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EOSDIS Core System Project

ECS System Acceptance Test Procedures - Volume 2 GSFC Procedures for the ECS Project

September 1996

Hughes Information Technology Systems
Upper Marlboro Maryland

ECS System Acceptance Test Procedures - Volume 2 GSFC Procedures for the ECS Project

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Preface

This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. This document is under ECS contractor configuration control. Once this document is approved, Contractor approved changes are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan, and changes to this document shall be made by document change notice (DCN) or by complete revision.

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Abstract

The ECS System Acceptance Test procedures documents contain the specific test instructions to completely verify that the TRMM ECS release (ECS Release A) installed at the GSFC, LaRC, and EDC DAACs, and the EOC and SMC sites satisfy the level 3 requirements documented in the Functional and Performance Requirements Specification (F&PRS).

There is a separate set of test procedures for each DAAC, the EOC and SMC. The test procedures are delivered as separate volumes for each site.

Keywords: Acceptance test, ECS Release A, level 3 requirements, GSFC

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Abbreviations and Acronyms

Glossary

1. Introduction

1.1 Identification

The Acceptance Test Procedures (ATPr), Contract Data Requirement List (CDRL) item 070, whose requirements are specified in Data Item Description (DID) 411/VE1, is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) Contract NAS5-60000.

The Release A ECS System Acceptance Test Procedures describe the approach the Acceptance Test Organization (ATO) takes to verify level 3 ECS requirements. The Release A ECS System Acceptance Test Procedures - Volumes 1-5 contain the step by step test procedures for each Release A site. Figure 1-1 graphically depicts the Release A ECS System Acceptance Test Procedures volumes.

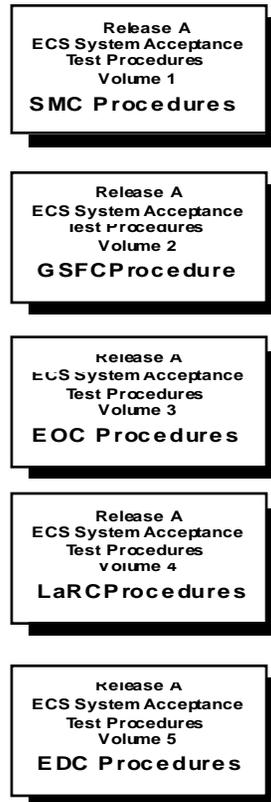


Figure 1-1. ECS System Acceptance Test Procedure Volumes

1.2 Scope

Release A of ECS supports the early operational stages of the Tropical Rainfall Measuring Mission (TRMM). Release A follows an earlier ECS delivery, referred to as Interim Release 1 (Ir1), which provided certain enterprise infrastructure in preparation for subsequent deliveries. Ir1 also provided science software integration and testing capabilities. The infrastructure delivery of ECS involves three Distributed Active Archive Centers (DAACs)-- these being the Goddard Space Flight Center (GSFC), the Langley Research Center (LaRC) and the EROS Data Center (EDC). Even though only two of the DAACs (GSFC and LaRC) directly support the TRMM effort, all three are updated at Release A. This simplifies configuration management and allows for interface testing for future ECS releases. For Release A, the Ir1 configurations of GSFC and LaRC DAACs are upgraded with major hardware and software deliveries. The EDC, which is not part of TRMM operations, receives a minor upgrade for Release A to support interface testing. Additionally, Release A provides for overall ECS system monitoring at the System Monitoring and Coordination Center (SMC) and core flight operations functionality at the EOS Operation Center (EOC) for EOS spacecraft.

This document comprises the IATO's test procedures for Release A. It contains the step-by-step procedures for implementing each formal acceptance test, including the detailed procedures for data reduction and analysis of the test results.

1.3 Purpose

The purpose of the Release A ECS System Acceptance Test Procedures is to define the procedures used to formally verify that the ECS Release A meets all specified level 3, operational, functional, performance and interface requirements. These procedures define the specific objectives, event sequences, support requirements, configuration identification, and testing procedures for each acceptance test or series of test to be performed during acceptance testing of the ECS.

1.4 Status and Schedule

The submittal of DID 411/VE1 meets the milestone specified in the Contract Data Requirements List (CDRL) for ECS Overall System Acceptance Test Procedures of NASA contract NAS5-60000. The submittal schedule is three months prior to the ECS Release A Release Readiness Review (RRR).

1.5 Organization

This document is organized in five volumes. The Release A ECS System Acceptance Test Procedures - Volumes 1 through 5 contain the step-by-step test procedures at each site.

The Release A ECS System Acceptance Test Procedures - Volumes 1-5 where-in the detailed procedures for each individual site are detailed. Sections 7-12 of Volumes 1-5 map directly to the material introduced in corresponding sections of the Release A ATPr's listed below.

- Section 1. Introduction- Provides information regarding the identification, scope, purpose, status and schedule, and organization of this document.
- Section 2. Related Documents: Provides a listing of parent documents, applicable documents, and documents which are used as source information.
- Section 3. Acceptance Test Overview- Describes Release A capabilities and provides an overview of the acceptance functional and interface tests. Acceptance test roles and responsibilities are also described.
- Section 4. Test Tools- Describes the test tools used by IATO to conduct ECS Release A System Acceptance Tests.
- Section 5. Test Execution and Coordination-Discusses the process by which formal acceptance testing is managed on a daily basis.
- Section 6. Release A Test Schedule- Depicts the overall ECS acceptance test schedule and coordination activities.

Sections 1-6 of Volumes 1-5 describes the approach that the IATO takes to Test ECS.

- Section 7. Test Site Environment- Provides an overview of the individual site test environment.
- Section 8. System Management Scenario Group- Contains the detailed procedures for the system management group of requirements.
- Section 9. Push Scenario Group- Contains the detailed procedures for the push scenario group of requirements.
- Section 10. Pull Scenario Group- Contains the detailed procedures for the pull scenario group of requirements.
- Section 11. Flight Operations Scenario Group- Contains the detailed procedures for the Flight Operations scenario group of requirements.
- Section 12. End-to-End Scenario Group- Contains the detailed procedures for the end-to-end scenario group of requirements.

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2. Related Documentation

2.1 Parent Documents

The parent documents are the documents from which the scope and content of this document are derived.

194-401-VE1-002	Verification Plan for the ECS Project, Final
409-CD-001-004	ECS Overall System Acceptance Test Plan for Release A
420-05-03	Earth Observing System (EOS) Performance Assurance Requirements for EOSDIS Core System (ECS)
423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (ECS)

2.2 Applicable Documents

The following documents are referenced within this Test Procedures document, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this document.

107-CD-002-XXX	Level 1 Master Schedule for the ECS Project (published monthly)
505-41-11	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and the Version 0 System, 10/95
505-41-12	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and Science Computing Facilities, 5/95
505-41-14	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and Tropical Rainfall Measuring Mission (TRMM) Ground System, 2/95
505-41-15	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS the AM project for AM-1 Flight Operations, 7/95
505-41-17	Goddard Space Flight Center, Interface Requirements Document Between EOSDIS Core System (ECS) and the NASA Science Internet (NSI), 10/95

- 505-41-18 Goddard Space Flight Center, Interface Requirements Document
Between EOSDIS and MITI ASTER GDS Project, 7/95
- 505-41-19 Goddard Space Flight Center, Interface Requirements Document
Between the EOSDIS Core System (ECS) and the National Oceanic and
Atmospheric Administration (NOAA) Affiliated Data Center (ADC),
5/95
- 505-41-21 Goddard Space Flight Center, Interface Requirements Document
Between EOSDIS Core System (ECS) and NASA Institutional Support
Systems (NISS), 5/95
- 505-41-32 Goddard Space Flight Center, Interface Requirements Document
Between Earth Observing System Data and Information System, and the
Landsat 7 System, 7/95
- 560-EDOS-0211.0001 Interface Requirements Document (IRD) Between the Earth Observing
System (EOS) Data and Operations System (EDOS), and the EOS
Ground System (EGS) Elements

2.3 Information Documents

The following documents, although not referenced herein and/or not directly applicable, do amplify or clarify the information presented in this document, but are not binding on the content of this ECS System Acceptance Test Procedures document.

- 222-TP-003-008 Release Plan Content Description for the ECS Project

3. Acceptance Test Overview

The Earth Observing System (EOS) Data Information System (EOSDIS) Core System (ECS) capabilities are developed in terms of four formal releases. The first of the four formal releases include capabilities necessary to fully support the scheduled launch and ongoing operations for Tropical Rainfall Measurement Mission (TRMM), interface testing for Landsat-7, and command and control interface testing for AM-1. This first release, called Release A, supports data operations that follow at the EOS Operations Center (EOC), System Management Center (SMC) and three Distributed Active Archive Centers (DAACs). The DAACs that are activated for Release A are located at Goddard Space Flight Center (GSFC), Langley Research Center (LaRC), and the EROS Data Center (EDC).

3.1 Release A Capabilities

Release A of ECS supports the early operational stages of the Tropical Rainfall Measuring Mission (TRMM). Release A follows an earlier ECS delivery, referred to as Interim Release 1 (Ir1), which provided certain enterprise infrastructure in preparation for down stream deliveries. Ir1 also provided science software integration and testing capabilities. For Release A, the Ir1 configurations of GSFC, and LaRC are updated with major hardware and software deliveries while EDC, which is not part of TRMM operations, receives a minor update to support interface testing. Release A provides initial capabilities at the EOC and SMC, which include support to early interface testing and core FOS functionality. Table 3-1 summarizes the Ir1 capabilities and Release A enhancements.

Table 3-1. ECS Ir1 to Release A Enhancements

SITE	Release Ir1 Capabilities	New Release A Capabilities Deployed at Each Site
SMC	System Performance Monitoring	System Performance Monitoring and Analysis; WAN Management; and System Coordination
GSFC	TRMM Mission Support; VIRS Data Ingest, Ingest, Ancillary Data	TRMM Mission Support; VIRS Data Ingest, Archive & Distribution ; Ingest Ancillary Data; AM-1 Interface Testing; AM-1 MODIS Science Software I&T; VO Data Migration & Interoperability; TOMS Ozone Data Ingest and Archive; and System Resource Management
LaRC	TRMM Mission Support; TRMM CERES Data Ingest; NOAA Ancillary Data Ingest	TRMM Mission Support; TRMM CERES Data Ingest, Production, Archive & Distribution; Data Migration & Interoperability; AM-1 Interface Testing; NOAA Ancillary Data Ingest; TRMM & AM-1 CERES, and MISR and MOPITT Science Software I&T; SAGE Aerosol & Ozone Data, and ISCCP Data Ingest and Archive; and System Resource Management
EDC	Landsat-7 Interface Testing; Landsat-7 Level-OR Data Ingest	Landsat-7 Interface Testing; Landsat-7 Level-OR Data Ingest; ASTER/MODIS Science Software I&T; Ingest and Storage of Landsat-7 LOR data; and System Resource Management
EOC		AM-1 Interface Testing; ASTER GDS, SCF, NCC, EDOS, and FDF Interface Testing; core FOS functionality, and System Resource Management

3.2 Release A Acceptance Test Approach

The acceptance testing of Release A capabilities is divided into five major scenario groups: System Management, Push, Pull, Flight Operations, and End-to-End. These scenario groups identify high level ECS functionality from a users and operations viewpoint. Each group is sub-divided into scenarios that emulate the operations and user environment. Scenarios are further broken down into more manageable test sequences in which test procedures that trace to level 3 requirements are executed. The Requirements and Traceability Management (RTM) Tool is used for the purpose of tracking level 3 requirements' test status.

3.2.1 ECS Functional Tests

The complete set of ECS functions allocated to Release A are verified to ensure that the release meets those requirements needed to support TRMM and provide core functionality for the AM-1 missions. This includes verifying requirements for all features needed to support the ECS Release objectives for spacecraft operations and control, scheduling, data operations, information management and archive, science processing, networks, and system management.

Acceptance testing include the verification of certain ECS features needed to support TRMM. These features are: the ingest, archive processing, and distribution of Level-1 through Level-3 of Precipitation Radar (PR), TRMM Microwave Imager (TMI), and Visible Infrared Scanner (VIRS) instrument data; and TRMM Ground Validation (GV) data transmitted from the TSDIS, which is a production system provided by the TRMM project. Additional features include the ingest, archive, product generation, and distribution of TRMM CERES and LIS instrument data received from the SDPF.

3.2.2 Interface Acceptance Tests

Acceptance testing verifies system compliance to level 3 requirements by focusing on the objectives and capabilities specified for Release A. These capabilities are tested for functionality and performance within the boundaries of the interfaces defined for the release. The external boundary of ECS is typically at communications, data medium or graphic interfaces. For communications, these interfaces act as conduits through which input (Level-0) and output data (Level-1, Level-2, etc.), and stimuli (commands, requests, etc.) and responses (acknowledgments, data, etc.) flow. The communications interfaces to be verified for Release A include National Aeronautics and Space Administration (NASA) Science Internet (NSI), NASA Communications (NASCOM) Operational Local Area Network (NOLAN), and EOSDIS Backbone network (EBnet) where they terminate at the applicable ECS sites. At the ECS, these interfaces are physically located at the SMC and EOC; and the ECS GSFC, LaRC and EDC DAAC sites. The communications networks that are connected to the ECS terminate at two classes of external systems: data providers (whose science data are later referred to as push data) and data users (whose requests result in what later are referred to as pull data). The data providers for Release A are the Sensor Data Processing Facility (SDPF), ECS Data and Operation System (EDOS), Flight Dynamics Facility (FDF), Network Communications Center (NCC), the Landsat Processing System (LPS), and the TRMM Science Data and Information System (TSDIS). The data users for TRMM are the science user community at the DAACs and the SCFs. The node chart in Figure 3-1 depicts the interconnection of external systems with ECS. A summary of the content and carriers associated with the data flowing across ECS interfaces is shown in Table 3-2. A more complete account of each interface may be found in Interface Control Documents 209/SE1-001 through 020.

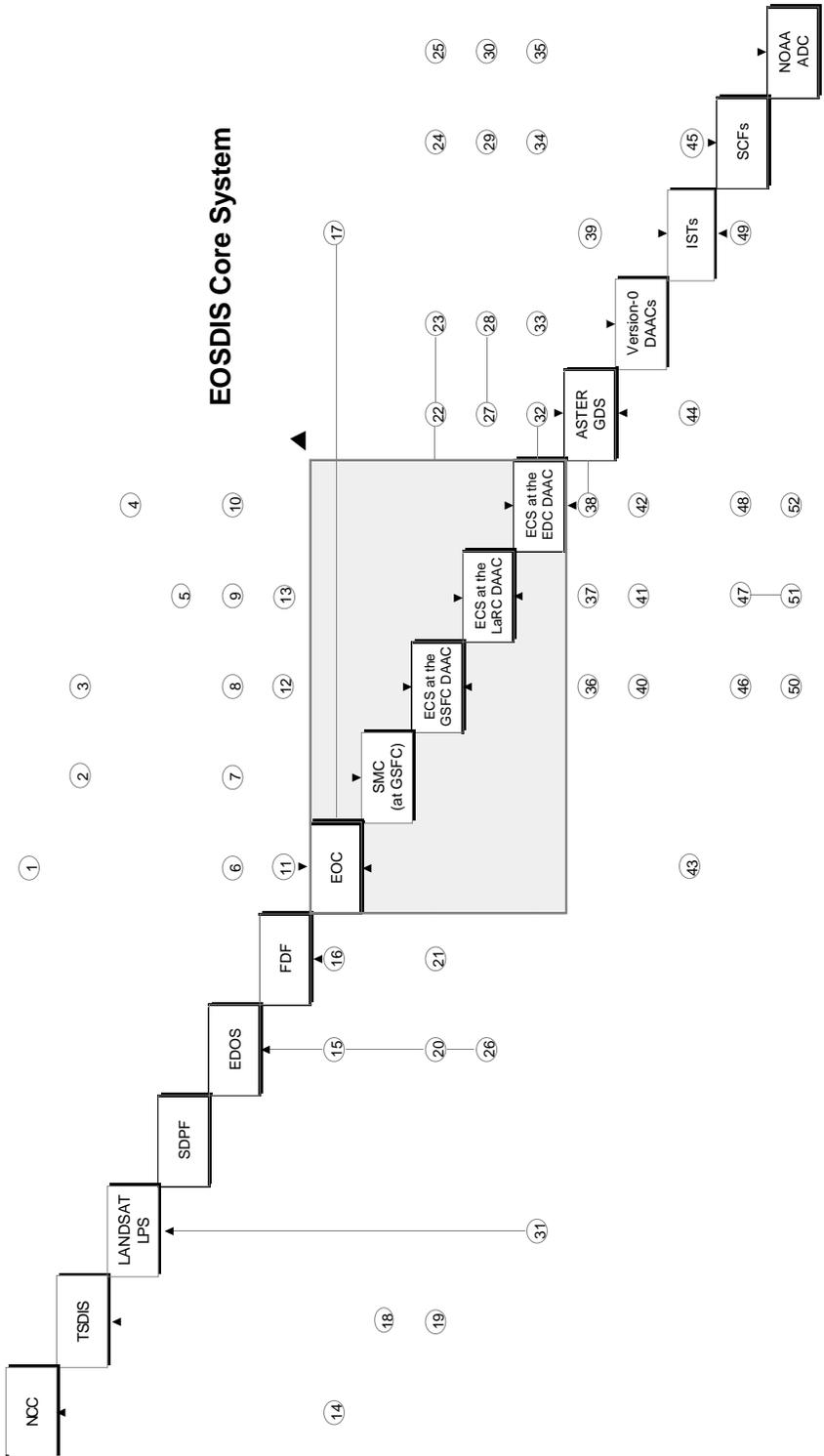


Figure 3-1. ECS Release A Interfaces with the EOS Ground System

Table 3-2. ECS Release A Data Flow Interfaces (1 of 7)

Node	Mission	Source	Destination	Carrier/Media	Data Content	Source	Date
1	AM-1	NCC	EOC	EBnet	GCM status and disposition messages.	305-CD-040-001 530-ICD-NCCDS/ MOC, Annex 4 329-CD-001-003	Oct-95 Sep-95 Oct-95
2	TRMM	TSDIS	SMC at GSFC	Email/ Phone	Schedule Coordination & Adjudication for Data Exchange with DAACs; and Status Information.	209-CD-007-001 Section 4	Jan-95
3	TRMM	TSDIS	ECS at the GSFC DAAC	Exchange LAN	Levels 1A to 3 TMI, PR, GV, VIRS and Combined Data Products, Browse Products, and Metadata; Updated Metadata; TMI, PR, GV, VIRS, Combined Algorithms and Documentation; Reprocessing Product Schedules, and Delayed Product Status; Request for Ancillary Data.	209-CD-007-004 Figure 5-1	May-96
4	Landsat-7	Landsat LPS	ECS at the EDC DAAC	Landsat Network	Data Availability Notice; Level 0R Data; Level 0R Inventory Metadata; Level 0R Browse.	209-CD-013-003 Table 3-1	Mar-96
5	TRMM	SDPF	ECS at the LaRC DAAC	EBnet	Quicklook Data Product; Level-0 Data Products; Ephemeris Data File.	510-203.103 Table 10-3	Apr-96
6	AM-1	EDOS	EOC	EBnet	Spacecraft and instrument real time housekeeping and health and safety telemetry; Real-time and rate-buffered.	510-ICD-EDOS Table 4.2.2-1 307-CD-001-003 329-CD-001-003	Jan-96 Oct-95 Oct-95
7	AM-1	EDOS	SMC at GSFC	EBnet	Summary Performance Report.	510-ICD-EDOS/EGS	Jan-96
8	AM-1	EDOS	ECS at the GSFC DAAC	EBnet	Service Request Disposition; PDSs (Level-0 data); ADSs (Back-up Level-0 Data); PDS and ADS Delivery Records; Physical Media Unit Delivery Record; Undetected Fault Isolation.	305-CD-014-001 Table 3.2-1	Jul-95
9	AM-1	EDOS	ECS at the LaRC DAAC	EBnet	Service Request Disposition; PDSs (Level-0 data); PDS Delivery Record; Undetected Fault Isolation.	305-CD-015-001 Table 3.2-1	Jul-95
10	AM-1	EDOS	ECS at the EDC DAAC	EBnet	Level-0; Quick Look, Status; and Coordination Data.	222-TP-003-005 Section 5	Dec-94
11	AM-1	FDF	EOC	EBnet	Basic connectivity test messages.	307-CD-001-003 329-CD-001-003	Oct-95 Oct 95
12	AM-1	FDF	ECS at the GSFC DAAC	NOLAN	Repaired Orbit Data.	305-CD-014-001 Table 3.2-1	Jul-95

Table 3-2. ECS Release A Data Flow Interfaces (2 of 7)

