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DEPARTMENT OF THE AIR FORCE
WASHINGTON 20330

OFFICE OF THE SECRETARY

FEB 25 1969

MEMORANDUM FOR DR. SEAMANS
THRU DR. FLAX Seems OK to me Jeff

SUBJECT: MOL Program Alternatives

On the opposite page is the proposed memorandum to Mr. Packard on MOL Program Alternatives. This differs from the version you reviewed in draft form only in (1) the Page 3 sub-section entitled "Additional Information"; and (2) the addition as Tab B of a tabular summary of financial/schedule/decision point considerations associated with the options discussed in the memorandum. For comparison purposes, Attachment 1 hereto contains the original version of the "Additional Information" sub-section.

The new sub-section has come about as a result of my discussions today with the DDR&E Staff. Apparently, sometime after Dr. Foster concurred in the draft yesterday afternoon, he and Dr. Tucker had some misgivings whether or not the memo made it perfectly clear that adoption of the four manned-mission program delayed for at least 1½ years the acquisition of an unmanned capability (unless a deliberate decision to do otherwise was made prior to December 1970). Additionally, they felt certain points made in Tab A should also be stated in the basic memorandum. All of their thoughts have been incorporated, and as of 1500 hours, DDR&E was again in agreement with the memo. . . . I understand you and Dr. Foster discussed this matter earlier today.

I concur in the changes and recommend you sign the opposite page memorandum.

JAMES T. STEWART
Major General, USAF
Vice Director, MOL Program

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a/s

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DEPARTMENT OF THE AIR FORCE
WASHINGTON 20330

Control System

OFFICE OF THE SECRETARY

FEB 26 1969

MEMORANDUM FOR THE DEPUTY SECRETARY OF DEFENSE

SUBJECT: MOL Program Alternatives

During the February 19 DoD/BoB meeting, you requested: (1) financial particulars on a MOL Program that included only the presently-planned three manned flights, with funding and schedule variations; and (2) information on a sustaining program which would minimize FY 70 funding. For comparison purposes, appropriate information on the present MOL Program is cited first.

Present Manned/Unmanned MOL Program:

The DCP-approved MOL Program includes five reconnaissance missions in a total of seven launches -- two unmanned booster/structure/Gemini B qualification launches (no camera systems aboard) preceding three all-up manned and two all-up unmanned flights. Financial and schedule particulars are as follows:

FY69 & Prior	FY70	FY71	End Prgm Total	1st Manned Launch	2nd Unmanned Launch
$1237M	$576M	$565M	$3037M	Feb 72	Oct 73

If program continuity and minimum cost transition into a follow-on phase are desired, the sixth reconnaissance mission (manned or unmanned) should be flown in the first half of CY 1974. Approximately 3½ years lead time is the minimum required for procurement, fabrication, assembly, and test of the system; and commitment of FY 71 funds is required. Decisions regarding this commitment must be made by December 1969 when the FY 71 Budget Estimate is prepared.

Three Manned-Mission MOL Program:

A MOL Program of three manned missions (also preceded by the two unmanned qual launches) on the same development and

manned flight schedule as the present manned/unmanned program would be as follows:

FY69 & Prior	FY70	FY71	End Prgm Total	1st Manned Mission	3rd Manned Mission
$1237M	$551M	$515M	$2690M	Feb 72	Jan 73

The effects of varying the schedule on total program cost and FY 70/71 funding would be approximately as follows:

FY69 & Prior	FY70	FY71	End Prgm Total	1st Manned Mission	3rd Manned Mission
$1237M	$590M	$540M	$2630M	Dec 71	Oct 72
$1237M	$510M	$550M	$2780M	May 72	Mar 73

A three manned-mission MOL Program would be directed towards the program objectives approved by the President in 1965, namely: semi-operational use to achieve [redacted] resolution photography of significant targets; development of the necessary high resolution optical technology and a camera system for manned or unmanned use; the provision of a space facility for the possible development, test, and use of other military applications; and information on the extent of man's military utility in space. A three flight program would provide considerable progress toward demonstration of a mature, flexible, manned reconnaissance satellite system and should provide adequate confidence to proceed with an operational configuration for either a manned or unmanned follow-on system.

The above FY 70/71 estimates do not include any follow-on activity. If continuity into a follow-on operational program is desired, a fourth reconnaissance mission should be flown in mid-CY 1973. This would require initiation of procurement in December 1969 and some FY 70 funding.

Should any follow-on decision be deferred until after the first manned mission is flown, the fourth mission (manned or unmanned) could not occur before late CY 1975; and some FY 72

and sizable FY 73 funding would be required. Restart costs would probably be unusually high since most of the production and special environmental test facilities would be in a standby status and a majority of the trained technical work force would no longer be on the payroll.

