

JUL 1 1968

MEMORANDUM FOR RECORD

SUBJECT: MOL Meeting with NASA AAP Representatives

At the request of Mr. Charles Mathews, Deputy Associate Administrator for Manned Space Flight, NASA Headquarters, a meeting was held at the McDonnell Douglas facility at Huntington Beach on June 25, 1968 at 0900 hours. The purpose of the meeting was to further define information required by NASA for potential NASA use of MOL hardware. The meeting grew out of a letter to General Stewart, dated June 17, 1968 and a meeting between General Stewart and Mr. Harold Luskin on June 20, 1968. A copy of Mr. Mathews' letter is attached as Tab A.

Principals present at the meeting were Major General Stewart, Major General Bleymaier, and Mr. Palley representing AF/DOD; Mr. Charles Mathews, Mr. Harold Luskin and Mr. Douglas Lord representing NASA. In addition to the above there were six other NASA employees and other Air Force personnel present. Mr. Robert Johnson, McDonnell Douglas also sat in most of the meeting.

The meeting opened with an introduction by General Stewart who covered the following points in his remarks. General Stewart recounted the background on the Mathews June 17 letter and his conversation with Mr. Luskin. He assured the group that the Air Force is prepared to provide any MOL data requested and to do any studies within reason. He explained the purpose of the meeting was to establish a clear cut understanding of what data NASA wished to have on the MOL Program. General Stewart cautioned the group it would be necessary, due to security considerations and contractual constraints, for the NASA people to work closely with both the Air Force and the contractors.

Mr. Mathews responded to General Stewart's introduction by summarizing NASA's interest and objectives following the lunar landing and return phase of Apollo. He alluded to their

desire to conduct subsequent lunar explorations and long range manned trips to the near planets. Mr. Mathews pointed out that one area of fairly high priority in NASA is manned earth orbital experiments in the near term time frame. The objective of these flights will be to learn new technology, refine man/machine relationships, etc. The knowledge gained will be applied to long duration sustained orbital operations in large space stations. Mr. Mathews further explained that recent events have caused them to re-evaluate their position and revamp their concepts on advanced planning. Thus, NASA has set up a task force to consider the future in terms of five year increments. One of the actions of the task force is to consider the options available to NASA for the near term extension of manned space flight. In this view, NASA wishes to look at the capability potentially offered to them by the MOL Program hardware. He stated that NASA had not developed a specific plan to this point, but that there was some urgency in producing, at least, an initial position by September with the objective of refining that position during the coming year. He observed that this meeting was the first step in getting the specific technical data that NASA needs to help them examine the applicability of the MOL capability and the possible extension of this capability into longer duration on-orbit operations.

The first presentation was given by Barry Moss, Aerospace Corporation, who reviewed MOL subsystems. Lt Col Larry Skantz followed this presentation with a description of MOL advanced planning activities concentrating largely on MOL studies relating to 30, 60 and 90 day orbital operations.

At the conclusion of the presentations, a short discussion followed. The group was then taken on a tour of the Douglas MOL facility including the lab mockup at the SAR level. After lunch, the group met in a working session to define specifically the information desired by NASA. The results of these activities are summarized in Tab B showing the data to be provided to NASA. Channels of communication agreed upon were that the following individuals would be normal points of contact within the organizations for the exchange of these data, however, there was no requirements to rigidly follow channels on routine details. The parties agreed to keep each other completely informed. NASA,

Dr. Franklin Dixon; MOL Program Office, Colonel Ralph J. Ford; MOL Systems Office, Lt Colonel Larry Skantz, McDonnell Douglas, Robert Johnson.

SIGNED

RALPH J. FORD
Colonel, USAF
Chief, Program and Policies
Div, SAFSL

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a/s

Cys to:
SAFSL - Chron File
SAFSLP - Official File
SCG Read

Col Ford/SAFSLP/50945/1 July 68/shw



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

JUN 17 1968

Col Ford

IN REPLY, REFER TO: MTY

Major General James T. Stewart, USAF
Vice Director, MOL Program, SAF-SL
Department of the Air Force
The Pentagon
Washington, D.C. 20330

Dear General Stewart:

In its continuing study of program alternatives in the post-Apollo time period, NASA is giving particular attention to alternative manned Earth orbital systems and missions capable of meeting the objectives of extended duration manned flight development and experimental data return. At the conclusion of the recent Saturn V Workshop Study, in which Colonel Battle and Colonel Ritchie participated, it was apparent that at least three aspects of the alternative approaches required further investigation.

