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DEPARTMENT OF THE AIR FORCE
WASHINGTON 20330

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CONTROL SYSTEM

OFFICE OF THE SECRETARY

15 December 1967

MEMORANDUM FOR THE SECRETARY OF DEFENSE

SUBJECT: MOL Program

In response to your memorandum of December 9 concerning FY 69 funding for MOL, the Project Office has examined several possible alternative courses of action. After careful review of those alternatives, I conclude that we should proceed with the MOL program, as presently constituted, providing at least sufficient funds in FY 69 to insure a reasonable rate of progress.

The four alternative approaches considered, including slight variations for several of them, are discussed briefly in this memorandum. Also included, as a baseline for comparative purposes, is a summary of the present program.

PRESENT PROGRAM

As you may recall, at the beginning of the FY 68 budget formulation cycle, the AF requested $510 million New Obligating Authority for MOL for that year. The funding was first reduced to $480 million and then later to the $430 million appropriated by the Congress. At the start of this fiscal year, the Air Force hoped to reprogram $50 million more into the MOL Program, if required, and included $440 million in the initial FY 68 Financial Plan as a first step toward that objective. Recently, as you know, we concluded that the MOL Program would have to operate within the Congressional appropriation of $430 million.

In parallel with these funding level changes, the program schedule and scope were readjusted several times during this calendar year, both to meet the funding constraints and to keep in step with an increasing realization of payload complexity. As a part of these readjustments, as much effort

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as possible was deferred until FY 69 or FY 70. Through all of these evolutions, however, the work content in the FY 68 program was planned and predicated on a funding level of approximately $640 million in FY 69.

Last week, the MOL Project Office and the associate contractors completed a detailed review and redefinition of the program based upon $430 million NOA in FY 68 and $640 million in FY 69. A new schedule and work plan was established, based primarily on the time required for Eastman Kodak to develop and produce the camera system with a high degree of confidence.

The present program still includes seven launches: two unmanned launches without prime mission equipment to verify basic spacecraft structural integrity, and qualify the Titan IIIM and the Gemini B; three manned launches in an all-up reconnaissance configuration (including all of the automatic devices necessary for "hands-off" camera operation); and two unmanned launches in an all-up automatic reconnaissance configuration. There is high confidence that [redacted] resolution and a worthwhile intelligence product will be achieved on the first manned flight now scheduled for August 1971. Approximately $640 million are required in FY 69, and the total program cost is estimated to be $2.7-$2.8 billion, of which some $720 million will have been invested by the end of FY 68. A mature manned system and reasonably mature unmanned system are expected at the end of these launches.

ALTERNATIVE PROGRAM #1

One possible alternative program considered would reverse the sequence of flights and launch three all-up unmanned systems first, followed by two all-up manned system launches. To hold costs to the minimum, an unmanned Gemini B would be used as the film return vehicle for the unmanned system upon completion of the mission (in lieu of developing the multiple re-entry vehicle nose section now planned for the unmanned version of the system in the present program).

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Since the three unmanned launches would also serve to qualify both the Gemini B and the Titan IIIM for the manned system, the first two launches in the present program, which are non-reconnaissance in nature, could be eliminated. A first unmanned all-up reconnaissance launch should be possible in August 1971, followed by the first manned launch some 13 months later. This version of the present program drops both the unmanned recovery system and all manned life-support peculiars from the lab module during the first three launches. The early flights are conducted without the man, thus probably substantially degrading the resolution of those flights, and with it the intelligence value. Not less than $415 million funding would be required in FY 69, and approximately $600 million in each of FY 70 and FY 71. The estimated total cost of this program is approximately $2.7-$2.8 billion. We should pursue it only if there is high confidence of being able to budget $1.2 billion over FY 1970 and 1971.

A variation of the above would be to develop the multiple re-entry vehicle capability for the unmanned system, rather than use the Gemini B, and thus acquire a more desirable unmanned operational configuration at the outset. In this variation, a sixth launch might be inserted between the three unmanned and two manned launches to qualify the Gemini B, unless such a flight could be accomplished "piggy back" on a Titan-IIIC launch. A first unmanned launch should be possible in August 1971, with the first manned launch some 15-17 months later (1973). Not less than $425 million funding would be required in FY 69, followed by approximately a $600 million level in both FY 70 and FY 71. The estimated total cost of this program is $2.8-$2.9 billion.

