



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

104

May 15, 1979

Memorandum

To: Director, Geological Survey
From: Chairman, EROS Study Group
Subject: EROS Study Report

By memorandum on February 21, 1979, the Associate Director established the subject committee to determine if improvements were needed in the EROS Program to increase its effectiveness, visibility, and stature, and to present options on the organizational placement of EROS. The committee was made up of representatives from the following Divisions/Offices:

Administrative Division
Conservation Division
Geologic Division
Land Information and Analysis Office
Topographic Division
Water Resources Division

The committee has been active since March 12, meeting with key people in the Department and in the Bureau associated with the EROS Program.

Because of time constraints, the committee could not complete all the research and study it would have liked, and the enclosed report represents only the review of Department input. However, the report does reflect our views and represents approximately 70 percent of our planned study.

It is hoped that the report will provide you the information desired to make the necessary decisions concerning the EROS Program. The committee stands ready to respond to any questions that you might have.

/s/ William B. Overstreet

William B. Overstreet
Chairman, EROS Study Group

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EROS STUDY GROUP REPORT



May 15, 1979

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I. EXECUTIVE SUMMARY

In February of this year, the Director of the Survey requested that a study group be formed to review the progress of the Earth Resources Observation System (EROS) Program in evaluating and encouraging the application of remote sensing technology to Departmental missions.

This review was particularly timely in that the President has stated his commitment to seek a smaller government in the future. Responsibilities, however, will not decrease; hence, Government must become more efficient--performing more work with less people and real dollars. New technologies, such as remote sensing, offer great promise to increase efficiency and improve decision-making in resource management.

The study group was charged to (1) determine if improvements were needed in the EROS Program to increase its effectiveness, visibility, and stature, both within the Department and in its interfaces with other Federal and State agencies and the general public, and (2) present organizational options to carry out the recommended improvements. All major Divisions of the Survey were represented on the study group, and a variety of viewpoints were heard, including those of Survey Director Menard, Assistant Secretary Joan Davenport, Science Advisor to the Secretary Gordon Law and representatives of the operating Bureaus of the Department. Members of the committee also visited the EROS Data Center in Sioux Falls, South Dakota.

The committee finds that, overall, the EROS Program has been effective in transferring remote sensing technology to the Bureaus of the Department. Notable examples include the aggressive information extraction programs of the Bureau of Land Management and the Bureau of Reclamation and the data relay program of the Survey's Water Resources Division. Moreover, the EROS Data Center functions as the national repository for Landsat data and Departmental aerial photography, and its Data Analysis Laboratory and training and technology transfer activities are acknowledged to be among the finest in the world.

Since FY 1973, however, steady-state budgets and requirements for increasingly complex Landsat data production equipment have eroded the EROS research program, forced the closing of four applications assistance facilities, and reduced technology transfer assistance to cooperating State and local governments. In addition, the competition for declining resources has heightened the disagreement regarding the appropriate thrust of the EROS Program. For example,

certain Divisions of the Survey are critical of EROS for reducing support of basic research, while the operating Bureaus are critical because they feel EROS emphasizes research over assistance to their operational programs.

The committee finds that the primary contributing factors to these problems are (1) the lack of a clear policy statement of the Department's role in the Government's civilian aerospace remote sensing program and (2) the current practice of assigning the management responsibility of a Departmental program to a single Bureau, particularly when the resources required for the Departmental program are expected to be accommodated within the managing Bureau's fund and slot guidelines (e.g., Bureau funding base + 8 percent in FY 1981). This practice (item 2) is grossly unfair to the managing Bureau which is expected to absorb costs for use by other Bureaus and the public, and to the Departmental program, which must compete for resources against high priority needs which fall within the defined mission of the Bureau.

The committee feels that, at a minimum, a mechanism needs to be established at a high level in the Department to allow all Bureaus to participate in formulation of policy, thrusts, priorities, and budget for the EROS Program if it is to be effective as a Departmental program in the future.

Consistent with this determination, and with cognizance of the President's announcement of the administration's commitment to a future operational Earth Resources Information System, Secretary Andrus' desire to have maximum impact on the definition and operation of the future operational system, and Assistant Secretary Davenport's strong endorsement of the EROS Program as a Departmental program, the committee makes the following recommendations:

1. The charter of the EROS Program be revised to include other aerospace technologies in addition to remote sensing, and the charter be formalized in the Departmental Manual.
2. A single interface with NASA be designated at the highest possible level in the Department. The individual should have responsibility within the line organization of the Department for the EROS Program and would call upon the EROS Program resources for staff support.

3. The EROS Interior Program Review Committee (consisting of the Bureau Directors) be re-activated and chaired by the individual identified in (2). Said committee would review recommendations from the EROS Program regarding operations, priorities, and budget and would provide policy guidance to the Director of the EROS Program.
4. Resource requirements to carry out the Departmental EROS Program be developed in consultation with the EROS Interior Program Review Committee and ranked at the Departmental level in the zero base budgeting process (i.e., all Bureaus share in the funding of Departmental programs).
5. Future budget increases for the EROS Program restore the research, technology transfer, and training activities to a more viable level rather than be solely directed to support development and installation of ground data-handling systems.

Recommendations 1 through 5 above are provided from the perspective of the committee--there may be other alternatives to accomplish the intent of the recommendations. The committee wishes to emphasize that the present system of providing policy guidance and resources to the Departmental EROS Program works very poorly and must be changed if the program is to increase in effectiveness, visibility, and stature.

In its deliberations, the committee also considered four possible organizational positions for the EROS Program. The four differ primarily in the visibility given EROS (i.e., the number of organizational layers between the program and the Secretary). The four options considered were:

1. EROS attached directly to the Assistant Secretary--Energy and Minerals (e.g., the Mine Health and Safety Academy).
2. EROS attached to the Office of the Director of the Geological Survey (i.e., to the Director or an Assistant Director).
3. EROS attached to the Land Information and Analysis Office in the Survey.
4. EROS attached to the new mapping division in the Survey.

All options have desirable and undesirable impacts. However, the committee feels that organizational change without positive action along the lines of the committee's recommendations will not lead to improvements in the effectiveness of the EROS Program and could tend to exacerbate the problems identified in this report.

II. INTRODUCTION

In February of this year, the Director of the Survey requested that a study group be formed to review the progress of the Earth Resources Observation System (EROS) Program in evaluating and encouraging the application of remote sensing technology to Departmental missions.

The study group was charged to (1) determine if improvements were needed in the EROS Program to increase its effectiveness, visibility, and stature, both within the Department and in its interfaces with other Federal and State agencies and the general public, and (2) present organizational options to carry out the recommended improvements. All major Divisions of the Survey were represented on the study group (see Table I) and a variety of viewpoints were heard, including those of Survey Director Menard, Assistant Secretary Joan Davenport, Science Advisor to the Secretary Gordon Law, and representatives of the operating Bureaus of the Department. Members of the committee also visited the EROS Data Center in Sioux Falls, South Dakota.

A considerable amount of background material on the EROS Program was collected by the committee--a small portion, relevant to discussions in this report, is provided in the following subsections.

A. CREATION OF EROS

The EROS Program was created on July 12, 1967, by the Department in a memorandum issued by the Under Secretary. The significant points in this memorandum were:

- "1. EROS is a Departmental program for the resource utilization of all types of space data, supported by an operational satellite data collection system developed in collaboration with NASA and other resource agencies. The three major objectives of the program are:
 - a. To construct and fly an Earth Resources Observation Satellite by the end of 1969 and to follow with improved and modified satellites as required by operational needs of resource programs.
 - b. To provide unclassified remote-sensor data collected by earth-orbital satellites to facilitate assessment of the land and water resources of the United States and other nations.
 - c. To design specific spacecraft data-collection remote-sensor systems on the basis of data-user requirements, to distribute such data to users, and to make operational use of the data in resource studies and planning.