Minimum-Sustaining Program:

The MOL Program presently has about 15,000 Associate Contractor and 1st-tier Subcontractor personnel aboard (about 85 percent of the peak work force), and is spending at a rate of approximately $550 million per year.

A program to minimize FY 70 funding might entail a fifty percent reduction in work force, no new material purchases, etc. Approximately $275-300 million would be required in FY 70 to maintain personnel competency and facility readiness. A delay of more than one year in development prior to the first manned flight would result and total program cost would increase more than $360 million.

In order to maintain a capability to pick-up the present program pace at the beginning of FY 71, a smaller work force reduction would be appropriate, new material purchases limited, etc. Approximately $360 million would be required in FY 70 for this alternate. The impact would be a one year stretchout in development prior to the first manned flight and a total program cost increase of approximately $360 million.

Program Alternative

As another alternative to the present manned/unmanned baseline program, consideration should be given to a four manned-mission MOL Program, with six rather than five month launch centers, as a means of protecting both operational and development options until formulation of the FY 72 Budget Estimate in December 1970. FY 70 costs are estimated to be only $5 million higher than those for the three launch program, and the total development program costs would be approximately $200 million less than the baseline program. Schedule and financial particulars for a four launch program are:

FY69 & Prior	FY70	FY71	End Prgm Total	1st Manned Launch	4th Manned Launch
$1237M	$556M	$545M	$2835M	Feb 72	Sept 73

Varying the schedule would have effect on total program cost and FY 70/71 funding similar to that shown for the three manned launch option.

The interval between now and December 1970 could be devoted to systematic and comprehensive analyses of a variety of options: optimized unmanned systems using the MOL camera system; more efficient and effective MOL systems; other possible MOL applications and configurations, etc. Additionally, definition of longer term MOL Program objectives and phasing may benefit from further DoD and NASA studies of possible common objectives toward future long-duration manned space stations and logistic resupply systems.

Also, much of the system ground qualification will be completed by the end of CY 1970, and optical performance confirmed. Decisions can be made at that time regarding operational configuration and deployment with minimum technical and financial risk.

Additional Information:

The primary objective justifying the MOL program is the acquisition of [redacted] resolution photography for technical intelligence uses. When the MOL program was approved by the President in 1965, only a manned capability was planned. In 1966, an unmanned reconnaissance version was added to provide "insurance" against possible foreign objections to manned overflight, unknown physiological problems, and/or to provide a lower cost option for recurring operational use. Therefore, both manned and unmanned systems are to be demonstrated in the present baseline program. A brief evolution of MOL Program objectives and scope, pros and cons of including an unmanned MOL system, and appraisal of program confidence are attached as Tab A.

The "manned-only" options presented in this memo do not eliminate the unmanned capability, but would delay its

availability up to 1½ years unless a decision were made prior to December 1970 to initiate that development. Such delay would be unfortunate only if serious political objections to manned overflight were raised during the initial MOL launches or if a manned flight disaster forced prolonged deferment of manned operations. However, unmanned systems, to be available for such contingencies, would have to be committed to production more than 3 years prior to such events.

Systematic and comprehensive analyses of a number of follow-on MOL Program options have yet to be conducted. The delay associated with the manned-mission only options presented in this memo would permit further deliberate evaluation of manned and unmanned operational considerations and analyses of lower cost unmanned systems. In addition, each program option presented will demonstrate the key to unmanned capability -- operation of the very high resolution camera in an automatic mode.

FY 70 expenditures of approximately $25 million for unique-unmanned development effort is now planned in the baseline program to meet a mid-CY 1973 launch date. The manned-mission only alternatives would defer that expenditure until FY 72 unless decisions regarding follow-on activity are made prior to December 1970. A tabular summary of all financial/schedule/decision point considerations discussed in this memo is attached as Tab B.

Recommendation:

This memorandum was prepared jointly by the DDR&E and Air Force Staffs. Dr. Foster and Dr. Flax agree with me that the four manned-mission MOL Program is a more desirable alternative than the three mission program. It would protect, with minimum commitment, until December 1970 a continuing very high resolution operational reconnaissance capability in the 1970's, provide time in which to carefully assess other options, and sustain a minimum cost development program leading to manned or unmanned operational systems.

If this course of action is adopted, I recommend the MOL Program be funded at not less than $556 million in FY 70.

Robert C. Seamans, Jr.

ROBERT C. SEAMANS, Jr.

