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CONTROL SYSTEMS JOINTLY

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AFCCS

14 MAY 1969

MOL

Secretary of the Air Force

1. As you know, the MOL program is presently undergoing budget review and questions have been raised concerning the requirement to operate the MOL as a manned system. I am concerned that budgetary decisions affecting the MOL may be made without a full appreciation of the unique contribution this system can make to negotiations with the Soviet Union on strategic arms limitation, a matter which President Nixon has indicated will have high priority in his administration. Several actions are already underway to prepare the U.S. position for such negotiations: the strategic forces study required by NSSM #3 and the study of alternative options for the U.S. negotiating position required by NSSM #28 are scheduled for NSC review this month. Therefore, I believe this is an appropriate time to insure that individuals at the highest level are made aware of the MOL's potential role in arms control.

2. A Special National Intelligence Estimate (SNIE 11-13-69) has been prepared on the subject of our ability to verify Soviet compliance with the various limitations which might be included in an agreement. Although we agree generally with the SNIE, we note that it does not make explicit the degree to which the judgments expressed are dependent upon advanced collections systems which are not yet in operation; among these would be the MOL. The SNIE does indicate that our capability will improve as the result of advances in satellite photography; however, no distinction is made between the new search system (KI-9) and the very high resolution spotting camera which will be a major feature of the MOL. Dr. McLucas has discussed this subject with Mr. Helms in an attempt to have the SNIE expanded or amended to provide more detail on the collection systems which will constitute the basis for our unilateral verification capability. Mr. Helms has not taken such action; therefore, we believe additional steps should be taken to focus attention on the capabilities of the MOL.

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3. The MOL represents a major advance in satellite photo technology. Its camera and optical system (KH-10) will provide photos with ground resolution of [REDACTED] enabling us to detect the technological advances by which the Soviets could attempt to alter the strategic balance, in violation of an agreement or in areas not covered by the agreement. In an era of agreed arms limitation, it will be especially important to have timely and accurate data on Soviet research and development, since it is impossible to predict all of the scientific and technological developments which could render an existing arms agreement meaningless. No system other than the MOL can provide a comparable photographic capability.

4. I am sure you agree that special emphasis should be placed on the fact that the MOL is essentially a manned system. Although it can be argued that the fundamental design objective of photography with [REDACTED] ground resolution can be achieved with MOL operating automatically, the crew is essential for assuring that MOL's high-gain optical system, with its inherently narrow field of view, will be accurately aimed and focused on intended targets. The crew also provides flexibility in target selection, the potential for real-time readout and an important capability to work around multiple equipment failures. It is the man in MOL who provides the confidence that we will achieve the designed capability on every flight and therefore assures that this sophisticated system can play a vital role in verifying arms limitation.

5. The MOL's reconnaissance role is a subject which may be considered in the report of the President's Space Task Group. However, it appears that the budget review as well as the preparation for arms limitation talks may produce decisions impacting vitally on the MOL program before the Space Task Group presents its recommendations. Therefore, I believe that it is important that the Secretary of Defense, and if you judge it appropriate, the President be apprised of the unique values of the MOL's potential contribution to an arms limitation agreement.

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6. Attached for your use are point papers summarizing some of the values of very high resolution photography and the role of man in the MOL.

signed
J. W. McCONNELL, General, USAF
Chief of Staff

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1. Point Paper, subject:
Man in the MOL.
 2. Point Paper, subject:
Very High Resolution
Photography and Arms
Limitation.

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POINT PAPER

on

MAN IN THE MOL

- MOL is designed as a manned system.
 - The camera and optical system could be placed in orbit and operated automatically, but this would result in degradation of the overall system capability and reliability for reasons outlined below.
- Manned MOL will always get best resolution.
 - Pointing
 - The high gain optical system which makes possible very high resolution photography has an inherently narrow field of view (approximately 9,000 feet).
 - Narrow field of view puts premium on pointing accuracy.
 - With man aboard, pointing error can be limited to 200 feet, or as precise as 30 feet if necessary.
 - Without man, pointing error is approximately 2,000 feet.
 - Tracking
 - Accurate compensation for the relative motion of the MOL with respect to the target is vital to achieving high resolution photos.
 - On-board computer commands will provide most of the correction.
 - In the automatic mode, vernier adjustment for motion compensation depends on the image velocity sensor (IVS).
 - Manual tracking is superior to the IVS, even when IVS functions properly.

