JSC-14578

TEST PLAN

FOR THE

LANDSAT IMAGERY VERIFICATION AND EXTRACTION SYSTEM (LIVES)

JOB ORDER 71-485

Prepared By:

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Houston, Texas

Contract NAS 9-15200

For

EARTH OBSERVATIONS DIVISION

National Aeronautics and Space Administration

LYNDON B. JOHNSON SPACE CENTER

Houston, Texas

October 1978

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FIGURES

ACRONYMS

CCT	-- Computer Compatible Tape
DTL	-- Data Techniques Laboratory
EOD	-- Earth Observations Division
FCMO	-- Facilities Configuration Management Office
GHIT	-- Goddard HDT Inventory Tape
JSC	-- Johnson Space Center
HDT	-- High Density Tape
LEC	-- Lockheed Electronics Company
LIVES	-- Landsat Imagery Verification and Extraction System
NASA	-- National Aeronautics and Space Administration
PC&S	-- Process Control and Status
SCII	-- Serial Control Interface Input

1. PURPOSE

This document establishes a plan, the execution of which, will achieve stated requirements and verify LIVES processing capability. Whereas implementation of the HDT System is shared by both Lockheed Electronics Company and Ford Aerospace, this document applies only to the testing of the software being developed by LEC.

All test elements identified in this test plan will be addressed in a Test Specification Document.

This plan defines the following stages of testing:

- Unit
- Module
- Module to Module Integration
- Total LIVES
- Data and Command Interface (with Ford Aerospace)

Specification and performance of tests are the responsibility of the implementing organization. All test specifications should be assessed with respect to compliance to objectives, validity, relevancy, and completeness; and test results independently evaluated by a test management team.

Control organization activities are in the realm of test management and are the responsibility of NASA and contractor designees.

2. SCOPE

2.1 General

This document establishes the Test Plan for the LIVES to be implemented on hardware located in the Johnson Space Center, Building 17, Data Techniques Laboratory (DTL).

The plan describes a series of test items (unit and modular test elements) identified as relevent and necessary to certify LIVES capability. Performance of the test specification (to be developed) shall verify that the software conforms to the requirements defined in this LIVES Test Plan. Satisfactory completion of these tests will represent total software validation testing of the LIVES.

2.2 Applicability

The LIVES test plan requirements insure NASA/JSC/EOD management, hardware and software engineering, users, and maintenance and operations personnel of proper functioning of the LIVES.

3. APPLICABLE DOCUMENTS

The following documents constitute a part of this LIVES test plan to the extent specified herein:

High-Density Digital Tape Recorders
Martin-Marietta Corporation P75-48236-2
June 1975

Serial Controller Interface - Input (SCII)
Interface Control Document and Test Software Requirements
General Electric Company
February 1978

Serial Controller Interface - Input (SCII)
Product Specification
General Electric Company
February 1978

Landsat HDT Reformatting System
Interface Control Document
Ford Aerospace
August 1978

Landsat HDT Reformatting System
System Design Document
Ford Aerospace
July 1978

Preliminary Functional Design Document For The
Landsat Imagery Verification & Extraction System (LIVES)
Lockheed Electronics Company, Inc.
August 1978

Goddard HDT Inventory Tape (GHIT)
Operations Research Inc. NAS 5-23762
February 1978

Functional Requirements Document For The
Landsat Imagery Verification & Extraction System (LIVES)
Lockheed Electronics Company, Inc.
August 1978

Other pertinent documents to be included as they become available.

4. TEST PHILOSOPHY

4.1 General

The test plan philosophy is to exercise the complete LIVES processing system within the anticipated operating environment, both with known simulated HDT^{*}_{p} data tapes and with actual HDT_{p} data tapes.

4.2 Purpose

The purpose of the tests covered by this plan is to delineate the step-by-step procedures by which unit and module interface tests are conducted in order to perform an entire integrated LIVES processing system test.

4.3 Modularity Structure

The tests identified in this section evolve from the primary development elements which describe the five major software modules performing identifiable processing functions.

Testing stages begin at the unit level, where a unit could be a small routine or a group of routines. Modules are processing functions identified as the five major software modules which comprise the LIVES. They are:

Preprocessing Module

Data Management Module

Screening and Translation Module

Data Extraction Module

CCT Generation Module

* Fully processed Landsat data (geometric and radiometric corrections applied)

Module to module integration tests will be conducted following individual module validation.

