AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS PART I

1. TRANSACTION CODE: A (A ADD, C CHANGE, D DELETE)

PAF

2. DOCUMENT CODE: 5

3. COUNTRY ENTITY: TAB TA/OST RDA 7

Type b - adaptation & Application

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 931-1166

6. BUREAU/OFFICE: A. SYMBOL: TAB; B. CODE: 8

7. PROJECT TITLE (Maximum 40 characters): Remote Sensing Resources Assessment (2)

8. PROJECT APPROVAL DECISION — ACTION TAKEN: A (A APPROVED, D DISAPPROVED, DE DEAUTHORIZED)

9. EST. PERIOD OF IMPLEMENTATION: YRS. 0 4 QTRS.

10. APPROVED BUDGET AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE				H. 1st FY 77		K. 2nd FY 78	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) FN	751 1	776				680		900	
(2)									
(3)									
(4)									
TOTALS									

A. APPROPRIATION	N. 3rd FY ___		O. 4th FY ___		LIFE OF PROJECT	
	O. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN
(1)					1,580	
(2)						
(3)						
(4)						
TOTALS						

11. PROJECT FUNDING AUTHORIZED (ENTER APPROPRIATE CODE(S): 1 = LIFE OF PROJECT, 2 = INCREMENTAL, LIFE OF PROJECT)

	A. GRANT	B. LOAN
	2	

C. PROJECT FUNDING AUTHORIZED THRU FY 8 0

12. INITIAL PROJECT FUNDING ALLOTMENT REQUESTED ($000)

B. ALLOTMENT REQUEST NO. ___

A. APPROPRIATION	C. GRANT	D. LOAN
(1)		
(2)		
(3)		
(4)		
TOTALS		

13. FUNDS RESERVED FOR ALLOTMENT

TYPED NAME (Chief, SER/FM/FSD)

SIGNATURE

DATE

14. SOURCE/ORIGIN OF GOODS AND SERVICES: ☐ 000 ☐ 941 ☐ LOCAL ☐ OTHER ___

15. FOR AMENDMENTS, NATURE OF CHANGE PROPOSED

FOR PPC/PIAS USE ONLY	16. AUTHORIZING OFFICE SYMBOL	17. ACTION DATE (MM DD YY)	18. ACTION REFERENCE (Optional)	ACTION REFERENCE DATE (MM DD YY)

AID 1330-6 (7-76)

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PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

PART II

ENTITY: TA Bureau

PROJECT: Remote Sensing for Resource Assessment and Management

PROJECT NUMBER: 931-1166

AID grant financing in the amount of $1.58 million is authorized for FY 1977 and 1978 for the Remote Sensing for Resource Assessment project. This is the project under which many of the responses to Mission generated requests resulting from the AIDSAT Demonstration will be fulfilled. This project also provides the first response to commitments made by the Secretary of State at UNCTAD IV. This project will finance an Africa regional remote sensing training center, utilization grants and field support. The project was reviewed and endorsed by the Research and Development Committee at its meeting of July 6, 1976.

This authorization is subject to the following conditions:

1. Obligation of funds in FY 1977 in excess of the $400,000 presented in the FY'77 CP (pg 13-14 IPB) is subject to prior notification to Congress.

2. The Assistant Administrator for Technical Assistance may authorize funds for additional sub-projects in FY 1977 and FY 1978 up to the amount requested in the project paper.

Clearances:
A. Curtis Farrar, AA/TA _____ Date 12/20/76
B. Philip Birnbaum, AA/PPC _____ Date 12/29/76

Signature: _____
John E. Murphy
Deputy Administrator
Agency for International Development

Date: 12/29/76

References:
Project Paper dated December 14, 1976
Action Memorandum recommending authorization

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE: A ADD, C CHANGE, D DELETE

PP

2. DOCUMENT CODE: 3

3. COUNTRY ENTITY: Worldwide

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 931-1166

6. BUREAU OFFICE: A. SYMBOL: TAB; B. CODE: 8

7. PROJECT TITLE (Maximum 40 characters): Remote Sensing Resource Assessment

8. ESTIMATED FY OF PROJECT COMPLETION: FY 80

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 1976; B. QUARTER (Enter 1, 2, 3, or 4); C. FINAL FY 80

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 –)

A. FUNDING SOURCE	FIRST FY 77 B. FX	C. L/C	D. TOTAL	LIFE OF PROJECT E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL						
(GRANT)	(1,075)	( )	( )	(9,375)	( )	(9,375)
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY	To be determined					
OTHER DONOR(S)	To be determined					
TOTALS						9,375

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	D. LOAN	E. 1ST FY 77 F. GRANT	G. LOAN	H. 2ND FY 78 I. GRANT	J. LOAN	K. 3RD FY 79 L. GRANT	M. LOAN
(1) FN	751	776		1,075		2,300		3,000	
(2)									
(3)									
(4)									
TOTALS									

A. APPROPRIATION	N. 4TH FY 80 O. GRANT	P. LOAN	Q. 5TH FY ___ R. GRANT	S. LOAN	LIFE OF PROJECT T. GRANT	U. LOAN
(1)	3,000				9,375	
(2)						
(3)						
(4)						
TOTALS						

12. IN-DEPTH EVALUATION SCHEDULED: See page 21 of Project Paper

MM YY

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1 = NO
2 = YES

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: Henry A. Arnold

TITLE: Director, TA/OST

DATE SIGNED: MM 12 DD 14 YY 76

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

AID 1330-4 (3-76)

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PROJECT PAPER

Remote Sensing for Resource Assessment and Management

by

Agency for International Development
Office of Science and Technology
Washington, D.C. 20523

December 14, 1976

4

AID 1020-28 (11-72)

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project
From FY [illegible] to FY [illegible]
Total U.S. Funding 2.5 million
Date Prepared: 7/9/76

Project Title & Number: Remote Sensing for Resource Assessment and Management

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: To improve resource exploration and management procedures in developing countries through assistance in the acquisition and use of remote sensing technology and earth resource satellite data.	**Measures of Goal Achievement:** Utilization of remote sensing technology by LDC resource agencies.	Establishment of permanent organizations in LDCs for use of remote sensing. Quantity of Landsat data ordered from EROS Data Center and regional ground stations. Reports of LDC projects appearing in remote sensing technical publications.	**Assumptions for achieving goal targets:** Improved resource data can contribute toward improved resource management. Organizations and personnel staffing in LDCs will remain in place for a useful period.
Project Purpose: To identify, adapt and demonstrate new procedures and techniques which support the utilization of remote sensing for inventorying, appraising and managing agricultural and other resources.	**Conditions that will indicate purpose has been achieved: End of project status.** LDC resource managers aware of applications, benefits, sources of data and assistance, and beginning to conduct own resource investigations.	Regular evaluation of all activities within project and examination of reports to determine extent of LDC involvement. Requests for technical assistance. Numbers of projects completed.	**Assumptions for achieving purpose:** Utilization of remote sensing technology can provide improved resource data. LDCs have capacity to utilize, and have need for outputs. LDCs can absorb and utilize persons trained under this project.
Outputs: Tested and evaluated regional remote sensing user assistance facility. Tested and evaluated specialized applications. Methodology for conducting intermediate and advanced training in remote sensing.	**Magnitude of Outputs:** One regional user assistance facility in operation. Four or five specialized applications evaluated and reports printed and distributed. 60-90 LDC resource managers trained and training guidelines developed.	Technical reports Final reports. Project records. Training guidelines. Numbers of LDC personnel trained.	**Assumptions for achieving outputs:** LDC cooperation with AID and contractors forthcoming.
Inputs: Technical support by U.S. remote sensing specialists and cooperating host country specialists. Specialized equipment and other physical facilities provided by AID and host governments. Landsat imagery.	**Implementation Target (Type and Quantity):** Personnel recruited and at work, facilities available, and institutional cooperation forthcoming.	Project records.	**Assumptions for providing inputs:** Current activities need augmentation. Regional user assistance facility approach more likely to succeed because assistance provided directly to ongoing LDC projects of high priority and will not require LDCs to divert personnel and funds to separate projects. Project has capacity to absorb additional inputs if justified.

