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5 September 1967

MEMORANDUM FOR RECORD

SUBJECT: PSAC Review of MOL Program

The Reconnaissance Panel of PSAC conducted a review of the MOL Program on 29 August 1967. The meeting took place at the offices of Dr. Land, Chairman of the Panel, in Cambridge, Mass. A list of members of the Panel in attendance is shown in Attachment #1.

Representing the MOL and Gambit programs were various members of the DoD, Air Force, Aerospace Corporation, EK and GE. A list of attendees is shown in Attachment #2.

After a brief introduction by General Stewart, the program proceeded according to the Agenda shown in Attachment #3. The presentation material used during the review is available in SAFSL under separate cover.

The briefing on Gambit-3 was received with a considerable amount of discussion. Although it was scheduled to be completed in one hour and fifteen minutes, the Panel took more than two and one-half hours for the subject. The Panel was obviously displeased with the inability of the program to reach its expected goal of the program were traceable to the inability of the contractor to properly manufacture the stereo mirror, to test the optical quality during manufacture, and consequently to establish a well-defined plane of best focus. Although EK indicated that they expect to reach the required system performance within twenty flights, Dr. Land stated that at this stage he had little confidence in EK reaching that goal. He didn't see any indications that they knew how to get there. This impression was slowly dispelled as the briefing progressed and the testing capabilities offered by the Dorian program were more thoroughly understood.

The highlight of the Panel discussion was EK's demonstration of the plans and current activities in expanding their test facilities. Near the end of the review, when the subject

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of the Acquisition and Tracking Scope and its ability to aid the astronaut in seeing active targets was discussed, Dr. Land suggested that an image-enhancing device be added to the viewing scope so that the constrast ratio could be improved. If this device were to be incorporated, he believes the man in the MOL would, indeed, have become a useful contributor. In view of that, Dr. Land was much less negative on the use of man in the MOL than he was at previous meetings.

Rather than discussing the entire review in detail, it might be more appropriate to paraphrase some of the more significant questions and statements raised by various members of the Panel in a sequence following the Agenda. Most of the questions were factually and adequately answered on the spot and none required a return to the Panel with more detailed information.

Garwin to Quinn: What is the status of the focus sensor? Why didn't you stop the Gambit-3 program to improve the optical quality? Who made the decision to cancel G and to proceed on to G-3? This is a display of poor management for not having a planned slack in the program to allow for perfecting the product. (Later in the day Gen. Stewart provided a proper reply in terms of total NRP context, operational requirements and funding considerations).

Steininger to Stewart: Can the unmanned Dorian system be flown before the manned? When do you order the Support Module?

Land to Panel: We should remember that we are trying to improve a near-perfect product and that we have the best capabilities in the country gathered to solve these problems.

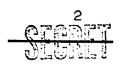
Garwin to Spoelhof: Why don't we conduct a Zero-G test by means of dropping the entire Camera Optical Assembly from a tall tower? Why don't we at least use parabolic flight in airplanes for optical testing?

Garwin to Passman: Why must we have a stiff beryllium structure? Why don't we put an accelerometer on the mirror to provide close loop control with a less stiff structure and thus save several hundred pounds?

Garwin to Passman: There is an inconsistency between two charts in which you show test results on bearing ripple under 1-G and 0-G conditions. (Difference between single set of test data and summary of all data.

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Garwin to Tennant: Can man track at light levels lower than the IVS? What is the residual IMC improvement provided by the IVS? How long does it take to capture a target while the structure is still in a settling process? The spatial frequency of the IVS which is listed at a minimum of 10 ft. and a maximum of 500 ft. is marginal at best. Isn't there a double focus created by the presence of the pellicle? Isn't the counter-rolling of the spacecraft in reaction to mirror roll causing a rotation of the image on the film which is not compensated?

Land to Tennant: In reference to Dr. Garwin's question on spatial frequency, the Panel would like to note that it is unhappy about the relationship of the IVS time constant and spatial frequency resolution. Can man see activity at low constrast? Have you simulated low constrast viewing conditions? Why don't you have a small TV in the ATS eyepiece to enhance constrast? Couldn't we add a delayed phosphor disc in one eyepiece to provide stereo viewing through the ATS?

Shea to Bernstein: Can't we use communications satellites to aid in diagnostic procedures and aid verbal reporting?

