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TASK 1 (UN 672)

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CORRELATION OF SATELLITE AND GROUND  
DATA IN AIR POLLUTION STUDIES

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SATELLITE AND GROUND DATA IN AIR POLLUTION  
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(Old Dominion Univ. Research Foundation)  
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BIMONTHLY REPORT FOR NAS5-21816, PROPOSAL 299  
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Air Pollution Studies  
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Apply Marine Station Data to the Study of Productivity  
along the Eastern Shelf Expanded Waters of the United States  
Dr. H. G. Marshall

Management and Fiscal Summary

Submitted to the

Goddard Space Flight Center  
National Aeronautics and Space Administration

By the

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## ABSTRACT

The Image Analysis laboratory at Old Dominion University is described. Air Pollution Ground Truth Data Network for Southeastern Virginia is currently operational. Analysis of U-2 imagery of CARETS site indicates Smoke plumes can be easily detected. First look at selected ERTS-1 color composites demonstrates plumes from forrest fires can be detected (Image identifier 1003-31355-MSS 4,5,7).

## INTRODUCTION

This first interim report contains a description of the work conducted since late July 1972 at Old Dominion University on ERTS-1 contract MMC #229-01, GSFC ID UN672: Correlation of satellite and Ground Data in Air Pollution Studies. The majority of the effort thus far has been divided into three principal areas: establishment of image analysis laboratory; implementation of ground truth facilities; and examination of U-2 imagery of the Chesapeake Bay region.

### IMAGE ANALYSIS LABORATORY

At present, the image analysis laboratory contains: two (2) Kelsh-Plotters modified for analysis of 9 1/2" X 9 1/2" transparencies; a three color stereo-viewer modified for viewing 70 mm transparencies; a light table; a motorized EG & G continuous viewing device for strip transparency film of any size; various optics; storage facilities for imagery; and desk space for the photointerpretors. (PI)

The primary land area of interest in this investigation is 1° X 1 1/2° centered on the entrance to the Chesapeake Bay. A large 8' X 8' map of this area has been constructed using 7 1/2 second USGS quadrangle maps. This map mosaic is used by the P. I.'s as a primary reference.

Three part-time employees have been hired to assist in the handling of imagery and correlation with ground truth. One of

these was trained as a photo-interpretator while on active duty with the U.S. Navy and has had experience with interpretation of high resolution aerial and satellite imagery. The other two research associates are engaged in collection of ground truth.

#### AIR POLLUTION GROUND TRUTH DATA

The primary source for air quality data in Virginia is the State Air Pollution Control Board (VAPCB). A close working relationship exists between the investigators and the directors of this organization and a free information exchange exists. The State has established an inventory of fixed air pollution sources. This inventory has been surveyed and 64 major particulate sources (smoke plumes) have been located and plotted on our map mosaic. The total amount of particulate material entering the atmosphere from these sources ranges from 5 to greater than 1,000 tons per year.

All 25 air quality data stations in the target area have been located and field data is at our disposal. These stations have been placed on our status map in the image analysis laboratory. The NASA imagery generated by overflights by U-2's during late 1971 has been analyzed and several important smoke plumes sources have been detected. In addition the USDA mosaics of that imagery has been purchased for use in analysis.

Meteorological data for this area is currently being recorded by various agencies in addition to Old Dominion University. Two staff meteorologist of the Geophysical Sciences Department are

currently gathering this information from all met. Stations for use in modeling calculations and for interpretation of imagery.

We have an agreement with the local personnel of the Federal Aviation Administration (FAA) by which we may obtain the position of any aircraft which is high enough to produce contrails during ERTS passes.

Much of the air quality data generated by the State is done by hi-volume air samplers. These devices collect over a 24 hour integration period the particulates present in the lower atmosphere. Thus, hi-volume samplers do not have sensitivity as to direction in their detection technique. Together with the VSAPCB, we are currently embarking on a program to do neutron activation analysis on the particulate samples in order to provide finger-print information as to possible sources.

Local fire departments have promised to provide intelligence as to major fires during ERTS-1 overflights. This coupled with VSAPCB data, ODU's data and meteorological information will have impact on local urban fire problems.