2. In order to further clarify the scope of the EROS program the following list indicates how the EROS program is unique and also how it complements existing Departmental and Bureau programs. The program, to be conducted cooperatively with NASA, provides for:
 - a. The design and construction of space flight hardware and related equipment and the launch and operational use of satellites for resource studies.
 - b. The reception, cataloging, and preliminary processing of satellite data (from whatever source).
 - c. Analysis of results of data use projects and study programs in terms of future space data requirements.
 - d. Development of advanced instruments for use in satellites.
 - e. Continuing applications and benefits research (with emphasis on "new" applications and "new" instruments).
 - f. Continuing program review, to assure conformity with recommendations of advisory committees, program balance, and maximum use of data.
 - g. The collection of aircraft data for test purposes.
 - h. Liaison with NASA on program elements of mutual interest.
 - i. Conducting seminars for users of space data within the Interior Department.
3. In developing and implementing the EROS program we intend to build upon the established expertise and the arrangements for liaison and collaboration which now exist within the Geological Survey. EROS is, however, a Departmental program in the fullest sense of the term. Accordingly, the organizational arrangements will provide for participation by using Bureaus in both policy formulation and research and development leading to full and effective use of the technology.

4. Within the Department, the EROS program will be so defined and its funding and management so arranged that it will have the unity and self-sufficiency which are essential for its success. Funds necessary for research and applications studies; hardware and information systems design and acquisition; and data processing, delivery and dissemination to users will be sought as a single appropriation. Participating Bureaus and offices will, however, provide the staff and resources needs for their operational use of the data derived from the program."

B. ORGANIZATION

The basic components of the EROS program are: EROS Program Office (EPO), which has both management and research responsibilities, and the EROS Data Center (EDC), which performs research, technology transfer, and training functions, as well as archiving, producing, and disseminating Landsat and aircraft data. The EROS Program Office has a staff of 16 civil servants. These individuals have varied scientific backgrounds and are generally responsible for a mix of administrative and research functions. Typically, duties performed by the EPO staff, in addition to research and coordination, include responding to "brushfires," i.e., preparation of testimony, developing Departmental position statements, or preparing budget exercises.

The EROS Data Center has four branches--Data Production, Computer Services, Systems Development, and Applications. Under the Applications Branch, there is an Applications Assistance Facility located in Bay St. Louis. EROS also has an Applications Assistance Facility contract with the University of Alaska in Fairbanks, and with the American Geodetic School in the Canal Zone. There are approximately 375 employees at EDC, 85 percent of which are support contractors.

C. MANAGEMENT

The EROS Program is managed by the Land Information and Analysis (LIA) Office of the Survey. LIA reports to the Director of the Survey.

To staff the EROS Data Center at the time of its establishment, slots were made available by other Divisions (notably the Topographic, Administrative, and Computer Center Divisions). These positions are under the administrative control of the Chief, EDC, an unusual administrative arrangement in the Survey. Recently, however, the 16 personnel slots from the Administrative and Computer Center Divisions were transferred to the EROS Program (EDC).

D. FUNDING

From FY 1964 to FY 1967, funding for EROS activities was provided solely by NASA (see Table II). Following issuance of Under Secretary Luce's EROS "creation" memo in 1967, a portion of the EROS budget for FY 1968 was provided from Survey funds. In FY 1969, \$200,000 was appropriated by Congress for the EROS Program. By design, as EROS funding has increased, NASA's contribution has decreased. In FY 1979, no funds were made available by NASA.

The significant drop in budget authority between FY 1973 and FY 1974 has two explanations. OMB directed that a cost/benefit study on Landsat data be undertaken in FY 1973, and appropriated the necessary additional funds. (The study was done with some reluctance by EROS because it was the first year of data gathering and too soon for a reasonable evaluation.) The lower budget figure in FY 1974 also reflects OMB's decision that EROS funding for FY 1974 should, in part, come from an increase in prices of data.

The increase in funding in FY 1976 reflects appropriations for the development and initiation of the EROS Digital Image Processing System (EDIPS).

TABLE IMembership and Activities of the EROS Study GroupMembership

William B. Overstreet, Chairman
 Linda D. Stanley, Administrative Division
 Hillary A. Oden/Harold L. Pumphrey, Conservation Division
 Lawrence C. Rowan/Anthony W. England/Gordon P. Eaton, Geologic Division
 *Gene A. Thorley, Land Information and Analysis Office
 Lowell E. Starr/John D. McLaurin, Topographic Division
 Leslie B. Laird, Water Resources Division
 Mary Ann Synan, Executive Secretary

Meetings

March 12, 1979	Frederick J. Doyle, Acting Chief, EROS Program
March 15, 1979	William R. Hemphill, Deputy Chief, EROS Program
March 20, 1979	Charles J. Robinove, Geologist, EROS Program
March 27, 1979	Planning Session
March 29, 1979	Gary W. North, Chief, National Cartographic Information Center
April 4, 1979	H. William Menard, Director, U.S. Geological Survey
April 10, 1979	Alden P. Colvocoresses, Research Cartographer, Topographic Division
April 12, 1979	Daniel G. Anderson, Office of Remote Sensing, Water Resources Division
April 16, 1979	Gordon Law, Assistant to the Secretary and Science Advisor
April 17, 1979	Joan Davenport, Assistant Secretary--Energy and Minerals
April 19, 1979	Lawrence C. Rowan, Remote Sensing Section, Geologic Division
April 23, 1979	Visit to EROS Data Center, Sioux Falls, South Dakota
May 1, 1979	John M. DeNoyer, Former Chief, EROS Program
May 3, 1979	Work Session
May 8, 1979	Bureau Coordinators Briefing - Charles D. Hoyt, BM and Grover B. Torbert, BLM
May 10, 1979	Work Session
May 11, 1979	Work Session

Table II

U.S. Geological Survey

Funding of the EROS Program, Fiscal Years 1964 -1979
(Dollars in thousands)

<u>Fiscal Year</u>	<u>To EROS from NASA</u>	<u>Budget Authority</u>
1964	\$ 100	\$ --
1965	300	--
1966	2,350	--
1967	2,180	--
1968	3,600	173 a/
1969	1,832	200 b/
1970	1,940	1,122 c/
1971	1,866	1,921
1972	1,035	5,744
1973	2,689	10,357
1974	58	8,967
1975	53	8,284
1976	411	10,392
T.Q.	60	2,610
1977	122	9,545
1978	35	9,720
1979 (Estimate)	0	9,920

a/ Reprogrammed from within the Survey

b/ First year of direct appropriations

c/ \$4.1 million appropriated by Congress, but \$3.0 million impounded by OMB.

III. ACCOMPLISHMENTS OF THE EROS PROGRAM

The accomplishments of the EROS Program might best be viewed in the context of the evolution of the program. Beginning in 1967 to the early 1970's, the program was primarily engaged in managing research monies obtained through direct appropriation and from NASA, as well as performing research with EROS personnel. These were heady times, for there was every expectation that the Department of the Interior would fund and manage the operational Earth Resources Observation Satellite (EROS) System from which the program derived its name. Research was sponsored in the Divisions of the Survey, other cooperating Bureaus, in academia, and private industry in preparation for the Earth Resources Technology Satellite-1 (ERTS-- now called Landsat) launched in July 1972.

