N83-17412

FINAL REPORT
THE EVALUATION OF
OSTA'S APT AND ASVT PROJECTS

April 3, 1981

Prepared for

Office of Space and Terrestrial Applications
National Aeronautics and Space Administration
Headquarters
Washington, D.C. 20546

In Response to
Task Order No. 27
Contract No. NAS W 3358

Prepared by

OAO Corporation
50/50 Powder Mill Road
Beltsville, Maryland 20705

ABSTRACT

This report presents the results of an evaluation of NASA's Applications Pilot Test (APT) and Applications System Verification and Transfer (AVST) Programs managed by the Office of Space and Terrestrial Applications (OSTA). These programs sponsor cooperative projects between NASA and potential users of remote sensing (primarily Landsat) technology from federal and state government and the private sector. Fifteen specific projects, seven APT's and eight ASVT's, are examined as mechanisms for technology development, test, and transfer by comparing their results against stated objectives. Interviews with project managers from NASA field centers and user agency representatives provide the basis for project evaluation from NASA and user perspectives. The intent of this study is not to provide project-specific findings or ratings; but is to find program-wide trends and arrive at conclusions and recommendations for the entire programs, based upon examination of individual projects. Results of this evaluation are provided as guidance for the conduct of future APT and ASVT projects.

CONTENTS

CONTENTS (cont.)

TABLES

SECTION 1. INTRODUCTION

SECTION 1. INTRODUCTION

NASA's Applications Systems Verification and Transfer (ASVT) and Application Pilot Test (APT) Programs have been underway for several years. A number of specific projects within each program have been completed or are near completion. Until now, a formal, structured evaluation of these programs has not been performed but is appropriate for providing NASA Headquarters with guidance and direction in the future of these programs. In this study, OAO Corporation (OAOCO) has examined 15 ASVT and APT projects managed from five NASA field centers to evaluate the results of the joint application project concept. It was designed to determine the degree to which stated project objectives and goals were met, to identify problem areas, and to assess user satisfaction and project accomplishments. Information to support this task was gathered from interviews with each NASA project manager and selected project participants from the user community. The findings, conclusions, and recommendations of this study are based upon an evaluation of this information.

1.1 BACKGROUND

NASA's charter defines it as a space research and development agency and in the conduct of these efforts NASA has played an active role in the test and in the transfer of remote sensing technology to representative user clientele. Satellite-derived information, primarily from Landsat, has been the major focus of these technology test and transfer efforts to date. In the mid-seventies, NASA initiated a joint user development and demonstration program to promote applications of this technology in the operational environment of the user community. Projects in this program were cooperative efforts in which an application of Landsat technology was developed and demonstrated for operational implementation by the user participants.

In the late-seventies, NASA recognized that the many applications of Landsat technology differed significantly in the level of research and development effort required. The feasibility of some applications had to be tested and their techniques developed and refined, while other applications involved techniques which had been essentially proven in previous studies. As a result, NASA divided the original joint user development and demonstration program into two components beginning in fiscal year 1979: The Applications Pilot Test (APT) and the Applications System Verification and Transfer (ASVT) Programs. The APT Program, conducted by the research divisions, was to involve projects in which there was a significant amount of research and development activity to develop and test the technical feasibility of an application before technology transfer was undertaken. The new ASVT program, conducted by the technology transfer division, was to involve projects in which an essentially proven application was verified and the majority of effort was expended in the technology transfer process.

This study evaluates these two programs as technology transfer mechanisms by examining fifteen specific projects (see section 2.2) in the two programs; seven APT's and eight ASVT's. The reason these two programs were evaluated in parallel is that both programs centered around the use of remote sensing (primarily Landsat) technology and both involved joint projects designed to meet the needs of specific potential users.

1.2 STUDY OBJECTIVE

The overall objective of this study has been to evaluate the APT and ASVT projects (listed in section 2.2) as a mechanism for technology development, test, and transfer by comparing their results against the project objectives.

The evaluation examined:

- what the participants (user and NASA) gained from the project, including the extent to which the original project objectives were met.

- to what extent the participants and other users assimilated the new techniques and the benefits therefrom.

- areas of additional technology transfer that have been or could be pursued with the project results.

Moreover, this study has gathered information on user satisfaction, identified problem areas and assessed what NASA has learned as a result of the joint project concept.

While the objective of this study has been the evaluation of APT and ASVT projects, it was not intended to provide project-specific findings or a ranking or rating of individual projects. The intent of this study was to find program-wide trends and arrive at conclusions and recommendations for the entire programs based upon examination of the individual projects. The variety of methodologies, procedures, and conditions under which the projects were undertaken provided a credible means to identify the positive and negative factors affecting the projects and to recognize successful and unsuccessful techniques used in conducting them.

1.3 STUDY METHODOLOGY

AS specified in the Task Order authorizing this evaluation, the primary source of information for this evaluation was in-person interviews with NASA field center project managers and project participants from the user community. The compilation and summarization of the information gathered from these interviews are the basis for the findings, conclusions, and recommendations presented in this report. The following activities were performed in preparing for, conducting, and evaluating the results of these interviews:

a. The NASA technical officer provided OAOCO with available documentation for the projects to be evaluated. A variety of documentation from NASA, its contractors, and user participants was provided including project plans, periodic progress reports, individual study phase plans, and status summaries. OAOCO reviewed this documentation to gain familarity with individual project's objectives, activities, and schedules. This review provided background information necessary for the interview process and highlighted the similarities and differences among the individual projects as well as trends within the two programs.

b. Two questionnaires were prepared; one for use in interviewing NASA project managers at the field centers, and the second for interviewing user agency participants. These questionnaires were developed for use by OAOCO personnel to help structure and standardize the interviews. They provided a format for obtaining pertinent information to answer questions such as the following presented in the original statement of work:

(1) What is the extent to which project objectives are being (were) met?

(2) What are the users learning or have learned from their projects?

(3) What is NASA learning or has learned from the joint project concept?

(4) What technique developments are being derived from these projects?

(5) What is the extent to which technology transfer was achieved, or how it could be pursued with project results?

(6) What is the status and extent of each project's documentation?

(7) What is the extent to which user acceptance of the techniques occurred and what benefits were derived?

Both questionnaires were edited and approved by the technical officer before use in the interviews. The NASA questionnaire appears in Appendix A and user questionnaire in Appendix B.

c. Each NASA project manager (listed in Section 2.2) was interviewed by OAOCO personnel at his(her) field center. These interviews were usually about 2 hours in duration and were tape recorded to allow for thorough review of the information obtained after all the interviews were completed. The interviews were primarily in discussion format in which the project managers were encouraged to talk about significant aspects of their projects in impromptu fashion, after which the interviewer asked specific questions until he had covered all the issues presented in the questionnaire. By design, each NASA project manager was interviewed before questioning any corresponding user agency personnel.

d. The task plan requested that telephone interviews be conducted for users in each project, with selected in-person interviews performed only for high priority projects. However, OAOCO chose to visit one or more users for all but two of the projects. This decision, with concurrence by the technical officer, was based upon the success of the in-person interviews with the NASA project managers. The cooperation and interest shown in those in-person interviews demonstrated that this technique was more effective than telephone interviews would be.

The user interviews were initiated by a letter of introduction from NASA Headquarters in most cases. Interviews were conducted with the project coordinator from the user community if one had been specifically designated. Whenever feasible, and especially when more than one user agency was involved, several users were invited to participate in the interviews. The users interviewed for each project are listed in Table 1 and 2. These interviews were usually about 1½ hours in duration and were also tape recorded. Again, the users were given the opportunity to discuss those aspects of the projects of greatest interest to them followed by specific questions as outlined in the questionnaire.

e. The information obtained from each of the interviews was compiled and examined. These results were evaluated as a whole to arrive at some general trends or overall significant findings. A draft report of these results and findings was presented to NASA OSTA personnel for review.

f. This final report was prepared based upon further expansion and discussion of the results presented in draft report, with the incorporation of the comments and ideas from the NASA review.

