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FOREST RESOURCE INFORMATION SYSTEM

Phase III Quarterly Report  
for the period

1 April 1980 to 30 June 1980

Prepared for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Johnson Space Center  
Earth Observations Division  
Houston, Texas 77058

4.  
Contract: NAS 9-15325  
Technical Monitor: R. E. Joosten/SF5

Submitted by:

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The Laboratory for Applications of Remote Sensing  
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West Lafayette, Indiana 47906

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Principal Investigator: R. P. Mroczynski

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<p>16 Abstract</p> <p style="text-align: center;">This report covers the fifth quarter of the fifteen-month System Transfer Phase of the Forest Resource Information System Application Pilot Test. The principle activities during this quarter revolved around the documentation of software systems. Timelines and a short description of the software documentation process is given.</p>			
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## Index

FRIS Project Overview	1
1.0 INTRODUCTION	1
2.0 SYSTEM TRANSFER TASKS	2
2.1 Preprocessing Software	2
2.2 Image Classification Software	3
2.2.1 Software Modifications	3
3.0 MANAGEMENT	5
Appendix A.I. Preprocessing Software	7
Appendix A.I.a. Preprocessing COSMIC Package	8
Appendix A.II. FRIS Software Development	9
Appendix A.III. FRIS LARSYS DV Documentation	11
Appendix A.IV. FRIS "LARSYS Documentation"	12
Appendix A.V. St. Regis COSMIC Package	13

## FRIS PROJECT OVERVIEW

The Forest Resource Information System Project (FRIS) is a cooperative effort between the National Aeronautics and Space Administration (NASA) and St. Regis Paper Co. (STR). Purdue University's Laboratory for Applications of Remote Sensing (LARS), under contract to NASA, will supply technical support to the project.

FRIS is an Application Pilot Test (APT) Project funded by NASA. The project is interdisciplinary in nature involving expertise from both the public and private sectors. FRIS also represents the first APT to involve a large broad base forest industry (STR) in a cooperative with the government and the academic communities.

### Purpose

The goal of FRIS is to demonstrate the feasibility of using computer-aided analysis techniques applied of Landsat Multispectral Scanner Data to broaden and improve the existing STR forest data base, thereby creating the foundation of a dynamic information system. The successful demonstration of this technology during the first half of the project will lead to the establishment by STR of an independently controlled operational forest resource information system in which Landsat data is expected to make a significant contribution. FRIS can be viewed by the user community as a model of NASA's involvement in practical application and effective use of space technology. Additionally, FRIS will serve to demonstrate the capability of Landsat MSS data and machine-assisted analysis technology to private industry by:

- o Determining economic potentials,
- o Providing visibility and documentation, and

- o The ability to provide timely information and thus serve management needs.

The ultimate long term successfulness of FRIS can be measured through future development of remote sensing technology within the forest products industry.

### Scope

FRIS is funded as a modular or Phase project with an anticipated duration of three years. The original project concepts were developed in 1973, and a formal project plan was submitted to NASA by STR in 1976. The project officially began in October 1977 after the signing of a cooperative agreement between NASA and STR; and after the completion of contractual arrangements with Purdue University.