Node	Mission	Source	Destination	Carrier/Media	Data Content	Source	Date
13	AM-1	FDF	ECS at the LaRC DAAC	NOLAN	Refined Orbit/Attitude data.	305-CD-015-001 Table 3.2-1	Jul-95
14	AM-1	EOC	NCC	EBnet	Ground Configuration Message Requests.	305-CD-040-001 530-ICD-NCCDS/ MOC, Annex 4 329-CD-001-003	Oct-95 Sep-95 Oct-95
15	AM-1	EOC	EDOS	EBnet	Spacecraft and instrument commands.	510-ICD-EDOS Table 4.2.2-1 307-CD-001-003 329-CD-001-003	Jan-96 Oct-95 Oct-95
16	AM-1	EOC	FDF	EBnet	Basic connectivity test messages.	307-CD-001-003 329-CD-001-003	Oct-95 Oct-95
17	AM-1	EOC	ISTs	NSI	Spacecraft and instrument telemetry.	305-CD-040-001 307-CD-001-003 329-CD-001-003	Oct-95 Oct-95 Oct-95
18	TRMM	SMC at GSFC	TSDIS	Email/ Phone	Schedule Coordination & Adjudication for Data Exchange with DAACs; and Status Information.	209-CD-007-001 Section 4	Jan-95
19	TRMM	ECS at the GSFC DAAC	TSDIS	Exchange LAN	Levels 1A to 3 TMI, PR, GV, VIRS, and Combined Data Products for Reprocessing; Ancillary Data for Processing and Reprocessing; TRMM Orbit Ephemeris; TRMM Level-0 Housekeeping data.	209-CD-007-004 Figure 5-1	May-96
20	AM-1	ECS at the GSFC DAAC	EDOS	EBnet	Service Requests (Back-up data requests); Fault report; Fault Isolation Request; Level-0 data.	305-CD-014-001 Table 3.2-1	Jul-95
21	AM-1	ECS at the GSFC DAAC	FDF	NOLAN	Repaired/Retained Orbit Data Request.	305-CD-014-001 Table 3.2-1	Jul-95
22	AM-1	ECS at the GSFC DAAC	ASTER GDS	NSI	Algorithms, Source Code, Documentation, SCF Interaction; Level 1 Data Products; Product Requests; Data Products; Status; System and Network Management; User Authentication, User Data Search & Request, User Product Requests, Status.	209-CD-002-003 Figure 3-1	Mar-96
23	All Missions	ECS at the GSFC DAAC	Version-0 DAACs	EBnet	Directory Search Requests; Inventory Search Requests; Acknowledgments; Browse Request; Product Request; Statistics; Quit; Pong.	209-CD-011-004 Figure 4-2	Mar-96

Table 3-2. ECS Release A Data Flow Interfaces (3 of 7)

Node	Mission	Source	Destination	Carrier/Media	Data Content	Source	Date
24	AM-1	ECS at the GSFC DAAC	SCFs	NSI	ECS Software Package; I & T Requirements; Science Software Integration Test Status; Data Availability notices; Operational Science Data Production Software Package; Test Product Availability Message during Software I & T; QA Notification Specification Acknowledgement; Data Quality Request Notification; Data Delivered for QA; Processing Status; Resource usage; Reprocessing Request Acknowledgement; Product history.	209-CD-005-005 Figure 3.1-1	Mar-96
25	AM-1	ECS at the GSFC DAAC	NOAA ADC	NSI	Inventory Search; Browse Request; Product Request; Guide Search.	209-CD-006-005 Figure 5-1	Mar-96
26	AM-1	ECS at the LaRC DAAC	EDOS	Ebnet	Fault report; Fault Isolation Request; Level-0 data.	305-CD-015-001 Table 3.2-1	Jul-95
27	AM-1	ECS at the LaRC DAAC	ASTER GDS	NSI	Algorithms, Source Code, Documentation, SCF Interaction; Level 1 Data Products; Product Requests; Data Products; Status; System and Network Management; User Authentication, User Data Search & Request, User Product Requests, Status.	209-CD-002-003 Figure 3-1	Mar-96
28	All Missions	ECS at the LaRC DAAC	Version-0 DAACs	EBnet	Directory Search Requests; Inventory Search Requests; Acknowledgments; Browse Request; Product Request; Statistics; Quit; Pong.	209-CD-011-004 Figure 4-2	Mar-96

Table 3-2. ECS Release A Data Flow Interfaces (4 of 7)

Node	Mission	Source	Destination	Carrier/Media	Data Content	Source	Date
29	AM-1	ECS at the LaRC DAAC	SCFs	NSI	ECS Software Package; I & T Requirements; Science Software Integration Test Status; Data Availability notices; Operational Science Data Production Software Package; Test Product Availability Message during Software I & T; QA Notification Specification Acknowledgement; Data Quality Request Notification; Data Delivered for QA; Processing Status; Resource usage; Reprocessing Request Acknowledgement; Product history.	209-CD-005-005 Figure 3.1-1	Mar-96
30	AM-1	ECS at the LaRC DAAC	NOAA ADC	NSI	Inventory Search; Browse Request; Product Request; Guide Search.	209-CD-006-005 Figure 5-1	Mar-96
31	Landsat-7	ECS at the EDC DAAC	Landsat LPS	Landsat Network	Data Transfer Acknowledgment.	209-CD-013-003 Table 3-1	Mar-96
32	AM-1	ECS at the EDC DAAC	ASTER GDS	NSI	Algorithms, Source Code, Documentation, SCF Interaction; Level 1 Data Products; Product Requests; Data Products; Status; System and Network Management; User Authentication, User Data Search & Request, User Product Requests, Status.	209-CD-002-003 Figure 3-1	Mar-96
33	All Missions	ECS at the EDC DAAC	Version-0 DAACs	EBnet	Directory Search Requests; Inventory Search Requests; Acknowledgments; Browse Request; Product Request; Statistics; Quit; Pong.	209-CD-011-004 Figure 4-2	Mar-96

Table 3-2. ECS Release A Data Flow Interfaces (5 of 7)

Node	Mission	Source	Destination	Carrier/Media	Data Content	Source	Date
34	AM-1	ECS at the EDC DAAC	SCFs	NSI	ECS Software Package; I & T Requirements; Science Software Integration Test Status; Data Availability notices; Operational Science Data Production Software Package; Test Product Availability Message during Software I & T; QA Notification Specification Acknowledgement; Data Quality Request Notification; Data Delivered for QA; Processing Status; Resource usage; Reprocessing Request Acknowledgement; Product history.	209-CD-005-005 Figure 3.1-1	Mar-96
35	AM-1	ECS at the EDC DAAC	NOAA ADC	NSI	Inventory Search; Browse Request; Product Request; Guide Search.	209-CD-006-005 Figure 5-1	Mar-96
36	AM-1	ASTER GDS	ECS at the GSFC DAAC	NSI	Algorithms, Source Code, Documentation, SCF Interaction; Level 1 Data Products; Product Requests; Data Products; Status; System and Network Management; User Authentication, User Data Search & Request, User Product Requests, Status.	209-CD-002-003 Figure 3-1	Mar-96
37	AM-1	ASTER GDS	ECS at the LaRC DAAC	NSI	Algorithms, Source Code, Documentation, SCF Interaction; Level 1 Data Products; Product Requests; Data Products; Status; System and Network Management; User Authentication, User Data Search & Request, User Product Requests, Status.	209-CD-002-003 Figure 3-1	Mar-96
38	AM-1	ASTER GDS	ECS at the EDC DAAC	Tape	Algorithms, Source Code, Documentation, SCF Interaction; Level 1 Data Products; Product Requests; Data Products; Status; System and Network Management; User Authentication, User Data Search & Request, User Product Requests, Status.	209-CD-002-003 Figure 3-1	Mar-96
39	AM-1	ASTER GDS	ISTs (ASTER only)	ASTER LAN	One-day schedule; Short-term schedule.	209-CD-002-003 307-CD-001-003 329-CD-001-003	Mar-96 Oct-95 Oct-95

Table 3-2. ECS Release A Data Flow Interfaces (6 of 7)

Node	Mission	Source	Destination	Carrier/Media	Data Content	Source	Date
40	All Missions	Version-0 DAACs	ECS at the GSFC DAAC	Ebnet	Directory Search Results; Inventory Search Results; ftp and Integrated Browse Results; Product Results; Quit; Pong; NCEP Ancillary data.	209-CD-011-004 Figure 4-2	Mar-96
41	All Missions	Version-0 DAACs	ECS at the LaRC DAAC	EBnet	Directory Search Results; Inventory Search Results; ftp and Integrated Browse Results; Product Results; Quit; Pong.	209-CD-011-004 Figure 4-2	Mar-96
42	All Missions	Version-0 DAACs	ECS at the EDC DAAC	EBnet	Directory Search Results; Inventory Search Results; ftp and Integrated Browse Results; Product Results; Quit; Pong.	209-CD-011-004 Figure 4-2	Mar-96
43	AM-1	ISTs	EOC	NSI, EBnet for ASTER IST	Instrument planning, Instrument Microprocessor Memory Loads.	305-CD-040-001 307-CD-001-003 329-CD-001-003	Oct-95 Oct-95 Oct-95
44	AM-1	ISTs (ASTER only)	ASTER GDS	ASTER LAN	Basic connectivity test messages.	307-CD-001-003 329-CD-001-003	Oct-95 Oct-95
45	AM-1	ISTs	SCFs	Site Campus Networks	Instrument Analysis Results.	305-CD-040-001 307-CD-001-003 329-CD-001-003	Oct-95 Oct-95 Oct-95
46	AM-1	SCFs	ECS at the GSFC DAAC	NSI	Algorithms; Remote Access Session Dialog; Request for Operational Data Production Software Package; Request for Test Products after Software Integration and Test; Test Product Reviews; QA Notification Specification; QA Metadata Updates; Request for Processing Status; Request for Resource Usage; Reprocessing Requests.	209-CD-005-005 Figure 3.1-1	Mar-96
47	AM-1	SCFs	ECS at the LaRC DAAC	NSI	Algorithms; Remote Access Session Dialog; Request for Operational Data Production Software Package; Request for Test Products after Software Integration and Test; Test Product Reviews; QA Notification Specification; QA Metadata Updates; Request for Processing Status; Request for Resource Usage; Reprocessing Requests.	209-CD-005-005 Figure 3.1-1	Mar-96

Table 3-2. ECS Release A Data Flow Interfaces (7 of 7)

Node	Mission	Source	Destination	Carrier/Media	Data Content	Source	Date
48	AM-1	SCFs	ECS at the EDC DAAC	NSI	Algorithms; Remote Access Session Dialog; Request for Operational Data Production Software Package; Request for Test Products after Software Integration and Test; Test Product Reviews; QA Notification Specification; QA Metadata Updates; Request for Processing Status; Request for Resource Usage; Reprocessing Requests.	209-CD-005-005 Figure 3.1-1	Mar-96
49	AM-1	SCFs	ISTs	Site Campus Networks	Instrument Microprocessor Memory Loads.	305-CD-040-001 307-CD-001-003 329-CD-001-003	Oct-95 Oct-95 Oct-95
50	AM-1	NOAA ADC	ECS at the GSFC DAAC	NSI	Advertising Information; Dependent Valid Update; Inventory Search Result; Integrated Browse Result; FTP Browse Result; Product Result Message; Guide Result; NCEP Ancillary data.	209-CD-006-005 Figure 5-1	Mar-96
51	AM-1	NOAA ADC	ECS at the LaRC DAAC	NSI	Advertising Information; Dependent Valid Update; Inventory Search Result; Integrated Browse Result; FTP Browse Result; Product Result Message; Guide Result.	209-CD-006-005 Figure 5-1	Mar-96
52	AM-1	NOAA ADC	ECS at the EDC DAAC	NSI	Advertising Information; Dependent Valid Update; Inventory Search Result; Integrated Browse Result; FTP Browse Result; Product Result Message; Guide Result.	209-CD-006-005 Figure 5-1	Mar-96

The capability of the ECS to communicate and transfer data over the external interfaces in accordance with the F&PRS and applicable IRDs are verified during acceptance tests. Data content flowing across Release A interfaces include TRMM data from SDPF and simulated AM-1 data from EDOS; ancillary data from NOAA and FDF; schedule data to/from SDPF, ground configuration messages to/from NCC, Level-1 through Level-3 TRMM data from TSDIS; Landsat-7 Level-0, metadata and browse data from the Landsat LPS; and selected Level-0 through Level-4 to the SCFs. The context chart in Figure 3-2 graphically depicts Release A key interfaces between GSFC and LaRC. The context chart in Figure 3-3 graphically depicts the Release A Landsat-7 and AM-1 key interfaces. The capability of the ECS to provide TRMM pre-launch ground system end-to-end test support, and AM-1 and Landsat-7 interface testing support are verified in acceptance tests for Release A. Tests to verify two-way inter-operability with the Version-0 system and

migration and/or access of Version 0 data archives are also conducted as well as one-way interoperability with NOAA.

Command and control interfaces to support AM-1 early interface testing are conducted. These tests include EOC planning, scheduling, command, control and monitoring of the AM-1 spacecraft; and CSMS system management and communications infrastructure.

The interfaces needed to support early Landsat-7 interface testing are also verified. These interfaces are those needed for: the receipt and storage of Landsat-7 level-0R data (viewable image data with radiometric and geometric information appended but not applied) at the EDC DAAC and the receipt and storage of Landsat-7 metadata and browse data at the EDC DAAC.

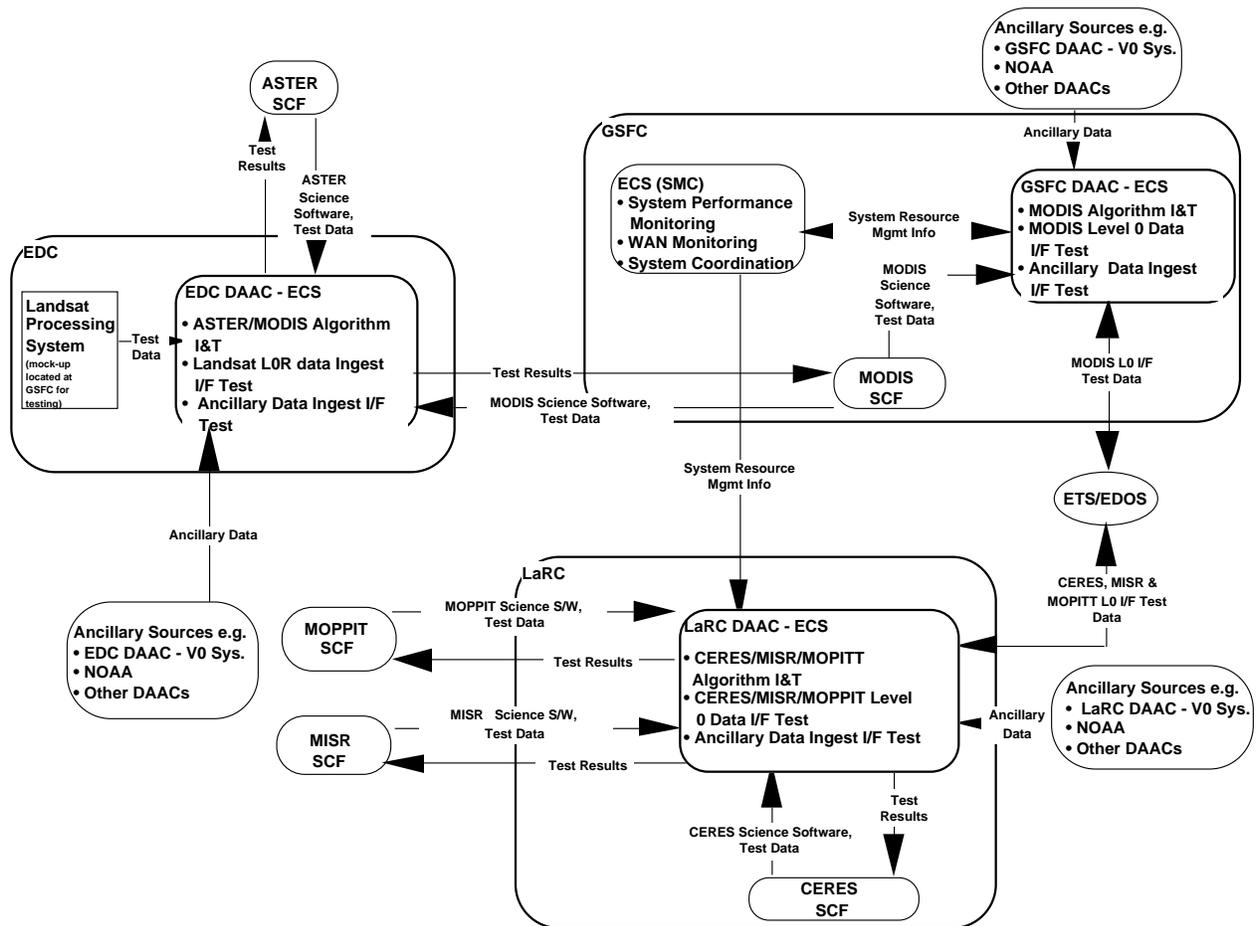


Figure 3-2. Release A Key Interfaces Between GSFC and LaRC

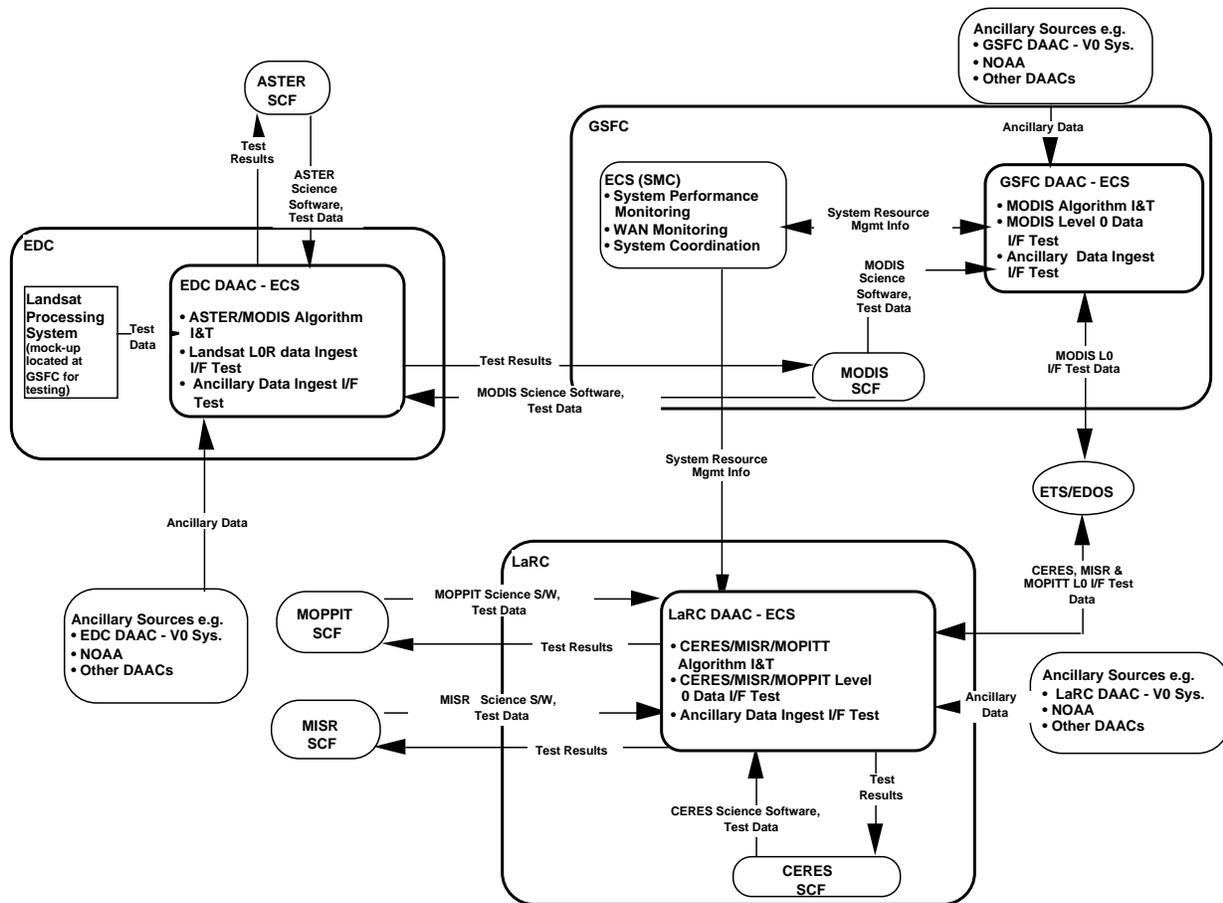


Figure 3-3. Release A Landsat-7 and AM-1 Key Interfaces

3.3 Acceptance Test Roles and Responsibilities

Acceptance testing is a formal process that requires the coordination of different organizations. Each organization has well defined roles and responsibilities for the acceptance testing process:

Independent Acceptance Test Organization (IATO): The IATO assigns a test manager to coordinate and run acceptance testing. The IATO also provides test conductors to execute the step-by-step procedures that are defined in the ATPr. Test conductors also write, collect, and track nonconformance reports and determine the impact of these reports on test plans, scenarios, test cases, and procedures.

Quality Office (QO): The QO provides a representative to witness the execution of acceptance testing. The QO also tracks the status of nonconformance reports and reviews them prior to closure to ensure that the required actions have been completed.

Configuration and Data Management Organization: The Configuration Management Office (CMO) coordinates with the IATO to capture the test configuration of software, hardware, test data, test tools, and documentation prior to test execution to ensure repeatability. They also capture and retain test outputs (e.g., test logs, data, and modified procedures) and distribute copies for test analysis. The product baseline, which is established prior to the RRR and includes test reports, is maintained by the CMO.

ECS Maintenance & Operations (M&O) Organization: As part of acceptance testing at the test site, the site manager assigns M&O personnel who are integrated into the test team to help execute acceptance tests. The early first-hand involvement of the site manager and his operations personnel in site acceptance testing provides the M&O Team with early visibility into each new release and hastens a smooth transition. This involvement and familiarity with ECS software in the stages before release to the user base greatly enhance the effectiveness and productivity of the M&O staff and positions a highly competent and responsive user support staff on-site at the DAACs. In addition, during the M&O phase, the IATO assists by providing benchmark tests to verify operational performance of the ECS system. The IATO provides guidance in acceptance testing during the verification of approved changes and enhancements.

ESDIS SI&T Contractor: The ESDIS Integration Contractor and the Independent Verification and Validation (IV&V) Contractor witness and monitors acceptance testing, as directed by the ESDIS SI&T, and the IV&V Contractor.

The Acceptance Test Team (ATT) consists of various personnel who assist the IATO Test Conductor during the acceptance testing phases. Listed below are the DAAC role players and a brief description of their responsibilities.

DAAC M&O Staff: Performs maintenance and operations activities, including hardware installations.

