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Progress Report No. 16

Title: A Study of Early Detection of Insect Infestations and Density/Distribution of Host Plants.

Citrus Insects Research
USDA, ARS
509 West Fourth St., Weslaco, Texas 78596

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(A) Weather was extremely cloudy this month and only 1.9 hrs were flown. In place of not being able to fly, the time was used to interpret the 190B data received during the previous reporting period. Among the things that we have been able to define are distinct contrasts between irrigated crops and brush. The irrigated crops appeared bright red while the brush appeared dark red to reddish brown. Field shapes were very distinct which provided easy crop identification as well as acreage measurements. Since crop identification appears to be easily accomplished from the film, we feel that dispersal patterns of pests could be more effectively determined by using the Skylab data. We can identify citrus accurately for fields that are 2 acres or more. This should include all commercial citrus in the Rio Grande Valley. We are able to identify sugar cane, citrus, winter vegetables, and brushland. Roads and irrigation canals are readily identifiable. After working with the film for 30 days we have determined that insect injury, nematode and plant disease damage that causes significant reflectance changes, along with physiological disorders in the crops could be detected when the damaged area is 45 feet in diameter. This would include most established injury from the causes indicated. The only problems we now have in reaching our experimental objectives would involve inadequate coverage of the test area and seasonal differences that would not be covered by the satellite data that was collected.

Different photographic techniques were employed, such as recopying the film with different filters, under-processing and over-processing which changes the film from low contrast to high contrast. With these techniques we have been able to extract much more information than was available on the original film sent to us.

(B) With the limitations imposed by incomplete coverage of the test area with 190B data and photography available during only one season we feel that the experimental objectives will be accomplished. The time lag between splash-down and the PI receiving his data presents some problems because of changes that may occur during this period. Shortening this period would be a vital step if practical use of the data is to become a reality.

(C) When we receive additional Skylab 190B data we feel that we can extract much additional information. We are continuing to fly the valley area mapping citrus and watching insects develop with remote sensing techniques. The data thus acquired will be related to the satellite data with allowances made for the resolution possible with the 190B data. This will provide some insights into potential of the satellite during periods in which we did not receive data. We also plan to process color IR film in modified developing times to determine if the film speed rating can be increased. Our previous experience with the film indicates that it can be done. This would be a great advantage during low light levels due to adverse atmospheric conditions or when photographing early or late in the day.

(D) The above discussions demonstrate that many problems on crops are identifiable from satellite data. With the resolution obtained from 190B data there is little doubt that practical applications in detecting plant injury are within reach. The only impediment that we visualize in the operational use of the technique is in the logistics of handling the data. It is obvious that the turn around time between data takes and availability of the data to the user would have to be reduced tremendously. The dynamic nature of biological systems requires immediate reaction when adverse circumstances first become apparent. It would thus be necessary to have more frequent data takes and more rapid means of making the data available to the users.

(E) The remaining effort will be devoted to photointerpretation and analysis of data. We anticipate a yield of considerably more information as this work progresses.

(F) Travel during this reporting period was limited to that associated with ground truth and aircraft data gathering missions.