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F/DDW/prj

JUN 10 1967

**MEMORANDUM for the Deputy Administrator**

**From: Assistant Administrator for Program Plans and Analysis**

**Subject: Lunar Mapping and Survey System (LMSS)**

Several years ago, the LMSS was introduced into the Apollo program as a special payload module to provide an independent capability for certification of manned lunar landing sites in the event that the Lunar Orbiter project was not successful in acquiring necessary data. The LMSS is a spacecraft approximately 18' long and 5' in diameter, with a docking adapter, that would be a replacement module for the Lunar Module for manned circumlunar flight operations. The actual payload within the module is being procured through the USAF. Five flight systems are under procurement with systems integration responsibility being handled by the Lockheed Aircraft Corporation. The first payload will be delivered in the near future and the remaining 4 within the next year. Through FY 1967 funds, \$33 million will have been obligated. Present plans called for additional obligations of \$18 million in FY 1968 and \$13 million in FY 1969 funds. The funding source is the Apollo program, but current management is by the AAP office.

In contrast to the back-up assumptions at the time of the introduction of the LMSS into the Apollo program, the Lunar Orbiter project has had outstanding mission success through the four flights to date. The project has enabled us to examine 22 potential Apollo manned lunar landing sites, from which 8 have been chosen for site certification. Four of the 8 sites have been certified to the present Apollo requirements level. The remaining 4 sites have been partially certified but it is planned to obtain additional convergent stereo data (4 to 8 frames per site) in the forthcoming Lunar Orbiter V mission, scheduled for August of this year, in order to complete the certification of the sites. The Lunar Orbiter V mission will, if successful, examine 42 additional locations on the front side of the moon that have been determined to have potential unusual scientific interests. Of the 42, 18 have been tentatively selected as potential

landing sites for the extended lunar exploration phase of the Apollo Applications Program. These 18 sites will be covered by stereo photography at 2 meters resolution (as compared with the current 1 meter resolution Apollo certification requirements). Westerly oblique approach photographs of these sites will not be obtained from the Orbiter V mission, however.

The current success of the Lunar Orbiter project and the data possibilities from the forthcoming Orbiter V mission have led to a recent searching reexamination of the requirements for and role of the LMSB in our lunar exploration program with the following results.

#### Current Lunar Exploration Plans

At the present time, our program plans for lunar exploration may be summarized as follows:

- (a) The basic Lunar Orbiter project will be completed with the August 1967 flight of the fifth spacecraft. If successful, this project will have provided us with essentially complete photo coverage of the front and back sides of the moon; we will have certified 8 high-confidence Apollo manned lunar landing sites; we will have surveyed 18 additional potential AAP manned lunar landing sites, though not to the Apollo certification requirement level; we will have medium resolution photography of 24 other scientifically interesting points on the front side of the moon.
- (b) The Surveyor project will have its next mission launched in July 1967. The last 3 Surveyor spacecraft are scheduled to be launched through January 1968. This will terminate the Surveyor project.
- (c) Current planning forecasts the launch of up to 11 Saturn V-Apollo missions through calendar year 1969 (including 2 unmanned test missions). If this schedule can be achieved there will be a high probability that a manned lunar landing can be accomplished within this time period, thereby terminating the Apollo-MLL phase of the manned flight program. We will have from 4 to 8 certified landing sites available as targets for this ultimate mission, depending on the success of the Lunar Orbiter V mission.

- (d) Assuming success in the MLL program by the Saturn V-511 mission, the Apollo Applications Program recommended by OMSF and now under review, includes a first lunar orbital LMSS mission on Saturn V-512 in calendar year 1970, a repeat lunar landing of a single manned Lunar Module in 1970, the first extended manned lunar mission in mid-1971 using a companion unmanned launch to provide a shelter/taxi capability, and subsequent manned lunar exploration missions of a similar nature in 1972 and 1973.

#### Scientific Needs in Lunar Exploration

The wealth of data being obtained from the Lunar Orbiter project appears to be sufficient to meet the current requirements of the scientific community for photographic coverage of the lunar surface. At the present time, future requirements for data from lunar orbit appear to be concentrated on the acquisition of selenodic figuring of the moon (through long-term perturbation measurements of lunar satellites) and the acquisition of gamma-ray data to contribute to an understanding of the radioactivity of the moon. The principal focus of the scientific community interests, however, is on the acquisition of data from the lunar surface utilizing the enhanced capabilities for observation and discrimination afforded by manned landings. From a first-order cost effectiveness viewpoint, the scientific community appears unwilling at this time to place a high priority on data that would require manned lunar orbital operations as contrasted with manned lunar surface operations.