SECTION 2. APT AND ASVT PROJECTS EVALUATED

SECTION 2. APT AND ASVT PROJECTS EVALUATED

2.1 INTRODUCTION

This section contains a brief summary and description of the projects evaluted in this study. The list of projects to be evaluated was provided by the NASA technical officer and included those APT's and ASVT's which have been completed or are near completion. Several projects more recently initiated were not evaluated because they were at least two years from completion and only interim results were available.

The descriptions which follow include the official project title, the user participants, and a summary of the project activities. In addition, the NASA field center from which the project was managed and the NASA project manager are listed as well as the fiscal years in which the project was conducted. The time periods shown here reflect those stated in project plans, although actual schedules were often significantly different due to delays in project initiation or extensions beyond the original schedule. Finally, the contractors acquired specifically to support individual projects are listed. General, on-site support service contractors are not shown.

Funding by NASA and the user participants is not presented in these project summaries because the technical officer did not request it as a factor in the analysis of the projects. Due to the variety of conditions and circumstances in which the projects were undertaken, it would be very difficult to asess whether funding levels were too high or low for specific projects; or to weigh project expenditues against accomplishments. Moreover, funding commitments did change during the course of some projects, making it difficult to obtain an exact tally of project expenditures. (A general discussion of the topic of funding is discussed in section 4.2.)

2.2 PROJECTS EVALUTED

Summary descriptions of the seven APT's and eight ASVT's evaluated in this study are listed below.

PROJECT NAME	Automated Cotton Acreage Inventory System Based On Landsat Data APT
USER PARTICIPANT(S)	Cotton, Incorporated
PROJECT DESCRIPTION	A cotton acreage inventory technique using computer analysis of Landsat digital data will be developed and tested in six domestic and one foreign test sites in major cotton producing areas. The results of these analyses will be evaluated with respect to accuracy, timeliness, and cost-effectiveness. If the technique meets the requirements of Cotton, Inc., it will be implemented in an operational program to inventory cotton acreage.
NASA FIELD CENTER/PROJECT MANAGER	National Space Technology Laboratories (NSTL)-Earth Resources Laboratory/R. Griffin
FISCAL YEARS	'79-'81
CONTRACTOR(S)	NONE

PROJECT NAME	Census Urbanized Area Delineation APT
USER PARTICIPANT(S)	Bureau of Census
PROJECT DESCRIPTION	The use of computer analysis of Landsat MSS data will be tested for census applications. Techniques will be developed for defining selected urban land cover categories for the perimeter of five U.S. urbanized areas. The accuracy of information derived from these techniques will be evaluated and procedures for integrating this information into existing census data will be developed. Useful technology will be implemented for operational use by the Bureau of Census for periodic delineation and updating of urbanized areas.
NASA FIELD CENTER/PROJECT MANAGER	Goddard Space Flight Center/D. Toll
FISCAL YERS	'77 - '80
CONTRACTOR(S)	GENERAL ELECTRIC JET PROPULSION LABORATORY

PROJECT NAME	Forest Resource Information System APT
USER PARTICIPANT(S)	St. Regis Paper Company (Southern Timberlands Division)
PROJECT DESCRIPTION	The feasibility of utilizing Landsat MSS data as a viable contributor to an operational forest resource information system will be tested, Landsat MSS digital data will be analyzed to determine forest cover information for test sites in the holdings of St. Regis Paper Company. If the utility of Landsat-derived information is successfully demonstrated, the capability to perform Landsat analysis will be established within St. Regis. This capability will be integrated into and become a significant data source in a computerized forest resource information management system.
NASA FIELD CENTER/PROJECT MANAGER	Johnson Space Center/R. Joosten
FISCAL YEAR(S)	'77 - '80
CONTRACTOR(S)	Purdue University

PROJECT NAME	Irrigated Lands Assessment for Water Management APT
USER PARTICIPANT(S)	California Dept. of Water Resources (DWR)
PROJECT DESCRIPTION	Digital analysis and image interpretation techniques of Landsat products will be examined for use in delineating irrigated and non-irrigated cropland as well as discerning irrigated crop types. Analysis of Landsat data will be performed on test sites throughout California using various levels of sophistication. Each of the techniques developed and tested will be evaluated by California DWR for suitability of incorporation into their operational water management models and decisions. Training and assistance in the implementation of viable techniques will be provided to California DWR.
NASA FIELD CENTER/PROJECT MANAGER	Ames Research Center/E.Bauer
FISCAL YEARS	'78 - '82
CONTRACTOR(S)	Universities of California at Berkley and Santa Barbara

PROJECT NAME	Land Cover Change Detection and Update APT
USER PARTICIPANT(S)	U.S. Geological Survey (Geography Program)
PROJECT DESCRIPTION	Techniques for detecting changes in land cover using Landsat MSS digital data will be developed and demonstrated on five test sites in Louisiana and Wyoming. The value of these techniques for updating (locating change) in the land use maps produced in the USGS Land Use and Data Analysis (LUDA) Program will be tested. Based upon the verification of the utility of these techniques, the capability to perform these analysis will be established within the Geography Program of the USGS.
NASA FIELD CENTER/PROJECT MANAGER	National Space Technology Laboratories (NSTL) - Earth Resources Laboratory/A. Joyce
FISCAL YEAR(S)	'77 - '79
CONTRACTOR(S)	NONE

PROJECT NAME	Landsat Based Automated Resource Inventory for the Navajo Reservation (APT)
USER PARTICIPANT(S)	Navajo Indian Nation
PROJECT DESCRIPTION	An automated resource base inventory and update system based on Landsat digital data and oriented to Navajo requirements will be developed and tested. Demonstrations of computer implemented analysis of Landsat MSS data will be conducted for various applications using test sites on the Navajo reservation (New Mexico, Arizona, and Utah). Based upon an evaluation of the system's capabilities by the Navajo Nation, it will be implemented on Navajo facilities for use in operational resource management activities.
NASA FIELD CENTER/PROJECT MANAGER	National Space Technology Laboratories (NSTL) - Earth Resources Laboratory/P. Conner
FISCAL YEARS	'78 - '80
CONTRACTOR(S)	Navajo Community College

PROJECT NAME	Wildland Vegetation Resource Inventory APT
USER PARTICIPANT(S)	Bureau of Land Management (BLM) (Denver Service Center)
PROJECT DESCRIPTION	An interactive, automated wildland vegetation inventory system based upon remotely sensed data and oriented to BLM management requirements will be developed and tested. Landsat MSS and other types of remotely sensed data will be used for wildland vegetation inventories in test sites in Alaska, Arizona, and Idaho. This work will include demonstration, evaluation, and also operational testing of the techniques which BLM has chosen to adopt for use in its resource management activities.
NASA FIELD CENTER/PROJECT MANAGER	Johnson Space Center/K. Hancock
FISCAL YEAR(S)	'77 - '79
CONTRACTOR(S)	Electromagnetic Systems Laboratories, Inc. (ESL)

PROJECT NAME	Appalachian Lineaments ASVT
USER PARTICIPANT(S)	Appalachian Regional Commission and agencies and universities in seven member states: New York, Pennsylvania, Ohio, Virginia, West Virginia, Kentucky, and Tennessee.
PROJECT DESCRIPTION	Enhanced Landsat imagery products will be generated for three test sites within the seven state region for use in delineation of fracture zones (lineaments). The most useful seasons and enhancement procedures will be determined and used by participants to identify fracture zones. An optimal set of procedures to utilize Landsat-derived information will be developed and documented. The value of information derived from Landsat products in support of ongoing state geologic programs will be determined and the use of this information will be supported.
NASA FIELD CENTER/PROJECT MANAGER	Goddard Space Flight Center/H. Blodgett
FISCAL YEAR(S)	'78 - '80
CONTRACTOR(S)	General Electric

