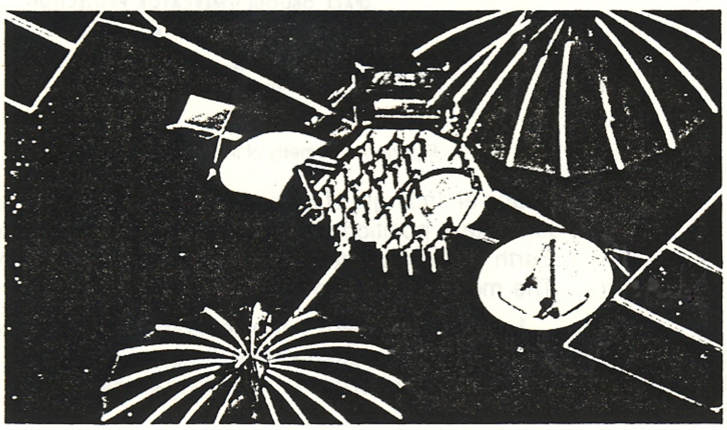
NEW DATA RELAY SYSTEM FOR LANDSAT D

A Tracking and Data Relay Satellite System (TDRSS) is scheduled to begin operation in the 1980's to relay data from Landsat D to a single ground station at White Sands, New Mexico. Consisting initially of two geosynchronous communication satellites and an Earth station, the TDRSS will receive and relay data, command, and telemetry signals to and from all of the National Aeronautics and Space Administration's (NASA's) orbiting satellites, including the Shuttle. This will reduce the number of ground stations needed and will simplify the handling of a growing volume of satellite telecommunications traffic.

Each of the TDRSS satellites will have transponders that will handle very high data-transmission rates (up to 300 million bits per second) in the K-band. The Landsat D data, once received at White Sands, will be retransmitted via Domsat to the NASA/Goddard processing facility. From Goddard, Domsat will be used again to transmit the multispectral scanner (MSS) data to the Earth Resources Observation Systems (EROS) Data Center for product generation and archiving, as is done now. Final plans for thematic mapper data are not firm at this time.

The link between the TDRSS and Landsat D will enable nearly continuous wideband communication with the ground U.S. receiving stations. It will thus be possible to transmit Landsat data in real-time, eliminating the need for onboard tape recorders. (An exception will be over a narrow section of the Indian Ocean, which is a TDRSS "blind spot.")

The system is expected to be operational in 1982.



Artist's concept of Tracking and Data Relay Satellite System (TDRSS).

MicroIMAGE FICHE STATUS

It was reported last January (see issue No. 10) that production of the Landsat microIMAGE accession aid system might be started again by March or April of this year. Production has not been resumed because little or no return-beam vidicon (RBV) data have been received at the EROS Data Center (EDC) since commencement of digital image processing operations in February of 1979. Long delays in delivery of MSS data from NASA/Goddard to EDC also have precluded timely delivery of accession aid information. These data are necessary because the microIMAGE system must be complete to be usable.

Landsat Data Users NOTES

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NASA

U.S. GEOLOGICAL SURVEY
EROS DATA CENTER
Sioux Falls, S. Dak. 57198

The interim procedure of placing MSS reference images (which *are* available) on microfilm cassettes will be continued indefinitely. Thirty cassettes have been produced so far, covering all Landsat 3 data received at EDC through March 1, 1980. When RBV digital data become available from NASA, the microIMAGE system will again be considered as a reference tool for Landsat images, and production will be scheduled to conform to the availability of RBV data.

USGS/EROS FIELD OFFICE IN ALASKA

The November issue of the NOTES mentioned plans by the EROS Data Center to open a field office in Anchorage, Alaska. This office opened in March of this year and is located on the third floor of the Skyline Building at 218 East Street, Anchorage.

An interactive digital image analysis system has been installed in the Field Office and is being used for image analysis demonstrations and training. This system is also available to Department of the Interior personnel who wish to use it in conducting resource inventories in Alaska.