A little known fact is that EROS defined the performance specifications for Landsat-1, in consultation with the Department of Agriculture, and the wisdom displayed by EROS in 1966 is apparent in the many routine and near-routine uses made of the data today by the Department (see Table III). The research sponsored and managed by EROS since 1966 forms a large part of the scientific foundation for today's successful application of Landsat and other forms of remote sensing data to the resource missions of the operating Bureaus.

By the early 1970's, it became apparent that the new administration questioned the cost-effectiveness of information gathering from satellites. Activities initiated by the EROS Program in preparation to manage an operational system (e.g., engineering studies for data acquisition, cost-benefit analyses, staffing with engineers with spacecraft data and operation experience, etc.) were redirected to the much less ambitious objective of archiving, processing, and disseminating the Landsat data.

However, serious problems developed at the EROS Data Center (EDC) when the traditional Survey civil servant supported, multi-division concept of management was applied to production of data from Landsat-1. After considerable debate, the EROS Program was given line management responsibility for EDC, and a single boss matrix management system with onsite support contractors was employed to solve the problem--a first for the Survey and perhaps a model for the future in this era of smaller government.

Since 1972, continual improvements have been initiated at EDC to reduce the delay from acquisition of the data to receipt by the user, improve the quality and diversity of the data products offered, and

Table IIIUses of Landsat Technology by the Department of the Interior 1/Routine Use

- . Mapping geologic structure for mineral and fuel exploration and hazards assessment
- . Surface water inventory
- . Wetland inventory to assess the amount and type of water fowl habitat and the impact of irrigation
- . Regional environmental surveys for preparation of environmental impact statements
- . Monitoring ice conditions in Arctic goose nesting grounds to aid in the prediction of water fowl populations
- . Contribute information for route selection of utility corridors
- . Assessment of soil salinity problems in major watersheds
- . Vegetation mapping of Alaska
- . Regional mapping of wildlife habitat
- . Contribute to National land use/land cover mapping program.

Near-routine Use

- . Analysis of potentially mineralized zones and rock alteration areas
- . Monitoring seasonal consistencies and variation in the Arctic Beaufort sea ice region
- . Detection and monitoring of surface mining and mine reclamation activities
- . Land use/land cover change detection and statistical analysis of non-urban areas at scales of 1:250,000 and smaller
- . Wildland vegetation inventory
- . Environmental data collection and relay for land, water, and wildlife management
- . Agricultural crop census for irrigation water use determination
- . Monitoring snow cover accumulation, melt, and change in irrigation and hydroelectric catchments
- . Assessment and monitoring of physical water quality, water turbidity, and algae blooms
- . Mapping extent of fire scars and rate of revegetation
- . Supplement and update orthophoto coverage of Indian lands
- . Publication of image maps at 1:250,000, 1:500,000, and 1:1,000,000 scale of the the United States and unmapped or poorly mapped regions of Antarctica and other regions in support of national and international cooperative programs
- . "Quick response" mapping of flooded areas

1/ Many of these applications are described in U.S. Geological Survey Professional Papers 929 and 1015.

increase the ease of determining data availability, both Landsat and aerial photography. Currently, EDC serves as the national archive for Landsat data and Departmental aerial photography, and is the single U.S. data outlet for Landsat data to the general public. Nearly 2 million reproductions have been distributed from a data base of nearly 6 million images. Dollar value of data produced totals over \$9 million, more than 60 percent of which has been from Landsat.

Coincident with improvements initiated by EROS in the data production activities at the Data Center was the early recognition by EROS management of the need for a technology transfer and training effort to bridge the gap between the resource manager and the remote sensing research activities. Beginning in FY 1973, a staff of scientist/trainers were assembled at EDC to address this problem. To date, close to 3,000 persons have been trained in the approximately 130 courses offered by EDC staff, including 650 foreign scientists from 79 countries. To assist in the training and technology transfer effort, a state-of-the-art Data Analysis Laboratory (DAL) is also maintained at EDC. The excellence of the technology transfer and training activities and the DAL at EDC are recognized worldwide.

During the past 12 years, EROS has spearheaded efforts to define low-cost data acquisition, archiving, processing, and information extraction techniques, with data formats and timeliness that are responsive to operational needs. The reinstatement of the multispectral scanner on Landsat-D, and the definition of Magsat are recent examples of these activities. Moreover, Interior high priority requirements for aerospace technology during the next 5 years have been assessed and transmitted to NASA and OMB (Table IV).

In summary, the EROS Program was initiated to infuse a new, innovative technology (remote sensing) into the resource management and research activities of the Bureaus. In carrying out this task, a concerted effort has been made to involve as many scientists, resource managers, and technicians as possible. Largely through the activities and support of the EROS Program, the Department has reached a "critical mass" of trained and knowledgeable people who can apply aerospace technology to their duties and problems, and who are capable both of specifying the performance of new systems they consider to be needed and to judge the capabilities of new sensors and systems that may be proposed. This is exemplified by the Bureau of Reclamation and the Bureau of Land Management, each of which have decided to install digital image analysis systems to support their operational programs after 10 years of diligent research, experimentation design, and training with EROS Program support.

Table IV

Current and Projected High Priority Interior Applications
Amenable to Aerospace Technology

Departmental Activities Bureau Applications	Onshore Energy and Minerals	Offshore Energy and Minerals	Water Resources	Land Resources	Fish and Wildlife	Telecommu- nications
<u>Bureau of Reclamation</u>						
Water Management			X	X		X
Irrigated Land Inventory			X	X		
Agricultural Crop Inventory			X	X		
Hydrometeorological Data Relay			X			X
Mesoscale Cloud Analysis			X			X
<u>Bureau of Land Management</u>						
Natural Resource Inventory	X	X	X	X	X	
Natural Resource Monitoring	X	X	X	X	X	X
Telecommunications Improvement						X
Geographic Positioning				X		
<u>Fish and Wildlife Service</u>						
Migratory Bird Management			X	X	X	X
Habitat Inventory and Analysis			X	X	X	X
<u>National Park Service</u>						
Vegetation/Land Cover Inventory				X		
Resource Condition Monitoring			X	X		X
Environmental Quality Monitoring			X	X	X	X
Emergency Communications						X
Environmental Education						X
<u>Geological Survey</u>						
Land Cover Mapping			X	X		
Water Management			X	X		X
Cartographic Mapping	X		X	X		
Geologic and Mineral Assessment	X	X				X
Conservation and Regulation	X	X	X	X		

IV. PROBLEMS

Since its establishment, however, the EROS Program has encountered a number of problems that have limited its effectiveness. Some of the more important problems are briefly outlined below.

A. MISSION

A major problem with the EROS program is the lack of the clear definition of its current mission and the acceptance of this mission by the Survey, Department, and OMB. EROS was initially established in 1967 to manage and operate the proposed Earth Resources Observation Satellite System. The EROS mission has since evolved to infusing and encouraging use of remote sensing technology in the Department of the Interior including research, training, and technology transfer, and archiving and disseminating space and aircraft remote sensor data.

Now there is pressure to become the focal point for encouraging the development of all remote sensing and space technology in the Department including communication satellites. There is also interest in becoming the principal civilian outlet for satellite data and the major spokesman for the user community.

A clear statement of the current mission is needed to insure the concurrence and understanding of the EROS Program activities at all management levels. Until this is done and accepted, EROS will continue to have problems justifying budgets and be subject to criticism from individuals with differing perceptions of the EROS mission.

B. NASA RELATIONSHIP

There is a serious problem in relationships with NASA, particularly in both planning and operations. Decisions on major new directions for the EROS Program require considerable Geological Survey and Departmental review and approval before commitments can be made to provide the support necessary to do the ground data-handling and data dissemination for systems developed by NASA. Furthermore, this relationship has at times limited the capability of the EROS program to apply any significant re-direction to efforts that NASA proposes for new data-collection systems.