Atch
a/s

cc: Dr. Foster

MISCELLANEOUS MOL PROGRAM INFORMATION

I. MOL PROGRAM OBJECTIVES/SCOPE CHRONOLOGY:

A. August 1965 Program Approved by the President:

o Scope: Six launch manned-only program: one unmanned qualification launch; one manned flight without camera; four manned missions with camera.

o Objectives: early operational [redacted] photography of significant targets (approximately [redacted] better than G-3 then under development); development of very high resolution camera systems suitable for either manned or unmanned use; determination of the extent of man's military utility in space; provision of a space facility for the development, test and use of other possible military space applications.

B. Why Only Manned Flights Proposed in 1965?

o As a primary reason, it was not considered practically feasible to point the camera and track targets (for image motion compensation) with sufficient accuracy for an unmanned system.

C. Program Scope Changed in Mid-1966:

o Unmanned reconnaissance systems were added to the program. Seven launch present program established: two qual launches; three all-up manned recce missions; followed by two all-up unmanned recce missions.

D. Why Were Unmanned Systems Added in 1966?

o Automatic (e.g. unmanned) camera pointing and tracking now appeared more feasible and practical, albeit very difficult to achieve.

o PSAC advocated the development of an unmanned system, feeling the U.S. would want both manned and unmanned capability in future (unmanned for "routine" operations).

o SecDef felt it would provide "insurance" hedges against foreign objections/threat or unknown man-in-space physiological problems, and also agreed with Mr. Schultz (then BoB Director) that unmanned system should be cheaper on recurring basis.

o NOTE: See Section II for major pros/cons on an unmanned MOL.

E. Why Then Still Continue Manned MOL and Why Fly it First:

o To assure achieving the resolution goal and to provide a useful reconnaissance product at the outset. Flight crews expected to not only point and track with great accuracy, but also "tune" or manually operate other essential, advanced automatic camera devices.

o To mature unmanned capability sooner through on-orbit flight crew diagnostics and controlled testing in various modes.

II. WHY AN UNMANNED MOL:

There follows brief pros/cons on past/present major points for including and/or continuing an unmanned version of MOL:

A. Political/Military:

o Possibility exists of international objections or foreign physical interference to manned MOL overflights (Sino-Soviet reaction to manned aircraft and unmanned drone overflights unmistakable in past). . . However, no objections so far to Gemini/Apollo overflights of Southern China.

o Since MOL flights will not be at all covert (only mission classified), it could be assumed Sino-Soviet probably would physically interfere first with unmanned U.S. reconnaissance satellites (on premise U.S. would be less likely to protest or react).

o A recent special National Intelligence Estimate for NRO concluded foreign physical interference with U.S. unmanned recce satellites unlikely unless prelude to general war

(analysis also noted that Soviets stopped protesting U.S. satellite overflights after USSR satellite recce program began in 1964).

o Might be difficult for U.S. to disprove accusation MOL is bomb-in-orbit without revealing recce purpose to world.

B. Physiological:

o USAF and NASA space-medicine community agrees there now are no temporarily incapacitating or permanently damaging physiological barriers to 30-45 day manned flights (based on scale-up of 11-14 day Gemini/Apollo flights; space chamber tests; bed-rest/water-immersion space simulation tests, etc.).

C. Technical:

o Abandonment of unmanned system might result in reduction of emphasis on automatic devices necessary for unmanned capability.

o Manned-only system advocates defend need for all automatic devices (pointing, tracking, alignment, focus, etc.) in system to fully exploit man's ability to evaluate, devise, adjust, etc.

D. Insurance Against Manned Disaster:

o Catastrophic loss of crew might result in extended delay in operational program if unmanned backup were not available.

o Even though MOL will have very high mission crew-safety probability (.995), catastrophic loss always possible. Subsequent delay would depend on nature of disaster. However, unless unmanned systems are built in parallel and available, no flexible backup will exist.

E. Rate of Data Return:

o Unmanned system to return film at 7-10 day intervals; manned at end of mission. Not timely.

o Major value of MOL is technical intelligence against problems/solutions several years ahead -- a few weeks delay probably is not important. . . . However, if timeliness significant for tactical, crisis, or arms agreement monitoring reasons, provisions for a read-out system and daily data return are included in manned MOL system.

