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EOSDIS Core System Project

Maintenance and Operations Management Plan for the ECS Project

Final

July 1995

Hughes Information Technology Corporation
Landover, Maryland

Maintenance and Operations Management Plan for the ECS Project

July 1995

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CDRL Item 109

SUBMITTED BY

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Preface

This document is a formal contract deliverable with an approval code 1, which requires Government review and approval prior to acceptance and use. This submittal of the document incorporates comments received from the Government concurrent with their approval. The document is under ECS contractor configuration control and contractor approved changes are handled in accordance with Class I and Class II change control requirements described in the EOS Configuration Management Plan. Changes to this document shall be made by document change notice (DCN) or by complete revision. Any questions should be addressed to:

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Abstract and Keywords

The **Maintenance and Operations Management Plan** describes the organizational structure and approach to management of the M&O activities of the ECS Contractor. ECS M&O organizations are established at each of the DAACs, and at the GSFC Building 32 System Monitoring and Coordination Center (SMC), EOS Operations Center (EOC), and Sustaining Engineering Organization (SEO). Also at Building 32, the System Integrated Logistics Support organization supports the activities and requirements of each of the ECS M&O organizations. The ECS M&O management staff resides in Building 32.

The primary contractual responsibility of each organization is to be responsive to its host customer organization. In the case of the ECS organization resident at each DAAC, the ECS organization is responsive to the tasks, priorities, and processes of the DAAC. At the SMC, the System Operations Manager (SOM) and Project Scientist provide direction. At the EOC, the Mission Operations Manager (MOM) and Project Scientist provide that function. The SEO and M&O management staff are responsive to the appropriate ESDIS Project management.

The roles and responsibilities of each ECS organization are described in detail. Potential organization charts are provided. Each organization is structured using operations and engineering teams that minimize the amount of dedicated supervision while maximizing responsiveness to tasks, problems, etc. The actual team organization is tailored by the specific needs of the host center and may change over time.

Also provided in the appendixes to the document are a potential configuration management approach (Appendix A), project management scenarios (Appendix B), excerpts from the DAAC Strategic/Management Plan which provide an alternative set of roles and responsibilities for the DAACs, ESDIS, and the ECS Contractor (Appendix C), and an alternative organization concept that merges the DAAC and ECS Contractor technical organizations (Appendix D).

Keywords: M&O, DAAC, SMC, ESN, EOC, SEO, ILS, CM, scenarios, operations, concepts

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Contents

Preface

Abstract and Keywords

1. Introduction

1.1	Identification	1-1
1.2	Scope	1-1
1.3	Status and Schedule	1-2
1.4	Document Organization	1-2

2. Related Documentation

2.1	Parent Documents	2-1
2.2	Applicable Documents	2-1
2.3	Information Documents	2-2

3. ECS Maintenance and Operations Organization

3.1	ECS Maintenance and Operations Office	3-2
3.2	Distributed Active Archive Center ECS On-Site Maintenance and Operations	3-4
3.2.1	ECS On-Site Manager Functions	3-6
3.2.2	ECS On-Site Operations Functions.....	3-6
3.2.3	ECS On-Site Engineering and Support Functions	3-9
3.3	ECS SMC Maintenance and Operations	3-11
3.3.1	ECS SMC Manager Functions	3-11
3.3.2	ECS SMC Operations Functions.....	3-13
3.3.3	ECS SMC Engineering and Support Functions	3-14
3.4	ECS EOC Maintenance and Operations	3-16

3.4.1	ECS EOC Manager Functions	3-16
3.4.2	ECS Flight Systems Engineer Functions	3-18
3.4.3	ECS FOT Operations Manager Functions	3-19
3.4.4	ECS Ground System Engineering Functions	3-20
3.5	ECS SEO Maintenance and Operations	3-20
3.5.1	ECS SEO Manager Functions	3-20
3.5.2	ECS SEO Operations Functions	3-22
3.5.3	ECS SEO Engineering and Support Functions	3-22
3.6	ECS ILS Maintenance and Operations	3-23
3.6.1	ILS Management	3-23
3.6.2	COTS Hardware and Software Maintenance	3-25
3.6.3	Property Management	3-25
3.6.4	M&O COTS Training	3-25
3.6.5	Facility and Installation Management	3-27
3.6.6	Packaging, Handling, Storage and Transportation (PHS&T)	3-27
3.6.7	M&O Technical Documentation	3-28
3.6.8	Logistics Data Management and Reporting	3-28

4. M&O Management Approach

4.1	Continuous Measurable Improvement	4-1
4.2	M&O ECS Wide Management	4-2
4.3	ECS Management at Host Sites/Centers	4-2
4.3.1	Operations Management Approach	4-3
4.3.2	Engineering Management Approach	4-6
4.4	ECS SEO Management	4-7
4.5	ECS ILS Management	4-7
4.6	Development Organization Interfaces	4-8
4.7	Launch Preparation Planning	4-9
4.8	Center Planning	4-9

5. Management Systems and Controls

5.1	Work Breakdown Structure	5-1
5.1.1	WBS 8.1 - M&O Management	5-2
5.1.2	WBS 8.2 - Integrated Logistics Support	5-2
5.1.3	WBS 8.3 - M&O Training	5-2
5.1.4	WBS 8.4 - M&O Sustaining Engineering	5-4
5.1.5	WBS 8.5 - Not Used	5-5
5.1.6	WBS 8.6 - Flight Operations.....	5-5
5.1.7	WBS 8.7 - Science Operations	5-5
5.2	Cost Accounts	5-6
5.3	Work Authorization	5-6
5.4	Scheduling	5-7
5.5	Budgeting	5-7
5.6	Budgeting Process	5-8
5.7	Performance Measurement	5-8
5.8	Determining Program Status	5-9
5.9	Reporting	5-9
5.10	Earned Value Status	5-9
5.10.1	Schedule Status	5-9
5.10.2	Earned Value	5-9
5.10.3	Internal Reviews	5-9
5.11	Performance Measurement Data.....	5-10
5.12	Management Involvement, Action, and Follow-up	5-10
5.13	Personnel Policies	5-10

6. Policies, Procedures, and Documentation

6.1	Management Systems	6-1
6.2	Personnel Policies	6-1
6.3	Site/Center Policies	6-1

Figures

3-1.	ECS Maintenance and Operations Organization	3-2
3-2.	ECS M&O Office Organization	3-3
3-3.	ECS On-Site Organization	3-5
3-4.	ECS SMC Organization	3-12
3-5.	ECS EOC Organization	3-18
3-6.	ECS SEO Organization	3-21
3-7.	ILS Organization	3-24
3-8.	ILS Planning Process	3-26
3-9.	ECS Maintenance Support	3-27

Tables

5-1.	Management Systems and Control Descriptions	5-1
5-2.	ECS M&O Summary WBS.....	5-3

Appendix A. M&O Configuration Management Approach

Appendix B. M&O Management Scenarios

Appendix C. Roles and Responsibilities

Appendix D. Customer/Contractor Integrated Organization Concept

Abbreviations and Acronyms

1. Introduction

The Earth Observing System (EOS) Data and Information System (EOSDIS), as the National Aeronautics and Space Administration's (NASA) overall Earth Science discipline data system, provides the ground system for the collection and analysis of science data to support scientists in resolving the dynamics of the Earth's components and the processes by which they interact. As a part of the EOS Program, EOSDIS supports: the planning, scheduling, and control of the EOS series of spacecraft; exchanging commands, data and algorithms with the European Space Agency (ESA), Japan, Canada, the National Oceanic and Atmospheric Administration (NOAA), and any other non-NASA entities involved in the overall EOS mission; the coordination of these activities with other data gathering systems; and the transformation of the observations into physical variables, providing for higher levels of processing and presenting the data to users in forms that facilitate and stimulate interactive scientific research. The portion of EOSDIS addressed in this document is the EOSDIS Core System (ECS).

The ECS is based on the functional and performance capabilities required by the baseline EOSDIS design. The ECS provides support for the EOS services spacecraft and instruments. ECS also provides information management, data archive, and data distribution functions for all other NASA Earth science flight missions, NASA Earth science instruments flown on non-NASA flight missions, and for other NASA held Earth science data.

1.1 Identification

This document is submitted as Contract Data Requirements List (CDRL) item 109, DID 601/OP1 under Contract NAS5-6000.

1.2 Scope

This document is based on the ECS Change Order 1 list of locations and Statement of Work. ECS elements are deployed to the institutions shown below:

- Distributed Active Archive Centers (DAACs):
 - Alaska SAR Facility (ASF) — University of Alaska - Fairbanks, Alaska
 - EROS Data Center (EDC) — Sioux Falls, South Dakota
 - Goddard Space Flight Center (GSFC) — Greenbelt, Maryland
 - Jet Propulsion Laboratory (JPL) — Pasadena, California
 - Langley Research Center (LaRC) — Hampton, Virginia
 - Marshall Space Flight Center (MSFC) — Huntsville, Alabama
 - National Snow and Ice Data Center (NSIDC) — University of Colorado, Boulder, Colorado

- Oak Ridge National Laboratory (ORNL) — Oak Ridge, Tennessee
- System Monitoring and Coordination Center (SMC) — GSFC Building 32
- EOS Operations Center (EOC) — GSFC Building 32
- ECS Sustaining Engineering Organization (SEO) — GSFC Building 32
- ECS System Integrated Logistics Support Organization (ILS) — GSFC Building 32

This plan addresses management of the maintenance and operations (M&O) hardware, software, and personnel resources of ECS deployed to these locations.

This document reflects the Technical Baseline submitted via contract correspondence number ECS 194-00343.

1.3 Status and Schedule

This submittal of DID 601/OP1 meets the milestone specified in the Contract Data Requirements List (CDRL) of NASA Contract NAS5-60000.

1.4 Document Organization

The ECS Statement of Work (SOW) states in Section 3.8.1:

3.8.1 ECS Maintenance and Operations Management (WBS 8.1)

The Contractor shall establish an on- or near-site management organization for GSFC ECS maintenance and operations with field offices at each of the other ECS sites. The Contractor is required to establish an organization that is responsive to the requirements of each site. The Contractor shall prepare a Maintenance and Operations Management Plan in accordance with DID 601/OP1 that describes the management system, controls, functions, policies, procedures, and documentation to be utilized in fulfilling the M&O requirements of each site. ...

DID 601/OP1, CDRL Item 109, reads as follows:

Maintenance and Operations Management Plan

Describes the Contractor's management organization for ECS operations at GSFC and the field offices at each of the other ECS sites. Describes the management system, controls, functions, policies, procedures, and documentation to be utilized in fulfilling the M&O requirements of the site.

This document responds to the SOW and DID and is organized into the following sections and appendices:

- Section 1, Introduction. Introduces EOSDIS and this document.
- Section 2, Related Documentation. Lists documents that drive, support or expand on the material in this plan. Site specific management, policy and procedural documents are

included in this section. Design and implementation details of site specific capabilities are in the appropriate interface and design documentation.

- Section 3, ECS Maintenance and Operations Organization. Describes the overall management structure and functions of the maintenance and operations organization at each center. Describes the management and technical functions performed at each center.
- Section 4, M&O Management Approach. Describes the relationships between ECS M&O center management and the M&O Office, as well as between ECS M&O center management and host organization management.
- Section 5, Management Systems and Controls. Describes the systems and controls used to direct, control and perform maintenance and operations.
- Section 6, Policies, Procedures, and Documentation. Describes the policies, procedures and documentation used to manage ECS maintenance and operations.
- Abbreviations and Acronyms.
- Appendix A, M&O Configuration Management Approach. Describes the approach the M&O organization recommends to manage the operational baseline.
- Appendix B, M&O Management Scenarios. Provides management scenarios for baseline management and configuration control, standard management meetings, and information flow.
- Appendix C, ECS M&O Roles and Responsibilities. Contains relevant sections of the ECS SOW and the Distributed Active Archive Center (DAAC) Strategic/Management Plan.
- Appendix D, Customer/Contractor Integrated Organization Concept. Describes an alternative organization structure that integrates customer and contractor personnel into a single technical organization.

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2. Related Documentation

2.1 Parent Documents

The parent document is the document from which this management plan's scope and content are derived.

423-41-01	Goddard Space Flight Center, EOSDIS Core System (ECS) Statement of Work
423-41-03	Goddard Space Flight Center, EOSDIS Core System (ECS) Contract Data Requirements Document

2.2 Applicable Documents

The following documents are referenced within this management plan, or are directly applicable, or contain policies or other directive matters that are binding upon the content of this volume.

GHB 1040.1	Goddard Space Flight Center Handbook: Emergency Preparedness Plans and Procedures, Volume I
GHB 1600.1	Goddard Space Flight Center Handbook: Security Manual
GMB 2540.2	Goddard Space Flight Center Handbook: Administrative Communications Facilities, Equipment, and Services
GMB 8800.2	Goddard Space Flight Center Handbook: Environmental Handbook
GMI 1700.2	Goddard Space Flight Center Management Instruction: Health and Safety Program
GMI 1772.1	Goddard Space Flight Center Management Instruction: Center Smoking Policy
GMI 3610.2	Goddard Space Flight Center Management Instruction: Hours of Duty
GMI 5104.7	Goddard Space Flight Center Management Instruction: Policy Concerning Contracts Requiring Onsite Performance and the Administration Thereof
GMI 8821.1	Goddard Space Flight Center Management Instruction: Facilities Configuration Management
GSFC NO. 90-59	Goddard Space Flight Center Announcement: Contractor Business Use of Official Mail and of the Mail Services Center

2.3 Information Documents

Several ECS and ESDIS documents provide additional information or influence elements of this plan. Additionally, HAIS, subcontractor, and DAAC directives provide center-specific policies, procedures, and practices.

While on Customer premises, the Contractor shall comply with requirements governing the conduct of personnel and the operation of the facility. ECS personnel resident or visiting a Customer facilities follow the policies and procedures of the host organization on matters such as, but not limited to, facility security, visitor policies, and holidays.

Should additional documents and/or material be identified to the ECS M&O Office and/or the ECS center-resident manager, they will be incorporated into the Contractor's policies and procedures, as directed by ESDIS Management, the Customer Center Manager, and ECS Management.

101-101-MG1	Project Management Plan for the ECS Project
194-102-MG1	Configuration Management Plan for the ECS Project
193-103-MG3	Configuration Management Procedures for the ECS Project
104-CD-001	Data Management Plan for the ECS Project
193-105-MG3	Data Management Procedures for the ECS Project
107-CD-001	Level 1 Master Schedule for the ECS Project
193-205-SE1	Science User's Guide and Operations Procedure Handbook for the ECS Project
193-212-SE2	User Requirements Study Report for the ECS Project
220-CD-001	Communications Requirements for the ECS Project, Final
194-302-DV2	ECS Facilities Plan for the ECS Project
194-501-PA1	Performance Assurance Implementation Plan for the ECS Project
194-602-OP1	Property Management Plan for the ECS Project
613-CD-001	COTS Maintenance Plan for the ECS Project
615-CD-001	Special Maintenance and Test Equipment for the ECS Project
193-616-OP2	Integrated Logistics Support Plan for the ECS Project
617-CD-001	Logistics Support Analysis Plan for the ECS Project
622-CD-001	Training Plan for the ECS Project
HAIS	Hughes Information Technology Corporation Cost and Schedule Management System, Manual 601

MM 5151.5C	[MSFC Management Memo] Performance Evaluation Operating Manual for CPAF Contracts
MMI 1700.16	MSFC Management Instruction: Safety and Health Program
MMI 8800.3	MSFC Management Instruction: MSFC Environmental Management Program
NHB 1600.6	NASA Handbook: NASA Communications Security Manual
NHB 8831.2A	NASA Handbook: Facilities Maintenance and Energy Management Handbook
NMI 2520.1	NASA Management Instruction: NASA Communications System Acquisition and Management
NMI 2540.1	NASA Management Instruction: Use of Government Telephones
NMI 3610.1	NASA Management Instruction: Power and Authority to Approve Deviations from the Standard Tour of Duty
none	Contractor's and Subcontractors' command media
none	Distributed Active Archive Center (DAAC) Strategic/Management Plan, Version: August 8, 1994
none	University of Alaska Personnel Policies and Regulations
none	Geophysical Institute Staff Manual, University of Alaska Fairbanks
none	New Marshall Space Flight Center (MSFC) Smoking Policy, J.A. Bethay

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3. ECS Maintenance and Operations Organization

This section addresses the organizational structure that provides overall M&O management, M&O functions at each of the DAACs, system monitoring and coordination and network management and operations at the SMC, and flight operations at the EOC. It also describes a GSFC Building 32 resident ECS SEO that provides system-wide maintenance and sustaining engineering, and the ILS organization.

The material in this section is based on the ECS SOW. Appendix C contains excerpts from that SOW and an alternative allocation of functions as contained in the Distributed Active Archive Center (DAAC) Strategic/Management Plan. Modification to the ECS SOW may be accomplished in the future through a change order. Planning for such a change may be initiated through a Technical Direction.

Management of ECS M&O activities includes planning, budgeting, accounting, resource management, customer relations, scheduling, and personnel. At the Consent to Ship Review for the TRMM Infrastructure Development Release (previously known as IR-1), ECS M&O will place staff at the following centers to support algorithm integration and test in cooperation with the Science Computing Facilities (SCFs), DAACs, and ECS offices:

- EDC,
- GSFC,
- LaRC, and
- MSFC

ECS M&O responsibilities for TRMM ECS operations and AM-1, COLOR and ADEOS algorithm development, integration and test support begin at the following centers at the Release Readiness Review (RRR) for the TRMM Development Release (previously known as Release A):

- EDC,
- GSFC,
- LaRC,
- MSFC
- SMC,
- EOC¹,
- SEO, and
- ILS

¹ EOC personnel are part of the ECS Flight Operations Segment development office.

ECS M&O responsibilities begin at the following locations between the TRMM Development Release RRR and the RRR for the AM-1/Landsat Release (previously known as Release B):

- ASF,
- JPL,
- and NSIDC².

3.1 ECS Maintenance and Operations Office

The ECS Maintenance and Operations Office, shown in Figure 3-1, as “Maintenance and Operations,” is housed in GSFC Building 32 and provides ECS-wide management and administration of M&O activities. These include personnel supervision, liaison with Earth Science Data and Information System (ESDIS) Project Office personnel; planning, budgeting, accounting, resource management, scheduling and subcontract management; development of system-wide policies, procedures, and priorities; and liaison with other ECS development (i.e., System Management Office, SMO, Science and Communications Development Office (SCDO), responsible for Communications and System Management Segment, CSMS, and Science Data Processing Segment, SDPS, development) and support (i.e., Science, Contracts, Quality, Business Operations, and Subcontractor Management and Procurement) organizations.

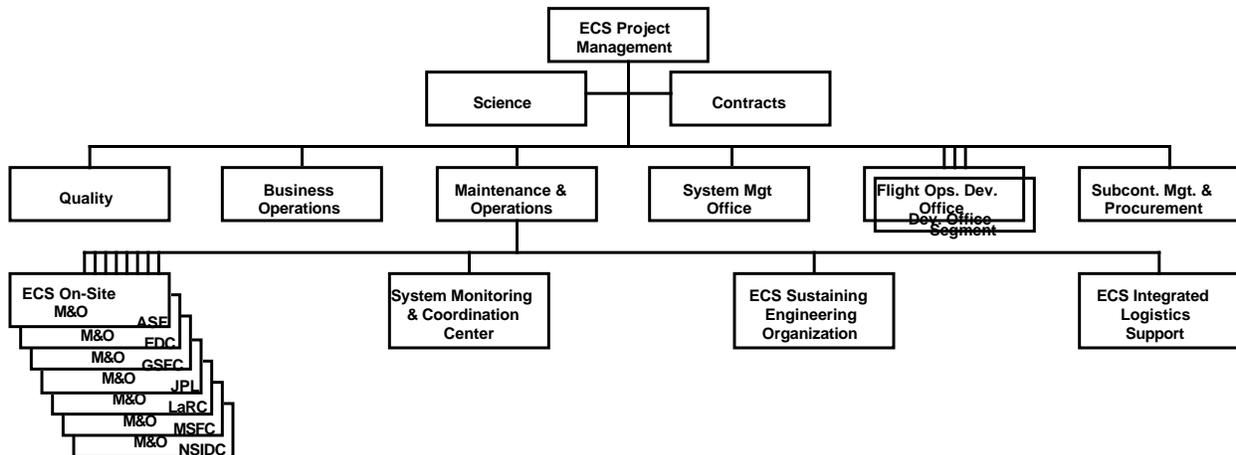


Figure 3-1. ECS Maintenance and Operations Organization

² No ECS M&O organization is constituted at ORNL. The ECS organization will, however, coordinate with ORNL staff for problem identification, resolution, new builds, etc.

As shown in Figure 3-2, the M&O Office uses a minimum overhead approach to providing the following management functions:

- ESDIS Project Office liaison — provide a point of contact to the ESDIS Project Office, including the Project Manager, the Contracting Officer’s Technical Representative (COTR), System Integration and Operations Office Manager, the DAAC Systems Manager, the SOM, the Network Manager, and the MOM,
- ECS Project Organization liaison — provide a management interface to the ECS project organizations,
- ECS M&O Office liaison — provide management liaison to ECS staff at DAACs, SMC, EOC, and SEO,
- ECS M&O Office personnel supervision — tasking, hiring, termination, time keeping, promotions, performance appraisals, salary adjustments, discipline, etc.,

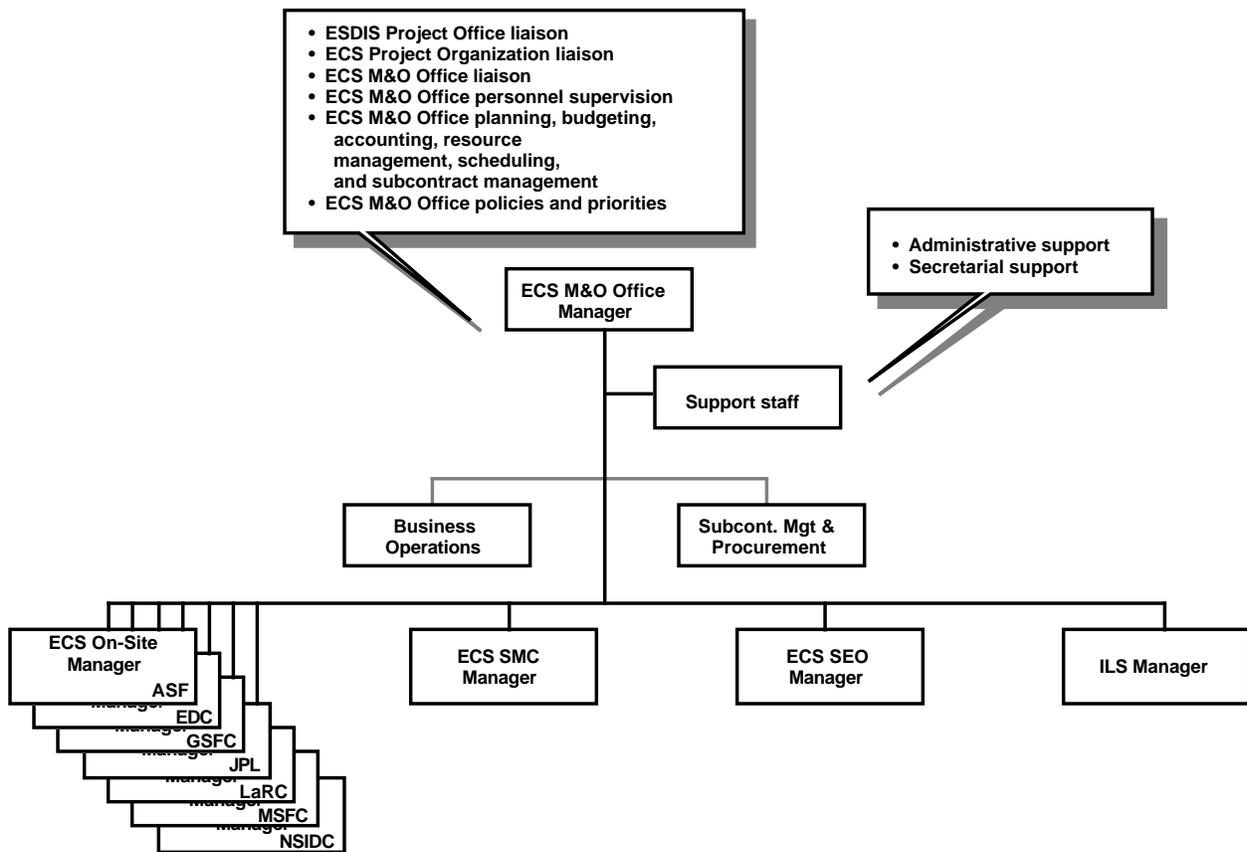


Figure 3-2. ECS M&O Office Organization

- ECS M&O Office planning, budgeting, accounting, resource management, scheduling and subcontract management — provide financial management and reporting on the ECS M&O Office as well as supervision and management of each of the other M&O organizations; provide tasking of ECS Contractor support organizations that provide routine support to M&O activities especially the Quality Office, Subcontract Management and Procurement Office, and Business Operations Office; and
- ECS M&O policies and priorities — ensure that ECS M&O personnel are tasked in accordance with ESDIS and ECS policies and priorities as driven by host organization needs; ensure that project and company procedures are properly followed.

Figure 3-2 also shows a support staff providing the following functions:

- Administrative support — support personnel administration; support planning, budgeting, accounting, resource management, scheduling and contract management activities; and
- Secretarial support — typing, filing, expense reports, mail distribution, meeting scheduling, etc.

3.2 Distributed Active Archive Center ECS On-Site Maintenance and Operations

The product generation, archive, catalog, distribution, and user support functions of EOSDIS are performed where the combination of science expertise in the use of the data and products, expertise in data and information services, and a long term institutional commitment to support these functions exists.

NASA Headquarters has established a set of DAACs in one or more of the Earth science disciplines that collectively constitute global change science. The DAACs host and operate the distributed elements of EOSDIS.

DAACs are responsible for providing data and information services including comprehensive support to their users. These users include each DAAC's specific discipline oriented community, the broader interdisciplinary global change community supported by all the DAACs collectively, and NASA sponsored EOS science software developers. User support includes advice in the use and application of data to scientific research.

ECS M&O is phased into the DAACs over time. At the TRMM Infrastructure Release, ECS M&O supports the SCFs, DAACs, and ECS Science Office performance of science software algorithm development, integration and test.

After RRR of the TRMM Development Release, ECS M&O supports GSFC, MSFC, LaRC and EDC DAAC management in bring ECS resources on line. ECS M&O begins at the remaining DAACs, (ASF, JPL, NSIDC, and ORNL) by RRR of the AM-1/Landsat Release. The DAAC M&O organizations are primarily responsive to the requirements of their host DAAC.

Functions performed by the ECS Contractor at each DAAC includes ECS management, ECS operations, ECS maintenance, ECS sustaining engineering, ECS technical assistance (i.e., user

service support, and algorithm development and integration and test support), and ECS development organization liaison.

ECS provided functionality, capacities, and staffing vary from DAAC to DAAC, and over time. Functionality is driven by the ECS SOW and EOSDIS Core System (ECS) Requirements Specification. For example, Product Generation System (PGS) resources are not provided at ASF and ORNL. Capacities are driven by Appendix C of the Specification³ which specifies the platforms and instruments processing and data storage volumes.

Figure 3-3 shows the planned ECS On-Site organization at each DAAC. The actual organization at each DAAC evolves as a function of time and is tailored to fit the management and operations mode of the DAAC, as well as the functions, numbers and skills of ECS personnel. Actual organization charts are issued on a regular basis in accordance with contractor policy.

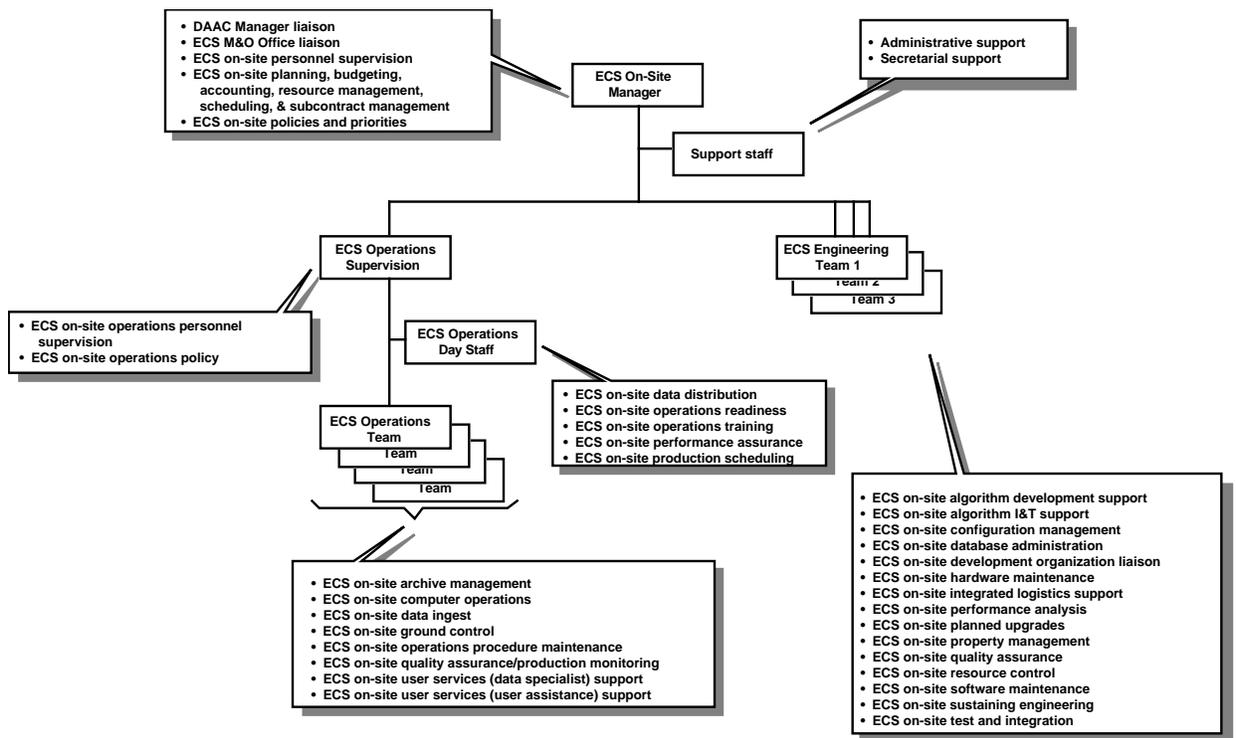


Figure 3-3. ECS On-Site Organization

³ Technical analyses may be based on other product sets.

3.2.1 ECS On-Site Manager Functions

ECS On-Site Manager provides liaison with DAAC management and staff to ensure that DAAC priorities and requirements are properly reflected in ECS Contractor tasking. ECS On-Site Management also represents the concerns of the DAAC's management within ECS to ensure that issues are properly identified and prioritized.

The ECS On-Site Manager has the following major functional responsibilities:

- DAAC Manager liaison — provide a point of contact to the DAAC Manager and staff on all ECS On-Site M&O organization activities;
- ECS M&O Office liaison — provide management liaison to ECS M&O Office staff including ECS staff at other DAACs, the SMC, the EOC, the SEO, the parent ECS M&O organization, and development and support organizations;
- ECS On-Site personnel supervision — provide tasking, hiring, termination, time keeping, promotions, performance appraisals, salary adjustments, discipline, training, certification, etc.,
- ECS On-Site planning, budgeting, accounting, resource management, scheduling and subcontract management — provide financial management and reporting on the ECS On-Site M&O organization; and
- ECS On-Site policies and priorities — ensure that ECS On-Site personnel are tasked in accordance with ECS policies and priorities as driven by DAAC needs; ensure that company, ECS, DAAC and/or Building 32, procedures and policies (including, but not limited to, finance, personnel, logistics access, property management, security, health, and safety) are properly followed.