The situation currently is one where NASA operates almost unilaterally and EROS is forced to try to respond with very limited resources. A case in point is the current controversy involving the ground data-handling system for the Landsat-D program. The Department had the opportunity to have the ground data-handling system designed and funded by NASA, but was slow in giving a positive reaction to the Office of Science and Technology Policy (OSTP). As a result, NASA went ahead with a contract to design the system to keep up with the Landsat-D program schedules and install it at the Goddard Space Flight Center. This would build in appreciable delays in providing data from the Thematic Mapper (TM) to EROS customers, and would cause significant reduction in the quality of these data. Now the Department is faced with trying to acquire the \$7-8 million necessary to build the capabilities at the EROS Data Center that will be required to handle these TM data.

There also appears to be a lack of planning by NASA-EROS relative to investigating and expediting the handling of new data types other than Landsat. For example, there is a large volume of Seasat data that was collected that have not been processed to the point of being useful to users. NASA claims it does not have the capability to process the data, and EROS has not made a major push to develop this processing capability. Of course, funding has been a problem to EROS in being able to do this. NASA often seems to devote considerable resources to data collection with very little to data processing or dissemination. EROS should take a greater role in planning for data dissemination for these new types of sensor systems.

C. COORDINATION

Coordination with other GS Divisions and other Bureaus in the Department has also presented problems. In many cases, the Bureau EROS coordinators are at relatively low levels within their Bureaus and, as a result, have had only limited success in fostering operational applications of the technology. In many respects, the coordinator program has functioned primarily as a procedure for information exchange. It should be noted, however, that coordination with two or three Bureaus in the Department has operated reasonably well and, on the whole, it could be said the coordination with the Department Bureaus is better than with other Divisions of the Geological Survey.

The Bureau of Land Management is moving aggressively to adopt remote sensing techniques in its operational mission, particularly in Alaska. Similar efforts are underway with Fish and Wildlife Service, Bureau of Reclamation, and the National Park Service. One problem that the Bureau coordinators do voice, however, is the perception that the EROS program responds primarily to the Geological Survey requirements. In point of fact, this does not seem to be the case.

D. FUNDING/STAFFING

Perhaps the major problem faced by the EROS Program relates to its definition as a Departmental program, but being placed within the Geological Survey has required the program's funding and staffing to be determined as part of the overall Survey budget. It, therefore, competes for resources from other elements of the Geological Survey and has not been able to obtain sufficient priority to gain the resources required to truly function as a Departmental element. The result has been virtually level budgets and staffing in the past few years because of constraints on the Geological Survey overall budget. If EROS is to provide the leadership in research and operational applications of remote sensing data that many see for it, then changes in funding and staffing procedures must be accomplished.

E. RESEARCH AND TECHNOLOGY TRANSFER

The operational elements of EDC have required increasing resources to meet the demands of users for data and to provide the equipment required to process Landsat-2 and Landsat-3 data. During the recent period of austere budgets, the result has been an increasing diversion of funds, used in previous budgets for research and technology transfer, to support the storage, production, and dissemination of Landsat data. As a result, the research effort of the EROS Program is very limited, and the support they are able to provide other Bureaus for research and development of operational application of remote sensing has been decreasing. This problem, of course, is intimately related with the problem mentioned above in item D concerning the requirement to fund the EROS Program completely from the Geological Survey budget.

F. OVERSELLING OF REMOTE SENSING

Another problem is the impression that has been created that the EROS program is primarily a Landsat program. Many other Federal and State agencies have this perception, possibly because of the overselling of Landsat that has been done mainly by NASA. In fact, there has been a certain amount of overselling of remote sensing in general that has created a skepticism in potential users to the point they often will not seriously consider valid applications. The EROS Program has from the beginning put emphasis on both aircraft and satellite data, but the perception has been created through various means that its principal concern and attention are focused on Landsat. Many users do not consider Landsat particularly useful for their specific applications and, therefore, have not seriously considered working with EROS to develop applications.

V. RECOMMENDATIONS

The above problems notwithstanding, the committee finds that, overall, the EROS Program has been effective in transferring remote sensing technology to the Bureaus of the Department. The committee feels that the problems listed in the previous section are merely symptoms of two generic problems:

1. Lack of a clear policy statement of the Department's role in the Government's civilian aerospace remote sensing program.
2. Assigning management responsibility of a Departmental program to a single Bureau.

In regard to item 1, Under Secretary Luce's memorandum creating the EROS Program provided clear policy and procedural guidance to the Department in 1967. The Department had proposed that an operational Earth Resources Observation Satellite System be established. The EROS Program was being created to manage and operate the system, and to insure the maximum utility of these data. However, with the change in attitude of the new administration in the early 1970's, the mission, role, and importance to the Department of the EROS program became unclear--a situation which exists today.

The committee senses, however, that there is a positive attitude towards the operational use of remote sensing from space and aircraft by this administration. For example, the President recently announced his support for an operational Earth Resources Information System. Moreover, Secretary Andrus has expressed a personal interest in the use of this technology to increase the effectiveness of the operating Bureaus in carrying out their missions, as well as indicating a desire to have a maximum role in the design and operation of an operational Earth Resources Information System.

Science Advisor to the Secretary Gordon Law has suggested that the current EROS Program could provide the foundation for an expanded Departmental role in this Nation's civil remote sensing program. Moreover, Assistant Secretary Davenport has indicated that she sees expanding opportunities for remote sensing data utilization throughout the Department and has strongly endorsed the Departmental role of the EROS Program to foster this utilization.

To achieve these objectives, however, will require a redefinition of the mission of the EROS Program--an updating of the 1967 creation memo. Therefore, the committee recommends that the charter of the EROS program be revised to include other aerospace technologies in addition to remote sensing, and the charter be formalized in the Departmental Manual.

The committee feels that the lack of a clear policy statement of the Department's role in the Government's civilian aerospace remote sensing program is also the root cause of the interface problems with NASA. The future of the civilian remote sensing program is being debated right now in the committees established by the administration in response to Presidential Directive #42 and in the halls of Congress (Senate Bill 663 and others). It is imperative that our Departmental representation in these arenas and with NASA be at the highest level possible if the Department wishes to be a major participant in the future operational Earth Resources Information System. Therefore, the committee recommends that a single interface with NASA be designated at the highest possible level in the Department. The individual should have responsibility within the line organization of the Department for the EROS Program and would call upon the EROS Program resources for staff support.

In regard to generic problem 2, the committee finds that the primary contributing factor to problems associated with coordination, funding and staffing, and lack of funds for research and technology transfer is the current practice of assigning the management responsibility of a Departmental program to a single Bureau, particularly when the resources required for the Departmental program are expected to be accommodated within the managing Bureau's fund and slot guidelines (e.g., Bureau funding base + 8 percent in FY 1981). This practice is grossly unfair to the managing Bureau which is expected to absorb costs for support of research and technology transfer for use by other Bureaus and the public, and to the Departmental program, which must compete for resources against high priority needs which fall within the defined mission of the Bureau.

The committee feels that a mechanism needs to be established at a high level in the Department to allow all Bureaus to participate in formulation of policy, thrusts, priorities, and budget for the EROS Program if it is to be effective as a Departmental program in the future.

The Luce memorandum defined an "EROS Interior Program Review Committee," made up of the Bureau Directors, to perform this function. Therefore, the committee recommends that the EROS Interior Program Review Committee be reactivated and chaired by the individual identified as the single policy interface for the Department with NASA. Said committee would review recommendations from the EROS Program regarding operations, priorities, and budget and would provide policy guidance to the Director of the EROS Program.