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Project Paper: Remote Sensing for Resource Assessment and Management

Drafter : Merrill Conitz, TA/OST

Clearances : AFR/DP, Frank Moore (by phone) ML
LA/DR, Robert Simpson (by phone) ML
ASIA/TD, Herbert Dodge (by phone) EP
NE/TECH, James Dalton (by phone) EP
SER/ENGR, John Rixse (by phone) ML

This project paper was reviewed at the R&DC meeting on July 6 and revised according to comments made during that meeting. The revised PP has been circulated to the R&DC members and was cleared by them.

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PROJECT PAPER

Remote Sensing for Resource Assessment and Management

PART I. SUMMARY DESCRIPTION

A. Goal

To improve resource exploration and management procedures in developing countries through the use of remote sensing technology.

B. Purpose

To identify, adapt and demonstrate new procedures and techniques which support the utilization of remote sensing for inventorying, appraising and managing agricultural and other resources.

C. Summary Description

The economies of most developing countries are heavily dependent upon resources, both renewable and non-renewable. Accordingly, economic development and the welfare of the people are tied in various ways to income derived from these resources. In order to maximize returns from resources, and thereby increase incomes, accurate assessment and rational management are vital elements of a resource development program. Resource management decisions are based upon many factors, but among the most critical is an accurate knowledge of the physical characteristics such as the amount, location, condition, distribution, rate of change, climatic conditions, and various environmental factors related to a given resource. Remote sensing, using both satellite and aircraft data, is a form of modern technology which can greatly contribute to the accuracy of these assessments while at the same time reducing the costs. Obviously this technology will not directly affect the political and social factors which also influence resource management decisions, but it will reduce uncertainty and the possibility of poor decisions based on erronious data.

The major effort under this project will be the development of a remote sensing regional user assistance facility for Africa. The facility will include a small staff of remote sensing specialists and the equipment needed to provide assistance in the utilization of remote sensing in Africa. Consideration is being given to locating the facility with the ECA Regional Centre for Services in Surveying and Mapping in Nairobi. The facility will differ from a training center in that it will have a much stronger outreach or extension capability and only modest provisions for training at the center itself. The staff will regularly visit the countries of the region to identify country needs and potential users of remote sensing and to assist in various ways in the utilization of the technology. The facility will become an important link between the users of the region and those organizations having major remote sensing programs such as NASA, EROS, and FAO.

This project will also provide grants to assist developing countries in developing their own capabilities for utilizing the technology. The grants will support training and the use of satellite imagery for resource inventories and other proven applications. A selected number of grants, perhaps five or six, will be awarded for the purpose of investigating new applications that are of particular importance to developing countries. These applications include tropical agriculture, control of vector borne disease and other insect infestations, desertification studies, demographic studies and forest inventories.

The grants will include technical assistance to be provided by the user assistance facility for those awarded in Africa and by a separate contractor elsewhere. Procedures for selecting grantees will be similar to those employed during the previous grant project. See Part II. B. for a more detailed description of the proposed grant activity.

PART II. PROJECT BACKGROUND AND DETAILED DESCRIPTION

A. Background

The dependence of developing country economies upon resources and the need for improved assessment and management practices are well known issues among the development assistance community. It is also known that remote sensing technology using earth resources satellite imagery is a cost effective means of collecting data needed to improve resource assessment and management practices. The worldwide acceptance of these views is reflected in the following statement of the United Nations Committee on the Peaceful Uses of Outer Space:

> ....a new and powerful tool is emerging to assist nations in their social and economic development and has been demonstrated by the Landsat orbital remote sensing system. That this new tool is needed is painfully emphasized by the critical problems facing people of every nation regarding the future availability of adequate food and other resources and that this new satellite remote sensing tool is considered relevant to the search for solutions to these problems is acknowledged by the worldwide interest in the application of Landsat data.
>
> Applications for remotely sensed data are being found in almost every discipline associated with sustaining life. They are particularly relevant to:
>
> -- Mapping areas of the world, and the recording of changes in the conditions and use of the earth's surface;
>
> -- Agricultural forecasting as an aid to crop, forest and animal production, and agricultural supplies and products distribution;
>
> -- Geologic mapping to facilitate the efficient exploration and development of mineral resources;

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-- Hydrological surveys for water resource identification, to permit urban, rural and agricultural planning and pollution monitoring;

-- Land use surveys to permit efficient development of urban and rural areas, and to aid in transmigration planning;

-- Oceanographic surveys for coastal and fisheries development.[1]

Recent developments in both the space and ground segments of remote sensing provide a technical basis and timely opportunities for further technology transfer projects. ERTS-1, which was launched in July 1972 and Landsat-2, which was launched in January 1975, have now obtained cloud-free imagery of virtually all of the land areas of the world. The EROS Data Center in Sioux Falls, South Dakota, the central repository of all ERTS and Landsat data, has distributed data products to users in almost all of the countries of the world. The recent decision to launch Landsat-3 in late 1977 assures continuity of the program through the decade. The multispectral scanner of Landsat-3 will contain a thermal imaging channel to provide an even wider range of applications. Preliminary planning is now underway for the design of a fourth satellite in this series which will have greater spectral and spatial resolution, and will carry the program another step closer to a worldwide operational system.

There have been developments in the ground segment which further increase the range of applications and the opportunities for utilizing the technology. The use of improved optical and digital processing techniques to aid in identifying different substances has become accepted practice among many users. Some of these techniques are appropriate for immediate use in developing countries and others will be available in the near future. There are also various data storage and handling techniques, which require less sophisticated computer requirements and which could provide immediate benefit to the developing countries.

For a relatively modest investment, A.I.D. has been able to make the benefits of appropriate aspects of U. S. space technology available to the developing nations. The Landsat experiments have provided a source of data which is not only vital to the development planning process, but which would otherwise be unavailable to most developing countries.

Well before the launch of the first Earth Resources Technology Satellite, the A.I.D. Office of Science and Technology recognized the potential value of satellite data for use in resource exploration, assessment and management, land use mapping and planning, and environmental monitoring in developing countries. A.I.D.'s interest was first translated in action

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through the sponsorship of the Smithsonian Symposium on "Potential Applications of Remote Sensing to Economic Development in Developing Countries" in 1970. This was followed by the development of an A.I.D. Remote Sensing Project which provided funding through FY 1976 and covered such activities as the development of an International Training Course in Remote Sensing at the EROS Data Center in Sioux Falls, South Dakota, an activity which has continued successfully under USGS sponsorship; regional training workshops in Panama, the Philippines, Mali and Kenya; low cost multispectral aircraft surveys in Indonesia; a major benefit assessment study conducted by the Environmental Research Institute of Michigan entitled "An Economic Evaluation of the Utility of ERTS Data for Developing Countries;" special studies in geology and range management in Afghanistan and the Sahel respectively; a study of the applicability of satellite data to disaster warning and relief; and grants for stimulating utilization to Pakistan, Bangladesh, Thailand, Chile, Bolivia, Philippines, Sri Lanka and Lesotho. A second project was developed by TA/OST in 1972, with funds provided by PHA, for an experimental project on the application of Landsat data in demographic studies. This project, which is now underway in Bolivia and Kenya, is testing the use of satellite generated data for population estimates in countries where adequate demographic data are lacking. Another A.I.D. sponsored project being undertaken by the USGS is a study to determine whether traces of mineralization can be detected in vegetation through multispectral analysis to help locate mineral deposits that might lie hidden in tropical forests.[2]

The National Academy of Sciences, under Task Order No. 1 of its contract with TA/OST, is conducting a comprehensive study of the potential role of A.I.D., as well as other aid donors, in making the benefits of earth resources satellite data available to the developing world. This study will provide guidance in the development of future A.I.D. programs and projects in remote sensing. While the final report of this study is not yet available (expected in late spring of 1976) this Project Paper was written with the benefit of preliminary comments of the Committee members.