Figure 3-3 also shows a support staff providing the following functions:

- Administrative support — support personnel administration; support planning, budgeting, accounting, resource management, scheduling and contract management activities; and
- Secretarial support — provide typing, filing, expense reports, mail distribution, meeting scheduling, etc.

3.2.2 ECS On-Site Operations Functions

The ECS Operations organization provides all ECS operations functions. This includes pre-launch operations, early orbit operations, and on-orbit operations. Operations are performed on shifts specified by the DAAC management and consistent with the ECS SOW.

Figure 3-3 shows one possible organization consisting of ECS Operations Supervision, ECS Operations Day Staff, and ECS Operations Teams. The size of the Operations organization, its structure and assignment of functions vary from DAAC to DAAC to better match the ECS operations structure to the DAAC structure as well as the skills of the ECS staff.

The functions performed by ECS Operations Supervisor are as follows:

- ECS On-Site operations personnel supervision — provide first line supervision of ECS operations, conflict resolution, policy enforcement, time keeping, productivity monitoring, shift worker scheduling, hiring, termination, promotions, performance appraisals, salary adjustments, discipline, etc., and
- ECS On-Site operations policy — develop and administer policies, directives, and guidance to implement both ECS and DAAC operations tasking, procedures, practices, and priorities.

The functions performed by the ECS Operations Day Staff are as follows:

- ECS On-Site data distribution — package, label and ship output to science users in a prioritized manner; follow up, trace undelivered output;
- ECS On-Site operations readiness — ensure elements are in a state of operational readiness at all times including launch preparations; conduct Operational Readiness Reviews and monitor M&O activities, provide visibility to DAAC, ESDIS and ECS management on operations readiness;
- ECS On-Site operations training and certification — develop and maintain center specific initial and refresher operations training and certification packages; maintain training and certification records; report on staff training; coordinate with SEO system-level training and certification requirements;
- ECS On-Site performance assurance — provide coverage of operational phase activities in PAIP (DID 501); continue the tasks of the RMA program throughout the operational phase; and
- ECS On-Site production scheduling — schedule system updates and maintenance schedules; coordinate user requests.

One or more ECS operations teams are formed at each DAAC. Each operations team cross-trains its members to allow dynamic assignment of personnel to tasks within a shift and adequate backup in the event of personnel absences (e.g., illness, vacations, etc.). Figure 3-3 assigns the following functions to the ECS operations team(s):

- ECS On-Site archive management — monitor data archive; ensure data is properly logged in/out; maintain catalog of data; ensure the viability and safety of storage media, replace or re-label as necessary;
- ECS On-Site computer operations — operate the host processor(s), support restarts/reboots, monitor system status, respond to console messages and do initial program loads for all system upgrades; perform minor housekeeping maintenance, operator level PM and problem diagnosis and recovery;
- ECS On-Site data ingest — receive, log and mark all non-electronic media for processing and storage; return media to sender, file or store; coordinate with sender to resolve any ingest problems;

- ECS On-Site ground control — monitor and manage the operation of the local area network and system status via Local System Manager (LSM) software suite; coordinate activities with other network management centers (e.g. SMC, NSI, Center LAN control organizations, etc.); take corrective actions to respond to anomalies, assist in diagnosis and isolation of hardware and software problems; maintain system configuration tables; monitor and report on network performance to management;
- ECS On-Site operations procedure maintenance — maintain and upgrade operational procedures to improve DAAC efficiency, simplify operations, improve quality, etc.; support development organizations in development of procedures;
- ECS On-Site quality assurance/production monitoring — monitor science algorithm program execution via automated tools; monitor quality and completeness of input and output;
- ECS On-Site user services (data specialist) support — as part of the ECS Technical Assistance Group (TAG), provide expertise on the use and development of data and metadata, subsets of data, numerical methods and tools, vector and parallel processor techniques, visualization and graphics tools, analysis tools, expert systems, data formats, and computing techniques; answer detailed questions concerning the ECS suite of data retrieval software tools, the structure of the data; provide an interface between the users and the EOS for more specific inquiries; and
- ECS On-Site user services (user assistance) support — as part of the ECS TAG, provide support to DAAC User Services for the access and use of the ECS including systems registration, general inquiry, product request, logistics, user accounting, user suggestions and feedback, and product acquisition and tracking.

Using procedures and manuals initially developed by the ECS development organizations, each M&O On-Site organization tailors the documentation and procedures to the needs of the individual centers. The document tailorings are reviewed and, where necessary to ensure system-wide functional and performance requirements are met, approved by the M&O Office. Improvements in processes and procedures developed at one DAAC will be forwarded to the other DAACs for potential incorporation.

Management of ECS operations at each center is under the direction of ECS Operations Supervisor and the ECS On-Site Manager. ECS operations also coordinates its policies, procedures, and staffing with other DAACs' operations and the SMC to ensure a seamless execution of operations.

The ECS operations team approach may assign a function to a single individual within a team or multiple functions to a single individual. For example, the User Services functions may be combined in such a way that a single individual provides both user assistance and data specialists functions on one or more data sets. Other individuals provide those functions for other data sets.

3.2.3 ECS On-Site Engineering and Support Functions

One or more ECS engineering teams are constituted at each DAAC. Cross-functional teams are established to minimize the number of internal interfaces required to work a particular problem or set of problems. Grouping similar skills together also ensures adequate coverage of needed tasks in event of staff vacations, vacancies, illnesses, etc., especially when staffing of a particular function is less than full time. Finally, not all functions are performed by the ECS Contractor at all centers (e.g., Algorithm I&T is not performed at centers that have no ECS product generation requirement).

The example shown by Figure 3-3 assigns the following functions to the ECS Engineering Team(s):

- ECS On-Site algorithm development support — as part of the ECS TAG, provide support to scientists in the development of algorithms for both updates and new algorithms that are executed by the ECS system; interface with users on access to the system (the ECS Science Office, supported by the M&O organization, will have the lead ECS contractor role in coordinating and executing initial algorithm development support; subsequent algorithm deliveries (i.e., modifications) will be the responsibility of the M&O organization. Please see Appendix C for a full explanation of the roles and responsibilities of the ESDIS Project, DAACs, ECS Contractor and Science Community.);
- ECS On-Site algorithm I&T support — as part of the ECS TAG, provide support to scientists in the test and integration of algorithms for both updates and new algorithms that are executed by the ECS system; interface with users on access to system (the ECS Science Office, supported by the M&O organization, will have the lead ECS contractor role in coordinating and executing initial algorithm test and integration; subsequent algorithm deliveries (i.e., modifications) will be the responsibility of the M&O organization. Please see Appendix C for a full explanation of the roles and responsibilities of the ESDIS Project, DAACs, ECS Contractor and Science Community.);
- ECS On-Site configuration management — coordinate usage of approved configuration management (CM) procedures with elements and external interface configuration management, ensuring that changes to the hardware, software, and procedures are properly documented and coordinated; assist in the development and administration of the library for CM procedures; if requested by Customer, provide recording secretarial tasks for the Customer Configuration Change Board (CCB), generate CCB monthly reports; prepare agendas for CCB meetings; coordinate Review Item Discrepancy (RID) requests generated during M&O reviews;
- ECS On-Site database administration — maintain the data bases and structure of the integrated SDPS at each DAAC; provide data base administration support for the distributed system management center element; provide the operations interface to perform data base administration utilities such as data base backup and recovery,

performance monitoring, and tuning; administer user access control and daily data base synchronization;

- ECS On-Site development organization liaison — provide feedback on the performance of installed systems; coordinate future installations; support development activities such as design and document reviews; coordinate trouble tickets (TTs) and Configuration Change Requests (CCRs);
- ECS On-Site hardware maintenance — provide first-level maintenance at each ECS center (other than GSFC); support the ECS availability requirements by replacement of LRUs; act as coordination point with the various vendors at the DAAC including preventative maintenance support; support the isolation of equipment problems;
- ECS On-Site integrated logistics support — interface with the GSFC Logistics Support Services to order supplies, interface with ECS M&O Office ILS function in coordination of delivery of COTS hardware or software; handle ECS center shipping and receiving; act as local ILS representative for ECS⁴;
- ECS On-Site performance analysis — analyze soft and hard copy reports on system effectiveness, productivity, capacity, and performance for ECS hardware and software resources and processes; monitor performance for trends and prepare reports of analysis;
- ECS On-Site planned upgrades — support and participate in planning and implementation of upgrades to the ECS;
- ECS On-Site property management — provide control of Contractor and Government property; provide continuous audit trail from receipt of ECS procured or developed items until transfer of accountability;
- ECS On-Site quality assurance — perform Quality Assurance (QA) audits on a periodic basis to ensure adherence to established standards and procedures for hardware, software and operations; produce audit reports semi-annually in accordance with DID 506; work with performance assurance personnel to track cmi program;
- ECS On-Site resource control — maintain and modify hardware and software system configurations, perform COTS administration (including operating system administration), support property management and support system anomaly tracking and analysis;
- ECS On-Site software maintenance — produce, deliver, and document corrections, modifications, and enhancements made to ECS software (including COTS), and/or adapt or incorporate any COTS software for ECS use;
- ECS On-Site sustaining engineering⁵ — analyze and identify ways to accommodate needed improvements, new technologies and new concepts; manage system upgrades and

⁴ ILS requirements for the GSFC DAAC are performed by the M&O ILS organization.

⁵ Efforts include, but are not limited to, installation, configuration and tuning of ECS software, COTS packages, operating systems, compilers, tools, utilities, networks and databases;

evolution; control and maintain ECS updates; perform the activities necessary to assure ECS reliability, maintainability, and availability; support/provide evaluation of user inputs and monitor system performance to tune the system for optimum response and support; support operational readiness and performance assurance; and

- ECS On-Site test and integration — feature test (i.e., ensure a new requirement and/or design is properly implemented) and regression test (i.e., ensure that previously provided capabilities continue to be properly provided) all system upgrades in center environment, either hardware or software; maintain and update test procedures and data bases.

Assignment of functions to personnel may result in a single function being assigned to one or more staff members or multiple functions to a single staff member or team. For example, the algorithm functions may be combined in such a way that a single individual (or set of individuals) provides both development support and algorithm integration and test support.

3.3 ECS SMC Maintenance and Operations

The ESDIS Project:

- Establishes system-wide performance requirements based on program guidance, inputs from the science community, and consultation with the DAACs;
- Establishes operations resources at the DAACs based on DAAC inputs;
- Coordinates operations, reprocessing, system administration, and accounting across the DAACs; and
- Monitors inter-DAAC data flows.

Monitoring and coordination functionality is primarily distributed to each of the DAACs and EOC and are described in Sections 3.2 and 3.4, respectively. The SMC supports the DAACs, EOC, and the ESDIS Project by providing the functions described in the following sections.

The planned organization chart for the SMC is shown by Figure 3-4.

3.3.1 ECS SMC Manager Functions

The ECS SMC Manager has the following major functional responsibilities:

- SOM and Project Scientist liaison — provide a point of contact to the SOM and Project Scientist on all ECS SMC M&O organization activities;
- ECS M&O Office liaison — provide management liaison to ECS M&O office staff including ECS staff at the DAACs, the EOC, the SEO, the parent ECS M&O organization, and development and support organizations;
- ECS SMC personnel supervision — provide tasking, hiring, termination, time keeping, promotions, performance appraisals, salary adjustments, discipline, etc.;
- ECS SMC planning, budgeting, accounting, resource management, scheduling and subcontract management — provide financial management and reporting on the ECS SMC M&O organization;

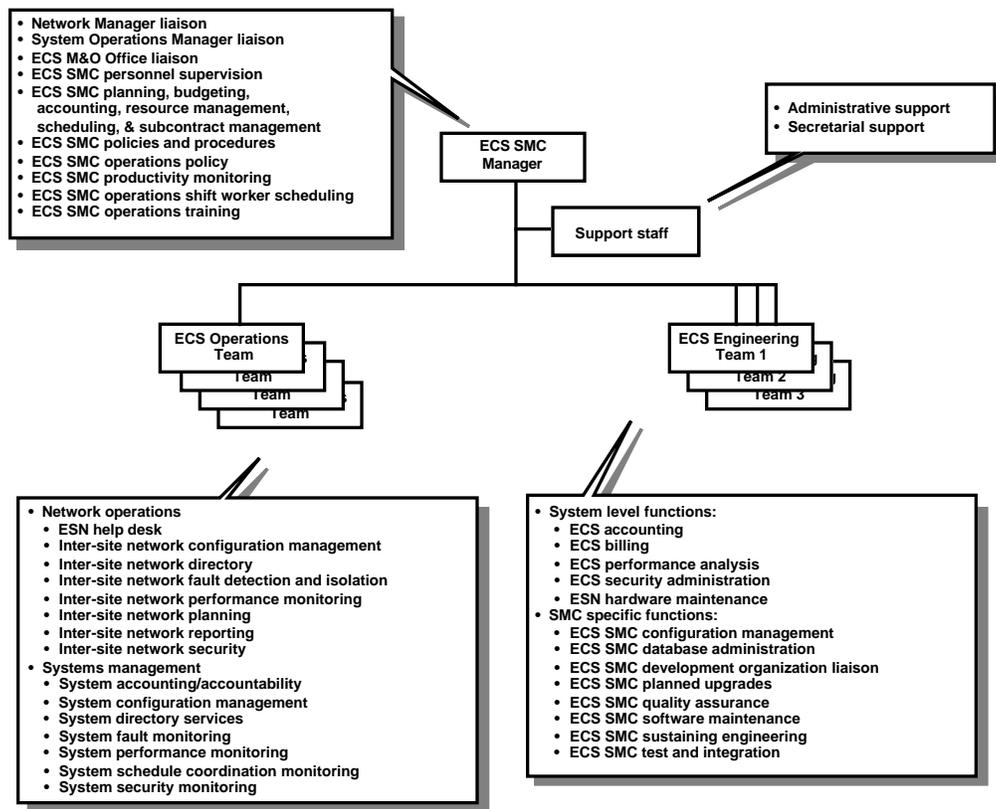


Figure 3-4. ECS SMC Organization

- ECS SMC policies and priorities — ensure that ECS SMC personnel are tasked in accordance with ECS policies and priorities as driven by SMC needs; ensure that company, ECS and SMC and/or Building 32 procedures and policies (including, but not limited to, finance, personnel, logistics access, property management, security, health, and safety) are properly followed; and
- ECS SMC operations team supervision and staff functions — supervise the performance of the SMC operations team including operations performance, operations policy, shift worker scheduling, operations training and certification, etc.

Figure 3-4 also shows a support staff providing the following functions:

- Administrative support — support personnel administration; support planning, budgeting, accounting, resource management, scheduling and contract management activities; and
- Secretarial support — provide typing, filing, expense reports, mail distribution, meeting scheduling, etc.

3.3.2 ECS SMC Operations Functions

SMC provides operations functions for inter-site network operations and systems monitoring/management. Network operations provides a central network management facility for ECS, supporting federated operations at all ECS centers. Network operations coordinates operations with external network operations organizations including those for Nascom, institutional networks, public networks, private networks, SCFs, Affiliated Data Centers (ADCs), Other Data Centers (ODCs), and international partner (IP) networks. The network operations functions are as follows:

- ESN help desk — provide overall user support of the ECS system including working directly with the user in helping access the system, providing or researching users' access complaints until resolved, working with network analysts in solving user problems providing feedback to the users, and working with the network configuration manager;
- Inter-site network configuration management — provide CM functions for inter-site network resources;
- Inter-site network directory — provide network directory management;
- Inter-site network fault detection and isolation — provide focal point (in cooperation with affected sites) for inter-ECS network problems; perform fault analyses including isolation, location, identification and characterization; interact with external systems on inter-system problems; support fault diagnosis testing for hardware, software, and resource-to-resource connectivity;
- Inter-site network performance monitoring — provide performance monitoring of networks;
- Inter-site network planning — support and maintain the high-level network event schedule;
- Inter-site network reporting — provide reports on all network operations functions; and
- Inter-site network security — monitor network security and respond to security alarms and events.

System management operations monitors, coordinates, and/or executes the EOS mission/science policies, procedures and directives. The operational functions are as follows:

- System accounting/accountability — provide system data collection and reporting; support each centers accounting/accountability activities;
- System configuration management — provide ECS system-wide configuration management and monitoring including collecting information describing the state of ECS resources, the network subsystem and its communications resources; exercise control and/or monitoring over the configurations, parameters, and resources of the subsystem and over the information collected; store the configuration information collected and display the configuration information for reporting purposes; assist the SMC personnel in fault, performance and security management;

- System directory services — provide system-level management of directory services; support each centers directory services activities;
- System fault monitoring — provide focal point for inter-ECS center problems; perform fault analyses including isolation, location, identification and characterization; responsible for interacting with external systems regarding inter-system problems; supports fault diagnosis testing for hardware, software, and resource-to-resource connectivity; support other centers' fault management activities;
- System performance monitoring — provide monitoring and reporting of ECS performance at the center and system-level;
- System schedule coordination monitoring — support and maintain the high-level ground event schedule for all ECS services; coordinate inter-DAAC product generation dependencies and monitor all schedules for compliance; and
- System security monitoring — provide system oversight on ECS security; support each center's security management activities.

3.3.3 ECS SMC Engineering and Support Functions

Cross-functional teams are established to minimize the number of internal interfaces required to work a particular problem or set of problems. Grouping similar skills together also ensures adequate coverage of needed tasks in event of staff vacations, vacancies, illnesses, etc., especially when staffing of a particular function is less than full time.

SMC engineering and support functions are a mixture of system-level monitoring and coordination, and SMC specific functions. The system-level functions are as follows:

- ECS accounting — support, maintain, and update accounting and accountability policies and procedures based on ESDIS policies and procedures; support user services by performing data and user audit trails (i.e., tracking of an order from request through its various stages until shipment (and payment if required); maintain and update a data tracking system to track data transport from system input to output including hardware and software resources;
- ECS billing — establish, maintain and update system wide pricing resource utilization information; generate invoices, including billing information for the ECS and distribute these bills; perform accounts payable, accounts receivable and disposition of receipt accounting function;
- ECS performance analysis — monitor hardware and the scientific and system software status at all operating centers to determine operational status; perform quality assurance for the overall ECS performance; generate, maintain and update performance criteria and responses to performance deficiencies for system, center and element resources and activities;
- ECS security administration — maintain policies regarding security management including password management, operational security, access to privileges, physical security and security compromise detection, mitigation and resolution; perform security

audit trails; maintain and update class scheme for centers to manage the authorized users inventory including users identification, addresses and allowed privileges; evaluate system problems and recommended solutions; establish, maintain and update approved facility access privileges including facility and equipment identification, address and allowed privileges; and

- ESN hardware maintenance — provide second-level maintenance consisting of repair, adjustment and testing of LRUs removed from service at the other centers during first-level maintenance.

The SMC specific functions are as follows:

- ECS SMC configuration management — maintain the ECS system configuration baseline and documentation library; coordinate system-level upgrades and adjust baselines as required in conjunction with DAAC configuration managers; if requested by Customer, provide recording secretarial tasks for the Customer CCB, generate CCB monthly reports; prepare agendas for CCB meetings; coordinate Review Item Discrepancy (RID) requests generated during M&O reviews;
- ECS SMC database administration — maintain the data bases and structure of the SMC database; provide database administration support for system-wide data bases maintained at the SMC; provide the operations interface to perform data base administration utilities such as data base backup and recovery, performance monitoring, and tuning; administer user access control and daily data base synchronization;
- ECS SMC development organization liaison — provide feedback on the performance of installed systems; coordinate future installations; support development activities such as design and document reviews; coordinate TTs and CCRs;
- ECS SMC planned upgrades — support and participate in planning and implementation of upgrades to the ECS;
- ECS SMC quality assurance — perform QA audits on a periodic basis to ensure adherence to established standards and procedures for hardware, software and operations; produce audit reports semi-annually in accordance with DID 506; work with performance assurance personnel to track cmi program;
- ECS SMC software maintenance — produce, deliver, and document the corrections, modifications, and enhancements made to ECS software (including COTS); adapt or incorporate any COTS software for ECS use;
- ECS SMC sustaining engineering⁶ — analyze and identify ways to accommodate needed improvements, new technologies and new concepts, manage system upgrades and evolution, control and maintain ECS updates, and perform the activities necessary to assure ECS reliability, maintainability, and availability; support/provide valuation of user

⁶ Efforts include, but are not limited to, installation, configuration and tuning of ECS software, COTS packages, operating systems, compilers, tools, utilities, networks and databases;

inputs and monitor system performance to tune the system for optimum response and support.; support operational readiness and performance assurance; and

- ECS SMC test and integration — feature and regression test all system upgrades in SMC environment, either hardware or software; maintain and update test procedures and data bases.

3.4 ECS EOC Maintenance and Operations

The ECS EOC organization staffs the Flight Operations Team located at the GSFC EOC in Building 32. The organization is part of the ECS Flight Operations Segment development office but is included here because of the system-wide nature of this document. Specific responsibilities of the organization include:

- Pre-launch operations,
- Launch through early orbit operations,
- On-orbit operations,
- Shared and/or coordinated observatory operations in conjunction with the observatory development contractor,
- Flight operations and mission planning support under the direction of the Government MOM and the Project Scientist,
- An ongoing interface for operations with the IPs, EDOS, FDF, Nascom II, TDRSS/ATDRSS, NCC/SNC, PSCN, NSI, etc.
- Preparing and maintaining periodic summary reports, and
- Cooperating with the observatory contractor for the planning, training, and operations of the FOT.

EOC M&O is chartered with ensuring maximum data gathering by the Instrument Packages on the spacecraft that are supported by the ECS contract while providing safe and efficient spacecraft operations.

EOC M&O management is responsible for preparation and participation in all phases of spacecraft operations. Each mission has several M&O Phases that must be managed, they include: mission planing phases; preparation; I&T; training & simulation; pre-launch; launch & early-orbit; normal operations; and contingency operations.

The EOC M&O management philosophy is that the key to effective spacecraft operation lies in building and maintaining a high-performance team. Accountability, responsibility and communication are stressed in every facet of team activity.

3.4.1 ECS EOC Manager Functions

As shown in Figure 3-5, the ECS EOC organization consists of three departments, Flight Systems Engineering, Flight Operations Team (FOT), and Ground System Engineering, reporting to a single manager, the ECS EOC Manager.

The ECS EOC Manager has responsibility for overall EOC M&O performance. Specific responsibilities include:

- MOM liaison — provide a point of contact to the MOM and Project Scientist on all ECS EOC M&O organization activities;
- ECS M&O Office liaison — provide management liaison to ECS M&O office staff including ECS staff at the DAACs, the SMC, the SEO, the parent ECS M&O organization, and development and support organizations;
- ECS EOC personnel supervision — provide tasking, hiring, termination, time keeping, promotions, performance appraisals, salary adjustments, discipline, etc.;
- ECS EOC planning, budgeting, accounting, resource management, scheduling and subcontract management — provide financial management and reporting on the ECS EOC M&O organization; and
- ECS EOC policies and priorities — ensure that ECS EOC personnel are tasked in accordance with ECS policies and priorities as driven by EOC needs; ensure that company, ECS, and EOC procedures and policies (including, but not limited to, finance, personnel, logistics access, property management, security, health, and safety) are properly followed.

Figure 3-5 also shows a support staff providing the following functions:

- Administrative support — support planning, budgeting, accounting, resource management, scheduling and contract management activities;
- Secretarial support — provide typing, filing, expense reports, mail distribution, meeting scheduling, etc.;
- Training coordination — develop training materials, plans updates, and M&O certification plans to ensure acceptable levels of proficiency of the EOC M&O personnel; provide raining during the life of the contract; coordinate with SEO system-level training function;
- Configuration management — ensure usage of approved configuration management procedures with element and external interface configuration management; ensure that hardware, software, and procedure changes are properly documented and coordinated; assist in the development and administration of the EOC library with respect to configuration management procedures; if requested by Customer, provide recording secretarial tasks for the EOC CCB, generate CCB monthly reports; prepare agendas for CCB meetings; coordinate Review Item Discrepancy (RID) requests generated during M&O reviews; and

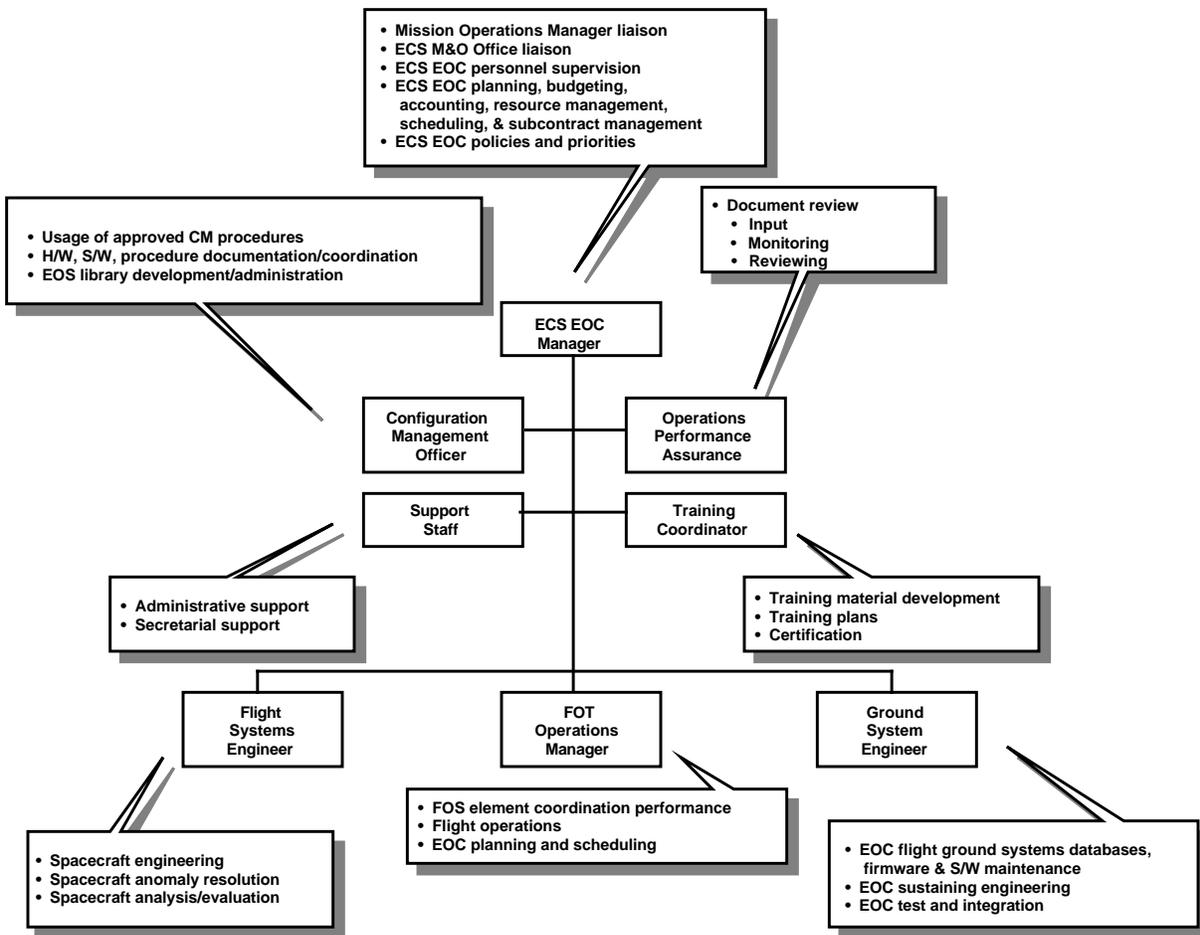


Figure 3-5. ECS EOC Organization

- Operations performance assurance — monitor, review and provide input to document reviews.

3.4.2 ECS Flight Systems Engineer Functions

The Flight Systems Engineer has the primary technical responsibility for the continuous monitoring of the flight systems health and safety, for coordinating dynamic responses to all flight systems anomalies, and for the performance of trend analysis of all spacecraft subsystems. The Flight Systems Engineer is directly responsible to the ECS EOC Manager while supervising and coordinating the daily activities of the off-line engineers, and on-line evaluators.

Primary functions include:

- Flight system engineering — evaluate flight system requirements, capabilities, performance, and operating procedures;

- Ground segment development — support ground system development, testing and provide critiques;
- Spacecraft analyses — perform trend analysis of spacecraft subsystems;
- Flight system problem analyses — analyze and report all flight systems problems and recommend corrective action;
- Anomaly resolution — accomplish dynamic reaction to flight system anomalies;
- Technical management — provide management and technical direction to the off-line engineers and on-line evaluators;
- Liaison — interface with the GSFC spacecraft project offices, spacecraft manufacturers, and EOSDIS project to establish proper Flight Systems status and utilization;
- Contingency planning — supervise the creation of flight system contingency procedures;
- Flight system maintenance — maintain flight system specifications, on-board computer software files, and flight systems operational procedures documentation;
- EOC training — support the training of EOC personnel using the spacecraft simulators; and
- Coordination — maintain close contact and coordinates with other EOC functions, and NASA support elements.

3.4.3 ECS FOT Operations Manager Functions

The FOT Operations Manager is responsible for managing the EOC operations staff and coordination with other elements to ensure the performance requirements of the EOS spacecraft are met in an efficient and timely manner.

Primary functions include:

- Flight operations - provide on-shift spacecraft and instrument flight operations and control, engineering, analyses, evaluations, and planning;
- Ground system engineering — evaluate ground system requirements, capabilities, performance, and operating procedures;
- Ground system development — support ground system development, testing and provide critiques;
- Flight segment — manage technical aspects of flight segment planning and scheduling, analyze operations and performance;
- Technical management — identify and assign priorities to hardware and software and analysis tasks to optimize schedules and budgets and to resolve technical problems;
- Reporting — establish and maintain status reports to give progress and problem visibility; and
- Coordination — maintain close contact and coordinates with other EOC functions, and NASA support elements.

3.4.4 ECS Ground System Engineering Functions

Ground System Engineering is lead by the Ground System Engineer. This organization is responsible for:

- Database administration — maintain and enhance flight and ground systems database;
- Sustaining engineering — provide support for the deployed EOC firmware and software; provide the professional and technical staff and resources required to correct latent system design errors; design and implement approved system enhancements within the scope of current requirements;
- Software maintenance — maintain and enhance the flight and ground systems database, firmware, and software;
- Integration and test — feature and regression test all system upgrades in center environment, either hardware or software; maintain and update test procedures and data bases;
- Status reports — establish and maintain status reports to give progress and problem visibility; and
- Coordination — maintain close contact and coordinates with other EOC functions, and NASA support elements.

3.5 ECS SEO Maintenance and Operations

The ECS SEO organization, housed at GSFC Building 32, provides a system-wide M&O function that is responsive to the ESDIS Project Office. Where the ECS On-Site, ECS SMC, and ECS EOC M&O organizations are focused on the issues, tasks and priorities of the individual centers, the ECS SEO provides a system perspective on maintenance, sustaining engineering and training. Supported by the other M&O organizations, the ECS SEO organization also provides the focus for development organization interactions.

Figure 3-6 shows the planned ECS SEO organization chart.

3.5.1 ECS SEO Manager Functions

The ECS SEO Manager has the following major functional responsibilities:

- ESDIS liaison — provide a point of contact to the ESDIS System Integration and Operations Office Manager and the DAAC Systems Manager. on all ECS SEO M&O organization activities,
- ECS M&O Office liaison — provide management liaison to ECS M&O office staff including ECS staff at the DAACs, the SMC, the EOC, the parent ECS M&O organization, and development and support organizations.