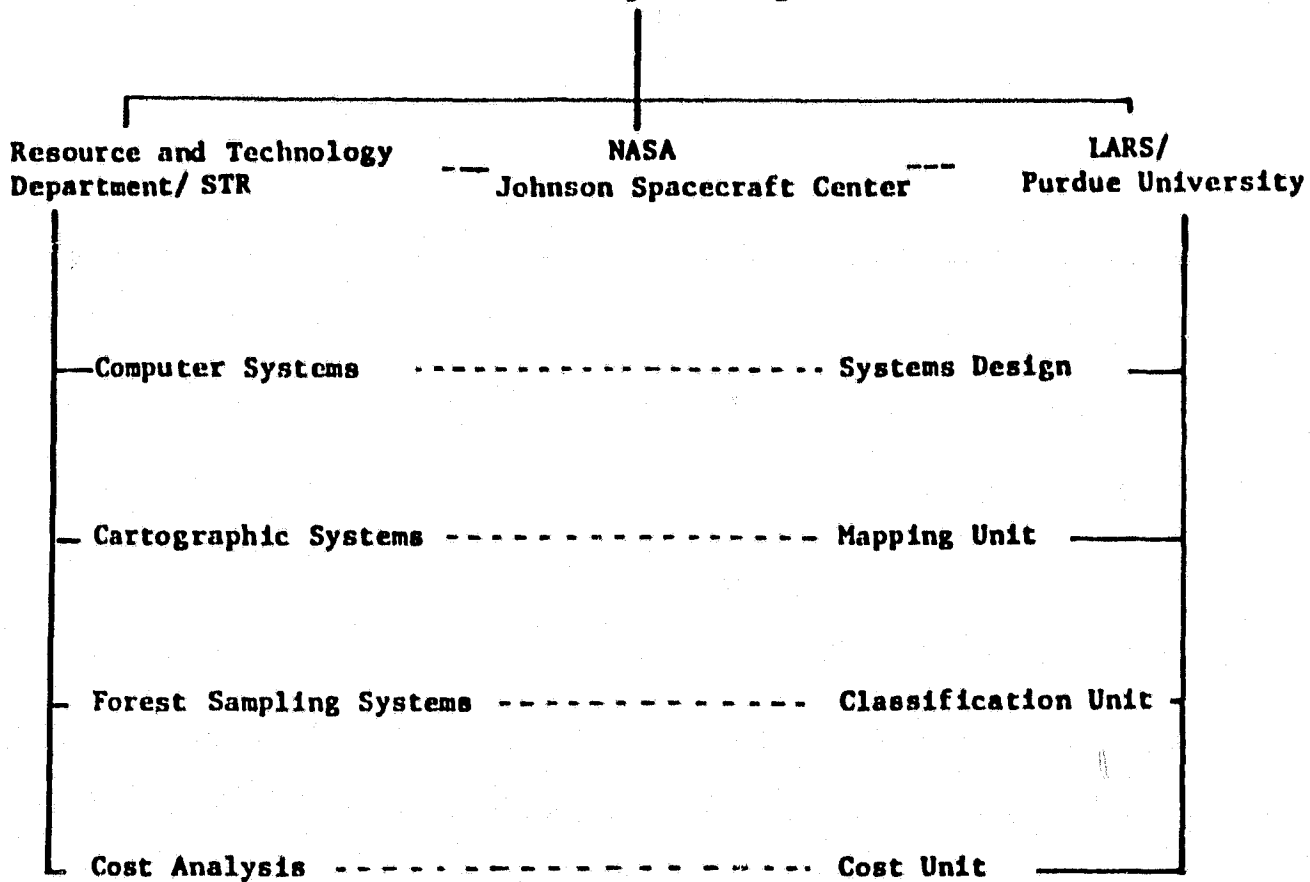
### Organization

The organization of FRIS is depicted in the chart that follows. Since FRIS is a cooperative involving three independent agencies, a steering committee consisting of a project manager from each institution was formed to provide for overall guidance and coordination. Operationally, both STR and LARS have project managers and project staff to insure for the timely completion of activities within the project. The NASA technical coordinator monitors project activities and provides a liaison between the STR and LARS staffs. The solid lines on the chart indicate the flow of management responsibility. The dash lines reflect the technical and scientific inter-changes between operating units.

**FRIS Organization**

**Steering Committee**

**ASVT Project Manager**  
**NASA Technical Monitor**  
**FRIS Project Manager**





## 1.0 INTRODUCTION

The material which appears in this report is a reflection of the FRIS Project Staff activities for the period 1 April 1980 to 30 June 1980. This time frame encompasses the fifth quarterly reporting period for Phase III of the Forest Resource Information System (FRIS) Applications Pilot Test (APT). Phase III or the System Transfer Phase of FRIS is directed at meeting the overall Project goal:

To document and transfer remote sensing technology developed throughout the project that will provide St. Regis with an independent operational system, having Landsat data as a significant and viable contributor.

The major staff effort during this reporting period have been directed at software documentation. Primary emphasis has been placed on documenting developmental LARSYS (LARSYS DV) software modules. These are modules, subroutines, that currently do not exist in the LARSYS ver. 3.1 software available through COSMIC.

