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Memorandum

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TO : DISTRIBUTION

DATE: 6 MAY 1968

FROM : MA/Apollo Program Director

SUBJECT: Minutes of the Apollo Site Selection Board Meeting of March 26, 1968

On March 26, 1968, the Apollo Site Selection Board met at NASA Headquarters. The meeting agenda is attached as Enclosure A. Attendees are listed in Enclosure B. Copies of nearly all the slides were handed out during the meeting. Additional copies are available upon request.

Implications of Further Reductions in the Number of Candidate Sites for Early Apollo

As a result of the last meeting of the Board, MSC was asked to study the implications of reducing the number of candidate sites for the first two missions to a total of three. After a review of the Set B sites and the Set C sites for missions I and II, a discussion was immediately started on the merits of conducting two missions to the same site. W. N. Hess stated that it would be scientifically undesirable to go back to the same site. However, O. W. Nicks emphasized that planning should not be so constrained since the scientific aspects of the first mission may not be completed.

J. R. Sevier discussed the advantages and disadvantages of reducing the number of lunar landing sites at this time. The recommendations of MSC were as follows:

Western Sites

1. Retain both II-P-13 and III-P-11 for the present.

2. Use expected launch dates to determine priority of effort and assignment to the 1st or 2nd mission.

3. Implications of reducing to a single site:

a. Selection of II-P-13 reduces number of launch opportunities by 4 months per year unless a hybrid trajectory is used. (A hybrid trajectory goes off free-return after transposition and docking, when the LM DPS can be considered as a back-up to the SPS.)

b. No alternate western site for 2nd mission.

INDEXING DATA

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Eastern Sites

1. Retain II-P-2 and II-P-6 for the present; postponing a decision, with no significant impact in effort or training, until recycle considerations are completely understood.

2. Consider effects of retaining II-P-2 and II-P-6 as potential sites right up till launch time, thus allowing flexibility to accommodate a one-day slip in initial launch date. It was noted that five sites can be retained in the RTCC (Real Time Computer Complex).

3. Eliminate I-P-1 from early mission consideration since it is the least desirable on all counts except recycle; its acceptability is most susceptible to changes in mission profile; the analysis and generation of products has barely started; and it does not serve to increase flexibility on the 2nd mission.

Central Site

Retain II-P-8 under any circumstance. If the first recycle is less than 68 hours, II-P-8 serves for a second launch attempt from II-P-2. If the first recycle is greater than 68 hours, II-P-8 serves to absorb a 2-3 day slip in pad operations.

Status Report on Space Vehicle Operational Readiness Analysis

R. E. Moser discussed the Apollo-Saturn V lunar mission launch scrub turnaround plan. The plan assumed a scrub at T-8.9 seconds (pre S-IC ignition) and only considered the first scrub turnaround from the original countdown. It was noted that the turnaround plan did not include the S-II fast fill rate and that ALSEP would be the only affected experiment.

The study concluded that the time to the next T-0 was a minimum of 66.5 hours for a scrub after launch vehicle cryogenic loading and prior to ignition. For a scrub before launch vehicle cryogenic loading (T-9.5 hours), the minimum turnaround time for targeted T-0 to targeted T-0 would be 49.5 hours. For a scrub before MSS removal (T-14 hours), the similar turnaround time would be 37.5 hours. Finally, for a scrub before securing the vehicle (T-19 hours), the similar turnaround time would be 20.5 hours. This possibility favors the retention of two sites in the east.

Mr. Moser noted that a second turnaround during the same launch opportunity would be somewhat longer than the first since additional items are involved, but is not expected to be more than 24 hours. However, this rules out two worst case turnarounds during the same launch opportunity.

General Phillips requested a detailed study of a second scrub turnaround plan after the second cryogenic loading. Specifically, how could a second turnaround plan of 66.5 hours be achieved. He also asked what would be necessary to achieve a 44-hour turnaround after the first scrub so that the value of implementing the necessary changes could be decided.

Implications on Crew Training on Site Selection Activities

The astronaut training that is necessary to support site dependent crew operations on a lunar landing mission was presented by H. H. Schmitt. About 20-30 hours of training are required per site. It is now felt that a given crew can possibly train for three sites, however, this depends on baseline training requirements and more exact definition of site dependent crew operations, especially in the area of crew procedures and the characteristics of the on-board data packages.

H. H. Schmitt also discussed the products required to support site dependent crew operations and the status of their production.

At present, a 1:2,000 scale topographic relief model is being manufactured for the prime landing ellipse in II-P-8. General Phillips questioned the need for models of all sites. Dr. Schmitt stated that we expect to learn more about this as we use the model (available November 1968), but at this time he did not think it would be necessary. Although models could probably be made on 3 month centers, General Phillips requested that the time and ability to produce models for each ellipse and the approach, be fully understood and that the use of high resolution Lunar Orbiter photography be studied, to simulate approach from high gate.

