Landsat DATA USERS NOTES

ISSUE NO. 34 NOVEMBER 1985

COMMERCE TRANSFERS LANDSAT TO PRIVATE SECTOR

On September 27, 1985, the Commerce Department signed the contract with Earth Observation Satellite Co. (EOSAT), that transfers the Landsat system to the private sector. EOSAT is a joint venture of the RCA Corp. and Hughes Aircraft Co.

The contract provides that federal funding will be phased out over the next five years. During the phase-out period, the company will receive $250 million to build and operate two new satellites and a new ground station and data-processing system for the new spacecraft. EOSAT also will operate the two existing satellites, Landsats 4 and 5.

RCA will supply the next-generation spacecraft through its Astro-Electronics Division in Princeton, NJ. Instrumentation will be supplied by the Santa Barbara Research Center, a Hughes subsidiary in Goleta, CA. EOSAT will provide succeeding satellites and ground facilities without further government subsidy.

The contract requires that EOSAT market Landsat data worldwide on a non-discriminatory basis.

For order and inquiry information see page 8.

LANDSAT COMMERCIALIZATION

The excerpt that follows is from Congressional testimony presented on June 13, 1985, by Anthony J. Calio, Deputy Administrator, National Oceanic and Atmospheric Administration, before a joint meeting of the Natural Resources, Agriculture Research and Environment Subcommittee and the Space Science and Applications Subcommittee.

The testimony represents a concise review of commercialization activities over the past two years and a summary of the terms and conditions negotiated into the contract between the Earth Observation Satellite Company and the Department of Commerce. The hearing was called specifically to examine whether the transfer conforms to the Land Remote-Sensing Commercialization Act of 1984 (Public Law 98-365) and whether the contract represents a "good deal" for the taxpayer:

"In February, 1983, President Reagan signed a decision memorandum authorizing a formal Landsat commercialization effort. Secretary Baldrige then established the Source Evaluation Board for Civil Space Remote Sensing (SEB/CSRS) empowered to issue a formal Request for Proposals (RFP), evaluate proposals submitted, and report their findings to him.

The primary goal of the competitive process was 'to establish a commercial U.S. civil operational land-observing satellite program...' to '...begin operation after the demise of the present Government Landsat system. This is being done to maintain U.S. leadership in remote sensing from space and to foster the economic benefits of such data for the private and public good...' (RFP, page i). In meeting this goal, one firm condition is that the commercial program meet Government policy requirements, principally National Security and international considerations.

The Government was also seeking costs lower than those projected for the continuation of a Government-managed and operated land observing satellite system. This includes periodic replacement of the space system as failures occur, replacement or augmentation of ground equipment as wearout occurs, or to improve products in response to market demands.

The Source Evaluation Board included representatives from the Departments of Agriculture, Defense, Interior, State, and Commerce, and the National Aeronautics and Space Administration (NASA). Additional staff and logistical support were provided by NOAA, NASA, the National Bureau of Standards, and the Departments of Defense, State and Interior.

A schedule was established leading to presentation of the Board's findings and recommendations to Secretary Baldrige in May 1984. The major steps included: (1) development of the RFP and establishment of qualification criteria and evaluation factors for the proposals; (2) circulation of a draft RFP to interested persons and/or organizations for comment; (3) review of the RFP by appropriate Executive Branch and Congressional officials; (4) issuance of the final RFP; (5) receipt of proposals; (6) interim evaluation and determination of proposals within the competitive range; (7) clarification of offers within the competitive range through oral and written response to questions; and (8) final evaluation, scoring, and a report of findings.

The RFP provided that no proposal could be considered if it were not acceptable with respect to: national security; foreign policy; understanding the Government requirements in the RFP; and particular stipulations of the RFP.

In addition, the RFP stated the evaluation factors which included costs as '...of equal importance to all other factors combined.' (RFP, page XI-1). The RFP further stated 'Cost to the Government will be a major factor in review of the proposals.' Therefore, it is the Government's desire that the offeror be prepared to develop and operate follow-on systems without Government subsidies. However, to facilitate rapid commercialization, an offeror may elect to include in his proposal mechanisms for short-term Government financial assistance... 'It is the Government's intention that...the private operator assumes the major financial risk over the longer term.' (RFP, page III-5).

Seven proposals were received by the official closing date for the RFP, March 19, 1984. The offerors were:

Earth Observation Satellite Co., Arlington, VA
Eastman Kodak Co., Rochester, NY
Geospectra Corp., Ann Arbor, MI
Milton A. Schulz, Williston, ND
Miltope Corp., Melville, NY
Space Access Corp., Marina Del Rey,

CA; and
Space America Corp., Bethesda, MD.