Garwin to Bernstein: What kind of devices does the astronaut have on board for aiding in the diagnostic process? He should have a lot of simple instruments -- like microscopes and viewers. Is it possible to have quartz elements in the Ross corrector? It would be a shame to miss a supernova while a large telescope like Dorian is in space.

Land to Stewart: It is most important that all effort be made to assure achieving resolution on the first flight of MOL. Certainly MOL should not be launched with a known optical quality deficiency just to satisfy a present schedule. (Gen Stewart and Mr. Kirk agreed).

<u>Post Script</u>: A subsequent discussion with Dr. Steininger revealed the following comments or opinions the Panel had after the briefers departed:

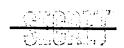
l. Dr. Purcell had additional ideas about Zero-G testing and would like to get in touch with someone from the program to discuss them. (Dr. Leonard has been requested to talk to Dr. Purcell).

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- 2. Dr. Steininger would like to be informed by a brief note to be written a few months from now on the status of the image-enhancing device suggested by Dr. Land and the Zero-G test concept suggested by Dr. Purcell.
- 3. The Panel has some doubt that MOL will, indeed, be able to produce resolution on the first flight.
- 4. The Panel is disappointed at the apparent lack of imagination that has so far been shown in using man in a diagnostic role. It is Dr. Steininger's opinion that, if pressed hard, Dr. Land would still maintain that man in MOL is not worth the cost.
- 5. The Panel is disappointed with the deletion of the Readout System since this action greatly reduces the utility and flexibility of the manned mode.
- 6. According to Dr. Steininger, Dr. Land will not write a report to Dr. Horning concerning the results of this review as he had done in the past.

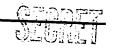
MICHAEL I. YARYMOVYCH Technical Director

MOL Program

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# RECONNAISSANCE PANEL OF PSAC MEMBERS IN ATTENDANCE

Dr. Edwin H. Land ----- (Chairman)
Dr. Edward M. Purcell

Dr. Sydney Drell
Dr. Marvin L. Goldberger
Dr. Richard L. Garwin

Dr. James Gilbert Baker Dr. Donald P. Ling Dr. Allen E. Puckett

Dr. Joseph Shea

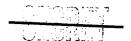
Dr. Donald H. Steininger- (Executive Secretary)

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### ATTENDANCE LIST FOR PSAC

#### 1. SAFSL

Gen Stewart Gen Bleymaier Dr. Yarymovych

# 2. SAFSS/SAFSP

Gen R. Berg Cdr Robert Geiger Col Bernard Quinn

# 3. DDR&E

Dr. Fink Mr. Kirk Mr. Koslov

#### 4. Aerospace

Dr. Leonard
Mr. Samuel Tennant
Mr. Harry Bernstein
Dr. Donovan

#### 5. EK

Herman Waggershauser Arthur B. Simmons John Sewell Stuart Lambers Charles Spoelhof

### .6. GE

Richard Passman John Gispan George Stocking A. G. Steinmayer

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### PSAC REVIEW OF MOL PROGRAM

# 29 AUGUST 1967

#### AGENDA

1. Review of Advanced Gambit Performance

a. Flight Results

Col B. Quinn (SAFSP)

b. Problems and Solutions

Mr. S. Lambers (EK)

2. Advanced Technology

Cdr Geiger (SAFSP)

a. Cer-Vit and ULE Status

b. High Speed Polishing Techniques

c. Large Advanced Optics

3. Program Status Summary

Gen Stewart (SAFSL)

a. Program Overview

b. Identification of System Segments

c. Contractors' Progress

d. Master Summary Schedule

4. Payload Status Review

a. Optical System Review

C. Spoelhof
(EK)

b. Work in Progress

J. Sewell (EK)

c. Testing and Manufacturing Techniques

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- d. Testing and Manufacturing Facilities
- e. Subsystems and Components
- 5. Tracking Mirror Control and Other Payload Systems
  - a. Tracking Mirror Bearing Desing Test, Validation and Subsystem Integration

R. Passman (GE)

b. Image Velocity Sensor

S. Tennant (Aerospace)

- c. Acquisition and Tracking Scope
- 6. Utilization of Man in Development Phase

M. Bernstein (Aerospace)

- a. Manned Diagnostic Techniques
- b. Active Target Selection
- c. Results of Static Simulations
- d. Aircraft Simulation

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