Network Analyst (NA): Performs network functions, including monitoring the network's performance and integrity.

Performance Manager (PM): Addresses system performance issues and concerns.

Resource Manager (RM): Manages ECS site resources.

System Administrator (SA): Performs overall system maintenance, including system backups and software upgrades.

Data Pull Technician: Manages ingest, pull and processing activities. (DAAC)

Production Planner: Populates and maintains the production planning database. (DAAC)

Production Scheduler: Reviews, approves and activates the daily production schedule. (DAAC)

Data Ingest Technician: Oversees ingest activities including the handling of physical media (e.g., mounting tapes) from which input data are read. Responsibilities also includes

verifying that all data reported on data availability schedules, product delivery notices, etc. are received, validated, accounted for, and archived. (DAAC)

Data Distribution Technician: Oversees distribution activities including handling of physical media (e.g., mounting tapes) onto which ECS data are written. (DAAC)

Science Software Integration Test Team (SSITT): Verifies that any and all updates to science software are thoroughly tested and verified before being permanently installed at the DAACs.

Listed below are the EOC role players and a brief description of their responsibilities.

Flight Operations Team (FOT): Executes activities performed at the EOC workstations including system initialization, scheduling, commanding, telemetry, and analysis activities. This team consists of the FOT Planner/Scheduler, FOT Operations Coordinator, FOT Spacecraft Activity Controller, FOT Spacecraft Evaluator, and FOT Instrument Evaluator. Listed below is a brief description of responsibilities.

FOT Planner/Scheduler -- Performs spacecraft and instrument command loading and schedule generation. This includes receiving planning and scheduling requests, instrument microprocessor memory loads, and command activity definitions from the Instrument Operations Teams (IOTs).

FOT Operations Coordinator -- Coordinates operational tests and deliveries of FOS software and the project database.

FOT Spacecraft Activity Controller -- Responsible for EOC ground system elements, hardware, software, communications links, command capability, and Local Site Manager (LSM) functions. This includes controlling and verifying ground script execution, verifying commands and load contents, transmitting and verifying commands and load uplinks, and monitoring ground system performance.

FOT Operations Controller -- Responsible for real-time interface coordination, approving real-time command uplinks, and resolving real-time anomalies.

FOT Spacecraft Evaluator -- Monitors spacecraft subsystems during real-time operations and assists in spacecraft trend analysis and anomaly recognition and resolution. This includes reviewing spacecraft activity logs and monitoring ground script execution, spacecraft command activity, and spacecraft health and safety.

FOT Instrument Evaluator -- Monitors and analyzes instruments during real-time operations and assists in instrument trend analysis and anomaly recognition and resolution. This includes reviewing activity logs and monitoring ground script execution, instrument command activity, and instrument health and safety.

FOT Database Manager -- Responsible for database administration of the project database and operational data files (ODFs), maintaining database access, validating user access/privileges, and investigating/documenting violations.

Instrument Operations Team (IOT) -- Executes activities performed at the CERES, MISR, MODIS, MOPITT and ASTER instrument workstations. This team consists of the IOT Planner/Scheduler and IOT Instrument Evaluator. These positions are not necessarily the actual positions utilized at Instrument Support Terminals (ISTs), but rather they represent the two major FOS-related roles accomplished at ISTs.

IOT Planner/Scheduler -- Provides the FOT with planning and scheduling requests, instrument microprocessor memory loads, and command activity definitions.

IOT Instrument Evaluator -- Performs real-time instrument command and telemetry monitoring and analysis. Responsible for instrument anomaly detection and contingency procedure execution, instrument command load validation, and instrument performance and trend analysis.

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4. Test Tools

This section identifies and describes the test tools (COTS and custom coded software) used in the execution of the Release A ECS Acceptance Test and the generation of data sets. The tools for requirements traceability, computer aided software test and performance, configuration management, network status and monitoring, and external interface simulators are discussed below. Table 4-1 summarizes the test tool suite available for Release A acceptance tests. Figure 4-1 shows the test tool categories used to exercise Release A acceptance tests.

Table 4-1. Release A Test Tool Descriptions

TYPE	TOOL	DESCRIPTION
Requirements Traceability Tool	RTM	The Requirements and Traceability Management tool provides an audit trail that enables multiple requirements to be traced.
Capture and Playback Tool	XRunner	XRunner is an automated software testing system for X window applications. XRunner automates the full range of software testing needs. Some of the gained functionality includes: output synchronization, text recognition, and a high-level testing mode that operates directly on GUI objects.
Automated Client/Server Testing System	Load Runner	LoadRunner is an automated testing system for client/server applications on UNIX/X platforms. By running multiple users in parallel off the server, LoadRunner enables the automation of load testing, performance testing, and system tuning.
Configuration Management Tool	Clear Case	Clear Case uses Version Object Base (VOB) to store the software versions. A VOB is a virtual directory tree of sources and other objects that is mounted like a disk partition. A project may have many VOBs. Any changes made by the developer after the software has been frozen will be conducted on a branch. The test organizations are responsible for merging the fixes (branches).
Nonconformance Reporting and Corrective Action Tool	DDTS	DDTS is a UNIX change management and bug tracking system that racks and manages changes throughout the life cycle of a hardware or software product from initial requirements planning to obsolescence in the field. DDTS works in conjunction with ClearCase.
Network Management Framework	HP Open View	HP OpenView is used to monitor any device that supports the Simple Network Management Protocol (SNMP). This tool will aid us in determining the status of the network and the devices on the network.
Network Analyzer/Monitor	Network Analyzer/ Sniffer	The Sniffer Network Analyzer assist in performance testing and monitors and generates traffic on Ethernet and FDDI networks.
Network Performance Tool	Netperf	Netperf is a benchmark tool which measures various aspects of network performance, primarily focusing on bulk data transfer and request/response performance using either the TCP or UDP and the Berkeley Sockets interface.
Source Simulator	TRMM/ TSDIS I/F Simulator	The TRMM I/F Simulator provides the basic protocol and interface functions employed by the SDPF/TSDIS.
EOSDIS Test System	ETS	ETS provides the capabilities to simulate EOS AM-1 spacecraft and instrument low rate telemetry data and high rate science data for the EOC and DAACs. The ETS also simulates the EDOS interface with the ECS.

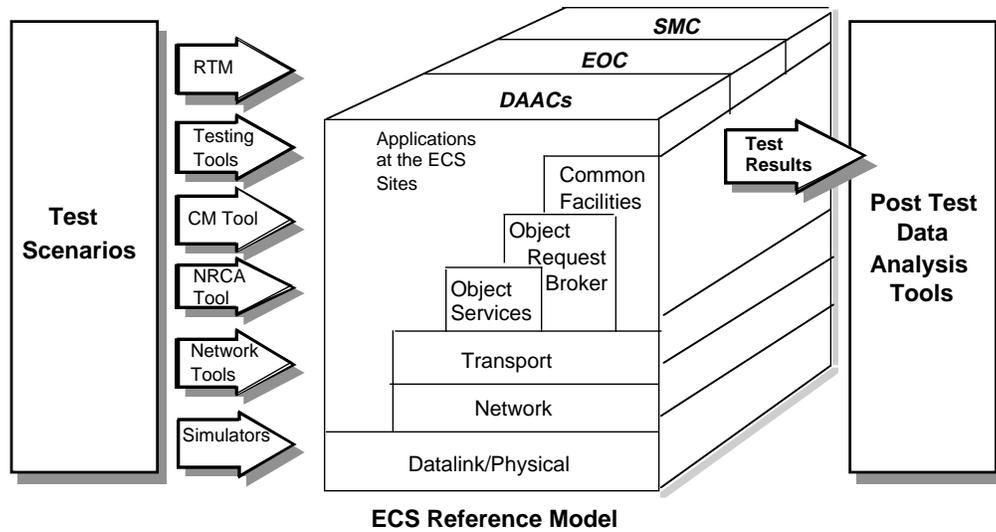


Figure 4-1. Release A Test Tool Integration

4.1 Requirements Traceability

The Requirements and Traceability Management (RTM) tools provides an audit trail for ECS requirements. This data dictionary provides definitions of classes and attributes in RTM database. Figure 4-2 depicts the RTM Class Definition and Table 4-2 provides a definition of each class.

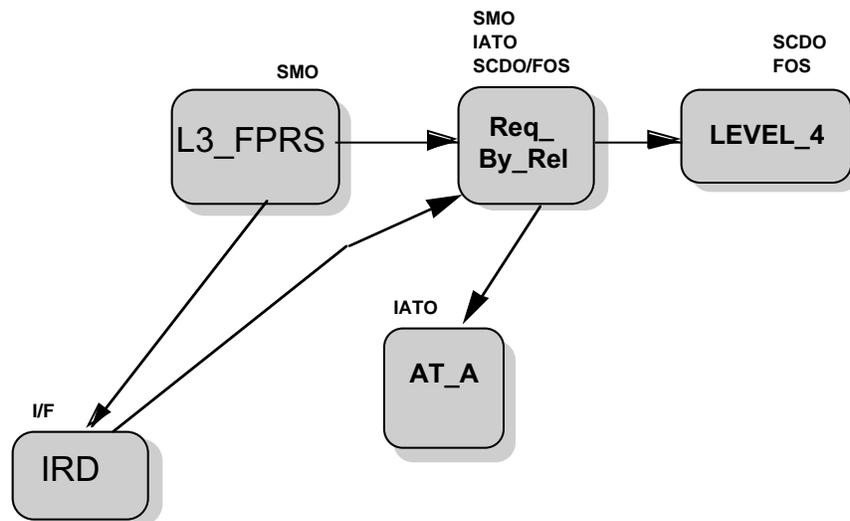


Figure 4-2. RTM Classes

Table 4.2 RTM Class Definitions

CLASS	DEFINITION
L3_FPRS	Contains the Level 3, Functional and Performance Requirements Specifications received from GSFC 07/94 (423-41-02). Objects in this class can be mapped to objects in LEVEL_2, IRD, itself, and REQ_BY_REL classes. All relationships are defined as many-to-many relationship.
REQ_BY_REL	Contains requirements allocated for each formal release and are expanded from L3_FPRS and IRD classes. It is used by development engineers to develop the Level 4 requirements. Objects in this class are mapped to objects in LEVEL_4, CCR, IRD, L3_FPRS, AT_A, AT_B, IT_Ir1, IT_A, IT_B, and IT_FOS classes. All relationships are defined as many-to-many relationships.
LEVEL_4	Contains Level 4 requirements which were expanded from the REQ_BY_REL class. Objects in this class are mapped to objects in REQ_BY_REL, IT_FOS, IT_A, IT_Ir1, IT_B, COTS, CCR, and COMPONENT classes. All relationships are defined as many-to-many relationship.
AT_A	Contains the system acceptance test sequences and test cases for A as identified in Acceptance Test Plan (ATP) and Acceptance Test Procedures. Objects in this class are mapped to objects in REQ_BY_REL class. Relationship between two classes is defined as many-to-many relationship.
IRD	Contains external interface requirements specified in Interface Requirements Documents (IRDs). Objects in this class are mapped to objects in L3_FPRS, CCR, and REQ_BY_REL classes. All relationships between classes are defined as many-to-many relationship.

4.2 Computer Aided Software Test and Performance Tools

The Mercury XRunner and LoadRunner are computer aided software test and performance test tools used to assist in the automation of testing. XRunner is designed to automate the test process by capturing, in a script file, keyboard, mouse input and system under test (SUT) responses, and then playing back those inputs and comparing the results to those stored in an expected results directory. LoadRunner is used to simulate a large number of actual users, in order to measure the response time of a server in a client/server application. Both tools offer sophisticated programming capabilities through a C based language called Test Script Language (TSL), that can be used to drive the system under test much more extensively than would be possible with manual testing. It also offers the virtue of repeating the test sequence with fidelity. The XRunner and LoadRunner tools also provide very reliable playback of user input. Specific usage of XRunner and LoadRunner in ECS acceptance tests are discussed below.

4.2.1 XRunner Usage

The primary use of the XRunner tool is the automation of functional tests that involve heavy use of graphical user interfaces. Examples of such user interfaces are the Release A desktop Graphical User Interface (GUI), DAAC or SMC operator screens, and EOC operator screens.

4.2.2 LoadRunner Usage

LoadRunner is utilized for all response time testing that involves the Release A desktop GUI and during End-to-End tests that involve large numbers of test and operations personnel at multiple sites.

4.2.3 Test Execution Reports

Upon completion of a test script execution, both XRunner and LoadRunner automatically generate test execution reports. LoadRunner generates performance graphs for analysis.

4.3 Configuration Management Tools

The ECS Configuration Management Organization (CMO) is responsible for the management and control of the Software Development Library (SDL), the Non-Conformance Reporting and Corrective Action (NRCA) System, and the baseline configuration management of hardware and software. The CMO uses two software tools to support its effort: ClearCase and Distributed Defect Tracking System (DDTS).

4.3.1 ClearCase

The CMO utilizes ClearCase to manage and control the SDL which is the central repository for ECS software including test verification items. ClearCase, an automated software tracking tool, manages multiple versions of evolving software components; tracks which versions were used in software builds; performs builds of individual programs or entire releases according to user-defined version specifications; and enforces site-specific development policies. ClearCase scripts are provided by CMO to be used throughout the software development life cycle in order to standardize and automate the tracking of the information in the SDL. The project instruction PI CM-1-019 Software Development Library, describes the SDL, the role of ClearCase in the SDL, and the associated ClearCase scripts.

The following test items are stored and baselined by the CMO, via the Software Turnover Process, as they are finalized.

- Verification documents, including test plans, procedures, scripts, and reports.
- Test data sets, software and hardware configuration, including test tools.
- Unit-tested components, data sets, Segment hardware configuration, and COTS software, as described in COTS Process Model, PI SD-1-013.
- Verified Segment/element threads and builds.
- Verified system builds
- Integration system build for a release.
- Evaluation of test results

The items are retrieved from the SDL, via ClearCase when required to perform various verification activities at the sites.

The ECS policies and procedures for baselining test items and retrieving test items from CMO is defined in PI CM-1-025, Software Development Handbook.

Since Acceptance Testing of the ECS is conducted within a baselined configured environment, ClearCase is installed at each test site; and CMO electronically deploys the binary files (executable) of ECS software, at each test site, from the ECS Development Facility (EDF). In order to maintain the integrity of the test script and test data, CMO deploys IATO's test scripts and test data, in the same manner they deploy ECS binary files. This allows the Acceptance Tester, at each test site, to maintain a baseline of changes to the test script and/or test data for the purpose of work around.

4.3.2 Distributed Defect Tracking System (DDTS)

The DDTS is a software tool used to support the NRCA system for the CMO. The DDTS records nonconformance's and reflects the progress of nonconformance Reports through resolution and captures necessary information to document that progress. Through the production of management reports, DDTS provides management visibility and metrics to insure that NCRs are being worked in a timely and effective manner. The policies and procedures governing the usage of DDTS on ECS are defined in the Non-Conformance Reporting project instruction (PI), SD-1-014.

The NRCA system is the process for identifying, investigating, and resolving problems with the ECS during development, integration, installation, and acceptance test. To facilitate disposition and resolution of problems, the NRCA system and its processes emphasize tracking of responsibility, effective communication and delegation of authority. The NRCA system utilizes the DDTS to record and track software nonconformances. DDTS is customized by ECS to accurately reflect the progress of NCRs through resolution and captures necessary information to document that progress. Through the production of management reports, DDTS provides management visibility and metrics to insure that NCRs are being worked in a timely and effective manner.

4.4 Network Status and Monitoring

The three network tools utilized in acceptance tests are the HP OpenView, Sniffer Network Analyzer, and Netperf. Each are described below.

4.4.1 HP OpenView

The HP OpenView is network tool which monitors and controls the entire network environment at each ECS site. As a diagnostic tool, it has the capability to isolate faults quickly. The tool, which resides on the Local System Management (LSM) at each ECS test site, allows the user to display a map of the network environment at that local site for the LSM and the maps of all sites at the SMC. These maps are real-time interactive graphical representations which allow the user to detect network problems as they occur without having to update or refresh the display screen, and to diagnose network connectivity. The tool allows the user to create submaps of the map which can be as small as a software component on the system. The Acceptance Test Team (ATT) utilizes this tool to introduce systems and/or network faults to the system.

4.4.2 Network Analyzer/Sniffer

The Network Analyzer/Sniffer is a performance testing tool which monitors and generates traffic on Ethernet and FDDI networks.

4.4.3 Netperf

Netperf is a benchmark tool which measures various aspects of network performance. It's primary focus is on bulk data transfer and request/response performance using either the TCP or UDP and the Berkeley Sockets interface.

4.5 External Interface Simulators

External interface simulators are used during acceptance testing when the real interfacing system is not available. For Release A, the simulators used for acceptance testing are described below.

4.5.1 TRMM Simulator (TRMMSIM)

The TRMM Simulator (TRMMSIM) is a subsystem of the DDF External Simulator (DESIM). The TRMMSIM provides the capability to test the ECS ability to ingest data from TSDIS and Pacor II (SDPF), and to send data to TSDIS. In order to perform these two tasks, the simulator consists of a consume part and a source part. The consume part of the simulator provides the capability to send a DAN and its associated data to, and receive a DAN and its associated data from an ECS DAAC.

The TRMMSIM operates in two modes, interactive and non-interactive. The interactive mode allows the user to modify and send message types (Authentication Response, DRVR, DDN, and DDA). This mode is useful when testing the interface for error handling. The non-interactive mode generates and sends the appropriate message type.

4.5.2 EOSDIS Test System (ETS)

The ETS is primarily designed to support ECS Release B and EOS Ground System (EGS) testing. For Release A, pending availability, the Low Rate System and the Multimode Portable Simulator is used for EOC testing. In this configuration, ETS provides simulated telemetry data.

4.6 Test Data

A variety of test data is required to exercise the Release A system at each site. This test data will be used in conjunction with the simulators described above to stimulate the system. Table 4-3 summarizes the missions, data sources and destinations and content required for Release A testing. Each of the site specific volumes contains detailed lists of test data sets.

Real test data provided by the instrument teams is used whenever possible. In situations where real data is not available, simulated data or similar heritage data is used for testing. The test data is validated and placed under configuration control prior to test execution.

Table 4-3. Release A Data Sources, Destination, and Data Content (1 of 2)

Mission	Source	Destination	Data Content	Test Data Source/Contact
AM-1	Aster GDS	ECS at the EDC DAAC	Algorithms; Level-1A&1B Data; Expedited Products; Product Status; and User Data Search&Order Dialog.	ESDIS Test Data Working Group
AM-1	Aster GDS	SMC at GSFC	Schedule; and Status Information.	ESDIS Test Data Working Group
AM-1	Aster GDS	EOC	Planning; Scheduling.	ESDIS Test Data Working Group
AM-1	EDOS	EOC	Real-Time Telemetry and Accounting.	ETS/GTSIM
AM-1	EDOS	ECS at the GSFC DAAC	Level-0;Expedited Telemetry, Status; and Coordination Data.	ETS/ESDIS Test Data Working Group
AM-1	EDOS	ECS at the LaRC DAAC	Level-0;Expedited Telemetry, Status; and Coordination Data.	ETS/ESDIS Test Data Working Group
AM-1	EDOS	ECS at the EDC DAAC	Level-0;Expedited Telemetry, Status; and Coordination Data.	ETS/ESDIS Test Data Working Group
AM-1	EDOS	SMC at GSFC	Status; and Coordination Data.	ETS/ESDIS Test Data Working Group
AM-1	FDF	EOC	Basic Connectivity Test Messages	TICTOC/FDF ENGINEERING ORG
AM-1	FDF	ECS at the LaRC DAAC	Repaired & Refined Orbit and Attitude Information.	TICTOC/FDF ENGINEERING ORG
AM-1	FDF	ECS at the EDC DAAC	Repaired & Refined Orbit and Attitude Information.	TICTOC/FDF ENGINEERING ORG
AM-1	FDF	ECS at the GSFC DAAC	Repaired & Refined Orbit and Attitude Information.	TICTOC/FDF ENGINEERING ORG
Landsat-7	Landsat LPS	ECS at the EDC DAAC	Directory & Guide Information; Level-0R Data.	VO DAACS
AM-1	NCC	EOC	Ground Configuration Messages	NCC Test System
TRMM	NOAA ADC	ECS at the GSFC DAAC	Ancillary and Correlative Data	Currently VO DAACS
Mission	Source	Destination	Data Content	Test Data Source/Contact
TRMM	NOAA ADC	ECS at the LaRC DAAC	Ancillary and Correlative Data.	Currently VO DAACS
TRMM	NOAA ADC	ECS at the EDC DAAC	Ancillary and Correlative Data.	Currently VO DAACS
AM-1	SCF	EOC	Instrument software loads.	ESDIS Test Data Working Group
AM-1	SCFs	ECS at the GSFC DAAC	Algorithms.	ESDIS Test Data Working Group
AM-1	SCFs	ECS at the LaRC DAAC	Algorithms.	ESDIS Test Data Working Group
AM-1	SCFs	ECS at the EDC DAAC	Algorithms, LANDSAT L0R Data	ESDIS Test Data Working Group
AM-1	SCFs	ECS at the LaRC DAAC	CERES higher level products	ESDIS Test Data Working Group

Table 4-3. Release A Data Sources, Destination, and Data Content (2 of 2)

Mission	Source	Destination	Data Content	Test Data Source/Contact
TRMM	SDPF	ECS at the LaRC DAAC	CERES Level-0, Housekeeping, Expedited Telemetry and Definitive Orbit Data.	ESDIS Test Data Working Group
TRMM	TSDIS	SMC at GSFC	Schedule Coordination & Adjudication for Data Exchange with DAACs; and Status Information	Internally Generated
TRMM	TSDIS	ECS at the GSFC DAAC	PR and TMI Level-1A through Level-3 Data Products; GV Data; Request For Ancillary/Correlative Data; and TRMM Product Delivery Schedules.	ESDIS via TRMM Project
TRMM	TSDIS	ECS at the GSFC DAAC	VIRS Level-1A through Level-3 Data Products; Request For Ancillary/Correlative Data; and TRMM Product Delivery Schedules.	ESDIS via TRMM Project
All Missions	Version-0 DAACs	ECS at the GSFC DAAC	Inter DAAC and Cross DAAC Communications; Inter-Operability; and Data Transfer.	VO DAACS
All Missions	Version-0 DAACs	ECS at the LaRC DAAC	Inter DAAC and Cross DAAC Communications; Inter-Operability; and Data Transfer.	VO DAACS
All Missions	Version-0 DAACs	ECS at the EDC DAAC	Inter DAAC and Cross DAAC Communications; Inter-Operability; and Data Transfer.	VO DAACS

5. Test Execution and Coordination

This section describes the process by which formal acceptance testing is managed at the site on a daily basis. The responsibilities of the test manager and test engineers are also described.