After initial evaluation, the Board found three proposals to be within the competitive range: Earth Observation Satellite Company, Eastman Kodak Company, and Space America.

These offerors proposed programs with the necessary satellite(s), a ground system to control the satellites and to produce satellite-acquired data, and a marketing plan to sell that data. All addressed the major features of the RFP. All proposed to satisfy, at least minimally, the requirements for National Security and international considerations.

Each of the three proposed a program providing nominal continuity after the demise of Landsat-5. The likelihood of success in meeting the schedules contained in the proposals varied among the offerors and was taken into account in the evaluations and in the projected schedules used to compute likely costs to the Government.

Each of the proposed systems would continue to provide multispectral data functionally equivalent to the Multispectral Scanner data from Landsats 1-5 and, hence, compatible with existing Landsat data processing systems. In addition, each would provide some technological advance over present sensors and systems. These varied both in degree of advancement and the schedule on which they were proposed.

On May 29, 1984, the Secretary selected the proposals of Eastman Kodak and EOSAT as the best proposals and directed that negotiations start with both companies toward definition of firm contractual agreements. The two firms were notified of their selection for further negotiations, and initial meetings were held with each firm. Both firms were informed that their technical approaches were acceptable, but their financial proposals were unacceptable as submitted.

Revised proposals and the refined financial analyses all confirmed that expected Government liability over the life of the program would have an adverse effect on efforts to reduce the Federal Budget. Accordingly, after consultation within the Administration, the President concurred in a decision by Office of Management and Budget Director Stockman and Secretary Baldrige that Government financial support for the establishment of the commercial system should be limited to: (1) the run-out of Government costs for operating Landsats 4 and 5; and (2) a maximum of $250 million of new budget authority for the commercial follow-on system. Both offerors were notified of this decision on July 20, 1984, and were requested to revise their proposals accordingly. EOSAT reduced requested Federal financial support in a proposal revision that also included certain technical changes, but Eastman Kodak declined to revise its proposal to meet the Government's conditions. As a result, since August 1984 we have been negotiating with one company, EOSAT.

EOSAT is a joint-venture partnership formed by Hughes Aircraft Company (HAC) and RCA Corporation (RCA), in accordance with the provisions of the Uniform Partnership Law of the State of Delaware, for the expressed purpose of establishing a private-sector U.S. operational land observation and data service program. HAC and RCA each have an equal interest in this joint venture.

In June 1984, Congress passed the Land Remote Sensing Commercialization Act of 1984 which was signed on July 17 by the President, who said the Act was an outstanding example of cooperation between the Administration and Congress. In addition to providing a framework for the transfer to the private sector of both the current Landsat 4/5 system and the follow-on commercial system, the Act dealt with licensing, R&D roles of Federal agencies, data archiving and several other matters. The provisions of this Act, and the Administration funding limitation, caused EOSAT to revise their program but still meet the requirements of the RFP.

Their Commercial Land Remote Sensing Program provides for the construction, launch, and operation of additional Landsat satellites; the development of a supporting ground system and the sale and distribution of remotely sensed data to the world at large.

In September 1984, the Secretary submitted a report required by the Act to your Committee and to the Senate Committee on Commerce, Science and Transporation which described the proposed decision to enter into a contract with EOSAT subject to fund availability.

In the course of developing the request for necessary funds, certain of the financial arrangements were not considered by the Administration to be in keeping with the President's requirement that the contractor accept the majority of the financial risk over the long term. As a result of these discussions, an agreement was reached as described in the President's FY 1986 Budget. The agreement requires that the contract stipulate two spacecraft for a fixed price of $250 million in new budget authority, which would result in data continuity from the new system for a period of a least six years.

In response to the Administration requirements, EOSAT agreed, by its March 1985 revised proposal, to meet the requirements of two spacecraft, at a fixed price of $250 million, providing over six years of data continuity. We completed the anlaysis of the EOSAT proposal several weeks ago. The Administration transmitted to the Congress on May 24, 1985, a Supplemental appropriation request for FY 85 of $75 million and a FY 86 request for $50 million. On June 7, 1985 the Administration transmitted to Congress a draft legislative proposal authorizing appropriations of $50 million for FY 86, $90 million for FY 87, $54 million for FY 88, and $26 million for FY 89. The total amount authorized includes $45 million for launching two Landsat satellites. The Administration bill also authorizes an appropriation of $30,604,000 for FY 86 for operation of the existing satellite system.

