Since geophysical observations are usually synoptic, it would be desirable to build up a net of observation points on the moon. In the follow-on Apollo Applications flights, traverses of about 10 kilometers from the landing point would be desirable to permit the emplacement of such a net. Probes dropped to the surface from lunar orbit would also contribute to the net.

When roving vehicles become available, gravity and magnetic anomalies associated with local and regional subsurface structures should be studied. Active seismic experiments with 10 kilometer profiles should be conducted.

If the magnetic field of the moon proves sufficiently strong, a magnetic survey from low orbit should be made. Also from orbit, use of an electro-magnetic pulse probe would provide significant geophysical information.

As more payload space becomes available, studies should be conducted to determine the maximum sensitivity that can be attained by seismometers emplaced on the moon and the efficiency of explosive and impact energy sources, which will transmit acoustic signals through the moon's interior. Analysis of these signals will provide information on the moon's interior, just as an understanding of the earth's interior is gained through analysis of the transmission of seismic reports of earthquakes.

After the average heat flow is determined, studies should be made of regions where the heat flow is anomalous. For detailed study of specific features of interest, dense networks of passive seismic stations should be emplaced, and seismic refraction, gravity and magnetic surveys conducted.

Geodesy/cartography

Geodetic and cartographic information is required for the moon in support of other scientific disciplines, especially geology and geophysics, since it provides the means of correlating theoretical and experimental results.

Tasks to be carried out include establishment of a coordinate system centered on the moon, description of the moon's gravitational field, derivation of the moon's center of gravity and distribution of mass, and establishment of a three-dimensional geodetic control system. Other tasks include systems for the collection, reduction, and presentation of photogrammetric data for lunar maps; measurements for complementary data such as rotation, librations, and lunar tides; and research and development programs for improving lunar geodetic information.

Intensive study should be undertaken to determine the design features of optimum camera systems for lunar geodesy and cartography. The cartographic camera should be coupled directly with a stellar camera and precise time should be available on the spacecraft. Precise altimetry is also necessary. Second priority should be assigned to the development of a high-resolution camera system.

Information on the lunar gravitational field would best be obtained by tracking lunar satellites from the moon itself. Laser altimeters should be developed for use from lunar orbits and radar and laser ranging should be undertaken from the earth to the moon to improve our knowledge of the moon's orbit and librations.

Astronomy

The moon offers a potential base for astronomical research. At the present time, available engineering and environmental information is insufficient to predict whether the moon's surface or a high earth orbit is better for this purpose. Studies should be started as soon as possible to determine the environment of the moon as it relates to an astronomical base.

In radio astronomy, a small, low-frequency radio telescope should be placed on the moon as early as possible to assist in obtaining environmental data. Feasibility studies should begin for a radio telescope array on the order of several kilometers, and a 100-foot dish antenna, both for operation in the latter portion of the 1970's.

In optical astronomy, a pilot telescope should be located on the moon in the early 1970's as an environment testing device. This telescope could serve as a research instrument as well as for site testing and could act as a prototype for the design and operation of a 100-inch telescope, should it prove desirable to place such an instrument on the moon. A lead time of about 15 years may be required for the construction of a 100-inch lunar telescope.

In X-ray and gamma ray astronomy, experiments should be conducted in the early 1970's to determine whether the lunar horizon or a crater rim might be used in locating such sources in space by the occultation method.