#### ERTS IMAGERY ANALYSIS

As of this date (30 Sept. 1972) no ERTS-1 imagery has been available of the target area since there has been total cloud cover on all passes. Cloud statistics indicate it maybe late winter 1972 or spring 1973 before such imagery is possible. Due to

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these facts, the principal investigator and two research associates have visited the User's Service located at Goddard Space Flight Center. The imagery of several complete orbital passes over the United States was viewed and evidence was established to the fact that smoke plumes can be detected by ERTS-1! To this pursuit imagery is currently being ordered for areas outside of the major test area, so that the staff may be trained and analysis may continue in this interesting problem.

TASK 2 (UN 628)

Dr. P. Fleischer  
(Dr. J. C. Ludwick)  
Dr. W. J. Hanna  
Dr. T. A. Gosink  
Dr. D. W. Bowker

INVESTIGATION TO RELATE THE CHLOROPHYLL AND  
SUSPENDED SEDIMENT CONTENT IN THE WATERS OF  
LOWER CHESAPEAKE BAY TO ERTS-A IMAGERY



A data base has been compiled and historical data on Chesapeake Bay water have been collected. A computer interrogation of MSS computer sample tapes has been completed. High-altitude photographs of the Chesapeake Bay region ordered in April 1972 for preliminary studies, have not been received to date.

The Bendix transmissometer we use to make turbidity measurements in surface water has been modified and made operational for the project. The light-beam path-length has been reduced to 43 cm to make the instrument functional in very turbid water. The original manual nullmeter readout has been replaced with a strip chart recorder and DC power for the light source. A suitable method of towing the transmissometer is presently being devised. A test flight of the rental helicopter, to gather ground-truth data, was conducted. A work-up of the test flight data is in progress.

No ERTS-A computer tapes have been received. No satellite photographs have as yet been received. Some early test sampling has been accomplished.

Each of the investigators who requested a graduate assistant has located one and started him working on the project, except one. A suitable student for that aspect of the project is being sought.

The satellite passes of September 3 and September 21 were not useable because of weather in the area. All coinvestigators are standing by, awaiting the October 9 pass. It is expected that the transmissometer will be towed during this pass, the drydocking schedule of the R/V Linwood Holton permitting.

The meeting on September 29, at Greenbelt, for the preliminary evaluation of ERTS-A data was attended by Dr. David Bowker and Dr. William Hanna.

TASK 3 (UN 673)

Dr. H. G. Marshall

THE USE OF ERTS-1 TO MORE FULLY UTILIZE AND  
APPLY MARINE STATION DATA TO THE STUDY OF  
PRODUCTIVITY ALONG THE EASTERN SHELF  
EXPANDED WATERS OF THE UNITED STATES

Principal Investigator: Harold G. Marshall  
Department of Biology  
Old Dominion University

1. Initial preparations have been carried out to receive, process, and analyze the ERTS-1 data for this project. Efforts in this regard have been coordinated with other investigators at Old Dominion University in the ERTS-1 program, and with Dr. David Bowker of NASA Langley.
2. A graduate assistant has been engaged to assist in the examination of water samples for phytoplankton analysis. Specific laboratory supplies and equipment have been ordered.
3. The delay in the launch of ERTS-1 proved to be unfortunate, since the satellite overpasses did not coincide with the scheduled collections by ship at sea. A change in the ERTS-1 data request was submitted to assure satellite data and sea truth information to come at the same time.
4. No ERTS-1 data has been received to date.

## MODIFICATIONS IN EQUIPMENT EXPENDITURES

An arrangement has been made to test the adaptability of some equipment available at Langley Research Center for use in place of the Coulter Counter requested in Part II of this project. It will not be known if this equipment can be used for those measurements until it can be checked out on some of the *in situ* samples. If the available equipment can be used for these purposes, permission will be sought to reprogram those funds allocated to the purchase of the Coulter Counter for the purchase of image viewing equipment, additional helicopter sampling time, additional student assistance and/or other purposes in line with the stated goals of Part II.

## PERSONNEL CHANGES

Dr. Ludwick, one of the coinvestigators in Part II, has found that the press of other duties will not allow him sufficient time to devote the necessary effort to this project. Accordingly, Dr. Peter Fleischer has agreed to work with the other coinvestigators in the conduct of the project. Dr. Ludwick will work in an advisory capacity with Dr. Fleischer and the other investigators.

## FISCAL STATEMENT

Funds available for the conduct of this project appear at present to be adequate for the completion of the projects. The change in Article XIX of the contract increasing the limitation of the government's obligation from \$3,000 to the sum presently available for payment, \$91,026 is gratefully acknowledged.