F. Recurring Cost Comparison Data:

o Unmanned system on comparable booster will always have at least a 4:3 orbital lifetime advantage and at least a 4:5 recurring cost advantage over manned system.

o Simulator tests and analyses indicate manned system will return approximately same total number of cloud-free targets per mission; will return 2-2½ times as many high-value, time-sensitive targets per mission; will average 10 percent better resolution pictures (manned system will have better pointing accuracy) even when unmanned system is working perfectly; and will average 30-100% better resolution pictures when automatic devices such as Cross-Format image motion compensation device or Image Velocity Sensor fail or malfunction.

o Additionally, the manned system has unique additional capabilities such as very high resolution photography [redacted] optional black & white and color or other special film intermixes on same target; visual reconnaissance; etc.

o Also camera has more resolution growth potential in manned system (Possible to increase effective focal length via a relay lens; however, field of view is greatly reduced and precise pointing/tracking capability of man would be required).

III. PROGRAM CONFIDENCE APPRAISAL:

High confidence in success at outset with manned missions because only the MOL camera system can be considered advanced technology. The Laboratory, Gemini, and booster represent combinations of flight-proven hardware technology and/or off-shelf components; and very high spacecraft reliability/safety is expected. With regard to the camera system:

o Have already achieved necessary advanced optical test and manufacturing facilities.

o Have already demonstrated ability to drive and control tracking mirror with necessary precision.

o Have necessary low thermal-expansion optical materials at hand.

o Test optics approaching flight quality.

o Flight crew simulator tests have confirmed their ability to point and track with great precision. The required pointing accuracy (all error sources) is approximately 2,000 feet; the flight crew is expected to routinely point with [redacted] accuracy. The required tracking rate is [redacted] or less per second to achieve the [redacted] resolution goal; flight crew tests indicate [redacted] manual tracking capability. . . With regard to pointing and tracking in the unmanned system, success is assumed but will not confirm ability to automatically point accurately enough until 1971, and may not confirm extent of automatic tracking capability until first manned MOL flight.

o Other camera system component development is progressing in satisfactory manner.

o Camera development program more than deliberately paced -- for funding reasons, it is 8-10 months behind one based on availability of camera system. MOL Program represents a more comprehensive camera development, test, and verification program than any other past or present satellite undertaking.

o Finally, also confident of achieving resolution goal because the MOL camera demands only relatively modest overall camera system performance. The MOL camera relies more on a long focal length and large aperture combination than other systems currently in use or development.

PRESENT & ALTERNATIVE MOL PROGRAMS

Program	FY69 & Prior	FY70	FY71	End Prgm Total	1st Manned Launch	Last Prgm Launch	Follow-on(1) Decision Point
Present Baseline (3 Manned; 2 Unmanned)	$1237M	$576M	$565M	$3037M	Feb 72	Oct 73	Dec 69(2)
3 Manned Missions	$1237M	$551M	$515M	$2690M	Feb 72	Jan 73	Dec 69(2)
Min FY 70 Sustaining(3)	$1237M	$360M	$575M	$3397M	Feb 73	Oct 74	Dec 70(4)
4 Manned Missions	$1237M	$556M	$545M	$2835M	Feb 72	Sep 73	Dec 70(4)

(1) Assumes follow-on program continuity is desired. Should such decision be deferred until after the first manned launch, the first launch of any follow-on buy (manned or unmanned) could not take place before late CY 75 at the earliest.

(2) Some FY 71 funds needed.

(3) Assumes resumption of present program pace in FY 71.

(4) FY 72 funds required.

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ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

19 February 1969

ADMINISTRATION

MEMORANDUM FOR THE DEPUTY SECRETARY OF DEFENSE

SUBJECT: Budget Issues on MOL, HEXAGON and Drones

The Mayo paper reopens extremely complex issues which were addressed by the Director of Central Intelligence, the Director of the Bureau of the Budget, the Director of the National Reconnaissance Office and the Deputy Secretary of Defense individually and the ExCom collectively in arriving at the size of these programs and their funding in the FY 1970 budget.

By reopening these issues at the interdepartmental level, he has, as a consequence, reopened the issues within the DoD. As a result, you will be replowing the ground that Paul Nitze covered during the last formulation of the budget.

Accordingly, we have summarized the BoB paper and the previous positions of the appropriate elements of DoD on these issues in the attached paper. The comments contained therein were coordinated and updated at the staff level with the officer concerned.