5.1 Acceptance Test Planning

Acceptance test planning is formally presented in the Verification Plan (DID 401/VE1), the Acceptance Testing Management Plan (DID 415/VE1) and the Acceptance Test Plan (DID 409/VE1). Both the ATP and ATPr documents reference the requirements verification matrix contained in the Verification Specification (DID 403/VE1). Contents of the Verification Specification are, in turn, imported from the requirements matrix data base maintained by the RTM tool. The Configuration Management activities related to transferring software code is described in the ECS Configuration Management Plan (DID 102/MG1) and the Configuration Management Procedures (DID 103/MG3).

Volumes 1-5 of the ECS System Acceptance Test Procedures provides the detailed test procedures for each site. Appendix A provides the template and data field descriptions for the test procedures format used in these sections. The sequence of activities that lead up to the completion of the Release A acceptance testing is shown in Figure 5-1. It shows the series of acceptance test activities that take place, how they relate to the major ECS reviews, and their relationship with the documents produced. It also shows the activities and their relationships with the System I&T, and Operations Phases of the Release A acceptance testing life cycle.

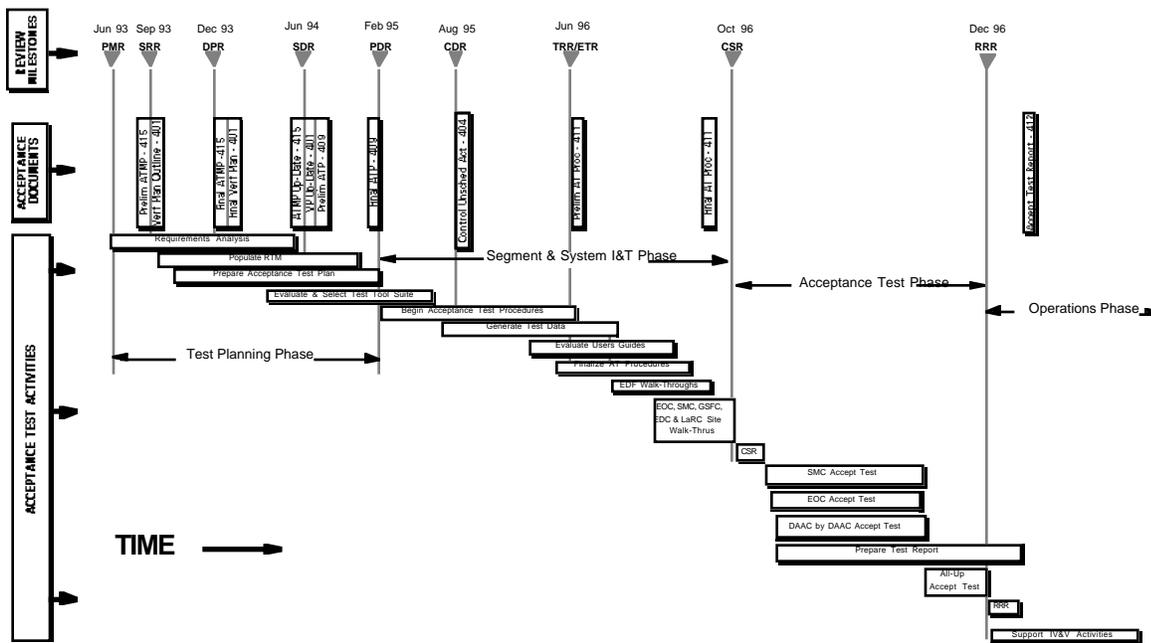


Figure 5-1. Release A Acceptance Test Life Cycle

5.2 Acceptance Test Preparation

The initial activities of acceptance test preparation are conducted at the ECS Development Facility (EDF). First, an inventory of the resources needed to perform acceptance tests is taken. Items inventoried include test input data, automated test tools, and technical documentation. If any required items are found to be missing or insufficient for acceptance test performance, corrective action is taken. Prior to CSR, walk-throughs of the entire Acceptance Test Procedure are conducted at the EDF to ensure proper format, contents, and completeness of the test scenarios and test plan. Additionally, concurrent with the execution of I&T, critical acceptance test sequences and test cases are executed by IATO against the I&T baseline to ensure that any major problems with either the Release, or the Acceptance Test Procedures and resources, are found at the EDF. During the EDF test activities, discrepancies are documented as NCRs. NCRs written during this time frame are controlled by the Release A CCB.

5.2.1 Software Pre-Install

Approximately 30 days prior to CSR, an ECS software pre-installation is performed at the applicable operational sites. The software used is a snapshot to the ECS system undergoing final system integration at the EDF. The pre-install serves as a pathfinder for the install of the formal delivery occurring after CSR. The activity is led by a development organization team consisting of developers and system I&T. Support is provided by configuration management and acceptance testing personnel, assisted by the M&O personnel already on site. A critical function of the pre-install is to perform the DAAC specific configuration of the ECS, such as verifying network addressing, enabling DAAC-unique functions, and tailoring COTS configuration files.

Discrepancies observed during the software pre-install are formally filed as NCRs. Changes to site-specific configuration files formulated as a result of pre-install are forwarded to the EDF for incorporation into the formal baseline. The formal installation of the release is accomplished at the sites immediately following CSR to support acceptance test implementation.

5.2.2 Release A Acceptance Test Readiness Reviews

In conjunction with CSR, Acceptance Test Readiness Reviews (ATTRs) are conducted at the applicable operational sites by the ECS Maintenance and Operations (M&O) organization. During this time, each site's readiness to receive Release A is assessed. The ATTR assesses plans for software installation and for conducting Acceptance Tests in parallel with on-going site operations.

5.2.3 Release A Consent to Ship Review

Before the shipment of ECS Release A to the operational sites, a CSR is held to address the readiness of the release for delivery to the operational sites for testing. The purpose of the CSR is to:

- Review the results of integration and test activities
- Review the approach for installation and test of the release at the operational sites to ensure that disruptions to ongoing operational services are minimal or nonexistent

- Review the status of test procedures for operational system integration and acceptance testing
- Determine the readiness of the equipment and staff at the operational sites for release installation

The CSR includes a review of the software pre-installs at the operational sites, and the acceptance test preparation activities at the EDF. CSR review items include:

- DID 324/405-I&T Report (preliminary)
- DID 411-Acceptance Test Procedures
- DID 512-Maintainability Demonstration Test Plan
- DID 521-CSR Tabulation of Non-conformance Reports
- DID 603-Operation Readiness Plan
- DID 609-Operations' Reference Manual
- DID 611-Mission Operations Procedures
- DID 625-Training Material

Based on the CSR presentation and the delivered CDRL documents, a recommendation is made to ESDIS to accept or reject Release A. ESDIS makes the formal decision to ship or not to ship the release.

5.3 Acceptance Test Implementation

Following a successful CSR, Release A is formally installed at the applicable operational sites. The formal installation replaces the pre-installation efforts. The formal installation of Release A includes custom code and commercial-off-the-shelf (COTS) software and, as applicable, executables, load modules, test data sets, test tools, and documentation. The formal installation at the operational sites is performed by the I&T organization, supported by the CMO and the M&O organization.

Prior to the execution of test scenarios at the test sites, three final checks are performed. The first check consists of a survey of the operational sites where the release is to be tested. This pre-test site check is to provide confidence that each operational site is properly configured for formal acceptance testing. The next pre-test check consists of performing a selected set of test cases from Ir1 to ensure that existing operations at the site are not adversely affected by the installation of the new release. The final check consists of a walk-through of the entire set of acceptance test procedures to ensure site compatibility for the release. In the event that any discrepancies are observed during these three checks, the discrepancies are filed as NCRs in the NRCA system.

5.4 Test Execution and Error Handling

When the final checks have been successfully executed the actual commencement of the formal acceptance test are coordinated with the Site Manager by the Test Manager. All acceptance tests are conducted under the direction of the Test Manager who has absolute authority regarding all aspects of the execution of the acceptance test. This authority includes the assignment of priority to NCR's and their disposition and impact on ongoing testing. This authority may be delegated by the Test Manager to the Test Conductor at specific times such as absences from the sites or off shifts hours. For additional information concerning duties of other acceptance test participants, see the Verification Plan (DID 401/VE1).

At each test site, site-specific and all up test phases are executed. The site-specific test focuses on each individual site, and the all-up test phase includes all sites and elements testing simultaneously. At each site, the final scenario to be executed is an acceptance test demonstration, which exercises a comprehensive sequence of events verifying the overall site-specific and ECS-wide capabilities of the release.

In unusual circumstances, where there is an unscheduled interruption in the execution of a planned Acceptance Test session, the Procedures For Control of Unscheduled Activities During Verification for the ECS Project (DID 404/VE2) may be invoked. This document describes the process used to resolve unplanned activities during the verification process.

5.4.1 Non-Conformance Reporting

Discrepancies observed during Acceptance Testing are filed as NCRs and entered into the NRCA system for disposition by the Release A CCB. If the CCB determines that modifications are necessary, the software is returned to the developers for correction. After the NCRs are corrected and test criteria have been met, the results are reported to the Release A CCB. The Release A CCB authorizes or rejects delivery of the software fixes to the operational sites. Figure 5-2 graphically depicts the NCR process throughout the acceptance test phase. Figure 5-3 provide sample reports available from the NRCA system.

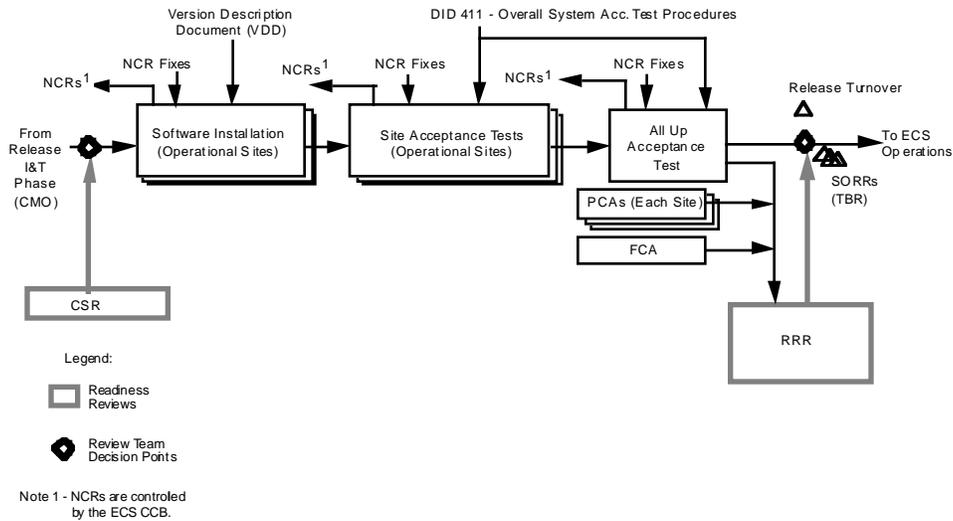


Figure 5-2. Acceptance Test NCR Process

Total Problems by Severity

Severity 1	25 (17%)
Severity 2	35 (24%)
Severity 3	48 (33%)
Severity 4	23 (16%)
Severity 5	15 (10%)
TOTAL	146

Unresolved Problems

Severity 1	0
Severity 2	0
Severity 3	0
Severity 4	0
Severity 5	0
TOTAL	0

Total Problems by State

New	0 (0%)
Assign-Eval	0 (0%)
Assign-Fix	0 (0%)
Fixed	0 (0%)
Assign-Verify	0 (0%)
Verified	0 (0%)
Closed	142 (97%)
Duplicate	4 (3%)
TOTAL	146

Figure 5-3. NRCA System Sample Reports

5.4.2 Acceptance Test Delays

As acceptance testing continues, the severity and number of unresolved NCRs are monitored on a daily basis, and compared with the established acceptance test criteria. As circumstances dictate, it may be necessary to halt testing based on the number and severity of open NCRs and resume testing when they have been corrected and incorporated in a new test version. Table 5-2 describes the discrepancy classification and priority scheme. Also, when an NCR documents an instance that impedes further testing, acceptance testing may be halted at the discretion of the Test Manager. In such cases, the release is returned to the responsible development organizations.

Table 5-1. Discrepancy Classification and Priority

Classification	Description
Severity 1	Catastrophic bug without work around that causes total failure or unrecoverable data loss.
Severity 2	Bug which severely impairs functionality. Work around might exist but is unsatisfactory.
Severity 3	Bug that causes failure of non critical system aspects. There is a reasonably satisfactory work around.
Severity 4	Bug of minor significance. Work around exists or, if not, the impairment is slight.
Severity 5	Very minor defect. Work around exists or the problem can be ignored.

CM tracks the product changes and revisions that result from correcting nonconformances. The revised version is returned to the test site. The acceptance test conductor then retests the new version using the scenarios that uncovered the original discrepancy to determine if the nonconformance was corrected. In addition, some regression testing may be conducted to make sure that the fix has not adversely affected other functions previously tested.

5.4.3 Discrepancies At Other Sites

As the acceptance testing proceeds from site to site, discrepancies may be uncovered which were not observed during tests at previous sites. If the mitigation of these discrepancies requires the generation of a new release version, retesting of the new version at each site is conducted during the all-up ECS acceptance test. Additional information on testing during verification is found in the Procedures for Control of Unscheduled Activities During Verification (DID 404-CD-001-001).

5.4.4 Physical Configuration Audits

The objective of the Physical Configuration Audits (PCAs) is to verify at each operational site that the “as-built” Release conforms to its design documentation. The PCA includes a detailed audit of engineering drawings, specifications, technical data for hardware; and a detailed audit of design documentation, listings, and manuals for software. The PCAs are conducted by an ECS Project team lead by CMO, and witnessed, at their option, by the ECS Project Quality Office (QO) and ESDIS. The results are presented at the Release Readiness Review (RRR) and documented in DID 506, Audit Reports. Approval of the Release A PCAs by ESDIS establishes the formal Product Baseline for Release A.

5.4.5 Functional Configuration Audit

The objective of the Functional Configuration Audit (FCA) is to verify that Release A's actual performance complies with its requirements and interface specifications. FCAs for Release A are satisfied by an inspection of the Acceptance Test results and are conducted by an ECS Project team led by CMO. The FCA activities are witnessed, at their option, by the ECS Project Quality Office (QO) and ESDIS. The results are presented at the Release Readiness Review (RRR) and documented in DID 506, Audit Reports.

5.4.6 Release Readiness Review (RRR)

After testing is complete, the IATO leads the Release Readiness Review (RRR) and reports on the results of the Release Acceptance Test to the ESDIS review team. The results presented in the RRR provides the basis by which ESDIS determines if the release is ready to proceed to IV&V operations. The ECS System Acceptance Test Report (DID 412/VE2) and the Acceptance Data Package (DID 535/PA1) are delivered to the Government four weeks after RRR to provide detailed test results, their analysis and a summary of open items to be corrected in the next version.

5.5 Test Logs

The test results are logged into the Test Conductor's site test log on a daily basis. Each entry contains the time and date, test procedure number, and results of the test procedure, including NCRs written during the tests. Figure 5-4 is an example of the test log summary used for acceptance tests. Any deviations from the test procedures is recorded in the test logs.

In addition, the actual procedures are marked up to indicate temporary (black or blue ink) and permanent (red ink) changes. Refer to the Procedures For Control of Unscheduled Activities During Verification for the ECS Project (DID 404/VE2) for the detailed process. All procedure markups, test logs, and supporting documentation are included in the formal Test Report to be delivered following RRR.

Sequence:			
Test Procedure Name:			
Test Procedure ID:			
Test Location:	Site:		
S/W Config./ Version:			
H/W Config./ Host Names:			
Test Data:			
Test Tools/ Scripts:			
Test Date:			
Witness(es):			
Comments:	Test Time:		
NCRs Written:			
NCRs Verified:			
NCRs Un-Verified:			
n Pass	Fail	Partial Pass/Fail	
1st Run	Formal Run	Retest	Release
Tester Signature(s)		Witness Signature(s):	
-----		-----	
-----		-----	
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Figure 5-4. Test Log Summary

6. Release A Test Schedule

The current plans call for conducting Release A acceptance testing during the two month period following the CSR, which is scheduled to occur October 1, 1996. The plan specifies conducting acceptance tests in three sessions. The first session occurs during the first three week period following CSR at SMC, EOC, GSFC, and LaRC. The second session occurs the following two weeks at EDC, with SMC and EOC remaining involved to participate where mutual testing is required. The final session occurs during the remaining three weeks of the period. During the final three weeks an All-Up End-to-End session occurs with all five sites participating.

6.1 Test Schedule

Figure 6-1 includes the detailed activity schedule for acceptance tests. The detailed test activity schedule for individual site is included in the respective volume.

Several assumptions were made for the overall acceptance test schedule.

- 1) Each test will take approximately 3 hours to execute,
- 2) Work proceeds five days per week, 8 hours/day,
- 3) No more than 2 tests will be ongoing at any one time at each site,
- 4) No problems/failures/delays occur.

These assumptions are validated or adjusted during the various test activities describe in Figure 6-1. As schedule adjustments are made, the details are presented during technical interface and management meetings with both the ECS project personnel and the Government.

The final detailed site schedules are coordinated with each site prior to the conduct of acceptance tests and during site personnel interface meetings. The final schedule includes dates, times and duration for all formal acceptance testing that may occur at each site.

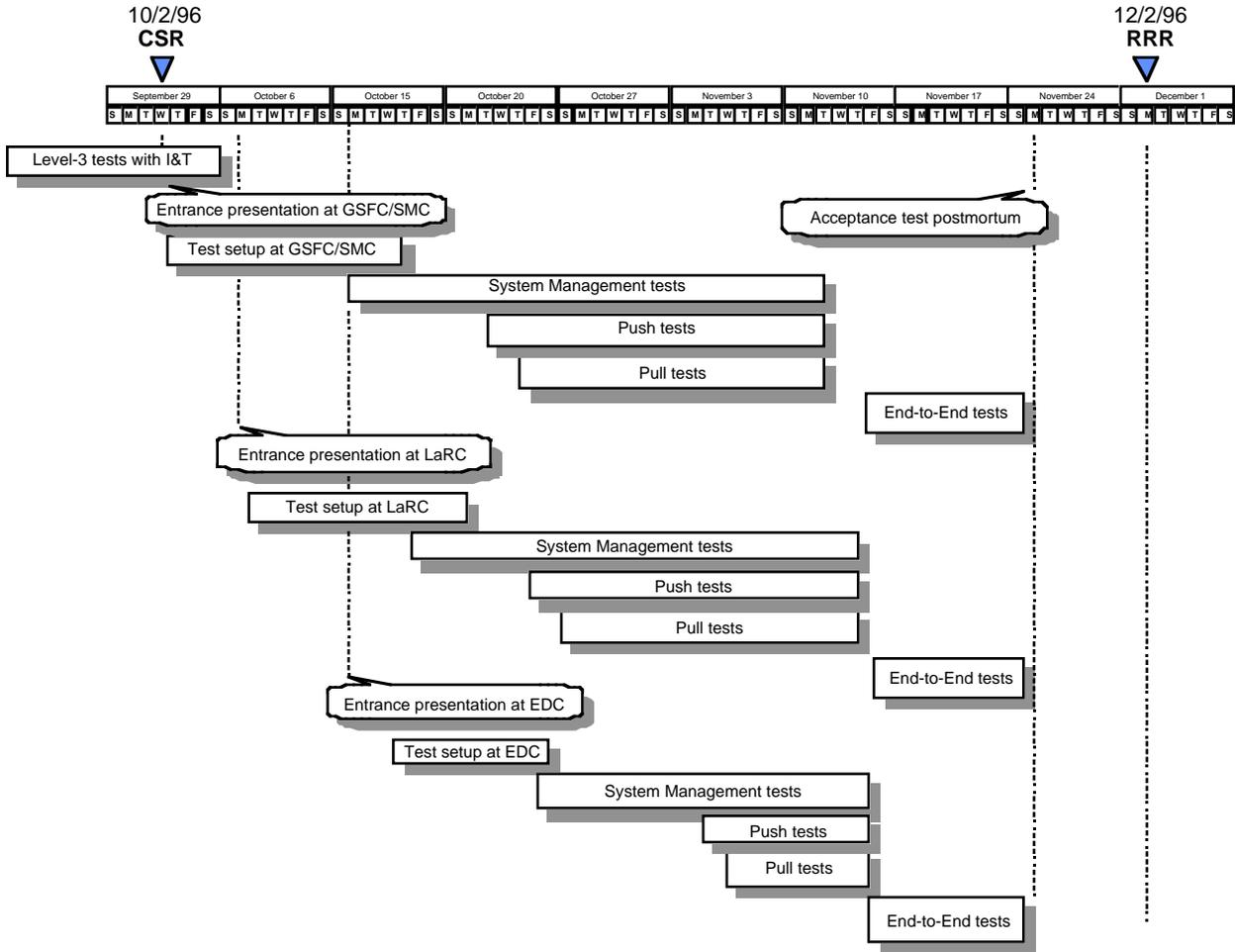


Figure 6-1. Release A Detail Test Activity Schedule

7. Overview

Release A of the ECS provides GSFC with mission and operations functionality to support the TRMM Science Data and Information System (TSDIS) and the Moderate-Resolution Imaging Spectroradiometer (MODIS) Science Computing Facility (SCF). The GSFC DAAC provides support to the TSDIS for the ingest, archive, and distribution of the Visible and Infrared Scanner (VIRS), TRMM Microwave Imagery (TMI), Precipitation Radar (PR) data products, and the Ground Validation (GV) data. Also, this DAAC provides support to the MODIS SCF for the integration of Version 1 science software into the Science Data Processing Segment (SDPS) for EOS-AM-1 early interface testing.