PROJECT NAME	ICEWARN ASVT
USER PARTICIPANT(S)	U.S. Coast Guard, National Oceanic and Atmospheric Administration
PROJECT DESCRIPTION	An all-weather, near real-time, airborne ice information system to aid in the extension of winter navigation on the Great Lakes will be developed and demonstrated. This side-looking airborne radar (SLAR) system will collect image products which can be interpreted to show ice thickness and sea conditions. Images on which this information has been delineated can be transmitted to ships at sea for use in navigation. If proven successful, this system will be implemented and operated by the Coast Guard.
NASA FIELD CENTER/PROJECT MANAGER	Lewis Research Center/H. Mark
FISCAL YEAR(S)	'74 - '79
CONTRACTOR(S)	NONE

PROJECT NAME: Operational Applications of Satellite Snow-cover Observations ASVT

USER PARTICIPANT(S): Federal Agencies: Soil Conservation Service, U.S. Geological Survey, U.S. Bureau of Reclamation, Bonneville Power Administration, U.S. Army Corps of Engineers, and National Oceanic and Atmospheric Administration.
State Agencies: California Dept. of Water Resources, Colorado Div. of Water Resources, and Arizona Salt River Project.

PROJECT DESCRIPTION: A technique will be developed and documented to map snowcover on image products from Landsat and NOAA satellites. Satellite imagery of test areas in Arizona, California, Colorado, and the Pacific Northwest will be provided to user participants in a timely fashion (about 72 hour delivery) so that snowcover information can be incorporated into traditional runoff prediction models. The benefit of snow-cover information in various runoff models will be assessed and, when feasible, the use of snowcover information will be implemented in operational programs.

NASA FIELD CENTER/PROJECT MANAGER: Goddard Space Flight Center/A. Rango

FISCAL YEAR(S)	'75 - '78
CONTRACTOR(S)	NOAA, ECOsystems International, Inc., Sierra Hydrotech, Inc.

PROJECT NAME	Pacific Northwest Project - Landsat Applications Program ASVT
USER PARTICIPANT(S)	Pacific Northwest Regional Commission, state agencies and universities in Washington, Oregon, and Idaho. (Technology transfer support to NASA from USGS-EROS and Geography programs.)
PROJECT DESCRIPTION	Based upon the favorable results of a number of cooperative demonstration projects covering a variety of applications and involving over 30 user participants in the three state area, an operational capability for analysis and utlization of Landsat data will be established in each state. NASA will assist each state in establishing, testing, and implementing a capability, using available state resources, which is designed for use by state agencies in managing natural resources.
NASA FIELD CENTER/PROJECT MANAGER	Ames Research Center/D. Wilson
FISCAL YEARS	'79 - '81
CONTRACTOR(S)	Electromagnetic Systems Laboratory, Inc. (ESL)

PROJECT NAME	Surface Water Detection and Mapping (DAM) ASVT
USER PARTICIPANT(S)	U.S. Army Corps of Engineers (regional and district offices), selected state agencies in the 50 states.
PROJECT DESCRIPTION	The Detection and Mapping (DAM) Package developed by NASA for identifying surface water using Landsat MSS digital data will be upgraded and maintained for operational use. This procedure will be implemented in the national water impoundment inventory which supports the National Program of Inspection of Dams Legislation. Products showing surface water on a quad map basis will be generated for all 50 states and field personnel will evaluate and report on the accuracy and utility of the information provided.
NASA FIELD CENTER/PROJECT MANAGER	Johnson Space Center/D. Amesbury
FISCAL YEARS	'78 - '80
CONTRACTOR(S)	NONE

PROJECT NAME	Texas Natural Resources Inventory and Monitoring System ASVT
USER PARTICIPANT(S)	Thirteen Texas State Agencies: Department of Water Resources, General Land Office, Air Control Board, Bureau of Economic Geology, Railroad Commission, Department of Agriculture, Forest Service, Industrial Commission, Department of Health, Department of Highways and Public Transportation, Parks and Wildlife Department, State Soil and Water Conservation Board, and the Coastal and Marine Council. (These 13 operate the Texas Natural Resources Information System (TNRIS) Task Force).
PROJECT DESCRIPTION	This project will develop an operational remote sensing capability, utilizing a mix of manual and computer-assisted techniques, to inventory and monitor natural resources in the state of Texas. This capability will be tested in a variety of demonstration applications involving several state agencies. Those elements of this capability which the agencies judge to be useful and cost-effective will be implemented in the Texas Natural Resources Inventory and Monitoring System, a computerized geographic information system.

NASA FIELD CENTER/PROJECT MANAGER	Johnson Space Center/L. Childs
FISCAL YEARS	'78 - '80
CONTRACTOR(S)	Texas A&M University

PROJECT NAME	Vegetation Resource Base Inventory and Monitoring ASVT
USER PARTICIPANT(S)	National Park Service (NPS) (Denver Service Center)
PROJECT DESCRIPTION	Computer-implemented techniques to derive geographically-referenced vegetation/land cover information from Landsat MSS data will be developed and demonstrated in three National Parks having diverse vegetation, climate, and topography. Based upon NPS approval, a capability (hardware and software) to use such techniques will be established within the NPS to support operational park resource management activities.
NASA FIELD CENTER/PROJECT MANAGER	National Space Technology Laboratories (NSTL)-Earth Resources Laboration/W. Cibula
FISCAL YEARS	'79 - '81
CONTRACTOR(S)	NONE

PROJECT NAME	Water Management and Control ASVT
USER PARTICIPANT(S)	U.S. Army Corps of Engineers (Hydrologic Engineering Center/Davis, California)
PROJECT DESCRIPTION	A relatively automated, simple-to-operate technique to utilize Landsat data for acquiring the land use or surface cover information required for hydrologic engineering models employed in flood control and waterworks planning, design, and management will be developed and demonstrated. Six watersheds will be studied to provide technique development and training in these procedures. The final technique will be evaluated, documented, and made available for use by Corps district offices.
NASA FIELD CENTER/PROJECT MANAGER	Goddard Space Flight Center/A. Rango
FISCAL YEARS	'77 - '79
CONTRACTOR(S)	University of California at Davis, Bendix, Battelle, University of Maryland

2.3 NASA AND USER PERSONNEL INTERVIEWED.

Tables 1 and 2 which follow list the personnel from the NASA field centers and the user agency(s) who were interviewed in this study. For every project, the current NASA project manager (managers changed during the course of some projects) was interviewed. The persons interviewed from the user community were direct project participants and recommended by the NASA project managers.