Noteworthy project accomplishments for this last quarterly reporting period include:

- o LARSYS software installed and operational at the St. Regis National Computer Center.
- o Decision as to the content of the LARSFRIS modules that will be documented for COSMIC.
- o Disconnecting the ROSCOE remote terminal link to Jacksonville.
- o Decision to develop the concept of and produce a FRIS color brochure.
- o Growth of the concept to conduct a FRIS end-of-project symposium.

The remainder of this report will discuss the System Transfer activities in more detail. Appendix A contains updated timeline charts for these activities.

## 2.0 SYSTEM TRANSFER TASKS

The System Transfer activities consist of documenting and transferring two major image processing elements; preprocessing software, and classification software. A discussion of the status of these activities are contained in the subsections that follow.

### 2.1 Preprocessing Software

Preprocessing transfer consists of four main tasks. The first three tasks involve the completion of the major systems of preprocessing programs known as Landsat Reformatting, Geometric Correction, and Image Registration. The last task is creation of the Preprocessing Cosmic Package. Documentation is an important part of all these tasks. Both programmer and user documentation is included.

The Landsat reformatting task is designed to deliver a system of programs which convert digital Landsat data to LARSYS format. Specifically the input of EDIPS "P" band interleaved format to LARSYS multispectral image tape format. Planning for this program has been completed as has all programming efforts. Test data has been assembled and all program abstracts have been generated. User documentation is scheduled for completion as of September 30, 1980.

Geometric correction is a modified system of programs designed to rotate EDIPS "P" format Landsat data to true north or other orientation as required. Actual inputs and outputs to and from the processor are in LARSYS format. Planning for this series of programs was completed in May with implementation of programs scheduled for completion at the end of August, 1980. Test data will be generated during program implementation. Abstracts and user documentation will be completed in parallel by the end of September, 1980.

Image registration is the third preprocessing software task. This processor provides the tool to register two coincident scenes of Landsat or other image data. Input images are assumed to be in LARSYS format. Planning for this processor will be completed in August, 1980. The main image registration programmed have been functionally specified and three-fourths of the units have passed the design stage. Over one-third have been implemented at this time. The second major section,

the coincident cross-correlation and the third multifit least squares analysis will be modifications of current program implementations. Program abstracts and user documentation for all sections are scheduled for completion as of October 31, 1980.

The final task is the creation and submission of a package of the above processors to COSMIC. Compiled listings of computer tapes containing all programs will be put together as of late October, 1980. All documentation for the package will be gathered and the package will be created and sent to COSMIC by mid-November, 1980. Detailed timeline charts for these activities appear in Appendix A.

## 2.2 Image Classification Software

The image processing software that St. Regis will use for classifying Landsat data will be called LARSFRIS. The modules that comprise this software currently exist as LARSYS ver. 3.1 and LARSYSDV, see Table 2.2.1. LARSYS ver. 3.1 currently exists as a completely documented software package available through COSMIC. LARSYSDV contains experimental modules that represent a logical development of new software capability. LARSYSDV is not available through COSMIC.

The principle project activity during this past quarter has been completing the documentation of LARSYSDV software. A secondary activity involves updating the software elements of LARSYS ver. 3.1 that are transferred to St. Regis. The end result of these activities will be a completely documented software package called LARSFRIS. This software will be available to interested users through COSMIC. Timeline charts for the various image processing components of LARSFRIS appear in Appendix A.

### 2.2.1 Software Modifications

LARSYS software that would support the FRIS image processing requirements was identified early during the preliminary system design task in Phase II. A re-evaluation of these software modules as the documentation process began indicated that some software was inappropriate to transfer to St. Regis. The GDATA, GRESULTS, and BROWSE modules are specific software unique to the LARS computer configuration and, therefore, have been deleted from the software listed in Table 2.2.1.

Table 2.2.1. Software modules that comprise LARSPKIS and their origin, either LARSYS ver. 3.1 or LARSYSDV.

