August 17, 1966

MEMORANDUM FOR RECORD

SUBJECT: Briefing to PSAC on MOL

At the request of Dr. Steininger from OST the Overhead Reconnaissance Panel of PSAC heard a briefing on the comparison of MOL and unmanned DORIAN reconnaissance systems. The briefing was held in the Executive Office Building on 13 August between 1030 and 1700 hours. It was preceeded by a short resume on the results of the recent successful GAMBIT 3 mission. The briefing was given in the following order:

General Evans - - - - - - - - -	Introduction
Mr. Michael Weeks - - - - - - -	MOL Baseline
Mr. Samuel Tennant - - - - -	Wholly Unmanned DORIAN System
Dr. Leonard/Mr. Pierson - - -	Manned/Automatic and Automatic Systems Analyses

A copy of the briefing charts used in the presentation is on file in SAF-SL.

Representing the PSAC panel were Dr. Land, Chairman; Dr. J. Baker; Dr. D. P. Ling; Dr. A. Puckett; Dr. J. Shea; and Dr. N. Garwin.

The Bureau of the Budget was represented by Messrs. Thomas and Fisher.

Dr. D. Steininger was the host from OST.

The Department of Defense was represented by Mr. John Kirk and Mr. Samuel Koslov.

In addition to the primary briefers, in attendance were: Dr. Flax, General Stewart, General Berg, Dr. Yarymovych, Colonel Carter, and Colonel Battle.

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Mr. Weeks' presentation on the baseline MOL passed uneventfully. The reference to our plans for electronic readout was not challenged. Dr. Land was satisfied to see a well-designed automatic mode vehicle in the baseline MOL concept. The concept of complete automaticity, even in the manned mode, and insistence on reliability through redundancy rather than extensive on-board manual maintenance, was very well received by the Panel and complimented, especially by Dr. Shea.

Mr. Tennant's presentation was also well received although it prompted extensive discussion. Mr. Tennant, in describing the various automatic devices necessary for achieving [redacted] resolution in an unmanned fashion, left the impression that we were indeed working very hard on perfecting these devices and that although there were no problems in the feasibility and principle of achieving our resolution and automaticity goals, serious development problems still remained.

The subject of reliability, which was addressed by Mr. Tennant and extensively discussed by the Panel, led to some very significant statements at the end of the briefing. Mr. Tennant demonstrated, and after some discussion apparently convinced the Panel, that after reaching a certain level of reliability it was not very useful to proceed to increase basic reliability further, but rather one should add expendables in such a way that vehicle life time on orbit could be increased--thus, increasing the mean mission life.

Dr. Shea, supported by Dr. Puckett, expressed very much the opinion that the concept of random failures is rapidly disappearing since we are learning more and more about failure mechanisms and thus can engineer around any potential trouble spots. Although the Chairman did not formally acknowledge the stipulation, it was clearly implied by Dr. Shea and Dr. Puckett that this level of maturity is only achievable at a cost and motivation which is representative of a manned program like Apollo or a program subject to high public scrutiny like Surveyor. This discussion led to an expressed opinion by the Panel that probably a new era in space flight has arrived where the old statistical method of calculating reliability is no longer valid and that it is quite reasonable to expect automatic systems to work in space for prolonged periods of time considerably in excess of 30 days.

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Dr. Leonard's presentation was geared toward establishing relative effectiveness factors of manned and automatic versions of MOL and the wholly unmanned concept of DORIAN. The fact that man could perform a better function in weather avoidance was not challenged. Target photography verification, however, was not accepted as being an additional benefit to man's presence, because Dr. Garwin struck upon the idea that the ITEK mechanism of the image motion sensor lent itself very well to the verification task by means of recording the output from the sensor.

Dr. Leonard's major thesis for manned advantages rested upon his ability to detect active indicators and thus enhance intelligence content by increasing the number of special photographs taken on a mission. The Panel was interested in this concept but did not accept it fully, primarily for the following reasons.

It was not at all clear to them that the laboratory simulations done until now were sufficiently representative of the real viewing conditions, particularly because of contrast enhancement possible with film. Thus, one could not determine whether man could, indeed, perform the necessary discriminating function in the 10 seconds allotted to him. It was suggested that if we are to pursue the thought of special photography any further that we embark upon an extensive aircraft simulation program, or even possibly try to introduce some active indicator searching tasks into the earth orbital flights of Apollo.

