TESTIMONY OF

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FIELD HEARINGS ON BILLS S.2350 AND S.3484
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Mr. Chairman and Members of the Committee:

I am most pleased to have the opportunity to appear at these Hearings in consideration of Senate Bills S.2350 and S.3484. It is very rewarding and satisfying to note the continuing interest and support of the Senate and its Members in the field of space applications and, in particular, the NASA and Department of the Interior's Earth resources remote sensing programs.

I recall that it was approximately one year ago, August 7,1973, that Senator Moss was present when Secretary of Interior Rogers C. B. Morton dedicated the facility that we sit in today; the only facility of its kind in the Nation uniquely dedicated to making space and aircraft acquired remotely sensed data of the Earth's resources available to resource managers of this country and the world. In addition, this facility and the professional staff serve another role in providing assistance and training in application of the data.

I am aware that earlier this week in Washington you received the views of the Department of the Interior and NASA on the proposed Bills being discussed today. Therefore I will generally restrict my comments to the events of the last year and the current status of operations at the EROS Data Center.

As you know, the Data Center is a prime dissemination source of ERTS and other remotely sensed data to the user public. In the two years since the launch of the ERTS satellite, the Data Center has supplied over 450,000 copies of remotely sensed images to this user community, of which 243,000 copies were reproductions of ERTS images. All products of the Data Center are for sale at the cost of reproduction. Receipts for data products during this period totaled $1,177,000. Our data sales have grown from approximately $250,000 in FY 73 to $900,000 in FY 74, and are projected to be 1 1/2 to 1 3/4 million dollars in FY 75.

You may be interested in the character of our ERTS user community to date. U.S. industry is our largest single user with 27 percent of total sales volume. Foreign users and various agencies and departments of our Federal Government are the next largest user groups with about 22 percent each. Educational and academic institutions account for 13 percent of our volume. The individual "man-on-the-street," buying images for his personal use, accounts for 12 percent of the total sales.

State, county, city, and local governments account for the remaining 3 percent.

You will recall that we moved into this new facility approximately 10 months ago. Coincident with the move we received world-wide publicity in the technical and popular press and, as a result, were deluged with requests for information and with orders for data. This difficult period is now behind us; we have an adequate, well-trained staff; our equipment and facilities are running smoothly. We are now able to ship an average order in two weeks after receipt at the Data Center, allowing ERTS users to receive data approximately six weeks after acquisition by the satellite.

Another important development will occur in the near future. Within the next few months, the Data Center will assume a major responsibility in supplying ERTS data to the NASA-funded investigators for the continuing ERTS applications experiments. We strongly support this move by NASA, a move that will insure that all users of the data are serviced on an identical basis.

Consistent with our efforts to more effectively service the serious user, we are planning to reduce our standard product line somewhat in the coming weeks. In general, we will no longer provide certain very low demand products as standard products. A "standard product" is one for which we are equipped to give rapid turnaround

on orders. Non-standard products will continue to be available through our custom laboratory service on a more extended delivery cycle. Implementing an instruction from the Office of Management and Budget, we have recently reviewed our costs for reproduction of data. This review resulted in modest increases in prices of standard products. The new prices have been coordinated with and accepted by the Inter-Agency Committee on Sales Prices for Aerial Photographic Reproductions.

In addition to imagery and photographic reproductions, the Center makes data available in digital form for machine analysis by the user community. Upon specific request, NASA supplies ERTS digital data to the Center where it is copied and subsequently disseminated to the user. Of particular importance is our desire to develop and implement, in cooperation with NASA, a digital image processing capability at the Data Center. This capability will retain the digital fidelity of the data in the reproduction process, thus maximizing the information content of the data.

Turning to Applications Assistance and Training, a primary objective of the EROS Data Center has been to develop a capability for transferring available data analysis techniques to the users. Currently, there is no central or easily accessible organization where domestic and foreign scientists and engineers can go for assistance in the analysis and use of remote sensing data for Earth resources application. Our national scientific and technical capabilities in the field of remote sensing are scattered throughout governmental

research and development organizations, academic institutions, and private companies, and are generally directed toward research and experimentation, as opposed to transferring operational technology. There is an urgent need to establish a centralized group which can evaluate and document the current state-of-the-art techniques in remote sensing and transfer these techniques along with performance evaluations and procedures to interested users. I feel that the EROS Data Center has the responsibility to provide this centralized applications assistance, and am actively working toward that objective.

Applications Assistance activities have been functional at the Data Center for about one year. During this period, the major emphasis within the Center has been towards training in manual image analysis and providing day-to-day applications assistance to interested users. Users have received advice and assistance from the Data Center staff through letters, telephone calls, and personal visits.

Current plans and equipment purchases are being directed toward developing capabilities in automated and semi-automated image analysis and applications assistance. A state-of-the-art data analysis laboratory is being implemented with the capability for image enhancement, analog multispectral classification, digital multispectral classification, training area extraction, study area extraction, and information storage

and retrieval, all with suitable hard copy display of results and output. Significant Data Center capability will be established in survey design and sampling, manual image analysis, automatic machine data analysis, information storage and retrieval systems, and applications evaluation and assessment. Discipline areas to be developed will be: agricultural inventory, forest and rangeland management, land use survey and inventory, mineral resources and civil works survey, and environmental monitoring.

