LARGE FORMAT CAMERA PHOTOGRAPHS
A NEW TOOL FOR UNDERSTANDING ARID ENVIRONMENTS

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The Large Format Camera (LFC) was developed by NASA to produce high resolution stereo photographs from space with maximum photogrammetric fidelity. The camera has a 30.5 cm focal length lens and an f/6.0 aperture. The optics are corrected to permit operation with black and white (b/w), natural color (col) and color infrared (cir) film. Interchangeable minus-haze and minus-blue filters are located near the aperture stop, and an anti-vignetting filter is provided on the front element of the lens. The field-of-view of the LFC along track is 73.7 degrees (ratio 1.5 x H) and across track is 41.1 degrees (ratio 0.75 x H)

The frame format of the LFC is 23x46 cm with the long dimension in the direction of flight. The camera can be operated to produce 10, 60, 70, or 80 percent forward overlap for stereoscopic coverage. With 80 percent forward overlap, the stereo model base height ratio is 0.3 for successive frames and 1.2 if every fourth frame is used. The LFC magazine has a capacity of 2400 frames.

Two horizon-looking stellar cameras, one directed 45 degrees forward and the other 45 degrees aft were used to photograph the star field in synchronism with exposures of the LFC. Post flight mensuration and calculation of the stellar photographs will provide altitude information for the LFC.

The initial flight of the LFC was on shuttle mission STS-41-G in October, 1984. This mission was at 57 degrees inclination and operated at three different altitudes: 352 km, 272 km and 225 km. Four Kodak film types were used: 3412 b/w Panatomic-X Aerocon II, 3414 b/w High Definition Aerial; 50-242 Aerial Color Positive, and 50-131 High Definition Aerochrom Infrared Positive. The four films were spliced together to provide a continuous roll in the magazine. The ground resolution of the photographs is better than 10 meters. Extensive coverage was obtained on all continents except Antarctica.

Approximately 150 LFC photographs of the world's arid lands are available from this mission. Most of the photographs are high definition black and white, some are color infrared, and a few are natural color positives. The photograph scale ranges from approximately 1:1,000,000 at the high altitude to 1:740,000 at the low altitude. Coverage varies from 190,000 square kilometers to 57,000 square kilometers.

Accurate large-scale topographic data in arid lands is difficult to obtain due to their general remoteness. Because the parameters of the LFC camera, the exposure position and the altitude

are well known, topography can be determined for each stereo model with high precision. Using the stereo capacity of the LFC, relief has been calculated for several dunes in select sand seas. Additionally, profiles of dunes indicate the morphometry of simple, compound and complex types, inportant in determining the present and past eolian regime. With the LFC photographs, the positions of dunes with respect to each other and the relief differences of adjacent interdunal areas are determined photogrammetrically.

Sand seas are less than 20 percent of the world's arid areas. In eolian deflation zones, subtle color differences may indicate changes in the underlying geology or in the desert varnish. Land-use patterns and water resources in the borders of arid lands are mapped.

Because of geometric fidelity, high resolution and stereoscopic coverage, the LFC is far superior to Landsat or any previously used Earth-orbiting photographic system for understanding arid land environments.