Members of the Technical Assistance Bureau are also cooperating with the Regional Bureaus in the design of agriculture, range, and human settlement projects which utilize Landsat technology in their data collection phases. Examples of these projects are the Masai Range Project in Tanzania, the Mali Resource Inventory, the Sub-tropical Land Development Loan in Bolivia and the proposed AID/IBRD/FAO project for the planning and development of areas freed from onchocerciasis in West Africa. The Regional Bureaus also recognize the need for training and institutional development in remote sensing. Since 1971, USOM in Thailand has supported a training project with analytical equipment and the provision of a full-time remote sensing specialist. In FY 1977 the Africa Bureau will establish a regional remote sensing training center in West Africa.[3]

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B. Detailed Description

(1) Regional User Assistance Facility

It is widely recognized that regional remote sensing facilities for technical assistance and training are the most cost effective means of supporting the needed institutional development.[4] This project will develop, test and evaluate, on a pilot basis, a regional user assistance facility in Africa The facility will be developed in cooperation with the Economic Commission for Africa and may be housed in the ECA's new Regional Centre for Services in Surveying and Mapping in Nairobi. This site has been recommended by the ECA Technical Evaluation Mission which visited several possible training center and ground station sites during February and March 1976.[5] Combining this facility with a regional mapping center will greatly facilitate implementation of the technology.

The physical components of the facility will include a browse file containing microfilm copies of all available Landsat images of the region, a photo library containing negatives and copies of all prints that have been processed by the facility, a reference library, remote sensing analytical equipment, photo lab, a four-wheel drive passenger vehicle equipped for collecting ground truth, and access to a light aircraft. If the need is demonstrated at a later date, considerations will be given to the addition of digital processing equipment such as the General Electric Image 100 or the Bendix M-DAS.

The staff of the facility will consist initially of two remote sensing specialists with broad experience in training and development applications, one photo lab technician, and one secretary/librarian. The staff will be augmented by short-term consultants who will assist with special projects and training workshops. Countries of the region will be encouraged to assign staff technicians to the facility for on-the-job training and assistance with facility functions on a no exchange of funds basis. The staff of the facility will work closely with the staff of the ECA Surveying and Mapping Centre and will collaborate on problems of mutual interest.

The most important functions of the personnel of the facility will be as follows:

-- Provide training courses, seminars and demonstrations at periodic intervals to stimulate utilization of remote sensing imagery in the region.

-- Provide photo processing and limited image interpretation for the countries of the region.

-- Maintain photo and reference libraries and insure that important publications and announcements are distributed to the countries of the region.

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-- Make frequent visits to the countries of the region to assist in the development of remote sensing programs and provide technical assistance as needed. Initially these visits will be concerned with the identification of local contacts and counterparts in each country and the development of linkages between users and sources of data. Later, the visiting staff will identify projects to which remote sensing could make a useful contribution and provide the necessary assistance in effecting utilization.

-- Award and monitor A.I.D. Grants for the utilization of remote sensing.

-- Establish linkages with local universities, colleges and technical institutes and provide assistance in incorporating remote sensing training into higher education in the resource disciplines.

-- Keep abreast of new developments in the U.S. space program and inform the countries of the region of new opportunities for using space technology. In particular, they will inform these countries of opportunities for participating in Landsat experiments and assist in the preparation of proposals where necessary.

-- Visit local USAID Missions periodically and be available to assist in project design and the identification of contractors.

-- Establish liaison with the international agencies and other bilateral donors which are active in remote sensing.

-- Assist the countries in establishing linkages and obtaining data directly from the Landsat ground stations in Zaire, Upper Volta and Kenya as these stations come on line.

The regional user assistance facility is not planned as a permanent institution and will continue only as long as needed--perhaps five to ten years. As participating countries gain experience in the application of this technology, they will acquire their own national centers and incorporate training into their university courses. As the training and interpretation functions become decentralized the facility could become a regional center for digital processing. Digital processing is seen by many as an essential element in future remote sensing analysis but the techniques are not yet readily adaptable for developing countries and the equipment is very expensive.

The Kenya Government is interested in converting the Italian built satellite launching platform at San Marco, off the coast of Malindi, into a Landsat ground station. If this develops there would be an even greater need for the facility described above as there are many advantages to combining training and assistance facilities with ground stations.

(2) Grants for Stimulating Utilization and Investigating Applications

In FY 1975, TA/OST announced the availability of remote sensing grants to stimulate the utilization of Landsat imagery for resource investigations (see Appendix A for announcement airgram and attachments). Nineteen proposals covering a wide range of potential applications were received and evaluated by a panel of remote sensing specialists. Six grants were awarded during FY 1975 and four more in FY 1976.

Because of the substantial interest in remote sensing grants among developing countries, the grant format will be employed in this project to further encourage the utilization of Landsat technology and to investigate new applications. The advantages of the grant mechanism are greater likelihood of a match with host country needs and priorities and greater incentive for successful execution.

Grants of $50,000 or more each will be made available to provide for equipment purchases, satellite imagery, computer processing, training, and technical assistance as required by the particular application being investigated. In all cases, sufficient technical assistance will be provided to insure appropriate project design with achievable objectives. Each grantee will produce a final report. Where a grant project investigates an application area that has general applicability, the contractor supervising the grant will produce an appropriate report or set of guidelines for general distribution.

As in the previous project, countries will be invited to submit proposals for projects to be carried out with grant support. These proposals will be evaluated and recipients selected on the basis of need, capability for executing project, consistency with host country and AID development priorities, and matching contribution.

In order to insure consideration of potential application areas of interest to AID, proposals may be invited for specific studies. These are areas which have not been investigated sufficiently because the principle application is in developing countries where there has been little remote sensing research. Examples of some application areas of particular importance to developing countries which will be explored during this project are as follows:

(a) Agriculture

Most agricultural studies to date have dealt with crops and agricultural practices in the U.S. and other countries in the temperate latitudes where crop identification is easier because of larger homogenous fields and clearly defined seasons. Since many of the developing countries lie in tropical latitudes there is a need to examine the applicability of remote sensing to tropical conditions in order that techniques for agricultural management, crop identification and crop forecasting might be developed. Because of the small irregular fields and mixed crops in most tropical areas, these investigations will be useful in ascertaining the most appropriate mix of aircraft and satellite data needed and the processing techniques. The final product of this

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investigation will be a detailed report outlining the method of data collection, aircraft, satellite, etc., and the method of analysis, optical or computer, which will provide the kinds of data required for agriculture assessments and planning in developing countries.

(b) Health

Remote sensing has been found to have considerable potential for application to health problems by providing data that are appropriate for the control of water and vector borne diseases and insect infestations. The objective of the investigations will be to test the application of techniques that have been developed for the control of diseases, in the U.S. and elsewhere, on similar problems in one or more selected developing countries. The primary source of technical data is expected to be the screw worm fly eradication experiments that have been conducted in the southwestern U.S. and Mexico, which use the sterile male technique for controlling reproduction. Both the timing and the location of areas in which to release the sterile males are determined from data collected by Landsat and weather satellites. It is expected that this technique will have application in the control of tsetse flies in Central and East Africa, malaria carrying mosquitoes in Thailand and elsewhere, and river blindness flies in West Africa. The final product of this study will be an evaluated and tested technique for the application of remote sensing to the control of water or vector borne diseases in developing countries.

(c) Desertification Studies

One of the advantages of Landsat is that it provides imagery of large areas taken at the same time of day through the year and year after year. This feature makes Landsat imagery an ideal tool for studying large scale environmental changes that occur over long periods of time such as the encroachment of deserts and changes in regional vegetation patterns. The purpose of this study will be to examine changes in sand dunes and the distribution of vegetation in selected parts of the Sahel region of Africa to determine if significant changes have taken place during the period of time in which data have been available, and to assess the utility of satellite data as a means of continuously observing and permanently recording these phenomena. Owing to the relatively short period of time in which Landsat data have been available (since July, 1972), aerial photography dating back to 1945 and 1946 will also be utilized. If the study reveals that there are changes taking place that contribute useful knowledge for the management of the region's resources, steps will be recommended for institutionalizing desertification studies and developing a continuous monitoring program.