The current budget is as follows:

	Total Approved Program FY 69-74 Launches/Vehicles	Costs ($M)
MOL	7 (1st launch FY71)	2515
HEXAGON	16 (1st launch FY 70)	[redacted]
DRONES (FY 69-70)		
147-T	60	37.9
147-S	342	99.6
154	20	48.7 (estimated)

CORONA
DORIAN
GAMBIT
HEXAGON

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Attachment

GROUP 1
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BYE-77890-69

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28 FEB 1969

BoB proposes cutting three major program (TAB "A"):

1. MOL: Terminate, saving $800M in FY 69 and FY 70, with total saving of $2 billion.

2. HEXAGON: Terminate, saving [redacted] in FY 70, and [redacted] FY 70 - FY 74. (If CORONA and GAMBIT were held to 6 launches per year, there would be additional savings of [redacted])

3. Drones: Reduce number of 147-T (high altitude) and 147-S (low altitude) drones to be procured in FY 69 and FY 70, and terminate contract for 154 (new model high altitude) drones. Possible savings are $41.7M in FY 69 and $25.7M in FY 70.

DDR&E, ASD(SA), DNRO, and JCS have previously provided material on the subjects of the BoB proposals. Their positions are appended as TABS; brief statements of all parties' rationale follow.

DORIAN CORONA GAMBIT HEXAGON

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MOL

BoB (BYE 11700-69)

MOL's [redacted] design resolution does not provide enough additional intelligence to justify its very high cost.

1. GAMBIT-3 is competitive.

2. SIGINT provides highly important information.

3. Sizing of U. S. strategic forces is conservative, to gain an assured destruction, second-strike capability, and probably would not be affected in any significant way by MOL photography.

4. Other precise information required (radar characteristics, weapons yield, accuracy, refine rates, operational doctrine) can be provided only by SIGINT, RADINT, or HUMINT.

5. MOL's high costs ($3.213 estimated) require termination.

DDR&E

- The value to DoD of MOL very high resolution photography combined with the mission flexibility of MOL justifies the expenditure of the remaining start-up costs ($1.8B) and estimated follow-on annual operating costs ($100 - 120 million per launch).

- Very High Resolution (VHR) imagery, when combined with engineering principles and applicable technology can provide high confidence answers to questions up to several years sooner on performance and characteristics of foreign weapons, systems, equipment, and facilities. The Director, DIA adds that, in addition to technical intelligence, VHR also can make a substantial contribution to the development of strategy and tactics for the employment of military forces.

- MOL additionally will have unique capability [redacted] can make a significant contribution to policing arms limitations agreements, and has some intelligence coverage potential during crisis periods.

- Terminating the MOL program now will result in FY 70 savings of $576M (not $800M) and total savings of $1.8B (not $2.0B).

- There is an unmanned configuration in the MOL program; thus GAMBIT does not have a unique advantage.

- GAMBIT-3 photography does not provide a resolution capability very close to MOL photography; the MOL by virtue of its much longer focal length and larger aperture will provide photographic resolutions approximately [redacted] better than GAMBIT-3.

- In their brief statement on Soviet strategic forces influencing U.S. calculations, BoB neglects consideration of tactical systems and threats, ignores the Chinese Communist threat completely, and focuses on "precise radar signal characteristics" as a determinant. If this is so, then no photographic reconnaissance, only SIGINT, is required.

- BoB implies that all issues have not been considered prior to preparation of their paper, referencing the DCI's

questioning of the benefit of [redacted] photography compared to GAMBIT's [redacted] photography. All issues have been considered, and DDR&Es judgments and conclusions, set forth in the MOL DCP (5 Dec 68), were supported by the Secretary of the Air Force, the President's Scientific Adviser, the Director NRO, and ASD(C), and were approved by DepSecDef.

ASD(SA)

- Agree with BoB position as far as it goes, but offer that:

1. VHR photography development should continue as a future option for the NRP.

2. Other considerations than intelligence apply: appeal of man in space; large sunk costs in MOL. Terminating MOL unrealistic option.

3. An option involving MOL combined with the Apollo Applications Program (AAP) be considered; slowing down MOL optical development and cancelling Apollo Telescope Mount Solar observatory. Result is common

space capsule development, common launch system and an integrated flight schedule. VHR photographic capabilities introduced as developed and as national security needs dictate. This option would accomplish the most important near earth orbit manned flight objectives and provide more time to solve the optics developmental tasks left in MOL. Problems under this option are (1) agencies involved probably prefer separation, (2) domestic and foreign political aspects of combined military - non-military program, and (3) 1958 Space Act would have to be amended concerning NASA's responsibilities.

HEXAGON

BoB (BYE - 11700/A-69)

- Photographic reconnaissance program includes two types of systems with overlapping capabilities.
  - Surveillance: GAMBIT-3 and MOL
  - Search: CORONA and HEXAGON
- Even after HEXAGON is operational there will be a need for 4 or 5 GAMBIT satellites each year for surveillance.
- Issue: given need for GAMBIT, does HEXAGON provide enough additional search to justify additional total costs?
- GAMBIT; CORONA combination is adequate to meet intelligence needs against Soviet/Chinese strategic force capabilities. Problem has thus narrowed to HEXAGON's unique capabilities against ground force targets.