Staff members will establish liaison and cooperative agreements with governmental research and development, academic institutions and private organizations, in order to develop and document techniques for subsequent transfer to the user community and resource management agencies.

When potential new applications are verified as feasible, tested, and proven to be accurate, reliable, and beneficial, a complete technique use package will be prepared which can be transferred to the user community and resource managers for consideration and implementation.

In addition to the activities in technology transfer, the Applications Assistance staff will sponsor workshops, work with user agencies in addressing specific Earth resource problems, and provide

day-to-day assistance to the general user. International workshops and training courses will be scheduled at appropriate intervals and audio-visual training packages covering a number of disciplinary subjects will be developed and made available.

In summary, a national capability comprised of a competent staff of professionals at the EROS Data Center and field Applications Assistance Facilities, along with state-of-the-art manual and digital analysis equipment, is being developed and will be accessible to the user community for evaluation and implementation of remote sensing technology.

The large number of personal visits to the Data Center by foreign nationals from countries of every continent in the world indicates the international role which the Data Center plays. Sixty-two scientists, engineers, and resource managers from 33 nations have participated in two formal Remote Sensing Workshops and Seminars conducted by the Applications Assistance staff of the Data Center.

The agenda for a two-day visit to the Center by 17 delegates to the United Nations representing the missions of 11 countries, all members of the Task Force on Data Dissemination of the United Nations Working Group on Remote Sensing of the Earth by Satellites, included formal presentations covering Data Center operations and activities

and general discussions of the role and experience of the Data Center in disseminating data to the international community.

Perhaps of as much international impact as the foreign participation in formal training courses and symposiums is the number of foreign individuals representing scientific and administrative governmental offices, technical and scientific fields of private industry, media communications, publishing firms, and universities and colleges, who make personal visits to the Data Center. All totaled, over 1,000 foreign nationals have visited the Data Center for one reason or another over the past year.

These foreign visitors to the Data Center, many of them from the highest levels of the aerospace agencies, agriculture departments, geological surveys, and other departments of their countries, receive comprehensive information presented in concise briefings. Their impressions of the EROS Data Center and the personnel who assist them have far-reaching implications as they return to their own countries and report to their governments and their associates.

Now let me turn to the future. The EROS Data Center must continue to fulfill its responsibility to provide national storage, retrieval, processing, and dissemination of remotely sensed Earth resources information. Experience to date indicates that resource managers,

scientists, and engineers throughout the U.S. and foreign countries rely on the Data Center for satellite and aircraft acquired data and for applications assistance and training to assist them in using the data for decision making processes regarding our Earth's resources. In order to make maximum use of the data available, certain deficiencies that exist with the current experimental data acquisition and ground handling system should be corrected to allow efficient use of the data. Generally stated, these deficiencies relate to 1) the significant delays between acquisition of data and availability to the user community; 2) the second and third generation photographic image products available from the current system which do not preserve information content; and 3) the rigid product formats which make information extraction and analysis of the data extremely costly and difficult to the user. In fulfilling its promise, the Earth resources remote sensing program must take the necessary steps to resolve these deficiencies by providing data of higher quality and information content to the user community in a more timely manner and with product formats optimized to user analysis and information extraction requirements. The implementation of digital data handling and processing techniques will make available products with much improved information content and in formats uniquely tailored and enhanced for application by the user community. The ability of digital computers to process image data has made rapid progress over the last several years, and it is now generally agreed

that digital image processing is the preferred approach and is planned by NASA for experimental implementation during the ERTS-B time period.

Real time satellite data reception and processing capability would allow data to be acquired from a satellite over any part of the contiguous U.S. This capability would eliminate the significant delays due to surface transportation of the data tapes and film processing that occur in the current experimental program.

In summary then, let me restate the proposed solutions to the existing program deficiencies.

Deficiency #1 - The significant delay between acquisition of data and availability to the user community.

Proposed Solution: Real time reception of satellite data at a geographically centralized U.S. site, coupled with implementation of a state-of-the-art digital data handling and processing system with suitable throughput to provide data to the user community within 48 hours of acquisition.

Deficiency #2 - The degraded information content of second and third generation photographic products available from the existing experimental system.

Proposed Solution: Implementation of a digital data handling and processing system with sufficient throughput to provide

fully corrected (geometry and radiometry) digital data and first generation imagery to the user community.

Deficiency #3 - The rigid and inflexible product formats which make information extraction and analysis of the data extremely costly and difficult to the user.

Proposed Solution: Once again, the implementation of readily available and state-of-the-art technology in the form of a digital data handling and processing system which will provide repeatable flexibility in providing products tailored to the user capability for analysis and information extraction.

The Department of the Interior EROS Data Center site selection was made on the basis of satisfying this real time data reception and processing requirement and the Center is rapidly building the engineering and scientific competence to implement such a system.

Thank you.