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A UNIFIED LUNAR CONTROL NETWORK: APRIL 1991

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This program has been designed to combine and transform various control networks of the Moon into a common center-of-mass coordinate system. The first phase, dealing with the near side, has been completed and published (Davies et al., 1987). This report contains coordinates of 1166 points on the near side of the Moon.

The location of the center-of-mass and the coordinate system on the Moon are defined by the locations of the laser ranging retroreflectors (Ferrari, et al., 1980). Coordinates of the retroreflectors are given in both principal axes and mean Earth/Polar axis systems. The IAU has recommended that mean Earth/Polar axis coordinates be used on the Moon (Davies et al., 1989). .The difference in these coordinates systems is significant, more than 600 m in latitude and longitude. The coordinates of the Apollo 11, 14, and 15 retroreflectors and the Lunakhod 2 retroreflector are accurate to a few meters (Williams et al., 1987).

Very long base interferometry (VLBI) measurements of the Apollo 12, 14, 15, 16, and 17 ALSEP transmitters and laser observations of the Apollo 11, 14, and 15 were combined in a solution for the coordinates of the transmitters (King et al., 1976). The Apollo 15, 16, and 17 ALSEP stations have been identified on Apollo panoramic photography and their locations transferred to Apollo mapping frames. Transformation parameters involving translation, rotation and scale were derived to best fit the Apollo control network coordinates to the three ALSEP station coordinates (Davies et al., 1987). The coordinates of points in Apollo control network have been transformed into the coordinate system defined by the laser retroreflectors for the unified system.

Coordinates of points in the telescopic network of Meyer, 1980 have been transformed into the unified system using 130 points common to Meyer's network and the Apollo network (Davies et al., 1987). The Mariner 10 control network covering the north polar region has been added to the lunar network.

The most reliable control network for the far side is the Lunar Positional Reference System (1974), 1975. The estimated accuracy of the coordinates of the points varies between 1 km to 16 km. 159 points from this system that fell in the far side Apollo region have been remeasured on Apollo pictures and new coordinates computed that are consistent with the unified system. The amount of the differences in the coordinates have been computed. 60 points had a shift over 10 km; we suspect that identification errors account for many of these. 43 points had a shift between 6 km and 10 km, and 48 fall between 3 km and 6 km. Only 8 points had a shift of less than 3 km.

Because the coordinate system is directly tied to the laser ranging retroreflectors, their locations are very important. In most cases they are too small to be observed in photography. (See Figure 1.) For this reason, the coordinates of nearby craters to the Apollo 11 and 14 retroreflectors have been determined. Because these craters were related to the astronauts' surface exploration, they have been given names. Their coordinates are:

	Crater Name	Latitude (°)	Longitude (°)
Apollo 11	Double Crater	0.67373	23.47239
	Little West Crater	0.67435	23.47534
Apollo 14	South Doublet Crater	-3.64294	-17.48117
	North Doublet Crater	-3.64122	-17..48319
	North Triplet Crater	-3.64757	-17.46675
	Center Triplet Crater	-3.65022	-17.46669
	South Triplet Crater	-3.65478	-17.46678
	Weird Crater	-3.64334	-17.45945

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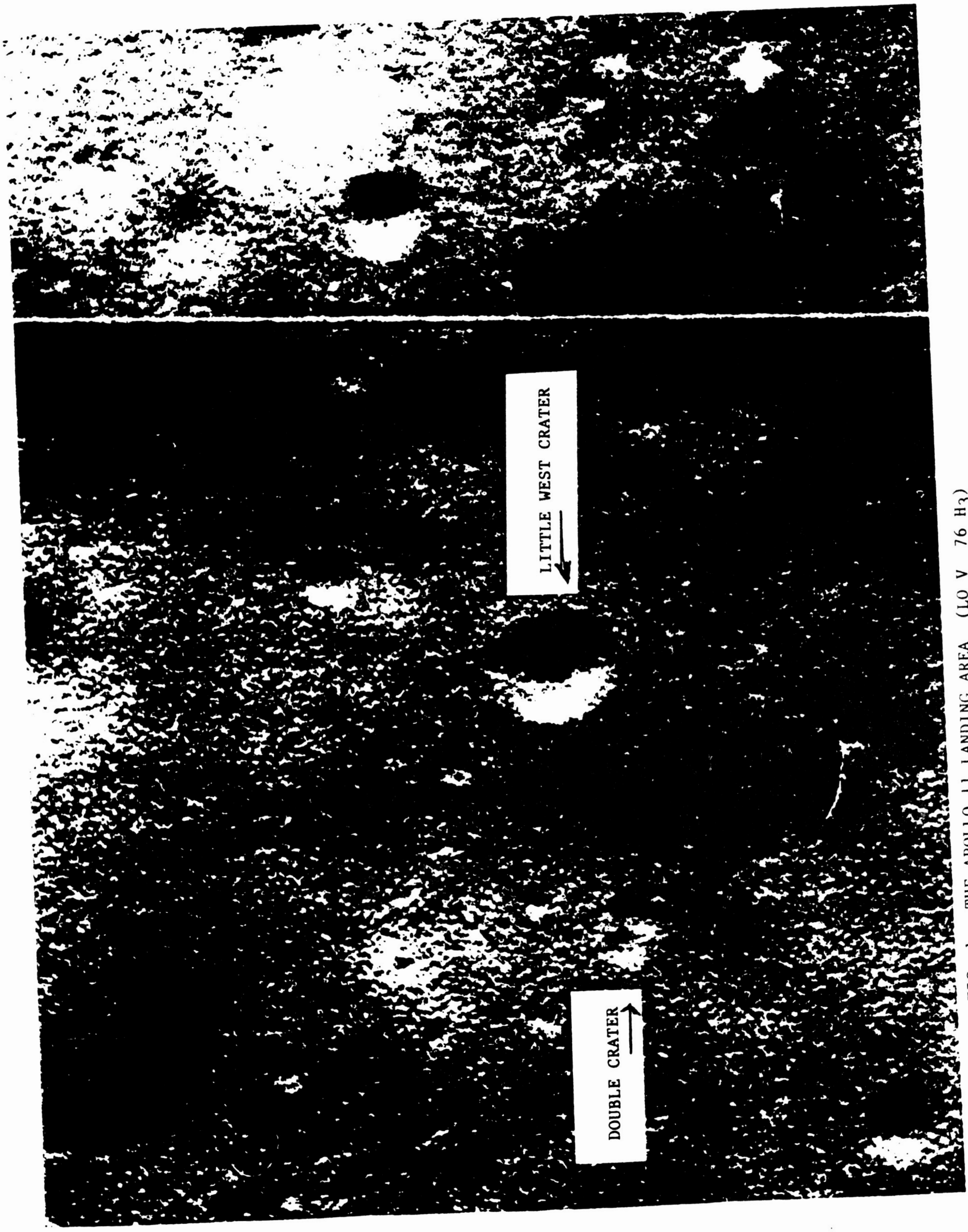

FIG. 1 THE APOLLO 11 LANDING AREA (LO V 76 H_3)