Equipment for manual (visual) image analysis has also been installed to support training, demonstrations, and project work. The field office has been staffed initially with four remote sensing scientists (including two data analysts) and is now officially operational, although renovations to the third floor of the Skyline Building are still in progress.

THE SPACE OBLIQUE MERCATOR PROJECTION

(The following is the last of a series of three articles which have appeared recently on the subject of map projections.)

The concepts and geometric definition of the Space Oblique Mercator (SOM) projection were first made in 1974 by Alden P. Colvocoresses of the U.S. Geological Survey,[1] and NASA has utilized this projection for the production of MSS imagery since 1975. It was not until 1978, however, that a complete mathematical definition of the projection became available when John P. Snyder[2] derived the transformation equations between the map projection *(x,y)* and the figure of the earth (latitude, longitude or ϕ, λ). Synder's equations are based, in several cases, on concepts other than those geometrically described in this article.

[1]Colvocoresses, Alden, P., 1974, "Space Oblique Mercator" *Photogrammetric Engineering*, Aug. 1974, pp. 921-926.

[2]Snyder, John P., 1978, "The Space Oblique Mercator Projection," *Photogrammetric Engineering and Remote Sensing*, May 1978, pp. 585-596.

The SOM projection is based on a unique mapping concept. Conventional map projections, including the Hotine Oblique Mercator (HOM), are based on a static model in which the Earth's surface and the projection surface are fixed with respect to one another. In the SOM projection, a dynamic model is used which takes advantage of the fact that Landsat is continuously imaging the Earth. The projection surface is fixed in space with the Earth rotating beneath it, and this allows the area of the Earth which is being mapped onto the projection surface also to change continuously.

The area imaged during a Landsat pass may be visualized in the SOM projection to be projected onto a cylindrical strip tangent to the Earth and normal to the orbital plane (see Figure 1). The cylinder is fixed in

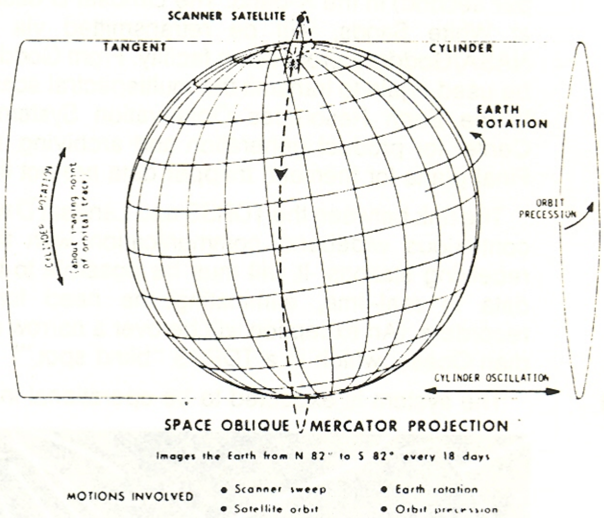

Figure 1. Geometry of the SOM projection.

space at an angle of about 9° to the polar axis. In order to relate a position on the cylinder to a location on the Earth, motions must be considered as functions of time. The motions involved are:

1. Mirror Sweep — the scanning motion of the sensor in the cross-track direction.
2. Satellite Orbit — the along-track motion of the satellite.
3. Earth Rotation — the westward shift of imaged data as a result of the rotation of the Earth.
4. Orbit Precession — the rotation of the plane of the orbit as needed to maintain a constant angle with the Sun as the Earth revolves about the Sun.

Because a cylinder can be unrolled into a plane without distortion, the above elements determine a map projection to the extent that the data can be system-corrected for geometric anomalies. Adjustments have been built into the SOM projection in order to make it nearly conformal whereby angular relationship and scale in any local area is preserved. The result, being an approximately conformal cylindrical projection is appropriately named after Mercator who was the original developer of such a projection.