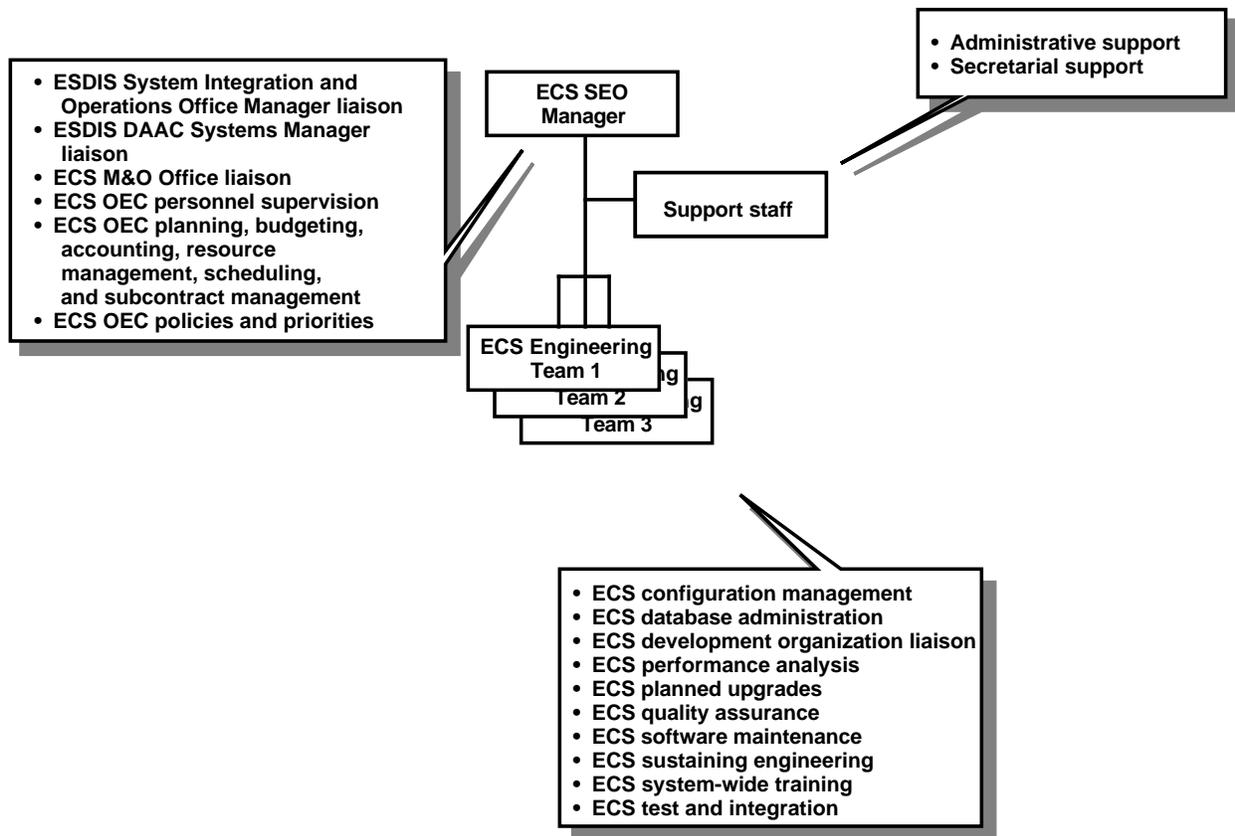


Figure 3-6. ECS SEO Organization

- ECS SEO personnel supervision — provide tasking, hiring, termination, time keeping, promotions, performance appraisals, salary adjustments, discipline, etc.,
- ECS SEO planning, budgeting, accounting, resource management, scheduling and subcontract management — provide financial management and reporting on the ECS SEO M&O organization, and
- ECS SEO policies and priorities — ensure that ECS SEO personnel are tasked in accordance with ECS policies and priorities as driven by SEO needs; ensure that company, ECS, and SEO and/or Building 32 procedures and procedures (including, but not limited to, finance, personnel, logistics access, property management, security, health, and safety) are properly followed.

Figure 3-6 also shows a support staff providing the following functions:

- Administrative support — support planning, budgeting, accounting, resource management, scheduling and contract management activities; and
- Secretarial support — provide typing, filing, expense reports, mail distribution, meeting scheduling, etc.

3.5.2 ECS SEO Operations Functions

The only operations function performed within the SEO is system-wide training. For economy of scale, this function is included as one of the SEO Engineering and Support functions.

3.5.3 ECS SEO Engineering and Support Functions

One or more ECS engineering teams are constituted within the organization. Cross-functional teams are established to minimize the number of internal interfaces required to work a particular problem or set of problems. Grouping similar skills together also ensures adequate coverage of needed tasks in event of staff vacations, vacancies, illnesses, etc., especially when staffing of a particular function is less than full time. The example shown by Figure 3-6 assigns the following functions to the ECS Engineering Team(s):

- ECS configuration management — provide M&O centralized CM functions in support of other centers' distributed CM functions and responsibilities; coordinate usage of approved configuration management procedures with elements and external interface configuration management; ensure that changes to the hardware, software, and procedures are properly documented, coordinated and distributed; assist in the development and administration of the library for CM procedures; if requested by Customer, provide recording secretarial tasks for the ESDIS CCB, generate CCB monthly reports; prepare agendas for CCB meetings; coordinate Review Item Discrepancy (RID) requests generated during M&O reviews;
- ECS database administration — provide system-level engineering on science data base classes/servers; supports needs of ECS On-Site data base administration;
- ECS development organization liaison — provide feedback on the performance of installed systems; coordinate future installations; support development activities such as design and document reviews; coordinate TTs and CCRs;
- ECS performance analysis — provide system-level (including inter-center) performance analyses; analyze soft and hard copy reports on system effectiveness, productivity, capacity, and performance for ECS hardware and software resources and processes; monitor performance for trends and prepare reports of analysis;
- ECS planned upgrades — support and participate in planning and implementation of upgrades to the ECS;
- ECS quality assurance — monitoring, inspection and analysis of ECS functions, procedures, equipment, personnel, and data assets;
- ECS software maintenance — accept and integrate maintenance changes to ECS software (including COTS) produced at one (or more) of the DAACs, SMC or EOC; produce, deliver, and document system-wide corrections, modifications, and enhancements made to ECS software (including COTS), and/or to adapt or incorporate any COTS software for ECS use;

- ECS sustaining engineering⁷ — provide for system-wide view of sustaining engineering functions (see 3.3, 3.4 and 3.5);
- ECS system-wide training — identification of system-wide training needs; provide training courses and materials; supports other centers' training needs; and
- ECS test and integration — feature and regression test system-wide upgrades, either hardware or software prior to shipment to other centers; maintain and update test procedures and data bases.

3.6 ECS ILS Maintenance and Operations

The ECS ILS organization provides system-wide oversight of all ILS activities through the duration of the ECS. These include:

- COTS hardware and software maintenance — provide centralized coordination of maintenance for commercial, off-the-shelf, products at each center as well as for preventative and corrective maintenance where such centralization is cost effective;
- Logistics support and systems — provide specification of supply support, support and test equipment, packaging, handling, storage, transportation, technical data and documentation; provide ILS management and engineering support to the individual centers and the GSFC Building 32 resident ECS organizations;
- COTS training — provide training on COTS products;
- Property management — provide identification and tracking of ECS procured hardware and software;
- Facility and installation planning — provide system level planning for the installation of new hardware deliveries into each center's environment; and
- RMA engineering — collect and report RMA data; provide system-level RMA reports.

This section addresses the ECS ILS planning and logistics management processes that result in logistics support being planned and executed in a manner that achieves ECS M&O objectives. Section 3.6.1 addresses the ILS objectives, the elements comprising ILS functions, organizational relationships. The remaining sections address each of the ILS elements and how they are managed throughout the ECS Project.

3.6.1 ILS Management

ILS management includes the planning, coordination, and execution of the logistics functions required to support the ECS, including Government furnished equipment (GFE) and consumables. Early ILS planning influences the ECS design to achieve the system operational availability (A_O) requirements at the least life cycle costs. ILS functions are iterative and

⁷ Efforts include, but are not limited to, installation, configuration and tuning of ECS software, COTS packages, operating systems, compilers, tools, utilities, networks and databases;

continuous from the early requirements analysis, system design and implementation, and throughout system operations.

The objective of ILS planning and logistics support operations is to achieve and sustain the operational availability (A_O) and mean down time (MDT) performance objectives specified in the ECS Performance and Requirements Specification. A collateral objective is to provide efficient, effective logistics support to ECS operations at the least system life cycle cost.

Responsibility for management of ECS ILS functions is delegated to the ILS Manager under the general direction of the M&O Office. Figure 3-7, "ILS Organization," depicts the functions within ILS and their relationship to the M&O organization.

The principal logistics interface to the NASA ESDIS Project Office is through the ECS ILS Management Team (ILSMT). The purpose of the ILSMT is to ensure active communications between the Government and the Contractor about logistics activities. The ILSMT monitors collateral activities within each area of ILS for their impact on ECS logistics support. The ILS Manager is an member of the ILSMT and performs functions directed by NASA's ILS Program Manager (ILSPM). This includes providing logistics data and reports, participation in ILSMT meetings, and executing ILS actions in support of the ILSMT. ILSMT meetings are called by the ILSPM. As an ILSMT member, the ILS Manager coordinates directly with the NASA Code 535.3 Logistics Management Section to identify and resolve logistics issues.

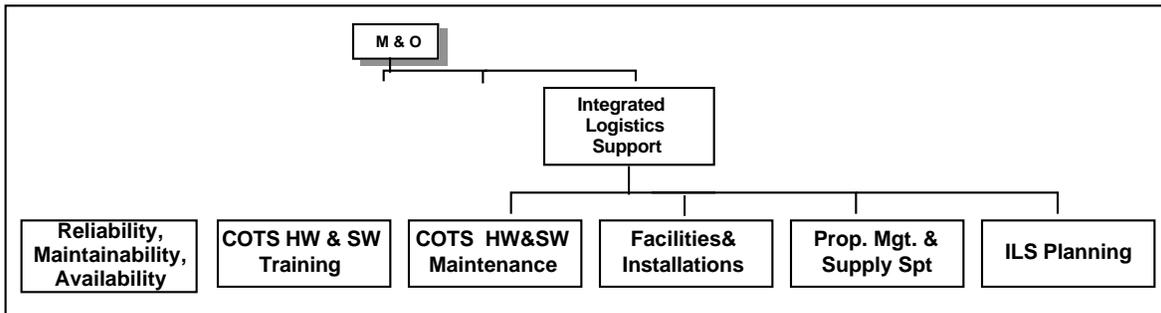


Figure 3-7. ILS Organization

Management of system, DAAC, SMC and EOC logistics operations is through the SMC and the center resident LSM, respectively. The configuration management services capabilities of the SMC and LSM functions of the ECS provide the ILS Office the means to monitor the logistics plans and operations. These include training, maintenance, repair parts and consumables, and equipment reliability. The ILS office uses the SMC data base in managing and reporting logistics operations performance. ECS logistics personnel at the DAACs provide center support within their capability and report logistics actions through the LSM functions of the ECS.

The focus of the ILS planning is to provide and manage the logistics resources (e.g., staff, technical documentation, tools, test and support equipment, spares and repairs parts, and maintenance) required to support ECS operations. The ILS planning begins once the system

requirements are identified, continues throughout the system life cycle, and is iterative as each release is developed and fielded. ILS is planned by the ILS Office and executed by the ECS logistics resources provided to the DAACs, the SMC, and the EOS Operations Center. ILS planning supports the system engineering functions during system design and development and the maintenance and operations functions during operations as depicted in Figure 3-8, “ILS Planning Process.”

The ILS function develops the plans, procedures, and schedules required to support the operational ECS; identifies the logistics cost and system availability drivers; and performs tradeoff analyses to optimize systems performance, support, and cost factors. Throughout the ECS operations phase, the ILS Office manages logistics operations to minimize costs and to optimize system support.

3.6.2 COTS Hardware and Software Maintenance

The COTS Maintenance Plan (DID 613) is the principal planning document for directing ECS maintenance support. It identifies the maintenance concept and equipment to be supported at each location. It also specifies the support personnel, training, support equipment and other resources required to satisfy operational requirements. The COTS Maintenance Plan establishes a trouble ticketing network and procedures for managing the maintenance effort. Figure 3-9, “ECS Maintenance Support,” reflects the sources of maintenance planned to support each of the centers.

3.6.3 Property Management

Contractor-acquired and Government-furnished equipment at all DAACs, the SMC, and the EOC are centrally managed by the ILS Office at the Contractor’s Landover, MD, ECS Development Facility (EDF) to maintain visibility and control and to meet Government reporting requirements. Property management policies and procedures are documented in the ECS Property Management Plan (DID 602). Contractor acquisition of Government property is performed in accordance with the ECS Procurement Management Plan, which is part of the ECS Project Management Plan (DID 101).

3.6.4 M&O COTS Training

Requirements for M&O training on COTS equipment and software are assessed during the operations and logistics support analyses performed for each release and are documented in the ECS Training Plan (DID 622) prepared for the Critical Design Review held for each release. This plan identifies the qualifications of personnel required to operate or maintain ECS systems. It also identifies the number, type, and schedule of personnel required for M&O staffing at each center. From these requirements, training is planned, scheduled and managed to ensure qualified M&O personnel are available to support DAAC operations.

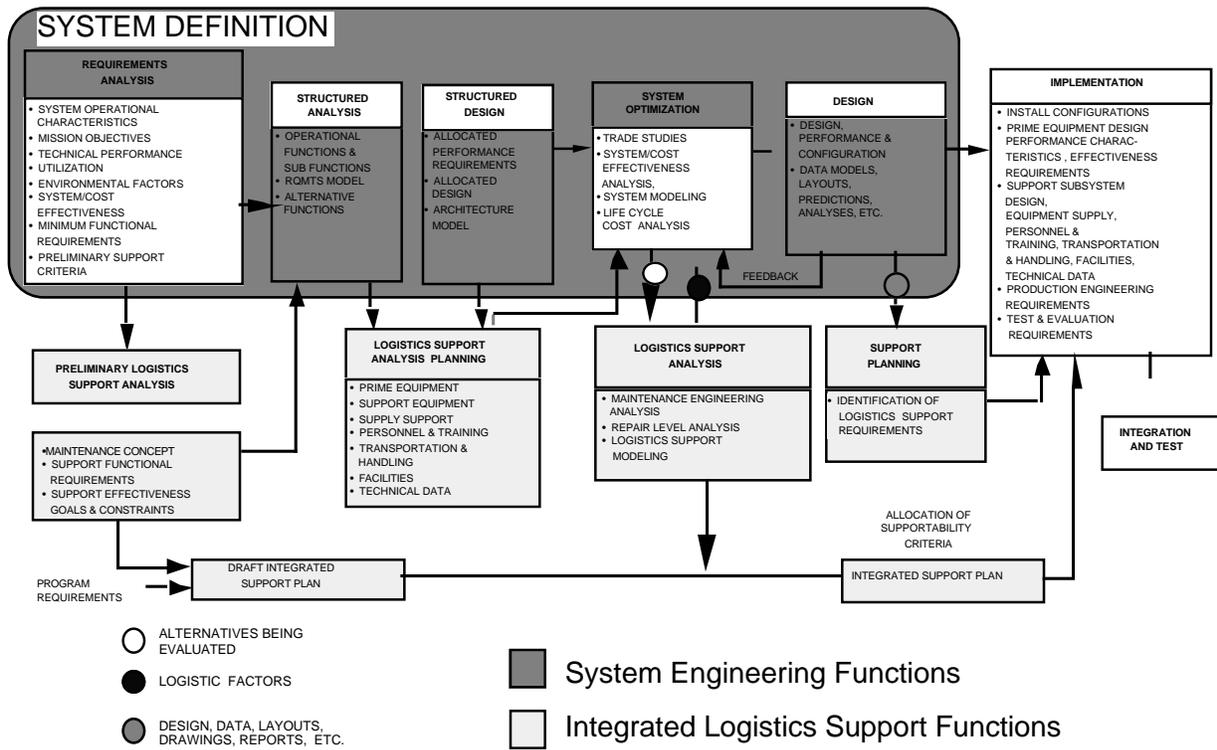


Figure 3-8. ILS Planning Process

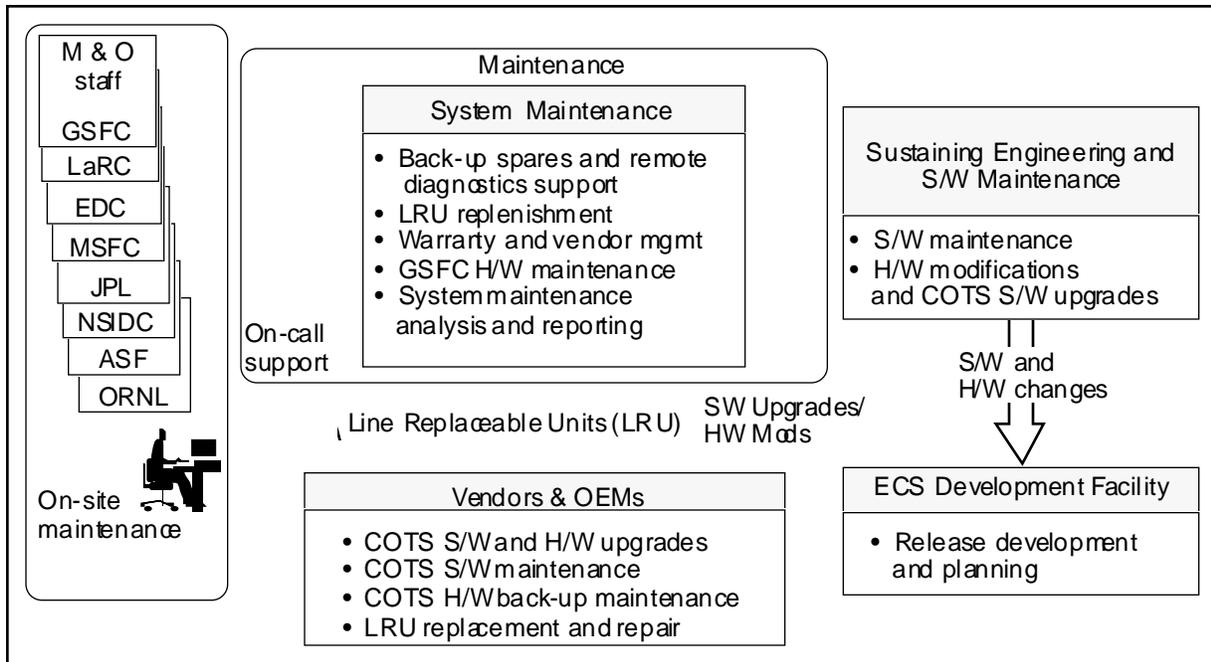


Figure 3-9. ECS Maintenance Support

3.6.5 Facility and Installation Management

Logistics requirements for space, utilities, and other support are identified early during the logistics support analysis to meet the lead times required by NASA to acquire facilities and related support. These requirements consider the capabilities existing at the ECS centers. Facility requirements are documented in the ECS Facilities Plans (DID 302) delivered prior to the CDR for each release. Space requirements for maintenance, logistics support, and equipment and parts storage are addressed in these plans. Installation planning is addressed in Site Installation Plans to be delivered 2 months prior to the installation of each ECS release. That document contains the detailed information required by the installation teams and the centers to prepare for the installation. It contains the detailed configurations to be installed, the installation schedule, facility preparation requirements, and appropriate administrative information.

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

COTS equipment and software are packaged and shipped using standard commercial practices of the OEMs. ECS equipment, software, and data storage media that are subject to deterioration or have a limited shelf life are 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 transit or storage.

3.6.7 M&O Technical Documentation

ECS technical documents (i.e., documents describing the operation and maintenance of ECS hardware and software) are maintained to reflect the current operational configuration of the ECS equipment. CCB-approved equipment changes are reflected in the supporting documentation by updates to reflect the changes. COTS technical documentation is in accordance with the OEM's standard commercial practices. Logistics documents developed as part of the ILS Program are compliant with the ECS Data Management Plan (DID 104) and ECS Data Management Procedures (DID 105). The adequacy of logistics documentation is assessed during logistics support analysis and at the Critical Design Review (CDR) held for each release.

ECS centers are provided technical documentation that provides the operations and maintenance procedures for equipment and software located at the center. When a follow-on Contractor is chosen, the library assets are provided to that Contractor.

3.6.8 Logistics Data Management and Reporting

Logistics data, including ECS equipment reliability and maintainability data, are centrally managed in the logistics data base required of the SMC by the ECS Functional and Performance Requirements Specification. This data is used for engineering trade studies; availability modeling; spares and repair parts management; life cycle cost analyses; and maintenance and logistics support planning and management. The ILS Office maintains the completeness and integrity of this logistics data.

The logistics data base is used continuously for logistics performance analyses, planning, and management. This data base is also used to assess and report the following:

- System and segment achieved operational availability
- System and segment mean down time
- Maintenance actions
- Life cycle costs
- Repair parts and consumable stocks management
- Property management

4. M&O Management Approach

Management of the M&O activities of ECS is focused on satisfying the needs of the user community. The primary approach to this is to support the requirements of the DAACs and the ESDIS Project Office including the System Integration and Operations Office Manager, the DAAC Systems Manager, the SOM, the Network Manager, the MOM, and the Project Scientist. The distributed nature of ECS requires a multi-center, coordinated approach. The following sections address host center management and M&O ECS wide management. Appendix B illustrates some of these approaches using management scenarios.

4.1 Continuous Measurable Improvement

An important part of the ECS M&O management approach is Hughes' continuous measurable improvement (cmi) program. Cmi is Hughes's persistent systematic approach to positive change, a management and work ethic, a commitment. It is an operating philosophy that includes everyone in everything the organization does. It's a process, not a program, that focuses on maximizing customer satisfaction by meeting or exceeding their needs with exceptional products and services. This process is enabled through disclosure and resolution of problems in an open atmosphere of involvement and teamwork of all disciplines.

Techniques and tools such as:

- Benchmarking/trending,
- Cycle time management,
- Concurrent/simultaneous engineering,
- Quality indicators (metrics),
- Quality function deployment,
- 7 management and planning tools,
- Statistical quality/process control,
- Design of experiments,
- Computer aided systems,
- Management by planning/policy,
- Process mapping, and
- Just-in-time

are used within each M&O organization and results shared across organizations.

4.2 M&O ECS Wide Management

The M&O Office has primary responsibility for the satisfaction of ESDIS M&O requirements and is responsive to its DAAC and ESDIS customers. The M&O Office is comprised by the M&O Office Manager, each DAAC's ECS On-Site Manager, the ECS SMC Manager, the ECS EOC Manager, the ECS SEO Manager, the ECS ILS Manager, and support staff. The following techniques are used to manage the geographically dispersed M&O organization:

- Monday-Friday, daily operations review meetings are held to review performance of the ECS systems including hardware failures, software aborts, resource utilization, data distribution, spacecraft and instrument status, network loading, etc., over the last 24 hours (or weekend). A meeting is held at each DAAC, at the SMC, and at the EOC. Plans for the next 24 hours are discussed. Summary material is provided to the SEO and M&O Office for review and distribution to ESDIS staff. If the host center organization holds a similar meeting, the ECS M&O organization supports that meeting also.
- Weekly voice or video teleconferencing keep the ECS management team synchronized on ECS wide tasks, issues, problems, priorities, policies, etc., as well as local center activities.
- Periodically, each organization reports on its cmi activities so that cross-location benefits can be realized. These reports may be combined with regular meetings or combined into an "ECS cmi Day" at a central location where cmi teams come together to discuss their successes, failures, tools, processes, etc.
- Private video or voice teleconferencing are used to work individual center issues.
- Semiannual meetings provide a forum in which ECS M&O managers can discuss common issues, such as hardware maintenance and interoperability issues, and highlight individual center characteristics including new specialized products and user services. The meeting location rotates between locations enabling them to gain an understanding of the different environments.
- Periodic visits by the M&O Office Manager allow for more direct interaction, both between the ECS personnel, as well as between the M&O Office Manager and the host center organization management team.
- Cost/schedule and technical status are summarized by each center and are presented to the M&O Office in the ECS organization via video or voice telecons. The M&O Office summarizes this data for the entire M&O organization and presents it to the ECS Project Organization.

Appendix B provides more information on routine management and technical meetings.

4.3 ECS Management at Host Sites/Centers

The ECS center managers are responsible for executing ECS functions in a manner that is responsive to the requirements of each center. The ECS manager provides the necessary liaison to the center management to ensure that center policies, procedures, tasks, priorities, etc., are properly reflected in the activities of the ECS staff. Liaison is performed at regular staff

meetings, one-on-one coordination, and/or ad hoc meetings with center management (e.g., DAAC Manager, SOM, Network Manager, MOM, or Project Scientist).

The daily and weekly operations and engineering meetings discussed in Section 4.2 and Appendix B are supported at each center so as to provide visibility into ECS activities to the center managers and staff.

Fostering of the cmi approach to improvement is an important part of the ECS management charter. By involving ECS, Customer, and/or other contractor personnel in these efforts, the ECS managers foster a philosophy of needing to constantly improve the performance of the system and organization.

The staffing approach followed at each center is to put management and supervisory level personnel in place early so they can develop local hiring plans and procedures and implement them in a timely manner.

4.3.1 Operations Management Approach

The ECS M&O operations organization at each center is structured for day-to-day operations with capacity for quick reaction. Daily and weekly operations meeting at both the center and M&O level provide a key coordination mechanism. This daily/weekly cycle of activity facilitates the management process, supports near-term replanning, scheduling adjustment and problem tracking. Operations working groups are also used as a management tool because it provides a high visibility path to surface suggestions and problems, a single control point for tracking resolutions, and use of a "lessons learned" approach.

Critical to the success of ECS operations is the need to perform those operations in the host organization environment. Each center has unique qualities that must not be lost in transitioning to the ECS environment. The ECS M&O organization tailors the expertise, size and organization of the operations team to the ECS mission of each DAAC, the SMC and the EOC. For example, each DAAC's hours of operation, functions performed on each shift, staffing levels, etc., are tailored to meet the needs of the DAAC.

Cmi activities in operations are focused on improving productivity and data distribution. Through the use of Customer and ECS supervisor, operator, and engineering focus teams and cmi tools, procedure improvements, software improvements, and maintenance actions are identified, prioritized and/or implemented.

4.3.1.1 Operations Training

Training is a key element in operations management. Training of operations personnel and the user community support efficient operations as well as facilitating the users ability to perform their investigations. The SEO and ILS organizations provide system-wide training functions while the other centers provide additional center specific training and tailor the system-wide training to meet the needs of the center.

A key objective of operations management is ensuring that all operators are properly trained and certified. The ECS training program aids management and employees in the following areas:

- Personnel recruiting — The training program aids in recruiting prospective employees. By increasing the skills and proficiency of current employees, it provides management with greater latitude in recruiting employees with different skill levels or experience.
- Phase-in and orientation — New employees are briefed on ECS shortly after they have started on the program. This briefing allows them to see how their individual and team assignments fit into the context of the center as well as all of ECS and EOSDIS. They are also briefed on the training and certification requirements for the new employee's position, specific training materials are identified, and a training schedule developed.
- Development of career goals — Via a careful and thorough review of various education, training and certification opportunities, potential opportunities for the new employee to develop and/or improve his/her skills are identified. In addition, Contractor personnel policies including salary adjustments, promotions, and awards and recognitions, etc., are discussed.
- Skills development — Regular counseling and documentation provide motivation for employees to participate in the training program. Courses completed, levels of proficiency at each operations position, etc., are tracked and documented.
- Certification — The training program provides the rationale, procedures, and documentation for training and certification of operations personnel. Certification indicates successful completion of all training requirements and demonstrated proficiency. The M&O Certification Plan (DID 626) outlines the method for ensuring that acceptable proficiency is achieved by ECS operations and maintenance personnel. For example, each EOC controller is required to be certified before “on console operations.” This includes the ECS Contractor as well as the Observatory Contractor. Recertification, also defined in the M&O Certification Plan, is accomplished on a periodic basis or when observation shows additional training/recertification is necessary. Training and Certification Records (DID 525) are maintained as part of the Performance Assurance system. Training and certification is an ongoing critical process that is a “must” to keep the system and user compatible.
- Cross-training — The cross-functional team approach to operations requires that operators be trained and certified at more than one function. The cross-training program allows management to identify employees working to learn and develop new skills. It also helps employees to develop long term career progression.
- Personnel development — An objective of the program is to provide information and opportunities for personnel development. Increased employee skills and increased mobility and progression, coupled with the opportunity for employees to be promoted into senior positions, provide career growth for employees.

The process starts with task requirements analysis, emphasizes feedback from the training recipients, and supports the delivery of the needed training documentation. Instruction is conducted using a combination of formal classroom, vendor, on-the-job, and cross training, along with multimedia self-study courses and tutorials.

The training program is documented in the ECS Training Plan (DID 622). This plan describes the training organization, curriculum, resources, schedule, and methodology. It details the method for providing early and continuing science user training and training necessary to achieve an orderly, phased transition from initial to full ECS operating capability.

Preparation of the Training Materials (DID 626) (including on-line operator position handbooks and other center-specific documents) is closely tied to the ECS development, integration and test efforts so that maximum use is made of existing system documentation.

4.3.1.2 User Services Training

User services provides support to all users, including scientists and others accessing EOSDIS data and information services, and to investigator teams developing science software for DAAC product generation. User support will span novice to expert levels and address system functions and interfaces, characteristics, processing algorithms, format, calibration, quality and use of data products available from EOSDIS.

Training of the User Services staff will be performed by combining both having the User Services staff attend pertinent portions of operations training (see section 4.3.1.1), COTS, and application training programs (see section 4.3.2.3), and the user training (see section 4.3.1.3). By combining the underlying technical background in ECS with specific user interface training, user support personnel are better prepared to answer “What”, “How”, and “Why” questions.

4.3.1.3 User Training

Training for the user community is also an important aspect of operations. The basic approaches are:

- Early hands-on classroom training using evaluation packages at the DAACs.
- Easy-to-use instruction and tutorials.
- Comprehensive training materials and guides.
- Demonstration and workshop training at conferences.

Early science user training encourages early system use and acceptance. A large number of the investigators are located near a DAAC where they can receive immediate hands-on ECS experience and training using the evaluation packages. Regular classroom training is scheduled at the DAACs before each new release, and easy-to-use instruction is available on-line with system delivery. Comprehensive training materials and guides coupled with on-line and phone support provide additional training assistance to SCF and remote users.

Training for the broader user community is provided through demonstrations and workshops at science conferences. Literature and brochures available to the general community explain how to access the system. On-line demonstrations and tutorials are available for first time users.

4.3.2 Engineering Management Approach

M&O engineering activities occur at the DAACs, the SMC, the EOC, and the SEO. In addition, development organizations have on-going engineering activities. Keeping these activities in synchronization requires frequent coordination. In addition, development of personnel requires a robust training program.

Cmi activities in engineering are focused on improving support to operations as well as improving the productivity of the engineering staff. By examining its own processes, low value added tasks can be identified and deleted or replaced by improved processes.

4.3.2.1 Role of ECS M&O Organizations

The charter of the M&O organizations at the ECS centers (i.e. DAACs, SMC and EOC) is to be responsive to the needs of each center. To meet this requirement, the centers tailor and manage the center specific baseline under the control and direction of the host organization management. TTs generated at each center are made available to the other centers, as well as the SEO and development organizations. Based upon severity of the problem, baseline merge impacts, etc., corrections can be made at each center independently, by the SEO for system-wide applicability, or by development organizations for later delivery. These decisions are controlled by the CCBs discussed in Appendix A.

Performance monitoring is focused on the local center. Resource utilization, customer satisfaction, trends, etc., are collected and analyzed by each center's staff. The SMC provides a system-wide look at resource utilization and performance including inter-site communications.

Evolutionary needs/requirements are identified. Resolution of those requirements are assigned to either the center, the SEO, or development organizations by ESDIS.