The committee further recommends that the resource requirements to carry out the Departmental EROS program be developed in consultation with the EROS Interior Program Review Committee and ranked at the Departmental level in the zero base budgeting process (i.e., all Bureaus share in the funding of Departmental programs).

The committee is particularly distressed at the continued reduction of available EROS funds for research and technology transfer. The committee agrees with Assistant Secretary Davenport and the recommendations of the Federal Coordinating Committee for Science, Engineering and Technology that beginning with the thematic mapper on Landsat-D and in the future, NASA should purchase and install at EDC the necessary production ground data processing equipment to allow dissemination of timely, high quality data acquired by their experimental satellites to the public. Therefore, the committee recommends that future budget increases for the EROS Program restore the research, technology transfer, and training programs to a more viable level rather than be solely directed to support development and installation of ground data-handling systems.

In summary, the committee wishes to emphasize that the present system of providing policy guidance and resources to the Departmental EROS Program works very poorly and must be changed if EROS is to increase in effectiveness, visibility, and stature.

VI. ORGANIZATIONAL OPTIONS

It should be noted at the outset that a decision on the organizational placement of the EROS Program will not, in and of itself, result in a resolution of the problems identified in Section IV. Indeed, the committee feels that organizational change without positive action along the lines of the committee's recommendations will not lead to improvements in the effectiveness of the EROS Program and could tend to exacerbate the problems described in this report.

In considering organizational placement of the EROS Program, the committee developed four options, each of which would provide an environment for addressing the problems of program mission accomplishment, the attainment of Departmental support for the program, funding the program's budget, coordination with Interior Bureaus, and coordination with NASA. Options for organizational placement of the EROS Program were developed with the following assumptions:

1. The EROS Program will continue to be a Departmental program.
2. The EROS Program mission as originally conceived will be updated and include applications of other space technologies to Departmental programs.
3. Funding for the EROS Program will be exempt from competition with Bureau budget priorities.
4. Responsibility and authority to act as the single Departmental contact with NASA will be vested in a member of the Secretariat.

Four options for organizational placement of the EROS Program follow.

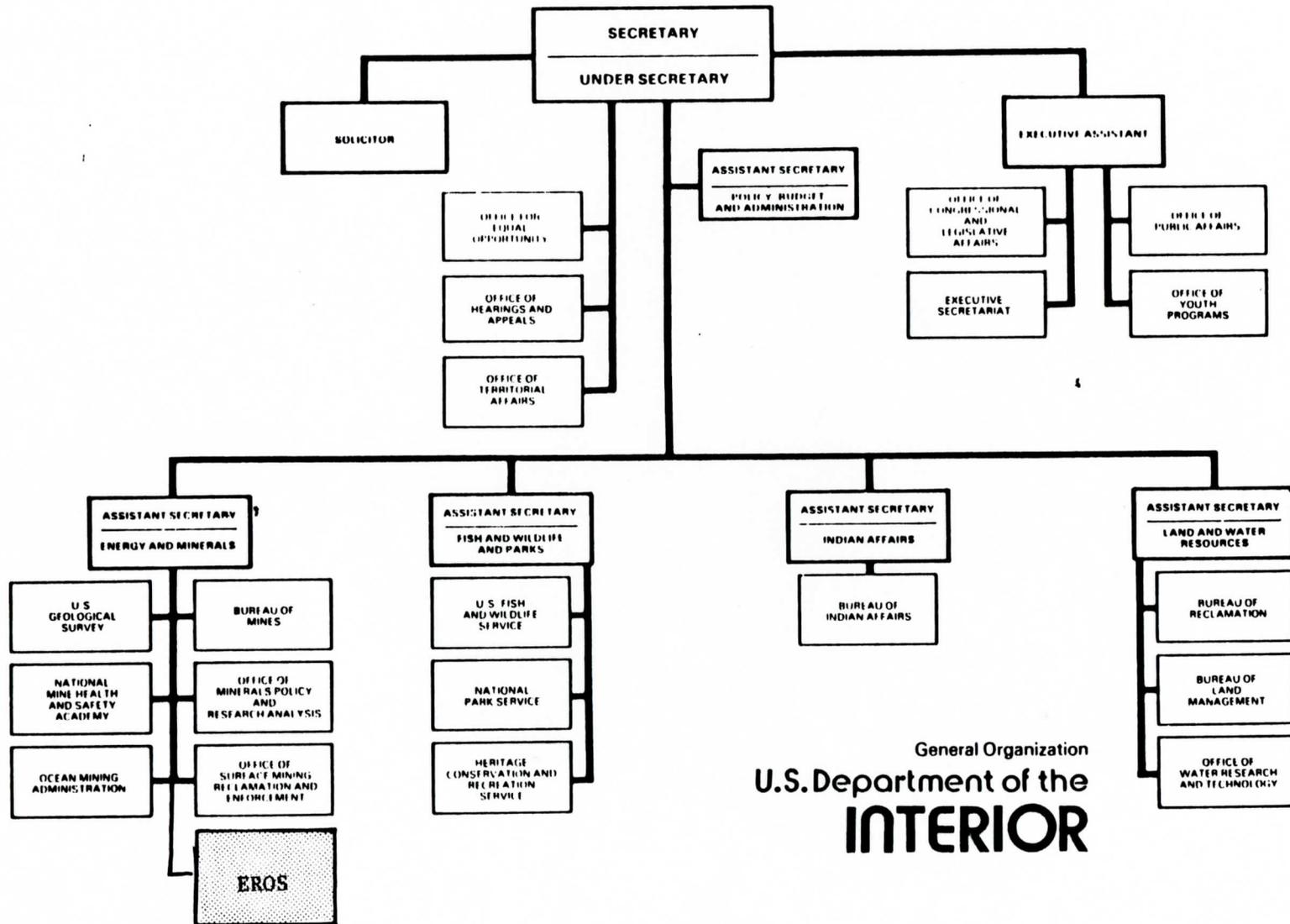
Option 1The EROS Program as an Organizational Component to the
Assistant Secretary for Energy and Minerals

This option involves transferring responsibility and authority for managing the EROS program from the Geological Survey to the Assistant Secretary for Energy and Minerals.

Impacts

- . Raises visibility of program within the Department of the Interior
- . Enforces Departmental concept of program
- . Provides opportunity to strengthen interdepartmental coordination of program policy and direction
- . Although precedence exists for operational activities to report to AS-EM, assignment of another such activity will increase the number of operational activities at the Secretariat level
- . Separation of EROS from scientific research organization may weaken ability to perform remote sensing research
- . Will increase AS-EM span of control resulting in stiff competition for attention to EROS program
- . May require additional administrative services

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Illustration 1 - Organizational Option 1

Option 2The EROS Program as an Organizational Component
of the Director's Office of the Survey