Figure 2 shows how an image strip would look if cast upon the projection surface. The X-axis is in the along-track direction and the Y-axis runs in the cross-track direction. In order to reflect the relative linear motion cross-track caused by Earth rotation, the cylinder may be assumed to oscillate along its axis at a rate that varies with latitude. This motion makes the Y coordinates vary in a sinusoidal manner (as shown in Figure 2).

Since the Earth's figure is an ellipsoid instead of a sphere, we can assume that the cylinder also rotates slightly about the ground track to remain tangent along the orbital path (see Figure 1).

The Landsat satellite repeats its coverage every 18 days, so the SOM mapping equations must extend over 18 days, or 251 paths. This is accomplished by allowing the variable for time to increase through 18 days and then be reset to zero. A continuous near-conformal mapping of the Earth within a single projection plane is thus accomplished.

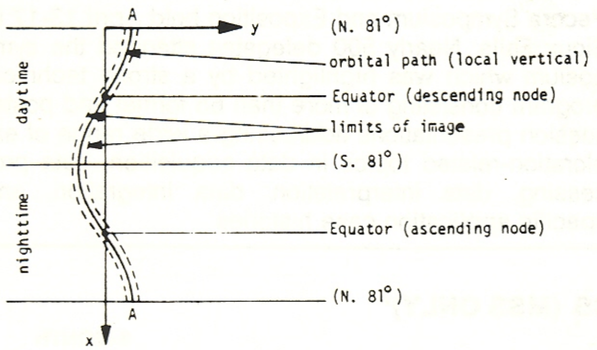

Figure 2. Presentation of an image strip on the projection surface.

Since the mathematical formulation of the SOM was not complete when plans were being made to implement the Master Data Processor at NASA/Goddard, the HOM was implemented as the standard projection for Landsat data. Current plans call for HOM to remain the standard projection until Landsat D is operational, at which time the SOM projection will become standard. For further information on the SOM, inquiries should be addressed to:

Assistant Division Chief for Research
National Mapping Division
U.S. Geological Survey, National Center
Mail Stop 519
Reston, Virginia 22092

EDC DATA BASE ACCESS

A central element of EDC's storage and production system is the computerized data base of information describing more than 6 million frames of master reproducible images and photographs. This data base is constantly being accessed, through both local and remote computer terminals, to obtain information regarding availability of images and photographs and to process and schedule orders for those products. The terminal network spreads throughout EDC itself and to numerous remote sites at locations nationwide.

Currently, 91 terminals are signed on as members of this network. Forty of these are operated internally by EDC. Another 27 are distributed among the six regional National Cartographic Information Center (NCIC) offices and their State affiliates. NCIC is the Federal organization that is responsible for providing information to the public on maps and charts, aerial and space photographs, and images, geodetic control data, and related materials. In addition to its regional offices, NCIC has been working with various State governments to establish a network of affiliates. Both the regional offices and the affiliates utilize their access to the EDC data base to satisfy requests for remotely sensed data.

The remaining 24 terminals are distributed among users from other Federal agencies (17), private industry (6), and the Canadian government (1). These organizations are frequent users of aerial and space photographs and images, and the immediate access afforded by an EDC computer terminal hook-up meets their information requirements within the times desired.

The network is expected to continue to grow, particularly as the number of NCIC affiliates and non-Federal users increase.

Except for EDC and the NCIC offices, all terminal users are limited to inquiry-only capabilities. In this mode of operation, users can interrogate the data base and receive information on image availability and descriptive characteristics such as:

Image identification number
Microfilm browse file location
Image or photograph characteristics:
- Quality rating
- Cloud cover
- Frame number

Master reproducible film characteristics:
- Sensor type
- Focal length
- Flying height
- Date of exposure
- Roll number

EDC-assigned characteristics:
- Storage location
- Accession status

Inquiries are made by supplying latitude and longitude coordinates that specify the location and size of a geographic area or, in the case of Landsat images, path and row numbers. The information retrieved can be used to make selections for ordering purposes. This same information, of course, can be obtained by writing or phoning EDC.