7.1 GSFC Release A Functions

The complete set of ECS functions allocated to Release A are verified to ensure that the release meets those requirements needed to support TRMM and AM-1 mission operations. This includes verifying requirements for all features needed to support the ECS Release objectives for spacecraft operations and control, scheduling, data operations, information management and archive, science processing, networks, and system management.

Acceptance tests include the verification of certain ECS features needed to support TRMM. These features are: the ingest and archive processing of Level-1 through Level-3 of Precipitation Radar (PR), TRMM Microwave Imager (TMI), and Visible Infrared Scanner (VIRS) instrument data, TRMM Ground Verification (GV); and combined products data transmitted from the TSDIS, which is a production system provided by the TRMM project.

Acceptance tests also include the early verification of interfaces needed to support AM-1.

7.2 GSFC Release A Interfaces

Acceptance testing of interfaces for Release A verifies the capability of the ECS to communicate and transfer data over all external interfaces in accordance with the Functional and Performance Requirements Specification (F&PRS) for the ECS and the Interface Requirements Documents (IRDs) associated with each interface. The handling and distribution of these various data sets at the GSFC DAAC involves a number of internal (ECS-to-ECS) and external (ECS-to-non ECS) interfaces.

There are three basic categories of sources providing these data sets to ECS at the GSFC DAAC, including the following:

- External interfaces (i.e., between ECS and a non-ECS system) where both sides of the interface are inside the GSFC DAAC (e.g., between ECS and the DAS Data Link Server).
- External interfaces (i.e., between ECS and a non-ECS system) where ECS is located inside the GSFC DAAC, and the non-ECS system is located outside the GSFC DAAC (e.g., between ECS and NOAA).

- Internal interfaces (i.e., ECS-to-ECS interfaces) where one side of the interface is located inside the GSFC DAAC, and the other side of the interface is located inside a different DAAC (e.g., between ECS at the GSFC DAAC and ECS at the Langley DAAC).

Simulators are used for verifying external interfaces except in those cases where the system on the other side of the interface is mature and available to support the acceptance test when needed.

Data content flowing across Release A interfaces include: AM-1 Level-0 data, and real time and routine TRMM data from SDPF and EDOS; ancillary data from NOAA; schedule data to/from NCC, SDPF, and EDOS; Level-1 through Level-3 TRMM data from TSDIS; and selected Level-0 through Level-3 to the SCFs. Figure 7-1 is a graphical representation of the interfaces between ECS sites associated with the GSFC DAAC. A summary of the content and carriers associated with the data flowing across GSFC ECS interfaces is shown in Table 7-1.

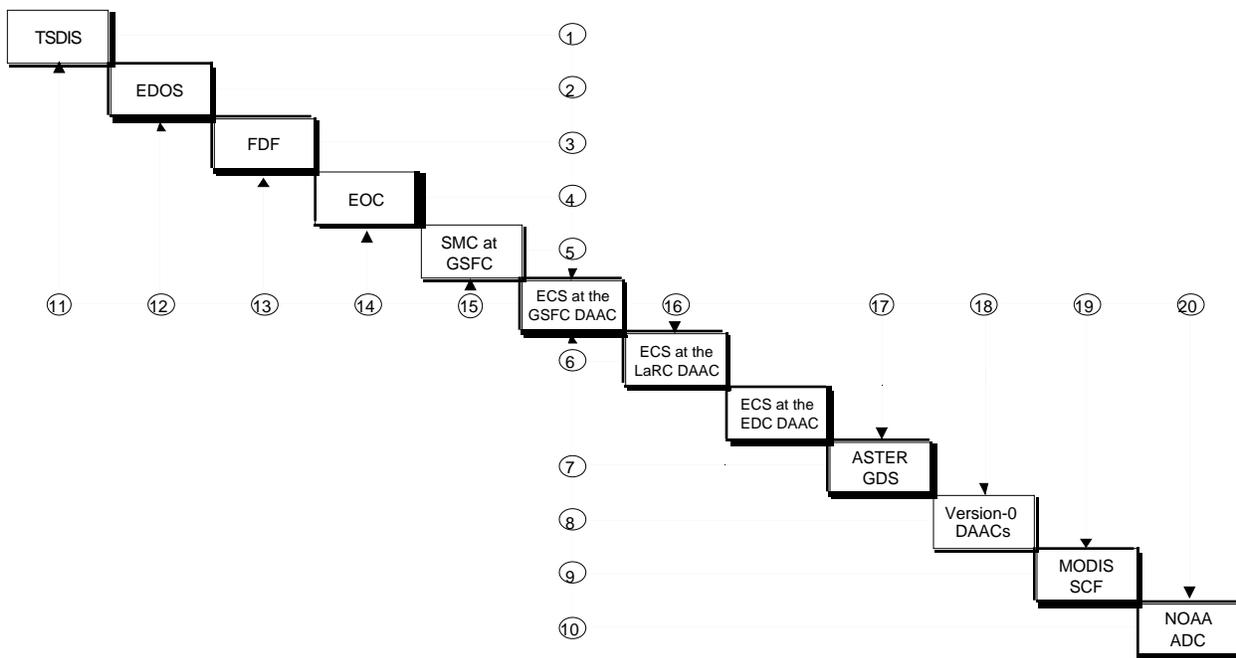


Figure 7-1. GSFC Interface Nodes

Table 7-1. GSFC ECS Release A Data Flow Interfaces (1 of 2)

Node	Mission	Source	Destination	Carrier/ Media	Data Content
1	TRMM	TSDIS	ECS at the GSFC DAAC	Exchange LAN	Levels 1A to 3 TMI, PR, GV, VIRS and Combined Data Products, Browse Products, and Metadata; Updated Metadata; TMI, PR, GV, VIRS, Combined Algorithms and Documentation; Reprocessing Product Schedules, and Delayed Product Status; Request for Ancillary Data.
2	AM-1	EDOS	ECS at the GSFC DAAC	EBnet	Service Request Disposition; PDSs (Level-0 data); ADSs (Back-up Level-0 Data); PDS and ADS Delivery Records; Physical Media Unit Delivery Record; Undetected Fault Isolation.
3	AM-1	FDG	ECS at the GSFC DAAC	NOLAN	Repaired Orbit Data.
4	AM-1	EOC	ECS at the GSFC DAAC	Exchange LAN	Telemetry Data; Event; EOC statistics, schedules, reports, etc.
5	TRMM AM-1	SMC at GSFC	ECS at the GSFC DAAC	Exchange LAN	Policies; Conflict Resolution; Procedures; Directives.
6	TRMM AM-1	ECS at the LaRC DAAC	ECS at the GSFC DAAC	EBnet	Subscription Orders for VIRS, TMI, TOMS & NMC Data.
7	AM-1	ASTER GDS	ECS at the GSFC DAAC	NSI	Algorithms, Source Code, Documentation, SCF Interaction; Level 1 Data Products; Product Requests; Data Products; Status; System and Network Management; User Authentication, User Data Search & Request, User Product Requests, Status.
8	All Missions	Version-0 DAACs	ECS at the GSFC DAAC	EBnet	Directory Search Results; Inventory Search Results; ftp and Integrated Browse Results; Product Results; Quit; Pong; NCEP Ancillary data.
9	AM-1	MODIS SCF	ECS at the GSFC DAAC	NSI	Algorithms; Remote Access Session Dialog; Request for Operational Data Production Software Package; Request for Test Products after Software Integration and Test; Test Product Reviews; QA Notification Specification; QA Metadata Updates; Request for Processing Status; Request for Resource Usage; Reprocessing Requests.
10	AM-1	NOAA ADC	ECS at the GSFC DAAC	NSI	Advertising Information; Dependent Valid Update; Inventory Search Result; Integrated Browse Result; FTP Browse Result; Product Result Message; Guide Result; NCEP Ancillary data.
11	TRMM	ECS at the GSFC DAAC	TSDIS	Exchange LAN	Levels 1A to 3 TMI, PR, GV, VIRS, and Combined Data Products for Reprocessing; Ancillary Data for Processing and Reprocessing; TRMM Orbit Ephemeris; TRMM Level-0 Housekeeping data.
12	AM-1	ECS at the GSFC DAAC	EDOS	EBnet	Service Requests (Back-up data requests); Fault report; Fault Isolation Request; Level-0 data.
13	AM-1	ECS at the GSFC DAAC	FDG	NOLAN	Repaired/Retained Orbit Data Request.
14	AM-1	ECS at the GSFC DAAC	EOC	Exchange LAN	
15	TRMM AM-1	ECS at the GSFC DAAC	SMC at GSFC	Exchange LAN	Conflict Resolution Request; Status; Performance.
16	TRMM AM-1	ECS at the GSFC DAAC	ECS at the LaRC DAAC	EBnet	VIRS, TOMS TMI & NMC Data.
17	AM-1	ECS at the GSFC DAAC	ASTER GDS	NSI	Algorithms, Source Code, Documentation, SCF Interaction; Level 1 Data Products; Product Requests; Data Products; Status; System and Network Management; User Authentication, User Data Search & Request, User Product Requests, Status.

Table 7-1. GSFC ECS Release A Data Flow Interfaces (2 of 2)

Node	Mission	Source	Destination	Carrier/ Media	Data Content
18	All Missions	ECS at the GSFC DAAC	Version-0 DAACs	EBnet	Directory Search Requests; Inventory Search Requests; Acknowledgments; Browse Request; Product Request; Statistics; Quit; Pong.
19	AM-1	ECS at the GSFC DAAC	MODIS SCF	NSI	ECS Software Package; I & T Requirements; Science Software Integration Test Status; Data Availability notices; Operational Science Data Production Software Package; Test Product Availability Message during Software I & T; QA Notification Specification Acknowledgment; Data Quality Request Notification; Data Delivered for QA; Processing Status; Resource usage; Reprocessing Request Acknowledgment; Product history.
20	AM-1	ECS at the GSFC DAAC	NOAA ADC	NSI	Inventory Search; Browse Request; Product Request; Guide Search.

7.2.1 GSFC Facility and Test Environment

The Goddard Space Flight Center (GSFC) Distributed Active Archive Center (DAAC) EOSDIS Core System (ECS) is located in Building 32 at the NASA/GSFC in Greenbelt, Maryland. Figure 7-2 shows the GSFC floor plan in the Release A time frame. Included in the diagram is the GSFC DAAC OPS Control Center and SMC, the location of the computers and the V0 DAAC.

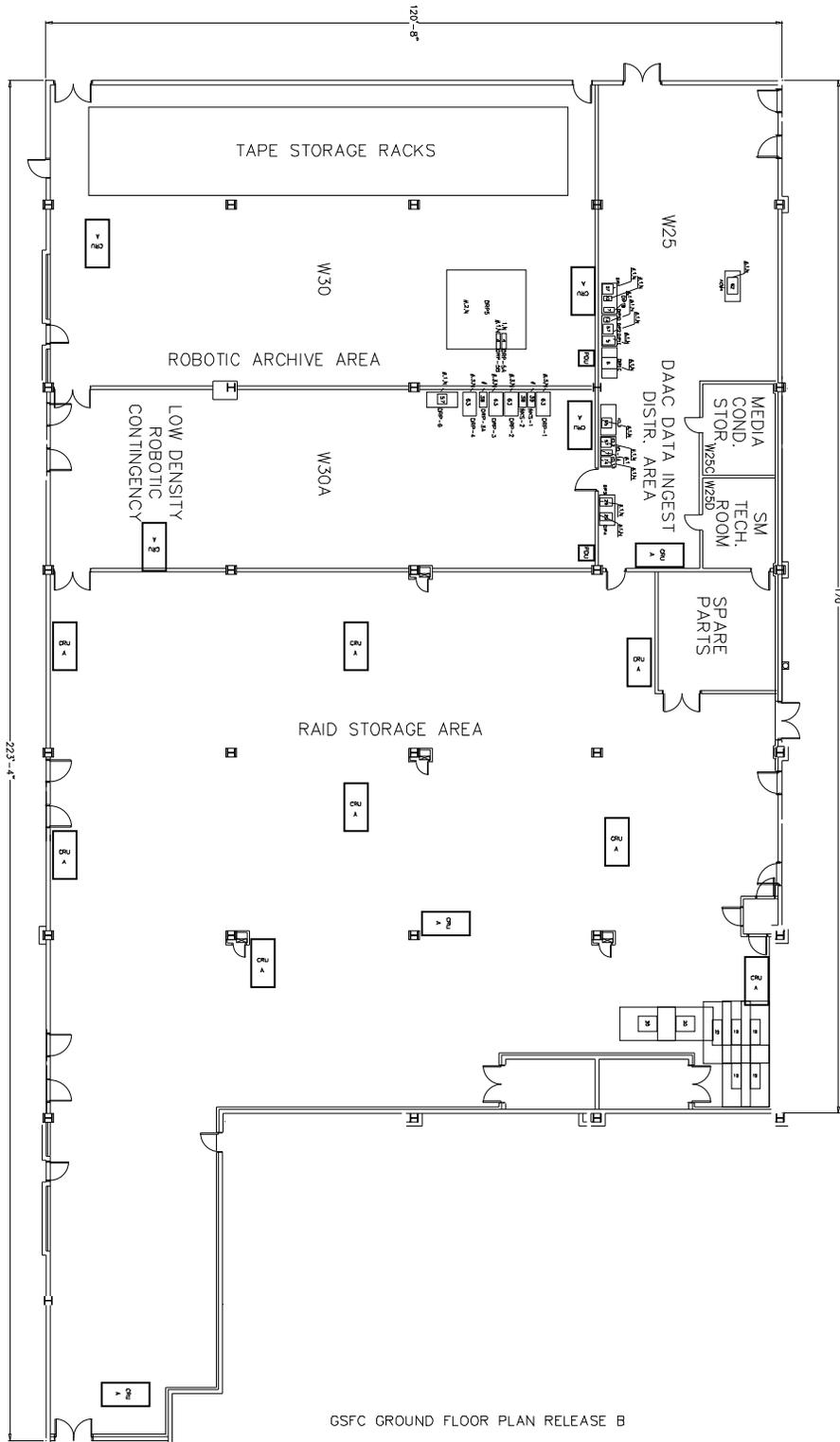


Figure 7-2. GSFC Floor Plans (1 of 3)

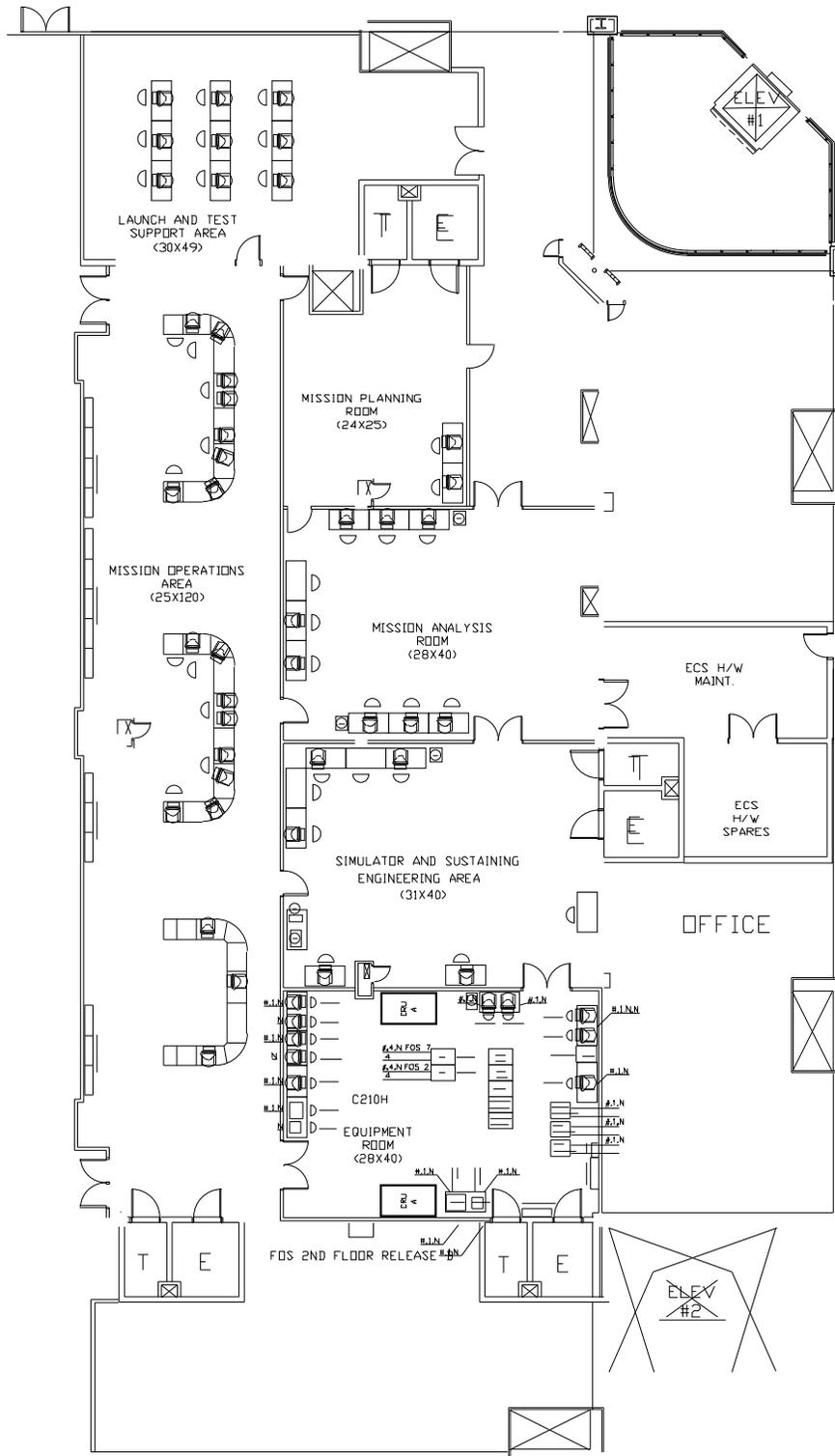


Figure 7-2. GSFC Floor Plans (3 of 3)

7.2.2 GSFC Test Environment Safety Considerations

The Hazard Analyses for the ECS Project (DID 513) considered both hardware and software caused hazards for each element and segment of ECS. Hazards to ECS personnel and to ECS equipment, and potential hazards external to ECS were considered. This analysis concluded that the effect of ongoing and future planning and implementation processes to purchase, verify, integrate and test, install, operate and maintain COTS hardware minimizes the potential for a ground system hazardous condition to personnel or equipment. These various processes and the documents that describe them are:

- Procurement of COTS hardware to commercial practice UL performance and safety standards. Other commercial standards such as ANSI, BICSI, CCITT, EIA, IEEE, ISO, and NEC may also be applicable. The COTS hardware installed in the user environment has been engineered for the user desktop operating environment with enclosed components and no exposure to moving parts or electrical discharge. The COTS hardware installed in the data center environment is accessible only to authorized, trained and certified operators and maintainers.
- Installation and Facility Planning to provide the DAACs with site specific Installation Plans and the ECS Facilities Plan (DID 302) to provide the planning necessary to assure that each ECS component meets all requirements for interfacing with the facilities in which they are located. The Facilities Plan contains physical layout, electrical power requirements, air conditioning requirements, antenna foundation, final equipment layout, mechanical/electrical loads, and functional arrangements.
- Environmental Control Planning to identify, in the Environmental Control Plan (DID 532), suitable environmental and cleanliness controls for all areas used for the operation, storage, maintenance, repair, inspection, or test of system equipment.
- Maintenance Planning, in the COTS Maintenance Plan (DID 613), to describe policies and procedures to be applied to maintenance of all hardware and software under M&O responsibility.
- M&O Procedures and the Operational Readiness Plan (DID 603) to describe the processes to assure all elements are in a state of operational readiness at all times.
- M&O Personnel Certification and Training to define the certification and COTS training required to prepare personnel to operate, maintain, and use the ECS. The COTS Training Plan (DID 622) and the M&O Certification Plan (DID 626) detail the approach and procedures required.
- Security Planning documents the approach to physical, informational and personnel security in the ECS Security Plan (DID 214).
- Disaster Recovery and Emergency Preparedness Planning is contained in the EDF Disaster Recovery Plan which provides for the safety and the protection of HAIS and the safeguarding of NASA computer resources and data assets. The Emergency Preparedness Plan focuses on personnel, visitors, and non-data assets.

During the pre-test meeting with GSFC management, the following safety risks are determined:

- a. Identification of hazardous situations and/or operations
- b. Precautions and safety instructions to insure the safety of all personnel
- c. Precautions and safety instructions to prevent degradation of test articles and measuring equipment
- d. Environmental and/or other conditions to be maintained within tolerances
- e. Specifications for facility, equipment maintenance, housekeeping, certification, inspection, safety and handling requirements before, during and after test activities.

The ATO Test Conductor coordinates with GSFC and ECS management and maintenance and operations personnel, and the Quality Office representatives concerning safety issues. If equipment, environmental, or personnel safety concerns arise, the Test Conductor immediately takes steps to ensure the safety of the personnel and equipment, notifies GSFC management, and coordinates corrective actions.