TABLE 2.1 PERSONS INTERVIEWED FOR THIS STUDY (APT's)

PROJECT TITLE	NASA FIELD CENTER PERSONNEL	USER AGENCY(S)-PERSONNEL
o AUTOMATED COTTON ACREAGE INVENTORY SYSTEM BASED ON LANDSAT DATA	NSTL/ERL - R. GRIFFIN, A. JOYCE	COTTON, INC. J. TULLOS, L. SHAW
o CENSUS/URBANIZED AREA DELINEATION	GSFC - D. TOLL	BUREAU OF CENSUS - J. SILVER*
o FOREST RESOURCES INFORMATION SYSTEM	JSC - R. JOOSTEN	ST. REGIS PAPER CO.- B. BARKER
o IRRIGATED LANDS ASSESSMENT FOR WATER MANAGEMENT	ARC - E. BAUER	CA. DEPT. OF WATER RESOURCES-G. SAWYER, C. FERCHAUD
o LAND COVER CHANGE DETECTION & UPDATE	NSTL/ERL - A. JOYCE	U.S. GEOLOGICAL SURVEY - D. WITMER, V. MILAZZO, S. GUPTILL

* NOT PERSONALLY INTERVIEWED

TABLE 2.1 PERSONS INTERVIEWED FOR THIS STUDY (APT's) (cont.)

o LANDSAT BASED AUTOMATED RESOURCE INVENTORY FOR THE NAVAJO RESERVATION	NSTL/ERL - P. CONNOR	NAVAJO TRIBE- E. BENALLY
o WILDLAND VEGETATION RESOURCE INVENTORY	JSC - K. HANCOCK	BUREAU OF LAND MANAGEMENT - B. BONNER

TABLE 2.2 PERSONS INTERVIEWED FOR THIS STUDY (ASVT's)

PROJECT TITLE	NASA FIELD CENTER PERSONNEL	USER AGENCY (S)-PERSONNEL
o APPALACHIAN LINEAMENTS	GSFC - H. BLODGETT	APPALACHIAN REGIONAL COMMISION-J. DEMCHALK
o ICEWARN	LeRC - H. MARK	U.S. COAST GUARD-R. KNAPP*
o OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS	GSFC - A. RANGO	CA. DEPT. OF WATER RESOURCES - J. PARDEE, J. BROWN, N. PETERSON; SIERRA HYDROTECH- J. HANNAFORD
o PACIFIC NORTHWEST PROJECT-LANDSAT APPLICATIONS PROGRAM	ARC - D. WILSON	IDAHO DEPT. OF WATER RESOURCES-K. JOHNSON; PACIFIC NORTHWEST REG. COMM. TASK FORCE-A. PORTER
o SURFACE WATER DETECTION AND MAPPING (DAM)	JSC - D. AMESBURY	U.S. ARMY CORPS OF ENGINEERS- I. McKIM
o TEXAS NATURAL RESOURCES INVENTORY AND MONITORING SYSTEM	JSC - L. CHILDS	TEXAS DEPT. OF WATER RESOURCES-S. McCULLOCH

*NOT PERSONALLY INTERVIEWED

TABLE 2.2 PERSONS INTERVIEWED FOR THIS STUDY (ASVT's) (cont.)

PROJECT TITLE	NASA FIELD CENTER PERSONNEL	USER AGENCY (S)- PERSONNEL
o VEGETATION RESOURCE BASE INVENTORY AND MONITORING	NSTL - W. CIBULA, P. CONNER	NATIONAL PARK SERVICE- M. NYQUIST
o WATER MANAGEMENT AND CONTROL	GSFC - A. RANGO	U.S. ARMY CORPS OF ENGINEERS- A. FELDMAN, B. CERMAK

SECTION 3. SPECIFIC FINDINGS IN RESPONSE TO TASK ORDER QUESTIONS

SECTION 3. SPECIFIC FINDINGS IN RESPONSE TO TASK ORDER QUESTIONS

3.1 INTRODUCTION

The interviews conducted for this evaluation were used as a mechanism to gather specific information about the fifteen APT and ASVT projects. The questionnaries for interviewing were developed to help gather the information in a standard format. This information can now be used to answer several specific questions posed in the original Task Order authorizing this study. This section provides answers to these specific questions.

Additional observations and findings based upon information gathered in the interviews is provided in Section 4.

3.2 FINDINGS IN RESPONSE TO SPECIFIC QUESTIONS

Seven specific questions pertinent to an evaluation of the APT and ASVT projects were posed in the task plan. These questions are listed below, followed by a response to each based upon the information gathered in the interview.

(1) What is the extent to which project objectives are being (were) met?

(2) What are the users learning or have learned from their projects?

(3) What is NASA learning or has learned from the joint project concept?

(4) What technique developments are being derived from these projects?

(5) What is the extent to which technology transfer was achieved, or how it could be pursued with project results?

(6) What is the status and extent of each project's documentation?

(7) What is the extent to which user acceptance of the techniques occurred and what benefits were derived?

RESPONSES TO QUESTIONS

1. What is the extent to which project objectives are being (were) met?

There are significant differences in the objectives of the various ASVT and APT projects evaluated. Objectives of most projects focus on plans to:

a. develop, test the feasibility of, or demonstrate the use of Landsat data applied to some discipline,

or,

b. design and implement an automated resource management information system with Landsat as a significant data source.

Some projects were designed to establish a Landsat capability with a user first, followed by a user evaluation of the utility of that system. By contrast, other projects were designed to have NASA demonstrate and the user evaluate the technology; subsequently the user would make a decision whether or not to establish his own Landsat capability.

Approximately a third of the projects have met their objectives as stated in the project plans. In addition, another third of the projects are still underway and even though problems exist, have the potential of meeting all of their stated objectives. The objectives in the remainder of the projects were only partially attained or not accomplished. Reasons that project objectives have not been met include the inability of the technology to meet the needs of the user, time constraints on project activities, and the inability of users to make or maintain commitments to their projects.

2. What are the users learning or have learned from their projects?

Every user interviewed believes that he was given an excellent opportunity to fairly evaluate the utility of remote sensing, particularly Landsat, in his resource management activities. Users now feel they have an appreciation for the capabilities of the technology as well as its limitations. The consensus among the user community was that they learned, through first-hand experience, that Landsat alone is not the answer to their resource management problems. However, when it is used in conjunction with other data sources, it can be of great value because it provides information which, until now, was not readily available through conventional means. Of particular value to many users was the large area, synoptic coverage of Landsat, as well as its repetitiveness. Some users found that Landsat data provided inventory information comparable to that from conventional methods but at a cheaper cost, while other users derived more accurate or complete inventories because of its coverage of large or inaccessible areas.

3. What is NASA learning or has learned from the joint project concept?

a. Users generally agree that information derived from Landsat technology is most useful and appropriate when incorporated into a larger information system utilizing information from various sources. Seldom is Landsat-derived information of enough value by itself to warrant the user community investing in the technology.

b. Landsat generally provides these users with a new source of information which allows them to better manage resources. It does not replace traditional means of information gathering, therefore the incorporation of Landsat technology, while it does improve the level of service, will usually not decrease overall costs of resource management. Landsat often provides users with an affordable method of performing large area inventories which they would otherwise have difficulty accomplishing. In addition, it provides data in a standard format with relatively frequent repetitive coverage.

c. The current ground system with its data delivery problems and the uncertainty of the future satellite configurations and launch dates are serious impediments to the adoption of Landsat technology. Approval by user management personnel for Landsat system purchases are difficult to justify in light of these problems. In some cases, users have been able to support an investment in a Landsat capability only because it is part of a larger geographic information system. If a hiatus in data delivery occurs these programs can survive using other data sources. In other case(s), NASA has successfully transferred a technology which users would implement in an operational program if the data were available in a timely fashion. Under the current conditions of data delivery, however, these users cannot apply the technology in their operational programs.

d. The demonstration/Landsat processing phase of ASVT/APT projects has almost always taken longer than originally scheduled, although additional funding was not necessarily required. In some cases, NASA has been very ambitious in the amount of demonstration work it agreed to undertake, and this has resulted in the deletion of evaluation or verification work in the later stages of some projects. Such deletions were felt to be detrimental to the validity of the test.

e. Project activities which were recognized as research and development at the start were very difficult to schedule stringently. R&D is nearly always an iterative process which can and, in these projects, has taken significantly longer than planned.

f. For a variety of reasons, most of the projects have taken longer than originally planned. Most of the users in federal and state governments were not bothered by this and some admit their agency caused a good share of the delays. However, participants in the two projects involving private industry users were very conscious of schedules and deadlines. Private industry was less tolerant of delays and this must be recognized in project planning.

g. The phasing of project activities to correspond with the users' activities and requirements was found to be important. For example, an evaluation of the technology by a user should be completed such that the user has the information to make a GO/NO-GO decision in concert with his budget cycles. Similarly, the timing of contracting procedures between NASA and its contractors was found to be a significant consideration in project planning.