4.3.2.2 Role of ECS Sustaining Engineering Organization

The role of the SEO is to respond to system-wide problems in a responsive manner. Based upon inputs from the centers on problems, impacts, priorities, etc., the SEO is allocated problems and enhancements that are system-wide in nature. Upon approval by the ESDIS CCB, these M&O modifications are distributed to the centers as well as to the development organizations.

4.3.2.3 Engineering Training

Section 4.3.1 describes the overall training concept. Applicable sections for the engineering staff are:

- Personnel recruiting — attraction of qualified employees.
- Phase-in and orientation — orientation on center, ECS and EOSDIS organizations, roles, responsibilities, functions, etc.
- Development of career goals and objectives — identification of training opportunities and needs.
- Skills development — improve and extend employee's skills.

- Cross-training — providing backup for functions assigned to a team.
- Personnel development — career growth.

4.4 ECS SEO Management

The ECS SEO organization is responsible for system-level activities. As such, it participates in the meetings discussed in Section 4.2 and Appendix B. In addition, it chairs the following meetings:

- The SEO holds weekly engineering status meetings to discuss SEO activities, plans, priorities, etc. with M&O management and ESDIS personnel. This material is provided to the M&O Office for review and distribution. Ad hoc management and technical meetings are held as necessary, to support high priority tasks such as launches, Consent to Ship Reviews (CSRs), RRRs, etc.
- The SEO holds weekly TT meetings with participation by the other ECS center M&O organizations via attendance or voice/video telecon. The purpose of the meeting is to ensure that TTs are properly prioritized and assigned to an organization for work-off. The SEO prepares weekly summaries of trouble tickets including how many are open by priority, the status of high priority TTs, the distribution of TTs by center, the distribution of open TTs by age, the number opened in the last week, and the number closed in the last week. These results are presented at the weekly engineering status meetings.
- The SEO holds weekly CCR meetings with participation by the other ECS center M&O organizations via attendance or voice/video telecon. The purpose of the meeting is to ensure that changes are being worked in the proper priority. The SEO prepares weekly summaries of CCRs including how many are open by priority, metrics on where CCRs are in the approval process (e.g., which ones and how many were approved by the ESDIS CCB since the last report, how many are pending at the ESDIS CCB, are in coordination with development organizations, etc.), the status of high priority CCRs, the distribution of open CCRs by age, etc. These results are presented at the weekly engineering status meetings.

4.5 ECS ILS Management

The ECS ILS M&O organization is responsible for supporting the ILS functions at each DAAC, as well as ILS for all ECS activities at GSFC Building 32. By reviewing expendables, maintenance status and histories, trouble tickets, etc., the ILS organization is able to forecast purchase requirements, as well as identify trends. The following regular meetings are chaired or supported by the ILS organization:

- A weekly video/voice telecon with the ECS DAAC On-Site ILS functions to identify ILS issues, develop work-off plans, determine status, etc.
- The weekly SEO meeting to provide ESDIS with an integrated look at ILS issues throughout the Project.

4.6 Development Organization Interfaces

The relationship between the ECS M&O Organization and the ECS development organizations is critical to the project. Based on the current schedule, between the RRR of the TRMM Development Release and the RRR of the last release, currently designated Release D, management of the development and the operations baselines is an important task.

It is the responsibility of the ECS M&O and development managers to ensure that communications between the M&O organizations and the development organizations occur in a timely manner. To facilitate this communication, the following techniques are used:

- Development organization coordination. The phased delivery of ECS on both the formal and incremental tracks means that development organizations require access to the centers' facilities, resources and personnel. ECS M&O management provides the initial point of contact for the development organizations and local center coordination prior to visits.
- IATO coordination. The development IATO requires access to the facilities and resources to install, integrate and test ECS deliveries. ECS M&O management ensures that these requests are properly coordinated and approved by the host center management. Video or voice teleconferencing, along with formal CDRLs and informal electronic messaging is used to ensure that the requests are properly identified and bounded.
- TT coordination. All open TTs written during development test and integration are transferred to the M&O organization for tracking so that known problems do not have to be rediscovered and redocumented. All M&O generated TTs are forwarded to the development organizations for review so that they have knowledge of the actual performance of the system in operations. The M&O SEO organization holds voice or video telecons to discuss problems and their associated priorities. Development organizations are invited to attend. Published minutes document the discussion and any decisions.
- CCR coordination. CCRs can be generated by either the development or M&O organizations. Weekly coordination meetings are held to allow for interaction on the changes. The intent is to identify which CCRs cause cost, schedule, or technical impacts to the development and M&O organizations. Alternative approaches that provide either improved performance or minimize development or M&O impact are identified. Recommendations to the various CCBs are made independently by the development and M&O organizations to ensure that the concerns of both organizations are properly surfaced. Within M&O, the SEO organization provides the primary interface, but is supported by the On-Site, SMC, and EOC organizations as needed.
- ECS Project status. The M&O Office is an integral part of the ECS Project and participates in project management and reporting activities including staff meetings, ad hoc technical meetings, and monthly presentations. The M&O Office has primary responsibility for these activities.
- ECS development status. The M&O organizations have representatives at meetings leading up to System Design Review (SDR), Release Initiation Reviews (RIRs),

Preliminary Design Review (PDR), Incremental Design Reviews (IDRs), Critical Design Reviews (CDRs), etc. as well as the formal meetings. The M&O organizations surface their concerns both informally and via RIDs on presentations and documentation. The M&O organizations also support the development organizations in trade-offs and analyses by supplying M&O insights and experience. The M&O Office and SEO have primary responsibility for these meetings but are supported by the centers as needed.

- Other developments' status. The M&O organizations attend key reviews and technical meetings of other developments such as EOS Data and Operations System (EDOS), EOS Communications (Ecom) and the flight and instrument projects/teams, to ensure that M&O is fully informed and its concerns are properly represented. The M&O Office and SEO has primary responsibility for these meetings but are supported by the centers as needed.

4.7 Launch Preparation Planning

A critical activity for ECS is preparing for the launch of each spacecraft. The ECS M&O organization at each center provides a comprehensive plan to support this activity. Issues to be addressed include:

- Resources required — what ECS hardware, network, software, procedures, etc., are required to support launch preparation, I&T, training and simulation, pre-launch, launch and early-orbit, and normal operations.
- Schedules — what is the current schedule for spacecraft, instrument, algorithm, ECS development and M&O activities, host center development and M&O activities, and other systems' development and M&O activities.
- Integration — what are the dependencies between resource requirements and conflicts.
- Personnel — what are the personnel requirements; what training and certification is required; what training and certification has been accomplished.
- Risk reduction — what are the risk reduction approaches identified and selected to reduce risk.

This material is briefed at appropriate internal and external coordination meetings (see Appendix B for a partial list), design reviews, CSRs, and RRRs. DAAC and ESDIS managers all have access to this planning material and are able to redirect plans, priorities and resources.

4.8 Center Planning

The phased delivery of ECS results in periodic infusions of staff, hardware, software, procedures, other documentation, etc., into each DAAC, the SMC, and the EOC. In addition, M&O activities alter the configuration of each center. The ECS M&O organization, drawing upon its own and the resources and plans of development organizations, develops detailed, center specific planning material such as:

- Schedules — a master schedule for each center showing development and M&O activities that impact the center. Key schedules include:

- Launch preparation (see Section 4.7),
- Development installations and testing,
- Maintenance activities (including testing),
- IV&V testing,
- External interface testing,
- Other center specific activities, and
- Planned operational baseline updates;
- Resource requirements — what are the resources (hardware, software, personnel, etc.) required to support key activities;
- Site installation plans — what are the facility requirements for each hardware and software installation; and
- Operational impacts — what are the operational impacts caused by any and all activities at the center; what are the impact mitigation plans.

This planning material is presented at regular status meetings as described in Appendix B, as well as at appropriate design reviews, CSRs, RRRs, and other meetings. DAAC and ESDIS managers all have access to this planning material and be able to redirect plans, priorities and resources.

5. Management Systems and Controls

The ECS Contractor provides the necessary management and technical resources to direct, control, and perform M&O for the overall ECS. The Contractor M&O activities extends to ECS centers for each of the hardware deliveries and software releases.

Management of M&O activities includes planning, budgeting, accounting, resource management, customer relations, scheduling, and personnel. The following describes the planning, budgeting, accounting, resource management and scheduling management systems and controls that are used during ECS maintenance and operations. The sections are organized as shown in Table 5-1.

Table 5-1. Management Systems and Control Descriptions

Function	Paragraph #	Paragraph Title
Planning	5.1	Work Breakdown Structure
	5.2	Cost Accounts
	5.3	Work Authorization
Budgeting	5.5	Budgeting
	5.6	Budgeting Process
Accounting	5.2	Cost Accounts
Resource Management	5.7	Performance Measurement
	5.11	Performance Measurement Data
	5.12	Management Involvement, Action and Follow-up
Schedule Management	5.4	Scheduling
Customer Relations	5.7	Performance Measurement
	5.8	Determining Program Status
	5.9	Reporting
	5.10	Earned Value Status
Personnel	5.13	Personnel Policies

5.1 Work Breakdown Structure

The Work Breakdown Structure of the ECS Contract is the mechanism used to allocate funding to the ECS organizations including the ECS M&O Office. The Work Breakdown Structure (WBS) provides:

- A formal structure for identifying the work.
- Subdivision of the total contractual effort into manageable units of work.

- Integrated cost, schedule, and technical planning, status assessment, and management.
- Assignments of responsibility for accomplishment of specific tasks.
- A reporting structure for both internal and customer-required management information.

The development of the M&O WBS is the responsibility of the ECS M&O Office, in coordination with each center's management. The objective is to provide a melding of customer requirements with the needs and methods of the performing organizations.

WBS 8 is the System Maintenance and Operations portion of the ECS WBS. This WBS element provides for the management and technical efforts related to directing, controlling, and performing the ECS operations and maintenance during the operations phase of the program. Integrated Logistics Support is inclusive and is initiated in the design phase.

The current summary WBS is shown in Table 5-2. The following sections describe the major WBS elements

5.1.1 WBS 8.1 - M&O Management

This element contains the management activities of planning, organizing, directing, coordinating, controlling, and approving actions to ensure the M&O of the ECS elements are conducted and delivered on schedule and within budget. It includes such functions as configuration management, management reviews, change board activity, budgeting, planning and scheduling, contract administration, procurement management, and performance management, which are focused on the activities of ECS M&O.

5.1.2 WBS 8.2 - Integrated Logistics Support

This element provides the management organization for planning, coordinating, and directing the activities of many technical disciplines associated with the identification and development of logistics support requirements and resources for equipment from design through disposal. ILS is a composite of all support considerations necessary to ensure the effective and economical support of equipment. The support considerations include maintenance planning, analysis of the system maintenance profile, supply support, support and test equipment, packing, handling, storage, and transportation (PHS&T).

5.1.3 WBS 8.3 - M&O Training

This element provides for all effort and resources required to support the ongoing training program necessary to train new employees, current employees, and Customer personnel (as required). It includes development and maintenance of the training program and materials, management, leased training services, and all other activities required to support ECS M&O.

Table 5-2. ECS M&O Summary WBS (1 of 2)

8	System Maintenance & Operations
8.1	M&O Management
8.1.1	GSFC
8.1.2	MSFC
8.1.3	ASF
8.1.4	EDC
8.1.5	JPL
8.1.6	NSIDC
8.1.7	LaRC
8.1.8	ORNL
8.1.9	EDF
8.2	Integrated Logistics Support
8.2.1	GSFC
8.2.2	MSFC
8.2.3	ASF
8.2.4	EDC
8.2.5	JPL
8.2.6	NSIDC
8.2.7	LaRC
8.2.8	ORNL
8.2.9	EDF
8.3	M&O Training
8.3.1	GSFC
8.3.2	MSFC
8.3.3	ASF
8.3.4	EDC
8.3.5	JPL
8.3.6	NSIDC
8.3.7	LaRC
8.3.8	ORNL
8.3.9	EDF
8.4	M&O Sustaining Engineering
8.4.1	GSFC
8.4.2	MSFC
8.4.3	ASF
8.4.4	EDC
8.4.5	JPL
8.4.6	NSIDC
8.4.7	LaRC
8.4.8	ORNL

Table 5-2. ECS M&O Summary WBS (2 of 2)

8.5	Not Used
8.6	Flight Operations Segment
8.6.1	Flight Operations Equipment Maintenance
8.6.2	EOC Operations
8.6.3	ICC Operations
8.7	Science Operations'
8.7.1	GSFC
8.7.1.1	GSFC Equipment Maintenance
8.7.1.2	GSFC Science Operations
8.7.1.3	GSFC SMC Operations
8.7.2	MSFC
8.7.2.1	MSFC Equipment Maintenance
8.7.2.2	MSFC Science Operations
8.7.3	ASF
8.7.3.1	ASF Equipment Maintenance
8.7.3.2	ASF Science Operations
8.7.4	EDC
8.7.4.1	EDC Equipment Maintenance
8.7.4.2	EDC Science Operations
8.7.5	JPL
8.7.5.1	JPL Equipment Maintenance
8.7.5.2	JPL Science Operations
8.7.6	NSIDC
8.7.6.1	NSIDC Equipment Maintenance
8.7.6.2	NSIDC Science Operations
8.7.7	LaRC
8.7.7.1	LaRC Equipment Maintenance
8.7.7.2	LaRC Science Operations
8.7.8	ORNL
8.7.8.1	ORNL Equipment Maintenance
8.7.8.2	ORNL Science Operations

5.1.4 WBS 8.4 - M&O Sustaining Engineering

This element provides the technical staff and resources required to correct latent system design errors and to design and implement approved system enhancements within the scope of current requirements. It includes hardware materiel, software engineering management, leased services, and all other activities required to support ECS M&O.

5.1.5 WBS 8.5 - Not Used

5.1.6 WBS 8.6 - Flight Operations

This element provides for all management and technical efforts related to directing, controlling, and performing operations and equipment maintenance for flight operations and equipment during the operations phase of the program.

5.1.6.1 WBS 8.6.1 - Flight Operations Equipment Maintenance

This element provides for the staff and consumables required to perform flight operations. It includes the maintenance of operational plans and procedures, management, leased services, and all other activities required to support this WBS.

5.1.6.2 WBS 8.6.2 - EOC Operations

This element provides for the staff and consumables required to perform EOC operations. It includes the maintenance of operational plans and procedures, management, leased services, and all other activities required to support this WBS.

5.1.6.3 WBS 8.6.3 - ICC Operations

The WBS element is used at any location with an ICC. As of the ECS SDR, the GSFC EOC is the only location with an ICC which may be combined with the EOC. This may allow the collection of all operations costs within WBS 8.6 in a single WBS element.

This element provides for the staff and consumables required to perform ICC operations. It includes the maintenance of operational plans and procedures, management, leased services, and all other activities required to support this WBS.

5.1.7 WBS 8.7 - Science Operations

This element provides for all management and technical efforts related to directing, controlling, and performing operations and equipment maintenance for the science operations of ECS during the operations phase of the program.

5.1.7.1 WBS 8.7.x - Site Specific

The following individual WBS elements provide for cost allocation and tracking for each of the operational sites, as needed. See Table 5-2 for the correlation between the sites and the specific paragraph number.

5.1.7.1.1 WBS 8.7.x.1 - Site Specific Equipment Maintenance

The WBS element is used at all locations. This element provides for the staff and consumables required to perform science operations. It includes the maintenance of operational plans and procedures, management, leased services, and all other activities required to support this WBS.

5.1.7.1.2 WBS 8.7.x.2 - Site Specific Science Operations

The WBS element is used at all locations. This element provides for the staff and consumables required to perform science operations. It includes the maintenance of operational plans and procedures, management, leased services, and all other activities required to support this WBS.

5.1.7.1.3 WBS 8.7.1.3 - SMC Operations (GSFC Only)

The WBS element is used at only GSFC. This element provides for the staff and consumables required to perform all SMC functions. It includes all activities discussed in Section 3.3 of this document.

5.2 Cost Accounts

The cost account is a natural control point for cost and schedule planning and control since it represents the work assigned to one responsible organizational element on one WBS element. Each cost account is uniquely identified by its own number. The cost account is a management control point at which budgets and actual costs are accumulated and compared to earned value. Cost accounts within the WBS structure are established for each of the M&O organizations so that both intra-center and inter-center management and reporting is facilitated.

5.3 Work Authorization

Work authorization is an iterative process. Initial statements of work, schedules and budgets developed by the Program are ultimately finalized when planning is completed and all parties reach an agreement. Work is authorized and budgets are allocated to performing organizations (e.g., an On-Site or Center).

The Work Authorization and Delegation (WAD) is used to authorize work to center managers. The WAD includes the scope of work to be performed and the associate budget and schedule. The WAD is essentially a contract between giver and receiver. It carries the task definition, the dates on which the task is to be started and completed; the total task budget, clearly defined delivery schedules, quality, configuration management, property, security, and financial requirements; packaging, shipping, and safety instructions; and the summary number that will be used to summarize costs for the task. The WAD also is used for authorizing work to the cost account levels. The center manager subdivides budgets into management levels and authorizes the Cost Account Managers (CAMs) at the cost account level to plan the work using the scope of work, schedule, and budget provided in the WAD (see section 5.6 for additional detail).

In the event of a contract change, a Financial Recap Contract Brief (FRCB) is prepared by Contracts. The FRCB is accompanied by the narrative Contract Brief which provides a description of contract objectives, scope of work, and applicable constraints. The FRCB provides the value of the contractually authorized work. The FRCB and Contract Brief represent the authority for the Program Manager to proceed with all authorized work on the contract.

In addition to the FRCB and WAD documents, other documents may be used to authorize work. These are the Minor Assist Work (MAW) authorization, the Manufacturing Request (MR), and the Purchase Order (PO). While these authorizations do not delegate responsibility, they are like any other statement of work document used for an internal performing organization.

The selection of which form of authorization to use is driven by the amount of money involved (in accordance with Company and Project policies), whether or not responsibility is to be delegated, and the procurement practices of both the giver and the receiver. For example, within ECS, the M&O organization can fund an ECS development organization's individual or team to perform an M&O task with either a WAD or MAW, depending upon the scope of the effort and the funding required.

5.4 Scheduling

The scheduling process provides for development and maintenance of a set of mutually supportive schedules. The set is organized by using the framework provided by the WBS and the organizational breakdown structure. The baseline schedule supports management analysis and visibility based on the following criteria:

- Overall sequence of work is readily understood.
- Significant task interdependencies are defined.
- Significant technical events and constraints are documented.
- Major inter-organizational interfaces are documented.

The schedules generated by each organization's CAM(s) (see Section 5.6) are tracked using the ECS Standard financial and earned value tracking tool. The reports and schedules provided by this tool are consistent across the ECS organizations with regard to format and content thus facilitating a common understanding of progress, problems, etc., within the distributed M&O organization.

Ad hoc schedule reports more appropriate for formal reviews are also generated using standard office automation planning and scheduling tools.

5.5 Budgeting

The budgeting process establishes a means for documenting and tracking the cost goals for all contractually authorized work. The Contract Budget Base (CBB) represents the total contractual budget for all authorized work, while the Performance Measurement Baseline (PMB) provides the tool for the ongoing assessment of program cost and schedule performance.

The CBB represents the total budget for all authorized contractual work. The CBB is always equal to the current negotiated contract cost, plus the estimated cost of any additional authorized work.

When the CBB is established, the Project Manager assesses all risk areas and establishes a Management Reserve (MR) prior to distributing budget to the performing organizations (i.e., the ECS M&O Office). The ECS M&O Office will also retain a small reserve from the funds allocated to it to accomplish the ECS M&O SOW. Management Reserve is an amount of the contract budget withheld for management control purposes rather than distributed for the accomplishment of a specific task. It is not part of the Performance Measurement Baseline. The purpose of the MR is to have a budget for the Project Manager and ECS M&O Office to provide for unforeseen problems.

The PMB is the time phased budget plan against which contract performance is measured. It is formed by budgets assigned to cost accounts, higher level WBS elements, and the applicable indirect and undistributed budgets.

5.6 Budgeting Process

After the CBB has been identified and the initial management reserve target established, target budgets are developed for each center. The CAM allocates that budget to the appropriate WBS elements (see Table 5-2). The CAM, a member of the performing center's organization, determines the subdivision of labor into cost accounts traceable to that organization. Each ECS center manager, approves the CAM(s) plan for subdivision of effort into discrete, level of effort, and apportioned effort cost accounts/work packages. Cost accounts are subdivided into phases of effort which are then translated into planning packages and work packages. Budget requirements and time phasing by element of cost are prepared for each work package and planning package.

The development of detailed planning for the cost account, and ultimate approval of the budget, schedule, and associated work authorization is accomplished through an iterative process. When detailed planning reveals the target budget established for the cost account is unrealistic (too high or low), the CAM, ECS center, M&O Office, and (perhaps) the ECS Project Manager, participate to determine appropriate adjustments. In some cases, this may require the use of management reserve.

5.7 Performance Measurement

Performance data is accumulated and reported by individual center using the ECS financial tools and summarized at the M&O level. The data bases contain information relative to schedules, budgets, estimates to complete, actual costs, and earned value.

Earned Value is the key performance measurement data element. Each work package has a designated measurement technique for the calculation of Earned Value based on the classification of work (discrete, LOE, apportioned) to ensure that it is calculated in the same manner in which the work was planned. The measurement technique provides an objective assessment of the performance of each work package.

Most M&O tasks (including management, operations, maintenance, and sustaining engineering) are LOE tasks. However, planned upgrade tasks, because they tend to be focused on an individual task, are candidates for discrete or apportioned classifications.

Subcontractor costs are reported to the ECS prime contractor in the same WBS coordinate system. Therefore, integration of both prime and subcontractor costs - both labor and ODC - and performance is facilitated.

5.8 Determining Program Status

The CAM(s) and center managers are responsible for ensuring the continual integration and compatibility of the schedule and cost information. Using the standard financial reports provided by the ECS Business Operations Office, at least monthly the CAMs review the cost and schedule progress of the cost accounts for which they are responsible. This includes both prime and

subcontractor costs. The standard financial reports also periodically address both actual and revised projections of overhead, facility burden, and G&A. Schedules are updated for progress made, revisions to plans and forecasted changes (schedule or cost). This information is used for statusing progress on open work packages and for analysis reporting. The center and M&O Office managers review the information prior to transmittal to the ECS Project Office.

5.9 Reporting

Performance and status reports provide visibility for initiation of corrective action when significant variances develop. Reports summarize current period, cumulative, and at completion information at the cost account, and higher summary levels, as appropriate. Both customer and internal reports are generated from the same data sources so reports provided by the Sites/Center, M&O Office and other ECS organizations are consistent. All data files, logs, and source documents are maintained for continuity and audit traceability.

5.10 Earned Value Status

Technical, schedule, and expenditure performance are measured against the appropriate baseline. The ECS Cost and Schedule Management System provides for their integration to report program status.

5.10.1 Schedule Status

As technical progress is achieved, performing areas reflect this in a variety of schedules. Program schedule status is determined as a routine management function.

5.10.2 Earned Value

Monthly, performing areas convert progress via schedule status or other measurable algorithm to dollar accomplishment (earned value) for each cost account.

5.10.3 Internal Reviews

The primary method of reporting status are regular project reviews conducted by the center and/or M&O Office manager(s). Performing area managers present status of technical areas, report problems and corrective actions being taken (e.g., the impact of workarounds, etc.) and indicate progress being made on outstanding action items. Other internal reviews include a review of performance measurement data, significant variances, including workarounds and corrective action plans for critical activities, and estimates at completion.

5.11 Performance Measurement Data

Budgets, earned value, actual costs, estimates at completion, and associated variances are combined at the cost account level by element of cost. Performance data is routinely reported at the cost account and center and M&O Office levels, customer reporting levels, and total project level.

Sources for performance measurement data are as follows:

- Time-phased budget
- Earned value
- Actual cost
- Estimate at Completion

Five types of performance measurement variances are reported:

- Schedule variance current month
- Schedule variance inception to date
- Cost variance current month
- Cost variance inception to date
- Variance at completion

After variances have been identified, management decisions are made relative to the size and severity of potential or real problems these variances represent. Variance thresholds are established for variance reporting based on dollar values and/or percentages.

5.12 Management Involvement, Action, and Follow-up

Managers at all levels are continuously involved with determination of program and problem status for their respective areas of responsibility. ECS project management, ECS M&O Office management, center management, and cost account managers are required to follow corrective action to the point of problem resolution.

5.13 Personnel Policies

Personnel policies (i.e., hiring, terminations, performance appraisals, salary adjustments, promotions, assignments, paid and unpaid time off, discipline, etc.) are in accordance with the ECS Contractor or Subcontractor company policies, practices and procedures.

6. Policies, Procedures, and Documentation

6.1 Management Systems

The primary source of direction for planning, budgeting, accounting, resource management and scheduling is the instruction manual for the Cost and Schedule Management System, Manual 601.

6.2 Personnel Policies

Company specific personnel policies are used to administer ECS staff. Additional directions in the form of Project practices (e.g., the specific holiday schedule when it differs from the Hughes Aircraft Company schedule) are also used.

6.3 Site/Center Policies

While on Customer premises, the Contractor shall comply with requirements governing the conduct of personnel and the operation of the facility. ECS personnel resident or visiting a DAAC, SMC, EOC or SEO follow the policies and procedures of the host organization on matters such as, but not limited to, facility security, visitor policies, and holidays.

The ECS On-Site, SMC, and EOC M&O organizations identify center specific practices and procedures and provide them to the M&O Office, SEO, and development organizations (see Section 2.3). The development organizations produce initial or updated procedures (DID 609) in the period prior to CSR. Leading up to CSR, the SEO, supported by the center organizations, produce operator manuals (DID 611) that are consistent with the procedures (as well as the center specific practices and procedures), the ECS Operations Concept Document (DID 604), the Maintenance and Operations Manual (DID 607), and the ECS Operations Plan (DID 608).

In accordance with the negotiated ECS contract, the NASA policies specified in paragraph H.7 apply to GSFC activities (see Section 2).

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Appendix A. M&O Configuration Management Approach

This Appendix to the M&O Management Plan is intended to put forward a potential hierarchy of configuration management and configuration control of the ECS System during M&O phases. As such, it is intended to serve as a method of stimulating discussion rather than a specification of how the Configuration Management system will work. The eventual authority, roles and responsibilities of each organization are subject to negotiation between the centers and the ESDIS Project Office.

Each organization (i.e., each DAAC, the SMC, the EOC, the SEO and each SCF) is assumed to have a configuration control function that manages the hardware, software, documentation, facilities, etc., baseline of the organization. At one extreme, it is assumed that this management function is performed by a CCB. At the other extreme, configuration control management is performed by the organization manager (or designee). This document assumes that the management function is performed by a CCB; however, the concepts presented are equally applicable to other forms of management.

The ECS Statement of Work contains the following material regarding M&O configuration management responsibilities:

3.8.1 ECS Maintenance and Operations Management (WBS 8.1)

...

3.8.1.3 Configuration Management

The ECS M&O organization shall provide configuration management and shall work with the ECS Program Management organization to ensure that a comprehensive ECS Configuration Management Plan (DID 102) and Configuration Management Procedures (DID 103) are prepared and implemented.

The M&O organization shall provide technical and administrative support to the Contractor's ECS contract level CCB, including:

- a. Coordinating usage of approved configuration management procedures with elements and external interface configuration management representatives;
- b. Ensuring that changes to the hardware, software, and procedures are properly documented and coordinated;
- c. Assisting in the development and administration of the library with respect to configuration management procedures;
- d. If requested, providing the recording secretary for the Government CCB;
- e. Coordinating RID requests generated during M&O reviews;

- f. Generating CCB monthly reports;
- g. Preparing agendas for and scheduling CCB meetings.

The recommended approach is as follows:

- The ECS Contractor constitutes segment and ECS CCBs to control all ECS products during the development cycle. This control includes determining if and when the development organization will perform a baseline merge to move the development baseline forward to the operational baseline.
- ESDIS constitutes a CCB to control products delivered by the ECS Contractor at the RRRs and/or by the ECS M&O organization.
- Each host center (i.e., each DAAC, the SMC and the EOC) constitutes a CCB to administer ECS deliverables in their environments as handed off from the development CCBs and the ESDIS CCB. The host center CCB also controls center-unique items and center-specific modifications to the ESDIS configured products. Examples of center-unique items include facilities, science algorithms, center-unique IMS services, and pre-ECS systems such as Version 0 or other data distribution systems. Center-specific modifications include tailoring of ESDIS configured products to the center's environment and modifications of the software to better service the center's user community. The scope and authority of the center CCBs vis. a vis. the ESDIS CCB will be controlled by agreements between the CCBs in accordance with plans such as the DAAC Strategic/Management Plan.
- Proposed changes to ECS common configuration items that have been approved by the host center CCB are forwarded to the ESDIS CCB for final approval and incorporation into the ECS baseline. Based upon recommendations from the other host center CCBs and the ECS CCB, the ESDIS CCB either approves or disapproves the changes to the system baseline. If the change is approved, the ECS Contractor updates the baseline as part of either a system-wide maintenance action and/or later delivery. The modified baseline comes under the control of the ESDIS CCB. If the change is approved by the ESDIS CCB for local implementation only, future baseline merges are the responsibility of the host center CCB⁸.
- The ECS development organization's CM function provides the ECS CCB with administrative support. Similarly, the ECS M&O organization's CM function provides the same support to the host center CCBs. Decision making authority, however, resides with the ESDIS Project and host center management, not the ECS Contractor.

⁸ Use of the ECS contractor personnel resident at the host site for both the initial modifications and subsequent baseline merges will be supported as M&O actions. The actual tasks performed will be selected based upon host site specified priorities and the personnel and skills of the ECS Contractor's staff.

A.1 Configuration Management Drivers

The M&O requirement for CM is to control ECS deliverable products as deployed at the operational centers. For purposes of this paper, host centers include DAACs, EOC, SMC, and SCFs⁹. The specific CM objective is to control the host center's baseline for components delivered or modified by:

- The formal track,
- The incremental track,
- Prototype testing and/or demonstrations,
- Non-ECS components integrated into the ECS system,
- ECS baseline changes due to maintenance actions, and
- Operations actions

to ensure that ECS hardware and software meets required operational capabilities.

These types of components (i.e., software or hardware configuration items) provide the drivers for the M&O CM process described in the following sections.

M&O provides its services under the direction of the host organization configuration control function. M&O CM can be characterized as a service organization, not a decision making organization. M&O CM has the responsibilities shown in Table A-1.

A.1.1 Formal Track

ECS is undergoing a phased implementation and delivery using multiple releases. From an M&O CM perspective, each release has the following major milestones in chronological order:

- Acceptance of each host center's Installation Plan (IP). The IP, written/updated and coordinated prior to each release's delivery of ECS hardware to each center, the hardware's configuration and facility layout, and the installation schedule for a each release at each center.
- A CSR. The CSR documents the development test baseline of all CIs (i.e., COTS hardware and software, application software, databases, etc.).
- An RRR. The RRR documents the configuration of all CIs at each of the host centers at the completion of ECS development testing for each release.

Between CSR and RRR, the development organizations' CCBs control the test baseline. However, the development organizations follow the practices and procedures of the host center configuration control process for installation of hardware into the facility and use of operational hardware for testing (e.g., operational test strings).

⁹ The ECS contractor provides technical and administrative support to the DAACs, FOS and SMC organizations. No ECS contractor support is provided at SCF or user sites under the current Statement of Work.