(d) Forest Resources Studies

Wood is still the basic source of energy for heating and cooking in many developing countries. The unregulated cutting of trees for charcoal making is causing rapid depletion of forests, especially around urban areas. This study will investigate procedures for monitoring forest reserves to determine the nature and rate of cutting which in turn could be used as the basis for control measures.

(e) Grid Cell Mapping

One of the most serious problems facing developing country resource managers and planners is the storage, retrieval and utilization of data. Frequently these data are collected from many different sources by many different agencies, presented in widely varying formats and stored in many different places. There are also problems in aggregating and analyzing these data for different purposes. The most common technique for aggregating land use data is the use of colored transparent overlays, but this method becomes cumbersome when more than five or six kinds of data are employed. Various computerized grid cell mapping techniques have been recently developed for storing and manipulating many different kinds of social, economic and physical data. With Landsat now providing a large and continuing amount of resource data, it is particularly important to develop systematic means for storing and retrieving these data. Grid cell techniques are simple to implement, flexible, and adaptable to many different types of computers. The purpose of this study will be to develop or adapt a grid cell mapping system appropriate for use in developing countries and test it in one or more selected countries.

Following an evaluation of these tests, a detailed report will be prepared describing the benefits of this system for developing countries along with details for implementation and the human and financial resources required.

(f) Other Applications

Remote sensing is a rapidly developing technology and in order to maintain its viability, this project will provide for new experiments and demonstrations as the needs arise. About midway in ths project period (late 1977), Landsat-3 will be launched. Lansat-3 will contain a fifth band in its multispectral scanner capable of imaging in thermal infrared range. The data from this channel will have application in various environmental surveys, coastal zone studies and geothermal prospecting. If the launch of Landsat-3 is successful, it will be desirable to design one or more experiments around its thermal imaging capability.

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(3) Analysis of Interpretation Techniques and Training

Training in remote sensing is much needed by developing countries. As interpretation techniques are improved it is desirable to continue to develop and test appropriate training programs. This facet of the project will build on the earlier experiences of A.I.D. in remote sensing training but will concentrate on methodologies designed to achieve more advanced levels.

Remotely sensed imagery from satellites may be utilized by persons with a wide range of disciplinary backgrounds as well as with a wide range of skills. Some use may be made of the imagery by persons with no remote sensing training, but the benefits derived increase proportionately with the development of interpretative skills and with the sophistication of the instruments used. One of the most difficult problems faced in transferring this technology to the developing countries is determining the most appropriate mix of techniques and instrumentation. The level of sophistication in remote sensing analysis employed by most developing countries is still relatively low.

As the need for more sophisticated data increases there are more complex optical and digital techniques which can be used. While the instrumentation required for this type of analysis is expensive and beyond the reach of most developing countries, the results are available to them through companies providing these services. Thus this activity will focus on the analysis and use of various interpretation techniques and data products rather than on the means of producing the data products. In this way the project will avoid creating a demand for sophisticated equipment for which the benefits have not yet been demonstrated.

PART III. PROJECT ANALYSES

A. Technical Analysis

Earth resources surveys from space, in conjunction with aircraft observations and ground investigations, represent a vital program in terms of potential application to the management of our resources. The possibility of surveying Earth resources from orbital altitudes was recognized during the early days of the U.S. space program, based on observations from remote sensors on Meteorological satellites and photography from manned missions such as Mercury and Gemini.

The work of the past few years indicates that spacecraft and sensor technology can produce information which can provide better assessment and management of natural and cultural resources. In the 1970's and 1980's, this technology may provide new and critically needed assistance for attacking world-wide problems related to ecology, agriculture, land use, water, minerals, energy, and pollution.[6]

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The selection of sensors for acquiring remotely sensed data depends upon several factors which include considerations of the kind, size, shape, location, and time of occurrence of the phenomenon to be sensed as well as the number of times and the interval between observations and the information to be extracted from the data. NASA is working closely with the various user agencies to obtain information on their data needs in order to develop remote sensors and satellite missions which will provide the user with the kinds and types of data they require in the time intervals desired.

Earth observation sensing is best done from various altitudes all the way from ground based sensors with probes and the data relayed via phone lines or satellites, thru remote sensing via aircraft, low orbit satellites or synchronous orbit satellites. Different information is best acquired by various combinations of these systems. Spacecraft are best used to acquire moderate resolution data where large areas of coverage are required and repetitive coverage is necessary to extract the desired information.

Both Landsat-1 and 2 carry sensors whose spatial and spectral qualities were considered optimum for collecting resource data over land areas. The instrument packages include a four channel multispectral scanner which scans, along a near polar orbit, a swath approximately 120 miles wide and sends this information back to ground receiving stations in televised form. Data for areas beyond the range of a ground receiving station (approximately one to two thousand miles) are stored on tape recorders for later transmission to a ground station. After processing, the data are distributed to users in the form of computer compatible tapes or photograph-like images in black and white but in four spectral bands. The images may be composited with colors added to enhance special features such as vegetation, water, soil variations, etc., or these may be enlarged to specific scales and annotated to form maps or map bases. The satellite is designed to provide repeat coverage at eighteen day intervals making the data useful for observing changing phenomena. Future satellites are expected to have improved spectral and spatial resolutions as well more frequent coverage.

One problem which affects the utilization of satellite imagery of developing countries is its availability. Data for areas beyond the range of ground stations must be temporarily stored on tape recorders. The tape recorders apparently are the weakest link of the system, both of them having failed on Landsat-1 and one on Landsat-2. This problem will be overcome eventually by the construction of more ground stations. At the present time there are six ground stations in operation, three in the United States, one each in Canada, Brazil and Italy. Zaire, Upper Volta, Iran and Chile have agreements with NASA which will permit them to proceed immediately with the construction of ground stations and several more countries including Kenya and Thailand have expressed interest in constructing stations.

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In selecting technologies for developing countries, it is necessary to assess both the need for the technology and the countries' capabilities for its utilization. There is little question about the need for this technology in developing countries as most of them are economically dependent upon agricultural production and natural resources. At the same time they have limited talent for managing their resources and optimizing the returns. These resources are often distributed over large and not very intensively explored areas. Thus, the type of macro view provided by satellite imagery is exactly the kind needed for providing small and medium scale base maps where none exist, for mapping coarse features in agriculture, land use, soils vegetation and surface water, and for providing a basis for more detailed surveys or mapping. Furthermore, the satellite imagery is readily available for most land areas of the world for modest cost. Coverage may be repeated as frequently as eighteen day intervals thus providing a graphic record of seasonal and annual changes.

One of the most attractive features of Landsat imagery, as far as developing countries are concerned, is the ease of interpretation. Because of the high altitude and the stability of the satellite platform, its sensors provide imagery that is nearly distortion free and, when enlarged to specific scales, approaches the map accuracy standards. The simultaneous sensing in several spectral bands enables resource managers to identify features which could not be discerned on either color or black and white film. Each band has unique characteristics providing information about land and resources. For example, the green band is superior for identifying variations in land use while infrared shows surface water and shorelines very distinctly. Also, the images from the separate bands of the satellite's scanner may be composited together with various colors added to enhance features such as vegetation, soil types, etc.

Photo processing and visual interpretation can be performed by resource managers having specialized training in their respective disciplines but with little or no training in remote sensing. Furthermore, these interpretations require relatively less human effort than the collection of data through ground observations or even by air photo interpretation.

Remote sensing is often considered a high technology and its use in developing countries is sometimes criticized on that basis. The response to those concerns is that while the operation of satellites and processing stations is high technology, the visual interpretation of the imagery is not. Also, among the resource data collection options available, the use of satellite imagery is often the least expensive.

B. Environmental Assessment

No detrimental environmental effects are anticipated from the participation of developing countries in remote sensing activities. Remote sensing is a method of collecting data and has no direct impact on the environment. The purpose of this project is to improve the management of agricultural

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and range resources. Thus it is inherently beneficial to the environment in both the long and short term. Furthermore, remote sensing itself is an environment monitoring tool. There are no apparent alternative methods for achieving the objective and purpose which would offer greater benefit to the environment.