Doubt was expressed whether our present design of a 5-inch Acquisition and Tracking Scope was sufficient to spot active indicators. It was suggested that a 15-inch aperture might be closer to what is required. In this area we were not well prepared to entertain a discussion, and it became quite obvious that a systems analysis and design effort in this area needs to be accelerated. Dr. Land speculated that the capability provided by such direct viewing high-powered telescopes, as now being necessary for special target identification, could be an added benefit in increasing man's contribution to improved intelligence collection.

When comparing the manned/automatic MOL with the wholly unmanned system, the point was made that actually a direct comparison is not possible, because of the various ways of using the two systems. The basic wholly unmanned system used for comparison was patterned around the 5-segment Titan III capability, and therefore limited to a 35-day life, which when degraded by the lower reliability of the unmanned system was really equivalent in terms of the number of mean mission

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days to the manned version of MOL. It was pointed out to the Panel that on the basis of special photographs, the manned system was vastly superior. The automatic version of MOL was presented as one that emerges from the same basic 30-day system but utilizes the excess booster capacity provided by the 7-segment Titan III after removal of the Gemini to achieve a lifetime of up to 65 days by carrying more expendables. Although not presented at the briefing, the Panel extensively discussed a single version of the wholly unmanned system which would be flyable on a 7-segment Titan III. The impression was that there was hardly any difference in design between the two 7-segment systems with respect to technical approach, performance and system reliability, and only a small difference in development and recurring costs.

Based on the previous discussions of reliability, it was readily conceded that a 60-day system is quite feasible and because of cost effectiveness highly desirable. The Chairman of the Panel made it quite emphatically clear that he is expecting the automatic mode of the MOL to be designed in such a way that a 60-day lifetime is achievable. The Panel concluded that on the basis of these large and long duration systems the question of man's presence or absence was not so important. At this point, there was some objection from the representatives of the BOB that the contractor quotations on MOL were significantly in excess of the AF cost estimates, and therefore the cost disparity between the two approaches might be significant. These objections were dismissed by the Panel with expressions that this statement might apply equally well to the unmanned system.

In addition to Dr. Shea's earlier statement that manual maintenance and the necessary accessibility may compromise the performance of automatic devices more than it would help total system reliability, the question of overall reliability of man in the system was raised by Mr. Koslov. Although Dr. Shea stated that he was 95% sure that man could stay in space for 30 days, Mr. Koslov appeared unconvinced. Dr. Steininger suggested that a biomedical panel of PSAC examine our activities in the area of assuring man's well being on orbit.

A brief discussion followed the questions on man's capability to withstand 30 days of weightlessness and the subject of the possibility of preserving the vehicle and the mission in spite of the need for abort of the crewmen. This subject needs further examination.

Dr. Land summarized his opinions with the statement that the Panel wants assurances that as a matter of national need, an unmanned reconnaissance capability be provided. Man may not be able to go on these missions because of political reasons. Dr. Land does not care if the

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Air Force puts man in the system for some mission enhancement, which he is quite willing to accept as fact; but it should never be done at the expense of compromising the stated need -- unmanned reconnaissance capability. The Panel was anxious for us to proceed with the various studies necessary to answer the questions raised, but they also were adamant that we should not hold up any contractual proceedings while these questions were being settled.