1. G-3 is meeting 95-97 percent of ground forces target looks required annually and quarterly by USIB. If requirements increase, longer-life G-3 will be able to meet them.

2. G-3 provides high confidence estimates against static targets, but

3. HEXAGON has clearest added value against mobile ground force targets.

4. HEXAGON may not provide an important, unique capability for understanding manning levels.

5. SIGINT and HUMINT provide complementary information about ground force targets.

6. There is a penalty paid in resolution by substitution of HEXAGON for some of the GAMBIT missions.

- Neither mix (HEXAGON/GAMBIT or CORONA/GAMBIT) has an advantage in timeliness for crisis management.

- HEXAGON's 280-mile swath width option is a significant advantage (CORONA's is 130-mile), but is costly in film consumption.

- For equal annual cost of [redacted] 4 HEXAGON and 4 GAMBIT, or 7 CORONA and 8 GAMBIT can be launched. The latter option more than meets requirements, although 4 HEXAGON will produce much more area coverage annually than 7 CORONA and surveillance requirement coverages by GAMBIT will be reduced somewhat.

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DNRO

- DNRO does not justify requirements, since he receives these from the USIB (TAB "B"). These requirements were reaffirmed by USIB D46.4/27 of 4 Feb 69. He does, however, provide cost estimates and assessments of technical performance and program risks. The DNRO comptroller has provided corrected cost figures with the comment that many costs in BoB paper are incorrect. Based on a 1 March 1969 decision to terminate HEXAGON the following numbers apply: c/BoB pg 2.

	Annual Total Launches (FY 73)	FY 70 Budget Costs	FY 1970-74 Costs
ExCom Decision			
HEXAGON	4	[redacted]	
GAMBIT-3	4		
Alternative			
CORONA	7	[redacted]	
GAMBIT-3	7		

1/ An additional savings of [redacted] accrues from prior year funding, resulting in a total of [redacted]

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BYEMAN-TALENT-KEYHOLE-COMINT
CONTROL SYSTEMS JOINTLY

The difference in FY 70 savings from the BoB figures is due to BoB's use of figures relating to a 1 December 1968 decision to terminate. Note that the above figures include in assumption that no improvements will be made in CORONA. It should also be noted that any decision to delay HEXAGON results in a need to buy more CORONAs with likely costs higher than potential HEXAGON savings.

DDR&E (BYE 78418-68)

- Three options available:

  1. Cancel HEXAGON, use seven GAMBIT and seven CORONA per year. Save [redacted] FY 68-70, and [redacted] FY 69-73. Lose significant benefits of HEXAGON in 1970's.

  2. Austere HEXAGON. Three HEXAGON and four GAMBIT per year. Save [redacted] in FY 70, and at least [redacted] in FY 68-73 costs. Operating costs less than Option 1, but intelligence value much higher.

3. Planned HEXAGON. Five HEXAGON and five GAMBIT per year. Costs [redacted] more per year in outyears, but produces 30% faster and additional reconnaissance.

- DDR&E recommends Option 2:
  - Better intelligence than Option 1.
  - Costs less than Option 3.
- Development costs for major improvements to CORONA would be roughly the same as those remaining for HEXAGON.
- HEXAGON resolution (2.5 - 4 ft) markedly more productive than CORONA (7 - 10 ft).
  1. DIA, CIA, and NPIC studies indicate there is a "breakpoint" in resolution productivity in 3 - 5 ft range.
  2. More than half of targets covered by GAMBIT could be adequately covered by HEXAGON.

- Three major intelligence contributions unique to HEXAGON:

  1. More thorough search of Soviet Union/China to detect new activity or provide confidence that suspicious activity is not under way.

  2. Improve intelligence on ground forces through better and faster understanding of force readiness, logistical support, and major redeployment.

  3. Enable detection and assessment of certain mobile forces such as ICBM's, IRBM's, tactical offensive and defensive missiles.

- We are unable to predict fully the expected value of radical new systems such as HEXAGON; GAMBIT, for example, provides intelligence on ground forces, although it was not originally designed for that. HEXAGON may be able to make such unexpected, significant, contributions.

- HEXAGON is in its third year of development, and development risk has been diminished. High risk areas are identified and under control.

- HEXAGON will present more options for mixes of reconnaissance systems:

  1. HEXAGON plus MOL may allow termination of GAMBIT.

  2. HEXAGON could carry MOL-DORIAN optics; development would be $150-200M above and beyond current MOL development.

  3. HEXAGON can be modified, or more vehicles launched, to keep a vehicle aloft 90% of the time. This would provide crisis coverage within a week or several days.

