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EARTH SATELLITE CORPORATION

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STUDY OF LANDSAT-D THEMATIC MAPPER PERFORMANCE AS APPLIED TO HYDROCARBON EXPLORATION

Period Covered: April 7, 1983 to July 7, 1983

(E83-10389) STUDY OF LANDSAT-D THEMATIC MAPPER PERFORMANCE AS APPLIED TO HYDROCARBON EXPLORATION Quarterly Progress Report, 7 Apr. - 7 Jul. 1983 (Earth Satellite Corp.) 4 p HC A02/MF A01 CSCL 05B G3/43 N83-32142 Unclas 00389

1. Problems: Weather or timing of acquisition continues to be the major problem. Many of our test areas that lie in the Western U.S. were covered or at least dusted with snow by the time western acquisition began. Several of the eastern areas have cloud cover. The small amount of cloud cover over the Cement test site does not interfere with spectral assessment, but the vegetation is already in a senescent stage, precluding much effort on geobotany. We are currently reviewing the scenes acquired (but as yet not processed) to see if there are any alternative scenes that may contribute to our study.

The above problems underscore the value of having a spacecraft in orbit that can acquire data essentially at will over a long period of time and, consequently, have a high likelihood of being able to acquire data under optimal climatic and seasonal conditions. If Landsat-4 continues to deteriorate, it will be very important to launch Landsat D' as soon as possible.

2. The attached paper reviews many of the accomplishments and significant results of the past three quarters. The paper was presented at the GEOSAT Workshop, June 14, 1983, and contains information included in the papers attached to our report for the previous quarter.

3. Computer Processing of Landsat-4 Thematic Mapper Tapes: We have received an A tape and have begun processing it. Our review of

spacecraft system performance suggests that the standard corrections applied at the Goddard Space Flight Center are more complicated than necessary in some areas (because the spacecraft hardware is performing to specification or beyond) and insufficient in other cases (because there are variations that were not expected or allowed for on ground processing design).

Specifically, the image motion compensation device on the Thematic Mapper works so well that bow-tying effects are very small; but there are differences in the radiometry of forward and backward scans that make additional calibration necessary.

EarthSat is therefore performing the following operations on an A tape of the Washington, D.C. scene, received close to the end of this reporting period:

(1) Line-length corrections and line-start position adjustment.

(2) Radiometric correction, regarding the 16 detectors in their foward and reverse scan sweeps as though they constituted 32 independent detectors. Cumulative histograms will be matched and de-striping performed.

(3) At this stage an image will be generated using radiometric contrast stretches, but without geometric corrections. The purpose of this is to examine the best image quality attainable before resampling.

(4) Systematic geometric corrections to take account of earth rotation, earth curvature, etc., will then be applied and a corrected image product generated.

4. The work described in the previous quarterly report on the selection of best bands for Thematic Mapper data will be presented in September at

the Automatic Image Pattern Recognition Workshop at the University of Maryland. Software for band selection now forms part of the EarthSat processing system and is being used on a routine basis.

5. Many of the scenes of particular interest in EarthSat's Landsat-4 investigation unfortunately have a light dusting of snow cover. We have begun an investigation of the possible use of hue-saturation-intensity transformations to reduce the effect of such snow cover. No results are available yet, but we hope to be able to report our progress in the next quarter.

6. We have received a tape of the Greeley, Colorado scene and have begun processing it into several types of imagery. We reviewed the scene on our I^2S interactive system and selected the image types to be produced (decorrelated 2,3,4; natural color 1,2,3; hue saturation value 5/2, 5/7, eigen 1; 4,5,7 in two color combinations). We shall report on the results of interpreting these images in the next quarterly report.

7. In several instances, we have found that a 1,3,4 combination produces a more useful false color infrared version of TM data than the more common 2,3,4 arrangement, probably because band 1 is less highly correlated with the bands 3 and 4 than is band 2.

8. Organizers of the Pecora VIII Conference to be held in Sioux Falls, South Dakota in October have requested that we present the results of our study to-date (proposed title: "Landsat-4 Thematic Mapper Contribution to Geologic Exploration").

9. Our intention is to complete test site reports, exclusive of detailed field work, for the Wind River, Cement and Greeley scenes by the next reporting period.