While the overall technical proposal remains the same as that described in the September 1984 Report to Congress, negotiations thereafter resulted in several changes to the technical proposal and related business arrangements included in the contract which improve the benefits that the American taxpayers are getting in this commercialization process. The latest EOSAT modified proposal is as follows:

- Two satellites and a new ground station are to be provided by EOSAT for a fixed price of $250M.
- Satellite hardware will continue present capabilities with improvements:
  - the new satellites will contain Thematic Mappers substantially identical to Landsats 4 and 5,
  - a new black and white band with ground resolution improved from 30 to 15 meters will be added,
  - a new onboard processor will be provided to allow Thematic Mapper data to be aggregated at a larger scale, thus lowering data rates and giving synoptic coverage and new band options for agriculture,

- additional thermal bands, at EOSAT's expense, are being considered for Landsat 7.

- The new ground station will have substantially more data processing capability (50 scenes/day as opposed to the current 13/day) and be less labor intensive.
- The program reaches to July 1994. Government funding occurs in the first five years.
- EOSAT will fund all capital costs over $250M except for the two launches which will be funded by the Governnment and for which new budget authority of approximately $45M is required. We are confident there is no situation in which the Administration would come to the Congress for any additional funding for this contract beyond the $250 million to EOSAT, the launch costs, and the cost to operate the 4/5 system for the duration of its lifetime. EOSAT will fund all other expenses beyond the budgeted Landsats 4 and 5 operational costs. This includes market development and administation, and data distribution for Landsats 4, 5, 6 and 7, as well as spacecraft and data processing functions for Landsats 6 and 7.
- EOSAT would market all unenhanced Landsat data and be entitled to retain all revenues from data sales, including a pro-rata share of access fees and royalty fees paid by foreign ground stations under an existing Memorandum of Understanding with the Government. If cumulative revenues fall below 65 percent of the projected revenues before the launch of Landsat 6 or 60 percent thereaftear, EOSAT can terminate marketing at any time and can terminate operations four months after the launch of Landsat 6. However, EOSAT still will be committed to build, launch and checkout Landsats 6 and 7, and provide the ground station for a fixed price of $250M."

SYNOPTIC PREVIEW OF LANDSAT DATA FOR CLOUD COVER

By Robert Kelly
Data Base Manager
The Earth Technology Corporation

[The Editors feel that this recent article by Mr. Kelly might be of interest to NOTES readers.]

Partial cloud coverage has been a persistent variable which has rendered many Landsat images useless to the unwitting user. Even for central Arizona, only 31% of the Landsat images were totally cloud-free in 1984. This article describes the use of GOES satellite images to increase user confidence when purchasing partially clouded Landsat images.

Renewable resource users among the agricultural, water resource and environmental industries are commonly dependent upon timely Landsat data for visual updates. These users have consistently sought faster processing and delivery of Landsat data[1], and the EROS Data Center has effectively satisfied that need. With good planning, Landsat MSS CCT's can be delivered within 10 days of the image acquisition without the need for the additional expenses of the "special acquisition" or "cloud insurance" options. However, in order for the user to quickly obtain the most current Landsat images, he must contend with the most unforgivable variable: cloud cover.

The percent cloud coverage is a routine image characteristic described in each image record retrieved from the EROS Landsat Main Image File.[2] The percent reported ranges from 0 percent (no clouds), 10% (less than 10% clouds) and upwards to 90%, and can be reported as soon as the image is catalogued at EROS. Thus, one can safely expect a useful image if the cloud cover is 0% and the other image characteristics are normal. However, if 10% or more cloud cover is present, the cautious user is faced with the dilemma—where are the clouds?

Of course, the less time-critical users (e.g., non-renewable resources) have the luxury of waiting for the distribution of the Landsat micro-images through the National Cartographic Information Centers (NCIC) where they can preview the Landsat images archived at EROS. For MSS, these micro-images are available about one month to six weeks after the Landsat scene is acquired. A micro-image of band 2 (red wave lengths) is definitely best for screening MSS data for cloud cover. However if you need to recieve today's data as soon as possible for cloud cover, you can take several steps to confidently order Landsat data without ever looking at the actual image.

Synoptic Preview Methods

One successful method is to observe the cloud cover over the target area at the same moment of the Landsat overpass. The approximate Landsat nominal scene exposure time is calculable or can be obtained from a scene identification code of a previous Landsat scene of the same coordinates of the Landsat World Reference System.[3] At the prescribed moment, the near-zenith cloud cover can be noted by ground observers.

This method is quick and requires little effort for effective real-time evaluation of cloud cover. However, this simple approach can be overwhelmed if the target area is too large or remote for the observer. In Arizona, for instance, the monitoring of crop lands includes 800,000 acres and extends across an entire Landsat scene. Clouds present off of zenith may obscure other areas of irrigation distant from the observer.