Table A-1. M&O Configuration Management Scope in the Host Site Environment

Source	COTS Hardware and Facilities	COTS Software	Custom Software Source Files	Custom Software Binaries/ Load Files	Custom Software Databases (incl. product database schema)	System Reqs & Design Docs.; IRDs & User Guides	System Admin Proc's, Training, Tests, etc.
Formal Track	Yes	Yes	Yes	Yes	Yes	Yes	Note 4
Incremental Track	Yes	Note 1	Note 1	Note 1	Note 1	Note 1	Note 4
Prototypes	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 4
Non-ECS Component	Yes	Note 3	Note 3	Note 3	Note 3	Note 3	Note 4
Maintenance Changes	Yes	Yes	Yes	Yes	Yes	Yes	Note 4
Operations	Yes	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Note 4

- Note 1: Site specific version descriptions are required prior to installation at a center. Authority to install is granted by the host center management.
- Note 2: Prototype components are delivered via the Incremental Track Evaluation Package process.
- Note 3: If the item is undergoing an iterative development process, CM in accordance with the "Incremental Track" model is appropriate. If the item has undergone a "formal" release, CM in accordance with the "Formal Track" model is appropriate.
- Note 4: Many items within this class will be under local administrative control. Where the item affects multiple locations or science product quality, the item should be under formal CCB control.

At RRR the following items come under the ESDIS and/or host center configuration control:

- Facilities. Facility layout is under the configuration control of the host center at all times.
- COTS hardware. The delivered configuration of COTS hardware is described and controlled at a hardware system-level. LRU level configuration is under the control of the maintenance organization. No custom hardware is planned at this time.
- COTS software and configuration files. The version of COTS software is described and controlled. COTS configuration files (e.g., system management files) are controlled by content and/or format. The contents of the files that are controlled by format are managed by system administrators.

- Custom software source code. ECS developed source code files are placed under formal configuration control.
- Custom software binaries/executables. Binaries/executables files are traced to the parent custom software source code.
- Custom software database schema and/or contents. Files required to configure and control the custom software are controlled by content and/or format. Should the file be controlled by format/schema only, proper procedures ensure that all content updates are (1) entered properly and (2) have the consent of an appropriate authority.
- System requirements and design documentation. Design documentation such as the level 3 specification, level 4 specifications, Interface Requirements Documents (IRDs), Interface Control Documents (ICDs), Operations Concept, System Design Specification, etc., are all placed under CM control.
- System administration procedures (including build and installation procedures), job control decks, test, training and operational material, etc. Configuration Management impounds the delivered versions of these items. If the material affects the generation of product (e.g., a product is sensitive to the sequence and timing of particular algorithms) it is placed under CM control. Otherwise, configuration is by the appropriate engineering or operations organization at each center. The correlation between the hardware CIs and software CIs (i.e., what software should be loaded on what hardware) is maintained as part of the system build and installation procedures under the administrative control of the M&O organization.

A.1.2 Incremental Track

Some ECS capabilities are initially developed on the Incremental Track. In this approach, software is made available to a limited number of users for assessment prior to formal delivery using Evaluation Packages (EPs). Eventually, components developed on the Incremental Track are formally delivered via the Formal Track.

The current design, development, and test process defined for EPs is an outgrowth of early rapid prototyping concepts which have been modified to allow the inter-functional and inter-segment coordination required as the EPs have grown in scope and complexity. Additionally, the desire to involve user and customer personnel in the objectives setting, design, and review process as well as in the evaluation, has dictated an increased level of structure on the process to allow planning and scheduling of design and visibility events. Since the EPs are just a delivery mechanism for products from the incremental development track, it is the development methodology requirements for that track that are the drivers for EP life cycle definition. Discussions which follow speak of the “EP process” for uniformity in this paper, but it must be remembered that the incremental products are the items of development. Details of incremental methodology may be found in the ECS System Engineering Plan, CDRL 201.

The challenge for EP life cycle design is to provide just the necessary amount of structure without creating an administration overload that totally removes the freedom to react to objectives and design changes dictated by evolving circumstances. That challenge has been

accomplished with the design of an EP life cycle that adopts selected practices from more traditional engineering methods, and applies them on the rapid prototyping form originally intended. These include the following features:

- Objectives setting and review,
- Design coordination and review,
- Documentation in Program Development Folders,
- In-process demonstrations and peer reviews with feedback to adjust implementations,
- Frequent EP team status assessments and planning adjustments,
- Early participation of test personnel in product testing,
- Progressive, semi-formal, integration and test,
- EP Consent to Ship Reviews (EP CSR), and
- EP Readiness Reviews (EPRR).

At the end of the each EP's development cycle, an EP CSR and EPRR are held to document the capabilities and configuration of all components to be deployed. This includes a Version Description Document that describes contents of the EP and the capabilities in the new EP in contrast to those of the previous EPs. The EP is under the configuration control of the Segment CCB(s). Through the use of a CCR, center management has the right to approve the conditions under which installations occur. Similarly, replacement of previously delivered configuration items by EP items will require host center management approval.

A.1.3 Prototype Components

Prototyping (the production of trial models) and project specific studies are an important aspect of the ECS systems engineering and development process. Prototypes that exhibit operational functionality are delivered into operations via either the incremental track or the formal.

A.1.4 Non-ECS Components

Non-ECS components are those items which provide, support or extend the services of the host centers but are not developed by the ECS Contractor. These include, but are not limited to, product generation algorithms, user services, extensions, and non-ECS systems that execute at the host centers. Host center configuration management functions are empowered to approve changes to that center's operational baseline.

The choice of what to configure needs to be flexible. If the item is undergoing an iterative development cycle similar to the EPs, CM should be as described in Section A.1.2. If the item has undergone a "formal" release, CM should be as described in Section A.1.1.

A.1.5 Maintenance Actions

For the purposes of this discussion, maintenance actions typically involve changes to implementation and design, not to requirements. A requirements change is considered a

development action, not a maintenance action. Therefore, maintenance actions are those changes that:

- Tailor ECS common components (e.g., control data bases) to the characteristics and configuration of each host center,
- Preventative and corrective maintenance to hardware items,
- Correct latent defects in implementation,
- Modify the implementation to support or enhance operator productivity, or
- Track evolving operations concepts.

The M&O CM process must ensure that the operational baseline at each center is traceable to the baseline(s) established at each release's RRR. By identification of changes, baseline merge issues among the host centers, as well as between the M&O function and the development function, can be identified and worked.

A.1.6 Operations Actions

The operations concept, processes and procedures at each host center undergo change because of experience, operator identified improvements, and user support needs. Changes to the host center configuration items occur as either maintenance actions (Sections A.1.4 and A.1.5), incremental track updates (Sections A.1.2 and A.1.4), and/or formal track updates (Sections A.1.1 and A.1.4).

In addition, operations will find it necessary to modify:

- The contents of files that are controlled at the format level,
- Operational procedures and processes,
- Training material.

To ensure adequate responsiveness to a dynamic operational environment, these types of material fall under the administrative control of the operations organization rather than the more formal control of a CCB.

Configuration management of the operational environment is also necessary. This includes control of what software is loaded on what hardware and what users are authorized access to what software. Permission to install software into the operational environment is granted at an Installation Control Meeting (see Section A.4). Software access control capabilities delivered by the development organizations are used to enforce access privileges. Determination of what users have access to what software is under the control of each host center CCB.

A.2 Configuration Change Boards

There are multiple levels of configuration management within the ECS Project as illustrated in Figure A-1. Operational center-level and ECS CCBs interact directly with the ESDIS CCB. The ECS segment CCBs (one for each ECS Segment — CSMS, FOS and SDPS) manage installation and changes at each location prior to RRR under the governance of the ECS CCB and, as necessary, the ESDIS and host center CCBs. The ECS M&O organization at each center does not

constitute a CCB but, rather, supports the host organization's CCB. The following subsections supply details of these relationships. Appendix B, Section 5.2.1 contains a scenario of how the CCBs interact.

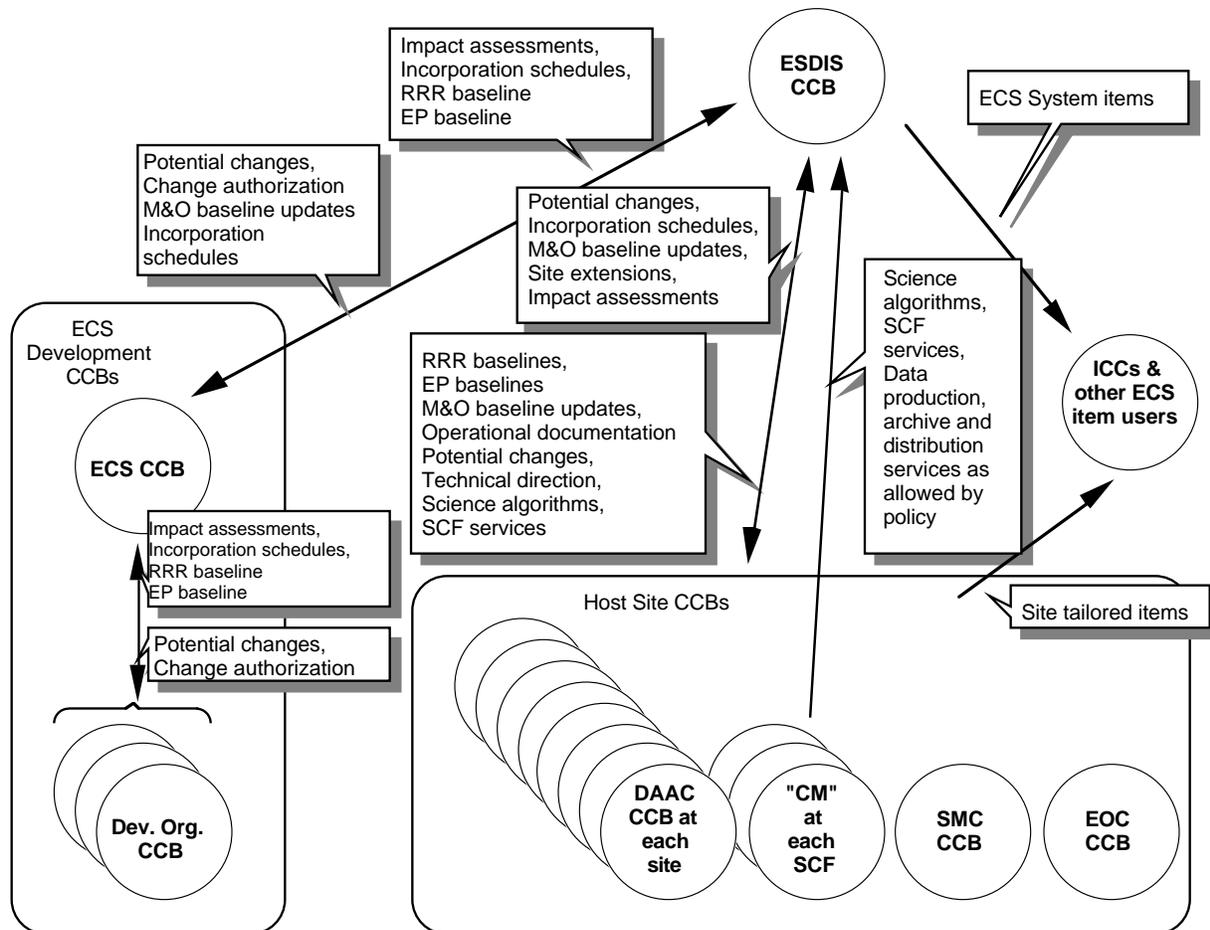


Figure A-1. CCB Relationships

A.2.1 Responsibilities of ESDIS CCB for M&O Activities

The ESDIS CCB is responsible for system-wide configuration management, for management of any system-wide extensions to the ECS and for approval of DAAC-unique extensions to ECS configuration items.

A.2.1.1 ECS Development Deliveries

The ESDIS CCB configures the ECS core system items delivered by the ECS Contractor at RRR. The ESDIS CCB places the items under Customer configuration control, informs the host center CCBs of the configuration and passes operational configuration control to the DAACs, EOC and SMC CCBs.

Because EPs are not a formal delivery of operational capabilities, the ECS Segment CCBs maintain configuration control of the EPs. However, configuration information is provided to the ECS, ESDIS, and center CCBs so that proper management visibility and operational control is maintained.

A.2.1.2 ECS M&O Deliveries

The ESDIS CCB establishes the system operational baseline as modified by the M&O organization. For example, if the SEO recommends a change that has system-wide applicability, the ESDIS CCB first authorizes the change and then adopts the new baseline and authorizes its distribution to the host center CCBs for operational configuration control. It also authorizes its distribution to the development parts of ECS for baseline merges.

A.2.1.3 Science Software Deliveries

The ESDIS Project is responsible for managing, in cooperation with the EOS flight projects and with DAAC support, science software development including quality assurance of the science software. The ESDIS Project is responsible for coordinating the overall delivery of science software to the DAACs. After delivery, the ESDIS Project Science Software Manager coordinates overall science software integration and test.

The ESDIS CCB places the science software under Customer configuration control, informs the DAAC CCBs of the configuration and passes operational configuration control to the DAACs.

A.2.1.4 Non-ECS Services

The ESDIS CCB serves as the authority for allowing “providers” to provide services using ECS resources within the constraints of NASA policy. Configuration control of the items is first established by the ESDIS CCB and then passed to the DAAC CCB for operational configuration management.

A.2.2 Responsibilities of ECS CCB for M&O Activities

The ECS CCB serves as the prime interface to the ESDIS CCB. By providing impact assessments (for example, cost) and recommended incorporation schedules, the ECS CCB supports the ESDIS CCB on suggested development and M&O changes and enhancements to the ECS baseline.

The ECS CCB also provides administrative review of operational elements deployed using Evaluation Packages (see Section A.1.2) at the EP CSR and EPRR.

A.2.3- Responsibilities of ECS Development Organizations CCBs for M&O Activities

Each ECS development organization, constitutes its own CCB. Each development organizations' CCBs control the configuration of all development items on the formal track through the Element Test Reviews (ETRs). Formal track program milestones such as the CSR provide additional points at which baselines are established during the development and integration process.

The development organizations' CCBs control the configuration of components in the Evaluation Packages up to the EP CSR when configuration control comes under the ECS CCB's control.

Baseline merges are especially important to the development process. The development organizations' CCBs establish the baseline for each of the formal and incremental track developments. The development organizations' CCBs support the ECS CCB by providing impact assessments on modifications requested by the M&O and host center organizations. Should such a modification be approved for either incorporation by the development organization or for a development baseline change, the CCBs control development activities and schedules for subsequent delivery or incorporation of the modification.

A.2.4 Responsibilities of DAAC, SMC, and EOC CCBs for M&O Activities

Each center's CCB is controlled by the host center organization and provides the authority and direction to the ECS Contractor to make site unique changes and to install approved system-wide approved changes to the center's operational baseline. The scope and authority of the each center's CCB is in accordance with the DAAC Strategic/Management Plan or similar agreements with the SMC and EOC CCBs.

Each center's CCB accepts configured items from the ESDIS CCB (see Sections A.2.1.1 through A.2.1.4). Installation of these items is under the control of each center's CCB¹⁰. The DAAC CCBs also provide configuration management of data holdings.

The DAAC, EOC, and SMC CCB control center resident non-ECS resources such as the host center facility itself. At the DAACs, in particular, it includes DAAC developed user services, and any legacy systems and resources.

Finally, the DAAC, EOC, and SMC CCBs support the ESDIS CCB by identifying potential system-wide changes and enhancements. Through the use of suggested changes, impact assessments and priority suggestions, the center CCBs provide necessary information to ESDIS regarding changes to the ECS system baseline.

¹⁰ Coordination between CCBs for installation(s) may be required.

A.2.5 Responsibilities of SCF Configuration Management for M&O Activities

The DAACs are responsible for directing science software integration and test performed by the ECS Contractor at the DAACs or performing science software integration and test with ECS contractor support. The DAACs are responsible for acceptance of integrated science software as operationally ready, following investigator validation of science integrity of the products.

ECS uses externally developed software (including databases, procedures, etc.) to perform the critical product generation part of its mission. The ESDIS CCB will place the developed software under configuration control. The ECS SEO organization will capture the baseline and deliver the software to the DAACs. The software delivered to the DAAC by the ESDIS CCB (see section A.2.1.3) and placed under the operational configuration control of the DAAC CCB. Should policy permit, the ECS architecture also allows an SCF to provide data production, archival, and distribution services to the user community (see section A.2.1.4). For the simplicity in grammar, these centers are called SCFs in the following discussion.

Each SCF is assumed to have a configuration control function. At one extreme, it is assumed that this function is performed by an SCF CCB. At the other extreme, only informal configuration control might have been performed on the products prior to delivery to the ESDIS CCB.

Regardless of the configuration control formality, it is assumed that two types of configuration control are performed:

- Configuration control of source and executable software and database schema and contents that are to be executed in another center's (e.g., a DAAC) environment. In this mode, a baseline is established by the ESDIS CCB and an operational baseline is established by the center's CCB. The ECS M&O CM function at each center accepts the items for archival. These items are incorporated into the center's configuration management system and operational baseline as directed by the center CCB.
- Configuration control of SCF resources that are made available to the EOSDIS community. Upon approval by the ESDIS CCB to provide user services in support of the ESDIS mission, the SCF functions in the same way as a DAAC CCB. The SCF supplies suggested improvements and modifications, impact assessments, etc., to the ESDIS CCB.

A.3 Users of ECS Configuration Items

Because ECS is architected to be extensible and evolvable into a UserDIS and GCDIS environment, it is likely that DAAC, EOC and/or SMC configured items are available to a larger community. For example, the EOC CCB establishes the operational configuration of the IST. This configuration forms the operational baseline for any ICCs that wish to operate the IST. Similarly, the SMC operational configuration is established by the SMC CCB for distribution to the community.

In the case of multi-center resident software, two sources exist. The UserDIS/GCDIS user can obtain the current operational baseline as configured by either ESDIS (without center specific tailoring) or from the CCB(s) of one or more centers if center specific extensions are wanted.

ECS continues to provide CM of the product in the ECS environment but does not provide CM to other users.

A.4 Operational Installation Control Meeting

The CCB process discussed in previous sections describes a management process that results in a fully control configuration. A separate meeting at each center reviews the configuration by discussing what CCRs have been incorporated, which documents have been updated, which operational procedures and practices have been updated, and what testing has been accomplished. Only after approval from this customer chaired meeting, is a new configuration installed into operations by the ECS Contractor.

Appendix B. M&O Management Scenarios

The following scenarios are intended to illustrate management actions during ECS M&O. The ECS Operations Concept Document, CDRL 112, DID 604, provides a similar look at operations scenarios.

B.1 ECS M&O Management Meeting Scenario

Figure B-1 illustrates a typical week for the ECS M&O organizations. All times shown are local times. The meetings addressed in the following sections can be held in conjunction with or support similar meetings held at each center to meet the needs of the center's management, operations, and engineering staff.

B.1.1 Operations Status Meeting

This meeting is held daily, Monday-Friday, at each operational location.

Meeting Objective. The objective of the meeting is to provide the ECS and center managers with visibility into operational performance, issues, concerns, and plans that directly impact operations.

Meeting Frequency. The 30 minute meeting is held each weekday morning at 8:30 AM (local) to review the previous 24 hours ending at 6:00 AM (local) and key activities planned for the next 24 hours.¹¹

Meeting Attendance. Attendees include:

- Customer manager (e.g., DAAC Manager, SOM, Network Manager, or MOM).
- ECS On-Site, SMC or EOC M&O Manager.
- ECS operations representatives: ECS Operations Supervisor (at a DAAC), or FOT Operations Manager (at EOC), ECS Operations Team Leader for on-duty shift.
- ECS engineering representatives: ECS engineering team leader(s), ILS representative(s), Ground and Flight System Engineers (EOC only).
- Customer staff.
- ECS support, and engineering staff as needed.

Presenter(s). The on-duty ECS Operations Team Leader makes the presentation summarizing the previous 24 hours and forecasting the next 24 hours operational activities.

¹¹ The Monday meeting will discuss activities over the previous weekend. The Friday meeting will forecast activities for the coming weekend.

Monday	Tuesday	Wednesday	Thursday	Friday
ECS M&O Office				
	10:00 ECS PROJECT STAFF MEETING 1:30 ECS M&O WEEKLY	4:00 ECS M&O WEEKLY S TAFF TELECON	8:30 ECS MONTHLY	
ECS SEO M&O				
	1:30 ECS M&O WEEKLY	4:00 ECS M&O WEEKLY S TAFF TELECON	2:00 ECS TT & CCR TELECON	
ECS ILS M&O				
8:30 ECS SMC & EOC Ops 10:00 ECS GSFC WEEKLY	8:30 ECS SMC & EOC Ops 1:30 ECS M&O WEEKLY	8:30 ECS SMC & EOC Ops 4:00 ECS M&O WEEKLY S TAFF TELECON	8:30 ECS SMC & EOC Ops 2:00 ECS TT & CCR TELECON	8:30 ECS SMC & EOC Ops
ECS SMC M&O				
8:30 ECS SMC Ops STATUS 10:00 ECS SMC WEEKLY	8:30 ECS SMC Ops STATUS	8:30 ECS SMC Ops STATUS 4:00 ECS M&O WEEKLY S TAFF TELECON	8:30 ECS SMC Ops STATUS 2:00 ECS TT & CCR TELECON	8:30 ECS SMC Ops STATUS
ECS EOC M&O				
8:30 ECS EOC Ops S STATUS 10:00 ECS EOC WEEKLY	8:30 ECS EOC Ops S STATUS	8:30 ECS EOC Ops S STATUS 4:00 ECS M&O WEEKLY S TAFF TELECON	8:30 ECS EOC Ops S STATUS 2:00 ECS TT & CCR TELECON	8:30 ECS EOC Ops S STATUS
ECS ASF On-Site M&O				
8:30 ECS ASF Ops S STATUS 10:00 ECS ASF WEEKLY	8:30 ECS ASF Ops S STATUS	8:30 ECS ASF Ops S STATUS 12:00 ECS M&O WEEKLY S TAFF TELECON	8:30 ECS ASF Ops S STATUS 10:00 ECS TT & CCR TELECON	8:30 ECS ASF Ops S STATUS
ECS EDC On-Site M&O				
8:30 ECS EDC Ops S STATUS 10:00 ECS EDC WEEKLY	8:30 ECS EDC Ops S STATUS	8:30 ECS EDC Ops S STATUS 3:00 ECS M&O WEEKLY S TAFF TELECON	8:30 ECS EDC Ops S STATUS 1:00 ECS TT & CCR TELECON	8:30 ECS EDC Ops S STATUS
ECS GSFC On-Site M&O				
8:30 ECS GSFC Ops S STATUS 10:00 ECS GSFC WEEKLY	8:30 ECS GSFC Ops S STATUS	8:30 ECS GSFC Ops S STATUS 4:00 ECS M&O WEEKLY S TAFF TELECON	8:30 ECS GSFC Ops S STATUS 2:00 ECS TT & CCR TELECON	8:30 ECS GSFC Ops S STATUS
ECS JPL On-Site M&O				
8:30 ECS JPL Ops S STATUS 10:00 ECS JPL WEEKLY	8:30 ECS JPL Ops S STATUS	8:30 ECS JPL Ops S STATUS 1:00 ECS M&O WEEKLY S TAFF TELECON	8:30 ECS JPL Ops S STATUS 11:00 ECS TT & CCR TELECON	8:30 ECS JPL Ops S STATUS
ECS LaRC On-Site M&O				
8:30 ECS LaRC Ops S STATUS 10:00 ECS LaRC WEEKLY	8:30 ECS LaRC Ops S STATUS	8:30 ECS LaRC Ops S STATUS 4:00 ECS M&O WEEKLY S TAFF TELECON	8:30 ECS LaRC Ops S STATUS 2:00 ECS TT & CCR TELECON	8:30 ECS LaRC Ops S STATUS
ECS MSFC On-Site M&O				
8:30 ECS MSFC Ops S STATUS 10:00 ECS MSFC WEEKLY	8:30 ECS MSFC Ops S STATUS	8:30 ECS MSFC Ops S STATUS 3:00 ECS M&O WEEKLY S TAFF TELECON	8:30 ECS MSFC Ops S STATUS 1:00 ECS TT & CCR TELECON	8:30 ECS MSFC Ops S STATUS
ECS NSIDC On-Site M&O				
8:30 ECS NSIDC Ops S STATUS 10:00 ECS NSIDC WEEKLY	8:30 ECS NSIDC Ops S STATUS	8:30 ECS NSIDC Ops S STATUS 2:00 ECS M&O WEEKLY S TAFF TELECON	8:30 ECS NSIDC Ops S STATUS 12:00 ECS TT & CCR TELECON	8:30 ECS NSIDC Ops S STATUS
ECS ORNL On-Site M&O				
		4:00 ECS M&O WEEKLY S TAFF TELECON	2:00 ECS TT & CCR TELECON	

Figure B-1. Typical ECS M&O Organization Weekly Calendar

Typical Agenda. Typical agendas at the DAACs, SMC and EOC are shown in Figures B-2, B-3 and B-4, respectively. Agenda items may be supplemented or replaced by hardcopy or softcopy reports.

Information Distribution. Material presented at the meeting is distributed within the ECS organization and host center (as directed by the Customer), the SEO, and the M&O Office.

At each of these meetings, the ECS and center managers have the opportunity to institute corrective actions, change priorities, and identify issues.

B.1.2 ECS Site/Center Weekly

Each center holds a weekly management, engineering and operations status meeting.

Meeting Objective. The objective of the meeting is to provide summary and, as needed, detailed reporting to the center management and engineering team on ECS activities. It also provides the ECS M&O manager the opportunity to discuss management priorities and tasking with both the ECS staff and the center management, operations, and engineering team.

Meeting Frequency. The 60-120 minute meeting is held at 10:00 (local) on Monday at each of the DAACs, the SMC and the EOC.

Meeting Attendance. Attendees include:

- ECS On-Site, SMC or EOC M&O Manager.
- ECS operations representatives: ECS Operations Supervisor (at a DAAC) or FOT Operations Manager (at EOC).
- ECS engineering representatives: ECS Engineering Team Leader(s), ILS representative(s), Ground and Flight System Engineers (EOC only).
- Customer management and staff.
- ECS support and engineering staff as needed.

Presenter(s). The ECS Operations Supervisor, ECS SMC Manager, or ECS FOT Manager makes a presentation summarizing and forecasting operational activities. ECS engineering organization leaders or staff (e.g. ECS engineering team leaders at the DAACs or SMC, or Flight Systems Engineer and Ground Systems Engineer at the EOC) make presentations on prior and planned activities.

Typical Agenda. Typical agendas at the DAACs, SMC and EOC are shown in Figure B-5. Agenda items may be supplemented or replaced by hardcopy or softcopy reports.

Information Distribution. Material presented at the meeting is distributed within the ECS organization and host center (as directed by the Customer), the SEO, and the M&O Office.

Mission Operations Metrics

- Data ingest status (number of level 0 products ingested by instrument and total, ancillary and correlative products ingested, problems encountered and problem response, etc.)
- Data production status (by instrument and total: number of products produced, volume produced, number of products QA'd, problems encountered and problem response, etc.)
- Data archive status (number of products archived, volume of products archived, etc.)
- Data distribution status (number of user supported, volumes of data distributed by distribution type (e.g., electronic, CD, tape, etc.)
- User services support (number of requests, volumes of data, types of data, etc.)
- Reprocessing status (number of requests, backlog, etc.)

Mission Operations Problems (hardware, software, network, operator, etc.)

- When
- What
- Why
- How long
- Impact to operations
- Corrective actions

ECS External Systems (as they impact the DAAC in general and ECS in particular)

- Non-ECS DAAC systems' status, plans and issues
- EDOS' status, plans and issues
- Ecomm's status, plans and issues
- Other systems' status, plans and issues

Next 24 Hours Plan

- Routine processing
- Reprocessing
- Data distribution
- String utilization
- System installations

Resource Utilization (done weekly showing last week and longer term trends)

- CPU
- Disk
- Tape
- Memory
- Network (both internal and external networks)

Reliability, Maintainability, Availability (done weekly showing last week and longer term trends)

- Fault data
- Fault trends
- Corrective actions

Miscellaneous Topics

- Special resource requests
- Visitors

Special Topics (as needed)

Figure B-2. Typical ECS On-Site Operational Status Meeting Agenda

<p><u>Mission Operations Metrics</u></p> <ul style="list-style-type: none"> • Network • System <p><u>Mission Operations Problems (hardware, software, network, operator, etc.)</u></p> <ul style="list-style-type: none"> • When • What • Why • How long • Impact to operations • Corrective actions <p><u>ECS External Systems (as they impact ECS in general and the SMC in particular)</u></p> <ul style="list-style-type: none"> • EDOS' status, plans and issues • Ecomm's status, plans and issues • Other systems' status, plans and issues <p><u>Next 24 Hours Plan</u></p> <ul style="list-style-type: none"> • Network utilization forecasts • Network reconfiguration plans • Network outages plans (and work arounds) • System processing plan • System reconfiguration plans • System outage plans (and work arounds) <p><u>Resource Utilization (done weekly showing last week and longer term trends)</u></p> <ul style="list-style-type: none"> • Networks • Each DAAC • SMC • EOC <p><u>Reliability, Maintainability, Availability (done weekly showing last week and longer term trends)</u></p> <ul style="list-style-type: none"> • Fault data • Fault trends • Corrective actions <p><u>Miscellaneous Topics</u></p> <ul style="list-style-type: none"> • Special resource requests • Visitors <p><u>Special Topics (as needed)</u></p>
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Figure B-3. Typical ECS SMC Operational Status Meeting Agenda

<p><u>Mission Operations Metrics</u></p> <ul style="list-style-type: none"> • Contacts • Spacecraft and instrument configuration and status • Orbit and attitude accuracy • IST activities <p><u>Mission Operations Problems (hardware, software, network, operator, etc.)</u></p> <ul style="list-style-type: none"> • When • What • Why • How long • Impact to operations • Corrective actions <p><u>ECS External Systems (as they impact ECS in general and the EOC and spacecraft/instruments in particular)</u></p> <ul style="list-style-type: none"> • EDOS' status, plans and issues • Ecomm's status, plans and issues • TDRSS' status, plans and issues • FDF's status, plans and issues • Other systems' status, plans and issues <p><u>Next 24 Hours Plan</u></p> <ul style="list-style-type: none"> • S/C contacts • S/C and instrument reconfigurations • S/C maneuvers and/or attitude adjusts • IST activities • Ground system installations <p><u>Resource Utilization (done weekly showing last week and longer term trends)</u></p> <ul style="list-style-type: none"> • CPU • Disk • Tape • Memory • Network (both internal and external networks) <p><u>Reliability, Maintainability, Availability (done weekly showing last week and longer term trends)</u></p> <ul style="list-style-type: none"> • Fault data • Fault trends • Corrective actions <p><u>Miscellaneous Topics</u></p> <ul style="list-style-type: none"> • Special resource requests • Visitors <p><u>Special Topics (as needed)</u></p>
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Figure B-4. Typical ECS EOC Operational Status Meeting Agenda

<p><u>Weekly Mission Operations Metrics</u></p> <ul style="list-style-type: none"> • Operations metrics (summarized from prior weeks daily meetings (see Section B.1.1)) • Trouble tickets written • Work-arounds (number, new, age, etc.) <p><u>Weekly Engineering Metrics</u></p> <ul style="list-style-type: none"> • Number of TTs written and priority assigned • Number of TTs closed and priority assigned • Number of CCRs written and priority assigned • Distribution of TTs by priority and age • Distribution of CCRs by status, priority and age • Hardware/ILS status and plans <p><u>ECS External Systems</u></p> <p><u>Monthly Rotating Briefings</u></p> <p><u>Operations Team Week</u></p> <ul style="list-style-type: none"> • Personnel status • Training status • Documentation status • cmi activities <p><u>Engineering Team Week</u></p> <ul style="list-style-type: none"> • See Section 3 for the list of functions on which reports will be provided • cmi activities <p><u>Special Topics (as needed)</u></p>
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Figure B-5. Typical Site/Center Weekly Agenda

B.1.3 ECS M&O Weekly

Meeting Objective. The objective of the meeting is to provide a system-wide look at engineering and operations to ESDIS staff and the ECS M&O Office. The meeting also addresses GSFC Building 32 ILS issues.

