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EOSDIS Core System Project

Release A Integrated Support Plan for the ECS Project

Final

July 1995

Hughes Information Technology Corporation
Landover, Maryland

Release A Integrated Support Plan for the ECS Project

July 1995

Prepared Under Contract NAS5-60000
CDRL Item 122

SUBMITTED BY

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Preface

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Abstract

This Integrated Support Plan (CDRL 122, DID 616) addresses the Release A integrated logistics support concept and the responsibilities of the ECS Project for the commercial off-the-shelf hardware and software products supplied by the ECS Contractor. The period of responsibility and the daily support hours are stated, as are the responsibilities of OEM/vendor and third-party contractors. This plan identifies the components of integrated logistics support, the integrated logistics support organization, Release A site locations, and the concept for Release A logistics support.

Keywords: *Support, supportability, standardization, availability, mean down time (MDT), maintenance, integrated logistics support (ILS), diagnostics, line replaceable unit (LRU), spares provisioning, electrostatic discharge (ESD), support equipment, facilities, and logistics support analysis (LSA).*

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Abbreviations and Acronyms

1. Introduction

This document, Contract Data Requirements List (CDRL) item 122, whose requirements are specified in Data Item Description (DID) 616/OP2, is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-60000).

1.1 Purpose and Scope

This Integrated Support Plan (ISP) covers the ILS planning and management functions to be performed to support Release A. This plan is provided in accordance with CDRL 122 and in compliance of the ECS Statement of Work.

1.1.1 Purpose

The purpose of this plan is to identify the processes for providing logistics support to Release A of the ECS project in a manner that accomplishes ECS objectives. This plan establishes the contractor's plan for managing the ECS ILS efforts. It provides the direction and guidance necessary to control the logistics efforts from initial design through system installation, operations, and upgrades. This document is applicable to the ECS Release A Project Team, vendors, and third party contractors in providing logistics support to the ECS Project.

1.1.2 Scope

This plan addresses the implementation and management of the ILS program. The ILS program includes management of components and systems identified as part of interim release 1 (Ir1) and Release A, including Government Furnished Equipment/Government Furnished Property (GFE/GFP) and consumables. The objective of ILS functions is to achieve the ECS operational availability (A_O) requirements at the least life cycle cost. ILS functions are iterative and continuous from the early requirements analysis, system design and implementation, and during system operations. The operational ILS thrust is to achieve and sustain the required operational availability (A_O) and mean down time (MDT) objectives.

1.2 Program Summary

ILS planning occurs early in Release A's life cycle to ensure achieving an optimal balance among operational, economic, and logistics factors in meeting ECS operational requirements at the least possible life cycle cost. This balance is achieved by influencing Release A design, COTS acquisition, and support operations. Logistics factors considered in design and acquisition efforts include the support requirements for equipment, facilities, tools, data, training, and personnel.

An integral component of the ILS program is logistics support analysis (LSA). Through LSA, logistics data related to the proposed design are gathered to identify the logistics support requirements, develop a logistics support concept, and plan logistics support for Release A operations.

1.3 Updating Process

Changes to this plan will be recorded in the change page at the front of this plan. This plan may be reissued whenever the number of changed pages make it more efficient and economical to do so. The distribution of reissued ISPs and changes will be in the same quantities and to the same organizations that received the initial ISP, unless the distribution list is revised by request.

1.4 Document Organization

The contents of the document are as follows:

- Section 1: Introduction - Introduces the Integrated Support Plan purpose, scope, program summary, up-dating process, and document organization.
- Section 2: Related Documentation - Describes the parent, reference, and applicable documents useful in understanding the details of subjects discussed in this document.
- Section 3: System Description - Describes the Release A architecture and provides specific logistics attributes of the COTS products to be supported as well as the Release A operational and maintenance objectives.
- Section 4: Program Management - Describes the logistics objectives, organization, and management.
- Section 5: ILS Program - Details specific ILS requirements for COTS products and DAAC sites.
- Section 6: ILS Schedule - Describes plans for performing the logistics functions and tasks.
- Section 7: Related Plans - Describes other ECS plans and documents that may impact ILS functions and tasks.
- Section 8: Appendices
- Section 9: Abbreviations and Acronyms

2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which the scope and content of this document derive:

194-102-MG1-001	Configuration Management Plan for the ECS Project
420-05-03	Goddard Space Flight Center, Performance Assurance Requirements for the EOSDIS Core System (ECS), 1/95
423-41-01	Goddard Space Flight Center, Statement of Work for the EOSDIS Core System (ECS), 2/95
423-41-02	Goddard Space Flight Center, Functional and Performance Requirement Specification for the EOSDIS Core System (ECS), 11/94

2.2 Reference Documents

The following documents are referenced herein and, amplify or clarify the information presented in this document. These documents are not binding on the content of this Integrated Support Plan.

none	Goddard Space Flight Center, EOSDIS Core System (ECS) Integrated Logistics Support Plan, 4/91
500-TIP-2110	Goddard Space Flight Center, Mission Operations and Data Systems Directorate Technical Information Program Specification for Document Formats, 8/92
DOD-STD-1686B	Department of Defense Standard: Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment, 12/92
MIL STD 1388-1A	Department of Defense Standard: Logistics Support Analysis, 4/83
NHB 6000.1D	NASA Handbook: Requirements for Packaging, Handling and Transportation, 9/90
STDN 402	Goddard Space Flight Center, System Maintenance Program, 8/90

2.3 Applicable Documents

The following documents are referenced herein and, amplify or clarify the information presented in this document.

193-103-MG3-001	Configuration Management Procedures for the ECS Project
104-CD-001-003	Data Management Plan for the ECS Project, Revision 1
193-105-MG3-001	Data Management Procedures for the ECS Project
194-201-SE1-001	Systems Engineering Plan for the ECS Project
194-207-SE1-001	System Design Specification for the ECS Project
194-302-DV2-001	ECS Facilities Plan for the ECS Project
194-501-PA1-001	Performance Assurance Implementation Plan for the ECS Project
515-CD-001-002	Availability Models/Predictions for the ECS Project, Preliminary
516-CD-001-002	Reliability Predictions for the ECS Project, Final
518-CD-001-002	Maintainability Predictions for the ECS Project
601-CD-001-003	Maintenance and Operations Management Plan for the ECS Project, Final
194-602-OP1-001	Property Management Plan for the ECS Project
604-CD-001-004	Operations Concept for the ECS Project: Part 1-- ECS Overview
604-CD-002-001	Operations Concept for the ECS project: Part 2B -- ECS Release B, Annotated Outline
193-616-OP2-001	Integrated Logistics Support Plan for the ECS Project
617-CD-001-002	Logistics Support Analysis Plan for the ECS Project
101-620-OP2-001	List of Recommended Maintenance Equipment for the ECS Project
622-CD-001-001	Training Plan for the ECS Project
800-WP-001-001	Facilities Plan for Ir1 and Release A for the ECS Project, White Paper
GSFC S-530-1	Goddard Space Flight Center, Specification for Ground System Spare Parts Program, 3/85
MIL-HDBK-217F	Department of Defense Handbook: Reliability Prediction of Electronic Equipment, 12/91
NHB 4200.1C	NASA Handbook: NASA Equipment Management Manual, 6/87
NHB 6000.1D	NASA Handbook: Requirements for Packaging, Handling, and Transportation, 9/90
NPRD-3	Reliability Analysis Center/Rome Laboratory/Griffiss AFB: Non-Electronic Parts Reliability Data 1991
STDN 507	Goddard Space Flight Center, Network Logistics Manual 9/89

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3. System Characteristics

3.1 System Description

Release A, including its incremental releases, is the initial fielding of COTS products for the ECS. ECS is the geographically distributed ground system network of hardware (HW) and software (SW) for the collection, processing, storage, and distribution of data obtained from a system of space platforms as well as storage and distribution of selected non-EOS data sets of the ECS. ECS also supports the operation and management of the EOS in-orbit payloads, US observatories and the interaction of its components. The overall ECS is an expandable, technology adaptable and modularly designed hierarchy of segments, elements, subsystems and components.

3.1.1 Functions of ECS Segments

The ECS is composed of three functional segments that are arranged into two of the three organizational components for managing their development. The functional segments are: The Flight Operations Segment (FOS), the Science Data Processing Segment (SDPS), and the Communications and Systems Management Segment (CSMS). Each segment has unique functions and availability requirements. The ECS, with its components and interfaces, is depicted in Figure 3.1, ECS Conceptual Architecture.

The functional segments are aligned into two of the three organizational components for development. The third organizational component provides selected services in support of developing the functional segments. The alignment is:

<u>Functional Segment</u>	<u>Development Organization</u>
FOS	FOS
SDPS and CSMS	Science and Communications Development Organization (SCDO) System Management Office (SMO) (DAAC operations, Test and Acceptance, and Modeling and Validation)

The Flight Operations Segment (FOS) manages and controls the EOS-AM1 space platform and instruments (observatory). The FOS contains the most time-sensitive functions and is composed of two elements. The EOS Operations Center (EOC) plans, schedules, controls and monitors EOS mission operations and the EOS observatory. Instrument Support Toolkits (ISTs) schedule, command, and operate the science instruments and monitor instrument performance.

The SCDO combines science data processing and communications/network management. The science element provides a set of processing, archival, and distribution elements for science data and a data information system for the entire ECS. The SCDO/Science element consists of seven

subsystems: 1) client, 2) interoperability, 3) data management, 4) data server, 5) ingest, 6) planning and 7) data processing. Together, these subsystems support the services required to receive, process, archive and manage the NASA Probe flight missions, EOS-AM1 space platform and instruments, other selected remotely sensed data, and their associated data products.

The Communications/Networks element provides overall ECS management and operation of the ground system resources, facilities, and networking services. It consists of 3 subsystems: 1) the Communications Subsystem (CSS), which is a collection of services providing flexible interoperability and information transfer between clients and servers; 2) the Internetworking Subsystem (ISS), which is the layered stack of communications services consisting of the data link and physical services, the network services, and the transport services; and 3) the Management Subsystem (MSS) which is a collection of applications that manages all ECS resources. Using these functions, the SMC will monitor and coordinate the operations of the ground system resources, facilities and communications network and interfaces to NASA's EOS Communication Network (Ecom). The Ecom provides a dedicated communications network and services for interconnections of the ECS and non-ECS facilities within the EOS Program.