C. Financial Analysis and Plan

The following budget estimate includes funds for a regional training facility, utilization grants and training courses. Each of these activities will be further supported with contributions from participating countries and organizations. It is expected that the regional center host will provide office and laboratory space as well as some sharing of personnel and equipment. The countries served by the facility will contribute projects and the personnel assigned to those projects. They will also provide logistical support for any investigations carried out within their respective countries. The grant and training activities will also be augmented by host country contributions. In the previous grant project managed by TA/OST, up to fifty percent of the support for the project activities was provided by the host countries. During previous workshops and training courses, host countries have also provided substantial logistical support. Countries participating in training under this project will be expected to support any portion of the training that is conducted in the U.S.

As indicated in Part II.B. (1) one of the functions of the regional center will be to coordinate activities with other donor organizations. Collaboration with these donors on the implementation of projects will be sought wherever practicable. Efforts will also be made to associate these activities with, or "piggyback" onto other A.I.D. projects which could benefit from the use of this technology.

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Budget Estimate

	(000) FY 77	78	79	80
African Regional User Assistance Facility				
Remote Sensing Specialist (4 including salaries & benefits)	150	320	320	320
Secretary/Librarian/Technicians	20	40	40	40
Consultants (3 mo. incl. travel)	20	30	30	30
Fellowships	-	80	100	100
Photo Lab. Equipment	70	30	20	10
Remote Sensing Equipment	50	50	40	20
Field Equipment	20	10	10	10
Travel within region	10	20	20	20
Aerial Photography	10	60	60	60
Imagery Processing & Library Material	20	50	50	80
Other Expenses	10	10	10	10
Total African Facility	380	700	700	700
Grants & Technical Support	495	1,200	1,600	1,600
Training and Symposia	200	400	700	700
Totals	1,075	2,300	3,000	3,000

The budget for the regional facility includes salary and expenses for three remote sensing specialists initially and a fourth in FY 1979. Their services will be augmented from time to time by consultants whose expertise may be needed for certain specialized activities or for the conduct of workshops and seminars. At least one of the original group of specialists will be a qualified remote sensing instrument and photo laboratory technician whose primary responsibilities will be photo processing and instructing in the use and maintenance of equipment.

The budget for the center also provides for remote sensing equipment, photo laboratory equipment and ground truth equipment. The remote sensing equipment will be of the optical type which can be used and maintained with a minimum amount of training. It will include light tables, zoom tranferscopes, diazo processors, color additive viewers, density slicers etc. Photo laboratory equipment will include photo processing and enlarging equipment as needed to augment that which is already in place or on order by the host organization. Ground truth will include cameras, radiometers, compasses, altimeters, thermometers, etc. as well as appropriate ground transport and field equipment.

Funds will be provided for necessary travel within the region by both commercial and charter aircraft. Light aircraft will be used frequently for augmenting satellite and ground truth data with aerial photographs.

The regional facility will encourage countries of the region to send trainees to the facility for on-the-job training, hopefully at the expense of their own organization. Provision will be made for selecting two or three persons trained in this manner for advanced training leading to an M.S. Degree in an appropriate resource field at a U.S. Institution having recognized expertise in remote sensing. Persons trained in this manner will be prospective counterparts for the facility staff upon their return and likely candidates for managers of regional or national centers.

Later in the project period consideration will be given to developing a schedule of reimbursements for certain of the services provided by the regional facility. Reimbursement might be expected for travel and per diem for the short term consultants and for aerial photography and photo laboratory processing provided by the facility. See Part IV.B. for further details on the question of reimbursement.

Utilization grants will be awarded for amounts varying upward from fifty thousand dollars. In order to achieve some regional balance most of these grants will be awarded to countries not served by the regional facility and will be managed under a separate contract. The grants will provide technical assistance as needed and may include equipment, imagery processing or training as desired by the grantee. Past experience with remote sensing grants indicates that an average cost of twenty thousand dollars is required for administering a grant and providing minimal technical assistance leaving only twenty thousand for image processing or other grant project activities out of a forty thousand dollar grant.

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Larger grants are, therefore, somewhat more efficient but this depends upon the nature of the grant activity. Details of implementation of the remote sensing grants are described in Section IV.B.

One remote sensing training project was implemented during FY 1976. A contract was awarded toaa university based on the competitive evaluation of proposals. The cost of the proposals evaluated ranged from $60 to $150 thousand. The proposal selected was for less than $100 thousand and was considered adequate.

This type of training is much more than a short seminar or workshop. It involves both U.S. and host country training with a period of on-the-job training and evaluation lasting up to six months. It is designed to achieve a more advanced level of understanding than is possible during a short workshop.

AIDSAT Demonstration Add-on

Funds have been included in the Project budget and in a Regional Bureau set aside for an appropriate response to the AIDSAT demonstrations and to the remarks of Secretary Kissinger at UNCTAD and Secretary Hills at Habitat. While this will provide for a greatly expanded level of effort in remote sensing, the descriptions, background and analysis in the preceding sections remain valid. For example, funding for the grant activities will be increased in FY 1978 to assist countries which have responded to offers made during the AIDSAT Demonstration. These grants will be of the same general nature as described in Part II.B.(2). With the amount proposed for FY 1978, which is expected to continue at the same or increased level in FY 1979 and 1980, it will be possible to allocate grants more on the basis of need than on competitive evaluation. In this way it will be possible to assist those countries lacking in the capability to prepare good proposals. The East African Facility will also be expanded to further accommodate those countries whose expectations have been stimulated by AIDSAT. Provision will be made for the sponsorship of one or more major international symposia on remote sensing in selected developing countries to give developing country resource managers more direct contact with the world's remote sensing community.

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D. Social Analysis

Ever since the idea of photographing from space was conceived, concerns have been expressed about the political ramifications. At least two proposals have been presented to the United Nations Outer Space Affairs Committee for the regulation of sensing from space and the distribution of remotely sensed data.[8] This project is concerned only with the utilization, for resource analysis purposes, of data that have already been collected and will have no influence on the kind and amount of data collected over various countries. Furthermore, it is consistent with the U.S. position on remote sensing from space which suggests that "The surest way to protect States from being disadvantaged or discriminated against was to ensure that all States had equal access to those data."[9] The term "equal access" carries the implication of not merely just the Physical access to the satellite imagery but access to the information contained in that imagery through an improved ability to extract that information. The goal of this project is to improve the developing countries' capabilities for extracting and using information from resource satellites.

Where the use of remote sensing technology results in improved resource management and agricultural practices there is a positive social impact. If utilized properly, the data could contribute toward increasing the world's food supply, reducing diseases, improving the environment, and better utilizing land and water and other resources. While the project does not directly impact on the rural poor as would a new road, for example, they are the class of people which stand to benefit most from improved resource and land use management decisions.

E. Economic Analysis

Several cost-benefit studies have been undertaken to assess the economic potential of remote sensing. In 1974 the Environmental Research Institute of Michigan produced a report for TA/OST entitled "An Economic Evaluation of the Utility of ERTS Data for Developing Countries." This study concludes that remote sensing has a wide variety of applications in developing countries and that significant benefits can result from its utilization.[10]

Two major cost-benefit studies have been undertaken for NASA and the Department of the Interior by Econ, Incorporated and Earth Satellite Corporation respectively, and while both contribute useful information they differ widely in their results.[11] The Econ study shows a benefit ration of 10:1 while the EarthSat study shows benefits ranging from .4:1 to 1.9:1. The variation in the results of the two studies is attributed to differing assumptions and criteria under which the two studies were conducted. The Econ analysis focuses on potential net benefits while the EarthSat study made an attempt to estimate net benefits that might actually be realized in the realtively near term. Accordingly, some of the most important potential long term benefits were ommitted from the EarthSat study.

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Both of the cost benefit studies mentioned above include detailed analyses of potential benefits in most of the important application areas. Since these investigations were all oriented to U.S. conditions, their application to this project is only valid when consideration is given to the different circumstances found in developing countries. In most cases, however, the range of benefits should be greater in developing countries because they have relatively less data with which to work making any addition more valuable. Furthermore, developing countries have fewer alternatives for collecting data. Despite their limitations, the Econ and EarthSat studies are the most comprehensive sources of data available on the costs and benefits of earth resource survey systems.