4. What technique developments are being derived from these projects?

Every project has resulted in some technique development due to the specific information needs of its applications. Even though many of the ASVT's employed what may be called "proven" technology, such as landcover classification, the idiosyncrasies of each user's applications required at least minor modifications to "standard" procedures. In addition to this specialization of standard techniques to particular applications, several significant advances were made during APT's in the field of Landsat data analysis:

a. Several projects have made contributions in the use of Landsat-derived information in a geographic information system, which stores and manipulates information from several sources. Developments in this field include improved techniques for registration and geometric correction of Landsat data, software to merge Landsat data in "grid" format with other data types in "polygon" format, and new applications which integrate Landsat and other data types to solve specific resource management problems.

b. The use of Landsat in detecting changes in landcover has been improved through the development of several new procedures, including "automated" techniques for registering different Landsat scenes and recognizing changes in raw data. The limitations of change detection techniques were also extensively explored.

c. Sampling methodologies were developed and refined for using information from Landsat in conjunction with other sources like aircraft photography and ground surveys.

5. What is the extent to which technology transfer was achieved, or how it could be pursued with project results?

Of the projects evaluated, over half have resulted in user(s) establishing some type of in-house capability to analyze Landsat data. However, only two of these users currently, or in the very near future, will utilize Landsat-derived information in an operational setting. The remainder are using Landsat-derived information in a research setting which could result in operational implementation at a later date. There are many complex and inter-related issues which are keeping the remainder of these Landsat processing capabilities from operational usage. Some of these issues include user agency politics, lack of faith in the technology by user personnel in the operational programs, lack of timely Landsat data, inability of the technology to meet the needs of operational programs, lack of funding in the user agency to implement an operational program and lack of user involvement throughout a project.

Of the projects in which a capability to analyze data has not been established to date, there are three projects in which it is too early to predict the outcome, although significant impediments exist. The remainder of these have been completed or terminated and there was very little, if any, success in establishing a user capability to utilize Landsat data to satisfy the originally stated objectives. Reasons that these projects did not result in the establishment of a user capability to analyze Landsat data include the inability of users to maintain commitments to their projects; lack of a mandate for the users (hence no funding) to conduct an on-going, operational program which uses the technology; and the inability of the technology to meet the information requirements of the users.

6. What is the status and extent of each project's documentation?

It was found that there is very little final project documentation for ASVTs and APTs. Some of the projects have recently been completed or are still underway, due, in several cases, to schedule slippages. Still, project documentation has often lagged behind the completion of technical activities. The most complete and up-to-date documentation generally exists for those projects in which NASA has contracted with universities or off-site contractors to conduct the activities. Project plans usually called for progress and final reports to be prepared jointly by NASA and the user but the specifics of these arrangements were not clearly stated. Because many of the projects took longer than originally scheduled, funds originally designated for documentation were depleted before the documentation activities started.

In addition to progress reports and final reports about a third of the projects have produced documentation of a technique or procedure developed as part of the project. These documents can be used in the transfer process to other potential users of the technology. Most of the software developed or utilized in these projects will be or already has been entered into COSMIC (Computer Software Management and Information Center -University of Georgia). Some NASA project managers and user representatives have published or are planning to publish results of their projects in scientific journals.

7. What is the extent to which user acceptance of the techniques occurred and what benefits were derived?

A vast majority of the users with immediate involvement in these projects stated that the technology developed or demonstrated is of definite value to their resource management problems. The joint demonstration phase was very thorough and convincing to the user participants in most projects. In only one project did the user participants state that the technology could not provide accurate enough information to meet the needs of their application. However, transferring or disseminating the technology from the experimental, test project environment to operational usage in the user agencies was much harder to accomplish. Most of the user project participants were convinced of the utility of the technology but their counterparts in operational programs had not accepted it, sometimes because they were not given an adequate opportunity to evaluate it.

In any event, every user emphasized that some benefit was derived from involvement in the program. As a minimum, the users gained an education and awareness in the use of the technology for solving their resource management problems. This awareness might spark interest in pursuing involvement in improved, future satellite systems whose data may better satisfy user information needs. In addition, at least half of the user agencies are now equipped with a capabiity to analyze remotely sensed data, primarily Landsat, in experimental or operational programs. Of these, two users have gone a step further and will be deriving the benefits from utilizing their capabilities in operational activities in their agencies. Three users could have the same capability once their projects have been completed.

SECTION 4. ADDITIONAL OBSERVATIONS AND FINDINGS

SECTION 4. ADDITIONAL OBSERVATIONS AND FINDINGS

4.1 INTRODUCTION

This section presents a variety of additional findings stemming from examination of the interview information from all fifteen projects. Included are observations of both positive and negative aspects of the program as a whole. In addition, factors which have had significant impact (either beneficial or detrimental) on several individual projects will be examined. These trends have surfaced as a result of analysis of the data base of information from the fifteen individual projects.

4.2 ADDITIONAL FINDINGS

These observations and discussions of their significance appear below. In the following subsection, 4.3, many of these findings and some of those in section 3.2 are summarized as factors affecting projects in the APT and ASVT programs.

VARIETY OF APPLICATIONS, CROSS-SECTION OF USERS

NASA has covered a wide variety of applications in the ASVT and APT projects. The use of Landsat and other types of remotely sensed data have been demonstrated, developed, and tested in specific applications of forestry, agriculture, hydrology, geology, and urban development. The APT and ASVT programs have reached a broad cross-section of potential users in federal, state, and substate government and in the private and academic sectors. Project participants from the user agencies were very cooperative and willing to disseminate the results of their projects throughout their own organizations using briefings, demonstrations, and internal publications. Moreover, other potential users and the general public have been exposed to the applications of Landsat data in these projects through scientific journal articles, symposia, workshops, and newspaper and television coverage. Through this variety of means these programs have greatly contributed to the general awareness of Landsat technology in many disciplines.

UNIQUE OPPORTUNITY FOR USERS

Without exception, the users interviewed expressed appreciation for the opportunity to participate in their projects. NASA provided the users with thorough, hands-on experience in the field of Landsat remote sensing which they could not have acquired any other way. Limited R&D funds preclude many potential users from their own development and testing of space-derived information systems for improved resource management. Regardless of the results of the technology transfer in the projects, users have gained an awareness and education in Landsat remote sensing which will be valuable to their agencies in assessing future opportunities to use the technology.

JOINT PROJECT CONCEPT

The joint project concept has proven to be a viable method of conducting these projects. Almost universally, users have been satisfied with NASA field center support and participation in the projects. Users felt that at least original funding levels have been adequate and that NASA field centers have met their commitments to the projects. Most users thought that NASA field centers have been very concerned about their needs and have allowed adequate opportunity for users to make inputs into the way projects have been conducted. In only one case was a user concerned that NASA had made unilateral decisions in project activities. Two other exceptions occurred when users expressed some dissatisfaction with the time required to get their projects started due to NASA signature and approval cycles.

Similarly, NASA project managers believe that the users met or exceeded their obligations to these joint projects in all but two cases. Users have been willing to apply the necessary resources to complete project activities, even though several users realized that they had originally underestimated the amount of work required. Most project plans were specific about the responsibilities of both parties involved. It appeared that NASA and the user both understood their respective roles in the projects from the beginning.

Another important aspect of the joint project concept which has surfaced is the interaction of NASA and user personnel involved. The personal relationships which have developed between NASA and the user participants have often played a significant role in project accomplishments. The mutual respect and friendship which developed between corresponding project managers was a topic often mentioned as a contributor to project success. Many participants thought such feelings provided an incentive to accomplish project goals and assure project success.