The System Management Office (SMO) provides the modeling to predict the functionality and reliability of a design and validates the design through test and acceptance procedures. SMO's efforts are provided to the FOS and SCDO organizations and encompass the FOS, SDPS, and CSMS functional segments.

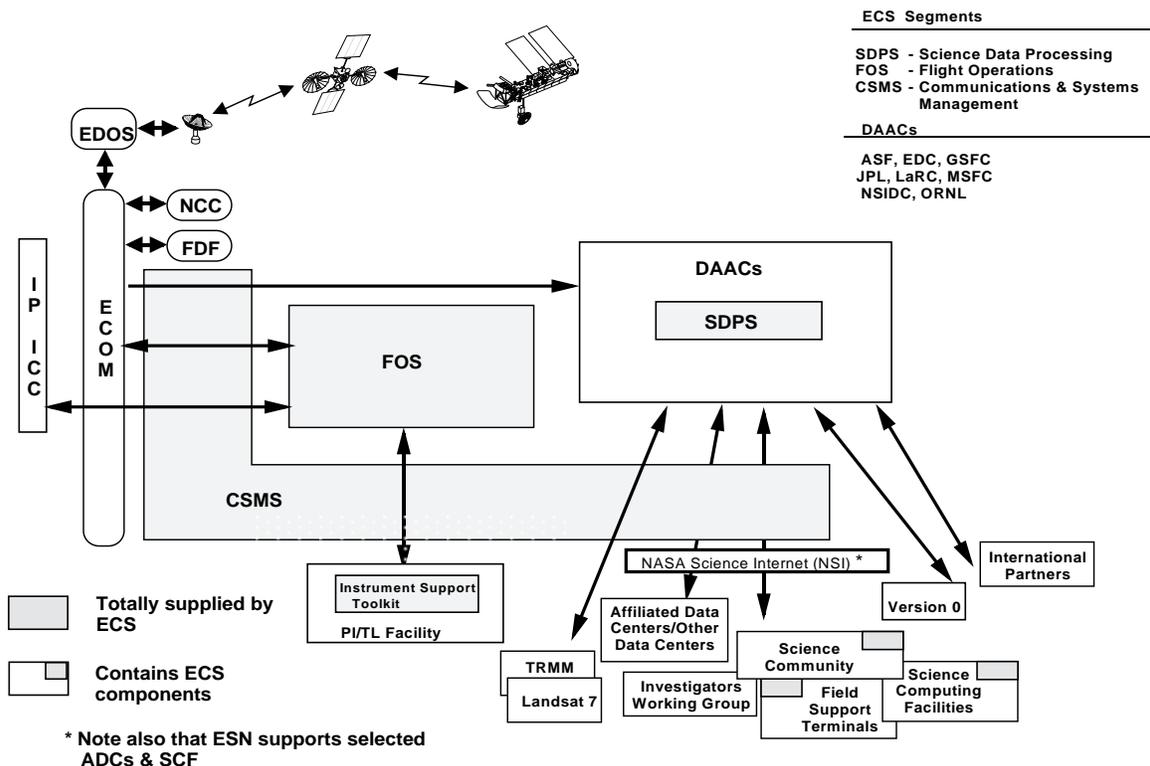


Figure 3-1. ECS Conceptual Architecture

3.1.2 COTS Products to be Supported

The ECS is comprised of COTS hardware (HW) and software (SW), government furnished equipment (GFE), and developed SW applications and science SW developed by scientists to execute in the ECS environment. Release A equipment consists entirely of COTS HW, such as workstations, servers, processors, robotics storage subsystems, concentrators, routers, bridges, and various peripherals. Also in Release A is COTS SW consisting of applications, development languages, operating systems, security tools, and data management tools. A preliminary (i.e. pre-CDR) list of Release A COTS HW is shown in Appendix A and SW in Appendix B. These lists are likely to change slightly between now and the time the equipment and SW are procured.

3.1.3 ECS Locations

Release A will be installed at four operational DAAC sites. The EDF will contain the same configurations of DAAC HW and SW (i.e. mirror image) to facilitate testing and sustaining engineering.

- a. Release A:
 - 1) Goddard Space Flight Center (GSFC), Greenbelt, Maryland, (includes EOC and SMC in follow-on releases)
 - 2) Earth Resources Observation Systems (EROS) Data Center (EDC), Sioux Falls, South Dakota
 - 3) Marshall Space Flight Center (MSFC), Huntsville, Alabama
 - 4) Langley Research Center (LaRC), Hampton, Virginia
- b. DAAC sites receiving their initial equipment and SW at Release B are as follows:
 - 1) University of Colorado, National Snow and Ice Data Center (NSIDC), Boulder, Colorado
 - 2) University of Alaska Synthetic Aperture Radar (SAR) Facility (ASF), Fairbanks, Alaska
 - 3) Jet Propulsion Laboratory (JPL), Pasadena, California
 - 4) Oak Ridge National Laboratory (ORNL), Oak Ridge, Tennessee

Additional locations may be incorporated into the ECS as operational needs warrant. ECS DAACs will share facilities belonging to the institutional hosts in accordance with the Release A Facilities Plan (Final), 194-302-DV2-002. Host facilities will provide space for ECS personnel, equipment; maintenance, spare parts, tools, and consumables storage.

3.1.4 Interim Release 1 (Ir1) Support

Logistics support during Ir1 is designed to support interface testing and science SW integration and test efforts at the four Release A DAACs and the EDF. There are no contractual operational requirements for Ir1. Therefore, operational availability (A_O) and mean down time (MDT) for ECS functions are not factors in the support of Ir1 equipment. Equipment maintenance during

Ir1 is performed solely by OEMs and maintenance vendors since equipment is still be under one-year warranty support. Equipment and SW problems are reported by site operations personnel to the ILS Office, which coordinates with the OEM or vendor for the support needed. Logistics support is provided by the site operations personnel until Release A is installed and declared operational. The ILS Office supports sites, as needed, in the functions of property accountability and supply support, configuration management, SW upgrades and licensing, and the execution of equipment warranty support. These personnel also establish and maintain the technical reference libraries for ECS documentation delivered to the sites during Ir1.

3.2 Reliability Factors

A significant logistics challenge is satisfying the ECS operational availability (A_o) requirements. Key to satisfying these requirements is the selection of HW having high inherent reliability rates, as measured by mean-time-between-failure (MTBF). ECS functions must meet a minimum A_o of 96 percent, with more stringent requirements for many of the critical ECS functions. Within the FOS is the requirement that there be no single point of failure for functions associated with real-time operations. Although there will not be spare assets to control during Release A time frame, the EOC functions will be exercised to prove capability for later releases. Within the SDPS product generation functions at the DAACs, the ECS must be configured to provide a "fail-soft" environment. Table 3-1, ECS Release A Operational Requirements, identifies the availability and mean down time (MDT) requirements that must be achieved.

The overall objective of the Release A ECS reliability, maintainability, and availability (RMA) program is to develop a system that accomplishes the following:

- a. Stays within the specified maximum MDT requirements
- b. Meets the A_o requirements for the ECS system functions
- c. Optimizes reliability and maintainability trade-offs to result in an efficient maintenance and logistics system that effectively supports ECS operations

Reliability allocations and predictions for ECS components are contained in 516-CD-001-002, Reliability Predictions for the ECS Project. Failure Modes and Effect Analyses (FMEAs) and Critical Items List (CIL) for FOS critical functions were conducted in accordance with 517-CD-001-002 (final). The ECS reliability program is based upon the requirements contained in GSFC 420-05-03, ECS Performance Assurance Requirements (PAR) and the ECS Requirements Specification. Data obtained through the RMA Program are contained in a common-use data base for the conduct of logistics and life cycle cost analyses.

Because Release A is composed of COTS equipment, the original equipment manufacturer (OEM) predictions of inherent reliability were used when available and credible. When OEM reliability data was not available or credible, equipment reliability was predicted using comparative analysis or calculated using the parts count analysis method of MIL-HDBK-217F, Reliability Prediction of Electronic Equipment and NPRD-91, Non-Electronic Parts Reliability Data.

Table 3-1. ECS Release A Operational Requirements

ECS Function	Functions	A ₀ Minimum	MDT Maximum
	Flight Operations Segment (FOS)		
3800	Critical Real Time Functions*	0.9998	1 Min.
3810	Non Critical Real Time Functions*	0.99925	5 Min.
3820	Targets of Opportunity*	0.992	1 Hr
3700	Observatory Real Time Operations Functions*	0.96	4 Hrs
3710	ECS shall have no single point of failure for functions associated with real time operations of the spacecraft and instruments		
	Science Data Processing Segment (SDPS)		
3900	Science Data Receiving	0.999	2 Hrs
3910	Switch over to Backup	NA	15 Min.
3920	Archiving & Distributing Data	0.98	2 Hrs
3930	User Interface to IMS at DAACs	0.993	2 Hrs
3940	Information Searches on the ECS Directory	0.993	2 Hrs
3950	Data Acquisition Request Submittals*	0.993	2 Hrs
3960	Metadata Ingest and Update	0.96	4 Hrs
3970	Info Searches on Local Holdings	0.96	4 Hrs
3980	Local Data Order Submission	0.96	4 Hrs
3990	Data Order Submission Across DAACs	0.96	4 Hrs
4000	IMS Data Base Management and Maintenance Interface	0.96	4 Hrs
4010	Product Generation Computers	0.95	NA
4020	Product generation computers shall provide a "Failsoft" environment		
	Communications and System Monitoring Segment (CSMS)		
5.6.4.3	Critical Services: Configuration Management, Resource Management, Performance Management Service, Report Generation, Accounting*/Accountability, Fault Management, Security Management, and Directory Services	0.998	20 Min.
5.6.4.3	Non Critical Services: Scheduling services and non-critical CM services	0.96	4 Hours
4030	SMC functions of Gathering and Disseminating System Management Information	0.998	20 Min.
4035	ESN shall have no single point of failure for functions associated with network databases and configuration data		
4036	ESN A ₀ shall be consistent with the specified A ₀ of the ECS functions.		
3630	Maximum down time shall not exceed twice the required MDT in 99 percent of failure occurrences		
A ₀ = Operational Availability		* = Not operationally required for Release A	
MDT= Mean Down Time			

3.3 Maintainability Factors

ECS mean down time (MDT) requirements necessitate that the Release A equipment require minimal maintenance. The capability to diagnose and isolate equipment failures to the line replaceable unit (LRU) was a criterion for selecting ECS equipment. Some systems are capable of being diagnosed remotely. Release A was designed to enable ECS components to be maintained without necessitating a shutdown of the system once operations have begun. Maintainability Demonstration Plans, CDRL 084, DID 511, will be prepared for the conduct of maintainability demonstrations to verify that the system can be maintained within the times and resources planned for maintenance support.