7.3 TRMM Operations Activities Mapped to Test Sequences

Figure 7-3 shows a context diagram of the functions related to the support of the TRMM mission at the GSFC DAAC. The diagram shows the TRMM input data or stimuli, the resultant outputs, and the test sequences that are used to verify functional and performance requirements at the GSFC DAAC. Other Release A related functions depicted, which the GSFC DAAC is expected to support, are Level-0 Data Migration and Interoperability, and TOMS Ozone Data Ingest and Archive.

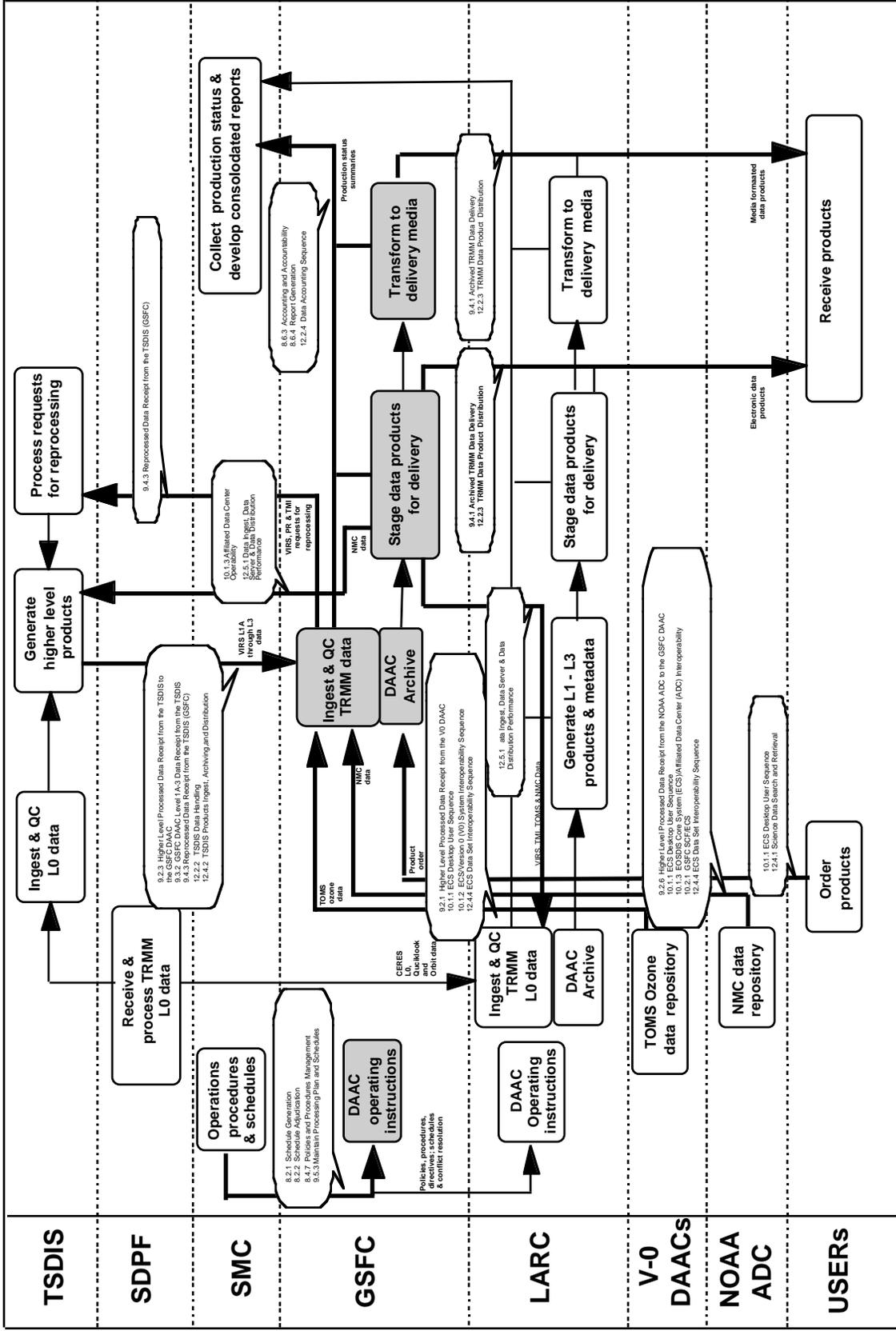


Figure 7-3. GSFC DAAC TRMM Operations Test Sequences

7.3.1 AM-1 Interface Testing

In addition to the tests exercised as part of the TRMM related test activities, several sequences are devoted to the early testing of the GSFC DAAC interfaces with other sites. These sequences include:

<u>Number</u>	<u>Sequence Title</u>
9.1.3	Early AM-1 Interface Test Support
9.1.4	Early FDF and AM-1 Interface Test Support
12.1.4	Early FDF and AM-1 Sequence
12.1.1	Inter-Site Message Sequence
12.1.2	Multi-Site System Management Sequence
12.5.4	ECS Testability and Overall Capabilities Sequence

7.3.2 AM-1 MODIS Science Software Integration & Test

Acceptance test activities do not include the verification of science software. Instead, tests include demonstrations of ECS's infrastructure to support the installation and operation of science applications on the Release A ECS system. This is accomplished at the GSFC DAAC by exercising the following sequences:

<u>Number</u>	<u>Sequence Title</u>
10.2.1	GSFC SCF/ECS Sequence
12.1.2	Multi-Site System Management Sequence

7.4 GSFC Configuration

Following a successful CSR, Release A is formally installed at the GSFC DAAC. The formal installation of Release A includes custom code and commercial-off-the-shelf (COTS) software and, as applicable, executables, load modules, test data sets, test tools, and documentation. The formal installation at the operational sites is performed by the I&T organization, supported by the CMO and the M&O organization. The system configuration needed to perform the acceptance test sequence is described in Table 7-2.

Table 7-2. GSFC ECS DAAC Release A System Configuration (1 of 4)

Subsystem	HWCI/CSCI	Platform	Custom Executables	COTS
Ingest	ICLHW	SPRHW-MSFC-3 (becomes ICLHW-GSFC-1.1)	peer agent	Irix Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, net.h++, tools.h++, dbtools.h++, sybase server, Remedy*, Tivoli client, wabi/office, netscape browser, essm, sqr wkbch, Npassword, TCPWrappers, Tripwire, Crack
Ingest	ICLHW	AITHW-MSFC-2 (becomes ICLHW-GSFC-2), DDSHW-MSFC-1	IngestServer, IngestSession, CSS SDPF gateway, CSS TSDIS Gateway, PollingIngest, Staging disk class libraries, RequestManager, peer agent, preprocessing executables, Ingest user and operator guis, advertising clients, sdsrv wrapper	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, net.h++, tools.h++, dbtools.h++, sybase server, essm, Remedy*, Tivoli client, wabi/office, netscape browser, Npassword, TCPWrappers, Tripwire, Crack, kftp, ftp, kerberos
			subscription engine, peer agent	sqr wkbch
CSS	DCHCI	CSS-GSFC-1 (CSS server) and MSS-GSFC-4 (MSS server)	DCE Directory, Security and Time servers, peer agent	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, net.h++, tools.h++, dbtools.h++, Remedy*, Tivoli, wabi/office, netscape browser, mail server, Npassword, TCPWrappers, Tripwire, Crack
MSS	MSSHCI	MSS-GSFC-4 (MSS server) and CSS-GSFC-1 (CSS server)	MsAgDpty, peer agent	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, C, C++, Softbench, bx, graphpak, epak, net.h++, tools.h++, dbtools.h++, Remedy TT, Tivoli server, wabi/office, Sybase server, essm, sqr wkbch, PNM, HPOV, dce dev tlkt
				Npassword, TCPWrappers, Tripwire, Crack, Satan, netscape browser
				HAL DCE cell manager
MSS	MSSHCI	MSS GSFC-1A	ClearCase, peer agent, Software change manager (DDTS), Inventory change manager (SoftPC/MS Office), XRP II Baseline Manager,	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase server and client, tools.h++, dbtools.h++, Remedy*, Tivoli client, wabi/office, netscape browser, sybase client, sqr wkbch
				Npassword, TCPWrappers, Tripwire, Crack, Satan
MSS	MSSHCI	MSS-GSFC-3 (MSS WS)	GUI executables, peer agent	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, tools.h++, dbtools.h++, Remedy*, Tivoli client, wabi/office, netscape browser, Npassword, TCPWrappers, Tripwire, Crack
Data Server	ACMHW	ACMHW-GSFC-3 and 4 (Ops WS)	Ingest operator GUI, peer agent	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, tools.h++, dbtools.h++, Remedy*, Tivoli client, wabi/office, netscape browser, Npassword, TCPWrappers, Tripwire, Crack
Data server	ACMHW	ACMHW-GSFC-1 and 2 (APC sybase server)	peer agent, STMGMT Network resource manager	Irix Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, net.h++, tools.h++, dbtools.h++, sybase server, Remedy*, Tivoli client, wabi/office, netscape browser, essm, sqr wkbch, Npassword, TCPWrappers, Tripwire, Crack

Table 7-2. GSFC ECS DAAC Release A System Configuration (2 of 4)

Subsystem	HWCI/CSCI	Platform	Custom Executables	COTS
Data Server	ACMHW	MSS-MSFC-3 (becomes ACMHW-GSFC-5) front-end to APC server	Science Data Server Process, peer agent, SDSRV admin process, STMGT network resource manager, STMGT pull monitor process, ingest server, ingest session, polling ingest, ingest request manager, advertising clients	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, tools.h++, dbtools.h++, Remedy*, Tivoli client, wabi/office, netscape browser, sybase client, Npassword, TCPWrappers, Tripwire, Crack, kftp, kerberos, sqr wkbch
			CSS SDPF gateway, CSS TSDIS gateway, SDSRV wrapper, subscription engine, staging disk class libraries, cgi scripts	
Data Server	DIPHW	DIPHW-GSFC-1 and 2 (distribution server)	DDIST Distribution server process, peer agent, STMGT CDROM Resource management process, STMGT tape resource manager, STMGT printer resource manager	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, tools.h++, Remedy*, Tivoli client, wabi/office, netscape browser, Npassword, TCPWrappers, Tripwire, Crack, ftp
Data Server	DRPHW	DRPHW-GSFC-1 and 2 (FSMS server)	peer agent, STMGT Staging Resource Manager Process, STMGT archive manager	Irix Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, C, C++, F77, CaseVision, bx, graphpak, epak, net.h++, tools.h++, dbtools.h++, amass, Remedy*, Tivoli client, wabi/office, netscape browser, dce dev tlkt, nfs
				Npassword, TCPWrappers, Tripwire, Crack
Data Server	DRPHW	DDSHW-MSFC-2 (becomes DRPHW-GSFC-6) front-end sun	peer agent, STMGT Staging Resource Manager Process, STMGT Staging Disk Monitor Process, advertising server, ingest request manager	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, tools.h++, Remedy*, Tivoli client, wabi/office, netscape browser, sybase client, dbtools.h++, Npassword, TCPWrappers, Tripwire, Crack, sqr wkbch
Data Server	DRPHW	DRPHW-GSFC-3 and 4 (DBMS server)	peer agent	Irix Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, tools.h++, dbtools.h++, sybase server, Remedy*, Tivoli client, wabi/office, netscape browser, essm, sqr wkbch, Npassword, TCPWrappers, Tripwire, Crack
Data server	DDSHW	DDSHW-GSFC-1 and 2	Document Data server process, peer agent, document repository process, www server process (secured, and unsecured), Advertising Custom CGI Bin Programs, advertising clients	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, tools.h++, Remedy*, Tivoli client, wabi/office, netscape commerce server, TOPIC server, illustra, sqr wkbch, dbtools.h++, Npassword, TCPWrappers, Tripwire, Crack
				Npassword, TCPWrappers, Tripwire, Crack, Netscape server (secured and unsecured; must be configured for DNS lookup)
Planning	PLNHW	PLNHW-GSFC-2 (Planning and queuing server)	peer agent, Resource planning application, Production planning application, subscription manager, advertising clients, delphi hcl,	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, C, C++, Sparcworks, bx, graphpak, epak, tools.h++, dbtools.h++, sybase server, essm, net.h++, Remedy*, Tivoli client, dce dev tlkt, wabi/office, sqr wkbch
			Autosys DB server (shadow), Autosys event processor (backup), execution manager, data manager, Resource manager, Autosys operators console, AutoXpert (including jobscape, timescape, hostscape)	Npassword, TCPWrappers, Tripwire, Crack, netscape browser, Autosys, AutoXpert, multithreaded debugger

Table 7-2. GSFC ECS DAAC Release A System Configuration (3 of 4)

Subsystem	HWCI/CSCI	Platform	Custom Executables	COTS
			PDPS Database server	
Planning		PLNHW-GSFC-1 Planning Workstation	peer agent, Production planning application, Resource Planning application, Autosys Operators console, AutoXpert (including Jobscape, TimeScape and Hostscape), ECS Desktop	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, tools.h++, dbtools.h++, sybase client, Remedy*, Tivoli client, d wabi/office, netscape browser, Npassword, TCPWrappers, Tripwire, Crack, sqr wkbch
Processing	SPRHW	SPRHW-GSFC-1 (Science Processor)	Autosys remote agent, peer agent (currently does not run), HDF-EOS, SDP Toolkit, Data Preprocessing, Science software, Processing support scripts	Irix Op sys, snmp agent, dce, motif, x11r5, ClearCase client, C, C++, F77, Ada, F90, CaseVision, bx, graphpak, epak, tools.h++, dbtools.h++, sybase client, Remedy*, wabi/office, netscape browser, IDL, IMSL Autosys, autoxpert, autosys remote agent
				Npassword, TCPWrappers, Tripwire, Crack, kftp, kerberos, sqr wkbch, Tivoli client
Processing	AQAHW	PLNHW-GSFC-2 (no dedicated hw at GSFC for qa)	Ops QA monitor, ECS DSKTP, peer agent, EOSView, HDF-EOS	
Processing	AITHW	AITHW-GSFC-1	Production planning application, Resource Planning application, peer agent	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, C, C++, Sparcworks, bx, graphpak, epak, tools.h++, dbtools.h++, Remedy*, Tivoli client, dce dev tlkt, wabi/office, netscape browser, f77, f90, ada, idl, imsl
			Document viewing, AIT Manager GUI, AI&T Tools, PGE Processing GUI, PGE Registration GUI, AutoSys Operators Console	Sybase Client, FORCHECK, Ghostview, emacs, Adobe acrobat, WABI, XEDIT, autosys remote agent, Npassword, TCPWrappers, Tripwire, Crack, kftp, sqr wkbch
			Autosys Xpert GUIs (TimeScape, JobScape, HostScape), ECS DSKTP, EOSView, HDF-EOS,	Npassword, TCPWrappers, Tripwire, Crack, kerberos
Processing	AITHW	AITHW-GSFC-2 AIT Workstation / DBMS Server	Subscription manager, PDPS DB server. Autosys DB server, AutoSys Event Processor, Autosys Agent, Data Manager, Execution Manager, Resource Manager, peer agent, ECS Desktop, advertising clients	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, C, C++, Sparcworks, bx, graphpak, epak, tools.h++, dbtools.h++, Remedy*, Tivoli client, dce dev tlkt, wabi/office, netscape browser, f77, f90, ada, idl, ims,
			SDP Toolkit, HDF-EOS	Sybase server, FORCHECK, Ghostview, emacs, Adobe acrobat, Netscape browser, WABI, XEDIT, autosys remote agent, essm, sqr wkbch
				FORCHECK, Ghostview, emacs, Adobe acrobat, WABI, XEDIT, Npassword, TCPWrappers, Tripwire, Crack, NCSA mosaic
Data Management	DMGHW	DMGHW-GSFC-1, 2, 3 (Data Specialist Workstation)	Specialist GUIs, peer agent	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, tools.h++, dbtools.h++, Remedy*, Tivoli client, wabi/office, Sybase client, netscape browser, Npassword, TCPWrappers, Tripwire, Crack, sqr wkbch

Table 7-2. GSFC ECS DAAC Release A System Configuration (4 of 4)

Subsystem	HWC/CSCI	Platform	Custom Executables	COTS
Data Management	DMGHW	DMGHW-GSFC-4 (Data Specialist Workstation)	Specialist GUIs, peer agent	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, tools.h++, dbtools.h++, Remedy*, Tivoli client, wabi/office, Sybase client, netscape browser, Npassword, TCPWrappers, Tripwire, Crack
Data Management	DMGHW	DMGHW-GSFC-5, 6 (DMG Server)	DMG Gateway, CSS Gateway executables - 2 processes per connection, peer agent	Op sys, snmp agent, dce, oodce, motif, x11r5, ClearCase client, tools.h++, dbtools.h++, Remedy*, Tivoli client, wabi/office, Sybase server & client, netscape browser, kerberos, Npassword, TCPWrappers, Tripwire, Crack
			CSS Gateway executables - 2 processes per connection	net.h++, essm, sqr wkbch, kftp
Interoperability	ADSHWCI co-located with DMGHWCI	DMGHW-GSFC-5, 6 (DMG Server)	COTS Sybase Replication server, COTS Sybase SQL Server, Custom Advertising Server, Custom Library for Advertising Clients, COTS Sybase Admin Tools (essm)	Npassword, TCPWrappers, Tripwire, Crack
	Users and Operators Workstation		Custom Installer Program	C++, Motif, Tools.h++, Miller C++ Libraries (Public Domain)
Client	DESKT	All operator workstations and servers (if xterms access servers)	EcsDesktop	ROGUEWAVE tools.h++ OODCE DCE C/C++ Doug Young's Library for Motif/C++ 1992 EPak Widgets
				Motif Window Manager, mwm (Solaris or SunOS) or platform-dependent alternative: VUEWM (HP), 4DWM (SGI), NCDs (NCDwm), etc.
				Web browser: Netscape
				DCE OODCE Motif or CDE with equivalent Motif version ICS Builder Xcessory ICS EPak widgets RogueWave tools.h++ C/C++ compilers and debuggers
				Doug Young's C++ library for Motif 1992 version ECS C++ widget wrapper library (TBD)
Client	WKBCH		User Registration Tool User Profile Tool	Same as Client

Notes: (1) The development environment is provided only on selected platforms; (2) Remedy Trouble ticketing is installed only on the MSS server; (3) All platforms that have Remedy indicated will have access via Netscape browser.

7.4.1 GSFC Hardware Configuration

The GSFC hardware configuration builds on the Ir1 supplied capacity and is designed primarily to support TSDIS product archival, early AI&T for MODIS and various forms of interface testing. Given these requirements, a significant subset of the subsystems have supplied components at the site: Data Server (for TSDIS data archival, and document services), Data Management (for V0 Gateway and Advertising Support), Data Processing (for AI&T science processing capacity), Planning (for early interface testing and demonstration, not operations), Ingest (for interface testing), Management (MSS, for local site management), Communications (CSS) and communications infrastructure support (ISS). Figure 7-4 provides an overview of the

entire configuration and includes the core Ir1 configuration built upon by the Release-A required units (shaded components are added at Release A).

7.4.2 GSFC Software Configuration

Below is a brief overview of the ECS software subsystems. A more comprehensive description is found in the Release A GSFC DAAC Design Specification for the ECS Project (DID 305).

- **Client Subsystem (CLS):** This software consists of graphic user interface (GUI) programs, tools for viewing and/or manipulating the various kinds of ECS data (e.g., images, documents, tables) and libraries representing the client application program interface (API) of ECS services. For Release A, the client subsystem consists of the desktop, an advertising user interface, and a data visualization tool (EOSView). The remainder of the Release A user interface is provided by an enhanced version of the V0 System Client. The client subsystem component is available to users for installation on their workstations and also is deployed on workstations within the DAAC in support of normal operations, including User Services support.
- **Interoperability Subsystem (IOS):** This subsystem maintains a database of information about the services and data offered by ECS, and allows users to search through this database to locate services and data that may be of interest to them. It provides an advertising service implemented as an SDPS developed distributed database application on top of a commercial off-the-shelf Data Base Management System (DBMS). The user interface to this subsystem is the Client subsystem.
- **Data Management Subsystem (DMS):** This subsystem includes functions which provide uniform access to descriptions of the data and the data elements offered by the EOSDIS repositories and provide a bi-directional gateway between ECS and Version 0. This subsystem also includes distributed search and retrieval functions and corresponding site interfaces; however, they are not part of the Release A design.
- **Data Server Subsystem (DSS):** The subsystem provides the physical storage access and management functions for the ECS earth science data repositories. Other subsystems can access it directly or via the data management subsystem (if they need assistance with searches across several of these repositories). The subsystem also includes the capabilities needed to distribute bulk data via electronic file transfer or physical media. Other components include, for example, administrative software to manage the subsystem resources and perform data administration functions (e.g., to maintain the database schema); and data distribution software, e.g., for media handling and format conversions. The main components of the subsystem are the following:
 - database management system - SDPS uses an off-the-shelf DBMS (SYBASE) to manage its earth science data and implement spatial searching, as well as for the more traditional types of data (e.g., system administrative and operational data). It uses a document management system to provide storage and information retrieval for guide documents, scientific articles, and other types of document data.