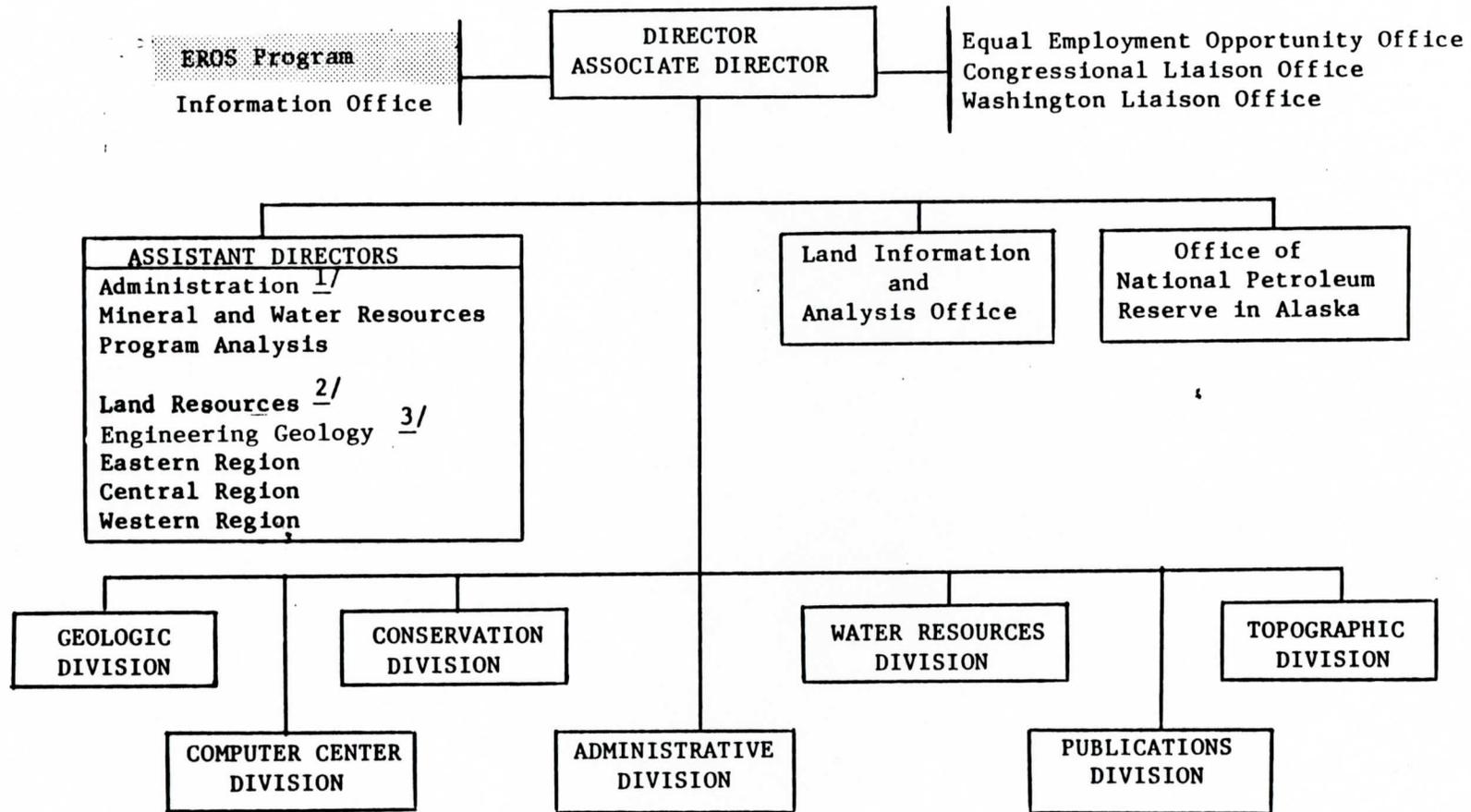
This option provides for the EROS Program to be assigned in its entirety to the Director's Office. This option can be implemented in one of two ways:

- A. The Chief, EROS Program reports directly to the Director.
- B. The Chief, EROS Program reports to an Assistant Director designated by the Director.

Alternatives A and BImpacts

- Increases visibility of program within Bureau
- Is not disruptive to EROS organization, i.e., does not separate interrelated program functions of data acquisition, processing, and dissemination; training/technology transfer; research
- Provides opportunity for stronger interdivision coordination to encourage the use of remote sensing technology in Survey programs
- Increases Director's span of control
- Perception of the EROS Program as a Survey program would continue
- Re-establishes operational program at Directorate level

U.S. Department of the Interior
GEOLOGICAL SURVEY



NOTE: See separate Division charts for additional detail on branch and field organization.

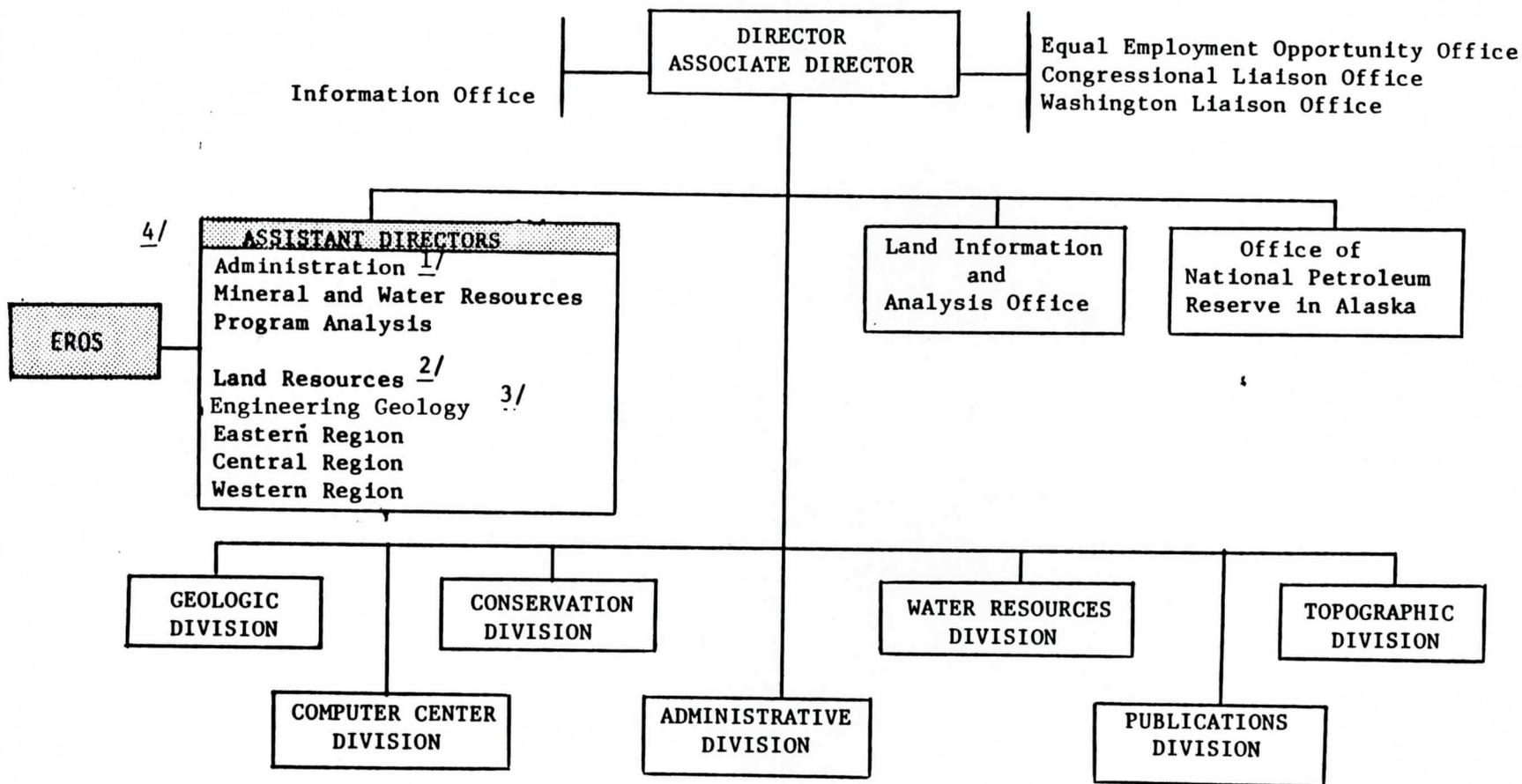
1/ Also serves as Chief, Administrative Division.

2/ Also serves as Chief, Land Information and Analysis Office.

