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EARTH PHOTOGRAPHY BY THE LARGE FORMAT CAMERA

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The Apollo program established the utility of orbital photographs in making accurate topographic maps. On Apollo missions 15, 16, and 17, two camera systems were used; a 76mm Fairchild metric camera and a 609mm Itek panoramic camera. From these systems orthophoto maps have been made of approximately 15% of the lunar surface at a 1:250,000 scale and of selected areas at 1:50,000 and 1:10,000 scales. The accuracy of these maps of the Moon is better than that of most maps of the U.S., not to mention the rest of the world.

Photography from orbit on the Gemini, Apollo, Skylab, and Apollo-Soyuz missions also established the utility of color film in studying the Earth. For example, color photographs from these missions have been used to map major fault systems and subsidiary fractures, to classify soil types in desert regions, and to determine sediment patterns at the mouths of major rivers. However, the resolution of these photographs, like that of Landsat data, is below what is required for detailed study and mapping.

The Space Shuttle program will open the way for application of what was learned on previous space missions and for better photography of the Earth. This will be done by using the Itek 505mm, f/6 "Large Format Camera". This camera will permit the acquisition of mapping quality, stereo, color, and high-resolution photographs from Earth orbit.

The Large Format Camera derives its name from the size of its individual frames; each frame is 23 cm x 46 cm, with a 40 x 74 degree field-of-view. The frame overlap can be set at 60%, 70% and 80% to allow for the required mapping accuracy. Edge fiducial marks constitute the calibration reference, and the radial distortion is measured to be ± 10 micrometers. The camera's framing rate varies from 5 to 45 seconds for use at various altitudes. The spectral range of the camera is 400 to 900 nanometers, and the system resolution is measured to be 100 lines/mm (1000:1 contrast) to 85 lines/mm (2:1 contrast). The camera will utilize a number of films, particularly Kodak high-resolution black-and-white (3414), color (SO-356) and color infrared (SO-131) in magazines with 150 meters of film.

NASA presently plans to fly the Large Format Camera on an early Shuttle mission. Photography from the first flight will mainly be used by the U.S. Geological Survey to update topographic maps. However, these photographs will also be available for detailed study and for resource surveys, particularly the exploration for petroleum and minerals.

In addition to its utility in Earth orbit, the Large Format Camera is designed to accommodate ultra-high-altitude photography. For example, this camera can provide 1m ground resolution photographs from an altitude of 20 km. Therefore, the camera opens the way for accurate, high quality photography for local and/or multi-national use in land and resource surveys.