(1) The feasibility of decoupling or loosely coupling major program elements (e.g., experiments from spacecraft development schedules) so that complex technical, management and funding problems could be rendered more tractable.

(2) The comparative merit of programs in which the flight qualification of long duration systems and experiments would be accomplished through a series of steps rather than the all-up single-step approach considered in the previous workshop study.

(3) Identification of possible systems capable of multiple application; e.g., high and low inclination or altitude, or both military and NASA missions.

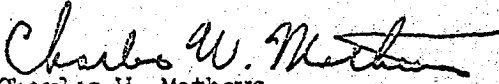
All three of these areas for further investigation suggest modular approaches to workshop configuration and program planning. Therefore, we want to carefully reconsider MOL and MOL derivatives as possible alternatives to laboratory or logistic systems based on Saturn/Apollo derivatives. The major thrust of this present activity is outlined in instructions which were sent to the NASA Manned Space Flight centers earlier this year. A copy of these instructions is attached as Enclosure 2.

The types of questions which have been raised relative to possible NASA use of MOL are summarized in Enclosure 1.

Neither the NASA-MOL study for one-year duration missions conducted by Douglas nor the descriptive information presented at the AACB Manned Space Flight Panel meeting on April 25, 1968 provide an adequate basis for input to considerations of workshop and logistics vehicle alternatives of most interest to NASA today.

Proper consideration of the presently planned or more advanced MOL systems by NASA is, of course, dependent on information and support from your office. I would like to propose, therefore, that with your concurrence a meeting be set up between NASA and DOD technical personnel to permit an exchange of information and ideas on the enclosed questions.

Sincerely yours,


Charles W. Mathews
Deputy Associate Administrator
for Manned Space Flight

Enclosures:

- (1) NASA MOL Questions
- (2) Letter to NASA Center Directors
requesting support for IOWS,
April 25, 1968

QUESTIONS RELATED TO POTENTIAL NASA USE OF MOL

Considerations of the possible use of MOL to accomplish the NASA objectives exclude the payload module and the subsystems and components which are directly related to it. Those systems which may have common applicability include the basic pressure vessel; electrical, environmental control, stabilization and control, telemetry, and crew support systems; launch vehicle, and certain portions of the ground support system. The following questions are, therefore, related to these elements:

1. Without changing basic USAF subsystem approaches, what would be the maximum feasible mission duration for a MOL to aid NASA development of long duration manned flight capability? Which subsystems would present the most critical reliability and safety problems in extended duration missions?

2. Has the USAF considered mission duration extension with the MOL using some form of resupply without changing basic subsystem approaches? If so, and considering the NASA interests, does such an approach seem feasible - and for what duration?

3. Has the USAF examined the feasibility of increasing the present MOL orbital duration through subsystem modification and increase in expendable quantities? If so, what changes have been considered and what lifetimes appear possible?

4. Have development costs and schedules been estimated for either approach 2. or 3.?

5. Has any consideration been given to accommodating a separable and dockable Mission Module? What cost would be involved? What time span would be required for development?

6. Has the USAF studied the possibility of modifying Complex 40 or 41 at the ETR to provide MOL capability? If so, have costs and schedules been estimated?

7. Would joint USAF and NASA operations at Vandenberg be possible using separate spacecraft but common launch and mission support systems? What form of joint operations might be the most practical? Would additional facilities be required for reasonable non-interference and, if so, what are the costs and schedules associated with them?