3.4 Human Engineering Factors

Because the ECS is a COTS-based system, human engineering factors will have been incorporated into the equipment design by the OEM. Evaluation of Release A equipment included assessment of how well the OEMs have done this. The assessment of the human-machine interface addressed equipment location and the work environment; workspace required versus available; body movements required to perform support functions; knowledge and skills required to perform tasks; instructional manuals required; and safety hazards associated with equipment operations and support. Human-machine interface factors are addressed in the Release A ECS Facilities Plan, 194-302-DV2-002, and Hazard Analysis, 513-CD-001-002. Table 3-2, Release A Operational Hours, identifies the operations periods to be supported during Release A.

3.5 Standardization Factors

Considering the multiple sites that must be logistically supported, equipment standardization is key to minimizing logistics support costs. Therefore, logistics analyses addressed the efficiency and cost advantages of standardizing ECS equipment, where feasible to do so. By factoring such considerations into the design, support costs are reduced and logistics efficiency is increased. However, because of the need for ECS to operate in a heterogeneous environment, a variety of equipment was incorporated into the Release A design. Future releases will provide a greater degree of standardization across sites.

3.6 Safety Factors

Release A logistics planning addressed protecting the system from damage to the equipment and facilities; damage to or loss of flight HW in post Release A time frame (including loss of critical science data); and safety of ECS equipment operators, maintenance engineers, and logistics support personnel. Safety is the product of several facets of logistics: education, selection of proper tools and equipment, good work practices and procedures, adequate staffing, and product selection. These safety factors are addressed in the following documents:

- a. The ECS Training Plan (CRDL 128, DID 622) defines training required to prepare personnel to safely operate, maintain, and use the ECS Release A COTS products, tools, and equipment.

- b. The M&O Certification Plan (CDRL 130, DID 626) provides the procedure for certifying that M&O personnel know the correct and safe maintenance and operations procedures.
- c. Standard Repair Procedures (CDRL 099, DID 526) will address vendor approved safe repair procedures.
- d. Maintenance and Operations Procedures (CDRL 116, DID 609) will address safe operations and maintenance procedures.
- e. The Contractor's Practices and Procedures, (194-502-PA2-001), addresses practices and procedures to be followed when making repairs or operating the equipment.
- f. The ECS Facilities Plan, 194-302-DV2-002, contains facility and equipment safety considerations.
- g. Environmental Control Plan , (CDRL 105, DID 532), will contain consideration for protecting HW and SW media from damage due to humidity, dust, temperature, and storage conditions.
- h. The Hazards Analysis (Final), 513-CD-001-002, address potential hazards to HW and SW to personnel

3.7 Packaging, Handling, Storage, and Transportation Factors (PHS&T)

Proper packaging, handling, storage and transportation of equipment and SW ensures Release A products are protected from damage or deterioration. Since Release A equipment is COTS, equipment and SW packaged and shipped by the OEMs/vendors will be according to commercial standards using best industry practices. When equipment is shipped to/from/between sites, the same commercial standards are employed. Computer and communications equipment that is subject to damage from electrostatic discharge is handled and shipped following guidance contained in DOD-STD-1686B, Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment. The provisions of NHB 6000.1D, Requirements for Packaging, Handling, and Transportation, are also be used as guidance.

3.8 Operations Considerations

Figure 3-2, Release A Operations Hours, identifies the operating schedules at sites that must be supported. Release A DAACs are scheduled to be operational 8 hours per day, 5 days per week, holidays excluded, until May 1997. At that time, LaRC will go into 16 hours/day, 7 days/week operations and MSFC will go into 8 hours/day, 7 days/week operations to support TRMM launch. Specific operations hours at the DAACs are set by each DAAC manager. Maintenance support of DAAC operations is provided during a principal period of maintenance (PPM), which will correspond to DAAC operations hours. Generally, this period is 8AM to 5PM Monday through Friday, excluding locally observed holidays. Maintenance support outside the PPM (OPPM) is provided by on-call maintenance providers. The PPM for the EOC, SMC, and EDF is 8 hours a day, 5 days a week, holidays excluded.

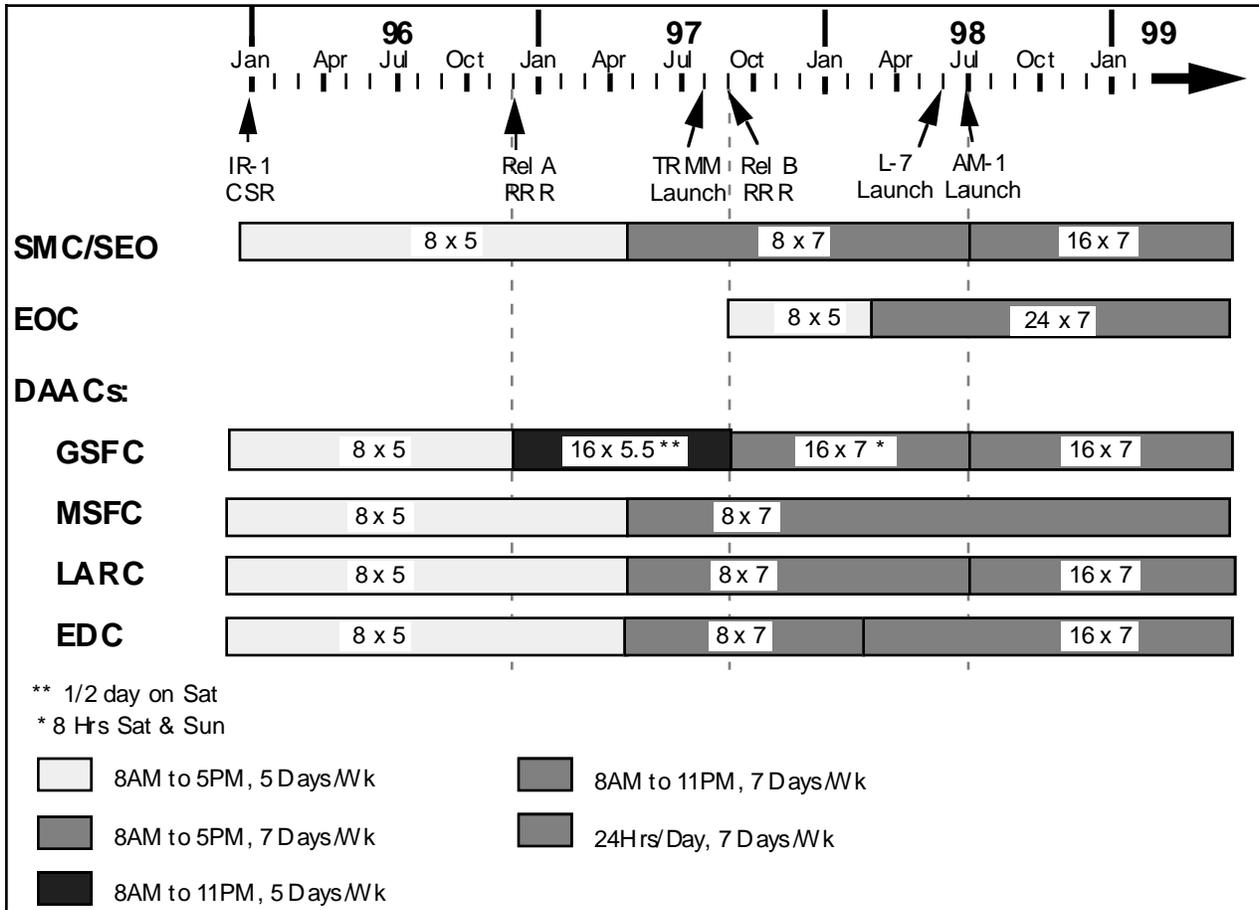


Figure 3-2. Release A Operations Hours

4. Program Management

4.1 Objectives, Policies and Procedures

This ILS program influences the ECS Release A design to achieve an optimal balance among operational and economic factors and to satisfy ECS A_o and MDT requirements. In addition, this support capability must be obtained without incurring unreasonable costs or support problems for future releases. The following documents provide the foundation for the execution of Release A logistics operations.

- a. Maintenance and Operations Management Plan, (Final) 601-CD-001-003
- b. Property Management Plan, 194-602-OP2-001\
- c. ECS Training Plan, 622-CD-001-001
- d. Maintenance and Operations Procedures, (CDRL 116, DID 609)
- e. Contractor Practices and Procedures, 194-502-PA1-001
- f. Maintenance and Operations Manuals, (CDRL 114, DID 607)
- g. Standard Repair Procedures, (CDRL 099, DID 526)

4.2 Organization

The ILS Manager plans and manages ECS logistics functions under the general direction of the M&O Manager and provides the logistics interface with the ECS development managers. This interface includes logistics issues related to design supportability, design tradeoffs, and system upgrades. As indicated in Figure 4-1, Logistics Organization, the ILS Office performs the following logistics functions:

- a. Logistics analysis, planning, and execution
- b. Maintenance planning and management
- c. Facility and installation planning
- d. COTS hardware and SW installation and training
- e. Spare and repair parts provisioning and replenishment
- f. Logistics cost input to the ECS Life Cycle Cost (LCC) model
- g. Property management and accountability for ECS contractor purchased, vendor loaned, and Government furnished equipment and SW.
- h. Support to the ECS RMA Program
- i. Performance assurance of COTS HW and SW installation, maintenance, and logistics support.
- j. Consumables management
- k. COTS SW license management