It must be understood that remote sensing data by themselves have no economic value. They take on value when they are translated into usable information which will actually affect the behavior of individuals and organizations so as, for example, to change the level of output, or reduce uncertainty. Benefits accrue from more efficient use of land and resources, more efficient marketing procedures in the case of crop forecasting, improved productivity and reduction in costs of health care in the case of health application, prevention of adverse environmental impacts and others. Of course, there is always the possibility of economically rewarding mineral discoveries through the use of this technology.

Another dimension that must be considered in assessing the economic value of remote sensing is its potential for reducing data collection costs. The alternatives in collecting resource data are remote sensing from aircraft and/or spacecraft and by ground sampling. The combined use of data from all three sources is generally considered to be the most cost effective. For many applications the elimination of satellite data would increase the cost and the dependence on ground sources. Even in developing countries where labor is cheap, ground data collection methods are not only the most expensive but the least reliable.

PART IV. IMPLEMENTATION PLANNING

A. Administrative Arrangements

This project will be managed by TA/OST. Regional Bureaus, Country Desks and Country Missions will be consulted for advice and guidance in implementing activities in their respective countries and regions. Desks and missions will be kept fully informed of implementation plans in their respective countries.

The execution of this project will be delegated to appropriate and qualified contractors. Subject to continued satisfactory performance, TA/OST will request authority to contract with the Environmental Research Institute of Michigan, contractor for previous AID remote sensing grants, for the administration of non-African grants. East African grants will be administered through the user assistance facility. The training grants will be administered separately by the same university which is selected to manage the FY 1976 training project. The regional user assistance

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facility will be supervised by an AID direct hire project manager with additional personnel and equipment provided under a PASA with the U.S. Geological Survey. Where necessary, contractors will be authorized to subcontract for personnel with special competence in application areas that fall outside of the contractors' normal range of expertise.

The selection of contractors will be based on known capabilities and experience. ERIM has managed previous remote sensing grants satisfactorily and could carry this experience into a new project. The USGS has the best known cartographic capability in addition to having a larger complement of experienced remote sensing personnel from which to draw than most other organizations. Provision will be made for subcontracting grant activities where appropriate. There are many potential contractors which have developed unique capabilities for specific applications or the use of specialized techniques. These special capabilities will be called upon to insure that the best and most appropriate technical assistance will be used to conduct the required surveys and investigations.

Evaluations of the project will be conducted at regular intervals by TA/OST with assistance by appropriate A.I.D. country and regional representatives and with assistance from remote sensing specialists in other agencies and organizations.

B. Implementation Plan

The proposed equipment budget for the regional facility is adequate to cover the photo laboratory remote sensing and field equipment needed for the initial operation of the facility. If the expected requests for additional equipment following the AIDSAT Demonstration materialize, the facility will be enlarged with both additional personnel and equipment to accommodate these requests. A study is now underway by the American Technical Assistance Corporation, an IQC Contractor for A.I.D., to refine the equipments requirements with lists of specific items and alternatives for both the proposed and expanded facility. This information will also be applicable to the Asian and other user assitance facilities supported by A.I.D.

Preliminary discussions concerning the scope and services of the user assistance facility have been held with ECA. Upon approval of this project, terms of agreement will be drawn up and submitted to the Governing Council for the Regional Centre for Services in Surveying and Mapping. It is expected that an agreement can be concluded and the facility ready for operation in early 1977.

Under the terms of agreement, the Centre will provide office and laboratory space. AID will provide remote sensing equipment and supplemntal equipment for the photo laboratory. AID personnel will have full access to the photo lab and remote sensing equipment during the life of the project. Upon termination, the photo lab equipment will stay with the Mapping Centre. The disposition of the interpretation equipment will be determined

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by mutual agreement between the Centre and AID. It will either be distributed to participating countries or remain in the Centre depending how it can best be utilized.

The AID personnel in the facility will retain full responsibility for the selection of countries and projects to be assisted by the facility. They will also retain full control over the disbursement of any AID grants awarded through the facility. Wherever possible they will seek to collaborate with Centre personnel on projects of mutual interest.

As an alternative to terminating the operation of this facility at the end of this project period, there are several options possible for continuing its operation. These options are continued operation with A.I.D. support, continued operation on a self supporting basis or with other donor support, absorption of the functions of the facility into the operation of the ECA Cartography center, decentralization to national remote sensing centers, and decentralization of basic interpretation and assistance functions but continuation as a digital processing center. These options will be reviewed during the second evaluation and a decision reached at the time of the third evaluation (see Project Performance Tracking Chart). Regardless of the option selected, all of the basic functions described in Part II, Section B. (1) will have been performed by the end of this project period. Thus achievement of the stated objectives will not be dependent upon continued A.I.D. funding beyond this project period. Given the substantial expressions of need for institution building and regional operations that have been made by the NAS Committee, the U.N. Outer Space Affairs Committee and others, it is unlikely that all of the functions of the facility will terminate by FY 1980.

The availability of remote sensing grants will be announced to AID Missions through an airgram and expressions of interest invited. If more countries express interest than there are grants available, proposals will be invited and the selection made on a competitive basis. Appendix A contains the announcement, scope and selection criteria for the present grant project. This will be used as a model for the design of a new selection procedure. In the new project, AID may invite proposals in specific application areas in order to cover the most important applications listed in Part II. B. 2.

Several countries have already requested the kind of assistance to be provided under this project. ECA, through its Technical Evaluation Mission in Remote Sensing has requested a user assistance facility to be co-located with the Regional Centre for Services in Surveying and Mapping. Bangladesh, Tanzania and Nepal have requested training. Colombia, Peru, Botswana, Philippines, Thailand, Indonesia, Korea and Kenya have all submitted proposals which could not be funded under the earlier projects.

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C. Evaluation Plan

Evaluations will be carried out in accordance with AID evaluation procedures. Evaluations will review progress toward accomplishment of objectives and improve day-to-day management of the project. Special consideration will be given to identifying opportunities for facilitating utilization. In addition to these and other general evaluation purposes, the evaluations of this project will be concerned with identifying new opportunities for investigating or demonstrating the utility of remote sensing technology for development purposes. The evaluations will also be used to establish guidelines for redirecting the project as needed throughout the project period.

The future course of the regional facility will be determined largely on the basis of evaluations. The first evaluation of the facility will determine if the tasks described in Section II.B.(1) are being accomplished. The possible redefinement of these tasks will take place at that time. A second evaluation will be scheduled for the purpose of determining the future course of the regional facility. Several options, as described in Part IV.B. are possible for termination or future operation of the facility. A decision as to the future course of the facility must be made sufficiently early to effect a smooth transition if changes are to be made by the end of this project period. The date of the second evaluation will be established during the first evaluation.

The utilization grants and training projects will be evaluated separately and will also conform with established procedures. The primary purpose of these evaluations will be to assess progress toward accomplishment of objectives and determine if any changes are necessary.

Evaluations are scheduled in the attached PPT network.

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Notes

1. United Nations Committee on the Peaceful Uses of Outer Space. A/AC.105/157

2. Final reports for most of these projects are available in TA/OST.

3. "Review of Landsat Remote Sensing Plans and Proposals for Africa," Report of AID Team, October 30, 1975. Africa Bureau PRP-substitute.

4. United Nations Committee on the Peaceful Uses of Outer Space, "Implementation Requirements for a Remote Sensing Training Facility at an International Regional Data Storage and Dissemination Centre," A/AC.105/138, 14 January 1975. pp. 8-12.

5. Team report has not yet been printed for distribution by ECA but a preliminary draft may be consulted in TA/OST. Countries visited were Ethiopia, Kenya, Tanzania, Zaire, Upper Volta and Egypt. See also "Minutes of the First and Second Meetings of the Governing Council" Regional Centre for Services in Surveying and Mapping, Nairobi, Kenya. 28 July - 1 August and 19 and 20 December 1975, respectively.

6. For results of Landsat 1 and 2 experiments in almost all application areas, NASA Landsat Symposium Proceedings. Copies are available in TA/OST.