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

IN REPLY REFER TO: MTY

April 25, 1968

Mr. Charles J. Donlan, Acting Director
Langley Research Center
National Aeronautics and Space Administration
Langley Station
Hampton, Virginia 23365

Dear Charlie:

During the past few weeks there have been many discussions, presentations, and reviews of the results of the recently completed Saturn V Workshop study with the objective of determining which of the programs proposed came closest to meeting the Agency's objectives within the constraints of projected funding limitation. These reviews have identified areas requiring further study and developed new objectives and guidelines for additional study. This letter requests your aid and the aid of your staff in continuing these studies and developing the knowledge required to prepare FY 1970 Program Memoranda which are scheduled for preliminary submission to the Bureau of the Budget in July. I am requesting that each Center which has conducted extensive studies of manned earth orbital activities in the past, namely MSFC, MSC and Langley, perform independent studies to identify the most desirable Agency program for the Saturn V Workshop and provide a Project Plan. No multiple Center committees will be formed since these studies can probably be most effectively accomplished within the existing Center organizational structure. The objectives and guidelines attached are intended to provide directions for the study and should not be considered absolute constraints nor should they prevent the exploration of new ideas or concepts.

Doug Lord and I have selected Frank Dixon to act as the Headquarters focal point for this in-house study activity in keeping with his position as Director, Manned Spacecraft, Advanced Manned Missions Program and in relation with the activities of the Extension of Manned Space Flight Capabilities Program Category Working Group chaired by Mr. Lord. Dr. Dixon plans to hold a study kick-off meeting with the study directors designated by you on May 6 or 7, 1968 in Washington. At this meeting the attached study objectives and guidelines will be discussed and clarified. Suggestions on schedule of activities and content with identification of planned Center efforts as specifically as possible would be helpful at that time.

C O P Y

ENCLOSURE (2)

C O P Y

C O P Y

ENCLOSURE (2)

C O P Y

2

The Agency must have definite plans in order to proceed at the earliest practical date with the program definition phase of the Workshop. This could be completed in the last quarter of this calendar year or in the first quarter of next year depending on the selected contracting approach and level of in-house definition efforts. The first or interim phase of this effort to be completed by July 1, 1968 will concentrate on the conceptual design and programmatic trade-offs beginning with the objectives, guidelines and expected results listed in Enclosure (1). The number of alternative design and programmatic approaches to be carried further into the definition phase beyond the July 1 milestone should not be decided arbitrarily at this time.

Enclosure (2) includes three charts which I have used in discussions with MSF and NASA management outlining items not conclusively resolved in the Saturn V Workshop studies, providing an alternate approach and indicating a possible Intermediate Workshop concept.

It is important to keep in mind that the Agency is faced with difficult decisions in an environment which promotes detailed evaluation of the Nation's space activities. A plan, to be accepted, must logically follow the programmed activities in AAP, yet be able to adapt to future changes in objectives, technology, and funding. It must keep the Nation's space capability functioning, provide significant rewards and accomplishments, and at the same time not demand excessive resource commitments. Structuring a program to meet these challenges will require application of the best talent available within NASA.

Sincerely yours,

Original Signed By

Charles W. Mathews
Director, Apollo Applications

Enclosures

2 a/s

Identical letter to:

Dr. Robert R. Gilruth, Dir., MSC
Dr. Wernher von Braun, Dir., MSFC

C O P Y

ENCLOSURE (2)

C O P Y

4/25/68

INTERMEDIATE ORBITAL WORKSHOP STUDIES

GENERAL: The most important requirement to be satisfied by the continuing study is to structure a program which can flexibly meet changes in funding, changes in technology or changes in experiment requirements. This intermediate workshop is not intended to be the ultimate space station but should be configured for truly long duration operation, which implies adequate in-flight maintenance and repair provisions. The flexibility requirements lead naturally to some form of modularization in which each module can be developed in a nearly independent manner. The core living systems and control module might then be orbited with relatively simple mission oriented modules separate from major advanced experiment modules or from modules containing advanced subsystems which could be launched later or incorporated later in the program. This approach allows the decoupling of the experiment development program from the spacecraft program to provide improvement in program element phasing. Also, this approach would permit accommodation of late developing experiments or of semi-independent use of the station by DOD. In addition, some portions of the workshop, namely the crew module and operating subsystems, might be used in higher energy modes such as polar orbits (launched from ETR or WTR), and synchronous orbits. The systems and crew module should be compatible with conversion to an artificial gravity mode.

