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MEMO FOR THE RECORD

12 NOV 1965

SUBJECT: PSAC Meeting, 8 November 1965

1. A meeting of the Reconnaissance Panel of the PSAC was held in Washington, D. C. on 8 November 1965 for the purpose of conducting a round table discussion on the general subject of manned and unmanned operational modes of the MOL/Dorian Program. Panel members present for this discussion included Land, Purcell, Shea, Garwin, Hornig, Thomas, Puckett, Baker, Goldberger, Golovin and Steininger. Fink and Koslov of DDR&E joined the meeting shortly after it got underway. In addition to Dr. Flax, the program was represented by Generals Martin and Berg, Dr. Leonard, Colonel Allen, and Lt Colonel Knolle. EKC personnel present were H. Waggershauser, A. Simmons, F. Oder, J. Sewell, and J. Collinge.
2. The meeting started at 1420 with opening remarks by Dr. Land. These remarks included the comment that although the committee was not responsible for the detailed technical aspects of the program they were responsible to see that it was carried out on sound technical grounds and that no technical "bluffers" were made. He also stated the desire that we have equally superb manned and unmanned system. That is, accepting the fact that there is going to be a manned vehicle. The question now is, how do we get a superb unmanned mode of operation. Following these opening remarks Dr. Flax and General Martin presented some general comments. General Berg presented the MOL schedule and general program planning information. Colonel Allen followed with a discussion of our present ad hoc committee effort for the investigation of the unmanned modes of operation. During this discussion questions were asked by Dr. Baker concerning the optical design and trade-offs between the size of the flat and primary mirrors for the present 70" X 70" design. He also discussed some of his work on a three mirror system and agreed to send EK a copy of his paper on this subject. In response to questions the inline and dump truck approaches were discussed in general terms.
3. Following these discussions General Martin asked the committee if they could give us their thoughts and desires concerning the actual manned/unmanned requirement. To answer this question and to present the intent of the committee a response was started around the table. First to respond was Joe Shea.

2 MAR 1968

SPECIAL HANDLING

~~SECRET~~

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**SPECIAL HANDLING**

~~SECRET~~

4. Following is a summary of Joe Shea's remarks: The ability to obtain ground resolution represents a significant capability. There exists a number of reasons over which we have no control which might deny us the use of the man, such as the political or biomedical problems. The committee is convinced that by the judicious use of inventions that the system can fly unmanned and obtain resolution. They also feel that our discussions and investigations tend to support this opinion. Therefore, the basic question in the minds of the PSAC is that, even in view of gross differences in the manned and unmanned systems, can a system be designed which, with relatively minor changes, be used either way. The choice of mode should be able to respond to generally normal pad cycle times of 2 to 3 months. In the manned case, the man would be used as a vernier on the automatic system. One would obviously remove the Gemini B and replace it with recovery buckets. The question is, how does one change the manual system to an automatic unmanned system. To do this one should look at what has been done with the LEM on the Apollo program. The LEM has been successfully designed for an unmanned demonstration before its manned flights. In the manned version error signals go to indicator lights and switches. For an unmanned mode these manned signals are also brought to break out boxes for routing to a computer and/or programmer. For the success of this concept it is necessary to make such provisions for an unmanned mode of operation in the initial design.

5. Following are Purcell's comments: The inventions necessary for the unmanned mode will make the manned mode that much better. The combination of across the format IMC and the improved navigation for the unmanned mode will also aid the man in obtaining better pictures and will tend to make his job easier, freeing him to concentrate on other things. The committee had not considered that the switch from a manned to unmanned mode would be a last minute decision in the launch cycle. Rather the concept of the committee has been that one could have both capabilities essentially available in the same basic system, that is, a common system capable of either manned or unmanned operation without a serious compromise to either mode resulting from this dual approach.

**SPECIAL HANDLING**  
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SPECIAL HANDLING

~~SECRET~~

6. Following are Dr. Hornig's remarks: The committee does not know if this dual approach will work, but they feel that it will. They want us to look at this concept and report our recommendations. We should be able to have the dual approach without deoptimizing either system. In response to General Martin's question of a modified lab versus a new OCV for the unmanned mode, Dr. Hornig indicated that we should consider the cost, schedule, and technical trade-offs for both approaches. The question is, what are the judicious trade-offs that should be made to realize this concept.
7. General Martin asked for the PSAC thoughts as to the desire for unmanned flights after the first such flight, that is, should we plan on a continued requirement for both types of flights. Land responded that it would be inconceivable that we would not want to continue with unmanned flights. Garvin commented that since the cost of the manned system is approximately twice that of the unmanned, one would want to fly most of the flights unmanned.
8. Purcell brought up the question of vulnerability with the indication that we should be giving some consideration to this subject. Colonel Allen said we had study underway in this area.
9. The question of the meaning of the requirement for an unmanned flight 9 months after the first manned flight was raised. The panel indicated that this was just an arbitrary number based on the assumption that some extra time would be required for the unmanned inventions and that this delay would be of the order of 6 to 9 months rather than 2 to 3 years. The manned system should not wait on the unmanned and the latter should follow as soon as possible. After the first unmanned demonstration flight the desire is to have the ability to go either manned or unmanned with normal recycle time. The committee was not in a position to establish the requirement for numbers of flights.
10. The panel wanted to know when they could have another look at this subject. Dr. Flax stated that 15 December was the present target date for the initial outputs of the present studies. The meeting adjourned at approximately 1700.