Meeting Frequency. The 60-120 minute meeting is held at 1:30 (local) on Tuesday at GSFC Building 32.

Meeting Attendance. Attendees include:

- ESDIS management personnel (e.g., Systems Integration and Operations Office Manager, DAAC Systems Manager, SOM, Network Manager, and MOM).
- ECS GSFC On-Site, SMC, EOC M&O, ILS and M&O Office managers.
- ECS engineering representatives: As selected by each organization’s ECS manager.
- Customer management and staff.

Presenter(s). The ECS SEO engineering team leaders make presentations summarizing and forecasting activities throughout ECS in general and within the SEO and ILS organizations in

particular. Material from the previous day's center weeklies (see Section B.1.2) are used as one source of material.

Typical Agenda. A typical agenda is shown in Figure B-6. Agenda items may be supplemented or replaced by hardcopy or softcopy reports.

Information Distribution. Material presented at the meeting is distributed within the ECS M&O organization and ESDIS (as directed by ESDIS).

<p><u>Weekly Mission Operations Metrics (System-look)</u></p> <ul style="list-style-type: none">• Operations metrics• Trouble tickets written• Work-arounds (number, new, age, etc.) <p><u>Weekly Engineering Metrics (System-look)</u></p> <ul style="list-style-type: none">• Number of TTs written and priority assigned• Number of TTs closed and priority assigned• Number of CCRs written and priority assigned• Distribution of TTs by priority and age• Status (e.g., pending approval by local CCBs, pending approval by ESDIS CCB, approved but backlogged (by organization), approved and in work (by organization), disapproved)• Distribution of CCRs by status, priority and age• Hardware/ILS status and plans <p><u>Weekly Engineering Metrics (Building 32)</u></p> <ul style="list-style-type: none">• ILS (including RMA) <p><u>ECS External Systems</u></p> <p><u>Monthly Rotating Briefings (See Section 3 for a list of functions on which reports will be provided)</u></p> <ul style="list-style-type: none">• Operations team(s)• Engineering teams• ILS (including RMA) <p><u>Special Topics (as needed)</u></p>
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Figure B-6. Typical ECS M&O Weekly Agenda

B.1.4 ECS Project Staff Meeting

The ECS M&O Office attends the ECS Project Staff Meeting held weekly on Tuesday morning.

Meeting Objective. This meeting provides the M&O Office with the opportunity to share M&O status with ECS Project management as well as the development and support organizations. It also provides ECS management with the opportunity to provide policies, direction, form tiger teams, etc., to address M&O and development issues.

Meeting Frequency. The 60-120 minute meeting is held each on Tuesday at 10:00 (local).

Meeting Attendance. Attendees include:

- ECS Project management.
- ECS development office managers.
- ECS M&O office manager.
- ECS support office managers.
- ECS support, and engineering staff as needed.

Presenter(s). The ECS Project Manager provides the introduction and flowdown of information from Hughes Management. Each individual attending the meeting is encouraged to contribute information, issues and/or concerns to the rest of the management team.

Typical Agenda. Typically, no agenda is published for this meeting.

Information Distribution. Material from this meeting is distributed within the ECS M&O organization at the ECS M&O Weekly Staff Telecon (see Section B.1.5).

B.1.5 ECS M&O Weekly Staff Telecon

The ECS M&O Office holds a weekly staff meeting. Using the tool of a telecon, ECS M&O organizations that cannot have a representative at the meeting, attend. Flowdown of material from the ECS Project Staff Meeting (Section B.1.4) occurs, as does discussion of ECS M&O issues and material.

Meeting Objective. This meeting provides the M&O Office with the opportunity to flowdown of material from the ECS Project Staff Meeting (Section B.1.4), and facilitates discussion of ECS M&O issues. It also provides ECS M&O management with the opportunity to provide policies, direction, assign action items, form tiger teams, etc.

Meeting Frequency. The 60 minute meeting is held each Wednesday at 4:00 (Eastern Time).

Meeting Attendance. Attendees include:

- ECS M&O office manager.
- ECS SMC, EOC, and ILS Managers.
- Via telecon, ECS On-Site Managers.
- ECS M&O support staff.

Presenter(s). The ECS M&O Manager provides the introduction and flowdown of information from the ECS Project Staff Meeting. Each individual attending the meeting is encouraged to contribute information, issues and/or concerns to the rest of the management team.

Typical Agenda. Typically, no agenda is published for this meeting.

Information Distribution. Material from this meeting is distributed within each ECS M&O organization.

B.1.6 ECS Monthly

On the third Thursday of each month, the ECS Project provides a presentation to the ESDIS Project on the total activities of the ECS Contractor. The ECS M&O Office participates in this presentation by providing a top level look at the status of M&O activities at each center, identification of issues and corrective actions, etc.

B.1.7 TT & CCR Telecon

Meeting Objective. This meeting functions as the M&O Failure Review Board and is held to synchronize and coordinate TT and CCR activities within the M&O organization as well as with development, customer and user organizations.

Meeting Frequency. The 60-120 minute meeting is held each Thursday at 2:00 (Eastern Time).

Meeting Attendance. Attendees include:

- Customer representatives.
- ECS SEO engineering teams leads (one is designated as chairperson of the meeting).
- ECS ILS engineering support.
- Via telecon, ECS engineering team leads and operations representatives.
- ECS M&O support staff.
- ECS development organization representatives (including management, technical, configuration management and quality assurance).
- SCF(s) representatives (in person or via telecon).

Presenter(s). The chairperson leads the meeting through the agenda. The operations representatives have reviewed the TTs and CCRs and are prepared to recommend a priority for each.

Typical Agenda. A typical agenda is shown by Figure B-7. Agenda items may be supplemented or replaced by hardcopy or softcopy reports.

Information Distribution. Material from this meeting is distributed within each ECS organization and to customer and user organizations as required.

<p><u>TT Discussion</u></p> <ul style="list-style-type: none"> • Review and prioritize each TT opened at each center • Review and re-prioritize older TTs (as required) • Assign TT work-off responsibility to one organization • Review distribution of TTs by organization, priority and age • Discuss TT issues with development organizations <p><u>CCR Discussion</u></p> <ul style="list-style-type: none"> • Review and prioritize each CCR opened at each center • Review and re-prioritize older CCRs (as required) • Review status of open CCRs • Review distribution of CCRs by organization, status, priority and age • Recommend new/revised assignments of CCRs to organizations/centers • Discuss CCR issues with development organizations

Figure B-7. Typical TT and CCR Telecon Agenda

B.1.8 Host Site/Center Staff Meetings

Not shown by Figure B-1, the ECS M&O Manager at each center should attend appropriate portions of the host organizations’ staff meetings to further team building and ensure alignment between the ECS and host organizations.

B.2 Coordination With ESDIS

The primary, regularly scheduled, meeting at which ESDIS receives system-level information is the ECS M&O Weekly as discussed in Section B.1.3. The SOM, Network Manager, and MOM also receive information at the daily ECS Ops Status, ECS SMC Weekly and/or the ECS EOC Weekly. The cognizant ECS M&O Manager should be given the opportunity to attend appropriate portions of Customer staff meetings .

Decisions and instructions regarding SEO and ILS activities can be given at any of these meetings. Additional ad hoc meetings can also be scheduled to provide more detail or opportunities for discussion.

Results of these meetings are shared with ECS M&O management and the other center managers at either the ECS M&O Weekly Staff Telecon or ad hoc meetings/telecons.

For example, suppose the System Integration and Operations Office Manager wishes to change the priority of an approved CCR. The following steps occur:

- The agenda for the ECS M&O Weekly typically shows the current priority of all approved and pending CCRs. Based upon the Manager’s review, either at the meeting or later, the Manager gives direction to change priorities.

- The requested priority change is brought to the TT & CCR Telecon where the priority change is discussed with both development and M&O staff.
- The TT & CCR Telecon minutes documents the priority change.
- At the next week's ECS M&O Weekly, the priority change is briefed and, as required, a work-off plan (i.e., what organization, what resources, what schedule, etc.) presented.

B.3 Coordination with DAAC Managers

Just as the SOM, Network Manager, and MOM have the opportunity to attend regularly scheduled meetings, the DAAC Managers receive information at, or receive it from, the ECS Operations Status meeting and the ECS DAAC Weekly. The ECS On-Site M&O Manager should be given the opportunity to attend appropriate portions of Customer staff meetings.

Decisions and instructions can be given at any of these meetings. Additional ad hoc meetings can also be scheduled to provide more detail or opportunities for discussion.

Results of these meetings are shared with ECS M&O management and the other center managers at either the ECS M&O Weekly Staff Telecon or ad hoc meetings/telecons.

B.4 Coordination within ECS

The ECS Project Staff meeting provides an opportunity for ECS Project management to give direction to the M&O Office. It also allows the M&O Office to surface accomplishments, issues and concerns, work-off plans, and directions received from ESDIS and DAAC management, for ECS review. Flowdown of material from that meeting to the rest of the M&O organization occurs via either the ECS Weekly Staff Telecon or ad hoc meetings.

ECS Project directions that directly impact ESDIS and DAAC customers are coordinated at either the regularly scheduled meetings or at ad hoc meetings (see Sections B.2.1 and B.2.2).

B.4.1 Budget Changes

Formal instructions to incorporate a change order in the planning and technical baseline are received in accordance with program instructions. Flowdown of the changes to the impacted organizations occur in accordance with program instructions.

B.4.2 Financial Status

On a monthly basis, the subject of the ECS M&O Staff Meeting is earned value. The ECS M&O organizations' managers present their earned value status, corrective actions, etc. This information is flowed back to the ESDIS Project via normal financial reporting as well as the ECS Monthly.

B.5 Reports

Consistent use of standard reports throughout ECS ensures that analyses, tasks, plans, and priorities are all determined based on consistent data. Because of the distributed nature of ECS, uniform presentation of key data facilitates inter-site coordination and cooperation.

Periodic written reports (hardcopy and/or softcopy) are used to document the performance of ECS and interfacing systems. These reports are primarily derived from data automatically collected by the ECS application and COTS software or Contractor financial systems.

Standard report writing features and office automation tools are used to generate reports that supplement or replace topics shown in Tables B-1 through B-7. Candidate reports can address snapshots in time and/or trends in areas such as computer resource utilization, communications (both LAN and WAN) performance and utilization, science operations activities, user accesses, data distribution, platform and instrument command and control activities, RMA data and analyses, TT statistics, CCR statistics, CM data, financial status reports, plans, schedules, etc.

Ad hoc reports will also be provided, as needed, using ECS tools and standard office automation products.

B.6 Configuration Management Scenarios

The following scenarios provide a model for management of the operational and development baseline using a Configuration Control Board process.

For the purposes of this section¹², the identifier for each release is in the form of *Release.Organization.Number_dev[.Number_M&O].Number_center* where:

- *Release* is the major release, A, B, C, or D.
- *Organization* is the organization that established the configuration. Legal values are DEV for development, M&O for M&O system wide, or center (e.g., SMC, EOC, EDC, GSFC, etc.) for center unique.
- *Number_dev* is a numeric identifier applied by the development organization to the major release and/or a minor release.
- *Number_M&O* is a numeric identifier applied by the M&O/SEO organization. This field is used by the SEO organization to establish the system M&O baseline.
- *Number_center* is a numeric identifier applied by each center. This field is used by the operational centers to establish the site specific baseline.

For example, at the TRMM Development Release RRR, the ECS CCB establishes the initial operational baseline. Assume this baseline is identified as A.DEV.3. A.DEV.3 is delivered to the ESDIS CCB. After ESDIS CCB acceptance, the M&O organization will configure and build its

¹² The actual release and/or center nomenclature will be determined by the ECS Configuration Management organization.

first, system-wide baseline, A.M&O.3.0. If it is assumed that some M&O tailoring is applied, the baseline released to the operational centers is A.M&O.3.1. Each center then configures a center specific baseline. The RRR baseline for EDC, GSFC, LaRC, and MSFC as well as the SMC and EOC is built from A.M&O.3.1 and are identified as A.EDC.3.1.1, A.GSFC.3.1.1, A.LaRC.3.1.1, A.MSFC.3.1.1, A.SMC.3.1.1 and A.EOC.3.1.1

Section B.6.1 illustrates the routine process to fix an operational problem. Section B.6.1.1 shows the approval scenario and Section B.6.2.2 the engineering change scenario. Section B.6.2 illustrates an accelerated process required to fix a critical operational problem. B.6.2.1 shows the approval scenario and Section B.6.2.2 the engineering change scenario.

B.6.1 Routine Approval and Change Scenarios

The routine approval scenarios describe engineering and change control processes appropriate for most changes. These include changes for which adequate work-arounds exist as well as changes which are categorized as of lower priority.

B.6.1.1 Routine Approval Scenario

This scenario describes the approval process for a “routine” CCR. The following steps are keyed to Figure B-8.

1. Operations at NSIDC reports a problem using a TT.
2. The TT is brought to the next ECS TT & CCR Telecon. The ECS NSIDC operations representative gives a recommendation on priority. The meeting chair, in consultation with other attendees, determines the TT’s priority, the organization assigned, and the Responsible Engineer (RE). The minutes of the meeting reflect the assignments. The RE could be from any M&O organization. For the purposes of this scenario, assume the RE is from NSIDC.
3. The RE investigates the problem and identifies potential solutions and selects an approach. The RE can recommend closure based on the providing additional training to the operations staff or development of a new or revised procedure.

If a procedural “work-around” exists, the TT is left open until either the “work-around” is incorporated as a formal procedure or until a CCR is installed. The ECS NSIDC operations representative must agree to any closure. Assuming a modification to a configured item is required, the RE writes a CCR documenting the problem (including TT identifier), the proposed solution, what configuration items require modification, and what documentation require updating.

4. The CCR is brought to the next ECS TT & CCR Telecon. The RE briefs the CCR to the attendees. Any issues are identified along with alternative solutions. The CCR may be disapproved at this point, returned to the RE for additional work, or approved for submission to the NSIDC CCB.

Upon approval, the CCR is sent to the NSIDC CCB for approval. The TT’s status is updated from OPEN to PENDING with a reference to the CCR identifier.

5. The ECS On-Site CM function puts the CCR onto the NSIDC CCB agenda and distributes the CCR to the CCB members. After discussion and preliminary approval, the NSIDC CCB places the CCR into PENDING status. The ECS On-Site CM function documents the results and forwards the CCR to the ESDIS CCB.
6. The SEO CM function schedules the CCR for a specific ESDIS CCB and adds the CCR to the ESDIS CCB agenda. The CCR and review schedule is distributed to the CCB members. The ESDIS CCB may DISAPPROVE the CCR at this point but in this scenario it puts the CCR into PENDING status. The SEO CM function documents the decision and schedules the ESDIS CCB at which the CCR is to be reviewed again. The CCR and review schedule is distributed to the ECS CCB for development organization review and to the DAAC, SMC, SCF (if required) and EOC CCBs for review.
7. Each receiving center ECS CM function puts the CCR onto the center's CCB agenda and distributes the CCR to the CCB members. Each reviewing CCB performs an impact assessment identifying cost, schedule and technical issues. Each CCB provides a recommendation on CCR disposition (e.g., approve, approve with modifications, disapprove, defer, etc.)

If the recommendation is APPROVE, a proposed incorporation schedule is supplied. Proposed modifications to the CCR can also be made which could require another round of review. The ECS CM function documents the results and forwards the CCR to the ESDIS CCB.

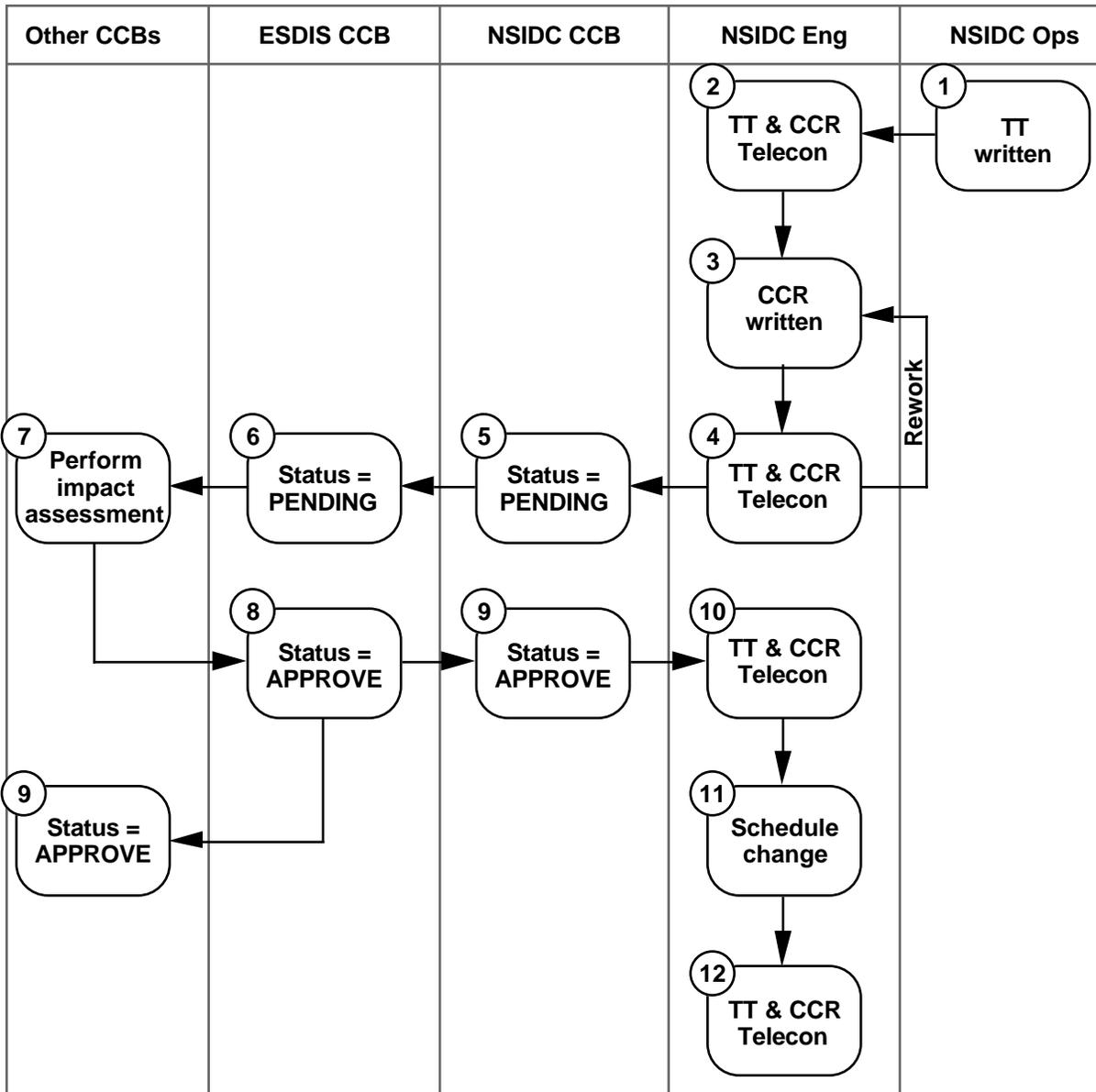


Figure B-8. CCR Approval Scenario

- The SEO CM function puts the CCR onto the ESDIS CCB agenda and distributes the CCR and impact assessments to the CCB members. Upon review of the CCBs' impact assessments, the ESDIS CCB changes the status from PENDING to DISAPPROVED or APPROVED.

If APPROVED, the ESDIS CCB selects the scope of the change as DEVELOPMENT, M&O, DEVELOPMENT_AND_M&O, DAAC_UNIQUE, SMC_UNIQUE, or

EOC_UNIQUE. In this scenario, assume that the scope is DEVELOPMENT_AND_M&O and NSIDC is selected as the implementing organization. The SEO CM function documents the decision and distributes the CCR and decision to the DAACs', SMC's, SCF's and EOC's CCBs for information and/or implementation. ESDIS CCB decisions are also published to the community via mechanisms such as the ECS Data Handling System (EDHS) and ECS Bulletin Boards.

9. The NSIDC ECS On-Site CM function puts the CCR onto the NSIDC CCB agenda and distributes the CCR and decision information to the CCB members. Assuming approval, the NSIDC CCB changes the status from PENDING to APPROVED. Other CCBs update the CCR in their tracking system. The ECS CM functions document the results of the CCB at each location.
10. The NSIDC ECS On-Site organization briefs the approved status of the CCR at the TT & CCR Telecon.
11. The NSIDC ECS On-Site organization plans to incorporate the change in A.NSIDC.3.4.3, a new NSIDC release built on A.NSIDC.3.4.2, and generates a schedule.
12. This incorporation schedule is presented at the weekly TT & CCR Telecon. SEO then schedules the incorporation into A.M&O.3.5 while the development organizations decide to incorporate the change into a baseline merge forming new development baseline, A.DEV.4.

B.6.1.2 Routine Modification Scenario

This scenario addresses the “routine” modification of an ECS configuration item after a CCR has been approved.

Based on the change in status of the CCR from PENDING to APPROVED, the NSIDC ECS On-Site organization is authorized to implement the CCR. It begins work on the change. Figure B-9 shows how the baseline changes flow throughout the following process.

1. The current system development baseline is A.DEV.3. The current M&O system baseline is A.M&O.3.4. The current NSIDC operational baseline is A.NSIDC.3.4.2. The differences and relationships between A.DEV.3, A.M&O.3.4 and A.NSIDC.3.4.2 are known and documented.
2. The NSIDC ECS On-Site organization makes the change to version A.NSIDC.3.4.2 and required documentation (e.g., design documents, interface documents, procedures, etc.). The ECS On-Site CM function impounds all configuration items and documentation prior to testing by the ECS test function. The new version is designated as A.NSIDC.3.4.3. DAAC-specific and system-wide testing is coordinated and performed.

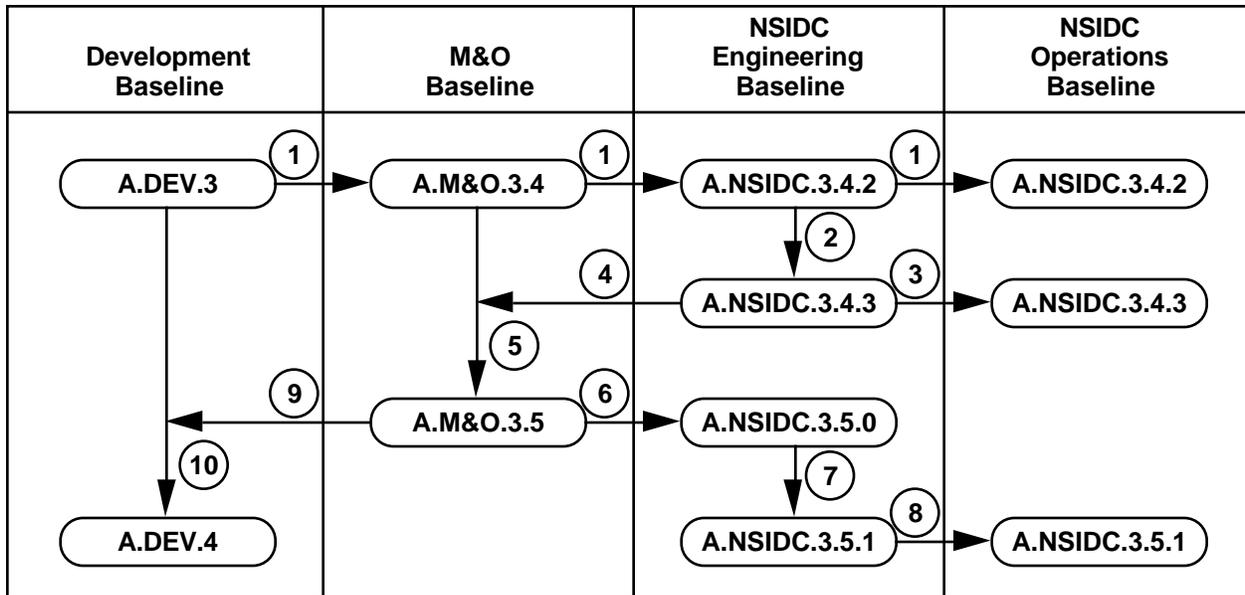


Figure B-9. Development, M&O and DAAC Baselines

3. Installation of the change at NSIDC could be scheduled at this point if:
 - a) the installation were allowed by the policies and procedures jointly agreed to by ESDIS and NSIDC,
 - b) the CCR allowed NSIDC to independently install the change, and
 - c) the change can be independently installed at NSIDC without impacting other organizations.

In this case, assume that the change can be independently installed at NSIDC. The integrated A.NSIDC.3.4.3 is presented to the DAAC Installation Control Meeting at which the incorporated changes, testing performed, documentation changes, and operational procedure changes are discussed. Upon approval from this meeting, the installation is scheduled and implemented by the ECS Contractor.

4. The NSIDC ECS On-Site CM function sends the change (including documentation) to the SEO CM function where it is impounded and made available to the SEO engineering function.
5. The SEO engineering function integrates the change with other approved changes that are in work against the A.M&O.3.4 baseline. The SEO CM function impounds the integrated delivery, A.M&O.3.5, and documentation prior to ECS independent testing.
6. Upon completion of testing, A.M&O.3.5 is distributed to each center's CM function. Using the authority of the approved CCR, each center's CM function (including NSIDC) accepts the new M&O baseline and creates a site specific baseline (at NSIDC, A.NSIDC.3.5.0)

7. At NSIDC, any DAAC unique changes are integrated, placed under configuration control, and tested as A.NSIDC.3.5.1.
8. Installation is scheduled and implemented after approval by the DAAC Installation Control Meeting. Similar activities are performed at all centers.
9. A.M&O.3.5 is provided to the development organization.
10. At a time convenient to the development organization, their development baseline for the AM-1/Landsat Release is moved forward from A.DEV.3 to the new baseline, A.DEV.4.

As each organization incorporates the change into its baseline, the CCR and TT status is updated at the TT & CCR Telecon until all actions are completed. At that time, the CCR and TT are marked CLOSED.

Throughout this process, the status of the CCR and TT are presented in either a summary or detailed manner at the weekly TT & CCR Telecon, the Site/Center Weekly, and the ECS M&O Monthly. Baseline merge activities are also discussed at these meetings as well as the ECS Monthly.

B.6.2 Accelerated Approval and Change Scenarios

B.6.2.1 Accelerated Approval Scenario

This scenario addresses a process for obtaining approval of an “emergency” change to an ECS configuration item. While not explicitly described in the scenario, ESDIS, SEO, SMC, and other DAACs are kept informed throughout the scenario.

1. Operations at LaRC discovers a critical/show-stopper problem on 3rd shift. Following DAAC approved standard operating policies and procedures, the LaRC operations organization immediately notifies ECS engineering using a pre-coordinated call list, contacts the SMC to notify that organization of the problem, and follows-up by writing an TT and collecting supporting data.
2. The contacted RE reports to the LaRC DAAC and collects relevant data and starts investigating the problem. If a work-around is identified, it is coordinated with the LaRC on-shift operations supervisor and SMC. When the day shift reports to work, DAAC and ECS management and supervision is briefed on the problem and any identified work-arounds and/or solutions. If an adequate work-around not requiring prior CCB approval is available, work-off of the TT follows the processes described in Section B.6.1. Otherwise, the accelerated process continues.
3. Additional engineering support at the SEO is arranged to develop a solution. Data collected at LaRC is sent (perhaps via ftp) to the SEO support RE(s). Using a telecon, potential solutions are identified and engineered. A final solution is determined and the LaRC RE writes an emergency CCR. The ECS LaRC On-Site CM function enters the CCR into its database.

4. Depending upon the scope of the change, one of the two following steps occurs:
 - a. If the change is LaRC DAAC-unique, the CCR is presented to the LaRC CCB chairperson for approval¹³. An emergency CCB is convened and the change approved. The CCR is added to the agenda of the next ECS TT & CCR Telecon for discussion (see Section B.6.1). The LaRC On-Site CM function sends the CCR to the SEO CM function.
 - b. If the change impact is of wider scope impacting other DAACs, the SMC, SCF's and/or the EOC, the LaRC RE's emergency CCR is presented to each organization's CCB chairperson¹⁴. Emergency CCBs are convened at each location and the change approved by each CCB. The LaRC On-Site CM function sends the CCR to the SEO CM function.

At this point, the accelerated modification scenario described in B.6.2.2 begins. System-wide review, impact assessments, and approvals by the ECS TT & CCR Telecon and the various CCBs are handled on a routine basis.

5. The CCR is brought to the next ECS TT & CCR Telecon. The RE briefs the CCR to the attendees. Any issues are identified along with alternative solutions. The TT's status is updated from OPEN to PENDING with a reference to the CCR identifier.
6. The SEO CM function puts the CCR onto the ESDIS CCB agenda and distributes the CCR to the CCB members. The ESDIS CCB puts the CCR into PENDING status. The SEO CM function documents the decision and distributes the CCR to the ECS CCB for development organization review and to the DAAC, SMC and EOC CCBs for review.
7. Each receiving center ECS CM function puts the CCR onto the center's CCB agenda and distributes the CCR to the CCB members. Each reviewing CCB performs an impact assessment identifying cost, schedule and technical issues. Each CCB provides a recommendation.

If the recommendation is APPROVE a proposed incorporation schedule for the previously developed change is supplied. Proposed modifications to the CCR can also be made which could require another round of review. The ECS CM function documents the results and forwards the CCR to the ESDIS CCB.

8. The SEO CM function puts the CCR onto the ESDIS CCB agenda and distributes the CCR and impact assessments to the CCB members. Upon review of the CCBs' impact assessments, the ESDIS CCB changes the status from PENDING to APPROVED.

If APPROVED, the ESDIS CCB selects the scope of the change as DEVELOPMENT, M&O, DEVELOPMENT_AND_M&O, or DAAC_UNIQUE. In this scenario, assume

¹³ This scenario assumes that either ESDIS and the LaRC DAAC have previously agreed that the LaRC CCB can approve the installation of DAAC-unique critical changes without prior approval of the ESDIS CCB or the LaRC CCB chairperson will coordinate with ESDIS prior to approval.

¹⁴See previous footnote regarding the authority of the DAAC, SMC and EOC CCBs.

that the scope is DEVELOPMENT_AND_M&O and the existing LaRC solution is selected. The SEO CM function documents the decision and distributes the CCR and decision to the DAACs', SMC's and EOC's CCBs.

9. The LaRC ECS On-Site CM function puts the CCR onto the LaRC CCB agenda and distributes the CCR and decision information to the CCB members. Assuming approval, the LaRC CCB changes the status from PENDING to APPROVED. Other CCBs update the CCR into their tracking system. The ECS CM functions document the results of the CCB at each location.
10. The LaRC ECS On-Site organization briefs the approved status of the CCR at the TT & CCR Telecon.

B.6.2.2 Accelerated Modification Scenario

This scenario addresses a process for making an “emergency” change to an ECS configuration item after having obtained the necessary approval(s). While not explicitly described in the scenario, ESDIS, SEO, SMC, SCFs (if required), and other DAACs are kept informed throughout the scenario.