An alternate method of cloud cover evaluation used regularly in Arizona has increased confidence and accelerated the delivery of Landsat data. The Landsat user may take advantage of the continuous images acquired by the GOES satellite series operated by NOAA. In fact, a high-resolution (1 km/pixel) GOES image usually is acquired within 15 minutes of any Landsat image over the western hemisphere. In central Arizona, the Landsat and GOES images are coincident within three minutes. Having access to the GOES image gives the Landsat user an opportunity to observe the Landsat field of view from above the Landsat satellite.

In Figure 1, a Landsat scene (ID# E-50173-17335) was acquired at 1733 hours Greenwich Time (or 10:33 a.m. local time) over central Arizona (path 37, row 37). Ground-based cloud observations at the predicted time identified cumulus clouds on the north and south horizons. The exact ground areas obscured could not be determined, and the clouds could have interfered with the agricultural surveillance project covering a full Landsat scene. Moments later, at the National Weather Service (NWS) Office at Sky Harbor airport in Phoenix, a high-resolution, visible-band GOES facsimile image

[1]NOAA, 1980, overview of conferences with non-federal users on U.S. Operational Land Remote Sensing Satellite Program, ESS, Washington, D.C. pp. 22.

[2]USGS, 1984, Landsat 4 Data Users Handbook, Section 8, p. 12, U.S. Geological Survey, Reston, VA.

[3]IBID. Section 7, p.6

was received from the NWS in San Francisco. Figure 2 is that GOES image, which was acquired at 1730 Greenwich Time, three minutes before and nearly 22,000 miles above Landsat. A path 37, row 37 template was placed over the GOES image using high-contrast ground features for reference. Features such as reservoirs, major rivers, and mountains present a familiar distribution of the geography in and around Phoenix.

Figures 1 and 2, when compared, illustrate how even small cumulus clouds are visible in GOES imagery and how they can also obscure large areas of the Landsat image. Fortunately, the 10% cumulus cloud cover spared virtually all the agricultural areas of interest. As a result, an order was placed with the EROS Data Center to ship the CCT without needing to wait for a microimage preview or risk an unsatisfactory purchase.

For those Landsat users who wish to employ similar synoptic preview techniques, an arrangement with a local airport NWS office can usually provide the necessary GOES images at the time of the Landsat acquisition. A high-resolution (1 km/pixel) visible GOES image can be requested at an enlarged scale such as in Figure 1. A visit to the NWS office on the day of a Landsat overpass can provide the preview opportunity and an analysis can be completed in minutes. Sometimes the image may be borrowed under special arrangements and reviewed later, since the NWS office often retains GOES images for a few days after the weather is forecasted and before forwarding them to a state climatology laboratory or a university.

[Editor's note: NOAA personnel suggest that this visit be coordinated with the specific NWS office several days prior to the actual satellite overpass.]

The synoptic preview of Landsat data using GOES images provides a useful method to accelerate the delivery of Landsat data and reduce the wasted purchases of cloud-obscured images. However, the method is not foolproof and special consideration should be given to the cloud type and degree of opaqueness.[4] For example, high cirrus clouds consisting of ice crystals have a unique, visible-wavelength opaqueness and infrared transmissivity unlike thin stratus clouds. Some vegetative

[4]**Bulk, Harold, 1985, Personal Interview. Laboratory of Climatology, Arizona State University, Tempe, Arizona.**

Figure 1: This Landsat MSS Scene (ID# E-50173-17335), acquired at 10:33 a.m. local time, covers the area of Phoenix, Arizona, and nearby irrigated agriculture. Simultaneous ground-based observations reported cumulus in the area, which would have obscured some of the agricultural information. This scene was ordered only after reference and confirmation of cloud positions seen on GOES imagery.