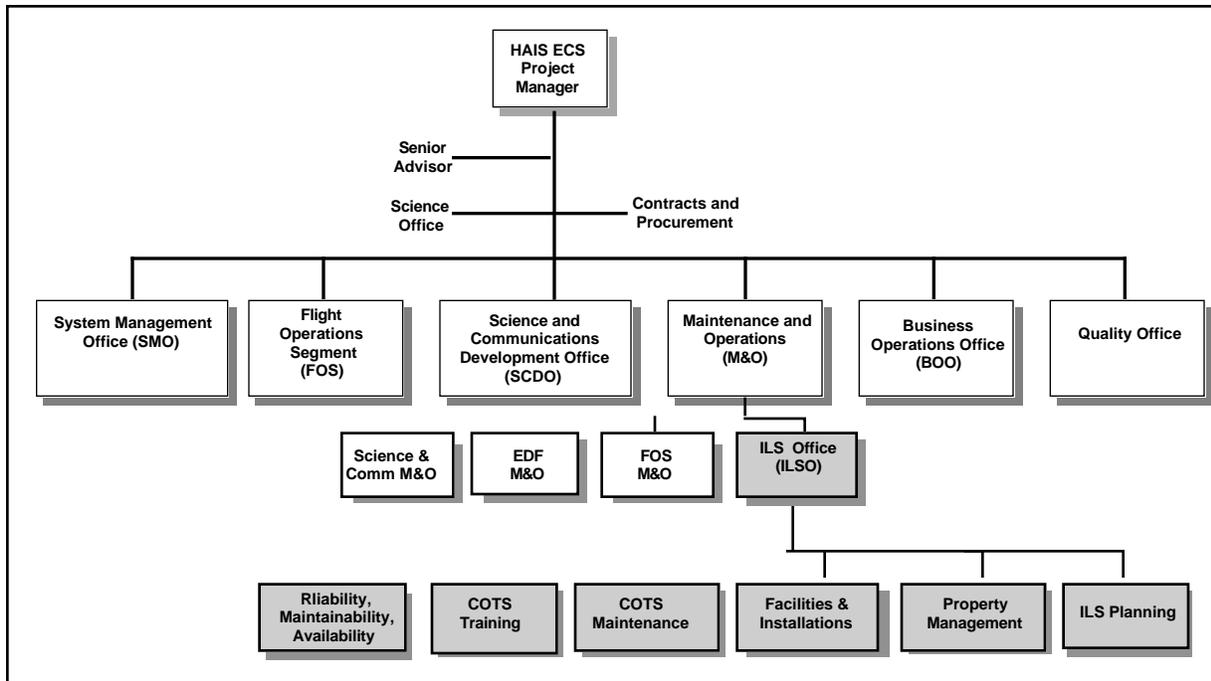


Figure 4-1. Logistics Organization

For Release A, the ILSO operates out of GSFC, Building 32, and the ECS development Facility (EDF) in Landover, Maryland.

4.2.1 ILS Planning Function

The ILS planning function defines the logistics effort required to achieve the optimal balance between operational, financial, and logistics issues at the least LCC. The ILS function develops the plans, procedures, and schedules required to support the operational ECS; identifies the logistics cost and operational availability drivers; and performs tradeoff analyses to optimize systems performance, support, and cost factors. Throughout the ECS Release A operations phase, the ILS function monitors logistics support operations to minimize logistics costs and to optimize system logistics support.

4.2.2 RMA Functions

The reliability, maintainability, availability (RMA) functions support the ECS systems engineering effort and the logistics planning functions by preparing reliability and maintainability predictions for ECS components and preparing availability models required to predict ECS A_0 . This was performed during the early design phase for Release A to determine the mix of COTS products that satisfies ECS A_0 and MDT goals and can be logistically supported at an optimal life cycle cost. This function continues throughout the operations phase to verify that ECS goals are achieved. If actual ECS performance is found to be less than

predicted, the RMA function then assists in identifying design or product changes that will achieve the ECS performance goals and/or decrease support costs.

4.2.3 COTS HW/SW Installation Function

Facility requirements are identified to ensure facilities are adequate at ECS sites to support operations, maintenance, and logistics support functions. Physical and environmental requirements for ECS equipment, storage media, and operations were identified early in the Release A design phase to ensure that the ECS design, equipment, and maintenance and operations concept were compatible with the existing capabilities and floor plans of the NASA facilities. The facility requirements include space, power, heating and air conditioning. The facility space requirements include equipment storage and maintenance, computer operations, and administrative areas. Also within this function is the planning and installation of COTS HW and SW at the ECS Release A sites and the EDF.

4.2.4 COTS HW/SW Maintenance Function

The ILSO develops and manages the ECS maintenance program to support the achievement of ECS A₀ and MDT requirements. This program is described in the COTS Maintenance Plan, 613-CD-001-001. It includes identification of maintenance levels to be performed; repairable and non-repairable components; the organizations to perform maintenance; the skills and training required to provide certified maintenance engineers; maintenance diagnostics, tools, and test equipment required, and the provisioning concept for spares and repair parts. The ILSO manages ECS equipment maintenance A₀ and MDT requirements identified in Section 5.6 of the ECS Functional and Performance Requirements Specification (F&PRS). COTS SW is maintained by the SW developer. However, reporting and monitoring the resolution of COTS SW problems is the responsibility of the ILSO.

4.2.5 COTS HW/SW Training Function

The ILSO identifies, coordinates, and provides vendor training required to qualify M&O personnel. Using the ECS design and results of level-of-repair analyses for ECS Release A equipment and SW, the ILSO identifies the quantity, types, schedules, and resources required to meet installation and maintenance requirements. The training requirements are documented in the Release A update to the ECS Training Plan. ECS Release A training will consist of a mix of COTS vendor-provided and Contractor-developed courses.

4.2.6 Supply Support and Property Management Function

Using a Contractor-developed property management system (i.e. VCATS) and office automation programs, the ILSO manages logistics support and property management functions. These functions include the following:

- Perform receiving, storing, shipping, and accountability of ECS HW, SW, and technical documentation
- Manage equipment warranties, SW licenses, and SW support contracts

- Establish initial provisioning and replenish LRUs and consumables based on demand and/or pre-determined stock levels

The ILSO is the property manager for ECS equipment, LRUs, COTS SW, and GFE. As such, the ILSO provides property accountability for Release A Government-furnished and vendor-loaned equipment and SW. The ILSO performs the property management and reporting functions required by NHB 4200.1C, NASA Equipment Management Manual.

4.2.7 Data Management Function

The data management function consists of managing technical documentation required to support the ECS COTS HW and SW installations, maintenance, and logistics support. It also obtains, records, and maintains vendor and Contractor-derived cost and performance data that may influence logistics support operations and decisions related to the planned and operational systems. Logistics documents required to be placed under configuration control are maintained and controlled in accordance with the ECS Contractor's Configuration Management Plan, 194-102-MG-001.

4.3 Subcontractor and Vendor Interfaces

The ILS Manager is the Contractor's logistics interface to equipment and SW vendors, OEMs and maintenance subcontractors regarding ECS logistics requirements and support. This includes the provision of logistics data required to support the RMA and LSA programs, equipment maintenance support, LRU spares and repair parts provisioning, equipment installation planning and support, and the flowing down of contractual requirements to vendors and third party subcontractors.

4.4 Government Interface

The principal logistics interface to the NASA ECS Project Office is through the ECS ILS Management Team (ILSMT) as indicated in Figure 4.2. The purpose of the ILSMT is to ensure active communications among ECS team members and between the logistics activities of the Government and Contractor; identify and address ILS problems as early as possible; and develop alternatives or solutions that can be implemented as quickly as possible. Further, the ILSMT monitors collateral activities within each area of ILS for their impact on ECS logistics support.

The ILS Manager, as an Associate Member of the ILSMT, performs functions directed by NASA's ILS Program Manager (ILSPM). The ILS Manager supports ILS Management Guidance Conference/Reviews. Other ILSMT functions performed by the ILS Manager include providing logistics data and reports, participation in ILSMT meeting as required, and executing ILS actions in support of the ILSMT. ILSMT meetings are called by the ILSPM and held at Government and contractor sites on an alternating basis. The ILS Manager submits the ILSMT meeting agenda for Government approval 15 days prior to meetings and prepares meeting minutes for Government review within 15 days of the meetings. As an ILSMT member, the ILS Manager coordinates directly with the NASA Code 535.3 Logistics Management Section to identify and resolve logistics issues.

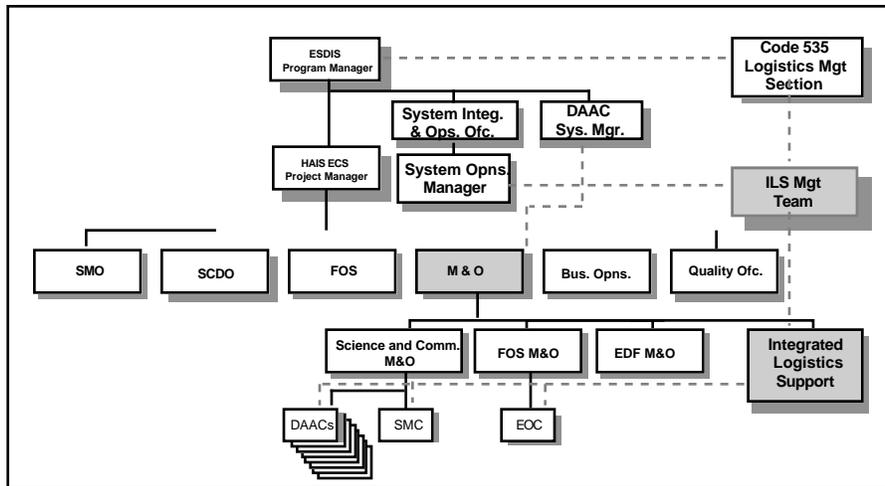


Figure 4-2. ILSMT Interface

4.5 Reviews

The ILS Manager participates in and supports ECS reviews as needed to support the ECS Release A design, implementation, and operations support activities. Remaining Release A reviews include the Critical Design Review (CDR), Consent to Ship Review (CSR) and the Release Readiness Review (RRR)

The ILSO also provides input to and/or participates in meetings and reviews that propose (or may result in) changes to ECS operational systems or requirements for logistics support. ILS Manager or ILSO involvement in other engineering or prototype reviews are on an as-needed basis to provide logistics representation.