Access via remote terminal is possible from 8:00 a.m. to 6:00 p.m. Monday and from 6:00 a.m. to 6:00 p.m. Tuesday through Friday (central time). Most of the terminals in use are teletype-compatible equipment, that is, terminals utilizing American Standard Code for Information Interchange (ASCII) character mode transmission, and are connected via dial-up telephone lines. Because of the small number of communication ports on the main computer (a Burroughs 6700), users are normally required to share the port assigned to them with other users.

EDC must recover some of the costs associated with supplying terminal access, so users are billed for the computer resources utilized. A credit is granted, based on the dollar amount of any products ordered, which can be used to offset this charge. Each organization receiving inquiry service provides its own terminals and pays for all telephone line charges.

Organizations interested in the details of this service may obtain further information from the Remote Terminal Coordinator, User Services, EROS Data Center, Sioux Falls, South Dakota 57198, phone: (605)594-6511, ext. 158.

NOAA HOLDS CONFERENCES

In March, a series of one-day conferences were held at various locations around the country for the purpose of acquainting non-Federal users of remote sensing satellite data with the National Oceanic and Atmospheric Administration (NOAA) and its National Environmental Satellite Service (NESS). NOAA was assigned management responsibility for the operational land remote sensing satellite program last November and hosted the conferences to inform the user community of the program planning now underway and to gather information from the attendees on their satellite data requirements.

APPENDIXES TO HANDBOOK AVAILABLE

Appendixes H and I to the *Landsat Data Users Handbook* are now available. These documents describe the format and content of two types of high-density tapes containing Landsat MSS data. Appendix H deals with archival, or partially processed, tapes (HDT-AM's); Appendix I deals with processed, or fully corrected, tapes (HDT-PM's). To obtain copies of these appendixes contact the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota 57198, phone: (605)594-6511, ext. 151.

PECORA VI

"Integration of Remote Sensing into the Exploration Process" was the theme of the Sixth Annual William T. Pecora Symposium and Exposition held April 13-17 in Sioux Falls. Nearly 500 delegates attended the symposium which was highlighted by a strong technical program consisting of more than 65 formal and poster session presentations addressing a wide range of exploration-related topics in data acquisition, data processing, data interpretation, data integration, and specific application case histories.

FY 80 LANDSAT STATISTICS (MSS ONLY)*

	OCT 79	NOV 79	DEC 79	JAN 80	FEB 80	MAR 80	6-MONTH TOTAL
Landsat scenes acquired (satellite acquisition)	2,751	1,750	1,590	1,317	1,398	1,773	10,579
Landsat scenes received at EDC**	2,471	2,828	3,001	2,626	2,704	835	14,465
Average time in days from acquisition to EDC receipt (by month of EDC receipt)	11.8	53.3	81.6	113.5	143.9	98.3	—
Average time in days from EDC receipt to archive availability	3.7	6.5	3.8	3.9	2.2	3.3	—
Average delivery time from receipt of order at EDC to shipment:							
Standard photographic products	17	14	11	12	9	10	—
Standard digital products	9	9	8	10	6	6	—
Landsat photographic frames sold	15,641	8,764	8,192	10,650	10,798	14,495	68,540
Landsat digital scenes sold	266	291	248	417	330	260	1,812
Total Landsat dollar volume	$231,317	$167,184	$149,565	$210,798	$199,822	$217,919	$1,176,605

*No digital RBV data received at EDC.

