight with an orderly progression of the development program will require a FY 1967 RDT&E funding level of approximately \$254 million. Funding levels appreciably lower than this will slip the schedule for a manned reconnaissance capability. Neither the program total nor the FY 67 funding requirements quoted include allowances for contingencies, negotiations, advanced studies and technology.

Also shown 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

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items which when funded in FY 67 would greatly enhance the health and future of the MOL Program. Therefore, I would like to solicit your support for reprogramming \$13.9 million for 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] 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.

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.

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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.

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

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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 continued, 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 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 now are 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,

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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].

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

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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.

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

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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 \$13.5 million of Military Construction funds. Ten million dollars from the FY 1968 funds would support the construction and 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.

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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. The \$253.9 million is a minimum estimate of FY 1967 requirements for the schedule proposed. An additional \$13.9 million in FY 1967 would provide the funds to carry on advanced studies and technology development to allow for system improvement and lead toward future system applications for MOL.

Actions Requested

The following specified approvals for the MOL Program are requested:

1. Program schedule and approach in principle.
2. Establish New Obligating Authority and release \$253.9 million in FY 1967 to support the scheduled development effort for the basic reconnaissance program.
3. Establish and authorize the expenditures of an additional \$13.9 million in FY 1967 for advanced studies and technology essential to future system application, which includes \$3 million for contract definition for Ocean Surveillance.
4. Reflect total RDT&E program estimate for the development program by readjusting the MOL Program total to \$1.75 billion

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and the 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

5. In addition to the RDT&E program funds requested, release \$8.7 million in FY 1967 MCP funds for MOL facilities at WTR and make budget allowance for \$13.5 million of MCP funds in FY 1968 for facilities and construction of a staging area for use in MOL recovery operation if such a need materializes and MOL launch facilities at WTR.

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

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TABS A, B, and C

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