In this alternative to the present program, [redacted] resolution photography could be achieved on the first unmanned flights if all of the automatic devices functioned within specified tolerances. However, frequent out-of-specification operation should be anticipated, any one of which could result in serious degradation or total loss of photography. These are the same devices that man can fine-tune or back-up manually in the manned system and thus provide a much higher

assurance of mission success. Therefore in this alternative, which would reverse the sequence of flights, there is a lesser probability of realizing a mature system at the end of the five flight program.

ALTERNATIVE PROGRAM #2

This possible program approach involves a decision now to develop only an unmanned reconnaissance system for the Eastman Kodak camera. Two variations of this alternative are discussed.

The first, which is aimed at retaining as much of the MOL design and contractor structure as possible, includes the redirection of the present MOL contractors from a manned and unmanned program to an unmanned-only approach. Since the Gemini B would no longer be used, it might be desirable to reorient McDonnell from the Gemini effort to the development of the multiple re-entry vehicle nose section and avert contract termination with that company. Nevertheless, at least partial contract terminations would be required at Douglas, General Electric, and McDonnell. A first unmanned launch should be possible in August 1971. Approximately $400 million would be required in FY 69. The estimated total cost of a 10 launch program, with launches at 3-4 month intervals, is approximately $2.4 billion.

The above program might prove difficult for the DoD to explain outside of special security channels -- i.e., an unmanned-only MOL program with a costly experiment which could not be publicly discussed in any specific terms (approximately $200 million of the $400 million in FY 69 would be on covert contracts).

The second approach to development of an unmanned system would retain only the optical system of the MOL. This would involve immediate termination of all MOL contracts except Eastman Kodak and that part of the General Electric effort directly associated with the camera for an unmanned system. Those Titan IIIM development efforts intended for incorporation

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in other Titan III models would be transferred to those programs. Then, over the ensuing 6-18 months, an optimized unmanned system would be defined, new competitions held, etc. This action would require approximately $370 of the $430 million available in FY 68. If a new spacecraft design were started early in FY 69, approximately $400 million NOA would be required during that year. In that case, the first launch should still be possible by August 1971, with an estimated total cost (including all prior MOL costs) for a 10 launch program between $1.8 and $2.3 billion (depending on whether the five segment Titan IIID could be used as a booster; whether a common spacecraft design could be achieved with other advanced unmanned reconnaissance systems, etc.).

A further reduction in FY 69 funding could be made if only the Eastman Kodak and reduced General Electric efforts plus some new program definition were accomplished in FY 69. In that case, the FY 69 funding requirement would be $225 million. This would delay the first launch at least well into calendar year 1972. It is difficult to estimate, because we would essentially be starting a new program.

Any of these three versions of Alternative #2 constitutes cancellation of the MOL and its replacement by a program unknown to the public and funded as an addition to the black budget.

ALTERNATIVE PROGRAM #3

This approach involves slipping the present program to accommodate a less than $600-plus million availability in FY 69. Three variations of this alternative are discussed.

The first alternative involves a partial termination of all MOL contracts except for Eastman Kodak and that part of General Electric's work directly associated with the camera system, and the reorientation of efforts other than EK and GE to a sustaining level of engineering effort. If this were done immediately, some $30 million of the $430 million available in FY 68 might be saved. Approximately

$325-$350 million would be required in FY 69, and some $600 million in FY 70 and 71. The first manned launch would undoubtedly slip beyond August 1972, and the total program cost would increase to $3.2 billion or more. In effect, this is a partial cancellation followed by a reinstitution of the same program later on.

Another variation of this approach would be to slip the program just enough to accommodate $400 million in FY 69. If funding could then be increased to approximately $600 million in FY 70 and 71, a first all-up manned launch might be possible in mid-CY 1972. Total program cost would increase to more than $3.1 billion.