ASD(SA)

- HEXAGON/GAMBIT program differs little in operating costs from BoB-proposed CORONA/GAMBIT program. Adding one additional annual GAMBIT launch to BoB program would make ExCOM program and BoB program equal-cost options in out-years. Thus issue is whether or not to spend about [redacted] in start-up costs for HEXAGON [redacted] in unexpended FY 68-70 funds) in order to change our satellite photography mix.

What does [redacted] buy for us?

1. Search. Four HEXAGON will cover 60-80 million square nautical miles annually; seven CORONA cover 54-63 M sq. N. Mi. HEXAGON search at higher resolution, but generally, task of searching for new systems would be performed equally well by both.

2. Surveillance. Commencing July 1969, longer-life (14-18 days) GAMBIT will provide 40-80% more camera actions per mission, and can provide required coverage with four or five of the longer missions. It appears that current surveillance mission could be performed equally well by either option (4 HEXAGON/4 GAMBIT or 7 CORONA/4 or 5 GAMBIT).

3. Intermediate-Resolution Surveillance. Difference between the two options is thus whether it is worth [redacted] to have HEXAGON perform a new task (while simultaneously searching) rather than have that same task performed by two to three long-life

GAMBIT missions not needed for the current surveillance task.

- Major debate about HEXAGON's effectiveness turns on its utility for photographing ground forces, their installations, and their movements.

1. Important during crisis periods.

2. A few low-priority Soviet/Chinese ground force targets are not now covered by seven short-life GAMBIT missions.

3. GAMBIT now covers 1964 major ground force targets: 1083 annually and 322 quarterly.

4. A few large ground force installations cannot be covered by GAMBIT in one pass; thus HEXAGON could offer some improvement in, say, vehicle counts (although vehicle counts are thought to be quite good already).

5. HEXAGON can provide more coverage of ground force units than GAMBIT, but at a lower resolution. It is

not clear whether this will be more positive than negative in assessing manning levels, since HEXAGON sees indicators more often than GAMBIT, but not as clearly.

6. HEXAGON is clearly superior to GAMBIT for detecting unit movements, crisis or otherwise, but information is not available to decision-makers for several days, and cloud cover can be a problem for a satellite. Drones are available for crisis reconnaissance.

Finally, using four HEXAGON and four GAMBIT launches annually, there will be only 175 days of coverage versus 230 days of coverage with seven CORONA and seven GAMBIT annually. To have a 90% probability that a HEXAGON would be aloft when a crisis began would require seven launches annually.

- HEXAGON might produce coverage of small, mobile ICBM's, which CORONA could not. But these could be detected by GAMBIT sampling of railroad yards and other transportation modes; a mobile ICBM in any significant

numbers would require one or more large support bases. HEXAGON would allow more precision about the number of such weapons, but this information would be marginally valuable to force planners. Photograph of a mobile system would not be useful since it could not be targeted.

Recommendation. If savings in FY 70 are necessary, HEXAGON's 1970 costs and its marginal utility make it a likely candidate for termination. Crucial U. S. intelligence objectives suffering from its termination are hard to find. The FY 68-74 costs are about [redacted] If FY 70 savings are not crucial, the conservative decision would be not to terminate, since HEXAGON may conceivably yield intelligence whose value we do not yet recognize.

DRONES

BoB (BYE 11699-68)

- Terminate the 154 drone as soon as possible and save $25M, rather than buying the 20 now scheduled (with delivery of last drone in November 1970).

- Buy 12 147-T drones in FY 70 vice 24 and save $6.8M, while providing full reconnaissance coverage of North Viet Nam through FY 70, even if SR-71 flights are suspended. Buying 12 (instead of 24 new scheduled) will avoid an excessive inventory if hostilities end.

- Buy 120 147-S drones in FY 69 vice 186 programmed and 90 in FY 70 vice 156 programmed, at a savings of $35.8 million. This will provide for 100 percent coverage of NVN if manned tactical reconnaissance (RF-4's) is continued, and 90 percent coverage if manned reconnaissance is discontinued, and avoids building an excessive inventory.

Secretary of the Air Force: (BYE 66791-68)

147-T: Buy 36 drones in FY 70.

Current SR-71 sortie rate appears to be maximum attainable due weather. Therefore impractical to expect increase to 110 sorties annually.

147-S: Buy 240 drones in FY 70.

Provides least costly means to build a hedge against loss of manned tactical reconnaissance south of 19°N, and builds inventory during hostilities.