3/ Provides policy guidance and direction to the Office of National Petroleum Reserve in Alaska.

Illustration 2 - Organizational Option 2, Alternative A

U.S. Department of the Interior
GEOLOGICAL SURVEY



NOTE: See separate Division charts for additional detail on branch and field organization.

1/ Also serves as Chief, Administrative Division.

2/ Also serves as Chief, Land Information and Analysis Office.

3/ Provides policy guidance and direction to the Office of National Petroleum Reserve in Alaska.

4/ Provides policy guidance and direction to the EROS Program

Illustration 3 - Organizational Option 2, Alternative B

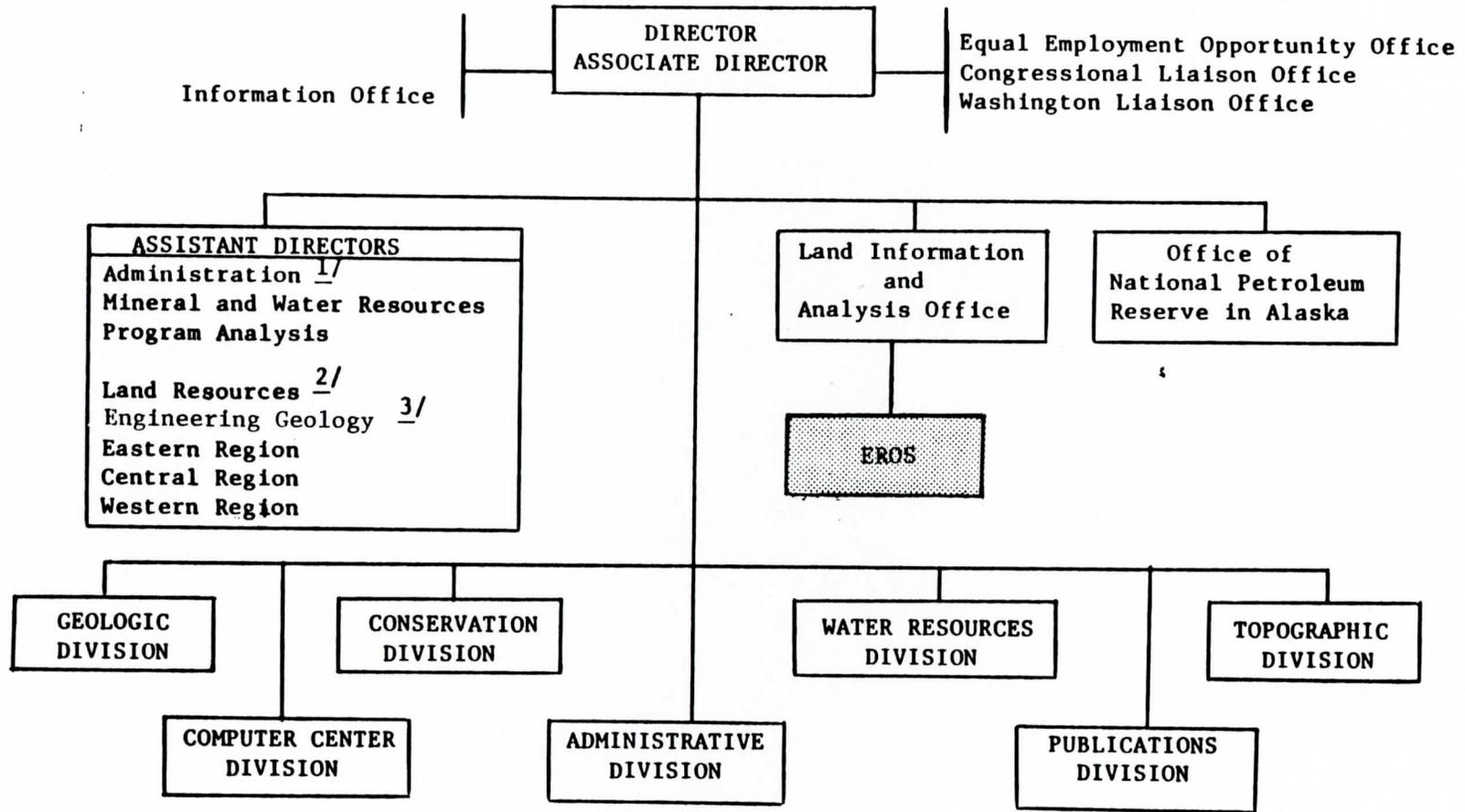
Option 3The EROS Program as an Organizational Component of the
Land Information and Analysis Office (Reorganized)

This option provides for assigning the responsibility and authority for managing the EROS Program to the Chief, Land Information and Analysis Office (LIA).

Impacts

- . Is not disruptive to EROS organization, i.e., does not separate interrelated program functions of data acquisition, processing, and dissemination; training/technology transfer; research
- . Provides a multidisciplinary environment which is supportive of EROS Program concept
- . Interdivisional, interbureau program activities can be managed more effectively at the LIA level, than in the environment of a traditional operating Division
- . Represents a status quo program
- . Will not strengthen Departmental program concept as viewed by non-Survey organizations
- . Visibility of EROS will not be increased

U.S. Department of the Interior
GEOLOGICAL SURVEY



NOTE: See separate Division charts for additional detail on branch and field organization.
1/ Also serves as Chief, Administrative Division.
2/ Also serves as Chief, Land Information and Analysis Office.
3/ Provides policy guidance and direction to the Office of National Petroleum Reserve in Alaska.

Illustration 4 - Organizational Option 3

Option 4

The EROS Program in the Proposed National Mapping Division

This option provides for assigning the responsibility and authority for managing the EROS Program to the Chief, National Mapping Division. This option can be implemented in one of two ways:

- A. The EROS program is incorporated into the National Mapping Division as a single organizational component reporting to the Division Chief.
- B. The functional elements of the EROS program are separated and integrated with like functions of the National Mapping Division. The EROS Data Center would become a field unit reporting to the Division Chief and the Program Office would become a unit reporting to the Division Chief.

Alternative A

Impacts

- . Will facilitate improvement of interface with NCIC activities
- . Supportive of digital mapping research
- . EROS research capability will strengthen and broaden research capability of proposed National Mapping Division
- . Could provide broader funding base for production activities at EDC
- . Relative position of EROS Program in Survey remains the same
- . Is not disruptive to EROS organization, i.e., does not separate interrelated program functions of data acquisition, processing, and dissemination; training/technology transfer; research
- . EROS is not a mapping program
- . Will serve to foster concept of EROS Program as a Survey program rather than a Departmental program
- . Organizationally, program will have low visibility both within the Survey and the Department
- . Interbureau and interdivision coordination of remote sensing research will be more difficult
- . National Mapping Division provides limited opportunities for true multidisciplinary and basic scientific research