This phase of Workshop Study activity, referred to as the Intermediate Workshop Study, will be conducted during May and June 1968 with continuing Center and contractor activity, leading to project definition.

OBJECTIVES FOR INTERIM PERIOD:

1. Define program and configuration approaches which are relatively insensitive to funding levels and schedule changes.
2. Identify program and configuration approaches which are compatible with a build up of flight qualification (or relief of extensive ground testing requirements) for long duration systems without requiring total workshop replacement in orbit and recommend best approaches.
3. Provide practical alternatives for decoupling the major experiments program design, schedule and funding from the spacecraft development program.
4. Define new modular configurations which not only contribute to the previous objectives but can provide major elements for:
 - a. Polar orbit missions.
 - b. 24-hour synchronous orbit missions.

ENCLOSURE (1)

Enclosure (1)

2

5. Provide a preliminary ranking of experiments for priority and availability based on realistic hardware schedules. NASA management generally supports biomedical/behavioral, operations, technology, astronomy, earth resources, other science, and applications experiments as useful objectives for orbital workshop activities. A structured approach to a sound experiment program integrated into the Workshop program is desired.

6. Integrated program schedules with substantiating data for critical paths will be provided.

7. Provide program cost comparisons of alternatives on a consistent basis with trade-off sensitivities, including comparison with updated costs for previous Saturn V Workshop Studies.

8. Identify program flexibility in terms of ability to react to increased or decreased funding, delays in experiment development, changes in test philosophy or changes in primary objectives.

GUIDELINES FOR INTERIM PERIOD:

1. For this study phase, the target period for Saturn V Workshop launch will be late 1973 to 1974 following a Saturn I Workshop program consisting of:

- a. Saturn I Workshop flights in 1970 and 1971.
- b. Automatic rendezvous and remote docking of ATM.
- c. Revisits employing a simplified, open-ended 56-day CSX.
- d. Extensive biomedical experiments for 60 days or more per man.
- e. Preliminary earth-resource experiments.

2. Workshop configurations will not be constrained to Saturn-Apollo mold lines. (Note that the intent here is encourage versatile smaller, not larger vehicle designs).

3. One approach to long duration subsystems will be assumed to require newly designed components packaged for maintenance, repair, and onboard checkout. Estimates from past contract studies will be used and updated as necessary.

4. Nominal 6-man crew with capability of growth to accommodate 9. Operable with a 3-man crew.

Enclosure (1)

5. Two year operational lifetime goal.
6. New generation of subsystems capable of eventually achieving full mission life will be specified with required steps in flight qualification.
7. Not existing structure (S-IVB) unless proven to be most effective.
8. Start with CSM resupply vehicle and show requirement for growth or new system phasing.

EXPECTED RESULTS IN INTERIM REPORT:

1. A reasonably detailed description of the preferred technical and programmatic approach to the Saturn V Workshop to be launched by Saturn V or Intermediate boosters with operations, logistics support, experiment phasing, and subsystem development plans.
2. A less detailed description of the alternative designs and programs considered.
3. A compilation and assessment of the trade-off data and considerations used in the selection process.
4. Statement of objectives to be met by experiment and flight activities proposed.
5. Recommendations and plans for future contractor support to include studies, systems definition, project definition, production, and operations.

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SATURN V WORKSHOP STUDIES

1. IMPLICATION OF ALL-UP PHILOSOPHY
2. LACK OF DEFINITION OF EXPERIMENT OBJECTIVES
3. QUESTIONABLE RELATIONSHIP WITH/SUPPORT OF DOD.
4. MANAGEMENT COMPLEXITY
5. B CONFIGURATIONS OFFER LITTLE IMPROVEMENT OVER SATURN I WORKSHOP
6. C CONFIGURATIONS LEAVE LONG GAP IN MANNED EARTH ORBITAL FLIGHT
7. C CONFIGURATIONS DO NOT ALLOW FOR PROGRESSIVE BUILDUP OF SYSTEMS CAPABILITIES
8. DIFFICULTY OF SELLING A "TOTAL" PROGRAM
9. HOW FAR CAN WE COMMIT TO ZERO G OPERATION?
10. HOW DO WE ESTABLISH A FAVORABLE "SALES" POSTURE?