MICHAEL I. YARYMOVYCH
Technical Director
MOL Program

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[redacted] DORIAN SECOR. FOR GEN BERG FROM GEN EVANS. THIS MESSAGE IN 4 PARTS. PART I. PROPOSED AGENDA FOR PSAC HAS BEEN REVIEWED BY MYSELF AND DR. FLAX AND THE PRESENTATION OUTLINE BELOW HAS BEEN ADOPTED. EACH OUTLINE ENTRY REPRESENTS SUBJECT MATTER TO BE ADDRESSED, AND NOT INDIVIDUAL BRIEFING CHARTS: (A) INTRODUCTION, DR. FLAX, 5 MINUTES. (B) PROGRAM STATUS, M/G H.L. EVANS, 15 MINUTES: (1) GENERAL PROGRAM GOALS; (2) SPECIFIC PROGRAM OBJECTIVES; (3) GENERAL CONTRACTOR STRUCTURE - NEW GE/EKC/DAC RELATIONSHIPS TO BE SHOWN; (4) CURRENT PROGRAM SCHEDULE - MAJOR MILESTONE EVENTS SINCE AUGUST 1965, INCLUDING DATES OF PROGRAM APPROVAL, START AND FINISH OF COP BY EACH OF THE MAJOR CONTRACTORS, COP, ETC.; (5) FUNDING STATUS. (C) BASELINE MOL. W.F. SAMPSON, 20 MINUTES. THIS SECTION SHOULD BE A BRIEF, CLINICAL, TECHNICAL DESCRIPTION: (1) GV BASELINE - GENERAL DESCRIPTION; (2) GEMINI B - GENERAL DESCRIPTION, WITH BRIEF REFERENCE TO MSQ FLIGHT; (3) LABORATORY MODULE - GENERAL DESCRIPTION; (4) LABORATORY SUBSYSTEMS - BRIEF DESCRIPTION OF MAJOR SUBSYSTEMS; (5) MISSION MODULE - GENERAL DESCRIPTION; (6) OPTICAL PAYLOAD - DETAILED DESCRIPTION, BRIEF STATUS OF CROSS FORMAT INC, IMAGE MOTION SENSOR, FOCUS SENSOR; (7) PAYLOAD OPERATING CHARACTERISTICS - MANNED, "HANDS OFF AUTOMATIC," UNMANNED AUTOMATIC; (8) BASIC SYSTEM CAPABILITIES; (9) BOOSTER; (10) ASCENT CONTROL; (11) ON-ORBIT CONTROL; (12) ORBIT ALTITUDE CONTROL; (13) RECOVERY OPERATIONS. (D) UNMANNED SYSTEM, S. TENNANT, 45 MINUTES. THIS SECTION SHOULD BE PATTERNED AFTER TAB A ENTITLED "STUDIES OF UNMANNED DORIAN SYSTEM" ATTACHED TO THE PROPOSED MEMO FOR DORAE, SUBJ: "MOL VERSUS AN EQUIVALENT WHOLLY UNMANNED SYSTEM." A COPY OF THIS DOCUMENT HAS BEEN FURNISHED TO SAFSL-1; (1) SYSTEM DESCRIPTION; (2) DEVELOPMENT PROGRAM; (3) OPERATIONS ANALYSIS; (4) DEVELOPMENT RISKS; (5) RELIABILITY; (6) COSTS. (E) BASELINE MOL EFFECTIVENESS FACTORS. B. P. LEONARD, 1 HOUR, 45 MINUTES; (1) INTRODUCTION - SUBJECTS TO BE DISCUSSED OUTLINED; (2) BASIC CREW FUNCTIONS - BRIEF DISCUSSION OF PRINCIPAL ACTIVITIES; (3) RELIABILITY, DEVELOPMENT RISK, MISSION SUCCESS; (4) NEW DEVELOPMENTS - PREFORMANCE REQUIRED, COMPARE WITH CURRENT STATE-OF-ART PREFORMANCE (IF ANY), DETAILED STATUS, CONFIDENCE IN