POLITICAL CONSIDERATIONS

To be successful, APT and ASVT projects must have a sound technical basis. It was found that political considerations have played a significant role in the selection and implementation of a few of the projects. In these cases, the interest by NASA Headquarters or a field center in involving a particular user may have overshadowed the technical merits of the project. While this does not preclude a project from being successful, those initiated under these circumstances have encountered more problems, taken longer than scheduled, or have required significant changes to their original plans.

These problems may have been due to the fact that too little consideration was given to factors which have a stronger influence on project success like a sound application technique, genuine user interest, or the ability of users to make commitments to the program.

LANDSAT DATA DELIVERY

The Landsat data delivery system continues to have a detrimental effect on the outcome of ASVT and APT projects. It is difficult to quantify the degree to which these problems are hindering the implementation of Landsat technolgy, but most users expressed frustration with their experience in dealing with the data delivery system. In the 1975 to 1978 period when most of these projects were begun, few people would have predicted that users would still be facing problems obtaining Landsat data in 1981. It is likely that most users felt, at the outset of their projects, that many of these problems would have been solved by the time they were to consider implementing the technology. In any event, data delivery will continue to prevent some users from utilizing the technology at all because of their application requirements. For example, at least two of the applications developed and demonstrated in APT and ASVT projects require Landsat data delivered within a week of when it was collected if it is to be used in operational user programs. The current data delivery system is unable to meet this requirement. In addition, all users feel uneasy about what they perceive to be NASA's inability or perceived lack of interest in rectifying the data delivery situation. Their reluctance to invest in the technology under these conditions is understandable.

FUTURE LANDSAT/LAND REMOTE SENSING PROGRAM

A similar and related problem to Landsat data delivery which influences users adopting this technology is the uncertainty about the future of the Landsat/land remote sensing program as a whole. In the mid-seventies, users were assured of the Landsat-D generation of satellites being in operation or very near launch by 1980-1981. The improved capabilities of the new systems were designed to expand the applications of satellite remote sensing. However, the future of the program became more and more uncertain until today there is doubt in the minds of users as to when, or if, there will be a Landsat-D and how it will be configured. The transfer of responsibility for an operational land remote sensing system from NASA to NOAA has further confused the short-term (next five years) outlook of the program. User uncertainty about continuity (and even continuation) of the program puts extreme negative pressure on the technology transfer process.

OPERATIONAL IMPLEMENTATION

Among the projects evaluated, there have been several in which the failure to establish an operational capability to utilize Landsat data was due to factors beyond the present control of NASA. It is not uncommon in these cases that the technology has been successfully demonstrated and has proven useful to the project participants. However, because of user personnel changes, higher priority commitments, political considerations, or lack of funding in the user agency, the technology is not to be implemented in operational programs. While many such obstacles cannot be foreseen, NASA should examine users with respect to their ability to adopt the technology. For example, NASA should not expect a user agency to incorporate the technology into operational programs after it has transferred the technology to a research branch of that organization which has no means to implement it operationally.

In addition, there should be an understanding of each potential user's charter or mandate for resource management. On-going, operational user programs which can use the technology should be identified and the factors surrounding implementation of the technology in them addressed. When this is done, genuine utilization of the technology is more likely. For example, the user agency involved in one of the most successful projects was recently given a legislative mandate to perform an on-going inventory program for its land holdings. The user felt the existance of legislation played a significant role in the project success. In at least two other projects, viable applications were developed and demonstrated but the user participants had no responsibility (or therefore funding) to perform on-going activities utilizing those applications.

IMBALANCE OF COMMITMENTS

In some projects there was an imbalance in the commitments (money, manpower, equipment, facilities) by NASA and the user. Occasionally strenuous demands were placed on NASA in project activities and items deliverable to the user. At the same time user participation was significantly less. While this division of commitments is not of ultimate importance, it is likely that the adoption and utilization of the technology is related to user commitment. The NASA goal in these projects was to transfer Landsat technology into operational utilization by outside agencies or groups, which requires that such groups make a genuine commitment to that transfer process in the conduct of the total project. If NASA essentially provides a Landsat analysis capability to a user who has had only token participation in its development, the danger exists that such a capability will never make the transition into the operational realm. On the other hand, a vested interest by the user, which implies a genuine belief in the technology, strengthens the changes for survivial of that technology.

An example of such imbalance of commitments occurred in some projects in which NASA agreed to provide a Landsat remote sensing capability and its interface to a Geographic Information System (GIS) while the user devoted his efforts to developing other aspects of the GIS - an activity he was probably willing to undertake regardless of its application to this project. The user seemed reluctant to become involved in the remote sensing aspects of the project, except as primarily an observer, possibly because of his doubts about the technology. What resulted from these projects were GISs with Landsat analysis capability and interface added to them. Each GIS, which was developed by the user, is a very viable resource management tool with or without utilizing the Landsat capability. Hopefully, the user is now inclined to support the Landsat capability as part of a total system on his own. Early user involvement in the development of the whole system might have increased that inclination.

In summary, an exact tally of commitments by each participant is not important and each project has its unique circumstances which dictate the division of responsibilities. However, significant user commitment is one indication of genuine user interest in a continued program. But, this does not mean projects without a tangible commitment will necessarily fail. For example, one of the most successful studies had very limited user commitment (in dollars or manpower) in the development of the Landsat analysis capability. However, this project was a success because the user was very convinced of the utility of Landsat derived information for his application. Yet in another project, a Landsat analysis capability with negligible user commitment either tangible or intangible, appears destined to go unused. A significant and tangible user commitment in developing the capability may be the best measure NASA has for assessing user interest in a lasting program.

GO/NO-GO DECISIONS

GO/NO-GO decision points have been included in some projects at the end of the "processing" or "demonstration" phase and before the start of the "technology transfer" phase. Both NASA and the user in these projects have not always taken the evaluation and subsequent decision seriously. While optimism that a positive "GO" decision will be made is justified, project plans often treat a "GO" decision as a foregone conclusion. In some cases a significant amount of the evaluation work in support of a GO/NO-GO decision has been eliminated and the user has less information on which to base his decision.

If a GO/NO-GO decision is significant enough to be required in a project plan, it should be given serious consideration by both parties. In addition, NASA Headquarters should be thoroughly briefed in the justification supporting a user's decision. Also, at the time a "GO" decision is made, there should be a reassessment and reaffirmation of the user's commitments to the project.

USE OF CONTRACTORS

Contractors from both the private and academic sectors were utilized in APT and ASVT projects. Private firms participated in these projects both as part of general on-site, support service contracts at the NASA field centers and under specific contracts to support individual projects. Individual contracts were written as both sole source and competitive bid. With a few exceptions, user satisfaction with contractor support was high for most projects, regardless of the type of contract or contractor used.

One significant trend was evident in the use of contractors. Several users had a previously established working relationship with a contractor (in many cases a university) and an effort was made by the user and NASA to utilize this contractor for support in the APT/ASVT project. In these cases, users were very satisfied with their contractors and thought previous relationships contributed to their ability to communicate and work efficiently together. From the user's perspective, it was worthwhile to utilize these user/contractor relationships when they existed.

NASA COMMITMENTS

With regard to sustained support for technology transfer efforts like the APT and ASVT programs, project managers have encountered severe travel limitations, delays in signing project agreements, project fund cutbacks at critical times in the transfer process, and changes in project personnel or reduction in contractor support in favor of higher priority programs. These are severe setbacks in projects where user confidence and belief in the technology are critical and hinge to a great degree on NASA's commitment to support technology transfer. Inconsistent support may be permissible in R&D activities, but only wholehearted support can consistently achieve success in technology transfer projects.