**February and March data to be reprocessed.

U.S. Senator from New Mexico and former Apollo astronaut Harrison H. Schmitt was the keynote speaker at the Symposium's kickoff luncheon. He addressed the delegates on the subject of "The Politics of Remote Sensing." The featured speaker at the symposium's formal banquet was Dr. George S. Benton, Associate Administrator for the National Oceanic and Atmospheric Administration (NOAA). Dr. Benton spoke on "An Operational Land Remote Satellite System: Implementing the Presidential Decision."

The banquet was highlighted by presentation of the 1980 Pecora Memorial Award, made jointly by the Department of the Interior and NASA to **Professor Verner E. Suomi** of the University of Wisconsin for his outstanding contributions in the field of atmospheric remote sensing.

BRIEFS . . .

Teachers and graduate students in education are invited by the University of Alberta to pursue advanced work with an emphasis on remote sensing educational technology. Those interested should contact Dr. Joseph M. Kirman, Director, Project Omega, 248 Education South, University of Alberta, Edmonton, Alberta T6G 2G5, for further information . . .

A directory of California firms providing services in acquiring and using remotely sensed data is now available from the California Integrated Remote Sensing System (CIRSS) Task Force, 1400 10th Street, Sacramento, California 95814 . . .

Public Technologies, Inc., a non-profit science organization, is in the process of compiling a national directory of remote sensing firms. Organizations wishing to be listed should contact Public Technologies, Inc., 1140 Connecticut Avenue, N.W., Washington, D.C. 20036 . . .

WORKSHOP IN AGRICULTURE

A workshop on remote sensing in agriculture will be held October 26-27 in Kansas City, Missouri. This introductory workshop, to be conducted by EDC personnel, has been designed especially for those who gather or use information about agricultural resources. The Soil Conservation Society of America is sponsoring a conference entitled "Remote Sensing for Resource Management" immediately following the workshop.

Emphasis in the workshop will be placed on a realistic appraisal of the advantages and limitations of using aerial photographs and satellite images in agricultural survey and management. The workshop will consist of lectures, hands-on interpretation exercises, classroom demonstrations, and a field trip. Special attention will be given to high-interest topics such as the use of low-cost 35-mm aerial photographs, color infrared film, computerized crop identification, and detection of stress and disease in crops. For additional information, contact William H. Anderson, Applications Branch, EROS Data Center, U.S. Geological Survey, Sioux Falls, South Dakota 57198, phone: (605)594-6511, ext. 114.

MSS LINE-START PROBLEM

For more than a year, the MSS sensor aboard Landsat 3 has been experiencing a problem with proper synchronization of scan lines, referred to as the line-start anomaly. NASA performed a series of tests during the period of April 8-24, 1979, in an attempt to correct the situation. However, in the fall of 1979 the problem began occurring with increasing frequency. Line-start anomalies are currently affecting 20%-40% of all Landsat MSS images being acquired.

HISTORICAL LANDSAT STATISTICS (FY 73 - FY 79)*

	FY 73	FY 74	FY 75	FY 76	FY 77	FY 78	FY 79
Landsat 1MSS scenes acquired ..	46,354	11,764	55,284	14,109	12,286	4,964	51
Landsat 2 MSS scenes acquired .	—	—	10,962	53,704	25,282	44,715	12,886
Landsat 3 MSS scenes acquired .	—	—	—	—	—	12,350	22,452
TOTAL LANDSAT MSS SCENES ACQUIRED	46,354	11,764	66,246	67,813	37,568	62,029	35,389
Landsat photographic frames sold (from EDC)	81,071	157,178	197,654	297,253	130,100	110,723	134,482
Landsat digital scenes sold (from EDC)	10	228	729	3,299	1,887	2,853	2,982
Dollar volume of total Landsat sales (EDC)	$229,642	$564,994	$909,009	$2,093,664	$1,453,837	$1,976,068	$2,131,813
Customer Profile of total Landsat data (by dollar volume):							
Federal government	27%	16%	21%	34%	26%	31%	23%
State/Local government	5%	2%	2%	1%	1%	1%	1%
Academic	13%	12%	16%	11%	10%	8%	11%
Industrial	30%	22%	24%	21%	28%	24%	24%
Individual	7%	13%	11%	8%	5%	4%	5%
Non-U.S.	12%	23%	19%	25%	30%	32%	36%
Non-Identified	6%	12%	7%	0%	0%	0%	0%

*Fiscal years 73-75 were July-June; FY 76 was July 75-September 76; FY 77-79 were October-September.