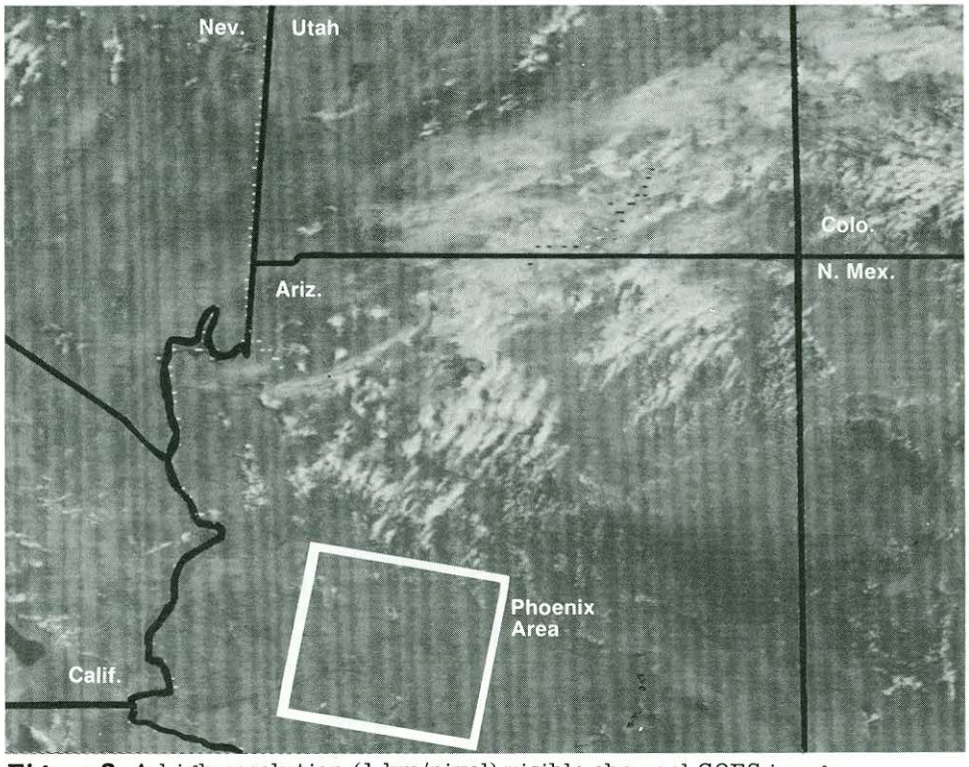

Figure 2. A high-resolution (1 km/pixel) visible-channel GOES image acquired simultaneously and above the Landsat satellite (see window). Clouds can be seen that coincide with the clouds in Figure 1. This image verifies that the cumulus clouds do not cover the agricultural areas.

assessments using band ratio techniques may not be affected by small amounts of attenuation by even high-percent, large-area cloud cover such as cirrus.

For the most common situation of partial cloud coverage, the synoptic preview is the fastest method to evaluate Landsat image utility. The most certain but most delayed verifications involve using the micro-image file or waiting for a 0% cloud cover image to be reported on an EROS Landsat data search.

Considering the timely delivery of Landat data so desired by the user community, a cautious effort by the user to verify the data selected will result in greater satisfaction. In addition, the user's Landsat image budget can be more efficiently used, image analysis results can be completed sooner, and the remote sensing tools provided by NOAA (GOES and Landsat) will have more utility than ever.

LGSOWG MEETING HOSTED BY NOAA

The annual meeting of the Landsat Ground Station Operations Working Group (LGSOWG) was held from September 16-19, 1985 in Washington, DC. LGSOWG convenes once a year at different stations around the world to discuss innovations and problems in the use of Landsat data. The meeting was chaired by NOAA.

Participating in this year's meeting were representatives from Australia, Brazil, Canada, China, India, Indonesia, Italy, Japan, Pakistan, South Africa, Thailand, and the United States.

The status of the Landsat worldwide receiving system at the present time is:

A. Stations and locations with MSS reception only and remarks:

Argentina, Mar Chiquita Comision Nacional De Investigaciones Espaciales (CNIE) 37.4° S, 57.3° W	Not currently taking data
Australia, Alice Springs Department of Resources and Energy (DRE) 23.8° S, 133.9° E	
Indonesia, Pekayon Indonesian National Institute of Aeronautics and Space (LAPAN) 6.3° S, 106.8° E	Not currently taking data
South Africa, Johannesburg Council for Scientific and Industrial Research (CSIR) 25.9° S, 27.7° E	
Thailand, Bangkok National Research Council of Thailand (NRCT) 13.7° N, 100.8° E	
United States of America Goldstone, California 35.3° N, 116.9° W	

B. Stations and location with MSS and TM reception and remarks:

Brazil, Cuiaba
Instituto De Pesquisas Espaciais (INPE)
15.5° S, 56.1° W

Canada, Prince Albert
Canada Centre for Remote Sensing
(CCRS)
53.2° N, 105.3 W

India, Hyderbad
National Remote Sensing Agency
(NRSA)
17.2° N, 78.3° E

Japan, Hatoyama
National Space Development Agency
(NASDA)
35.6° N, 139.8° E

Italy, Fucino
European Space Agency (ESA)
41.9° N, 13.6° E

Spain, Maspalomas European Space Agency (ESA) 27.8° N, 15.7° W	Limited reception effort
Sweden, Kiruna European Space Agency (ESA) 67.9° N, 20.3° W	
United States of America Goddard Space Flight Center Greenbelt, Maryland 39.0° N, 76.9° W	

C. Stations and locations about to become operational and remarks:

Bangladesh, Dacca Bangladesh Space Research and Remote Sensing Organization (SPARRSO 23.6° N, 90.5° E	MSS and TM capability
Pakistan, Islamabad Pakistan Space and Upper Atmospheric Research Commission (SUPARCO) 33.5° N, 73.2° E	MSS and TM capability
People's Republic of China, Beijing Chinese Academy of Sciences (CAS) 40.5° N, 116.9° E	MSS and TM capability
Saudi Arabia, Riyadh Saudi Arabian National Center for Science and Technology (SANCST) 24.7° N, 46.8° E	MSS and TM capability

1985
William T. Pecora Award Citation
Dr. Charles Elachi

In recognition of his outstanding contributions as a scientist, engineer, and manager in developing and demonstrating synthetic aperture imaging radar techniques for Earth sciences and practical applications.