- file storage management systems - they are used to provide archival and staging storage for large volumes of data. SDPS is considering the use of several hardware/software configurations which are either off-the-shelf or a mixture of off-the-shelf and developed software.
- data type libraries - the libraries implement functionality of earth science and related data that is unique and not available off the shelf (e.g., spatial search algorithms and translations among coordinate systems). The libraries interface with the data storage facilities, i.e., the database and file storage management systems.
- **Ingest Subsystem (INS):** The subsystem deals with the initial reception of all data received at an EOSDIS facility and triggers subsequent archiving and processing of the data. Given the variety of possible data formats and structures, each external interface, and each ad-hoc ingest task may have unique aspects. Therefore, the ingest subsystem is organized into a collection of software components (e.g., ingest management software, translation tools, media handling software) from which those required in a specific situation can be readily configured. The resultant configuration is called an ingest client. Ingest clients can operate on a continuous basis to serve as a routine external interface; or they may exist only for the duration of a specific ad-hoc ingest task.
- **Data Processing Subsystem (DPS):** The main components of the data processing subsystem - the science algorithms - are provided by the science teams. The data processing subsystem provides the necessary hardware resources, as well as software for queuing, dispatching and managing the execution of these algorithms in an environment which eventually will be highly distributed and consist of heterogeneous computing platforms. The DPS also interacts with the DSS to cause the staging and de-staging of data resources in synchronization with processing requirements.
- **Planning Subsystem (PLS):** This subsystem provides the functions needed to pre-plan routine data processing, schedule ad-hoc processing, and dispatch and manage processing requests. The subsystem provides access to the data production schedules at each site, and provides management functions for handling deviations from the schedule to operations and science users.
- **Management Subsystem (MSS):** The Management Subsystem (MSS) provides enterprise management (network and system management) for all ECS resources including: commercial hardware (including computers, peripherals, and network routing devices), commercial software, and custom applications. Enterprise management reduces overall development and equipment costs, improves operational robustness, and promotes compatibility with evolving industry and government standards. Consistent with current industry trends, the MSS thus manages both ECS's network resources per EBnet requirements and ECS's host/application resources per SMC requirements. Additionally MSS also supports many requirements allocated to SDPS and FOS for management data collection and analysis/distribution.

The MSS allocates services to both the system-wide and local levels. With few exceptions, the management services is fully decentralized, no single point of failure

exists which would preclude user access. In principle every service is distributed unless there is an overriding reason for it to be centralized. MSS has two primary key specialization's: Enterprise Monitor and Coordination Services and Local System Management Services.

For IR-1 and Release A not all of the MSS services are fully implemented, some are provided through COTS and COTS customization, while others are provided through the use of Office Automation (OA) tools.

- **Communications Subsystem (CSS):** The CSS services include Object Services, Distributed Object Framework (DOF) and Common Facility Services. Support in this subsystem area is provided for peer-to-peer, advanced distributed, messaging, management, and event-handling communications facilities. These services typically appear on communicating end-systems across an internetwork and are not layered, but hierarchical in nature. Additionally, services to support communicating entities are provided, included directory, security, time, and other ancillary services. The services of the Communications Subsystem are functionally dependent on the services of the Internetworking Subsystem. The services of the common facility, object and DOF are the fundamental set of interfaces for all CSMS management and FOS and SDPS user access (i.e., pull) domain services. The DOF services are the fundamental set of dependencies of the common facility and object services.
- **Internetworking Subsystem (ISS):** The Internetworking Subsystem provides for the transparent transfer of data between end systems within local and wide area networks. The ESN LANs are responsible for transfer of data within the DAACs, SMC and EOC. ECS interfaces with external systems and DAAC to DAAC communications are provided by the EOSDIS Backbone Network (EBnet). EBnet's primary function is to transfer data between DAACs, including both product data and inter-DAAC queries and metadata responses. Other networks, such as NSI, provide wide-area services to ECS. In addition, "Campus" networks, which form the existing networking infrastructure at the ECS locations, provides connectivity to EOSDIS components such as SCFs and ISTs.

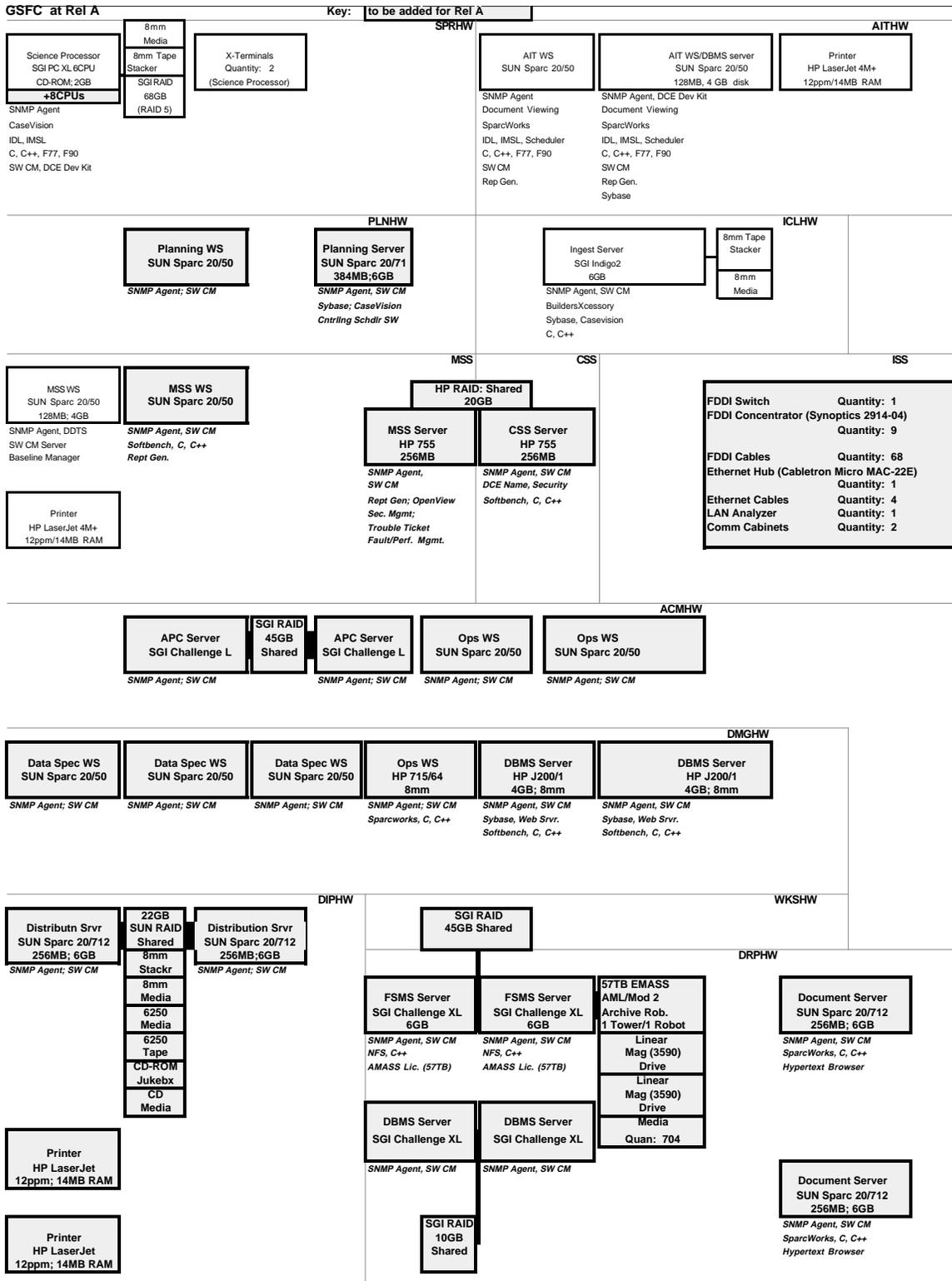


Figure 7-4. GSFC DAAC Hardware Configuration Overview

7.5 Acceptance Test Preparation

ATO holds an Acceptance Test kick-off briefing with GSFC management personnel. The kick-off meeting discusses the following:

- GSFC's readiness to conduct Acceptance Test
 - Results of hardware and software installation
 - External interface availability
- Required personnel
- Daily test execution schedules

7.5.1 GSFC's Site Readiness to Conduct Acceptance Test

The results of the hardware and software installation, and any associated problems, are analyzed by GSFC management and ATO during the kick-off meeting. In addition, GSFC management verifies the status of the necessary external interfaces and the expected site layout. The external interfaces needed for GSFC Acceptance Tests are depicted in Figure 7.1. Figure 7-2 depicts the expected GSFC site layout.

7.5.2 Required Personnel

During the kick-off meeting, GSFC management personnel have an opportunity to review and verify that the needed GSFC personnel are available to conduct the planned test events. Sections 8-12 lists the necessary GSFC personnel needed for each test sequence. Acceptance testing is a formal process that requires the coordination of different organizations. Each organization has well-defined roles and responsibilities for the acceptance testing process. Below is a summary of these organizations and personnel.

Acceptance Test Organization (ATO): The ATO assigns a test manager to coordinate and run acceptance testing. The ATO also provides test conductors to execute the step-by-step procedures that are defined in the ATPr. Test conductors also write, collect, and track nonconformance reports and determine the impact of these reports on test plans, scenarios, test cases, and procedures.

Quality Office (QO): The QO provides a representative to witness the execution of acceptance testing. The QO also tracks the status of nonconformance reports and reviews them prior to closure to ensure that the required actions have been completed.

Configuration and Data Management Organization: The Configuration Management Office (CMO) coordinates with the ATO to capture the test configuration of software, hardware, test data, test tools, and documentation prior to test execution to ensure repeatability. They also capture and retain test outputs (e.g., test logs, data, and modified procedures) and distribute copies for test analysis. The product baseline, which is established prior to the RRR and includes test reports, is maintained by the CMO.

ECS Maintenance & Operations (M&O) Organization: As part of acceptance testing at the test site, the government site manager assigns M&O personnel who are integrated into the test team to help execute acceptance tests. The early first-hand involvement of the site manager and his operations personnel in site acceptance testing provides the M&O Team with early visibility into each new release and hastens a smooth transition. This involvement and familiarity with ECS software in the stages before release to the user base greatly enhance the effectiveness and productivity of the M&O staff and positions a highly competent and responsive user support staff on-site at the DAACs. In addition, during the M&O phase, the ATO assists by providing benchmark tests to verify operational performance of the ECS system. The ATO provides guidance in acceptance testing during the verification of approved changes and enhancements.

ESDIS SI&T Contractor: The ESDIS Integration Contractor and the Independent Verification and Validation (IV&V) Contractor witness and monitors acceptance testing, as directed by the ESDIS SI&T, and the IV&V Contractor.

The Acceptance Test Team (ATT) consists of various personnel who assist the ATO Test Conductor during the acceptance testing phases. Listed below are the DAAC role players and a brief description of their responsibilities.

DAAC Computer Operator: Operate DAAC host processors, supporting restarts, reboots and shutdowns. Monitor system status and respond to console messages, documenting all operations problems and actions.

DAAC Ingest/Distribution Technician: Receives, logs and marks all non-electronic media for processing and storage in the ECS system.

DAAC Operations Readiness and Performance Assurance Analyst: Responsible for ensuring DAAC staff, hardware, software, documents and databases are in a state of operational readiness at all times including requisite DAAC system changes and launch preparations.

DAAC Operations Supervisor: Ensure all operations staff adhere to established policies, procedures and schedules. Provide direction and assistance to "on-line" operations staff as needed.

DAAC Production Monitor: Monitor science software execution via automated tools. Manage On-Demand and planned processing schedules and requests, document and support problem resolution and report performance status.

DAAC Production Planner: Develop daily, weekly and monthly DAAC science production schedules. Populate and maintain production database with science software characteristics, production rules and priorities. Develop and maintain ancillary/input data schedules.

DAAC Resource Manager: Coordinate with SMC for network problems and DAAC reconfigurations in response to ECS system anomalies. Responsible for site hardware, software, LAN and local DCE cell configuration, allocation and utilization performance.

DAAC Resource Planner: Responsible for reviewing and integrating all resource requests for DAAC system resources into daily, weekly and monthly DAAC resource schedules.

In addition to the operations staff, AT may draw upon available mission operations expertise from the following:

DAAC Administrative Assistant

DAAC Archive Manager

DAAC System Administrator

DAAC Configuration Management (CM) Administrator

DAAC Database Administrator

DAAC ECS Contractor Manager

DAAC Maintenance Coordinator

DAAC Integrated Logistics Support (ILS) Administrator

DAAC Science Coordinator

DAAC Science Software I&T Support Engineer

DAAC Software (S/W) Maintenance Engineer

DAAC System Engineer

DAAC System Test Engineer

DAAC User Services Representative

DAAC Science Data Specialist

7.6 Acceptance Test Sequences

The acceptance testing of Release A capabilities is divided into five major scenario groups: System Management, Push, Pull, flight operations, and End-to-End. These scenario groups identify hi-level ECS functionality from a user and operations viewpoint. Each group is further sub-divided into scenarios that emulate the operations and user environment. Scenarios are further broken down into more manageable test sequences in which test cases that trace to Level-3 requirements are executed. Sections 8 through 12 describe the nature of each scenario, the test sequences within them, and their individual test cases. Table 7-3 depicts the planned test sequences at all sites, including GSFC.

Table 7-3. Planned Sequence of Test Activities (1 of 5)

Sequence	Test Case	G	L	E	S	E
		S	a	D	M	O
		F	R	C	C	C
		C	C	C	C	C
8.1.1 M&O Procedures Review and Confidence	8.1.1.1 ECS Sites Nominal Operations Policy and Procedures Review	X	X	X	X	X
	8.1.1.2 ECS Hardware and Software Configuration Items Review	X	X	X	X	X
8.1.2 Start-up	8.1.2.1 Site Startup Confidence Test	X	X	X	X	X
	8.1.2.2 Site Restart Including Introduction of Previous Results	X	X	X	X	X
8.1.3 Site Operations	8.1.3.1 SMC Monitoring and Control of Managed Resources				X	
8.1.4 Site Shutdown/Recovery	8.1.4.1 Emergency and Other Abnormal Shutdown	X	X	X	X	X
	8.1.4.2 Recovery from Catastrophic Emergency Shutdown	X	X	X	X	X
	8.1.4.3 Recovery from Abnormal Non-Catastrophic Shutdown	X	X	X	X	X
8.1.5 Site Maintenance	8.1.5.1 DAAC M&O Interfaces	X	X	X		
	8.1.5.2 Maintenance of ECS Databases	X	X	X		
8.1.6 Site Data/Metadata/ Information Management	8.1.6.1 File Management	X	X	X		
	8.1.6.2 ECS Storage/Archive/Backup Capability	X	X	X	X	
8.1.7 Facilities Interface	8.1.7.1 SMC External Interfaces				X	
	8.1.7.2 EOC External Interfaces					X
	8.1.7.3 GSFC DAAC External Interfaces	X				
	8.1.7.4 LaRC DAAC External Interfaces		X			
	8.1.7.5 EDC DAAC External Interfaces			X		
	8.1.7.6 ECS Internal Interfaces	X	X	X	X	X
8.2.1 Schedule Generation	8.2.1.1 DAAC Schedule Generation	X	X			
	8.2.1.2 SMC Schedule Generation				X	
8.2.2 Schedule Adjudication	8.2.2.1 Adjudication of ECS Site Conflicts	X	X			
	8.2.2.2 Adjudicate Contention for Resources Between ECS Sites				X	
8.3.1 Enhancements	8.3.1.1 ECS Enhancements	X	X	X	X	X
8.4.1 Resource Management	8.4.1.1 Resource Management Directive	X	X	X	X	X
	8.4.1.2 Sufficient Storage	X	X			
8.4.2 Maintenance Management	8.4.2.1 On-site Preventive Maintenance				X	
	8.4.2.2 On-site Corrective Maintenance				X	
8.4.3 Logistics Management	8.4.3.1 Logistics Monitoring	X	X	X	X	X
	8.4.3.2 Logistics Replenishment	X	X	X	X	X
8.4.4 Training Management	8.4.4.1 ECS Training and Certification Program Management	X	X	X	X	
	8.4.4.2 On-the-Job Training				X	
8.4.5 Inventory Management	8.4.5.1 Inventory and Configuration Management	X	X	X	X	
	8.4.5.2 LSM Enhancement Evaluation & Implementation Management				X	
	8.4.5.3 SMC Enhancement Evaluation & Implementation Management				X	
8.4.6 Quality Management	8.4.6.1 SMC Quality Assurance				X	
	8.4.6.2 LSM Quality Assurance	X	X	X		X

Table 7-3. Planned Sequence of Test Activities (2 of 5)

Sequence	Test Case	G S F C	L a R C	E D R C	S M C	E O C
8.4.7 Policies and Procedures Management	8.4.7.1 Policies and Procedures Control	X	X	X	X	X
	8.4.7.2 Policies and Procedures Maintenance	X	X	X		X
8.4.8 Network Management	8.4.8.1 Network Configuration and Status	X	X	X		X
	8.4.8.2 Directory Service	X	X	X		X
8.5.1 Metrics	8.5.1.1 Performance Metrics Establishment	X	X	X	X	
	8.5.1.2 Performance Measurement and Degradation Response Capability	X	X	X	X	
	8.5.1.3 RMA Assurance Test and Analysis	X	X	X	X	X
8.5.2 Performance, Monitoring, Analysis, and Testing	8.5.2.1 Performance Testing	X	X	X	X	
	8.5.2.2 Performance Monitoring and Analysis	X	X	X	X	X
8.6.1 Fault Management	8.6.1.1 DADS Fault Analysis and Diagnostic Testing	X	X	X		
	8.6.1.2 Product Generation Fault Analysis and Diagnostic Testing	X				
	8.6.1.3 Communications Fault Analysis and Diagnostics Testing	X	X	X	X	X
	8.6.1.4 Push Error	X				
8.6.2 Security Management	8.6.2.1 SMC Security Functions				X	
	8.6.2.2 LSM Security Functions	X	X	X		X
8.6.3 Accounting and Accountability	8.6.3.1 Accountability: Data Tracking and Audit Trails				X	
	8.6.3.2 Accountability: LSM Data Tracking	X	X	X		X
8.6.4 Report Generation	8.6.4.1 SMC Report Generation				X	
	8.6.4.2 LSM Report Generation	X	X	X		X
9.1.1 Data Ingest, Processing, and Archive at ECS/LaRC from SDPF	9.1.1.1 CERES Data Receipt from SDPF to ECS/LaRC Test Procedure		X			
	9.1.1.2 CERES Data Validation/Formatting at ECS/LaRC Test Procedure		X			
	9.1.1.3 CERES Metadata and Level-1 through 4 Data Processing at ECS/LaRC Test Procedure		X			
	9.1.1.4 Archive CERES Data Products at ECS/LaRC Test Procedure		X			
	9.1.1.5 CERES Data Receipt from SDPF to ECS/LaRC (Fault) Test Procedure		X			
	9.1.1.6 CERES Data Validation/Formatting at ECS/LaRC (Fault) Test Procedure		X			
	9.1.1.7 CERES Metadata and Level-1 through 4 Data Processing at ECS/LaRC (Fault) Test Procedure		X			
	9.1.1.8 Archive CERES Data Products at ECS/LaRC (Fault) Test Procedure		X			
	9.1.1.9 Ingest, Validate, and Archive CERES Documentation from SDPF Test Procedure		X			
9.1.2 Data Ingest, Processing, and Archive at ECS/MSFC from SDPF						
9.1.3 Early AM-1 Interface Test Support	9.1.3.1 AM-1 Data Ingest from EDOS at ECS/LaRC Test Procedure		X			
	9.1.3.2 AM-1 Data Ingest from EDOS at ECS/GSFC Test Procedure	X				
	9.1.3.3 AM-1 Data Ingest from EDOS at EDC Test Procedure			X		

Table 7-3. Planned Sequence of Test Activities (3 of 5)

Sequence	Test Case	G S F C	L a R C	E D M C	S M C	E O C
9.1.4 Early FDF and AM-1 Interface Test Support	9.1.4.1 Orbit/Attitude Data Ingest from FDF	X				
9.2.1 Higher Level Processed Data Receipt from the V0 DAAC	9.2.1.1 Ingest, Validate, and Archive Migration Version 0 Data from the V0 DAAC	X	X	X		
	9.2.1.2 Ingest, Validate, and Archive TOMS Ozone Ancillary Data from the V0 DAAC	X				
	9.2.1.3 Ingest, Validate, and Archive Migration Version 0 Documentation from the V0 DAAC	X	X	X		
	9.2.1.4 Ingest, Validate, and Archive SAGE II Ancillary Data from the V0 DAAC		X			
9.2.2 Higher Level Processed Data Receipt from the TSDIS to the MSFC DAAC						
9.2.3 Higher Level Processed Data Receipt from the TSDIS to the GSFC DAAC	9.2.3.1 Ingest, Validate, Process, and Archive VIRS Data from TSDIS	X				
	9.2.3.2 Ingest, Validate, and Archive VIRS, PR, TMI, and GV Documentation from TSDIS	X				
	9.2.3.3 Ingest, Validate, and Archive VIRS, PR, TMI, and GV Data from TSDIS (Fault)	X				
9.2.4 Higher Level Processed Data Receipt from EPDS (Landsat-7)	9.2.4.1 Science Planning Information			X		
	9.2.4.2 Ingest Data/Metadata from Landsat-7			X		
9.2.5 Higher Level Processed Data Receipt from the NOAA ADC to the LaRC DAAC	9.2.5.1 Ingest, Validate, and Archive NOAA ADC Ancillary Data at the LaRC DAAC		X			
9.2.6 Higher Level Processed Data Receipt from the NOAA ADC to the GSFC DAAC	9.2.6.1 Ingest, Validate, and Archive NOAA ADC Ancillary Data	X				
9.3.1 Reprocessing Request Receipt/Processing from the SCF (LaRC)	9.3.1.1 SCF Reprocessing Requests Receipt/Validation at the LaRC DAAC Test Procedure		X			
	9.3.1.2 SCF Reprocessing Plan Generation/Dispatching at the LaRC DAAC Test Procedure		X			
	9.3.1.3 CERES Standard and Browse Data Products Reprocessing at the LaRC DAAC Test Procedure		X			
	9.3.1.4 CERES Standard and Browse Data Products QA Assessment Metadata Receipt/Processing at the LaRC DAAC Test Procedure		X			
	9.3.1.5 Reprocessed CERES Data Directories/Inventories Update and Notification Test Procedure		X			
9.3.2 Reprocessing Request Receipt/Processing from the SCF (MSFC)						
9.4.1 Archived TRMM Data Delivery	9.4.1.1 TSDIS Data Requests Receipt/Validation at the MSFC DAAC					
	9.4.1.2 Deliver Archived TRMM Data to the TSDIS from the MSFC DAAC					
	9.4.1.3 GSFC DAAC Data Requests Receipt, Validation, and Deliver Archived TRMM Data to the TSDIS	X				
	9.4.1.4 Deliver Archived TRMM Data to the TSDIS from the GSFC DAAC	X				
9.4.2 Reprocessed Data Receipt from the TSDIS (MSFC)						