4.6 Management Control System

For Release A, the logistics management database resides at the ECS Development Facility (EDF) in Landover, Maryland. This database is used to record logistics data for use in supportability analyses. Logistics data and reports are obtained from equipment suppliers or from operations experience. This database is used in logistics support analysis (LSA), maintenance analysis, logistics planning, spare and repair parts planning, and to identify logistics cost drivers. Information in this database is transferred to the SMC when it becomes operational. Logistics data is input to this data base by the DAAC site M&O representatives and the ILS Office. This database will contain the historical data used for future logistics support planning and performance monitoring. ILS task schedules and resources are planned and monitored using the Contractor's project management system to ensure tasks are completed on schedule and to account for resources expended in the ILS program. The integrity of the logistics management data base is the responsibility of the ILS Manager.

4.7 Configuration Management Program

The ILS program supports the ECS configuration management program in accordance with the *ECS Configuration Management Plan*, 194-102-MG-001 and *ECS Configuration Management Procedures*, 193-103-MG-001. This includes support to the Configuration Control Board by assessing the logistics impacts of proposed changes to the ECS design or its configuration items; reporting the as-installed configuration at ECS sites; maintaining site facility diagrams; implementing only CCB-approved changes to the operational configuration; and maintaining technical documentation that reflects the current configuration, plans, and procedures approved by the CCB.

The ILS Office supports the data management function through adherence to requirements of the *ECS Data Management Plan*, 104-CD-001-003 and *ECS Data Management Plan Procedures*, 193-105-MG3-001. Because of the cost to develop and maintain technical documentation, vendor-provided technical manuals, drawings, and training media are not be modified unless it is clearly deficient with regard to providing an understanding of the installation, operation, and/or maintenance of COTS products. The ILSO reviews vendor documentation as part of the LSA process to verify the adequacy of vendor technical documentation prior to Government approval of the procurement of the product.

5. ILS Program

5.1 Support Concept

The focus of the ILS Program is to plan, provide, and manage the Release A logistics resources required to support ECS operations. The ILS program is centrally managed from the SMC and executed through the logistics resources provided to each ECS site. Logistics personnel performing support functions at ECS sites follow the support concepts contained in this plan and the policies and procedures applicable to ECS sites. The specific policies and procedures for controlling and managing the logistics resources are included in this plan, the following documents, and ECS project instructions associated with these documents:

- a. COTS Maintenance Plan, 613-CD-001-001
- b. Property Management Plan, 194-602-OP1-001
- c. ECS Training Plan, 622-CD-001-001

The goal of the logistics program is to provide and sustain the support needed to achieve the ECS required operational capabilities and performance at the least LCC.

5.2 Maintenance Planning

The Release A COTS Maintenance Plan is the principal planning document for directing maintenance support. It will identify the equipment to be supported at each location and the personnel, training, support equipment, and other resources required to satisfy maintenance requirements. Since the maintenance plan is dependent upon the equipment and SW to be presented at Release A CDR, its delivery has been delayed until one month after CDR. That plan will address the maintenance requirements, processes, and procedures necessary to support ECS maintenance operations. That plan will also address the malfunction reporting and resolution process to be employed for COTS HW and SW.

5.2.1 Two-Level Maintenance Support

It is currently planned that the ECS Release A COTS maintenance concept will be a two-level approach to provide timely and cost effective support at Release A sites. The M&O staff at each site will provide user/operator fault detection, initial diagnostics, and fault reporting. However, the low population of COTS HW in Release A precludes self maintenance as a cost effective option at most sites. Therefore it is planned that OEM and/or third party maintenance support will be the primary source of maintenance support. GSFC, having a larger equipment population, may employ a limited self-maintenance approach.

Procurement of ECS equipment includes one year on-site full service warranty. Warranty support ends six months into the operational phase of Release A. OEM and third party maintenance providers will be contracted for maintenance support following expiration of warranties.

Figure 5-1, ECS Maintenance Support, reflects the sources of maintenance planned for supporting the sites.

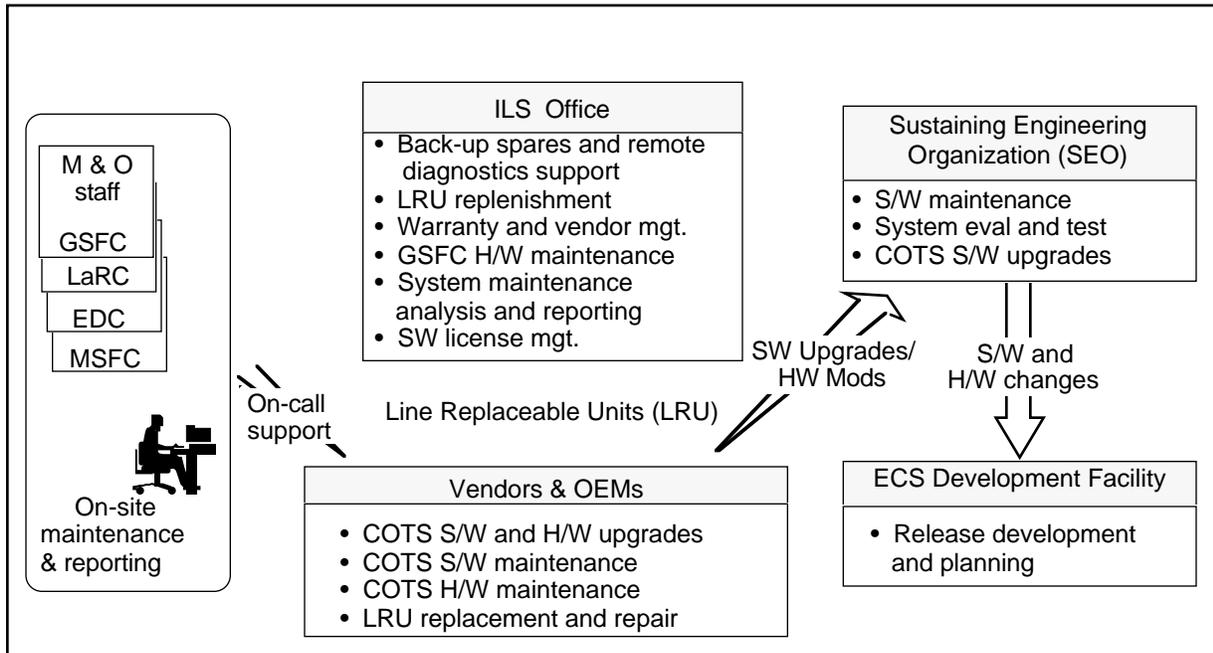


Figure 5-1. ECS Maintenance Support

HW OEMs and/or maintenance vendors provide on-call support during the primary period of maintenance (PPM) of Monday through Friday (except for recognized holidays) from 8AM to 5PM local time with a 4 hour on-site response time. Sites also have the capability to obtain support outside the PPM hours if needed to support critical operations. Corrective maintenance actions by the OEM or third party maintenance provider include fault detection/diagnostics, isolation, and correction through replacement of failed line replaceable units (LRUs). Removal and replacement of the failed LRUs is performed without the need to interrupt the operation of the ECS function unless personnel or equipment safety would be at risk. Routine preventive maintenance is accomplished at times that do not interfere with operations or during corrective maintenance actions.

Maintenance actions related to COTS SW is managed by the ILSO, with the actual functionality changes (i.e. patches and upgrades) provided by the COTS SW developer. Maintenance action consists of telephonic support for SW problem resolution and providing patches and upgrades as they are released. Escalation procedures exist for both HW and SW support whereby increased OEM/vendor management attention is brought to bear on any problem not resolved within 4 hours after the start of corrective action.

5.2.2 COTS SW License Management

COTS SW licenses are centrally managed by the ILSO and recorded in the Contractor's logistics data base (i.e. VCATS). At the time COTS SW is received and installed, the ILSO establishes a record for each ECS platform on which the SW resides, the type of maintenance support associated with the SW, date of installation, and version number. Upgrades and patches to COTS SW versions are provided by the SW manufacturer as long as the license and maintenance support contract is maintained current. The ILSO reviews COTS SW licensing and support contracts quarterly to identify those nearing expiration. Prior to the renewal of expiring licenses/support contracts, the ILSO notifies the Sustaining Engineering Organization (SEO), which verifies that the SW license/support contract is still required and authorize renewal. SW upgrades are distributed to ECS sites only as directed by the ESDIS CCB and following M&O configuration management policies and procedures. Master copies of COTS SW, upgrades, and related documentation delivered to ECS sites are placed under the site's configuration management control and installed per ESDIS CCB direction.

5.3 Logistics Support Analysis (LSA)

Release A equipment consists entirely of COTS HW. An initial LSA was performed on this HW to determine the supportability of the design and to develop the support concept. LSA will continue as the Release A design is finalized and during operations to determine whether these initial analyses and the support concept result in a supportable system. These follow-on analyses will use operational data to verify whether OEM supplied data (e.g. predicted MTBF, MTTR) are accurate and to determine the optimum support concept. This LSA process validates support requirements and identify cost and performance drivers and tradeoffs that may improve system support or lower support costs. Figure 5.2, ECS LSA Process and Interfaces, depicts the flow of LSA activities and interactions that support the continuing analysis and ILS planning process. The LSA database is a contractor developed database that is located and maintained at the EDF. It will be accessible by the SMC for monitoring ECS support operations and used throughout operations to assess support performance and to identify trends.