7. According to the Project Paper entitled "Demonstration of Advanced and Space Technology and Applications to Development," a follow-on program of from $15-25 million annually might be expected from all of the areas of technology represented in the demonstration. The magnitudes of the various programs or projects will depend largely on the response of the countries participating in the demonstration. Therefore, no firm future funding estimate can be indicated at this time.

8. Argentina and Brazil have proposed that remote sensing from space should not be undertaken without permission of "sensed" states. U.N. Document A/C.1/1047. France and Russia in a somewhat more liberal proposal would permit remote sensing from space but would restrict the distribution of data for a given country without permission of that country. U.N. Document A/AC.105/C.Z/L.99.

9. United Nations Committee on the Peaceful Uses of Outer Space, Legal Subcommittee, 14th Session. A/AC.105/C.Z/SR.233. See statement by Ronald Stowe of U.S. Delegation, pp. 2-7.

10. "An Economic Evaluation of the Utility of ERTS Data for Developing Countries," Vols. I and II by D.S. Lowe, R.A. Summers and E.J. Greenblat, Environmental Research Institute of Michigan under AID contract No. CM/ta-73-38, August 1974. See pp. 93-97 for conclusions.

11. "The Economic Value of Remote Sensing of Earth Resources from Space: An ERTS Overview and the Value of Continuity of Service," Vols. I-X. ECON Incorporated Contract No. NASW-2580, October 31, 1974.

"Earth Resources Survey Benefit--Cost Study, "Vols. I-VI. Earth Satellite Corporation and Booz-Allen Applied Research Corp. USGS Contract No. 135-19, November 22, 1974.

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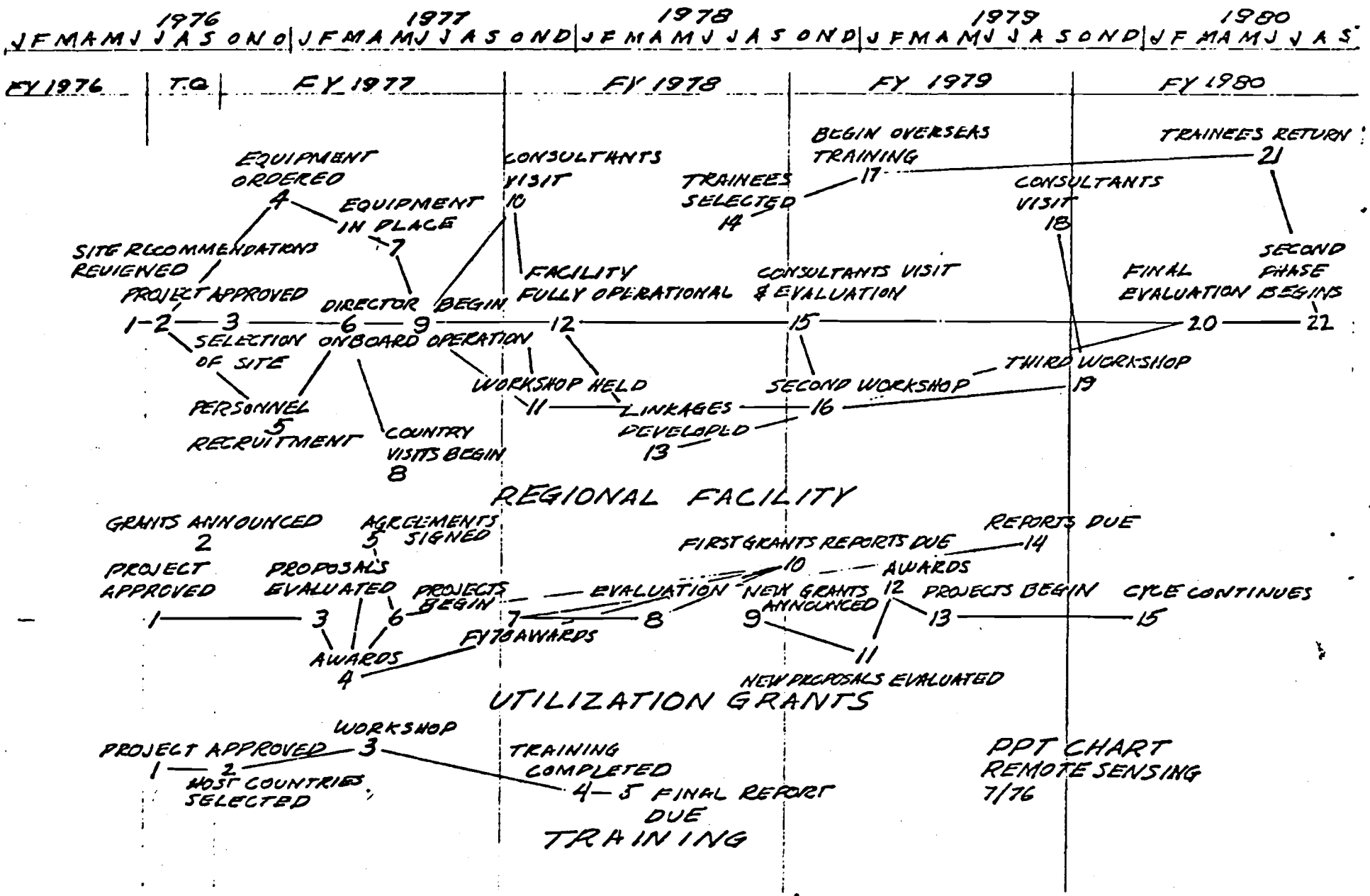

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Remote Sensing for Resource Assessment
Project Performance Tracking

REGIONAL FACILITY

1. 6/76 ECA Remote Sensing Mission Report received and recommendation reviewed.
2. 7/76 Project approved.
3. 10/76 Final Selection of Host Country and Organization.
4. 12/76 Equipment needs determined and equipment ordered.
5. 12/76 Personnel recruitment begins.
6. 3/77 Director onboard.
7. 5/77 Equipment in place.
8. 5/77 Country visits begin.
9. 6/77 Facility begins operation.
10. 10/77 Consultants visit.
11. 11/77 Workshop held.
12. 12/77 Facility fully operational, staff onboard, equipment tested and functioning, countries visited.
13. 4/78 Linkages fully developed, users in all countries of region identified.
14. 7/78 Trainees selected.
15. 10/78 Consultants visit and evaluation to determine if objectives being accomplished.
16. 11/78 Second Workshop held.
17. 1/79 Trainees begin overseas training.
18. 9/79 Consultants visit.
19. 10/79 Third Wrokshop
20. 3/80 Final evaluation, future course of facility determined.
21. 6/80 Trainees return and assist in operating the facility.
22. 8/80 Second Phase Begins.

UTILIZATION GRANTS

1. 7/76 Project approved.
2. 9/76 Missions queried on country needs and capabilities to manage grant. Proposals invited.
3. 2/77 Proposals received and evaluated.
4. 3/77 Awards announced.
5. 4/77 Country visits begin and agreements signed.
6. 5/77 Projects begin.
7. 10/77 FY 1978 awards made.
8. 4/78 Evaluation.
9. 8/78 FY 79 and 80 grant availability announced and proposals invited.
10. 10/78. Final reports on FY 77 grants due.
11. 1/79 Proposals received and evaluated.
12. 2/79 Awards made.
13. 4/79 Country visits made and work in progress.
14. 8/79 Final reports on FY 78 grants due.
15. 1/80 Project cycle continues.

TRAINING

1. 7/76 Project approved.
2. 10/76 Host countries selected and preliminary visits completed.
3. 4/77 First workshop held. OJT begins.
4. 1/78 Training completed and final seminar held.
5. 3/78 Final report due.

Note: A second training project with similar characteristics will commence approximately six months after the first project.

AIRGRAM

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TO - AIDTO CIRCULAR 675

FROM - AID/W

SUBJECT - Grants Program for Utilization of Earth Resources Technology Satellite (ERTS) Data

REFERENCE -

1. To encourage and support LDC utilization of ERTS data for development purposes, the Office of Science and Technology is initiating a competitive small grants program to be administered by the Environmental Research Institute of Michigan (ERIM) assisted by System Planning Corporation (SPC). The program will provide modest grant funds and limited technical assistance to achieve greater development payoff from investigations based on the use of ERTS data in one or more of the following fields: agriculture, range management, water resources, forestry, land use, rural and regional development, environmental protection, cartography, geology and marine resources. Details of the grant program are provided in the attached announcement.