PROJECT WORKSHOPS

End-of-project workshops or seminars have been planned for several of the projects to serve as technology dissemination or transfer mechanisms to other potential users. Those workshops which have been conducted to date were open to members of the user community interested in learning about applications of the technology, project results, implementation of the technology, and opportunities available to them in adopting the technology. User participants in the projects in which workshops have been or will be conducted are very willing to share their experiences with other potential users in hopes of furthering technology utilization. These workshops are a valuable mechanism for technology dissemination when they are given wholehearted support. NASA should take advantage of this opportunity by playing an active role in design and conduct of these workshops.

4.3 FACTORS AFFECTING PROJECT OUTCOME

In the course of examining the fifteen APT and ASVT projects, a number of specific factors have surfaced which have had significant impact on the outcome of one or more projects.

It is unlikely that any of these factors, considered individually, could account for project success or failure. However, each factor was observed to have a played a significant positive or negative role in some project(s). NASA should take advantage of the experience gained from these projects and should examine each of these issues in the context of future project planning.

The significant positive and negative factors observed, some of which have been previously discussed, are listed below.

POSITIVE FACTORS

- Project has a strong User Manager
  - belief in the program.
  - good standing in the user agency.

- NASA manager has interest in the project and application being studied.

- User has thorough understanding of Landsat capability prior to the project, and/or NASA has realistically described what the user can expect.

- Project has adequate and consistent funding and support. (e.g., sufficient travel money for NASA manager to participate in important project activities.)

- NASA and USER have free exchange of ideas, including joint project design.

- User has examined what is required for operational implementation of the technology in his organization.

- NASA understands the role of Landsat technology in the user's activities.

- User has a mandate (e.g., legislation, charter) to perform on-going, operational activities which can utilize Landsat technology.

- NASA's contractors understand user's needs and the two have a good working relationship. (e.g., through previous contracts)

NEGATIVE FACTORS

- User Agency is not fully committed (e.g., lacks adequate staff to perform the study or funding to implement the technology.)

- Project is too time constrained (e.g., project trying to meet the needs of operational programs.)

- NASA and/or user project managers change during the project.

- Too much political motivation in initiating the project with too little concern for technical merit.

- Project involves too many agencies and/or disciplines. Project tries to accomplish too much.

- Users lack faith in Landsat technology (perhaps they were oversold in the beginning.)

- Conflicts exist at NASA field centers with higher priority programs.

- Internal politics among user agency participants govern project activities (i.e., when several agencies are involved in one project.)
- User has immediate, stringent Landsat data requirements.

SECTION 5. CONCLUSIONS AND RECOMMENDATIONS

SECTION 5. CONCLUSIONS AND RECOMMENDATIONS

This section presents conclusions and recommendations resulting from this evaluation of APT and ASVT projects. They are organized into three categories. General conclusions and recommendations about the whole programs and their future appear in section 5.1. More specific recommendations about the selection and design of future projects are presented in sections 5.2 and 5.3. Section 5.2 recommends issues to be considered in design of future projects and section 5.3 examines considerations for potential user participants and applications.

5.1 GENERAL CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations apply to the APT and ASVT programs as a whole:

a. The joint project concept is a viable means to accomplish technology transfer. Both NASA and user participants have expressed their satisfaction with this approach.

b. A wide variety of applications of remotely sensed (primarily Landsat) data have been examined in these projects. Included are forestry, agriculture, hydrology, geology, and urban development.

c. A broad cross-section of users have been involved in these projects. Federal, state, and substate levels of government have participated as well as the private sector and the academic community.

d. The degree of success or level of accomplishments varies greatly among projects but significant benefits have been derived from each one. Benefits range from user-supported, operationally-implemented Landsat analysis capabilities to a thorough examination and user understanding of an application of remotely sensed data.

e. Approximately one-half of the projects have met or appear that they will meet all their stated objectives. The reasons objectives were not met were sometimes within NASA's control and in other instances not. (Discussions of these reasons appear in sections 3 & 4.)

f. The current Landsat data delivery system and uncertainties about the future of land remote sensing are serious impediments to technology transfer efforts.

g. NASA Headquarters and field centers have provided inconsistent support (See Section 4.2) to the APT and ASVT programs, which has had a detrimental effect on some projects.

5.2 CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE PROJECT PROCEDURES AND DESIGN

In the planning, design, and conduct of future APT and ASVT projects, the following factors are significant and must be given serious consideration:

a. The amount of R&D required for projects must be carefully scrutinized because of its effect on project scheduling. When necessary, a pre-APT effort should be undertaken to insure that research-proven techniques are ready for development and testing with a user.

b. Project initiation should be more efficient. The signing of project agreements should be expedited to get projects underway on schedule.

c. Project activities should be synchronized to be in phase with user activities and requirements, such as budget cycles, whenever possible.

d. The amount of demonstration or test activity (e.g., number or size of test sites) must be strictly limited to what is required to conduct a valid and convincing test. Over-extended project activities have resulted in significant schedule slippages.

e. The scheduling for R&D activities (primarily in APTS) should be more flexible than other activities to account for uncertainties in the rate of progress.

f. Serious consideration should be given to GO/NO-GO (or redirection) decisions, including formal involvement of NASA Headquarters, documentation of rationale which forms basis for the decision, and a reaffirmation of user commitments to the project.

g. Utilizing contractors that have an established working relationship with users has been beneficial in past projects and should be continued when feasible.

h. Because these projects involve technology transfer to outside users, NASA should make efforts to maintain adequate, consistent support, including sufficient travel money, funding levels which remain as originally specified, and stable management and staffing levels.

i. Greater emphasis is needed on separate technology "outreach" efforts such as symposia, workshops, and conferences, coupled with transferable documentation. These activities are critical if transfer beyond original users is to be accomplished.

5.3 CONCLUSIONS AND RECOMMENDATIONS FOR EVALUATION OF POTENTIAL USER PARTICIPANTS AND APPLICATIONS

In evaluating potential user participants and their resource management applications to be examined in APT and ASVT projects, consideration should be given to the following issues:

a. Users should have the responsibility or mandate (e.g., legislative) to perform an on-going, operational program which will use the technology once the project ends.

b. Projects should not be undertaken primarily for political reasons. If a project with a particular user is politically important, the application to be utilized should be thoroughly examined and understood, and the project design tailored to account for specific requirements.

c. Users should be required to make significant, meaning ful commitments (in funds, manpower, equipment) throughout the projects, in concert with the resources available to them.

d. Applications should be technically sound and not place unreasonable demands (e.g., in resolution, data delivery) on the current Landsat system.

e. The number of user entities or groups participating in projects should be manageable. If a larger number is necessary, a central point of contact with decision making authority must be established and maintained within the user group.

f. User applications in which the results are to be part of an operational user activity should not be included in APT or ASVT projects when time constraints of the operational activity govern project activities. This has proven to be too limiting to project flexibility.

APPENDIX A. NASA MANAGER QUESTIONNAIRE FOR EVALUATION OF APT's AND ASVT's

QUESTIONNAIRE FOR EVALUATION OF NASA'S ASVT AND APT PROJECTS

PROJECT TITLE ______________________________________

____

APT or ASVT

PROJECT MANAGER/FIELD CENTER ______________________

____

INTERVIEWER ________________________ DATE __________________

OAO Corporation

A. Project Evolution

1. Where did the idea come from?
   - NASA HQ
   - NASA Field Center
   - Contractor
   - User Agency

2. At what level was the project conceived? (e.g., administrative, management, working level)

3. Had there been previous (related) work with the user agency(s)? (i.e., to lead into this project)

4. Were programmatic considerations important in the formulation of this project? (as opposed to just its technical merit)

5. What was your first involvement with the project?
   - Previously related work?
   - Project proposal/development?
   - Management after funding approval?

