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URBAN AND REGIONAL LAND USE ANALYSIS:  
 CARETS AND CENSUS CITIES EXPERIMENT PACKAGE

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MONTHLY PROGRESS REPORT

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Monthly Progress Report: April 1974  
Investigation No. 469

a. Overall status, including problem areas and significant progress to date:

a.1. CARETS -- Land use analysis: Since the last reporting period, individual Skylab frames, to be used in detailed comparative land use analysis, have been selected and sent to a commercial photo lab for enlargement. The actual land use mapping should begin during the next reporting period. At the present time, a multi-scale analysis is planned using the Skylab data and then comparing it to corresponding data sets derived from ERTS and high-altitude aircraft. Also, there is to be an analysis of the relative cost-effectiveness and corresponding trade-offs incurred in the use of each sensor system.

On April 9th members of our staff met with Rigdon Jooston, our technical monitor at JSC. At that time, we were informed by Mr. Jooston that there were no Skylab 4 data takes over the CARETS area. He also told us that reprocessing of S192 data from Skylab 3 would begin in June, hopefully cleaning up the tapes to a more useable form.

a.2. CARETS -- Land use climatology: During the period of this report, John Lewis and Dale Brown conversed, by phone, on NASA's plans for processing and distributing the thermal data. From Brown's comments, it is now our understanding that JSC will not deliver S-192 tapes, in useable form, before mid-August or possibly even September. The land use climatology team is now evaluating the impact of this revised timetable on the allocation of the remaining project resources.

a.3. Census Cities: Since the last reporting period, Census Cities has completed a study which presents some findings on the applications of ERTS and Skylab imagery for metropolitan land use analysis. Some of its major points follow.

Analysis of ERTS-1 and Skylab 2 EREP imagery alone and in comparison with land use data generated from 1970 and 1972 high-altitude photography indicates that certain categories of intra-urban land use can be identified from the satellite imagery. False color infrared composite enlargements were

made by combining the three S-190A black-and-white images (green, red, and infrared bands) with appropriate filters in the photo lab. This color infrared rendition was of better quality than the color IR photo taken by the multi-spectral camera. The color enhancement enabled the extraction of more intra-urban land use detail than from either the ERTS imagery or other Skylab S-190A images. Land use category identification from ERTS and Skylab compared favorably with that mapped from the high-altitude photography.

Many areas of post-1970 and post-1972 land use changes at the rural urban fringe and those changes involving large tracts of land in older areas could be easily and accurately identified both on the ERTS and particularly on the Skylab images. Small intra-urban land use changes, however, could not be readily discerned. Most of the changes mapped involved conversion of agricultural land to residential use. A three percent addition of urban residential land in 1973 (1200 hectares) was documented from the Skylab 2 photography in the 20 x 20 Km study area. This information proved of value in updating portions of the 1972 land use data base for this area.

James Wray provided George Lendaris, NASA Johnson Space Center with USGS 1970 land use maps of the Washington and San Francisco test sites. Lendaris planned to digitize the SL-3 S-190B high resolution color scene of Washington and to analyze spatial patterns (versus spectral patterns), comparing them with the 1970 USGS land use map. When Lendaris found atmospheric attenuation in the SL-3 S-190B scene of Washington and when he saw the fine SL-4 S-190B high resolution color scene of San Francisco, he transferred (early in March) the test site for his spatial pattern recognition experiment from Washington to San Francisco. Hence, he needs the USGS 1970 land use maps of San Francisco for control data.

As of mid-April USGS Skylab investigators have not yet received Skylab 4 imagery. How does it happen that NASA investigators get the SL-4 imagery so far in advance of other EREP investigators?

- b. Recommendations concerning decision and/or actions required to ensure the attainment of the experiment's scientific objectives: No change.
- c. Expected accomplishments during the next report periods:
  - (1) continue land use analysis of urban area S-190A and S-190B data.

- (2) put finishing touches on optical integrating technique for deriving net radiation maps from thermal imagery, as back-up technique for processing of data from S-192 scanner.
- (3) prepare for user evaluation of Skylab data from CARETS area.

d. Significant results and their relationship to practical applications or operational problems:

A number of likely applications and follow-on analyses are suggested by the tensus Cities evaluation of ERTS and Skylab data. Some of these applications are: 1) estimate water use requirements; 2) define urban expansion; 3) document the pattern of residential development and assess quality of residential environment; 4) project future population densities, and estimate changes in population distribution between censuses; 5) assess environmental impact resulting from gradual as well as catastrophic changes.

e. Summary outlook for the remaining effort to be performed:  
No change.

f. Travel summary and plans: Valerie Milazzo presented an invited paper on the use of Skylab data in detecting urban growth at the annual meeting of the American Geophysical Union in Washington, D.C. on April 12. She also presented a paper entitled "Some Findings on the Applications of ERTS and Skylab Imagery for Metropolitan Land Use Analysis" at the Ninth International Symposium on Remote Sensing of Environment in Ann Arbor, Michigan on April 16.

Robert Alexander, while attending the Ninth International Symposium on Remote Sensing of Environment at Ann Arbor, coordinated work on the land use climatology part of this investigation with Fred Thomson of the Environmental Research Institute of Michigan (ERIM), who is principal investigator on a related Skylab investigation. The ERIM project is scheduled for completion in about a month, and it appears that its results on S-192 data processing would be useful aids to our investigation.

Alexander plans to present a discussion on the results of this investigation at the UCLA Skylab Conference May 11, 1974.

Approved:

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