Dr. Charles Elachi has been a leader in satellite-borne synthetic aperture imaging radar remote sensing for studying the solid Earth and oceans. The remarkable capabilities of this technique have been demonstrated by three space systems flown under NASA sponsorship: (1) the Seasat satellite, launched in 1978; (2) SIR-A, carried into orbit on the Shuttle in November 1981; and (3) SIR-B, on the Shuttle flight in November 1984. These three systems were designed and developed at the Jet Propulsion Laboratory under Dr. Elachi's guidance and expert leadership.

The Seasat radar was designed primarily to observe ocean features, but also proved capable of producing highly useful images of land. The Seasat mission was the first flight in space of an imaging radar and its success assured a sound basis for further development and application.

The SIR-A and SIR-B missions have been progressively more impressive. The SIR-A instruments delineated land surface features in great detail and also penetrated the extremely dry sand of the Eastern Sahara to a depth of several meters to reveal alluvial deposits and drainage patterns which had not been detected by conventional imaging. These findings opened new areas of investigation. The SIR-B mission provided images at a variety of incidence angles and illumination geometrics, enabling the construction of stereographic images from the data.

Demonstration of the capability of imaging radar involves considerably more than the flight apparatus, for by its nature the technique produces huge quantities of raw data. Dr. Elachi led the effort to update earlier optical processors and is playing a key supportive role in developing advanced digital techniques for SIR-B data.

The satellite missions have received wide public acclaim. But during the decade prior to these highly visible contributions, Dr. Elachi conducted pioneering work in theoretical analyses and airborne systems to show the potential of imaging radar for oceanography and meteorology on Earth and for studying Venus. The breadth of these contributions, represented in over one hundred publications in a variety of technical fields, arises from his unique skill in interpreting radar images and his intimate knowledge of Earth science. Beyond these notable technical abilities, Dr. Elachi has unusual skill in communicating with his co-workers, engineers and scientists from other disciplines, and with management.

In recognition of these accomplishments, the National Aeronautics and Space Administration and the Department of the Interior take great pleasure in presenting the William T. Pecora Award to Dr. Charles Elachi.

Donald Paul Hodel
Secretary of the Interior

Administrator, National Aeronautics and Space Administration

The William T. Pecora Award

THE WILLIAM T. PECORA AWARD, presented annually in recognition of outstanding contributions of individuals or groups toward the understanding of the Earth by means of remote sensing, is sponsored jointly by the National Aeronautics and Space Administration and the Department of the Interior. The award was established in 1974 to honor the memory of Dr. William T. Pecora, former Director of the U.S. Geological Survey, and later, Undersecretary, Department of the Interior. Dr. Pecora was a motivating force behind the establishment of Earth resource sensing from space. He was a Government leader with broad vision and deep appreciation for the use of satellite programs in continually inventorying and managing our national resources.

PREVIOUS RECIPIENTS

1974 William A. Fischer, U.S. Geological Survey, Department of the Interior

1975 William Nordberg, National Aeronautics and Space Administration, and Carlos Brockmann, Director of the LANDSAT-Bolivia Project

1976 Awarded jointly: Environmental Research Institute of Michigan and Laboratory for Applications of Remote Sensing of Purdue University

1977 Robert N. Colwell, School of Forestry, University of California, Berkeley and Michel T. Halbouty, Consulting Geologist and Petroleum Engineer, The Halbouty Center

1978 David S. Johnson, National Environmental Satellite Service, Department of Commerce

1979 John M. DeNoyer, U.S. Geological Survey, Department of the Interior and Virginia T. Norwood, Senior Scientist, Hughes Aircraft Company

1980 Verner E. Suomi, Professor of Meteorology, University of Wisconsin

1981 Leonard Jaffe, National Aeronautics and Space Administration and James R. Anderson (posthumously), U.S. Geological Survey, Department of the Interior

1982 Alexander F.H. Goetz, National Aeronautics and Space Administration and Lawrence C. Rowan, U.S. Geological Survey, Department of the Interior

1983 Floyd F. Sabins, Jr., Senior Research Associate, Chevron Oil Field Research Company

1984 Archibald B. Park, GLOBEX, Inc.

1985 Charles Elachi, Jet Propulsion Laboratory

SYMPOSIA

The MITRE Corporation is presenting the seminar, "Weather Services in the 90's," November 20-21, 1985. The symposium will be held at the conference facilities of The MITRE Corporation, McLean, VA. This seminar will bring together experts from various public and private agencies, private sector weather consultants, and major users of weather information. Speakers from these sectors will discuss the trends they expect to see in the next decade in connection with each phase of weather data collection, interpretation, and dissemination. For further information contact: George Swetnam, The MITRE Corporation, 1820 Dolley Madison Blvd., McLean, VA 22102. Telephone: (703) 883-5845.