<u>LARSYS ver. 3.1 Modules</u>	<u>LARSYSDV Modules</u>
PICTUREPRINT	SEPARABILITY
STATISTICS	PRINTRESULTS
IDPRINT	CHANNELTRANSFORM*
LISTRESULTS	SECHO*
PUNCHSTATISTICS	MERGESTATISTICS
LINEGRAPH	RATIOMEANS*
COLUMNGRAPH	BIPLOT
HISTOGRAM	COMPARERESULTS*
GRAPHHISTOGRAM	SMOOTHRESULTS
COPYRESULTS	
EXCOMAND	

\*Indicates a module name change, refer to sec. 2.2.2 of text.

In addition to deleting the three modules, four modules were renamed. Renaming was deemed appropriate because the new module name better represented the functions that the software performed. The following module names were changed:

<u>New Name</u>	<u>Old Name</u>
CHANNELTRANSFORM	DUPLICATERUN
SECHO	ECHO
RATIOMEANS	RATIO
COMPARERESULTS	CHANGE

### 3.0 MANAGEMENT

During the quarterly reporting period both the LARS/NCC and LARS/JAX remote terminals were disconnected. The FRIS terminal network was intended to augment the technology transfer activities and assist with the system transfer. The LARS/JAX proved valuable during on-site training sessions at Jacksonville. The LARS/NCC terminal link was not extensively used because STR staff involved in software implementation had fewer problems than anticipated.

The FRIS Steering committee has developed a concept to produce a color brochure, and conduct an end-of-project symposium. Planning for both these activities began during this quarter.

## Appendix A

## Timelines

- I. Preprocessing Software
  - I.a. Preprocessing COSMIC Package
- II. FRIS Software Development
- III. FRIS LARSYS DV Documentation
- IV. FRIS "LARSYS Documentation"
- V. St. Regis COSMIC Package

FRIS PREPROCESSING Software Documentation Task

	Apr	May	June	July	Aug	Sept	Oct	Nov
I. Preprocessing Software								
A. Landsat Reformatting (EDIPS)								
1. Plan Processor	✓							
2. Implementation			✓					
3. Test Deck								
4. Program Abstracts					✓			
5. User Documentation						✓		
B. Geometric Correction								
1. Plan Processor		✓						
2. Implementation					✓			
3. Test Deck						✓		
4. Program Abstracts						✓		
5. User Documentation							✓	
C. Image Registration								
1. Plan					✓			
2. Implementation						✓		
3. Test Deck						✓		
4. Program Abstracts							✓	
5. User Documentation								✓

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FRIS LARSYS Software Documentation Task

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	Apr	May	June	July	Aug	Sept	Oct	Nov
II. FRIS Software Development								
A. COMPARERESULTS								
1. Programming (completed 6/79)								
2. User Documentation								
3. Program Abstracts								
4. System Manual Flowchart								
5. Test Procedures								
B. CLASSIFYPOINTS (MiniDistance)								
1. Programming (completed 3/79)								
2. User Documentation								
3. Program Abstracts								
4. System Manual Flowchart								
5. Test Procedures								
C. SMOOTHRESULTS								
1. Programming								
2. User Documentation								
3. Program Abstracts								
4. System Manual Flowchart								
5. Test Procedures								
D. PRINTRESULTS (Combine versions)								
1. Programming								
2. Program Abstracts								
3. User Documentation								
4. System Manual Flowchart								
5. Test Procedures								



	Apr	May	June	July	Aug	Sept
III. FRIS LARSYSDV Documentation						
A. MERGESTATISTICS						
1. Program Abstracts		✓				
2. User Documentation		✓	✓			
3. System Flowchart		✓				
4. Test Procedures		✓				
B. BIPILOT						
1. Program Abstracts		✓				
2. User Documentation		✓	✓	✓		
3. System Flowchart		✓				
4. Test Procedures		✓				
C. RATIOMEANS						
1. Program Abstracts		✓				
2. User Documentation		✓	✓	✓	✓	
3. System Flowchart		✓				
4. Test Procedures		✓				
D. SECHO						
1. Program Abstracts		✓				
2. User Documentation		✓	✓	✓	✓	
3. System Flowchart		✓				
4. Test Procedures		✓				