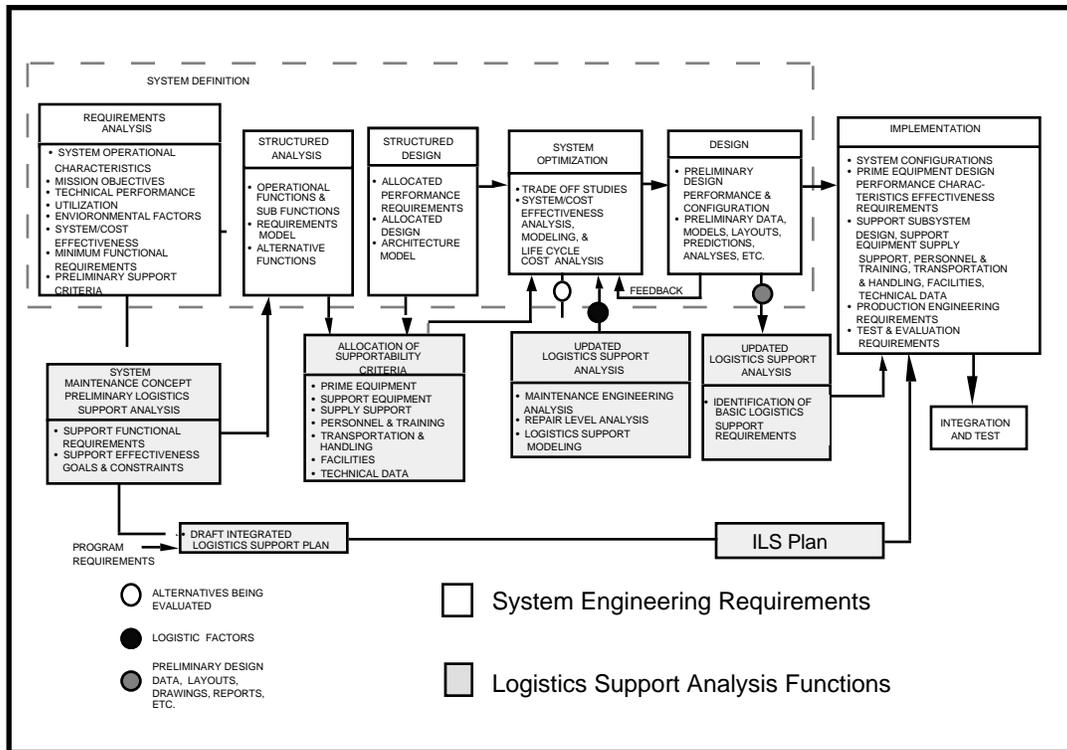


Figure 5-2. ECS LSA Process and Interfaces

5.3.1 Reliability, Maintainability, Availability (RMA)

Key to ILS Release A planning is modeling of the ECS and its functions to predict and monitor the availability of the operational system. Since Release A is the first COTS HW procurement for the DAAC sites, the specific makes and models of HW in the final design have not yet been determined. Nevertheless, preliminary modeling was accomplished using data from similar types of HW until Release A HW RMA information data are available. After Release A COTS HW is known the RMA models will be updated with the OEM's predicted reliability and availability data for ECS equipment.

5.3.1.1 Reliability Modeling

Reliability modeling is performed using the methodology stated in Reliability Predictions for the ECS Project, 516-CD-001-002. The OEM-supplied reliability data is compared to that of like equipment of the same technology from other manufacturers or recent history of like items. If OEM reliability predictions are questionable, vendors are required to identify the methodologies and procedures used to arrive at the estimate and, if necessary, the historical data to support the estimate. If the parts count method described in MIL-HDBK-217F, Reliability Prediction of Electronic Equipment, is required to predict COTS HW reliability, the SW tool "Relex" will be used. The parts count method is used when OEM data is not available and there is no similar

equipment to that used in the ECS design. Reliability is expressed as Mean Time Between Failure (MTBF).

5.3.1.2 Maintainability Modeling

Maintainability modeling is performed at the LRU equipment level using the methodology stated in Maintainability Predictions for the ECS Project, 518-CD-001-002. This document provides the predicted maintainability of Release A COTS HW using OEM data, if available. Where OEM data is not available, historical or comparable data for like HW using similar technology in similar environments is used if available and credible. Lacking this data or its acceptability, maintainability predictions is performed per MIL-HDBK-472, Prediction Procedure II. This procedure will use OEM equipment drawings and list of standard equipment repair times requested from the vendor for use in maintainability modeling.

Maintainability of a part is expressed as Mean Time To Repair (MTTR). The MTTR is the corrective maintenance time lapse from start of LRU replacement to completion of LRU replacement. The rationale for the maintainability assumptions used in performing maintainability analyses is documented in the Maintainability Predictions document. Where a failed component has a backup, the switch-over time is used to compute the Mean Down Time (MDT) value. Maintainability data will be requested from the ESDIS Project office for any GFE included in the design.

5.3.1.3 Availability Modeling

Availability modeling is performed at the ECS function level by the SMO organization. This modeling uses the string analytical techniques stated in Availability Predictions for the ECS Project, 515-CD-001-002. HW functional and reliability block diagrams, part of the string analytical technique, are used to determine the components required to achieve A_o requirements as well as predicting the availability of individual functions. The reliability component of the block diagrams comes from the output of the reliability and maintainability modeling, referenced above. Availability models are updated with information resulting from adjustments to reliability/maintainability predictions as well as design or operational changes (including any changes in mission parameters or operational constraints).

As the ECS is installed and made operational, actual ECS A_o and MDT performance are calculated and used to adjust logistics planning factors and to assess support changes needed to satisfy ECS RMA goals. The operational modeling of RMA is expressed in terms of mean time between maintenance (MTBM), mean time to repair (MTTR) and mean down time (MDT). Only interruptions of service resulting from factors within the control of ECS are considered failures.

5.3.2 Life Cycle Costs (LCC)

Logistics life cycle costs are considered in analysis of alternative logistics support concepts. As the design is identified, logistics LCC analyses are performed to optimize support concepts.

5.4 Support and Test Equipment

Release A HW requires no support or test equipment other than that used by the OEM/maintenance vendors to diagnose and repair the equipment. Likewise, there exists no requirements for special maintenance or test equipment, as documented in DID 615, Special Maintenance and Test Equipment.

5.5 Provisioning and Supply Support

At the time of submission of this plan, the quantity, make, and model of Release A COTS equipment has not been finalized. Because spares provisioning is dependent upon the knowing the HW selected for the final Release A design, the extent of spares/repair parts (i.e. LRUs) to be provisioned are not known until design receipt and development of a sparing concept. Submission of CDRL 124, Replacement Parts List & Spare Parts List, will identify the spares and repair parts recommended for provisioning to support the Release A design. Provisioning LRU stock levels are approved by the ILS Management Team at provisioning conferences held prior to each RRR. Spares provisioning modeling is guided by provisions contained in GSFC S-530-1, Specification for Ground System Spare Parts Program. Stocks of repair parts are maintained at the level required to sustain the ECS A_o and MDT goals.

5.5.1 LRUs

LRU provisioning stocks are prepositioned at ECS sites to provide immediate replacement of failed LRUs within an operational equipment item. Such stocks may be ECS-purchased or OEM-/maintenance vendor-owned.

LRUs purchased as provisioning stocks are centrally procured and managed by the ILSO, even though they may be positioned at an ECS site. Accountability for LRUs prepositioned at ECS sites are the responsibility of the site property administrators, who will comply with the requirements and procedures contained in the ECS Property Management Plan. When provisioned LRUs are used to support site maintenance actions, sites immediately record such use in the related maintenance Trouble Ticket and report it to the ILSO. Site property administrators ship repairable LRUs to the appropriate repair source within one business day using an overnight shipment carrier. Upon receipt of repaired or replacement LRUs, site property administrators report such to the ILSO. Non-repairable spares/repair parts are purchased and replenished by the ILSO, which expedites procurements to minimize the risk of equipment being inoperable due to unavailability of an operable LRU. The Contractor's property management system is used to manage the ECS spares accountability at each location until the CSMS inventory management system is delivered at Release B.

Some OEMs or maintenance vendors may be required by subcontract to provision spares/repair parts to support ECS maintenance operations. Such stocks will be OEM/maintenance vendor-owned and managed as determined by the subcontract.

5.5.2 Consumables

Consumables are those supplies stocked at the site that are required for routine operations, are consumed in their normal use, and/or are expendable because they are low cost and replaced rather than repaired when unserviceable.

Office consumables will be provided as GFE by the local DAAC. Office consumables include the following:

- desk supplies (paper, pencils, staples, envelopes, etc.),
- packing and packaging materials used in the distribution of data media to ECS science users, and
- computer support products (e.g. 3.5” disks, 4 and 8mm tape cleaning cartridges, printer paper and toner, impact printer ribbons, etc.).

DAACs should provision initial stocks of office consumables based on the quantity of personnel and types/quantities of equipment to be located at the site during Release A (reference Appendix D, “M&O Release A Staffing Profiles” and Appendix A, “Release A COTS HW”). Quantities for initial stockage and replenishment of packing and packaging materials should assume distribution to science users of 10 percent of the science data expected to be received and processed at the DAAC during the period. ECS site property administration will follow local policy and procedures on the replenishment of consumables.

The ECS Contractor is responsible for the initial provisioning and replenishment of data media (8mm tapes and CDROM disks) required at the ECS sites for temporary storage and/or archive of science data, distribution of science data to users, and backup of ECS systems. Initial stocks of such media are delivered to the site with the equipment at Ir1 and Release A in quantities to support operations for 90 days. Site Property Administrators request from the ILSO replenishment of media used, allowing 45 days from time of request to receipt of the replenishment stocks. The ILSO centrally procures and distributes Contractor provided consumables to the sites.

5.6 Packaging, Handling, Storage, and Transportation (PHS&T)

COTS equipment and SW are packaged and shipped by the OEM/vendor using best industry practices. Site property administrators inspect equipment, software, and supplies for damage at the time of receipt and report such occurrences following procedures contained in the ECS Property Management Plan. OEM/vendor shipping containers are retained for reuse in re-shipping the product to sites. The return of repair parts to OEM/maintenance vendors is accomplished using the packaging materials used by the OEM to ship the replacement LRU to the site.

ECS equipment, SW, and data storage media that is subject to deterioration or has a limited shelf life is marked and tracked in accordance with NHB 6000.1D, Requirements for Packaging, Handling, and Transportation. The goal is to retain the ECS equipment’s inherent reliability and useful life by minimizing the incidence of damage or deterioration while it is in one or more phases of PHS&T activities. Hazardous material and items requiring special storage or handling

is appropriately marked using standard commercial practices. Markings for the packages requiring expedited shipment is appropriately marked for ease of identification.

5.6.1 Storage

At the time of purchase of COTS HW, SW, and consumables the ILSO determines the manufacturer's recommended storage and operating environment and any shelf-life limitations. Generally, the HW and SW is operated at the sites in a dust, temperature, and humidity controlled environment. ECS property is stored in an area controlled by the site property administrator. Stocks of items with a shelf life limitation will not exceed 180 day usage level to avoid expiration of their useful life. Issue of such items is on a first-in, first-out basis. Periodic inventories are conducted shelf life. Inventory records of shelf life stocks will contain date purchased, stock, stock location, and expiration date. Expired stocks are inspected and verified serviceable before they are issued to support operations requirements. Stocks found to be no longer serviceable are physically separated and processed for disposal in accordance with the Property Management Plan.

