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MEMORANDUM FOR GENERAL EVANS

October 4, 1966

SUBJECT: Comments on MOL SPO Letter on Subject of MOL Flight Test Objectives

The criteria presented in the referenced SPO letter, governing the objectives of the first two MOL missions, require two flights of the T-III for man-rating the launch configuration, one flight of the Gemini B with recovery and one flight of the Laboratory and Mission Module structure alone, suitably ballasted. Planning is intended to provide for repeating critical tests should failure be experienced.

Flight #1 is expected to obtain T-IIIM performance data, to qualify the Gemini B from launch through recovery and to obtain aeromechanic and thermal environmental data on the orbiting vehicle during ascent. The profile will approximate the MOL orbital flight profile through Stage Zero propulsion and will then be lofted to provide re-entry of the Gemini in a manner that approximates the orbital re-entry profile and design heating. It may be questionable whether a re-entry test is adequate which does not plan to exceed by a safety factor the environment of the Gemini normal re-entry profile. We need information to demonstrate that the planned test is adequate and that more severe testing through use of a shallow re-entry angle or positive velocity increase from propulsion during re-entry is not necessary. Other matters are left unanswered in this letter such as whether the Easter Island recovery capability will be or should be exercised on this flight and whether a tracking ship will be integrated into this sub-orbital flight.

In general, I recommend that the objectives of Flight #1 be approved but that additional information be presented to clarify the methods to be used.

Flight #2 is justified in the SPO letter as a back-up to Flight #1, with provision to change to a complete Gemini B, if needed. Remaining objectives consist of another T-IIIM verification, in the same trajectory to be used on the first manned flight (i.e., an orbital profile), plus acquisition of additional aeromechanic and thermal data on the orbiting vehicle during ascent. The strongest justification for Flight #2, other than as a back-up to Flight #1, appears to be the need for a second T-IIIM flight for man-rating purposes.

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The flight could, however, be employed for primary or secondary mission experimentation. There is need to understand the schedule problems and costs that reportedly result from adding certain subsystems to the Laboratory on Flight #2 in order to make the flight more useful. I suggest that itemization of some of the subsystems with their costs and availability problems be obtained. Analysis could then be made of what would be involved in providing, for example, the stabilization system for Flight #2, so that a useful orbital flight could be achieved. The addition of other subsystems could be evaluated in terms of cost and schedule versus benefits of demonstrating sustained flight performance prior to the first manned flight.

It may also be well to consider demonstrating vehicle burn-up destruction through the controlled re-entry of the Laboratory and Mission Module prior to the first flight which would have the mission payload aboard.

It is a fact that until Flight #3 there will be no demonstration of Gemini in an unoccupied quiescent configuration for up to 30 days. If the flight were to carry another Gemini or Flight #1 were to be orbital this quiescent testing could be accomplished.

The cost of testing subsystems on Flight #2 to enhance the probability of success on Flight #3 should be compared with the potential cost to the overall MOL program of possibly losing payload operating days on orbit during Flight #3 in the event failure of a non-payload subsystem requires de-orbit of the astronauts. Although the urgency of obtaining 30 days of mission payload productive operation on Flight #3 is not apparent at this point in time, it may well be an important demand by the time of this flight. It may not be possible to presently assess in dollars the value per day of mission payload operation on Flight #3, but the counter analysis of schedule difficulty and program cost for selected Laboratory and Mission Module subsystem testing on Flight #2 to enhance the confidence factor on Flight #3 could be done now.

In general, I believe there is much more we should understand and analyze relative to the flight objectives of Flight #2 than is presented in the SPO letter. I am concerned whether optimum planning has occurred for this flight.

Flight #3 objectives are quite generalized but appear adequate for a first level analysis. I concur with maximum planning toward critical mission objective accomplishment in the first 15 days, or sooner, of orbit time. This is even more important if we do not increase the level of activity on Flight #2 in order to improve hardware confidence for Flight #3.

In general, I am strongly in favor of developing a 7-flight Mission Requirements or Flight Objectives document. I feel such a document is essential, because the above comments imply that considerably more work should be done toward clearly defining supportable flight objectives. Such a document should be part of the formal program planning documentation. It should be as comprehensive as possible at this point in the program and should be periodically revised as our program vision improves, but control must be maintained by requiring Program Director approval for all changes thereto. I suggest this planning activity be initiated as soon as possible.

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