2. Missions are requested to distribute the announcement to one or more resource agencies or organizations which may be interested in participating in this program. In view of limited funding of the program it is suggested that no more than two proposals be submitted by a single country as only one grant will be awarded to a country. In parallel, ERIM will distribute this announcement directly to LDC principal investigators involved in ERTS-1 or ERTS-B investigations with the National Aeronautics and Space Administration to advise them of the existence of this competitive grant program.

3. To facilitate scheduling, potential investigators are requested to cable a brief description of their grant proposal to ERIM on or before November 15, 1974. Completed proposals are due at ERIM January 1, 1975. Selections will be made promptly and the results made known to those who submitted proposals.

Environmental Research Institute of Michigan
P.O. Box 618, Ann Arbor, Michigan 48107
Attn.: D. Lowe

4. PROP approved through FY 1976. XXXXXXXXXXINGERSOLL

PAGE 1 OF 2

DRAFTED BY	OFFICE	PHONE NO.	DATE	APPROVED BY
Merrill Conitz:ep	TA/OST	28937	9-13-74	Henry A. Arnold, TA/OST

AID AND OTHER CLEARANCES
NASA: J. Zimmerman (phone) AFR/DP: E. Donoghue (phone) SA/PPB: L. Pompa (phone)
GC/TFHA: A. Richstein (subs) SER/DM: N. Tharp (subs) LA/DP: A. Silver (phone)
TA/PM: R. Mills (draft) ASIA/TECH/PSD: G. Coleman (draft)

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Appendix A

26 September, 1974

ANNOUNCEMENT OF A COMPETITIVE GRANTS PROGRAM TO FOSTER BROADER UTILIZATION OF EARTH RESOURCES TECHNOLOGY SATELLITE DATA FOR DEVELOPMENT PURPOSES

The Agency for International Development (AID), through the Technical Assistance Bureau's Office of Science and Technology (TA/OST), is establishing a small competitive grants program to enable developing countries to strengthen their efforts in utilizing data from the Earth Resources Technology Satellite (ERTS) in solving problems related to resource development and environmental monitoring. This program will be administered for AID by the Environmental Research Institute of Michigan (ERIM), P.O. Box 618, Ann Arbor, Michigan, 48107. ERIM will be assisted by System Planning Corporation (SPC).

Grant Program Goals

The major objective of this competitive grant program is to provide an incentive to selected developing countries to achieve broader use of information derived from ERTS data for development purposes. In addition to grant funds, the program will provide limited technical assistance in the form of training, consulting, and data processing to be arranged by ERIM. Grant proposals will be awarded to support projects in one or more of the following applications:

--Agriculture
--Range Management
--Water Resources
--Environmental Monitoring
--Forestry
--Land use
--Rural and regional development
--Cartography
--Geologic mapping or mineral exploration
--Marine resources

The competitively-awarded grants will enable the selected countries to take advantage of the substantial benefits that can accrue from the application of ERTS data in the solution of problems in these areas. In order to encourage the participation of planners and decision makers in the grant activities, the receiving country should consider the anticipated impact of the ERTS-derived information on decision making and economic growth. Technical assistance organized by ERIM will provide limited support to the recipient countries to accomplish such an analysis. This aspect of the program is intended to stimulate the managerial sectors to seek further uses of the ERTS-derived information.

Description of Grants

A total of $100,000 (U.S.) is being made available for this grant program. It is expected that approximately five grants averaging $20,000 each will be awarded. Grant proposals for larger or smaller amounts will be considered, but the total amount awarded cannot exceed $100,000. Each award will be supplemented by technical assistance valued at up to $10,000 in the form of consulting, training, and computer processing. ERIM will administer the grants and, with assistance from SPC, provide the supplementary technical assistance as mutually agreed upon after the award of the grants. ERIM/AID will organize a panel to review, evaluate, and make the final selection of grant proposals for award on the basis of criteria listed in the following section. ERIM will negotiate a specific agreement with the appropriate sponsoring agency of the selected proposals which defines the program, schedules, budgets, and reporting procedures.

After the grants have been awarded, a project monitor will be assigned to each grant. His responsibility will include planning discussions with the grantee, developing a training or consulting program, arranging for computer processing or other technical assistance, and monitoring the progress of the project.

Project Selection Criteria

To be eligible, a participating country must have an ERTS-1 or ERTS-B program approved by NASA. The proposed grant activities should, however, constitute new initiatives based on ERTS data utilization and should not duplicate or replace experiments which the countries have already agreed to perform under terms of their agreement with NASA. ERTS-B data may be required for projects that involve the observation of continuously-changing natural phenomena, for which repeated up-to-date coverage must be analyzed. Grants requiring ERTS-B data will be negotiated subject to successful launch and operation of the ERTS-B satellite.

In addition to this requirement, the following criteria will be utilized in arriving at the final selection:

1. Importance of the application to the priorities and needs of the grant country.

2. Assurance that the ERTS derived information will be of value to and used by a decision oriented agency.

3. Technical validity of the proposal and probability of accomplishment.

4. Probability that the success of this project will lead to a continuing program of utilization of ERTS data in the recipient country.

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5. Grantee's technical and managerial competence to implement the project or need to develop this competence within the country.

6. The contribution of personnel or financial resources by the grantee's sponsoring institution or satisfactory justification for lack of such support.

7. Assurance that the grant is not to be used as a substitute for, or as a basis for funding of, existing ERTS-1 or ERTS-B experimental program activities.

Proposal Preparation

To facilitate scheduling and program development, if your institution plans to submit a grant proposal, please notify ERIM, Attn. D. Lowe, by cable before November 15, 1974 and include a brief description of the projects proposed. This statement of intent should be followed by 5 copies of the completed proposal due at ERIM on or before January 1, 1975. Selection of proposals for grant awards will be copleted promptly. For your planning purposes, it is anticipated that negotiations will be completed with grant recipients by February 15, 1975. The selection panel's comments will be transmitted to each organization that submits a proposal whether or not that proposal results in grant award.

To increase the opportunity to receive a research grant, a country may wish to propose more than one project. However, submission of more than two proposals from a single country would probably not be warranted as only one grant will be awarded to a country.

The proposal should provide the following information:

Objective of the project. Describe the problems of resource inventory and management or environmental protection you propose to analyze, and alternative decisions or actions that may be based on the utilization of information derived from ERTS data.

Technical approach. This should include an analysis of the types of information to be obtained from ERTS and other sources, and general procedures for processing and analyzing ERTS data. Requirements for ERTS data should specify geographic area to be covered, coverage dates, and type of ERTS data products needed. It is expected that ERTS-1 data currently available in the grantee country will be used for this project. If these data are not sufficient, additional data may be ordered from the EROS Data Center, Sioux Falls, S.D. 57198. A current price list is enclosed for your information. The nominal cost of these data should be borne within the grant budget. Concepts of how the resulting information will impact programs in the country should be outlined.

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Previous experience, if any, with ERTS-1 data.

Principal personnel to be assigned. Indicate experience and current responsibilities of principal investigator and other key personnel, and estimate man-months of participation.

Itemized budget and technical assistance. An itemized budget for the expenditures to be covered by grant funds must be included. Equipment purchases not specified in the proposal will require specific approval of the project monitor. Estimate the type and amount of consultation, training, computer processing, and other technical assistance desired in support of your project. Distinguish between that assistance which is required and that which is highly desirable but not essential.

Supplementary effort. Indicate the amount and kind of support, if any, the grant recipient will provide to supplement the grant funds, including both financial support and personnel effort.

Project time schedule. All proposals should be for projects which can be completed and the final reports issued no later than 13 months. Earlier completion dates are desirable. Completed proposals are due on or before January 1, 1975 and should be sent to:

Environmental Research Institute of Michigan
P.O. Box 618
Ann Arbor, Michigan 48107, U.S.A.
Attn: Mr. D. Lowe