5.6.2 Electrostatic Protection

Computer and communications HW, firmware, and chips are subject to electrostatic discharge (ESD) damage. When handling, storing, or transporting such components the logistics personnel complies with ESD procedures contained in DOD-STD-1686. ESD procedures include prominent ESD labeling, the use of a common human-equipment ground, and/or static proof wrappings and work-mats.

5.7 Technical Data

ECS technical reference documentation (i.e. documents describing the operation and maintenance of COTS HW and SW) is maintained at the EDF in the master ECS library. Technical documentation is maintained current to reflect the current operational configuration of the ECS equipment. The documentation may be in any media (hard copy, CD-ROM, 4 or 8mm tape, on-line electronic, and/or diskettes)

COTS technical documentation is in accordance with the vendor's standard commercial practices and will not be developed specifically for the ECS contract. Logistics documentation developed as part of the ILS Program will be compliant with the ECS Data Management Plan, and the ECS Data Management Procedures. The adequacy of logistics documentation is assessed prior to each Release RRR.

ECS sites are provided technical documentation that describes the operations and maintenance for equipment and SW located at the site. Master copies of site technical documentation may be in any media referenced above. Sites will maintain the current and two previous versions of COTS SW in a controlled location.

5.8 Facilities

Logistics requirements for space, utilities, and other facility support for Release A were tentatively identified early during the LSA process in order to meet to the long lead times required to prepare the facilities. These requirements, with due consideration given to the capabilities existing at the sites, are contained in ECS Facility Plan for the ECS Project. The facility requirements for Release A sites were further refined and contained in a White Paper, titled Facilities Plan for Ir1 and Release A. Representative equipment was used because the specific HW had not yet been determined. When Release A design is finalized, the ECS Facility Plan (Final), will be published.

5.9 Personnel

Designated logistics personnel at Release A sites perform the multiple functions of maintenance support, property management, supply support, and configuration management. These personnel are trained and certified prior to being permanently assigned to the function to determine equipment status. These personnel are the principal interface with the contracted OEM/maintenance vendor organizations supporting the site. Logistics personnel perform site logistics reporting responsibilities. Staffing profiles for the ECS M&O staff at each site are identified in Appendix D, M&O Release A Staffing Profiles.

5.10 Training

Site logistics personnel are trained and/or experienced in the following logistics functions:

- a. Property Administration procedures and the property management system
- b. Configuration Management procedures and the baseline management system
- c. Fault diagnostics and maintenance of selected Release A equipment
- d. Fault reporting system

Most of these are provided through on-the-job training (OJT) using the equipment and management systems at the sites. In the course of these OJT programs, personnel are required to develop a working knowledge of the ECS practices, policies, and procedures related to the respective logistics function. Prior to being permanently assigned to the function they are certified in accordance with the requirements of the ECS Certification Plan.

Logistics personnel are not be required to be knowledgeable on the maintenance of all ECS equipment, as much of it is maintained by contracted maintenance providers and OEMs. However, for equipment in which they are assigned maintenance responsibility (i.e., preventive and/or corrective) they must be certified prior to maintaining the equipment. In most cases this training is provided by the OEM. Local area networks (LAN) diagnostics and maintenance is an example of such training.

5.11 Test and Evaluation

Ongoing evaluation of the logistics supportability of the ECS is the responsibility of the ILSO. This is accomplished through review of the integration and test results and monitoring the following:

- a. Failure rates of ECS equipment
- b. Mean down time and operational availability of ECS functions and equipment
- c. Mean repair times of equipment (i.e. MTTR)
- d. Maintenance vendor response time
- e. Mean time to obtain replacement of failed LRUs
- f. Provisioning stock levels
- g. Consumables stock levels
- h. Inventory accuracy rates
- i. Consumables replenishment time
- j. Logistic support costs
- K. OEM/vendor response times for COTS HW and SW problems

Where performance in these areas is found to be below expectations, analyses of causes and alternative corrective actions are performed. When appropriate, change to support policies, practices, and/or procedures are directed and implemented by the ILSO and/or sites.

6. ILS Schedule

6.1 Key ILS Program Milestones

The ECS Intermediate Logic Network contains the major milestones and schedule for the ECS program. Key milestones related to the ILS program for Release A include the following:

- a. Sep 95 -- Assembly and test of Ir1 HW and SW begins.
- b. Nov 95 -- Ir1 COTS HW and SW installation at sites begins. Logistics support operations commence. Property management system must be operational.
- c. Jan 96 -- Support for interface testing and integration and testing of science SW begins.
- d. May 96 -- Rel A installation begins at sites.
- e. Oct 96 -- Consent to Ship Review (CSR) for Release A. COTS HW and SW installation must be complete and operational. M&O staffing and training for Release A operations begins.
- f. Dec 96 -- Release Readiness Review (RRR) for Release A. Sites commence operations. Logistics management support systems must be in place and operational.
- g. Feb 97 -- Assembly of Release B HW and SW begins.
- h. May 97 -- Support for TRMM launch testing begins. Installation of Release B begins.
- i. Sep 97 -- Logistics support of Release B begins.

6.2 ILS-Related CDRL Deliverables

Table 6-1 identifies the CDRL documents related to the ILS program.

Table 6-1. CDRL Schedule (1 of 2)

Title	CDRL	DID	INITIAL SUBMISSION	FOLLOW-UP
Life Cycle Cost (LCC) Reports	033	213	Yearly-	Yearly
ECS Facilities Plan 1	043	302	SDR - 2Wks	Ea CDR - 2 Wks
ECS sys Integration & Test Procedures	073	414	RRR - 3 Months	NA
Hazards Analysis	086	513	PDR - 2Wks	Ea IDR - 2Wks
Training & Certification Records	098	525	Available for review	Available for review
Standard Repair Procedures ¹	099	526	RRR #1- 1Mo	Ea RRR - 1Mo
Malfunction/Failure Rpts (MRs)	102	529	Monthly when DRs are reported	NA
Closeout submittal of MRs	103	530	As required	NA

Table 6-1. CDRL Schedule (2 of 2)

Title	CDRL	DID	INITIAL SUBMISSION	FOLLOW-UP
Environmental Control Plan ¹	105	532	Ea CDR - 1Mo	NA
Response to Problem Notices/Alerts	106	533	As required	As required
Maintenance Records ¹	107	534	Ongoing-Available on request	NA
M&O Mgt Plan	109	601	SDR - 2Wks	Ea PDR - 2Wks
Property Mgt Plan ¹	110	602	SDR + 1Mo	None
Maint & Ops Rqmts Manual	114	607	Ea CDR - 2Wks	None
Maint & Ops Procedures	116	609	Ea CSR - 2Wks	None
COTS Maintenance Plan ¹	119	613	PDR - 2Wks	Ea CDR - 2Wks
Special Maint & Test Equip ¹	121	615	PDR + 1Mo	Ea IDR + 1Mo
Integrated Support Plan ¹	122	616	SRR - 1Mo	Ea CDR - 2 Wks
Logistics Support Analysis Plan ¹	123	617	SRR - 1Mo	PDR - 2Wks
Replacement Parts & Spare Parts List ¹	124	618	Ea CDR - 2Wks	Ea RRR - 2Wks
Test & Support Equip Requirements List ¹	125	619	Ea CDR - 2Wks	Ea RRR - 2Wks
M&O Transition & Training Plan	127	621	6 months prior to contract end	None
ECS Training Plan	128	622	PDR - 2Wks	Ea CDR + 1Mo
Training Material	129	625	Ea RRR - 2Wks	None

¹ Indicates the ILS Office has primary responsibility for preparation and update.

7. Related Plans

7.1 Other-Related Plans

Plans that are directly and indirectly related to ILS efforts are listed in Table 7-1.

Table 7-1. Other-Related Plans

Document Title	CDRL	DID
ECS Project Management Plan	001	101
ECS Data Management Plan	004	104
ECS System Engineering Plan	021	201
Configuration Management Plan	022	202
System/Element Integration and Test Plan	054	319
Verification Plan	063	401
ECS System Integration and Test Plans	064	402
ECS Overall System Acceptance Test Plan	069	409
Performance Assurance Implementation Plan (PAIP)	076	501

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Appendix A. Release A COTS HW

Table A-1. Release A COTS Equipment: Preliminary/Pre-CDR

Description	Description
SGI Indy 133MHz (Workstation)	SUN Sparc20/61 (SX) (Workstation)
32MB RAM	1.05GB internal SCSI disk
128MB Memory upgrade for Indy	1.05GB SCSI expansion disk
External 2GB 3.5" fast SCSI-2 drives	2.1GB Desktop disk
GIO Bus Fast SCSI card for Indy-additional	32MB RAM expansion(32MB SIMM)
Internal 2GB 3.5" fast SCSI-2 drive	32MB RAM
External 4x CD ROM SCSI drive	8.4GB Multidisk pack (external)
SPARCcompiler C (Slim Kit)	Sbus FastSCSI-2/Ethernet card
FDDI Dual attached Sbus card	Sbus FDDI Card (single attached)
Sbus FDDI Card (single attached)	SunCD 2Plus internal CD-ROM drive
SGI Indigo2 XZ graphics (Workstation)	SX-24bit Graphics
128MB RAM	SUN Sparc20/71 (1CPU) (Workstation)
External 4x CD ROM SCSI drive	1GB Disk drive
2GB System disk	32MB RAM
Internal 3.5" 4.3GB fast SCSI-2	8MM Tape unit
Internal 5.25" 2GB Fast SCSI-2	SUN Sparc20/50 (1CPU) (Workstation)
SGI Challenge L (Server)	64MB RAM
2 CPUs	1.05GB internal SCSI disk
128MB RAM	SUN SPARC 20/712 (Server)
FDDI card	256 MB RAM
SGI Power Challenge L (Server)	2GB
2 CPUs	Dual FDDI
128MB RAM	2 CPUs
FDDI card	SUN SPARC 100E (Server)
SGI PC XL (2, 4, or CPU) (Server)	2x1.05 internal disk drives
110VAC Programming terminal for Challenge	Sbus FDDI single attach
2GB DAT internal drive	14GB internal 8mm tape drive
4.3GB SCSI-2 F/W system disk-upgrade	CD-ROM