154: Keep program alive; buy 12 drones per year after delivery of 20 now contracted for.

Program should be kept alive (better camera, better survivability, growth potential); continued production for at least 2 years is required to give reasonably flexible force level.

Chairman, Joint Chiefs of Staff: (JCSM 728-68)

147-T: Buy 36 drones in FY 70.

Weather limits SR-71 sorties to about 68 per year, therefore planning on increasing SR-71 sorties over

NVN to 110 per year is impractical. Therefore only feasible option is to plan on current high altitude drone sortie rate, with losses of 24 per year.

147-S: Buy 240 drones in FY 70.

Build inventory at rate of seven per month during hostilities, which provides hedge against loss of manned tactical reconnaissance south of 19°N by March 1970. Lower cost ($104.8M) than Option 3 ($150.8M), which provides hedge by August 1969.

154: Keep program alive. Buy 12 drones per year after first 20 delivered.

Case for or against continued production of 154 drone should not be based only on predicted attrition and replacement costs. Analysis assumes that target coverage from 147-T or 154 is equally satisfactory/useful to photo interpreter. This is not valid since 154 optical bar camera has twice as good resolution as 147-T camera. Precise identification (discrimination within target type of known types) and target description (exact size and

dimensions, detailed layout, analysis of components, construction details) each require one-foot resolution, which 154 provides and 147-T does not. Growth potential of 154 is high, adding possibility of improvement in survivability. Consideration of above factors makes it appear logical to continue production at present rate until operational experience is gained and program can be reviewed.

DDR&E

Needs to know if 147-T camera can be replaced by 154's optional bar camera, and needs examination of TAGBOARD program to determine whether or not it will be used in actual operations. Cannot make valid choices of options until this data received.

Submits following comments:

147-H losses over China may all have been caused by MIG's, which raises 147-T attrition factor. Much better camera in 154 provides 100% of precise identification requirements and 61% of description requirements, while 147-T provides

61% and 4% respectively 154 thus much more effective and hence more cost-effective. 154 also has greater swath width (45 nm) than does 147-T (25 nm). The 154 has greater growth potential, while 147 series has been modified and improved to its practical limit. Cost figures shown ($1.5 M per unit) are too low; $2.0M is probably better figure, giving 147-T decided edge over 154 in cost per target covered. If it is assumed that 154's will not be replaced, however, 154 system becomes least costly of all systems. If an SR-71 is shot down, a re-evaluation of use of entire SR-71 system will be required.

ASD(SA):

147-T: Buy 24 drones in FY 70.

Increased SR-71 sortie rate results in fewer drone losses; builds up inventory during hostilities as hedge. BoB option builds lower inventory, thus allowing fewer for special missions and new contingencies upon loss of manned tactical reconnaissance in NVN.

147-S: Buy 156 drones in FY 69 and FY y0 each.

Does not add to inventory already provided by conversion of 52 147-NC drones. Provides smaller hedge against loss of manned tactical reconnaissance south of 19°N than approved program, but larger than BoB proposal. BoB proposal results in zero inventory if 100% coverage in current operations in maintained.

154: Terminate program after 20 drones now on order are delivered.

Nothing has happened which should change last year's decision to discontinue 154 production. The drone is currently planned for use only against South China. If Air Force attrition estimates are correct, then 20 drones now programmed will provide 2 1/2 years of effort. If Air Force estimates are incorrect, then 147-T drones are more cost-effective, but 40 per year would be required for South China. The 154 is more adaptable to changes in air defenses, but these changes aren't expected prior to the late 70's. If changes occur sooner, then the production line can be re-opened.

Further investigation is required to ascertain amount of cost over-run, size of savings, and number of drones lost through early termination of contract. No recommendation can be made on early termination until these facts are known.

Director, NRO: (BYE 13589-68)

147-T: Buy 36 drones in FY 70. Rationale is same as Secretary of the Air Force.

147-S: Buy 240 drones in FY 70. Rationale same as Secretary of the Air Force.

154: Continue program at 12 per year after first 20 are delivered.

It is not sound to use a single point value, assumed valid for all time, for drone and aircraft attrition. Experience shows how variable attrition can be. Does not concur that only interceptor capability to be considered is that encountered in China (essentially MIG-19s). Against advanced interceptors 154 could well remain invulnerable,

while 147's probability of survival could drop to 0.5 or lower; advanced interceptors are in production in Soviet Union and may be expected to be encountered anywhere it suits the Soviets. 154's camera has higher resolution and swath width. 154 is less vulnerable to SAM attrition. Finally, must consider a plausible range of tactical and political situations, not just one fixed situation.