The Sixth Asian Conference on Remote Sensing will be held November 21-26, 1985 at the Hotel Deccan Continental, Hyderabad, India. The conference is being organized by the Asian Association on Remote Sensing and National Remote Sensing Agency, Department of Space, India. The conference will include national reports, technical papers, poster presentations, and commercial exhibits emphasizing the following objectives: Asian problems in remote sensing, academic and technical information exchange, and operational applications. For further information contact: Prof. Shunji Murai, Institute of Industrial Science, University of Tokyo, 7-22, Roppongi, Minatoku, Tokyo, JAPAN. Telex: 02427317 KOSMUR J.

The 10th Canadian Symposium on Remote Sensing will be held at the Hotel Westin, Edmonton, Alberta, May 5-8, 1986. The symposium is sponsored by the Canadian Remote Sensing Society of the Canadian Aeronautics and Space Institute, the Canadian Institute of Surveying, and the Canada Centre for Remote Sensing. The technical program will feature all aspects of remote sensing including: sensors, data acquisition, processing and analysis, environmental monitoring, with special emphasis on the value of remotely sensed data in operational use. For further information contact: M. Diane Thompson, Technical Committee Co-Chairperson, INTERA Technologies Ltd., –1200, 510-5th Street S.W., Calgary, Alberta, Canada, T2P 3S2. Telephone: (403) 266-0900. Telex: 03-824537.

The International Symposium on Photogrammetric and Remote Sensing Systems for Data Processing and Analysis will be held in Baltimore, Maryland, May 26-30, 1986 at the Sheraton Inner Harbor. Sponsored by the International Society for Photogrammetry and Remote Sensing, the symposium's technical program will consist of papers on instrumentation in the following areas: analytical instruments, systems for analysis of remotely sensed data, photogrammetric digital image processing systems, systems and instrumentation for synthetic aperture radar processing, systems for reception, recording, preprocessing, archiving, and dissemination of remotely sensed data, optical photographic instruments and methods for remote sensing, and integrated photogrammetric systems. Abstracts of less than 250 words, in English, should be submitted to Lawrence W. Fritz, President, Comm. II, ISPRS, NOAA/NOS N/CG21, 6001 Executive Blvd., Rockville, MD 20852 USA or William P. Bishop, Secretary, Comm. II, ISPRS, NOAA/NESDIS Ex1, FOB 4, Room 2069, Washington, DC 20233 USA.

NEW PUBLICATIONS

Two publications of extreme interest to Landsat 4 and 5 data users are:

RACING INTO TOMORROW - 1985 ACSM-ASPRS Fall Convention, Technical Papers - September 8 - 13, 1985 - Indianapolis, IN (ISBN 0-937274-66-7) Published by The American Congress on Surveying and Mapping, and The American Society for Photogrammetry and Remote Sensing (contact: American Society of Photogrammetry and Remote Sensing, 210 Little Falls Street, Fall Church, Virginia, 22046. Telephone: (703) 534-6617.

PHOTO—GRAMMETRIC ENGINEERING & REMOTE SENSING Vol. L1, No. 9 - September 1985 Special Landsat Image Data Quality Analysis (LIDQA) Issue (ISSN 0099-1112) See ASPRS address above.

Both publications include materials derived from NASA's Landsat Image Data Quality Analysis (LIDQA) program. Many papers given at the ACSM/ASPRS convention addressed "Utilization of Landsat 4 and 5 TM and MSS data."

The remote sensing center in Hungary, Foldmeresi Intezet, has announced the availability of a multilingual glossary of terms on Earth remote sensing. The publication contains 900 terms with definitions in Russian and corresponding equivalents in English, Bulgarian, Hungarian, German, Polish, French and Czech. It is available for purchase at $30 (U.S.) from: Mr. A. Szarvas, CARTOGRAPHIA, Export/Import Department, Budapest, P.O.B. 132, 1443-Hungary. Telex: 22-6218.