The MSS is equipped with a hardware feature that generates a line-start pulse to activate the MSS detectors at the beginning of each mirror sweep. The problem occurs when this start pulse is either absent or of abnormally low amplitude. Because the detectors are not activated at the appropriate time, no data are acquired during the initial part of the scan. A second pulse does activate the detectors when the mirror is about 30% of the way across a scan, but the early (western) portion of the intended scan area is lost by this time.

Because there are six detectors per band, multiples of six scan lines are involved. The number of scan lines affected in a given frame is random and depends on how many line-start pulses are missed. As many as 40% of the scenes are affected, and the number of affected scans varies from 10% to 90% of the scans in the image.

Before the occurrence of this problem, all scan lines were left-justified during routine processing at NASA/Goddard; that is, they were aligned at the left side of the image. For every line-start pulse missed, a set of six scan lines was thus aligned with those that had normal start pulses. This caused that set of scan lines to shift on the ground about 48 km to the left of where they should have been. Figure 3 shows an image having several bad scans; no usable image data are in the bad scan lines because the data are not in the proper place with respect to the rest of the image.

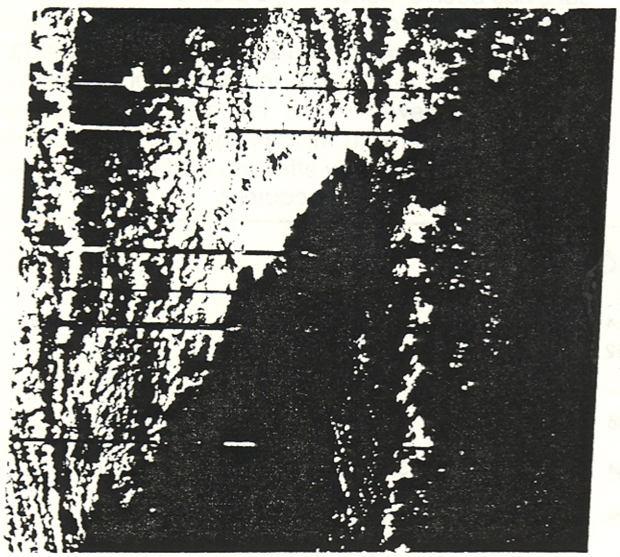

Figure 3. Image with misaligned scans.

After the first appearance of the line-start anomaly, NASA/Goddard contracted to have the ground hardware modified to alleviate this problem. This modification had been completed and was scheduled for implementation when the most recent rash of anomaly occurrences began in February 1980. Basically, the hardware properly aligns the good portions of the affected scan lines with respect to the other scan lines so that the ground features line up correctly. Unfortunately, the 30% of the data that was missed in each scan is lost; missing areas are represented in the image as blanks. See Figure 4.

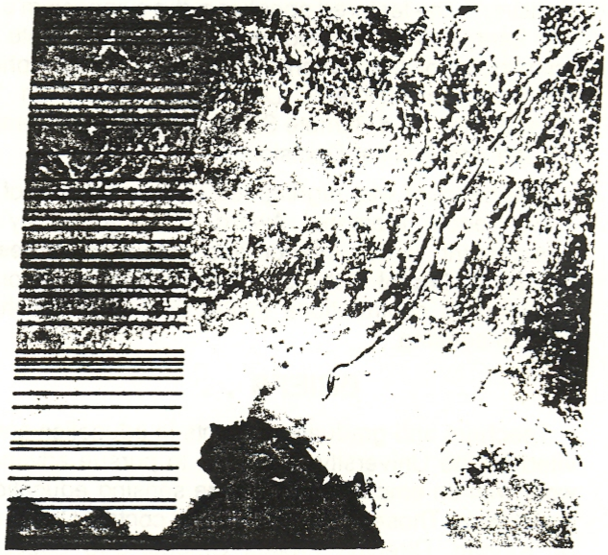

Figure 4. Image after corrective processing.