A third variation of this alternative would be to slip the present program just enough to accommodate a reduction of approximately $100 million below the desired funding level of $640 million in FY 69. A program aimed at a first all-up manned system launch in January 1972 has been examined. This program would require approximately $520 million in FY 69, followed by approximately $600 million in FY 70. The estimated total cost of this program would increase to approximately $2.9-3.0 billion.

ALTERNATIVE PROGRAM #4

The possibility of a manned-only MOL Program has also been examined. Such a program might include six launches: the first two to verify structural integrity and qualify the Titan IIIM and Gemini B; and the last four as all-up reconnaissance missions (which should be sufficient to bring the system to an acceptable level of maturity). The first manned launch could be made in August 1971, with a high confidence of achieving [redacted] resolution photography on the first flight. The present manned/automatic system design concept would be continued to permit a later block change to an unmanned vehicle if so desired. However, development of the support module, which is a more economical and efficient element for the unmanned configuration, would be deferred until the decision to develop an unmanned system were made.

Approximately $575 million would be required in FY 69, and the total program cost is estimated to be $2.5 billion.

ROLE OF MAN IN MOL

Subsequent to your visit to Rochester this Fall, we have re-examined in considerable detail the role of and necessity for man in the MOL satellite reconnaissance system. These studies reaffirmed the desirability of flying the manned system first to insure a high confidence of achieving both [redacted] resolution photography and a worthwhile reconnaissance product at the outset. Briefly, man's contribution in the MOL Program includes:

1. Fine-tuning the camera to peak performance and/or substituting a completely manual mode of operation for failed or grossly malfunctioning subsystems.

2. Accelerating the diagnosis and early correction of design deficiencies and/or production shortcomings through his ability to manually control and operate essential subsystems on orbit.

3. Adding to the quantity and quality of useful photography achieved over that possible with the unmanned system through such techniques as the immediate verification to the mission director of photography achieved (permitting the assignment of new targets with assurance on subsequent orbits over the same area); weather avoidance through the selection of alternate targets; and when weather is not a factor, the selection of those targets having a momentary increased intelligence value (for example, a missile loading in a silo versus a nearby but empty silo).

FUTURE MOL SYSTEM POTENTIAL

As discussed during earlier considerations of the program, the basic MOL space system, without camera, will provide an excellent platform for the development of other earth sensors (radar, infra-red, etc.) and/or the early achievement of additional operational capabilities (for example, [redacted] Once the initial nonrecurring development costs have been borne,

the basic MOL space system can explore and/or develop such other capabilities for nominal cost. Further, as a follow-on photographic reconnaissance system, very long stay times on orbit, with an attendant significant increase in cost-effectiveness, are achievable using the basic MOL hardware and employing rendezvous/resupply techniques.

DISCUSSION/RECOMMENDATION

I believe that the present MOL program is a sound undertaking with a high confidence of achieving [redacted] resolution and a worthwhile intelligence product on early manned flights. Early operation with man as an integral part of the system is a prime reason for that high confidence because although the camera system will function in a hands-off mode, it will operate more poorly without man's inputs in the early stages. Perhaps ultimately, the system will operate automatically as well as with the man. We are not exploring the usefulness of man in general (although that is the cover story), but rather employing his unique capabilities to enhance and support the system development and reconnaissance mission in ways already partially verified by experience in the Gemini Program and from realistic simulations.

The probability of early success in achieving high resolution photography with an unmanned only program is considerably lower than with a manned system. Further, manned flights first will undoubtedly hasten the achievement of an acceptable level of maturity in an unmanned system.

In examining the alternatives discussed previously (briefly summarized in Attachment 1), there appear to be only two logical courses of action if we desire to have a program giving us a high confidence of achieving [redacted] resolution in the 1971-72 period, and within a total program cost near that now forecast. These are a continuation of the present program, or one deferring until later some of the unmanned equipment, at a reasonable development pace. Otherwise, we should cancel MOL and terminate all but the Eastman Kodak and a part of the General Electric covert contracts, with the latter being continued at the present pace for the near term while various options toward a covert unmanned-only system are studied.