ML-4/9/68

SATURN V WORKSHOP ALTERNATE

MODULARIZATION TO:

- a. PERMIT PROGRESSIVE BUILD-UP OF EXPERIENCE
- b. PERMIT SYSTEM EVOLUTION AND REPLACEMENT
- c. IMPROVE CONFIDENCE IN MISSION SUCCESS
- d. MINIMIZE CONFIGURATION COMPROMISES
- e. DECOUPLE EXPERIMENT/SPACECRAFT SCHEDULES
- f. IMPROVE DEVELOPMENT PROGRAM PHASING
- g. IMPROVE POSSIBILITY OF JOINT NASA/DOD USE
- h. IMPROVE THE ABILITY TO ADJUST TO CHANGE

Enclosure (2)
Page 2

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INTERMEDIATE TERM WORKSHOP CONCEPT

REDUNDANT SYSTEMS MODULE

GOOD MAINTENANCE AND REPAIR PROVISIONS

CAPABLE OF HANDLING NINE MEN

CONTAINS LIVING QUARTERS

EXCESS CAPABILITY FOR POWER, COOLING, ETC.

LIMITED PRODUCTION

FLEXIBLE MISSION MODULES

GENERAL PURPOSE LABS

ONBOARD EXPERIMENTS (LIMITED FOR FIRST FLIGHT)

HANGAR AND DOCKING PROVISIONS

FLY UP EXPERIMENT, EXPENDABLES AND MODULE DELIVERY

POSSIBLY SEVERAL GROUND LAUNCHED CONFIGURATIONS

DATA LIST

From MOL Systems Office

1. MOL study dated July 1966 which is directed to the examination of the MOL vehicle under a variety of orbital operations, e.g. inclinations, orbital altitudes, life time on orbit, etc.
2. Current weight budgets exclusive of payload.
3. Briefing charts from the June 25, 1968 meeting including backup materials (this presentation was based on the PSAC presentation earlier this year).
4. Estimated costs and schedules to include recurring and non-recurring costs for hardware and hardware lead times for two MOL vehicle versions. Case I - 30 day on-orbit life, MOL vehicle less MOL payload peculiarars. Case II - Modification to MOL baseline vehicle for 60 day, on-orbit, manned operations less MOL program peculiarars.
5. Cost of additional manufacturing facilities if required, e.g. separate NASA vehicle assembly area, etc.
6. Cost and schedule associated with conversion of MOL vehicle command and control equipments (AVE) to use with NASA command and control net.
7. Cost and schedules associated with lab module simulator and Gemini B simulator less MOL peculiarars.
8. Cost and schedules associated with ETR launch of NASA MOL vehicle, including the following considerations:

On-pad build up, for one pad or two pads; additional facilities to accommodate T-IIIM MOL configuration to include pad modification, additional supporting buildings and services, e.g. fuel. Also AGE peculiar to T-IIIM boosters, laboratory vehicle, Gemini B.

Cost schedules associated with use of a single pad and vehicle build up in the ITL facility modified for MOL hardware.

Facilities requirements for installation and check-out of laboratory module simulator and Gemini B simulator.

Data prepared on ETR will be qualified to reflect that the provision of the cost estimates in no way implies Air Force agreement for NASA use of T-III facilities at ETR. Special agreement will be required.

9. A narrative paper on the availability of MOL flight hardware which discusses considerations on schedule, conflicts in manufacturer's tests, qualification, and check-out of NASA hardware including the ramification of MAC/DAC, Huntington Beach security.

From McDonnell Douglas Company

1. Copy of the ground test plan.
2. Available data on failure mode analysis (mean time to failure).
3. Available data on MOL 60 day design analysis.
4. Discretionary astronaut time lines for on-orbit activities.
5. Vehicle lay-out drawings less MOL payload peculiarars.
6. The MOL data books (subsystems descriptions).
7. AVE/CEI specifications.
8. Copies of the Air Force/DAC Long Duration Operation study (LDO) and the NASA sponsored NASA/MOL study.
9. Breakout of power requirement by subsystems.
10. Typical power profile.
11. Information on weight capability and volume of Gemini data return containers.

DATA LIST

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