1. The current system development baseline is A.DEV.3. The current M&O system baseline is A.M&O.3.4. The current LaRC operational baseline is A.LaRC.3.4.4. The differences and relationships between A.DEV.3, A.M&O.3.4 and A.LaRC.3.4.4 are known and documented.
2. After emergency CCB approval (see step 4 in Section B.6.2.1), the LaRC ECS On-Site organization makes the change to version A.LaRC.3.4.4 and performs programmer level testing. Only documentation critical for operations is updated at this time.
3. The LaRC CM organization captures the change and documentation, and builds the new operational version, A.LaRC.3.4.5. If the change impacts more than one DAAC, the SMC and/or the EOC, the changes are distributed to the appropriate organizations' CM functions which impound the material and build new operational versions.
4. The impacted organization(s) perform emergency feature and regression testing to ensure that the problem has been solved and that there is little likelihood that new problems have been added.
5. The integrated A.LaRC.3.4.5 is presented to an emergency LaRC DAAC Installation Control Meeting at which the incorporated changes, testing performed, and operational procedure changes/redlines are discussed. Upon approval from this meeting (as well as similar meetings at other impacted organizations), the installation is scheduled and implemented by the ECS Contractor.
6. The crisis over, the LaRC RE updates any remaining necessary documentation and provides the material to the CM organization. The remainder of the process is handled on a routine basis.

7. The LaRC ECS On-Site CM function sends the change (including documentation) to the SEO CM function (and other impacted sites) where it is impounded and made available to the SEO engineering function.
8. After approval from the ESDIS CCB (see Section B.6.2.1), the SEO engineering function integrates the change with other approved changes that are in work against the A.M&O.3.4 baseline.

If the CCR was approved with changes, the SEO (or LaRC) makes the necessary modifications for the system-wide release.

The SEO CM function impounds the integrated delivery, A.M&O.3.5, and documentation prior to ECS independent testing.

9. Upon completion of testing, A.M&O.3.5 is distributed to each center's CM function. Using the authority of the approved CCR, each center's CM function (including LaRC) accepts the new M&O baseline and creates a site specific baseline (at LaRC, A.LaRC.3.5.0)
10. At LaRC, any DAAC unique changes are integrated, placed under configuration control, and tested as A.LaRC.3.5.1.
11. Installation of A.LaRC.3.5.1 is scheduled and implemented after approval by the DAAC Installation Control Meeting. Similar activities are performed at all centers.
12. A.M&O.3.5 is provided to the development organization.
13. At a time convenient to the development organization, their development baseline for the AM-1/Landsat Release is moved forward from A.DEV.3 to the new baseline, A.DEV.4.

As each organization incorporates the change into its baseline, the CCR and TT status is updated at the TT & CCR Telecon until all actions are completed. At that time, the CCR and TT are marked CLOSED.

Throughout this process, the status of the CCR and TT are presented in either a summary or detailed manner at the weekly TT & CCR Telecon, the Site/Center Weekly, and the ECS M&O Monthly. Baseline merge activities are also discussed at these meetings as well as the ECS Monthly.

Appendix C. Roles and Responsibilities

As noted in Sections 1 and 3, this document is written to the contractual baseline Statement of Work, as modified by Change Order #1. However, there have been ongoing discussions and agreements between the DAACs and ESDIS as to the eventual roles and responsibilities of the ECS Contractor and the DAAC staff, especially in the operations and user services area. These agreements are in the process of being documented in the Distributed Active Archive Center (DAAC) Strategic/Management Plan

To allow a comparison between the baseline SOW and the DAAC Strategic Management Plan, the following sections contain:

- The ECS SOW, as modified by Change Order 1, sections relevant to ECS M&O, and
- The Roles and Responsibilities matrix from the DAAC Strategic/Management Plan.

It is important to emphasize that the DAAC Strategic/Management Plan is not a compliance document on the ECS contract at this time. The excerpts from that document are provided for information only.

C.1 ECS Statement of Work Excerpts

The following sections contain excerpts are from the ECS Statement of Work, as modified by Change Order 1. They are drivers on the M&O management effort.

C.1.1 ECS Functional Elements and DAAC Locations.

1.4.1 ECS Functional Elements

The three ECS segments and their functional elements are:

- a. A Flight Operations Segment (FOS) which manages and controls the EOS spacecraft and instruments. The FOS elements include:
 - 1) EOS Operations Center (EOC) — The Goddard Space Flight Center (GSFC) element responsible for mission planning and scheduling and for the control and monitoring of mission operations for the spacecraft and instruments.
 - 2) Instrument Control Centers (ICCs)/Instrument Control Facilities (ICFs) — The ICCs are the elements responsible for scheduling, commanding, and operating the science instruments and for monitoring instrument performance. Several ICCs constitute an ICF. The FOS also interfaces to ICCs at International Partner Facilities.
 - 3) Instrument Support Terminals (ISTs) — Investigator-site ECS software toolkits to connect a Principal Investigator (PI) or Team Leader (TL) to an ICC in support of remote instrument planning and monitoring. (Investigator facilities are shown outside the FOS in Figure 1.4.1-1; they are connected to the FOS via

the EOSDIS Science Network (ESN).) IST toolkits are hosted on user-provided systems.

- b. A Science Data Processing Segment (SDPS) which provides a set of processing, archival, and distribution elements for science data and a data information system for the entire ECS. The SDPS elements include:

- 1) Distributed Active Archive Centers (DAACs) — Each institutional DAAC facility will consist of a Product Generation System (PGS), a Data Archive and Distribution System (DADS), and a portion of the Information Management System (IMS). The ECS hardware and software will process data from the EOS instruments to standard, Level 1-4 data products, provide short- and long-term storage for EOS and selected non-EOS data, and distribute the data to EOS users.

ECS DAACs will be located, at a minimum, at the following institutions:

- (a) Goddard Space Flight Center (GSFC)
- (b) Marshall Space Flight Center (MSFC)
- (c) University of Alaska — Fairbanks (UAF) Facility
- (d) U.S. Geological Survey (USGS) Earth Resources Observation Systems (EROS) Data Center (EDC)
- (e) Jet Propulsion Laboratory (JPL)
- (f) University of Colorado — National Snow and Ice Data Center (NSIDC)
- (g) Langley Research Center (LaRC)
- (h) Oak Ridge National Laboratory (ORNL)

- 2) Information Management System (IMS) — a distributed information management system for the ECS that includes a catalog system to support user data selection and ordering. The IMS will be implemented in a distributed configuration, with the distribution of IMS functions between the DAACs and an IMS coordinating element to be optimized to meet the requirements of the ECS Specification. The IMS must function as a single integrated service from the point of view of the user, and must present the same comprehensive view of the ECS from any IMS access node. The distribution of IMS functions must not compromise the integrity of the IMS as a whole.

- c. A Communications and System Management Segment (CSMS) which provides overall ECS management and operations of the ground system resources, facilities, and communications/networking services for an extensive science data communications network and interfaces to NASA's Space Network (SN), EOS Communications (Ecom), Program Support Communications Network (PSCN), and other communication networks. The CSMS elements include:

- 1) System Management Center (SMC) — a system management service for ECS ground system resources.
- 2) EOSDIS Science Network (ESN) — a dedicated internal ECS communications network for providing interconnection services for the widely distributed ECS facilities, IPs, and EOS investigators at their ISTs or SCFs as required to support ECS operations, and a separate network interface from the ECS to gateways provided by the NASA Science Internet to external science research networks in support of other science communities' access to the ECS.

C.1.2 ECS Operations Concept

1.4.2 ECS Operations Concept

Basic ECS operations are discussed in this section in terms of the three operational segments.

1.4.2.1 FOS Operations

The EOC provides the capability for mission management and coordination. This function includes overall spacecraft and instrument responsibility (including command and control of the spacecraft, planning, scheduling, and health and safety monitoring) and coordination with the ICCs, the IPs, and other non-ECS institutional elements such as the FDF or the NCC.

The ICFs at GSFC will support the ECS. In addition, there will be ICCs in Japan and Europe. An ICF consists of one or more ICCs, each responsible for monitoring the health and safety of its instrument, generating commands, and coordinating plans and schedules with the EOC. The ICCs will interface primarily to the EOC for spacecraft operations. The IPs will also provide ICCs in their countries to operate their instruments on the U.S. spacecraft.

The ECS Contractor shall provide software (toolkits) for ISTs. ISTs will allow a remote instrument scientist to participate in the planning and scheduling function, review engineering data, develop command requests, and assist in the resolution of anomalies.

1.4.2.2 SDPS Operations

Production of scientifically useful Level 1 and higher data products from the EOS instruments is distributed across the DAACs. The DAACs then store the generated products in a manner which provides convenient access to the data for distribution in support of the users. The DAACs will be designed to support long-term archiving of standard and other pertinent products.

The DAACs will receive Level 0 data from EDOS and will generate standard products, metadata, and standard browse products for these standard products. Standard Level 1 through Level 4 products will be produced routinely using approved algorithms. Standard browse products also will be produced routinely for the standard products, providing investigators a quick way of examining the potential suitability of

a standard product without actually having to order it. In addition, DAACs will produce certain standard and prototype products, for limited geographic areas and time periods, in response to approved requests.

For the instruments, the investigators are responsible for the development and maintenance of the algorithms (science data processing software) for the production of the products. They are also responsible for reviewing the products produced and for providing quality control/validation of the results. Computing facilities at the SCFs provide for the development and testing of algorithms, data calibration and validation, the assessment of data quality, and support of investigator research.

Interdisciplinary Investigators (IIs) will use SCFs in their research. They will obtain various levels of data from the DAACs and will produce additional products for archival and distribution under ECS. Some IIs will undertake standard product generation through the PGSs with responsibilities identical to those for instrument PIs as described above.

Due to the large volume and complexity of the EOS data collection, the ECS will provide the science user community with the capability to effectively locate and order the data required to support research. Information about all aspects of the ECS data will be available from the IMS which provides a single point of contact from which all ECS data can be requested. The IMS will transmit the request to the appropriate DAAC, monitor the response, and provide accounting information. The IMS will provide production status information and information about data and data products.

The IMS will provide user information on ECS data, processing status, science processing software, available data products, and mission descriptions and schedules. It will provide user information searches of ECS metadata and access to other ECS elements and external science data systems from users' home facilities. The IMS will help users form requests for data products, route and track requests, and provide user access to status and accounting information. It will also help form user requests for future data acquisitions and non-routine data processing, will decompose, sequence, and route those requests to the appropriate ECS element, and will provide other electronic library services as necessary.

1.4.2.3 CSMS Operations

The SMC will provide system-wide coordination and tracking of ECS operations and resources. The SMC will ensure that production schedules involving inter-DAAC product dependencies are met. The SMC will provide a source for administrative, security, and accounting management on a system-wide basis, with corresponding administrative, security, and accounting functions at the individual element level.

The ESN will include a high capacity, dedicated communications network, internal to the ECS, that supports ECS operations (e.g., operational transfer of data and products between DAACs required for standard product generation, between a DAAC and an SCF to support operational product Quality Assurance (QA) and validation, or to IST/ICC instrument operations support. The ESN will also provide an interface to the NASA Science Internet (NSI) to connect with users for access to the IMS to locate

and order data sets or request other information and also to provide the path for electronic delivery of requested data to the user. The internal operational network will be isolated from the gateway connections for general user access.

C.1.3 DAAC Activities

1.6.9 DAAC

The Contractor is to install, operate, and maintain the hardware and software at the DAACs necessary for data ingest, product generation, archival, and distribution. DAAC personnel may augment the DAACs outside the scope of this contract. Additionally, each DAAC Project Manager may request the ECS Contractor perform special studies and support by forwarding task requests to the ESDIS Project for approval. The CO/COTR may negotiate transitions of M&O responsibility from the ECS Contractor to the DAAC sites as agreements are established with the DAAC sites.

C.1.4 Government Furnished Facilities, Equipment, and Services

1.7 Government Furnished Facilities, Equipment, and Services

The EOSDIS Facility (see Appendix B) will be provided at GSFC to house the EOC, GSFC ICF, GSFC DAAC, SMC, GSFC ESN components, EOSDIS library, supporting development, and EOS ground system and operations management functions. This facility will provide space for a permanent installation of the GSFC ECS equipment with maintenance and operations (M&O), workstation, and storage spaces. The beneficial occupancy date (BOD) for this building is given in the GFE clause of the contract.

Before the BOD, development and M&O support shall be performed at Contractor-supplied facilities. For initial planning purposes, layout of the Government-furnished building at GSFC and available space are shown in Appendix B, Electrical and Mechanical Requirements & Preliminary Floor Plan for EOSDIS Facility.

Availability dates of DAACs and other facilities not located at GSFC have not been identified, but the ECS Contractor shall assume they are consistent with the Delivery Schedule defined in this contract. The ECS Contractor shall develop and provide facility requirements for each of the DAAC sites. Existing capabilities and facilities at these sites shall be considered in their facility planning.

ECS-developed toolkits will be hosted on user-provided systems, e.g., workstations, FSTs, and SCFs. These user-provided systems shall meet the requirements and standards specified by the Project. The Contractor shall support the definition of these requirements and standards and shall provide toolkits that depend only on the standards. Installation/integration of toolkits is the responsibility of the user; however, the ECS will provide assistance to the users via help services.

The Government will furnish the communications circuits for the ESN backbone and tail circuits. Remaining EOSDIS value-added networking/communications requirements, such as network hardware and software, network management, DAAC LAN support, and other services including user directory and information systems, shall be provided by the

ECS Contractor. The Contractor shall prepare, based on the User Requirements Study (DID 212/SE2), circuit requirements for PSCN and level-of-service requirements for NSI in keeping with schedules for ordering and implementing the circuits in accordance with DID 220/SE1.

C.1.5 ECS Maintenance and Operations

3.8 ECS Maintenance and Operations (WBS 8)

The Contractor shall provide the necessary management and technical resources to direct, control, and perform maintenance and operations (M&O) for the overall ECS. The Contractor responsibility for M&O activities extends to ECS sites and elements at each of the ECS sites and to each of the hardware deliveries and software releases. The Contractor shall be responsible for defining and staffing ECS M&O positions (including management, administrative, engineering, technicians, and operators); defining required prerequisite training and skill, on-the-job training, and formal training, and ensuring that necessary training is accomplished; defining staffing plans and other planning required for a comprehensive maintenance and operations activity. The Contractor shall, as a minimum, perform the M&O tasks defined in the following paragraphs.

The Contractor shall provide M&O personnel at each of the ECS sites to operate and maintain the ECS systems and subsystems (including hardware, firmware, and software) and to perform element, segment, and system functional operations. The Contractor shall provide a level of staffing for maintenance and operations that corresponds to the required support for the different phases, at the specified ECS sites, from development through operational support.

The CO/COTR may negotiate transitions of M&O responsibility from the ECS Contractor to the DAAC sites as agreements are established with the DAAC sites. The Contractor shall support transitions of M&O responsibilities as negotiated, including training of new personnel.

The Contractor shall provide EOS AM operations support per the following table (*Table 3.8-1*) and delivery schedule requirements:

At DAACs supporting pre-EOS AM missions (i.e. LANDSAT 7, TRMM, COLOR), 24H/7D support shall be provided no later than 3 months prior to launch.

Table 3.8-1 Operational M&O (Hours per Day / Days per Week)

	1994	1995	1996	1997	1ST QTR 1998	2ND QTR 1998 to 2002
Pre EOS AM DAAC/ IMS Releases		8 hours per day/5 days per week	12 hours per day/5 days per week	16 hours per day/7 days per week	16 hours per day/7 days per week	
Algorithm I&T		8 hours per day/5 days per week	12 hours per day/5 days per week	12 hours per day/5 days per week	16 hours per day/5 days per week	full operational capability
EOS AM Science Operations					16 hours per day/5 days per week	full operational capability
EOC/ICC			as required	as required	8 hours per day/5 days per week	24 hours per day/7 days per week

3.8.1 ECS Maintenance and Operations Management (WBS 8.1)

The Contractor shall establish an on- or near-site management organization for GSFC ECS maintenance and operations with field offices at each of the other ECS sites. The Contractor is required to establish an organization that is responsive to the requirements of each site. The Contractor shall prepare a Maintenance and Operations Management Plan in accordance with DID 601/OP1 that describes the management system, controls, functions, policies, procedures, and documentation to be utilized in fulfilling the M&O requirements of each site. The Contractor’s M&O team shall monitor the development of the ECS to ensure that the final system and operations plans are compatible and support the overall mission requirements. The M&O team shall ensure that the tools required to perform the maintenance and operations activities are included in the ECS system design and implementation.

The Contractor shall provide the management and administrative resources required at the system, element, and facility levels. Management and administrative activities shall include, but not be limited to, planning, budgeting, accounting, resource management, customer relations, scheduling, and personnel.

The ECS Contractor shall provide the operations support and services necessary to ensure that ECS hardware and software (including COTS) meets required operational capability, for assigned functions and for interfacing with other subsystems and components of the ECS or external systems as required. The Contractor shall arrange for technical support as needed from vendors of computers, mass storage devices, communications equipment, or any other hardware or software installed at the site. General operations support shall include, but not be limited to, the following:

- a. System and subsystem monitoring;
- b. Product assurance and quality assurance functions;
- c. Status reporting;
- d. Logging/archiving/deloggging in support of ECS anomaly analysis and management of ECS operations;
- e. Verifying operational readiness, including performance measuring and monitoring;
- f. Supporting maintenance activities aimed at fault detection and fault isolation;
- g. Logistics support;
- h. Supporting hardware and software testing and installation.

3.8.1.1 Maintenance and Operations Control

The Contractor shall be responsible for the allocation and control of resources and administrative functions including, but not limited to, finance, personnel, logistics access, property management, security, health, and safety which are compatible with local DAAC site policies and procedures. The Contractor shall provide for ongoing personnel management of the maintenance and operations staff throughout the contract lifetime, including personnel administration, evaluation and promotion, recruiting, and staffing. The Contractor shall provide for finance, accounting, and subcontracting in support of M&O throughout the contract lifetime.

3.8.1.2 Property Management

The Contractor shall prepare a Property Management Plan in accordance with DID 602/OP1 and NASA Equipment Management Handbook (NHB-4200.1C) that provides for the control of Contractor and Government property and for a continuous audit trail from receipt of an item until transfer of accountability or disposal. The Contractor shall have property management responsibility for ECS equipment until it has been accepted by the CO/COTR. In addition, the Contractor shall have responsibility for property management of equipment for which they have M&O responsibility. This requirement includes, at a minimum:

- a. Establishing and maintaining records of property;
- b. Reporting untagged controlled equipment to the NASA Property Administrator;
- c. Assisting the NASA Property Manager in the physical inventory of controlled equipment;
- d. Preparing and distributing monthly transaction reports and quarterly property inventory reports;
- e. Preparing required forms when property is transferred, shipped, disposed of, or modified;
- f. Identifying and reporting equipment no longer required;

- g. Continuing surveillance to ensure that equipment is properly used and physically protected;
- h. Training Contractor personnel on their property responsibilities and obligations.

3.8.1.3 Configuration Management

The ECS M&O organization shall provide configuration management and shall work with the ECS Program Management organization to ensure that a comprehensive ECS Configuration Management Plan (DID 102/MG1) and Configuration Management Procedures (DID 103/MG3) are prepared and implemented.

The M&O organization shall provide technical and administrative support to the Contractor's ECS contract-level CCB, including:

- a. Coordinating usage of approved configuration management procedures with elements and external interface configuration management representatives;
- b. Ensuring that changes to the hardware, software, and procedures are properly documented and coordinated;
- c. Assisting in the development and administration of the library with respect to configuration management procedures;
- d. If requested, providing the recording secretary for the Government CCB;
- e. Coordinating RID requests generated during M&O reviews;
- f. Generating CCB monthly reports;
- g. Preparing agendas for and scheduling CCB meetings.

3.8.1.4 Security

In accordance with NASA Management Instruction (NMI) 8610.22 — National Resource Protection Program, the Contractor shall be responsible for the physical security and control of persons working in and visiting his assigned spaces. The EOC shall be operated as a mission critical resource and the balance of the ECS shall be operated as a mission essential resource.

3.8.1.5 Operational Readiness and Performance Assurance

The Contractor shall be responsible for generating and maintaining an Operational Readiness Plan in accordance with DID 603/OP1 that ensures elements are in a state of operational readiness at all times, including preparations for mission launches and sustaining levels of performance of hardware, firmware, software, and personnel for which the Contractor has M&O responsibility. This document shall include the Contractor's plan for managing Operational Readiness Reviews. The Operational Readiness Plan must provide for regular monitoring of M&O activities under this contract and provide visibility to both the CO/COTR and program management. The Contractor's PAIP (DID 501/PA1) shall include coverage of the operational phase activities of the ECS. Requirements of GSFC 420-05-03 pertinent to the maintenance and operation of the system shall be implemented.

3.8.1.5.1 Operational Readiness

The Contractor shall develop, implement, and maintain staffing, training, scheduling, and testing procedures that ensure continuous operational readiness of the elements/sites for which he is responsible. This requirement includes the development of the Staffing Plan section of the Operational Readiness Plan (DID 603/OP1) and ensuring that staffing is provided according to the plan. The Staffing Plan shall include provisions for the gradual build-up for a Flight Operations Team (FOT) that will assume operations of the EOC from the spacecraft contractor approximately three months after the launch or successful checkout, whichever is later.

The Contractor shall establish plans and procedures in the Hardware Readiness section of the Operational Readiness Plan (DID 603/OP1) for ensuring the operational readiness of equipment and facilities.

The Contractor shall establish plans and procedures in the Software Readiness section of the Operational Readiness Plan (DID 603/OP1) for ensuring the operational readiness of software and firmware delivered by the Contractor and accepted by the IATO and for externally developed (non-ECS) software which has successfully passed operational verification and operational testing. The Software Readiness section of the plan shall insure that software and firmware management and configuration management activities are implemented on software and firmware maintenance tasks and shall provide rigorous discipline for deliveries, discrepancy reporting, implementation, and tracking. The plan shall ensure visibility into software and firmware status for both the CO/COTR and program management.

3.8.1.5.2 RMA Program

The Contractor shall continue the tasks of the RMA program throughout the operational phase. The activities shall include performance of analytical tasks to cover any changes made in the system hardware, collection of reliability and maintainability data on the system during its operation, and support of refining and updating maintenance and logistics planning and execution, as required by GSFC 420-05-03.

3.8.1.5.3 Segment Operational Readiness Reviews

Segment Operational Readiness Reviews (SORRs) shall be conducted to determine the readiness of each ECS segment to provide services. These reviews shall be held at segment/element facilities to baseline the functional capabilities, performances, and operational characteristics of each ECS segment. SORRs shall concentrate on operational procedures, human interfaces, and the Operational Readiness Plan (DID 603/OP1).

3.8.1.6 General Support

The ECS Contractor shall provide the operations support and services necessary to ensure that ECS hardware and software (including COTS) meets required operational

capability, for assigned functions and for interfacing with other subsystems and components of the ECS or external systems as required. The Contractor shall arrange for technical support as needed from vendors of computers, mass storage devices, communications equipment, or any other hardware or software installed at the site. General operations support shall include, but not be limited to, the following:

- a. System and subsystem monitoring;
- b. Product assurance and quality assurance functions;
- c. Status reporting;
- d. Logging/archiving/deloggging in support of ECS anomaly analysis and management of ECS operations;
- e. Verifying operational readiness, including performance measuring and monitoring;
- f. Maintenance activities aimed at fault detection and fault isolation;
- g. Logistics;
- h. Supporting hardware and software testing and installation.

The Contractor shall participate in the EOS operations working groups to provide a forum for resolving issues associated with the operation of the ECS.

The Contractor shall be responsible for the effective allocation, general maintenance, and cleanliness of the space assigned to the Contractor within Government-managed EOSDIS facilities and within facilities managed by non-Government agencies or organizations. The Contractor shall be responsible for those items necessary to operate on a day-to-day basis such as transportation and courier services.

3.8.2 Integrated Logistics Support (WBS 8.2)

The Contractor shall provide a systematic and comprehensive engineering/analytical approach in support of program design engineering and system engineering integration through operations. This support, commonly referred to as Integrated Logistics Support (ILS), shall provide for:

- a. Analysis of design characteristics for integration of support considerations into system and equipment design;
- b. Development of support requirements that are consistently related to design and to each other;
- c. Management of support resources acquisition and utilization through the duration of the ECS.

ILS elements shall include maintenance, supply support, support and test equipment, packaging, handling, storage, transportation, personnel, training facilities, technical data and documentation, and ILS management and engineering support.

The Contractor shall prepare and implement an Integrated Logistics Support Plan in accordance with DID 616/OP2 and a Logistics Support Analysis Plan in accordance with DID 617/OP3.

When required by the findings of the Logistics Support Analysis, the Contractor shall prepare a recommended Replacement Parts List and Spare Parts List in accordance with DID 618/OP3 and a Test and Support Equipment Requirements List in accordance with DID 619/OP3.

The Contractor's logistics support shall consider the utilization of existing site capabilities.

The Contractor shall be a member of and support an Integrated Logistics Support Management Team (ILSMT) as established by the Government.

3.8.3 Segment Maintenance and Operations (WBS 8.3, 8.4, 8.5)

The Contractor shall provide maintenance and operations support for ECS hardware, software, and firmware systems delivered under the ECS contract at the ECS sites. The Contractor shall maintain and operate the ECS until the end of the contract or until the transition to the successor M&O contractor(s), which will occur at different times for different ECS sites. The Contractor shall provide a Maintenance and Operations Transition and Training Plan in accordance with DID 621/OP1 for the transition of maintenance and operations to the permanent maintenance and operations organizations and their contractors. The Contractor shall support and facilitate these transitions by providing training, up-to-date documentation, databases, and any special software or equipment procured or developed in support of M&O under this contract.

The ECS M&O team shall:

- a. Operate and maintain the ECS within the system performance specifications;
- b. Perform operations planning and procedures development, testing, and support to design reviews and operations working groups, such as the EOS Mission Operations Working Group (EMOWG);
- c. Operate and maintain the ECS systems and subsystems at ECS sites. M&O support shall be provided for all phases of the contract, including, but not limited to:
 - 1) Development and pre-launch operations, including archival and distribution of pre-EOS data,
 - 2) Launch through early orbit operations,
 - 3) On-orbit operations through contract termination date,
 - 4) Shared and/or coordinated spacecraft operations responsibility with the spacecraft development contractor (approximately L-6 to L+3 months), and
 - 5) Training of and transition of M&O responsibility to successor contractor(s).
- d. Provide flight operations and mission planning support under the direction of the Government MOM and the Project Scientist;

- e. Provide science operations and planning support under the direction of the SOM and the Project Scientist;
- f. Maintain an ongoing interface for operations coordination with the IPs, EDOS, FDF, Ecom, TDRSS, NCC, PSCN, NSI, NASA test and simulations facilities, and other external systems and organizations with which the ECS interfaces;
- g. Provide vendor subcontract management, dispatch services, courier services, and related support;
- h. Prepare and maintain periodic summary reports on the status of hardware, firmware, and software;
- i. Conform to personnel security management policies and directives;
- j. Cooperate with the spacecraft contractor for the planning, training, and operations of the FOT.

3.8.3.1 Development of Maintenance and Operations Material

The Contractor shall provide an ECS Operations Plan (DID 608/OP1) covering each of the ECS segments. The ECS Operations Plans shall describe the way each ECS segment will appear to its users/operators and detail how operational tasks shall be performed.

The Contractor shall provide an Maintenance and Operations Manual (DID 607/OP2). This document shall define maintenance and operations requirements for the system elements and describe how the elements and subsystems shall be operated and maintained, including roles and responsibilities of M&O personnel.

The Contractor shall provide Operator's Manuals for each of the ECS elements in accordance with DID 611/OP3. The manuals shall provide the procedures and information necessary to operate each system element/subsystem.

The operational plans and manuals shall include procedures for handling operational anomalies and post anomaly analysis.

The Contractor shall provide Programmer's Manuals in accordance with DID 612/OP3 for each of the ECS elements. The manuals shall describe programming aspects of the element computers in sufficient detail to support software sustaining engineering.

3.8.3.2 Maintenance

The Contractor shall provide the resources, personnel, tools, hardware, software, and logistics support required to maintain the ECS hardware, firmware, and software. The Contractor shall provide the capability to modify the ECS hardware, firmware, and software to operate under new host operating systems, to accommodate new hardware, and/or other approved system changes. As a minimum, this shall include the ability to:

- a. Maintain, modify, or repair the system hardware and firmware, including testing the item(s) before returning them to an operational state;

- b. Maintain, modify, install, integrate, and test the ECS software;
- c. Maintain, diagnose, install, integrate, and test the COTS software;
- d. Install, integrate, and test investigator software; and
- e. Maintain portability among ECS COTS and developed applications software, databases, tables, and other operations software.

The Contractor shall develop and implement a Maintenance Plan (DID 613/OP1) prescribing policies and procedures to be applied to maintenance of hardware, firmware, and software for which the Contractor has M&O responsibility. The hardware, firmware, and software shall be maintained according to this plan. The plan shall delineate the Preventive Maintenance (PM) for systems/equipment and provide a means for scheduling its accomplishment; provide a system of records to document maintenance, including both PM and corrective maintenance, as well as modifications; specify reports to be provided; provide procedures for configuration control; and specify training requirements and schedules.

The Contractor shall develop preventive and corrective maintenance procedures using STDN 402, System Maintenance Program, as a guideline. The Contractor shall include any state-of-the-art techniques that are developed and/or applicable to the ECS. Hardware maintenance procedures shall conform to NASA, GSFC, and/or other Government agency safety standards.

The Contractor shall develop and document in the Maintenance Plan (DID 613/OP1) policies and procedures for maintaining visibility and control of system problems using trouble tickets or similar mechanisms. The same policies and procedures shall be applied to COTS hardware or software.

The Contractor shall maintain an ECS hardware, software, and firmware documentation library consistent with the needs at each of the ECS sites. This activity shall include the updating or procurement of ECS-related documents (schematics, user or technical reference guides, maintenance manuals, etc.) whenever ECS hardware, firmware, or software is modified or replaced. Updates to documents shall be made in accordance with configuration management procedures.

Facility layout of equipment and work areas including power, electrical, and air conditioning requirements shall be provided and maintained. Installation, administration, and maintenance guides shall be provided for each type of processor, software tool, and application.

The Contractor shall utilize trained and certified M&O personnel to maintain the ECS hardware, firmware, software, and supporting equipment. The Contractor shall provide maintenance subcontracts as needed with vendors of ECS hardware and software. The Contractor shall maintain software licenses with software vendors, the receipt of updates, new releases, etc. The phase-over of maintenance to the successor maintenance contractor shall include the transfer of system and site documentation, test equipment, test tools, site licenses, and related materials.

3.8.3.2.1 Sustaining Engineering

The Contractor shall provide a sustaining engineering function (hardware, software, and firmware) that shall identify and, when directed and approved by the Government CCB, implement needed improvements to the current operational version of the hardware, software, and firmware. These improvements will be identified by science users, operations personnel, the Project, and through analyses and evaluation of ongoing system operations by the sustaining engineering organization. The sustaining engineering function shall include the analyses and identification of ways to accommodate new technologies and new concepts, manage system upgrades and evolution, control and maintain ECS databases, and perform the activities necessary to ensure ECS reliability, maintainability, and availability.

Changes are subject to the configuration management policies and procedures defined in the ECS Configuration Management Plan (DID 102/MG1). The improvements shall be documented and incorporated into subsequent ECS system releases in accordance with the configuration management policies and procedures as part of the ongoing ECS implementation activity.

The sustaining engineering effort shall include, but not be limited to, installation, configuration, and tuning of the ECS software, COTS packages, operating systems, compilers, tools, utilities, networks, and databases.

3.8.3.2.2 Hardware Maintenance

The Contractor shall implement a hardware maintenance program that complies with the ECS availability and performance requirements. Hardware maintenance shall be conducted at each site at a minimum of two levels. First-level maintenance shall be conducted to support the ECS availability requirements by replacement of line replaceable units (LRUs). LRUs include printed circuit cards or other plug-in components, rack-mounted equipment drawers and panels, or other assemblies which can be removed by unplugging power and signal connectors without physically disturbing other LRUs.