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ATTAINMENT OF REQUIRED PREFORMANCE OF THE PRINCIAPL DEVICES AND SUBSYSTEMS ESSENTIAL TO EFFECTIVE MISSION PERFORNANCE; (5) ADAPTATION OF EXISTING DESIGNS AND SUBSYSTEMS; (6) BASIC RELIABILITY PROJECTIONS - DISCUSS HOW ARRIVED AT, BASIS FOR PROJECTIONS, COMPARISON WITH OTHER SYSTEMS, NASA MANNED SPACE FLIGHT EXPERIENCE; (7) INFLIGHT MAINTENANCE - TROUBLESHOOTING, ADJUSTMENT, REPAIR, REPLACEMENT; (8) MAINTENANCE OF MISSION PERFORMANCE - WORKING AROUND, SWITCHING, OR OVERRIDING MALFUNCTIONING EQUIPMENT; (9) MAINTENANCE OF MISSION PERFORMANCE - MODES AND PERFORMANCE WITH CUMULATIVE SUBSYSTEM DEGRADATION; (10) ASSESSMENT OF MAN'S ROLE IN SYSTEN DEVELOPMENT; (11) MISSION ORIENTED CREW FUNCTIONS; (12) TARGET ANALYSIS - DISCUSS FIELD OF VIEW, COMPARE WITH G, G CUBED, USE DAVE PIERSON'S MATERIAL, EMPHASIZE PREMIUM ON CAREFUL TARGET SELECTION, AND OPTIMIZATION ON TECHNIQUES TO EXTRACT MAXIMUM INTELLIGENCE; (13) TECHNIQUES FOR INCREASING CLOUD FREE TARGET PHOTOGRAPHY; (14) VERIFICATION OF TARGET PHOTOGRAPHY; (15) SELECTION OF ACTIVE AND TRANSIENT TARGETS; (16) FIELD OF VIEW AND RESOLUTION OF ACQUISITION AND TRACKING SCOPES; (17) TYPICAL ACTIVE INDICATOR TIMELINE; (18)VISUAL RECONNAISSANCE - GROSS CAPABILITIES, CONTRIBUTION TO OVERALL INTELLIGENCE VALUE OF VISUAL "NON-SELECTION" OF A TARGET WHEN OPERATING IN "ACTIVE
INDICATOR MODE;" (19) TIMELINESS OF DATA RETURN - DISCUSS WIDEBAND READOUT; (20) OTHER BASELINE MOL APPLICATIONS; (21) CRISIS SURVEILLANCE- DISCUSS ACCESS TO SANCTUARIES," ORBIT ALTERATION TO PROVIDE FREQUENT REPEATED COVERAGE - BROADENED FIELED OF VIEW AND AREA ACCESSIBLE AT HIGHER ORBIT ALTITUDES; NO REDUCTION IN MISSION DURATION; (22) [redacted] (23) PLANETARY ASTRONOMY; (24) BASELINE IMPROVEMENTS - SUCH AS CER-VIT, EPS; (25) EPS - ELINT POINTING SYSTEM - DISCUSS ADDITION OF EPS TO POINT OPTICS TO ACTIVE EMITTERS, DRAW ANALOGY OF ACTIVE EMITTER AS AN ACTIVE INDICATOR, DISCUSS INHERENT CAPABILITY OF EPS TO DO SOPHISTICATED SIGNAL ANALYSYS, USEFUL DURING NIGHT OR CLOUD COVERED PASSES; DISCUSS [redacted] (26) OTHER MISSION APPLICATIONS - DISCUSS OCEAN SURVEILLANCE. (IF) SYSTEN COMPARISON SUMMARY - COL C. L. BATTLE, 45 MINUTES: (1) RELIABILITY AND PROBABILITY OF MISSION SUCCESS; (2) THE VALUE OF CLOUD FREE PHOTOGRAPHY; (3) REAL TIME VERIFICATION OF TARGET PHOTOGRAPHY; (4) THE VALUE OF ACTIVE TARGETS COLLECTED; (5) TIMELY DATA RETRIEVAL; (6) SUMMARY OF CAPABILITIES. PART II. PREPARATION SHOULD BE MADE TO RESPOND TO EXTENSIVE QUESTIONING ON LIFE SUPPORT, CONFIDENCE IN MAN'S ABILITY TO FUNCTION EFFECTIVELY AND WITHOUT HARM FOR 30 DAYS, AND WHY; AND IMPLICATIONS OF RECENT SOVIET LONG DURATION FLIGHTS WITH DOGS. BACK-UP BRIEFINGS SHOULD BE PREPARED TO ADDRESS THIS SUBJECT IF CONSIDERED NECESSARY. PART III. SECTION A-INTRODUCTION; SECTION B-PROGRAM STATUS; AND SECTION F-SYSTEM COMPARISON SUMMARY WILL BE PREPARED BY THIS OFFICE ON THE EAST

COAST, TOGETHER WITH AN AGENDA CHART. SECTION C-BASELINE MOL SHOULD BE KEPT BRIEF, WITH THE PRINCIPAL PURPOSE OF ORIENTING PSAC TO THE CURRENT CONFIGURATIONS. PART IV.
CURRENT TENTATIVE SCHEDULE CALLS FOR ONE SESSION 1500-1700, MONDAY, 1 AUGUST DURING WHICH SECTIONS A, B, C AND D WILL BE COVERED. SECOND SESSION FOLLOWS 0900-1200, TUESDAY, 2 AUGUST DURING WHICH REMAINING SECTIONS E AND F WILL BE COVERED. YOU WILL BE ADVISED ASAP OF ANY CHANGES. DESIRE BRIEFING TEAM AND MATERIALS BE PRESENT MOL PROGRAM OFFICE, ROOM 50227, PENTAGON, 0830 SATURDAY, 30 JULY 1966 FOR REVIEW OF PRESENTATIONS AND FINAL PREPARATIONS. DR. FLAX DESIRES TO DRY RUN ONLY SECTION F-SYSTEM COMPARISON SUMMARY.
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