The corrected images are technically more than 70% usable, meaning this much of the image area is unaffected, but their appearance is hardly aesthetic. Engineering studies continue concerning the cause of this anomaly; the problem, however, is onboard the satellite and, for all practical purposes, is impossible to correct without loss of some data.

TRAINING AIDS

Workshop exercises developed by EDC's Applications Branch are available to educators and other professionals for hands-on instruction in the application of remote sensing data to natural resource inventory and management.

Each exercise consists of written instructions and several photographs and overlays which allow a student to carry out an actual measurement, analysis, or interpretation task. The student can then compare his results with the exercise solution. Although some of the exercises can be used alone, the majority are most useful in conjunction with classroom lectures. Nearly all were developed for training courses in remote sensing at EDC.

There are currently 55 titles available, examples of which are:

- Targeting Mineral Exploration in Central Colorado Using Landsat Satellite Imagery
- Targeting Ground-Water Exploration in South Central Arizona Using Landsat Imagery
- Monitoring Agricultural Land Use Change in Central South Dakota Using Landsat Satellite Imagery

- Regional Soils Mapping in Southeastern South Dakota Using Landsat Imagery
- Introduction to the Multispectral Characteristics of Landsat Imagery
- Application of Variable Probability Sampling to Estimating Acreage of Forest Land with Satellite and Aircraft Data
- Measurement of Rangeland Plant Parameters and Vegetation Change Using Very Large-Scale Color Infrared Photographs
- Urban Land Use Mapping in a Semi-Arid Region Using Landsat Imagery
- Delineating Flood Boundaries on Aerial Photographs

Depending on the number of accompanying photographs and overlays, the price of an exercise can range from $30 to more than $100. Film transparencies of the photographs can be requested by users wishing to make their own reproductions.

Although the exercises are not intended to thoroughly document research or applications, or even to present concepts in depth, they are valuable training aids when supplemented by other training materials or classroom discussions. A complete list and more information on how to obtain these exercises are available from User Services, EROS Data Center, U.S. Geological Survey, Sioux Falls, South Dakota 57198, telephone: (605)594-6511, ext. 151.

SYMPOSIA

A colloquium on the application of data from the next generation of Earth resource satellites will be held November 25-26 in Montreal. The objective will be to determine as precisely as possible the formats and ways of using data products from Landsat D and SPOT.[1] The program will be based on simulated data, and selected application areas will be singled out for scrutiny and critical discussion. Contact Mr. Keith P. B. Thomson, Canada Centre for Remote Sensing, 2464 Sheffield Rd., Ottawa, Canada K1A OY7, phone (613)995-1210.

"Remote Sensing for Resource Management" will be the theme of a national conference, October 28-30, 1980, in Kansas City, Missouri. The program will feature numerous case histories and examples of how information collected by remote sensing systems can be used to solve resource-related problems. Only minor emphasis will be given to the actual technology of remote sensing. The call for papers requests that abstracts be submitted by June 1. Further information can be obtained from the Soil Conservation Society of America, 7515 Northeast Ankeny Road, Ankeny, Iowa 50021.

[1]SPOT stands for *Le Systeme Probatoire d'Observation de la Terre*, which translates literally as "Earth Observation Test System."

EDC TRAINING SCHEDULE

The EROS Data Center's Applications Branch staff will conduct or participate in several training courses and workshops in the coming months.