Description		Description
CD-ROM, 680MB Quadspeed		HMX X terminal w/ UTP
256MB Super density memory		8MB RAM
SGI RAID5 enclosure w/1 controller		DEC Alpha 1000/200
2 Powers supplies		4x6GB disk drives
5x4.3GB drives		Dual network
HP LaserJet 4M+ PS LUL2 (Printer)		IBM RS6000 (Workstation)
6GB Memory		32GB RAM
8MB Memory expansion		1GB Disk drive
HP RAID		Ethernet
2 Power supplies		3.5" Diskette drive
5x2GB disk drives		4mm Exabyte Tape Stacker
HP K200 (Server)		3ea 5GB Drives (EXB 312800)
192MB RAM		SCSI Adapter card
64MB RAM (total of 256MB)		8mm Exabyte 210T Stacker
6.0GB F/W SCSI drive (system disk)		3ea 10GB Drives
2GB F/W SCSI-2 disk expansion kit		E MASS "G" Series Robot Archive
600MB SCSI internal CD-ROM drive		SCSI Adapter card
HP 715/64 (Workstation)		25TB
2GB SCSI disk drive		Jukebox
3.5" Diskette drive		CD-ROM (read/write)
660MB SCSI CD-ROM		Single drive
32MB RAM		SCSI Adapter card
Cabletron Ethernet Hub		Minitower (Floor standing)
AUI interface w/ DB15 connector		1x 2GB F/W SCSI-2 storage
AUI M-to-F interface cable (5meters)		Linear Magnetic Drives
Alantic Power Hub FDDI Switch		6 MBps
Synoptics 2000 FDDI Concentrators & Ethernet Hubs		X Terminals

Appendix B. Release A COTS Software

Table B-1. Release A COTS SW: Preliminary/Pre-CDR

Ada 2.1 Products (Ver 2.1.1) (for SUN)
Adobe Acrobat (Document Viewing)
C products (Ver 3.0.1) (for SUN)
C++ 4.0 Compiler for IRIX Ver 5.3
ClearCase Ver 2.x (CM software)
Baseline Management SW (TBD)
Trouble Ticketing SW (TBD)
DCE Client (for OSF1/ Ver 1.03A)
DEC UNIX Ver 3.2 OS
FORTRAN 77 (Ver 3.0.1)
FORTRAN 90
H.P. Openview Network Node Manager for H.P. 9000 Series 600/700/800
HP UX Ver 10.0.0 OS
HP Ver 9.0 software
IBM OS AIX Ver 3.2.5
IDL Ver 4.0 (Visualization)
IMSL (Math and Science Libraries)
Lotus Notes Server Bundle
Mosaic (Document Viewing)
MS Office Ver 3.2 (Report Generator and Document Viewing))
NCDware Boot Software (Xterminal SW)
Pageview (Document Viewing)
Scheduler Agent (TBD, RFP still out)
SGI OS IRIX Ver 5.3
SGI OS IRIX Ver 6.1 (Power Challenge servers)
SNMP Agent (TBD, RFP still out)
SoftWindows (Report Generator)
SUN Solaris Ver 2.4
Sybase Ver 10.0 (DBMS)
Textedit (Document Viewing)

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Appendix C. Release A Consumables

Table C-1. Release A Consumables

Description	Part Number	Qty	From	Platform
8mm Exatape Data Cartridge, Data Grade BX 5 (Exabyte Stacker)	EXB-307265		MBA	SGI
.5 inch, 1,100' 3490E Tapes for EMASS Robotic ATL	84-9801-8452-1		3M	"G" Series
TDK 4mm 90M 2.0GB tape cartridge	62002		IBS	
4mm, 90M Digital Audio Tapes	3M42818		GDA	
CD-ROM (Read/Write)				
6250 Data Cartridge (250MB)for 4mm tape stacker	3M12937		GDA	HP
8mm Digital Audio Tapes				

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Appendix D. M&O Release A Staffing Profiles

Table D-1. M&O Site Staffing

Functional Title	GSFC			LaRC			MSFC		EDC		
	Rel A CSR	Rel A RRR	Rel B RRR	Rel A CSR	Rel A RRR	TRMM (L-3)	Rel A CSR	TRMM (L-3)	Rel A CSR	Rel B IAT	Rel B RRR
	10/1/ 96	1/1/ 97	9/1/ 97	10/1/ 96	1/1/97	5/1/97	10/1/ 96	5/1/97	10/1/ 96	6/1/ 97	9/1/ 97
	3 mo	8 mo	4 mo	3 mo	4 mo	8 mo	3 mo	9 mo	8 mo	4 mo	4 mo
Contractor's Senior DAAC Rep	1	1	1	1	1	1	0.5	0.5		1	1
Administrative Support	1	1	1	1	1	1				1	1
Ops Readiness & Performance Assurance	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			0.5
Sustaining Engineering											
Engineer	2	2	5	3	3	5	1.5	1.5			5
S/W Maintenance		3	3		3	3	1	1			2
Science											
Configuration Management	1	1	2	1	1	1	0.5	0.5		1	1
Testing	2	2	2	1	1	2	0.5	0.5		1	1
Property Management/ILS	1	1	1	1	1	1	0.5	0.5	0.5	1	1
H/W Maintenance	2	2	3	1	1	2.8	0.5	1	0.5	1	1
Resource Planning/Performance Analyst	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			0.5
Algorithm Technical Support			3		7	7		1			
DAAC Assistance	1	1	3	1	1	3	1	1			
Operations Supervisor	0.25	0.25	0.5	0.25	0.25	0.25	0.25	0.25			
Production Scheduler	0.25	0.25	0.5	0.25	0.25	0.25	0.25	0.25			
QA/Production Monitor	0.5	0.5	4.8	1.5	1.5	3.3	0.5	0.5		1	1
Ground controller			2.8	1	1	2.8	1	1		1	1
User Services		2									
Data Specialist	2		3	2	2	2	2	3.8		2	2
User Assistance	1	1									
Ingest/Distribution	1	1	6	1	1	3				1	1
Archive Manager	3.2	3.2	2.8	1	1	2.8	1	1		1	1
System Administration	1	1	4.8	1	1	2.8	1	1	1	1	1
Database Administration			3	1	1	3	1	1		1	1
Algorithm Technical Support											
Equivalent Staffing Totals	21.2	24.2	53.2	20.0	30.0	48.0	14.0	17.3	2.0	14.0	22.0

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Abbreviations and Acronyms

AIT	Algorithm Integration and Test
AM1	EOS AM Project spacecraft 1, morning series - - ASTER, CERES, MISR, MODIS and MOPITT instruments
A _o	Operational Availability
ASF	University of Alaska Synthetic Aperture Radar (SAR) Facility
CCB	Configuration Control Board
CD	Contract Deliverable
CD-ROM	Compact Disk-Read Only Memory
CDR	Critical Design Review
CDRD	Contract Data Requirement Document
CDRL	Contract Data Requirements List
CIL	Critical Items List
CM	Configuration Management
COTS	Commercial Off-the-Shelf
CSMS	Communications and Systems Management Segment
CSR	Consent to Ship Review
CSS	Communications subsystem
DAACs	Distributed Active Archive Centers
DID	Data Item Description
DM	Data Management
Ecom	EOS Communications Network
ECS	EOSDIS Core System
EDC	Earth Resources Observation Systems (EROS) Data Center
EDF	ECS Development Facility
EOC	EOS Operations Center
EOS	Earth Observing System
EOSDIS	Earth Observing System (EOS) Data and Information System (DIS)
EROS	Earth Resources Observation Systems
ESD	Electrostatic Discharge
ESDIS	Earth Science Data and Information System

ESN	EOSDIS Science Network
F&PRS	Functional and Performance Requirements Specifications
FOO	Flights of Opportunity
FMEA	Failure Modes, and Effects Analyses
FOS	Flight Operations Segment
GFE	Government Furnished Equipment
GFP	Government Furnished Property
GSFC	Goddard Space Flight Center
HDBK	Handbook
HW	Hardware
I/FT	Installation/Field Test
IDR	Increment Design Review
ILS	Integrated Logistics Support
ILSMT	ILS Management Team
ILSO	Integrated Logistics Support Office
ILSPM	ILS Program Manager
IMS	Information Management System
ISP	Integrated Support Plan
ISS	Internetworking Subsystem
IST	Instrument Support Toolkits
IV&V	Independent Verification and Validation
JPL	Jet Propulsion Laboratory
LAN	Local Area Network
LaRC	Langley Research Center
LCC	Life Cycle Cost
LORA	Level of Repair Analysis
LRU	Line Replaceable Unit
LSA	Logistics Support Analysis
M&O	Maintenance and Operations
MDT	Mean Down Time
MIL	Military
mm	Millimeter
MR	Malfunction Report

MSFC	Marshall Space Flight Center
MSS	Management Subsystem
MTBF	Mean Time Between Failure
MTBM	Mean Time Between Maintenance
MTTR	Mean Time To Repair
NA	Network Administrator
NASA	National Aeronautics and Space Administration
NHB	NASA Handbook
NSIDC	University of Colorado, National Snow and Ice Data Center
OEM	Original Equipment Manufacturer
OJT	On The Job Training
OPPM	Outside the principal period of maintenance
ORNL	Oak Ridge National Laboratory
PAIP	Performance Assurance Implementation Plan
PAR	Performance Assurance Requirements
PDR	Preliminary Design Review
PHS&T	Packaging, Handling, Storage, and Transportation
PM	Preventive Maintenance
PPM	Principal Period of Maintenance
RMA	Reliability, Maintainability, and Availability
RRR	Release Readiness Review
SA	System Administrator
SAR	University of Alaska Synthetic Aperture Radar
SCDO	Science and Communications Development Organization
SDPS	Science Data Processing Segment
SDR	System Design Review
SMC	System Monitoring and Coordination Center
SMO	System Management Office
SOW	Statement of Work
SRR	System Requirements Review
SW	Software
TRMM	Tropical Rainfall Measuring Mission (Joint US-Japan)
UPS	Uninterruptable Power Supply

VCATS	Vendor Cost And Tracking System
VO	Version zero
WAN	Wide Area Network
WP	White Paper