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----- There is some developmental risk in the IVS and it may malfunction frequently during early flights; the crew provides manned back-up.

-- System Fine Tuning

--- The crew will verify proper camera focus and make adjustments if automatic focus devices are malfunctioning.

----- Crew verifies focus by processing exposed film in on-board film processor and assessing results with on-board film viewer.

--- For optimum exposure, the crew controls camera exposure settings manually after viewing scene and scene contrasts.

----- In automatic or unmanned mode, exposure is calculated on the ground for nominal conditions expected in target area. Exposure setting is then varied either side of the nominal value in subsequent frames of the same scene to compensate for uncertainties. Unmanned system can not recognize and compensate for cloud shadow, high contrast, haze.

----- Exposure error of one stop causes up to a 20% degradation in resolution.

- Manned system can be targeted against very specific objectives.

-- Within a target complex there are often many individual targets, e.g:

--- More than 40 separate targets within Soviet test center at Tyuratam.

--- Loading pits at both ends of the 12,000 foot runway at China's Lop Nor test center.

-- Only a manned system, with high pointing accuracy, can be targeted against the specific point of interest.

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- Target location data is often inaccurate (errors of $\frac{1}{2}$ mile or more) and our ephemeris prediction capability is limited by in-track error of approximately 5-6,000 feet (should improve to about 2,000 feet).
- Therefore, some targets will not be framed at all in automatic mode; many targets will not be centered in MOL's 9,000 foot field of view.
- Manned system has flexibility to select alternate targets
- Without man, a significant portion of photo capacity will be wasted on cloud-covered targets.
- Weather uncertainties require that unmanned systems photograph important targets on several separate passes to increase probability of obtaining usable photos
- MOL crew will achieve 20-25% more cloud-free pictures daily by selecting alternate targets, and know with certainty whether or not specific targets have been photographed.
- Vital intelligence often results from opportunities to observe transient situations: construction, open silos, silo loading, test pad activity.
- An unmanned system is incapable of selecting alternate targets to take advantage of momentarily increased intelligence.
- Two astronauts, together, will be able to view the primary target and an average of 3 alternate targets before each photo sequence.
- The MOL crew can double or triple the rate of acquisition of such time-sensitive photography.
- The quality of the intelligence product obtained with the MOL will be enhanced by man's ability to insert special film (color, infra-red, etc.).
- The crew provides the capability for real time or near real time read out on visual observations and on image interpretation.

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- High confidence in manned system operation

- The MOL crew will increase significantly the overall system reliability.
- Man provides greater confidence in getting a useful product at the outset. Man can adjust, diagnose, and evaluate camera and spacecraft performance.
- The non-rigid MOL optical system must be clamped down for launch and re-aligned after orbit is achieved.
- Manned alignment is superior to automatic alignment.
- Conduct "health" checks on focus, exposure, alignment, etc. throughout mission.
- The crew will be able to work around multiple system failures which could cause mission failure in an unmanned vehicle.

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POINT PAPER

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VERY HIGH RESOLUTION PHOTOGRAPHY AND ARMS LIMITATION

- Satellite photography, which is essential for external policing of any arms limitation agreement, is obtained by two essentially different reconnaissance satellite systems.
 - Search system, with broad area coverage, provides information on numbers and locations of weapons
 - presently KH-4, providing coverage of a ground track 120 miles wide, with optimum ground resolution of 7.5 to 10 feet.
 - by mid-1970's the KH-9, covering a ground track 285 miles wide with 2.5 foot optimum resolution.
 - Spotting system, with high resolution camera, provides detailed photography necessary for qualitative analysis of weapons.
 - presently KH-8. with optimum ground resolution of approximately [REDACTED].
 - mid-1972 KH-10 (MOL) will provide optimum ground resolution of [REDACTED].
- The very highest resolution achievable is a vital element of an arms limitation verification system.
 - Only very high resolution photography can detect and identify the many technological improvements and covert weapon substitutions by which an opponent might attempt to alter the strategic balance in violation of an agreement or in areas not covered by the agreement.