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SPECIAL HANDLING

SPECIAL HANDLING

~~SECRET~~

11. I would summarize the meeting into the following points:

- a. Satellite reconnaissance producing [redacted] ground resolution is a significant capability.
- b. We should have the ability to obtain this [redacted] quality by either manned or unmanned operation. The desire is to have both modes of operation available with basically the same system.
- c. Conceptually, it appears feasible to obtain this dual mode of operation with relatively minor changes to the system and without deoptimizing either mode of operation. The studies and investigations should be performed to determine the trade-offs required to realize this concept. Based on these studies we must recommend a course of action.
- d. After the decision to use either mode, launch delay should be based generally on normal pad cycle times (2 - 3 months).
- e. The unmanned capability should follow as closely as possible the first manned flight. The time scale for this is months, not years.
- f. Following the realization of an unmanned capability both modes of operation should continue to be available.
- g. As many of the unmanned automatic features as feasible should be included in the manned operation to assist the man.



B. F. KNOLLE  
Lt Colonel, USAF

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*John Sewell's Notes*

PSAC MEETING - 8 NOVEMBER 1965

Land - Technical Board of Directors. Interested in understanding the reasons for technical choices. System to be superb both M and U.

Flax - We can now only express our opinion on what should be looked at. McM said couldn't do both in same time.

Land - Not a competition - but a search for a superb unmanned vehicle - offer government U vs. M choice.

Shea - Lets see schedules - what is output of CDP.

Russ Berg -

1st launch February 1968

7 segment June 1968

1st M launch October - December 1968

In February - April 1966 will have firm schedules.

Land to Martin - Lets plunge into the discussion. Allen begins to lead a discussion.

Allen - Ground Rules:

- 1) Concurrent studies
- 2) Same optics
- 3) Same subsystems
- 4) ████████ resolution
- 5) Flight demonstration ASAP after M
- 6) Review alternate optical designs

(Good notes not taken because Allen's briefing was on viewgraphs. Steineger goes out for Viewgraph for Allen.)

Allen - One reason for Ross - ease of alignment. Can currently point to get 95% of targets within 1° field automatically. Unmanned system needs better IMC and better pointing in order to eliminate residual smears.

Baker - Talks about spherical primary and super correcting Ross. Talks about 3 mirror system and application to Hale - adding ellipsoid and sphere - useful for f/2 300 line system. Will send EK copy of paper.

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~~SECRET~~

SPECIAL HANDLING

- 2 -

Allen - Looking at map matching - will survey field. Goodyear is using an ITT tube correlation device, V/H sensor said to be .04%.

Precise navigation system needed - state-of-art permits - star trackers good to \_\_\_\_\_, rate gyros good to \_\_\_\_\_, location to 500 feet, need altitude sensor - laser.

This is Approach II, i.e., "perfect pointing". IMC not required. Approach I means IMC.

In track smear can be removed by IMC, cross track (3.55 - 4.7 @ 10° stereo 20° obliquity edge of format) cannot be removed.

Joe Shea -

■ resolution is significant to country.

We may be politically denied man in MOL.

Improved Nav + IMC and current optics is compatible with either M or U.

Then, are two systems required?

Can we, from start, design a system which can go either way?

If man is viewer override, the main change might be replacement of Gemini capsule with bucketed nose.

How does manned system get designed to be operated - by machines - if you think of it from start can use computer instead - LEM an example - enthusiastic contractor solved problem - CSM got started manned only - now tough to turn around.

Frame of mind of people.

Purcell - If U problems are solved, the M system is better - IMC and navigation as an example - also unburden man for other jobs.

Flax - Gemini \$24M/copy.

Hornig - Man to be an override, an improvement on a very good system.

ROUGH DRAFT

~~SECRET~~

SPECIAL HANDLING

ROUGH DRAFT

~~SECRET~~

SPECIAL HANDLING

-3-

Martin - If we examine to what extent LAB can be operated unmanned with recovery bucket capsule.

Hornig - Two objections to independent developments--(1) \$, (2) commensality will improve both.

Martin - *missed*  
(revised comment)

Land - Want to build on  Gambit tradition plus things you do for U will make M better.

Martin - Understand you want U at M plus 9 months - after that point what concept of program do you have?

Land - DOD (Mac) has to answer - but he guesses U to M ratio will be 5:1.

Hornig - Can't answer question at this time.

Garwin - U \$35M  
M \$70M

Need a good reason - commented on collaboration of U and M.

Joe Shea- Would want to replace Gemini with buckets - standard configuration to which you add either M or buckets.

Purcell - Vulnerability reassurances needed.

Allen - 

Land - Need a schedule for both.

Martin - *missed*  
(revised)

Land - Instructions to get first manned flight.  
Committee is convinced U just as good can be made.  
"Joe said it - build it in from the beginning."  
Can't go U just to go if no better than G<sup>3</sup>.

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-4-

Flax - Pleads for program flexibility.

Simmons - Sees U as an extension of G<sup>3</sup>.

Garwin - Disagrees.

Flax - Program not frozen until February.

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