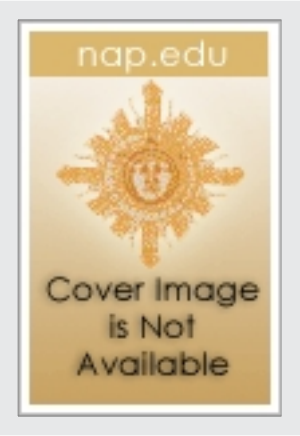

On Robotic Lunar Precursor Missions of the Office of Exploration: Letter Report

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On August 21, 1992, Space Studies Board Chair Louis J. Lanzerotti and Committee on Planetary and Lunar Exploration Chair Larry Esposito sent the following letter to Dr. Michael D. Griffin, associate administrator for NASA's Office of Exploration.

As you know, the Space Studies Board is the National Research Council's primary advisory body for civil space research. 1 Within this broad scope, the charter of the Board's Committee on Planetary and Lunar Exploration (COMPLEX) is to advise the Board on "the entire range of planetary system studies that can be conducted from space." 2 This advisory purview extends across the entire spectrum of U.S. space research conducted by both "NASA and other government agencies." 3 COMPLEX's advisory capacity thus includes planetary science aspects of the Space Exploration Initiative (SEI) being implemented by NASA's Office of Exploration (OEXP).

At COMPLEX's April 27-28, 1992, meeting in Washington, D.C., you briefed committee members on the report, Workshop on Early Robotic Missions to the Moon, 4 sponsored by your office, and on the current status of OEXP's lunar exploration program. The attached scientific assessment, prepared by COMPLEX based on information provided during this meeting, gauges the extent to which the flight program outlined in the LPI report addresses the recommendations that COMPLEX has made on priorities for lunar science.

In your presentation to COMPLEX, you noted that the federal budget development schedule obliged OEXP to initiate a rapid assessment of the possible instruments for its proposed lunar orbiters and lander, precluding a more widely publicized and more formally peer-reviewed instrument evaluation. The Board notes that a broadly based selection process that includes peer review has served the science community very well in the past; it has helped NASA accomplish its goals, while assuring fair competition and the best possible science. As a result, although the Board and committee appreciate your efforts to act expeditiously and streamline the procurement process, it is recommended that future OEXP review and selection processes promote and actively facilitate the widest possible community participation.

Overall, COMPLEX's assessment suggests that the program of robotic lunar exploration that the committee reviewed presents a significant opportunity to advance scientific investigation of the Moon. It is emphasized that the committee's assessment is limited to these lunar science objectives and does not consider the separate issue of the adequacy of data from the proposed flight program to support a subsequent program of human exploration. The

Board and COMPLEX look forward to providing further guidance on scientific aspects of the SEI on a continuing basis.

1 National Academy of Sciences President Detlev Bronk, June 26, 1958.

2 *Assessment of Solar System Exploration Programs: 1991,* Committee on Planetary and Lunar Exploration, Space Studies Board, National Academy Press, Washington, D.C., 1991, page 3.

3 Reference 2, page 3.

4 Workshop on Early Robotic Missions to the Moon, Lunar and Planetary Institute, Houston, Texas, February 1992; proceedings of a workshop organized by NASA's Office of Exploration.

On Robotic Lunar Precursor Missions of the Office of Exploration

The Space Studies Board's Committee on Planetary and Lunar Exploration (COMPLEX) met in Washington, D.C., on April 27-28, 1992, to review the robotic lunar probes proposed by NASA's Office of Exploration (OEXP) as precursor missions for its program of human exploration. The committee's intention was to determine the extent to which OEXP's program was consistent with recommendations for lunar science outlined in previous COMPLEX reports. 1,2,3

During its deliberations, COMPLEX was briefed on the current status of OEXP's lunar exploration program by Dr. Michael D. Griffin, NASA's Associate Administrator for Exploration. The committee was particularly keen to discuss the Lunar and Planetary Institute (LPI) report, *Workshop on Early Robotic Missions to the Moon.* 4 This report, sponsored by OEXP, outlines the instrument complement for a flight program of two lunar orbiters and a single lander intended by OEXP to gather scientific and engineering data necessary to facilitate the safe return of humans to the Moon. While COMPLEX recognizes that these are not primarily scientific missions, they have the potential to gather data addressing scientific questions discussed in past COMPLEX reports.

The committee concludes that the LPI workshop's recommendations for the instrument payloads of Orbital Missions 1 and 2 are responsive to the priorities for lunar science stated in past COMPLEX reports. In particular, Orbiter Mission 1 would address COMPLEX's highest-priority goal for lunar exploration, to "determine the chemistry of the lunar surface on both a global and regional scale." 5

The committee has some concerns, however, about instrumentation proposed to perform these observations. The LPI report states that the instrument of choice is a "gamma-ray/neutron spectrometer with a germanium detector." COMPLEX concurs with this preference but disagrees with the report's subsequent advice that "if development concerns arise regarding this detector, we recommend use of a NaI detector with subsequent flight of a germanium system." 6 Because the spectral resolution of the germanium detector is far superior to that of the NaI detector, COMPLEX recommends that OEXP fly a germanium detector, even at the expense of a modest launch delay.

With regard to the other proposed instruments for Orbital Missions 1 and 2, COMPLEX finds that the proposed visible and infrared imaging spectrometers as well as the imaging, laser altimetry, and gravity mapping (using two spacecraft for far-side gravity determinations) experiments would satisfy high-

priority measurement objectives that COMPLEX has presented previously. 7

The lander mission appears to have scientific value, but its present lack of definition precludes an adequate assessment of its potential contribution to the achievement of COMPLEX's objectives.

1 *Strategy for Exploration of the Inner Planets: 1977-1987,* Committee on Planetary and Lunar Exploration, Space Science Board, National Academy of Sciences, Washington, D.C., 1978.

2 *1990 Update to Strategy for Exploration of the Inner Planets,* Committee on Planetary and Lunar Exploration, Space Studies Board, National Academy Press, Washington, D.C., 1990

3 *Assessment of Solar System Exploration Programs: 1991,* Committee on Planetary and Lunar Exploration, Space Studies Board, National Academy Press, Washington, D.C., 1991, page 3.

4 Workshop on Early Robotic Missions to the Moon, Lunar and Planetary Institute, Houston, Texas, February 1992; proceedings of a workshop organized by NASA's Office of Exploration.

5 Reference 3, page 7.

6 Reference 4, page 2.

7 Reference 2, page 18.