#### Site Certification Needs for the Apollo Applications Program

As of today, we cannot forecast whether the present Apollo requirements for a landing site certification will have to be tightened or might be relaxed for subsequent manned lunar landings; it is unlikely that we will be in a position to make such an assessment until after the Apollo-MLL initial landing. Furthermore, until we have initially accomplished the manned lunar landing objective, we will not be in a position to assess the feasibility and desirability of attempting landings over more rugged terrain or into regions with smaller acceptable landing footprints. Although forecasts cannot be made with any degree of certainty, there exists a high probability that we may find

it desirable or necessary to accomplish several landings in the relatively smooth terrain included in our present 8 MLL landing sites before we embark for sites that might be scientifically more interesting but with potentially greater landing hazards.

Alternative Decision Possibilities

The lack of hard current scientific data requirements from lunar orbit that might require an LMSS make the decision to proceed with the project dependent upon AAP landing site certification requirements. If the forthcoming Lunar Orbiter V mission is successful we will have in hand preliminary site surveys for 18 potential AAP landing sites. Insofar as complete site certification is concerned, we will then have three possibilities:

- (1) We could continue with the development of the LMSS, planning for an orbital mission in CY 1970 and in subsequent years as necessary to obtain site certification data. In addition to the remaining costs for development and procurement of the system (\$31 million), this course would commit NASA to a mission cost of about \$300 million for each manned lunar orbital flight, and an uncertain additional cost for maintaining system readiness for a number of years prior to usage.
- (2) OSSA has determined that a sixth Lunar Orbiter could be assembled from spares in the Orbiter project and could be launched in no more than a year's time at a total cost of about \$16 million, including launch vehicle procurement. Such a spacecraft could provide all the photographic data required to meet current Apollo level site certifications for from 10 to 13 AAP sites, if such sites can be culled from the forthcoming Orbiter V surveys. By following this path, we could have early site certification data to Apollo standards for up to 21 potential manned lunar landing sites.
- (3) We could firm our intermediate plans on the assumption that it would be at least 1972 (second AAP shelter/taxi mission) before we would contemplate landing at other than the relatively smooth Apollo sites. On this basis,

we could plan on awaiting the outcome of the initial MLL touchdown mission before deciding on the need and requirements for further site certification photography. This course of action would permit us to suspend all current activity aimed at the acquisition of additional site data (beyond Orbiter V), including cancellation of the LMSS and termination of the Orbiter projects.



D. D. Wyatt

cc: ADA/Shapley  
M/Mueller  
S/Newell  
X/Biggs  
XP/Jenkins  
XC/Freibaum



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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
WASHINGTON 25, D.C.

JUN 1 1967

OFFICE OF THE ADMINISTRATOR

MEMORANDUM For: M/Associate Administrator for Manned Space Flight  
S/Associate Administrator for Space Science  
and Applications

From: Deputy Administrator

Subject: Lunar Mapping and Survey System (LMSS)

Reference: Memo to AD fm P, subject as above, dtd 6/19/67

We have had a series of discussions on the requirements for the LMSS, the results of which are summarized in the referenced memorandum from the Office of Program Plans and Analysis.

I have concluded that our program requirements as currently foreseen, including the uncertainties inherent in such planning, do not warrant the continuation of the LMSS system in the NASA program. I therefore direct that the contracts covering this system be terminated at once, and that appropriate revisions to the Apollo Project Approval Document be prepared reflecting this decision.

I have further concluded that we should await the results from the forthcoming Lunar Orbiter V mission before we make any decisions regarding further additional certification for AAP sites. We should, however, make definite plans to evaluate the results of that flight as soon as possible to determine whether we need to add a sixth Orbiter for AAP site certification purposes, whether it would be prudent and desirable to add a seventh Orbiter for back-up, and whether such plans should, if adopted, be included in the FY 1969 budget request or considered for FY 1968 initiation using monies recovered from the termination of the LMSS project. Such plans will, of course, be strongly influenced by Congressional actions on our FY 1968 budget request.

/Unsigned/

Robert C. Seamans, Jr.