Total LIVES testing will be conducted utilizing both simulated and actual data in the anticipated environment.

Upon completion of the hardware installation in the DTL, total LIVES testing will be repeated exercising the data and command interfaces.

5. QUALITY ASSURANCE

5.1 Internal LEC Tests

Unit testing (subroutine or submodule elements) is performed during construction of module software. Results of these unit tests validate executable logic and software programming practices.

Module testing (functional software entities) are performed after all units which comprise the module have been verified. Results of these module tests confirm the defined function is satisfied, validates unit integration and integrity, and verifies executable logic and software programming practices.

Module integration testing (LIVES software configuration) is performed after all modules comprising the LIVES system have been independently tested and verified. Results of the module integration tests demonstrate and validate satisfaction of the total LIVES functional design requirements.

5.2 NASA Acceptance Tests

Test results will be recorded on an appropriate form which will be identified in the LIVES Test Specification Document (to be developed). Test approval format will be in accordance with "Facilities Configuration Management Office (FCMO)" Appendix D "Preparation of Test Plan and Test Specification."

The test approval form will be completed and signed upon completion of each test. The quality assurance test witness shall be responsible for delivery of the master copy of the acceptance test results to the Data Techniques Library.

5.3 Acceptance Criteria

Acceptance of the LIVES software shall be contingent upon the systems satisfactory performance in accordance with the LIVES Acceptance Test Specifications.

5.4 Test Milestones

See LIVES Schedule (Figure 5-1).

LANDSAT IMAGERY VERIFICATION AND EXTRACTION SYSTEM (LIVES)