Analysis of Science Sites and Recommendations for Future Work

J. H. Sasser presented the results of a preliminary look at proposed sites for later missions and also recommended a site selection process for later missions. The sites studied were:

A. Apollo Zone Redesignate Science Sites

1. Mare Terra Contact in II-P-2 (2° 43.5' N, 34° 24' E)

2. Crater, Ridge, and Mare Ridge Contact in II-P-8 (0° 29' N, 1° 17' W)

3. Flamsteed Ring in III-P-12 (2° 37' S, 42° 32' W)

B. Apollo Zone Science Sites

1. Censorinus North (0° 17' S, 32° 39' E)

Censorinus West (0° 23' S, 32° 32' E)

2. Fra Mauro (3° 45' S, 17° 36' W)

C. Science Sites Outside Apollo Zone

1. Abulfeda (14° 57' S, 14° 18' E)

2. Littrow (21° 44' N, 29° 02' E)

Based on the preliminary analysis of the sites, the following conclusions on acceptability were made:

1. Redesignate science sites in II-P-2 and II-P-8 are acceptable.

2. Redesignate science site in III-P-12 is marginal on data availability but otherwise acceptable.

3. Littrow is acceptable.

4. Fra Mauro is unacceptable based on approach path topography and marginal on other counts.

5. Censorinus and Abulfeda are unacceptable.

As a result of this "quick look" and the orderly site selection process that was employed for the early Apollo missions, a more orderly process of site selection for later missions was proposed. Three categories of sites were suggested. Set A would include all sites for which Lunar Orbiter II, III, or V high resolution photography is available ($\sim$ 80 sites). Set B would include those sites of higher scientific interest that are available from a performance viewpoint at least one day each year ($\sim$ 20 sites). Set C would be those sites chosen from Set B for specific mission assignments. It was felt that Board approval for Set B could be requested in July, 1968, and that Set C sites would be ready for approval in early 1969.

Actions by the Board

1. For the present, retain all five sites for the first mission.

2. Eliminate site I-P-1 from second mission consideration.

3. Select the western site when the launch date can be better predicted.

4. Postpone a decision concerning one or two eastern sites until crew training requirements and training time becomes firm.

5. Investigate the effects, other than crew training, of keeping four sites up to mission time. (Action item - MSC).

6. Investigate system design changes, operational constraints, and the relationship between prelaunch rules and mission degradation for the purpose of reducing the first turnaround time from 66.5 hours to 44 hours. (Action item - KSC and MSC).

7. Prepare a detailed study of a second turnaround plan for a scrub after the second cryogenic loading. In particular, how could a second turnaround plan of 66.5 hours be achieved. (Action item - KSC).

(Items 6 and 7 are to be covered in a letter, to be sent within a month of the meeting, from KSC to MSC with a copy to General Phillips.)

8. The proposed plan for orderly selection of science sites for later missions was acceptable.

9. The next meeting of the Board will be scheduled for either June or July, 1968.

Samuel C. Phillips
Major General, USAF
Apollo Program Director

ENCLOSURE A

APOLLO SITE SELECTION BOARD

March 26, 1968

NASA Headquarters

A G E N D A

Implications of Further Reductions in the Number of Candidate Sites for Early Apollo - MSC-ASPO	J. R. Sevier
Status Report on Space Vehicle Operational Readiness Analysis KSC-AP	R. E. Moser
Implications on Crew Training on Site Selection Activities - MSC-FCOD	H. H. Schmitt
Presentation and Discussion of Prospective "Science" Sites for Follow-on Apollo Missions - MSC-S&AD	J. H. Sasser

ENCLOSURE B

Board Members Present (All):

Maj. Gen. S. C. Phillips, MA, Chairman
Dr. J. H. Turnock, MA, Secretary
Maj. Gen. J. D. Stevenson, MO
Capt. L. R. Scherer, MAL
Mr. O. W. Nicks, SD
Mr. O. E. Maynard, MSC-PD
Dr. W. N. Hess, MSC-TA
Dr. E. Stuhlinger, MSFC-R-RP
Adm. R. O. Middleton, KSC-AP

Other Attendees

A. W. Frutkin, NASA Hq - AA-F
W. G. Stroud, NASA Hq - AA-S
E. M. Cortright, NASA Hq - MD
T. E. Jenkins, NASA Hq - MA
L. Reiffel, NASA Hq - MA
A. W. Kinny, NASA Hq - MO
D. A. Beattie, NASA Hq - MAL
J. B. Hanley, NASA Hq - MAL
J. Goldberg, NASA Hq - MAL
P. Grosz, NASA Hq - MAL
B. Milwitzky, NASA Hq - MAL
M. W. Molloy, NASA Hq - MAL
W. T. O'Bryant, NASA Hq - MAL
A. T. Strickland, NASA Hq - MAL
G. P. Chandler, NASA Hq - MAO
J. K. Holcomb, NASA Hq - MAO
E. W. Land, NASA Hq - MAO
R. A. Peterson, NASA Hq - MAP
D. R. Anselmo, Bellcomm - MAS
A. P. Boysen, Jr., Bellcomm - MAS
C. H. Eley, Bellcomm - MAS
V. Hamza, Bellcomm - MAS
V. S. Mummert, Bellcomm - MAS
F. N. Schmidt, Bellcomm - MAS
I. Silberstein, Bellcomm - MAS
J. P. Nolan, NASA Hq - MOA
R. W. Johnson, NASA Hq - MTX
A. O. Crobaugh, NASA Hq - PT
W. H. Woodward, NASA Hq - RN
R. S. Young, NASA Hq - SB
H. S. Fosque, NASA Hq - TA
D. C. Cheatham, MSC-EG
J. M. Eggleston, MSC-ADX
J. R. Elk, MSC-FM5
J. H. Sasser, MSC-TH3
H. H. Schmitt, MSC-CB
J. R. Sevier, MSC-PD12
R. E. Moser, KSC-LO-PLN
H. Masursky, USGS
C. W. Schlager, DoD/Mapping