International Business Machines Corporation

18100 Frederick Pike
Gaithersburg, Md. 20760

October 23, 1972

Reference: Contract NAS 5-21716
NMC # 161
PR 514

Mr. Arthur Fihelly
Technical Monitor
Code 430
Goddard Space Flight Center
NASA
Greenbelt, Maryland 20771

Dear Mr. Fihelly:

Subject: All Digital Precision Processing of ERTS Images

The following constitutes the Type I Progress Report (Article II, Item 3 of Referenced Contract) for the period ending September 30, 1972:

Problems

No problems have been encountered to date.

Accomplishments for This Reporting Period

Major program modules have been written, tested, and are being assembled into a programming system. Performance testing of the various algorithms is being implemented concurrently. Requests for specific NDPF products have been made in support of the experimentation.

Programs to generate image annotation data have been written and are ready to be tested. The analysis to determine latitude/longitude and UTM tic mark locations has been performed, and the programs that combine the tic marks and alpha-numeric data blocks with the image data are in final coding.

Preliminary testing of the Sequential Similarity Detection Algorithm (SSDA) using digitized U2 images is underway. Preliminary results show that registration can be achieved, although some false detection occurs due primarily to large photometric differences between successive U2 frames containing overlapped areas. Image normalization is necessary, and

additional testing is underway to determine the best parametric values and sensitivity to conditions. It is anticipated that large photometric differences will not exist in ERTS imagery; thus fewer operational problems are anticipated when testing is done with the ERTS image CCT data. Testing on ERTS data has been delayed pending receipt of requested CCT's containing multiple coverage of the same ground area.

Documents giving the 18x18 and 9x9 radiance mapping data for the RBV cameras were received from NASA. However, all attempts to derive the 9x9 values from the 18x18 values have been unsuccessful. Requests for a consistent set of 18x18 and 9x9 data in legible form have been made. Until valid preflight radiance map values for the RBV are received, the adequacy of the method proposed for RBV radiometric corrections cannot be evaluated. Timely delivery of the required information is essential in order to implement and evaluate an adequate RBV radiometric correction scheme within the confines of the present contract schedule.

RBV and MSS CCT's of the July 25, 1972 viewing of the Monterey, California, area as well as the Bulk Image Annotation Tape for that period have been received from NASA. UTM co-ordinates for several Geodetic Control Points (GCP's) in the images have been received from USGS. The GCP's have been located in the image data through the use of computer-generated shade prints. Thus the information required to geometrically correct the seven images is on hand. Application of that correction will be accomplished following the integration and testing of the programs.

Integration and testing of the various program modules continues. At present the system is capable of reading ERTS CCT's of both RBV and MSS images, reformatting the data into complete images, applying radiometric corrections and geometric corrections, and producing output images which will be at 1:1,000,000 scale when recorded on film with a square spot 50.8 microns on a side.

Plans for the Next Reporting Period

It is anticipated that the following objectives will be accomplished during the next reporting period:

- The seven images of the Monterey area will be converted into geometrically corrected UTM projections at 1:1,000,000 scale and will be recorded on film. Subimage areas containing the GCP's will be shade-printed, and the corrected image geometric accuracy evaluated.

- The corrected film images will be submitted to Mr. Tom Burger of USGS for an independent geometric accuracy evaluation.

- An evaluation of the performance of the SSDA on ERTS data will be initiated using CCT data (on order) of the Phoenix and Monterey Test Areas.

- The proposed RBV radiometric correction scheme will be evaluated (and modified, if necessary) upon receipt of the required radiometric calibration information. The MSS radiometric correction program will also be evaluated.

- The programs to generate image annotation data (tic mark and alpha-numeric data) will be tested and the results evaluated.

- Integration and testing of all program modules which can be developed from information currently on hand will be completed.

- An analytic error analysis of the implementation methods will be done.

Other Comments

- The project is within projected budget. Except for the SSDA evaluation and RBV radiometric correction scheme development which have been delayed by the lack of required data, the project is on schedule.

- There are no changes contemplated, recommended, or requested at this time.

- Mark Cain and Stephen Murphrey have been added to the project staff to support both the analysis and programming efforts.

- It is planned to use a high resolution grey scale display at IBM Gaithersburg to allow viewing and evaluation of images before and after processing.

- There have been no papers, articles, reports, talks, etc., produced in connection with this work.

Very truly yours,

Ralph Bernstein

Ralph Bernstein
Principal Investigator

RB:tb