AUGUST 29, 1978

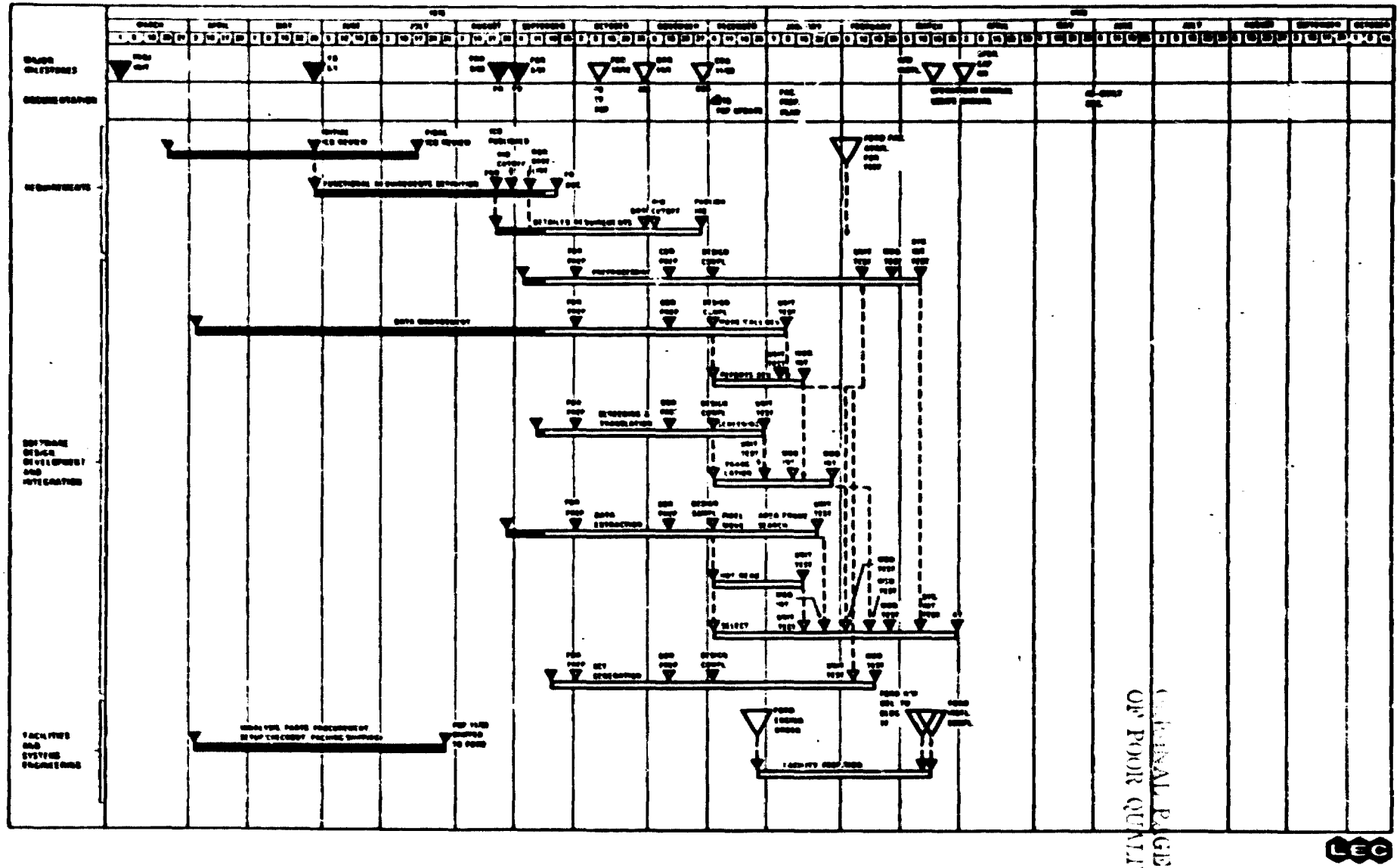

FIGURE 5-1 LIVES SCHEDULE

6. TEST REQUIREMENTS

6.1 General

This section addresses, in general terms, the individual internal LEC tests to be performed on software modules listed in Paragraph 4.3. The following individual tests shall be defined in the LIVES test specification.

6.2 Preprocessing Module

This module will read a record from the Goddard High Density Inventory Tape (GHIT) and, compare earth coordinates data on the record with earth coordinates of the PC&S data base. This module will demonstrate its ability to search and update the PC&S data base. The update function will insert workload parameters to perform subsequent search area extraction and processing modules. This module will also generate a print output of HDT tape and scene ID's for the HDT Reformatting Subsystem (Ford Aerospace).

6.3 Data Management Module

This module will create, update, and generate print output reports of HDT processing. (Output formats to be defined).

Software governing data base control indicators will be exercised to insure proper function to support concurrent data base updates from different tasks. (Communication software between computer processors can only be verified upon total system (hardware/software) integration.

6.4 Screening and Translation Module

The screening function of this module will demonstrate the capability to access the search area data base reading those files requiring screening. It will provide graphic display of header data, annotation data, trailer data, image and reference image data. It will demonstrate a capability to accept specifications of selected pixel, scan line, and band to be displayed and provide appropriate graphic displays.

The translation function will demonstrate a capability to reposition and redisplay images according to user/analyst command and cursor image control capabilities.

6.5 Data Extraction Module

This module will demonstrate the capabilities to read the user PC&S data base obtaining the parameters for search areas extraction processing from the full scene data base. Extracted search areas will be reformatted and stored in a search areas data base.

The extraction module performs 'cloud cover' and other quality checks and, will demonstrate that those search areas which require screening/ translation processing are appropriately identified.

6.6 CCT Generation Module

This module will demonstrate its capability to select and sort, by user, areas of interest. It will generate the required header and other ancillary records and create an area of interest magnetic tape file in CCT format.

7. LIVES SYSTEM TEST

7.1 Internal LEC LIVES Tests

In addition to the unit and modular tests described in Paragraph 6, one other integrated test is required.

This test exercises the total LIVES software configuration on actual HDT hardware configured in the Ford Aerospace facility. This test is necessary to insure total LIVES system continuity and verify capability in a simulated operational environment. The test will be phased, integrated, and repetitively executed to insure continuity.

After the HDT subsystem hardware has been installed in the DTL, this test will be repeated to insure software executability on the actual hardware configuration.

7.2 NASA Acceptance Test

The total LIVES software configuration test will be the basis for the NASA Acceptance Tests to be performed in the DTL.

7.3 Controls

Simulated known input data will be used to insure subsystem integrity. This input will be reviewed by the Test Management Team and made available to the implementing organizations. A repeat of these tests with real data would be run in the system test phase and for the NASA Acceptance Test.

7.4 Tests Specifications and Schedules

Test specifications are to be determined. Test schedules are given in Figure 1.