B. Project Objectives

6. What do you believe are the objectives of this project?

7. To what degree have the objectives (both stated and your perception) been accomplished?

8. Have the objectives changed over the duration of the project? (e.g., due to over or underestimating the degree of success of the project)

9. Were the objectives reasonable? (i.e., too difficult to attain or not taxing enough)

10. Do you think NASA and the user agency shared an understanding of and appreciation for the goals of the project? Was the M.O.U. specific enough?

C. Project Participants - Outside private contractor (not support service)

11. Did the outside contractor perform to your satisfaction during the project?

12. Did the outside contractor understand the objectives of the project?

13. Was the outside contractor responsive to the needs of the user, and were the two able to communicate effectively?

14. Did the outside contractor have enough money to perform its tasks properly? (i.e., did any phase of the project suffer due to lack of funds?)

15. Did any unforeseen obstacles arise to hinder the outside contractor in performing its duties?

16. Would you recommend using an outside contractor on this type of project in the future?

17. Would the project have been more successful if the work had been performed by the field center (or support contractor)?

18. How was the outside contractor selected? Why not an on-site support contractor?

D. Project Participants - User Agency

19. What was the level of user agency involvement? Did they participate to a greater or lesser extent than you expected? Why?

20. How were the user agency participants assigned to the project? Were all the "key figures" included? Did they have any previous exposure to Landsat/Remote Sensing?

21. Did the "working level" user agency personnel have a genuine interest in the project?

22. Did the user agency personnel have enough time to work on the project?

23. Did the user agency personnel fulfill their obligations as far as assignments, deadlines, etc?

24. Was the user agency prepared to undertake this effort? Were they aware of the magnitude of the project and their commitments? Did NASA seem too "pushy" in trying to involve them?

25. What user agency personnel should be interviewed to evaluate this project?

26. How well was this project geared to the user agencies' information needs? (e.g., product type, format, content) Was there a documented use for this technology?

E. Project Participants - NASA HQ

27. Did NASA HQ provide the proper backing to carry out the project? Did NASA HQ impose any constraints on you (as a field center) which hindered the project?

28. Was NASA HQ's interaction (i.e., higher level) with the user agency proper?

29. Did NASA HQ show interest in the project and help you solve problems which arose?

F. Results/Achievements

30. Has the technology transfer been successfully accomplished? If not, what is the status?

31. Is the technology developed/transferred currently being used by the user agency?

32. What was the major impediment to the technology transfer process? Were you aware of this impediment (or its magnitude) at the outset of the project?

33. How reproducible are the results of this project elsewhere? Can this technology be adapted to other sites? If not, what factor(s) complicate the process?

34. Have the results of this project led to the development of other technology transfer efforts in the future?

35. At what stage is the project documentation? Has the final report been completed?

36. Has the work on this project helped identify new R&D or technology development needs?

37. Do you consider the project a success?

38. Were the training activities sponsored by NASA for the user agency valuable in the technology transfer process? Was NASA properly prepared to provide training? Was the user agency participation adequate?

39. What is your opinion of the cooperative "demonstration" project approach? Was user agency participation adequate?

40. In the latter stages of the project, were NASA's technical assistance efforts adequate? (as consultants in the technology implementation at the user agencies) Did NASA remain unbiased as far as the level and type of user agency involvement?

41. Did the data processing stage of the project run smoothly? Were there any unforeseen impediments stemming from data availability or acquisition, technique development software or hardware unreliability.

G. Summary/General

42. Has the joint approach using NASA and a user agency, employed in ASVT and APT's, been effective?

43. According to the definitions of APT and ASVT, has this project been correctly called an (APT or ASVT)?

44. What is the most significant result/achievement of this project?

45. How could NASA improve upon the APT/ASVT approach as a technology transfer mechanism?

46. Has the funding been adequate to meet the objectives of the project?

47. Do you feel the user agency has participated at the desired/required level?

48. Did the results of the test or verification phase of the project warrant the continuation into the T^2 phase?

49. Was the schedule/timing of the project a problem in attaining the objectives? Did the original schedule slip? Did NASA rush the project at expense of the technology transfer process? Was there enough flexibility?

50. Did the user agency appreciate the commitments required (e.g., $, manpower, equipment, training) to use this technology operationally?

APPENDIX B. USER REPRESENTATIVE QUESTIONNAIRE FOR EVALUATION OF APT's AND ASVT's

QUESTIONNAIRE FOR EVALUATION
OF NASA'S ASVT AND APT PROJECTS

PROJECT TITLE ______________________________________

____
APT or ASVT

USER REPRESENTATIVE/AGENCY ______________________

____

INTERVIEWER ________________________ DATE __________________
OAO Corporation

1. Where did the idea for this project originate? Were you contacted by NASA or did the idea come from within the agency (company)?

2. Did you have a working relationship with NASA prior to the project?

3. What was the reason for your agency (company) examining remote sensing/Landsat technology as an information source? (e.g., cost savings, speed, accuracy, data format)

4. How did you become involved with this project as a user agency (company) representative?

5. When did the management level of your agency (company) become involved? Were they skeptical at the start of the project?

6. How were the management level personnel kept aware of the project accomplishments? Were they interested?

7. How does this technology compare to traditional techniques in:
   accuracy
   timeliness
   cost savings (if any)
   information content

8. Did NASA push to get the project underway before your agency (company) was ready? Did the project get started according to schedule?

9. Did the project last longer than the original schedule? Why? Was this a problem?

10. During the planning and implementation stage of the project (prior to the official start), were you given the opportunity to make inputs to the design of the project?

11. Have the objectives your agency (company) set forth in this project been accomplished? If not, why not?

12. Prior to this project, was your agency (company) acquiring and using the kind of information derived from this technology? (i.e., was this a source of a new kind of information or a new way to acquire information already being gathered)?

13. Did your agency (company) appreciate the magnitude of its commitment in the go/no-go decision? Were they prepared, at the outset of the project, to make the "go" decision at the decision point?

14. Do you think your agency (company) took a risk by participating in this project? Were your commitments to this project too great? Would your management have made a greater commitment?

15. Was your agency (company) given adequate training in understanding and using the technology?

16. Was your agency (company) given enough opportunity for "hands-on" participation in the project work?

17. Were there any logistical problems (e.g., travel, access to equipment, location of personnel) that seriously impacted the project?

18. Do you think the go/no-go decision was a foregone conclusion? Did the evaluation of the technology really warrant a "go" decision?

19. How successful has the transfer of NASA technology been to your agency?

20. Will the information derived from this technology be used in conjunction with information from other sources? (e.g., in a geographic information system)?

21. What commitments has your agency (company) made to adopt this technology? (e.g., manpower, facilities, equipment)

22. Does your agency (company) have personnel that are able to utilize the technology without NASA's help?

23. Was your agency (company) able to fulfill all its commitments throughout the project? If not, why? Did NASA meet its obligations? Were the obligations of both parties clear at the outset?

24. Is your agency (company) currently using this technology in an operational mode?

25. Are there any problems involved in using this technology to provide inputs to your resource management practices? Is information derived using this technology credible and accepted?

26. Were you satisfied with the performance of NASA's contractors (especially outside, not on-site)? Is there any reason you would have preferred to work directly with NASA personnel?

27. At some point during the project, you (the agency or company) were asked to evaluate the results of the project and make a decision as to whether or not you would adopt the technology. Was the evaluation completed? Were the results conclusive? Who designed the evaluation? How was this technology compared to traditional techniques?

28. What is the status of the project documentation? Does the technology used/developed in this project exist in a readily transferrable "package"?

29. Have any post-project activities been initiated to extend the technology transfer to other (potential) users?

(for APT)

30. In many projects of this kind, at least some research and development (R&D) work is required. Were you surprised by the level of R&D effort required to make the technology transferrable?

(for ASVT)

31. Was the technology ready to be transferred at the start of the project?