NATIONAL MAPPING DIVISION

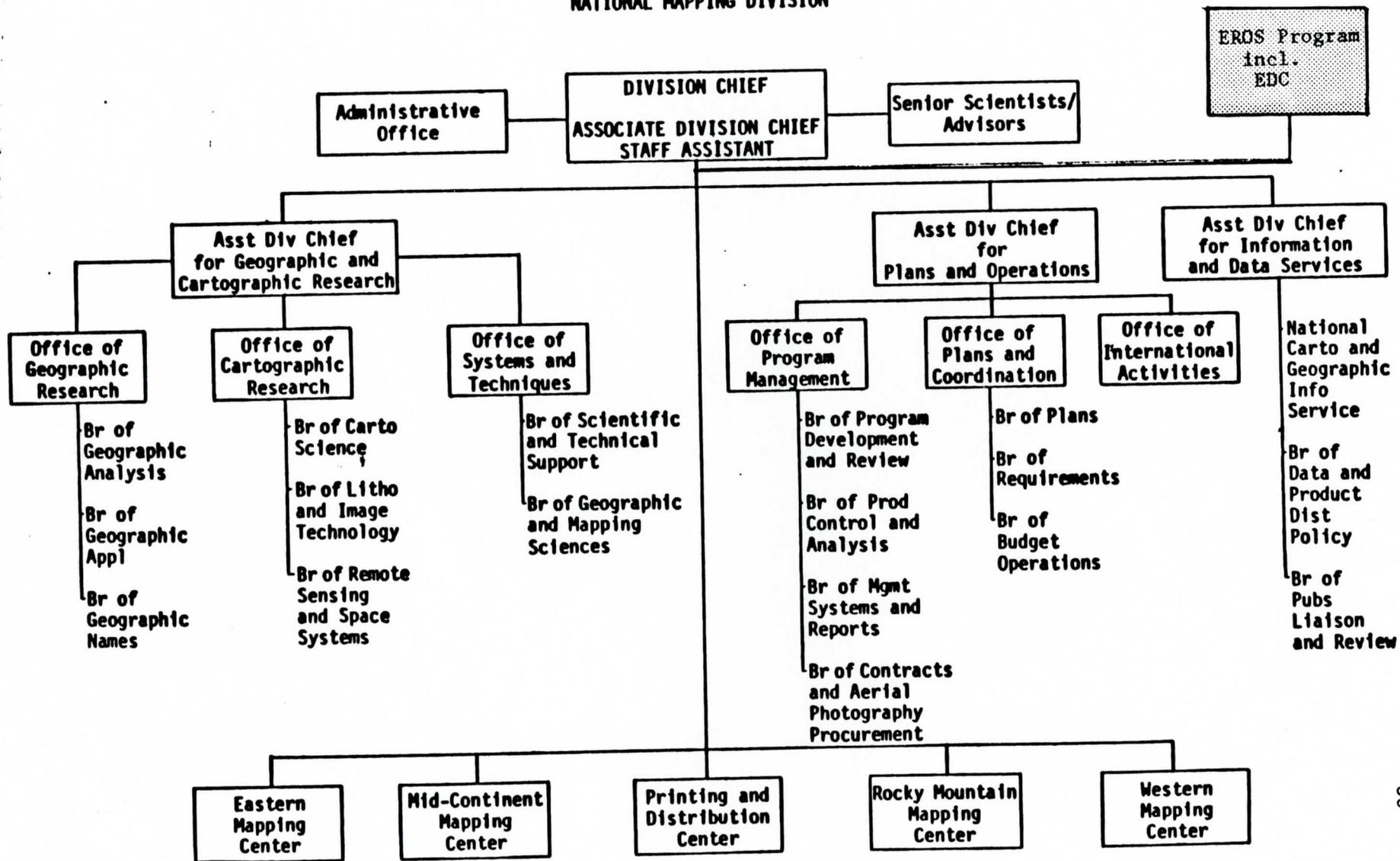


Illustration 5, Organizational Option 4, Alternative A

Option 4 - Alternative BImpacts

- . EROS research capability will strengthen and broaden the research capability of proposed National Mapping Division
- . Will facilitate improvement of interface with NCIC activities
- . Will be supportive of research in digital mapping
- . Could provide a broader funding base for production activities at EDC
- . Program identity will cease to exist - mission and functions will lose visibility
- . Traditional production oriented organization is not a favorable environment for an organization whose mission is technology transfer
- . Coordination of EROS research efforts at EROS - Reston with those at EDC will be impaired
- . National Mapping Division provides limited opportunities for true multidisciplinary and basic scientific research
- . Dispersion of EROS program functions will impair interdivision coordination of remote sensing research

NATIONAL MAPPING DIVISION

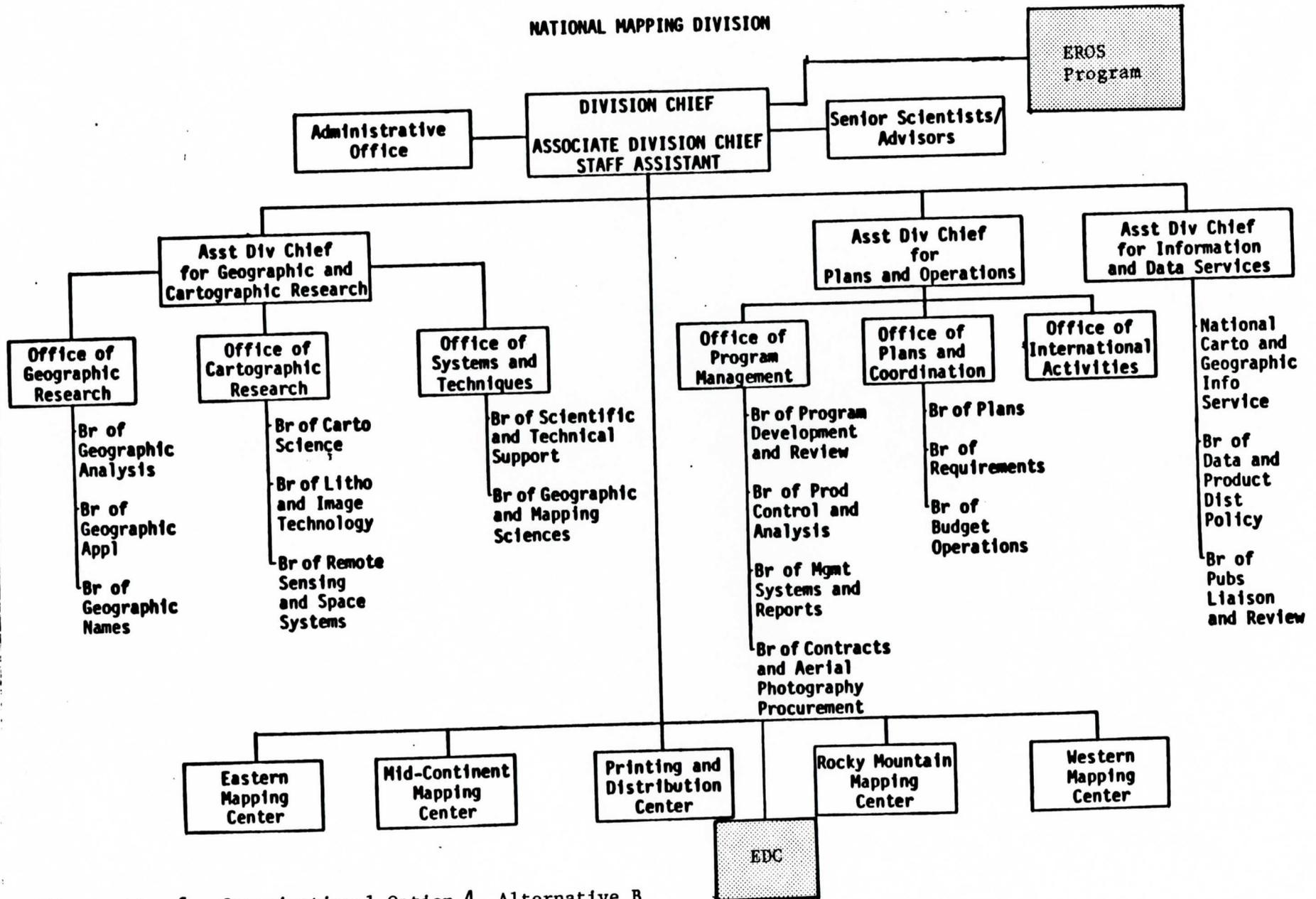


Illustration 6 - Organizational Option 4, Alternative B