The American Society for Photogrammetry and Remote Sensing has published the **SPOT Simulation Applications Handbook.** The book is designed to be useful to researchers preparing to use SPOT data, especially those involved in cartography, geology, forestry, agriculture, water resources, and urban planning. Copies

Also published by ASPRS is **Close-Range Photogrammetry & Surveying: State-of-the-Art,** bringing the latest techniques and technologies to photogrammetrists and surveyors in various fields. According to Close Range Workshop Director Jerry Beamish, the book "...can be a basic planning resource document for your future evaluation and implementation of the photogrammetric measurement process." Copies are available from: Same as above. Costs for the book are: $40 — ASPRS members, $30 — students, and $60 — non-members.

TRAINING IN REMOTE SENSING

Nov. 18-22

Synthetic Aperture Radar with Remote Sensing Applications, The George Washington University School of Engineering and Applied Science, Washington, D.C. Contact: Course Coordinator, Darold Aldridge, Washington, D.C. Telephone: (202) 676-8518 or toll free in the U.S. and Canada at (800) 424-9773.

Dec. 2-6

Spatial Data Analysis for Resource Assessment; GIS Technology in Natural Resource Management -Theory and Techniques. (EROS Data Center, Sioux Falls, South Dakota). Contact: Training and Assistance Section, Applications Branch, EROS Data Center, Sioux Falls, SD 57198. Telephone: (605) 594-6114 or FTS 784-7114.

Dec. 3-4

Seminar and Workshop on Remote Sensing of Estuaries, Department of Commerce Auditorium, U.S. Department of Commerce, 14th & Constitution Avenue, Washington, D.C. Contact: Jim Thomas - (202) 634-1595 or Vic Klemas - (302) 451-2336, NOAA Estaurine Programs Office, 3300 Whitehaven Street, NW, Washington, D.C. 20235.

Dec. 10-12
Advanced Geological Remote Sensing: Shortwave Infrared, Thermal Infrared, and Microwave Techniques, The George Washington University School of Engineering and Applied Science, Washington, D.C. Contact: Course Coordinator, Ron Donais, Washington, D.C. Telephone: (202) 676-8523 or toll free in the U.S. and Canada at (800) 424-9773.

Dec. 10-12
Geographic Information Systems (GIS) Workshop (Springfield, VA). Contact: Ms. Carolyn A. Keen, Workshop Coordinator, Science and Technology Corporation, 101 Research Dr., Hampton, VA 23666-1340. Telephone: (804) 865-1894.

Feb. 24-28
Application of Remote Sensing to Mineral Exploration, Centre of Studies in Resources Engineering, Indian Institute of Technology, Bombay. Contact: Dr. T.V. Pavate, Chief Project Engineer, Training Cell, Remote Sensing Division VI, CSRE, IIT, Bombay.

Jan. 27-31
Application of Remote Sensing to Water Resources Studies, Centre of Studies in Resources Engineering, Indian Institute of Technology, Bombay. Contact: Dr. T.V. Pavate, Chief Project Engineer, Training Cell, Remote Sensing Division VI, CSRE, IIT, Bombay.

Mar. 24-28
Application of Remote Sensing to Geotechnical Engineering, Terrain Evaluation, Urban Development and Landuse Planning, Centre of Studies in Resources Engineering, Indian Institute of Technology, Bombay. Contact: Dr. T.V. Pavate, Chief Project Engineer, Training Cell, Remote Sensing Division, VI, CSRE, IIT, Bombay.

ORDERS AND INQUIRIES

It is the intention of both EOSAT and the United States Government to minimize the customer impact of Landsat commercialization.

To do this, Landsat orders and inquiries will continue to be processed by the EROS Data Center until EOSAT completes its data processing facility in Maryland.

Orders and inquiries for Landsat data should be directed to:

Earth Observation Satellite Co. (EOSAT)
c/o EROS Data Center
Sioux Falls, South Dakota U.S.A. 57198
TWX No. 910-668-0310

Checks or purchase orders for Landsat products must be made payable to EOSAT, as the United States Government cannot transfer customer's money to EOSAT.

Additional commercialization information will be in the next issue of the Landsat Data Users NOTES.

For telephone information on orders or data inquiries:

U.S. customers call 1-800-367-2801
(South Dakota customers call 1-800-344-9933)
Foreign customers call 605-594-2291

The Landsat Data Users NOTES is published quarterly in order to present information of interest to the user community regarding Landsat products, systems, and related remote sensing developments. There is no subscription charge; individuals and organizations wishing to receive the NOTES should contact: NOAA Landsat Customer Services, Mundt Federal Building, Sioux Falls, SD 57198, U.S.A., Telephone: (605) 594-6151, FTS: 784-7151.

Comments, corrections and queries of any kind may be directed to: Editor, Landsat Notes, Mundt Federal Building, Sioux Falls, SD 57198.

☆GOVERNMENT PRINTING OFFICE: 1981-564-078/8