Further gross slippage of the present program would cause the total program cost to escalate considerably higher and delay the early benefits inherent in the manned system. Unfortunately, the MOL contractor structure and program have been geared closely to a high level of funding in FY 69 and FY 70 and there is no economical way to turn the effort down again (another slowdown would be the third in less than 14 months).

I believe the present MOL Program approach is worth the cost in terms of assurance of meeting the resolution goal and returning a worthwhile product at the earliest reasonable date, plus the verification and exploration of additional manned reconnaissance contributions such as target coverage verification, target selection, weather avoidance, etc.

I therefore recommend, as a first option, that we fund the present program in FY 69 at not less than $600 million. If that is not possible, then the program should be funded at not less than a $520 million level (Alternative 3-3) in FY 69 and the resulting 5-6 month additional stretchout and increased total cost of the program be reluctantly accepted. We should do the latter only if we are willing to accept the $600 million cost in FY 70 and perhaps that much in FY 71. If we are not, we should terminate the MOL Program except for the Eastman Kodak and General Electric efforts and define a new unmanned system (Alternative 2-2). In that situation, approximately $400 million should be budgeted in the black for FY 69.

Harold Brown

Harold Brown

1 Attachment
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PRESENT AND ALTERNATIVE PROGRAMS

PRESENT PROGRAM

Seven total launches: two subsystem qualification launches, followed by three all-up manned and two all-up unmanned launches. First all-up manned launch in August 1971. Requires $640 million in FY 69. Estimated total cost if $2.7-$2.8 billion.

ALTERNATIVE #1

Five total launches: three all-up unmanned launches followed by two all-up manned launches. First all-up unmanned launch in August 1971 and first all-up manned launch 13-17 months later. Requires $415-425 million in FY 69. Estimated total cost is $2.7-2.9 billion depending on specific approach toward unmanned film recovery vehicles.

ALTERNATIVE #2

Abandon manned approach and develop dedicated unmanned system. Involves early public cancellation of MOL program and termination of all except EK and GE contracts. Ten launch program, with first launch in August 1971 possible. Requires up to $400 million in FY 69. Estimated cost up to $2.4 billion depending on approach.

ALTERNATIVE #3

Stretch out the present 7 launch program to accommodate less than optimum funding in FY 69. A $325-$350 million level in FY 69 slips first all-up manned launch to much later than August 1972 and increases total program cost to more than $3.2 billion. A $400 million level in FY 69 slips first all-up manned launch to at least mid-CY 1972 and increases total program cost to more than $3.1 billion. A $520 million level in FY 69 slips first all-up manned launch to January 1972 and increases total program cost to $2.9-3.0 billion.

ALTERNATIVE #4

Develop only the manned/automatic system -- one which retains the capability to modify to an unmanned system in a later block change. Six launch program: two subsystem qualification launches followed by four all-up manned launches. First all-up manned launch in August 1971. Requires $575 million in FY 69. Estimated total program cost is $2.5 billion.

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I believe the present MOL Program approach is worth the cost in terms of assurance of meeting the resolution goal and returning a worthwhile product at the earliest reasonable date, plus the verification and exploration of additional manned reconnaissance contributions such as target coverage verification, target selection, weather avoidance, etc.

(Dr. Brown - Alternate Recommendation #1)

I therefore recommend, as a first option, that we either fund the present program in FY 69 at not less than $600 million or the manned-only program at about $575 million (Alternative 4). Otherwise, we should terminate the MOL Program except for the Eastman Kodak and General Electric efforts and define a new unmanned system (Alternative 2-2). In this situation, approximately $400 million should be budgeted in the black in FY 69.

(Dr. Brown - Recommendation Option #2)

I therefore recommend, as a first option, that we fund the present program in FY 69 at not less than $600 million. If that is not possible, then the program should be funded at not less than a $520 million level (Alternative 3-3) in FY 69 and the resulting 5-6 month additional stretchout and increased total cost of the program be reluctantly accepted.

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2 Attachments
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