Table 7-3. Planned Sequence of Test Activities (4 of 5)

Sequence	Test Case	G S F C	L a R C	E D M C	S C C	E O C
9.4.3 Reprocessed Data Receipt from the TSDIS (GSFC)	9.4.3.1 Reprocessed Data Receipt at the GSFC DAAC from TSDIS	X				
9.5.3 Maintain Processing Plan and Schedules	9.5.3.2 Maintain SMC Processing Plans and Schedules	X	X	X		
10.1.1 ECS Desktop User	10.1.1.1 System Access via Network Link	X	X			
	10.1.1.2 System Access via Direct Connection	X	X			
	10.1.1.3 User Registration	X	X			
	10.1.1.4 User Profile	X	X			
	10.1.1.5 Data Access Privileges (DELETED)	X	X			
	10.1.1.6 Directory Search	X	X			
	10.1.1.7 Guide Search	X	X			
	10.1.1.8 Inventory Search	X	X			
	10.1.1.9 Browse	X	X			
	10.1.1.10 Information Search	X	X			
	10.1.1.11 Product Order	X	X			
	10.1.1.12 Distribution Medium	X	X			
	10.1.1.13 Application Programming Interfaces (MOVED)					
	10.1.1.14 Data Product History (DELETED)					
	10.1.1.15 User Statistics Report Generation	X	X			
10.1.2 ECS/Version 0 (V0) System Interoperability	10.1.2.1 ECS User Access to Version 0	X	X	X		
	10.1.2.2 Search ECS & V0 from the ECS Desktop	X	X			
	10.1.2.3 Version 0 User Access to ECS	X	X			
	10.1.2.4 Search ECS & V0 from the V0 Client	X	X			
10.1.3 EOSDIS Core System (ECS)/Affiliated Data Center (ADC) Interoperability	10.1.3.1 ECS User Access to NOAA ADC	X	X			
	10.1.3.2 ECS User Access Request NOAA ADC Product	X	X			
	10.1.3.3 Product Status Request	X	X			
	10.1.3.4 ECS User Search	X	X			
	10.1.3.5 ECS User Access & Search of MSFC SCF Products	X				
10.2.1 GSFC SCF/ECS	10.2.1.1 Algorithm Integration and Test at the GSFC DAAC	X				
	10.2.1.2 Product QA at the GSFC DAAC	X				
	10.2.1.3 Search, Browse, Request, and Receive Data at the GSFC DAAC	X				
	10.2.1.4 Data Management Services at the GSFC DAAC	X				
	10.2.1.5 Toolkit Testing at the GSFC DAAC	X				
10.2.2 LaRC SCF/ECS	10.2.2.1 Algorithm Integration and Test at the LaRC DAAC		X			
	10.2.2.2 Product QA at the LaRC DAAC		X			
	10.2.2.3 Search, Browse, Request, and Receive Data at the LaRC DAAC		X			
	10.2.2.4 Data Management Services at the LaRC DAAC		X			
	10.2.2.5 Toolkit Testing at the LaRC DAAC		X			

Table 7-3. Planned Sequence of Test Activities (5 of 5)

Sequence	Test Case	G S F C	L a R C	E D M C	S C C	E O C
11.1.1 EOC Tests						
12.1.1 Inter-Site Message	12.1.1.1 Inter-DAAC and DAAC-SMC Communications	X	X	X	X	X
12.1.2 Multi-Site System Management	12.1.2.1 Schedule Generation, Coordination and Adjudication Support	X	X		X	
	12.1.2.2 TRMM and AM- 1 Resource Scheduling Support	X	X		X	
	12.1.2.3 SMC Support to Integration Test & Simulation Activities				X	
12.2.1 SDPF Data Handling and Processing	12.2.1.1 Retrieve CERES Data from SDPF, Process and Archive Standard CERES' Products at LaRC DAAC		X			
12.2.2 TSDIS Data Handling	12.2.2.1 VIRS, PR, TMI, and GV Data Ingest and Store	X				
12.2.3 TRMM Data Product Distribution	12.2.3.1 TRMM Data Product Distribution	X	X			
12.2.4 Data Accounting	12.2.4.1 Data Product/Data Receipt Accounting	X	X			
12.4.1 Science Data Search and Retrieval	12.4.1.1 Multi-Site Data Search and Access	X	X			
	12.4.1.2 Data Receipt and Data Storage	X	X			
	12.4.1.3 Science Ancillary Data Access	X	X			
12.4.2 Science Data Product Production	12.4.2.1 Science Algorithm Retrieval and Compatibility	X	X			
12.4.3 Science Metadata Production and Storage	12.4.3.1 Metadata Production and Updating	X	X			
	12.4.3.2 Metadata Storage and Retrieval	X	X			
12.4.4 ECS Data Set Interoperability	12.4.4.1 ECS DAAC and V0 DAAC Interoperability	X	X	X		
	12.4.4.2 NOAA Data Centers/ECS DAAC Interoperability	X	X			
12.5.1 Data Ingest, Data Server and Data Distribution Performance	12.5.1.1 High Data Rate Ingest, Archiving and Retrieval	X	X			
	12.5.1.2 Ingest and Archiving of Triple the Average Data Rates	X	X			
	12.5.1.3 GSFC DAAC Data Reprocessing Support and Archiving	X				
	12.5.1.4 LaRC DAAC Data Reprocessing Support and Archiving		X			
12.5.2 System Response Time Performance	12.5.2.1 Client Server Response Time Performance	X	X			
	12.5.2.2 Data Access Retrieval and Transmission Performance	X	X			
12.5.3 ECS Sizing, Evolution, and Growth	12.5.3.1 Accommodation of ECS Expansion Analysis	X	X	X		
	12.5.3.2 ECS Growth and Evolution Adequacy Analyses	X	X	X	X	X
12.5.4 ECS Testability and Overall Capabilities	12.5.4.1 Test Support in an Operational DAAC	X	X			

7.6.1 GSFC Test Procedure Roadmap

This section provides a listing of tables from the Appendices to this document, that cross reference test sequences or procedures to each of the following:

External Interfaces (Appendix A) - The left column of this table lists each interface external to the Release A ECS GSFC DAAC. In the right column is a list of test sequences which contains tests involving that external interface.

Operational Scenarios (Appendix B) - This table lists each of the operations scenarios from the Operations Scenarios for the ECS Project: Release A (DID 605) in the left column, and in the right column a list of test sequences which contains tests which use that scenario as part of the procedure(s) in that sequence.

M&O Procedures (DID 611) (Appendix C) - This table lists each of the maintenance procedures from the Maintenance and Operations Procedures (DID 611) in the left column, and in the right column a list of test procedures which use that procedure.

GSFC H/W (Appendix D) - This table lists each piece of hardware at the Release A ECS GSFC DAAC in the left column, and in the right column a list of test procedures which use that hardware as part of the procedure(s).

7.7 Test Conduct

Test conduct is the execution of the approved test procedures in the officially approved and controlled test configuration. ATO test conduct takes place at the GSFC ECS DAAC on a fully approved and configured release baseline as approved at the CSR.

7.7.1 Test Direction

All formal tests are conducted under the direction of the Test Conductor who has direct authority regarding all aspects of the execution of that test. This authority includes the assignment of priority to NCRs, NCR disposition, and the NCR's impact on ongoing testing. The step-by-step details of non-conformance reporting and software configuration management is described in the Software Nonconformance Reporting and Corrective Action System Process Project Instruction (SD-1-014) and the Software Development Handbook Project Instruction (CM-1-025).

Authority is vested in the Test Conductor by the Project or Release Manager, but may be further delegated at specific times (off-shift) and/or sites or during his absence. Where activities involve more than one site, this delegation of authority is key. The local test conductor needs autonomy, but also needs centralized guidance. For further information concerning duties of other test participants, see the Verification Plan (DID 401/VE1).

7.7.2 Test Schedule Management

The Test Conductor is responsible for the scheduling and dispatch of test resources and activities. In consultation with concerned parties, he/she determines what portion of the test is executed on a given day. During this process all pertinent factors are examined: availability of system resources, conflicts with other activities and inherent test sequencing concerns. During the planning and preparation phases the overall verification activity was divided into scenarios and sequences to provide flexibility in scheduling. The sequences comprising a scenario provide a manageable increment of the test with clear starting and stopping points. The test procedure is the most basic increment of execution. It is crucial that the Test Conductor be cognizant of dependencies within the test structure (e.g., does the current procedure require that another procedure has run successfully to establish initial data conditions?). These are documented in

the test procedure itself, but the Test Conductor must have broader understanding and control of the test environment at all times to deal effectively with test scheduling issues.

When a given test procedure is scheduled for execution, the Test Conductor ensures that all necessary materials and supporting data are present. Included and key to this activity are copies of the applicable procedures, either hard copy or access to on-line soft copy. Specially labeled copies of the procedures are distributed to each participant actually performing the test. Observers receive copies so they may follow the execution. The copies of the test procedures held by those performing the test and the Test Conductor's copy is collected and becomes part of the official record of the test. As such, on the day of the test they are marked, by hand, to indicate date, time, operator position (or role) and who is using the procedure.

Before the beginning of a scheduled test period a pre-test meeting is held by the Test Conductor. The Test Conductor determines the need for both regularly scheduled and Ad Hoc meetings. The purpose of the pre-test meetings is to:

- a. Brief the activities to be performed
- b. Assess readiness to proceed with those activities
- c. Discuss any special conditions for the conduct of the activity
- d. Apply any last minute markups to the test procedures to be used. If there are any, they are made, initialed and dated.

All changes to test procedures, either during planning, execution or post test analysis, are approved and initialed by the Test Conductor. Changes to test procedures are either temporary or permanent. Temporary changes are those that are made to accommodate a singular event or circumstance. Temporary changes generally apply to only one execution of the test procedure and are made to document the deviation for reporting purposes. For temporary changes the procedures are marked up in blue or black ink. Permanent procedure changes are made to correct errors in the procedures or insert new steps which are executed every time the test is re-run. Permanent changes are marked up in red ink and are reflected in the next document release which contains that particular test procedure.

7.7.3 Test Execution

The test begins under the control of the Test Conductor or a designated authority. Team participants follow, exactly, the instructions written in the procedures. In some cases these procedures have an inherent timeline that is critical to the success of the activity. In these cases the procedures have, for each step or group of steps, a time tag telling when they should be performed. The Test Conductor coordinates the pacing of these steps by providing synchronized time sources to all participants. In other cases, the procedures have self-contained pacing instructions. These may instruct the test participant to wait until directed to proceed with a given activity.

The test procedures specify what data is to be collected as the test is executed. This may include spaces where data is to be entered into the procedure itself to capture results or to record the time it took to perform a given activity. All entries requested must be entered in blue or black ink.

7.7.4 Unscheduled Events During Test Execution

Problems encountered which interrupt or prevent the execution of the test procedures might include the following:

- a. Failure of the system to perform as specified in the procedure.
- b. Inability to perform the next step due to, for instance, missing data. An example is: "Select an ASTER image dated 9/11/98".
- c. Critical software failure.
- d. Hardware, communications, or special test equipment failure.
- e. An error in following the procedure. Steps might be inadvertently skipped. This may be noticed by the operator or might cause a more overt problem already listed above.
- f. Unexpected actions by others that affect the test environment.

It is the responsibility of the test participants to determine if problems have occurred. If there is doubt, they immediately address their concerns to the Test Conductor. The Test Conductor is, likewise, responsible to carefully follow the conduct of the test constantly, looking for deviations or anomalies. Actions to be taken in response to unscheduled events are detailed in the Procedure for Control of Unscheduled Activities During Verification for the ECS Project (DID 404/VE1).

7.7.5 Test Conduct Documentation

As the test proceeds, significant events are recorded in test logs. Each test team participant keeps a log. The Test Conductor keeps a master test log which include the information recorded in the individual logs.

Upon completion of a session of testing, the Test Conductor directs the securing of all necessary information. Material to be collected/controlled includes:

- a. All test procedures (including markups)
- b. Test Logs (including individual logs and notes and the master test log)
- c. Materials produced by the system under test (e.g. printouts, screen dumps)
- d. Post test file dumps. This may involve collection of actual media to perform the saves. If instead, the dumps are recorded on disk, they should be placed under CM control by saving them within the ClearCase tool. In this case, a record of the data set names and version must be maintained.

- e. NCRs written during the testing period. Note: Some problems encountered are obvious NCRs and can be written immediately. Other problems are discussed at the post test review meeting described below. ECS policy is to write NCRs freely and dispose of duplicates or erroneous submissions after review.

7.7.6 Daily Test Reviews

At the completion of each day of testing, a post test review meeting is held to review the events of the day. If testing involves simultaneous activities at multiple sites, as in the end-to-end scenarios, this post test review meeting is held as a teleconference. During this meeting, overall testing status is assessed. Problems encountered during the day are reviewed. This is accomplished by reviewing all test procedures and test logs. Each problem is discussed and assessed. A determination of the need to create a Nonconformance Report is made. If an NCR is opened, a team member is assigned to enter it in the NRCA system. The status and priority of the problem is determined, if possible. Any necessary follow-up investigation is assigned, including imposition of a due date. A daily log of statistics is kept citing the number of test cases executed, number of Nonconformance Reports filed, their classification and other test metrics for status reporting purposes. Specific metrics relating to test execution are developed, reviewed, and approved prior to the start of test conduct activities.

Finally, a determination of success for the day's activities is made and discussed. This guides the planning for the next session's activities. Based on this assessment, any changes in the scheduled activities for the next day is evaluated and the test schedules and procedures updated appropriately. Generally, complete success in meeting the objectives for a day's testing results in the uninterrupted continuation of the planned test activities. Unexpected interruptions to testing results in the rescheduling of test activities and resources to minimize the impact to the testing effort.

7.8 Acceptance Test Schedule

Figure 7-5 depicts the acceptance test schedule for the ECS Release A. During the conduct of acceptance testing, ATO conducts a daily acceptance test status meeting to apprise EDC management personnel of on-going acceptance test schedules and status.

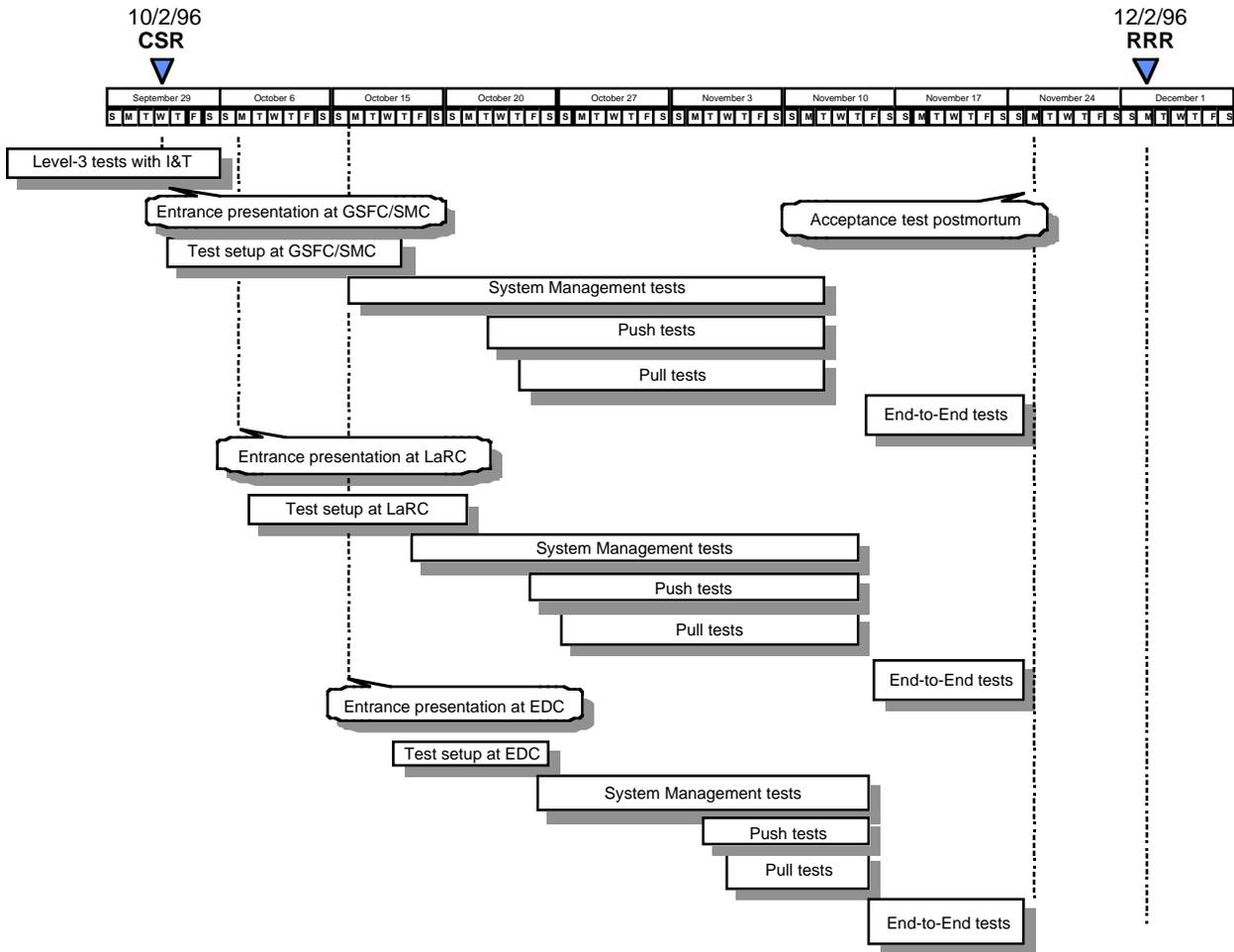
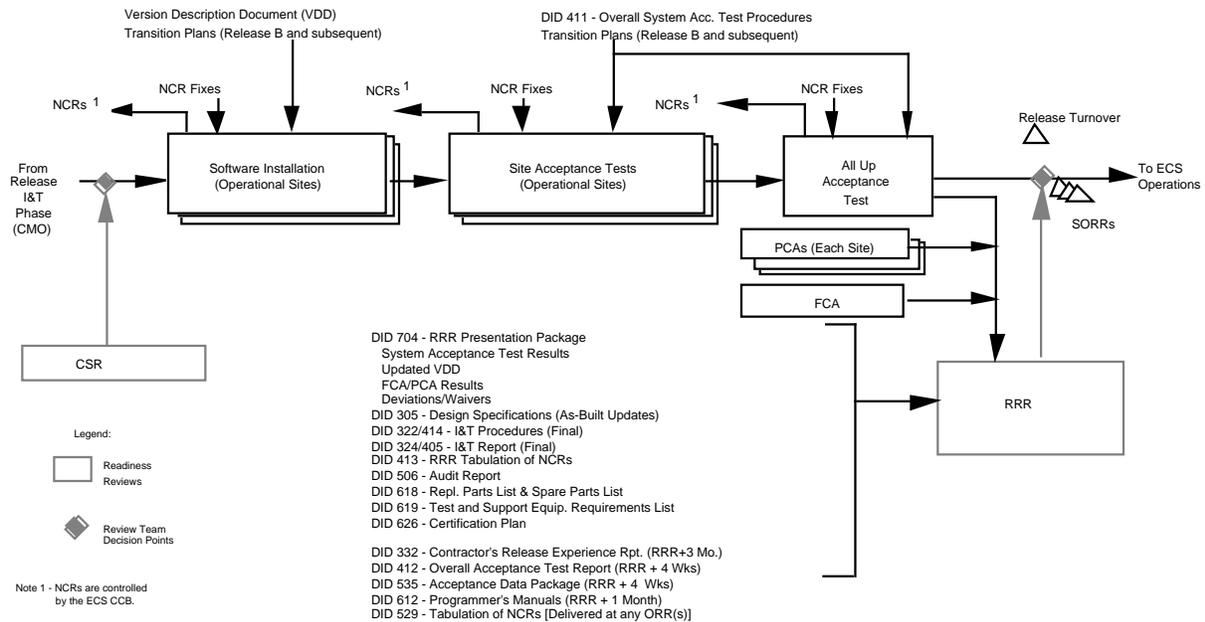


FIGURE 7-5. ACCEPTANCE TEST SCHEDULE

7.9 Release Readiness Review (RRR)

Before ECS Release A is formally approved for use, a RRR is held to validate the utility and suitability of the release. This review focuses on the degree to which requirements for Release A have been satisfied. The current status of interfacing elements and the user support infrastructure within the ECS is reviewed to ensure that Release A actually improves overall system operation. In addition to a summary of new capabilities and changes since the Ir1 release, the data products scheduled in the ECS CDRL for delivery prior to the RRR, shown in Figure 7-6, are available for review.

The results of the Physical Configuration Audits (PCAs), conducted at each applicable operational site, are presented at RRR. Witnessed by the Quality Office and ESDIS, the PCAs are conducted by the ECS Project Team and led by the CMO. The results of the Functional Configuration Audits (FCAs), accomplished by review of Acceptance Test results, are presented at RRR. The FCA's are performed by the Quality Office and ESDIS. Both PCA and FCA results are documented and delivered in CDRL 081, Audit Report (DID 506/PA3).



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Figure 7-6. Release Readiness Review Material

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