Sep 8 - Oct 3 *International Remote Sensing Workshop* (Sioux Falls, South Dakota), Open to non-U.S. scientists. Contact: Office of International Geology, U.S. Geological Survey, National Center (917), Reston, Virginia 22092.

Oct 26 - Oct 27 *Introduction to Agricultural Remote Sensing* (Kansas City, Missouri). Immediately precedes the Soil Conservation Society of America conference on Remote Sensing for Resource Management. Open enrollment. Contact: Branch of Applications, EROS Data Center, Sioux Falls, South Dakota 57198, phone: (605)594-6511, ext. 114.

Nov 3 - Nov 7 *Water Resources Remote Sensing Workshop* (Sioux Falls, South Dakota). Open enrollment, preference given to Federal Agency personnel. Contact: Branch of Applications, EROS Data Center, Sioux Falls, South Dakota 57198, phone: (605)594-6511, ext. 114.

Nov 17 - Nov 21 *Advanced Course in Geological Remote Sensing Techniques* (Sioux Falls, South Dakota). Open enrollment, preference given to Federal Agency personnel. Contact: Branch of Applications, EROS Data Center, Sioux Falls, South Dakota 57198, phone: (605)594-6511, ext. 114.

ADDITIONAL TRAINING IN REMOTE SENSING

Jul 21 - Jul 25 *International Conference on Soil Conservation* (Bedford, England). Contact: Mrs. P. M. King, National College of Agricultural Engineering, Silsoe, Bedford, England MK45 4DT.

Aug 4 - Aug 22 *Remote Sensing of Natural Resources* (Blacksburg, Virginia). Contact: Dr. Roy Mead, School of Forestry and Wildlife Resources, Virginia Tech, Blacksburg, Virginia 24061, phone: (703)961-5482.

Aug 11 - Aug 15 *Fundamentals of Applied Remote Sensing* (Lawrence, Kansas). Also to be held Sep 8-12. Contact: James Merchant, KARS Program, Kansas University Space Technology Center, Lawrence, Kansas 66045, phone: (913)864-4775.

Sep 8 - Sep 26 *Introduction to Remote Sensing* (Panama). Instruction in Spanish. Sponsored by the Defense Mapping Agency, Inter-American Geodetic Survey, and EROS Program. Contact: Chief, DMA-IAGS Cartographic School, APO, Miami, Florida 34004.

Sep 22 - Sep 26 *Manipulation of Computer-Compatible Tapes* (Panama). Instruction in Spanish. Sponsored by the Defense Mapping Agency, Inter-American Geodetic Survey, and EROS Program. Contact: Chief, DMA-IAGS Cartographic School, APO Miami, Florida 34004.

Sep 29 - Oct 17 *Landsat Mosaic Workshop* (Panama). Instruction in Spanish. Sponsored by the Defense Mapping Agency, Inter-American Geodetic Survey, and EROS Program. Contact: Chief, DMA-IAGS Cartographic School, APO Miami, Florida 34004.

Monthly: *Short Course on Numerical Analysis of Remote Sensing Data* (West Lafayette, Indiana). Contact: Douglas B. Morrison, Purdue/LARS, 1220 Potter Drive, West Lafayette, Indiana 47906, phone: (317)749-2052.

Continuing: *Training in Remote Sensing* (Brookings, South Dakota). Long-term (3-12 months) detailed training in technical and administrative techniques of remote sensing technology. Contact: Dr. Donald G. Moore, Remote Sensing Institute, South Dakota State University, Brookings, South Dakota 57006.

NOTE: If you are planning a training course in remote sensing, please let us know well in advance so that we can list it in this newsletter. Contact the Chief, Training and Assistance, U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota 57198, phone: (605)594-6511, ext. 114, concerning all training-related activities.

* * *

The Landsat Data Users NOTES is published bi-monthly 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 the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota 57198, U.S.A., telephone: (605)594-6511.

Comments, corrections, and other inquiries should be directed to:

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