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--- high confidence dimensional data is essential for estimating basic weapon characteristics: re-entry vehicle weight, warhead yield, range, gross vehicle weight.

--- Research and development and weapons substitutions could proceed without adding new sites.

---- would probably not be detected without very high resolution photos.

- For example:

-- New re-entry vehicles (RV's) can provide a greater yield, improved accuracy, greater maneuverability, reduced radar cross section, better ECM capability.

--- Our present spotting camera (KH-8), with ground resolution greater than [redacted] permits us to identify only 20% of the external observable characteristics of an RV; with [redacted] resolution (MOL system), we could identify 75% of the external observables.

-- More sophisticated ICBM/MRBMs deployed in place of older missiles would not be detected by search cameras or even by the KH-8 spotting camera.

--- Improvements could include Fractional Orbital Bomb, Depressed Trajectory Missile, MRV, MIRV

--- Very high resolution (MOL) photography would permit high confidence assessments of missile systems at the earliest possible time.

---- saving as much as one to two years of analysis effort.

----- e.g: very high resolution (MOL) photography would increase confidence in our estimates of the SS-13 as follows:

	% Confidence	
	<u>Current</u>	<u>With MOL</u>
Range	30%	80%
RV Weight	30%	75%

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- Upgrading SAM's to ABM's is a potentially serious violation not detectable without very high resolution photography.
- Our estimate of the SA-5 (TALLINN) missile could have been made with greater confidence 5 years sooner with very high resolution photography.
- A key element in identification of a defense system such as the SA-5 is analysis of associated electronic systems.
 - role of BEER CAN radar, originally associated with Leningrad ABM complex, has never been defined because of lack of detail on feed structure.
 - radars associated with SA-5 have still not been photographed with resolution adequate for analysis and evaluation.
- Anti-Submarine Warfare (ASW) developments (even though not prohibited by agreement) could seriously affect the strategic balance by increasing the vulnerability of our Polaris force.
- Soviet's first guided missile helicopter carrier entered the Mediterranean in September 1968 with new systems (anti-submarine missile and a dipping sonar) which had never been seen before.
 - although these systems were under development for several years, the resolution of existing satellite photography has not been sufficient to evaluate or even detect these new systems
 - MOL photography would probably have detected the systems at an R&D facility 2 or 3 years earlier.
- Entirely New Weapons Systems
 - Agreement to limit specified weapons puts premium on research and development
 - New weapons not covered by an agreement may render the agreement meaningless.

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----- Such developments must be detected and evaluated before deployment begins.

----- Elaborate, apparently weapons-related complexes, have been located in both the Soviet Union and Communist China; resolution of available photography is inadequate for determining the role of these complexes.

- Evidentiary Value

-- If the Soviets are detected violating the agreement or

-- If the Soviets develop new weapons not prohibited by the agreement but which seriously threaten the strategic balance

--- The President would need the highest confidence and the most irrefutable evidence prior to taking appropriate military or political action

----- Very high resolution photography would be invaluable.

- In summary, photographic systems for verification of arms limitation must provide:

-- broad coverage, to detect new deployments.

-- the highest achievable resolution.

--- to identify and evaluate scientific and technological advances.

--- to provide photo signatures for use in interpreting search photos.

--- to provide evidence to support Presidential decisions.

- The MOL system, combining a very high resolution optical system, and the inherent advantages of a manned space system, represents a significant forward step in satellite photography.

-- and provides the basis for greatly increased confidence in the viability of any agreement on arms limitation.

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