Second-level maintenance shall be conducted to restore malfunctioning equipment to serviceable condition when the failure requires unit/element disassembly. Second-level maintenance shall also be required when the fault isolation capabilities of first-level maintenance are incapable of localizing a failure to a line replaceable item within an LRU. Second-level maintenance shall consist of the repair, adjustment, and testing of LRUs removed from service during first-level maintenance actions.

The Contractor shall provide general and special test equipment and other resources to support maintenance of ECS systems and subsystems at all sites. Special maintenance and test equipment shall be used only if COTS equipment is unavailable. The Contractor shall provide a List Of Recommended Maintenance Equipment in accordance with DID 620/OP2 covering standard and special equipment required for maintaining and testing the equipment

before it is returned to operational service. The Contractor shall provide Special Maintenance and Test Equipment in accordance with DID 615/OP2 documentation.

3.8.3.2.3 Software and Firmware Maintenance

The Contractor shall provide for complete software and firmware maintenance, including activities associated with producing, delivering, and documenting the corrections, modifications, and enhancements made to ECS software (including COTS) and firmware, and/or to adapt any COTS software for ECS use. The software and firmware maintenance activities shall include the maintenance and control of software and firmware documentation and configuration management, including change control, configuration status accounting, and quality assurance.

The Contractor shall develop a Software Maintenance Plan in accordance with DID 614/OP1 and maintain ECS software (including COTS) and firmware in accordance with the policies and procedures specified in that plan and in the ECS Configuration Management Plan (DID 102/MG1).

The Contractor shall provide resources, including dedicated equipment and software tools and personnel to perform software and firmware maintenance, testing, and validation to maintain ECS functional, performance, and availability requirements. These resources and plans and a history of maintenance actions shall be provided to the successor contractor.

The Contractor software/firmware maintenance activity shall include services required to produce, deliver, install, test, and document corrections and modifications of existing ECS software and firmware. The maintenance activity shall include software/firmware CM, including change control, configuration status accounting, and software/firmware QA and shall provide software tools for the automation of these functions, including the reporting associated with these functions.

The Contractor shall provide the capability for integration, system testing, and validating ECS software and firmware.

The Contractor shall provide for maintenance of ECS software and firmware final design source code, executable code, and operational versions thereof.

3.8.3.3 Operations

The Contractor shall operate the ECS elements and supporting equipment with trained and certified M&O personnel. The Contractor shall supply sufficient technical and professional support personnel to provide the scientific community with the required assistance in the use of the ECS facilities. The Contractor shall generate and distribute data products in accordance with the system functional and performance specifications and provide system-wide reporting and accounting of operations activities.

The Contractor M&O organization shall provide management staff to perform tasks that include planning, budgeting, accounting, resource management, customer relations, scheduling, and personnel. The Contractor M&O organization shall also provide an operations staff to perform tasks that include the operation of computers and peripheral devices, data and product quality checking and accounting, librarian, and media dispatching, delivery, shipping, disposition and reporting.

3.8.3.3.1 Flight Operations

Flight operations support shall be centralized at the GSFC with interfaces to the external institutional facilities, and the international partner ICCs (for instruments/payloads on the U.S. spacecraft). The Contractor shall staff the FOT located at GSFC FOS. The FOT shall provide mission operations support with technical directives from the NASA MOM and the EOS Project Scientist and/or his deputy provided as necessary. Coordinated spacecraft planning, scheduling, and commanding operations shall be performed by the FOT in accordance with the MOM's policy guidelines and directives. Instrument science planning and scheduling operations, including conflict resolution, shall be performed under the general high level direction and guidance of the Project Scientist or his deputy.

The ECS EOC and ICF shall be operationally ready one year prior to an EOS spacecraft launch.

The Contractor's FOT shall perform operations required at the FOS to ensure that the ECS flight segment achieves the functional and performance requirements of the ECS Specification. These functions include operation of the DAR processing service, the planning and scheduling service, command management service, commanding service, telemetry processing service, spacecraft and instrument monitoring and analysis service, data management service, element management service, and user interface service. The Contractor shall also monitor system performance and perform the fault detection and isolation function.

The Contractor shall coordinate with the spacecraft contractor for functions associated with the spacecraft simulator and spacecraft analysis tools.

The ECS shall provide flight operations support 24 hours a day, seven days a week. The FOT shall provide support to external operational interfaces, and the international partner equivalent flight operations and data handling/ processing systems.

The FOT shall include sufficient technical and professional support personnel to provide the scientific community with needed assistance in the use of the EOS flight operations systems.

The FOT shall provide timely, accurate, and reliable operations support for command and control of the spacecraft and instruments. Spacecraft and instrument safety shall be the overriding factor in flight operations.

Lead responsibility for the operations of a spacecraft will initially be provided by the spacecraft contractor to support launch, starting with a trained and certified core staff at approximately launch minus six months (L-6) through launch plus three months or until satisfactory checkout of the spacecraft and instruments whichever is later. The ECS Contractor shall coordinate and cooperate in flight operations training for the spacecraft contractor. The ECS Contractor shall support the transition of operations from the spacecraft contractor to the ECS Contractor and assume full operations responsibility at approximately three months after a launch. The ECS FOT and the spacecraft contractor FOT shall provide integrated and cooperative operations support through launch plus approximately 3 months. The ECS Contractor shall have the lead responsibility for performing instrument operations after the instruments have been initialized and checked out. This responsibility will be exercised in coordination with the spacecraft contractor and the instrument teams. The ECS Contractor shall support the transition of flight operations from the ECS Contractor to the successor contractor prior to the expiration of the ECS contract.

3.8.3.3.2 Science Data Processing Operations

At each DAAC site, the ECS Contractor shall provide the science data processing operations consisting of the archiving, processing, and information management functions for which it developed the software, hardware, and procedures. The DAAC sites shall also host elements of the distributed SMC and ESN, with coordinating SMC and ESN elements located at GSFC. The science data processing operations, shall accept high level direction and guidance from the SOM.

The Contractor shall provide staff and resources required to achieve required functional and performance capabilities of the ECS science processing segment. The DAAC sites shall be operated 24 hours a day, 7 days a week.

The product generation activities, including processing, reprocessing, ingestion, archiving, and distribution shall be scheduled, monitored, controlled, reviewed, dispatched, and managed by the Contractor's operations staff using the developed ECS capabilities.

The Contractor shall provide product distribution, archive maintenance, systems support, and data housekeeping activities (such as data backup recovery functions).

The Contractor shall provide a Technical Assistance Group (TAG) to assist in access to and use of the ECS, to address user needs (including systems registration, general inquiry, product request, logistics, user accounting, and product acquisition and tracking), and to aid in the use and development of: metadata, subsets of data, numerical methods and tools, vector and parallel processor techniques, visualization and graphics tools, analysis tools, expert systems, data formats, and computing techniques. This organization shall also

support the scientists in testing and integrating their new and modified product generation algorithms into the production environment on the PGS.

3.8.3.3.3 Communications and System Management Operations

3.8.3.3.3.1 Network Operations

The Contractor shall provide staff and resources required to achieve specified ECS network functional and performance capabilities. Network operations shall be provided as a central network management facility at GSFC with supporting operations at all ECS sites, as required. The Contractor shall coordinate operations with external network management and operations organizations including those for Ecom, institutional networks (e.g., PSCN), public networks (NSI), private networks, SCFs, ADCs, ODCs, and IP networks.

The Contractor operations staff shall provide network management functions including planning, performance monitoring, fault detection and isolation, configuration management, reporting, security, and directory and accounting services.

The Contractor operations shall provide network user's support services. Users of the ECS networks will include members of the science community, the EOS Project, ECS operators, SCF, ADC, and ODC operators, sustaining and maintenance organizations, science algorithm developers, and the ECS development team.

3.8.3.3.2 Systems Management

The Contractor shall provide staff and resources required to achieve required functional and performance capabilities of the ECS SMC. System management for ECS shall be performed via the SMC located at GSFC.

The SMC operations shall receive high level direction and guidance from the ESDIS Project. The SMC operations shall execute the EOS mission/science policies, procedures, and directives as well as the ESDIS Project policies, procedures, and directives. The SMC operations monitors the implementation of and adherence to the aforementioned policies, procedures, and directives.

The SMC operations shall perform high-level scheduling, configuration management, performance management, fault management, security management, accounting/accountability, and directory services.

3.8.3.4 Training and Certification

The Contractor shall provide hardware, software, and operations procedure training in at least the following areas:

- a. User training;
- b. Investigator training;
- c. Government manager orientation training;
- d. Operator training for both equipment operations and mission operations;
- e. Maintenance training for ECS hardware, software, and firmware;
- f. ECS security procedures.

The Contractor shall conduct training as necessary during the life of the contract. The training shall be provided, but not necessarily limited, to the following:

- a. The spacecraft contractor FOT;
- b. Users of the ECS, including project personnel, investigators, and instrument teams;
- c. ECS M&O personnel;
- d. Successor contractor personnel;
- e. IV&V personnel;
- f. Government management and technical personnel;
- g. DAAC M&O personnel.

The Contractor shall augment user services during release transitions to provide additional support to users. The schedule of operations during release transitions shall be coordinated so that users do not experience disruption in services or planned activities. The Contractor shall inform users in advance of release upgrades

modifications and schedules. The Contractor shall provide technical assistance support to users.

The Contractor shall provide training for systems and equipment delivered under the ECS contract. The training program shall be accomplished in accordance with the provisions of the Contractor Provided Training Specification (535-TIP-CPT-001). Training policies, plans, and procedures shall provide for an orderly phased transition from initial ECS operating capability through full operating capability into sustained operations and maintenance. ECS training shall prepare EOS personnel, both Government and Contractor, to operate, maintain, and utilize the ECS in the support of EOS missions. ECS training shall include courses in security procedures for ECS operations personnel. For ECS maintenance personnel, ECS training shall include maintenance procedures that support the ECS maintainability and reliability requirements. Training shall be conducted at GSFC and other locations.

The Contractor shall deliver instructor and student training courses and material for use in ongoing refresher and new hire training for Government/user/contractor personnel during the operational life of the ECS contract. The courses and materials shall be updated as necessary to reflect changes to the ECS. The Contractor shall provide training devices, equipment, software, administrative, and facilities support to implement the training program.

M&O positions encompassed by this contract shall require certification that assignees meet standards at an acceptable level of competence before permanent assignment is made. The capabilities required may be obtained by suitable recruiting measures, but many unique factors require formal and/or on-the-job training. The method of training selected shall be based upon the lowest cost per trainee, but shall ensure that performance standards are not compromised. General training shall not be provided under this contract by the Contractor since personnel should have accomplished such training prior to assignment to this contract. Types of training to be provided include:

- a. **Formal Training.** Classroom and laboratory-based training classes that follow instruction plans developed for each course and include written or oral examinations to ensure that the required material has been learned by the students.
- b. **On-the-Job Training.** Proficiency in the operating positions shall be gained primarily through on-the-job training (OJT). Operations instructions and other Contractor-developed or Government-approved documentation and procedures shall be used in providing OJT. Trainees shall be required to perform specified tasks satisfactorily, give adequate response to prepared written or oral questions and work under a certified operator for a specified time to complete OJT. Periodic refresher courses covering security procedures shall be given to ECS operations personnel.
- c. **Self-Study Courses.** Self-study courses shall be developed and used to supplement formal training courses and prepare ECS M&O personnel for certification testing. Courses shall be short in duration (less than 1 week) and

used where the instructional strategy lends itself to a self-study format. They may be used to provide prerequisite training prior to formal or OJT training.

- d. Vendor Training. Vendor training courses for ECS equipment shall be provided to ECS Contractor personnel, IV&V personnel, Government technical personnel, and spacecraft contractor operations personnel, as applicable. The ECS Contractor shall prepare a plan for distribution of vendor training from vendor training credits and from purchased training. This plan shall be submitted to the CO/COTR for review and approval.
- e. Cross-Training. Cross-training may be used for training of persons already certified in one position to prepare them for certification in another position. Cross-training will be a combination of other types of training and shall be tailored to avoid duplicating training in knowledge or skills already possessed by the trainee.

3.8.3.4.1 Certification Program

The ECS M&O certification shall ensure that an acceptable level of proficiency is achieved by personnel prior to being assigned to work in defined operations or maintenance positions. The Contractor shall produce an M&O Certification Plan in accordance with DID 626/OP1 for CO/COTR approval, designed to ensure that acceptable levels of proficiency are achieved by ECS maintenance and operations personnel. The plan shall include the procedures and examinations which shall be required to achieve certification for each operations or maintenance position.

3.8.3.4.2 Development of Training Material

In accordance with the ECS Training Plan in accordance with DID 622/OP2, the Contractor shall define the types of training to be performed, training class plans, student requirements, and similar material. The Contractor shall determine the total ECS maintenance and operations training requirements and provide an overview for each ECS element.

The Contractor shall provide the Training Material (DID 625/OP3), as approved by the CO/COTR, needed to administer the training courses for each ECS element. ECS training material and equipment shall be prepared or otherwise provided in accordance with Contractor Provided Training Specification (535-TIP-CPT-001). The course material shall be modularized and individualized, and shall use multimedia learning resources including manuals, study guides, workbooks, audio-visual materials, and interactive computer-aided instruction and/or computer based training. Training documentation shall be developed and configured to be compatible for direct electronic interface/interchange with the Standard for Automated Interchange of Mission Operations & Data Systems Directorate Technical Information 500-TIP-2601.

The Contractor shall provide science user/investigator on-line training. A Science User's Guide and Operations Procedures Handbook shall be developed

in accordance with DID 205/SE1 to enable remote users to access ECS Services by signing-on from terminals at their home institutions.

3.8.3.4.3 Conduct of Training

The Contractor shall provide training using the training plans and training material developed for this purpose. The major objective in training shall be the preparation of M&O personnel for becoming certified in operations and maintenance positions and the preparation of users of the ECS to effectively utilize the system. In this context, "users" include science investigators or operators of other non-ECS EOSDIS elements who will interface with or directly utilize the ECS.

During the development phase of the ECS, preliminary training courses shall be conducted to prepare Government, IV&V contractor, ECS Contractor, and other personnel for integration and test of the ECS. The curriculum of the preliminary training courses may be different from that of subsequent M&O training courses. The Contractor shall make student positions in vendor training courses available to Government, IV&V contractor, and other personnel to supplement the preliminary training courses.

As a minimum, the following training courses shall be provided:

- a. Preliminary Training Courses . A preliminary training course for Contractor M&O personnel, for IV&V personnel, for Government technical and contract support personnel, and for spacecraft contractor operations personnel shall be conducted at the Contractor's facility early in the integration and test phase of the contract. This training course shall prepare these persons to assist in subsystem and system tests and perform the maintainability demonstrations. Additional preliminary training courses shall be conducted prior to installation of new Releases and shall be conducted on-site at the ECS facilities where the new Release will be installed.
- b. Vendor Training Courses. The Contractor shall arrange training courses to be conducted by vendors of COTS hardware and software, where the vendors offer such training as a standard product. The ECS Contractor shall make available positions for Government technical and IV&V personnel for hardware and software training on purchased equipment at the vendor's facilities or other location agreeable to the CO/COTR.
- c. Final M&O Training Courses. Final M&O training courses shall be conducted as necessary to provide trained and certified Contractor personnel for those positions for which the Contractor has M&O responsibility. Training shall also be conducted by the Contractor at the facilities prior to the transition of M&O responsibility to the permanent M&O contractor at each facility. A copy of training material shall be provided for retention and use by the facility and the permanent M&O contractor.

- d. Science User Training. Science user training shall be conducted as necessary to familiarize science users with ECS services, the interface software toolkits provided, and increased capabilities available in new ECS releases. As a minimum, the Contractor shall provide this training at the DAAC sites.
- e. Training for spacecraft flight operations personnel. Training for spacecraft flight operations personnel shall be provided as stated elsewhere in this SOW.

3.8.3.5 Planned Upgrades

The ECS Contractor's M&O organization shall support and participate in planning and implementation of upgrades to the ECS. These upgrades may be the result of:

- a. Installation of planned system capacity growth for increases in computational power, data storage capacity, communications capacity, etc.;
- b. Installation of system capacity expansion required due to growth of system capacity requirements beyond original performance estimates;
- c. Replacement of obsolete, out-of-date equipment, unacceptably expensive to maintain identified by the Annual Capabilities, Requirements, and Technology Report (DID 204/SE3);
- d. New releases of COTS.

C.2 DAAC Strategic/Management Plan Roles and Responsibilities

The following material has been copied from Section 3 of the DAAC Strategic/Management Plan. The context is provided by the tabular material, the Roles and Responsibilities Matrix, which summarizes the roles and responsibilities of the Project, DAACs, ECS Contractor and science community. The following excerpts contain the introductory material from the relevant sections in the document.

C.2.1 System Development

3.1 System Development

System development includes all development of systems to be operated by the DAACs, which include the ECS and DAAC-unique extensions to the ECS, such as stand-alone product generation systems (e.g. RADARSAT at ASF) that are interfaced to the ECS, a standalone archive (e.g. a former Version 0 archive subsystem or off-line archive of less active data) as well as DAAC-unique features (e.g. an information management service extension tailored to a DAAC's discipline community) added to the DAAC's ECS configuration. DAAC-unique extensions may not compromise system-wide, ECS or DAAC performance requirements. The ECS must meet DAAC operational requirements for ingest, archive, catalog, and distribution of data from ongoing missions flowing from DAAC-unique systems (again, e.g. the RADARSAT products at ASF) to the ECS. The Version 0 Interface Requirements Document (IRD) and its successor, the DAAC-Unique IRD, describe these interfaces in general terms. Specific Interface Control Documents (ICDs) will be developed for each DAAC to identify and describe in detail each interface (such as between the Radarsat SAR processor and the ECS) at each DAAC. Those interfaces that will be active during the Version 0 period at each DAAC will fall under the Version 0 IRD - those that remain active will be migrated to the DAAC-Unique IRD, and ICD's describing new post-Version 0 interfaces will be covered by the DAAC-Unique IRD.

C.2.2 System Testing

3.2 System Testing

This item includes testing and acceptance of ECS deliverables and DAAC-unique extensions.

C.2.3 System Management

3.3 System Management

System management includes configuration management, of ECS hardware and software, DAAC-unique extensions to the ECS, any system-wide extensions to the ECS, and the organization of data and metadata.

System management also includes setting priorities for processing.

C.2.4 System Maintenance

3.4 System Maintenance

System maintenance includes hardware repairs, software debugging, and sustaining engineering (enhancements to a current release that improve functionality or performance).

System Development Roles and Responsibilities Matrix (8/4/94)

Function	ESDIS Project	DAACS	ECS Contractor	Science Community
System Development	<ul style="list-style-type: none"> • Overall management with support of the DAACs (through participation in Focus Teams, ECS performance evaluation process, evaluation of ECS prototypes, EP's, releases, and ongoing coordination with DAAC Systems Manager) • Budget allocation 	<ul style="list-style-type: none"> • Development and integration of DAAC-unique extensions • DAAC prototyping • Aid project in ECS development management (e.g., Focus Teams and participating in and evaluating ECS prototypes, etc.) 	<ul style="list-style-type: none"> • Continuing development of ECS releases • Perform prototyping of ECS elements, at DAACs to take advantage of operational environment/ experience as appropriate 	<ul style="list-style-type: none"> • Participate in planning, conducting, and evaluating DAAC and ECS prototypes • Participate in defining requirements for, planning and evaluation of ECS (including toolkits) and DAAC-unique elements, including recommendations for upgrades/ changes

System Testing Roles and Responsibilities Matrix (8/4/94)

Function	ESDIS Project	DAACS	ECS Contractor	Science Community
<p>System Testing</p> <ul style="list-style-type: none"> • ECS deliverables • DAAC-unique extensions 	<ul style="list-style-type: none"> • Manages overall test strategy Ecom, EDOS, IV&V, ECS, DAAC • Approves DAAC test plans and any IV&V support required • Overall ECS acceptance (contingent upon DAAC concurring recommendation of acceptance by DAAC) 	<ul style="list-style-type: none"> • Reviews ECS and IV&V test plans, witness testing, and provides assessment to Project • Develops test plan for key system functions from DAAC perspective (complementing ECS and IV&V test plans) • Performs (or guides ECS contractor and/or IV&V contractor in performing) DAAC tests of ECS • DAAC recommends acceptance by Project of ECS deliverables • Performs DAAC-unique functions integrated with ECS system 	<ul style="list-style-type: none"> • Performs ECS testing • Supports IV&V and DAAC testing 	<ul style="list-style-type: none"> • Participate in testing of ECS and DAAC-unique extensions (e.g., testing of user interfaces from “user perspective”)

System Management Roles and Responsibilities Matrix (8/4/94)

Function	ESDIS Project	DAACS	ECS Contractor	Science Community
<p>System Management</p> <ul style="list-style-type: none"> • Configuration Management <ul style="list-style-type: none"> - ECS hardware and software - Extensions to the ECS (system-wide and DAAC-unique) - Data and metadata organization - Processing priorities 	<ul style="list-style-type: none"> • System-wide configuration management • Manages system-wide extensions • Approves local DAAC extensions • Establishes user service, data products, processing requirements for DAACs with DAAC inputs • Directs ECS system-wide monitoring and control functions 	<ul style="list-style-type: none"> • Local ECS configuration management, with Project review • Proposes DAAC-unique extensions • Implements approved DAAC-unique extensions without compromising system and DAAC performance requirements • Configuration management of DAAC-unique extensions • Configuration management of data holdings • Manages DAAC to meet requirements 	<ul style="list-style-type: none"> • Performs accounting and system monitoring functions • Configuration management of ECS environment (including metadata supporting cross-DAAC IMS functions) coordinated with DAAC to protect DAAC operations 	<ul style="list-style-type: none"> • Provide advice, recommendations to Project, DAACs re system management via Data Panel, DAAC UWG's, etc.

System Maintenance Roles and Responsibilities Matrix (8/4/94)

Function	ESDIS Project	DAACS	ECS Contractor	Science Community
System Maintenance <ul style="list-style-type: none"> • Hardware repairs • Software debugging • Sustaining engineering 	<ul style="list-style-type: none"> • ECS contract management • Prepare overall maintenance strategy with DAACs • Coordinate maintenance scheduling across DAACs 	<ul style="list-style-type: none"> • Day-to-day technical guidance of ECS • Maintenance and sustaining engineering of DAAC-unique functions • Modification of DAAC-unique functions to work with new ECS releases • Schedule maintenance (subject to inter-DAAC conflict resolution) • Hardware maintenance as cost effective 	<ul style="list-style-type: none"> • Performs software maintenance <ul style="list-style-type: none"> - Within contract scope, terms, and conditions - Within cost plan - Raises issues to ETM for DAAC operations, DAAC manager • Performs ECS sustaining engineering • Hardware maintenance as cost effective 	

C.2.5 Operations

3.5 Operations

Operations includes routine data reception, product generation, cataloging, archiving and distribution, and reprocessing by the ECS and all DAAC-unique operations. Data reception includes receiving and storing level 0 data from EDOS/ECOM, receiving products from other DAACs required for local product generation, receiving auxiliary data from other U.S. and international agencies, and receiving special products and metadata from SCFs.

Operations also includes system administration and accounting.

C.2.6 User Support

3.6 User Support

User support includes support to all users, including scientists and others accessing EOSDIS data and information services, and to investigator teams developing science software for DAAC product generation. User support will span novice to expert levels and address system functions and interfaces (e.g., API's available to users),

characteristics, processing algorithms, format, calibration, quality, and use of data and products available from EOSDIS.

C.2.7 Science Software Development, Integration, and Test

3.7 Science Software Development, Integration ,and Test

This category includes the full range of activities involving development of science software by EOS investigators, integration of this software into the DAAC production environment, and testing of the integrated science software and verifying its readiness for operational product generation.

This category also includes development and test of non-EOS science software for operational product generation by DAACs outside of the ECS.

Operations Roles and Responsibilities Matrix (8/4/94)

Function	ESDIS Project	DAACS	ECS Contractor	Science Community
<p>Operations</p> <ul style="list-style-type: none"> • Routine processing, cataloging, archiving, and distribution • Reprocessing • System administration and accounting 	<ul style="list-style-type: none"> • Establishes system-wide performance requirements based on program guidance, inputs from science community, in consultation with DAACs • Establishes operations resources at DAACs based on DAAC inputs • Coordinates operations, reprocessing, system administration, and accounting across DAACs, monitors inter-DAAC data flows 	<ul style="list-style-type: none"> • Manages day-to-day ECS operations in response to requirements within cost plan, raising issues to DAAC System Manager (becomes "Performs" after transition of responsibility to DAACs) • Perform all non-ECS operations • Advises Project on reprocessing needs • Maintains locally-required system administration/ accounting 	<ul style="list-style-type: none"> • Performs DAAC based and other ECS operations (changes to other than DAAC based after transition of responsibility to DAACs) <ul style="list-style-type: none"> - Within contract scope, terms and conditions - Within cost plan - Raises issues to ETM for DAAC operations and DAAC manager • Provides operations training to DAAC operations staff in preparation for transition • Responsibility for performance of operations transitions to DAACs, schedule TBD • Provides on-going operations training to DAAC operations staff for ECS release after operations transition 	<ul style="list-style-type: none"> • Establish processing, reprocessing priorities (for EOS and non-EOS product generation) via IWG, UWG's via processes coordinated by EOSDIS Project Scientist

User Support Roles and Responsibilities Matrix (8/4/94)

Function	ESDIS Project	DAACS	ECS Contractor	Science Community
<p>User Support</p> <ul style="list-style-type: none"> • Novice to expert levels • System functions • Algorithms/data • Algorithm integration support • System interfaces 	<ul style="list-style-type: none"> • Establishes user support resources for DAAC based on: <ul style="list-style-type: none"> - DAAC inputs on user needs - Project budget constraints 	<ul style="list-style-type: none"> • Provides all user support to scientists and other users of DAAC data and information services, including those supported by the ECS • Provides day-to-day guidance of ECS contractor activities within contract scope and cost plan to ECS on-site manager 	<ul style="list-style-type: none"> • Provides training and technical support to DAAC user services and operations personnel, in areas including: <ul style="list-style-type: none"> - System functions - System interfaces (e.g., networks, Applications Program Interfaces) - Algorithm integration - Toolkits 	<ul style="list-style-type: none"> • Provide (to Project, DAACs) feedback, advice, recommendations on DAAC user support services via DAAC UWG's, IWG, individually

Science Software Development, Integration, and Test Roles and Responsibilities Matrix (8/4/94)

Function	ESDIS Project	DAACS	ECS Contractor	Science Community
Algorithm/ Science Software Development, Integration, and Test	<ul style="list-style-type: none"> • Manages science software development process with DAAC support • Manages overall delivery of science software to the DAACs • Manages development of ECS toolkits • Coordinates overall algorithm integration and testing • Manages I&T of initial representative algorithm set with DAAC support • Manages quality assurance of science software • Manages QA of EOS products by SCF's 	<ul style="list-style-type: none"> • Directs (performs after transition) science software integration and testing supported by ECS contractor at DAAC site, coordinates with Project • Advises Project on science software development, software development of toolkits, QA of science software • Develop DAAC-unique products to be generated on DAAC-unique PGS, with science involvement • Advises Project on reprocessing needs • Acceptance of integrated science software • Manages DAAC QA of EOS products • Maintain/ update science software if/when science developer defaults, with approval of Project, Project Scientist 	<ul style="list-style-type: none"> • Provides technical support for toolkits • Supports science software development under DAAC guidance • Provides support to DAAC personnel in integration and test of science software 	<ul style="list-style-type: none"> • Develop EOS science algorithms and science software, including science QA procedures • Deliver science software to produce EOS Standard Products to DAACs for integration into DAAC PGS • Perform validation and science QA of EOS and DAAC-unique products

C.2.8 Science Data Planning

3.8 Science Data Planning

This category includes data set baseline definition and management as described in detail in section 5.3.

Science Data Planning Roles and Responsibilities Matrix (8/4/94)

Function	ESDIS Project	DAACS	ECS Contractor	Science Community
Science Data Planning	<ul style="list-style-type: none"> Maintain, in cooperation with the DAACs, under configuration control the system-wide EOSDIS data baseline, including EOS data and products (guided by the IWG) and non-EOS data and products (based on DAAC inputs) Edit and publish the annual Science Data Plan, containing a snapshot of the EOSDIS data and product baseline 	<ul style="list-style-type: none"> Maintain under configuration control the DAAC-unique data and product baseline 	<ul style="list-style-type: none"> Support data planning by the Project and DAACs (e.g., by providing information concerning costs, media required, etc.) 	<ul style="list-style-type: none"> Through process coordinated by the EOS and ESDIS Project Scientists, the IWG develops and maintains the EOS data and product baseline Through a process coordinated by the ESDIS Project Scientist, the DAAC UWGs set priorities for, and recommends level of service for, non-EOS data and products to be held by the DAACs

C.2.9 Transition of Responsibilities from ECS Contractor to DAACs

Appendix B -- Management and Performance of DAAC ECS Operations

...

B.1 Guiding Concepts

The division of roles and responsibilities between the Project, DAACs, and ECS Contractor and the specifics of the plan to transition responsibility for performing operations to the DAACs must satisfy two conditions: the integrity of the ECS as an integrated system must be preserved, and the ECS must be operated as an integrated system meeting overall system mission requirements.

B.1.1 Preserving ECS System Integrity

...

ECS configuration management will be distributed, with DAACs having responsibility for local configuration management but subject to review by a Project level configuration management process to ensure that actions taken locally do not create a system level problem or do not create a problem with integration of future ECS deliveries. Database administration will be made a DAAC responsibility but will be part of the DAAC configuration management and Project level review.

ECS sustaining engineering and software maintenance will not be transitioned, given the commonalty of software across the system. ...

B.1.2 Assuring that ECS Will be Operated as an Integrated System

Because all ECS SDPS operations (post transition) will be performed by the DAACs, the ESDIS Project must have a means of monitoring overall ECS performance to see that system-wide as well as DAAC specific performance requirements are being met. The ECS SMC will provide this capability. In support of this monitoring, the ECS Contractor's Performance Analysts positions will not transition. ...

B.2 DAAC by DAAC Approach to ECS Operations

The DAACs are different, each unique in its own way, in terms of its institutional history and its EOS mission. ...

The planning for transition of responsibility for performing operations from the ECS Contractor to the DAACs must take into account the differing roles or phasing of implementation of EOS roles of the DAACs.

a. GSFC

GSFC is the most complex and biggest operation; the primary nexus for dependencies which will not be fully in play until AM-1 operations begin (even though GSFC will have a TRMM role). In order to maintain an ECS Contractor responsibility for operability of ECS, a continuing responsibility for ECS operations at the GSFC DAAC is planned, with an explicit delegation of the needed degree of COTR authority to the GSFC DAAC manager.

b. EDC

The EDC DAAC will not be fully functional until the start of AM-1 operations. Thus a transition of responsibility for performing operations from the ECS Contractor to the EDC DAAC will be made after successful completion of the Assessment Period after AM-1 launch.¹⁵

¹⁵ Defined in Section B.1.2 as “ ... four months after the start of genuine operations (after full scale post-launch operations, which may commence three months after launch depending on the actual mission plan involved).”

- c. LARC
Langley will be fully functional (product generation, cataloging, archiving and distribution) with TRMM operations, which include sufficient inter-DAAC operations to adequately test the overall system capability. Thus a transition of responsibility for performing operations from the ECS Contractor to the LARC DAAC will be made after successful completion of the Assessment Period after TRMM launch.
- d. MSFC
MSFC will follow the LARC model, given the analogous MSFC role for TRMM.
- e. ASF
ECS operations at ASF do not involve any production dependencies with other DAACs. ASF will receive no EOS platform data. Information management interoperability is the key system-wide requirement. ASF also has an agreement of long standing with NASA to have operations responsibility. ASF will provide operations staff that, with training and technical support from the ECS contractor, will operate the ECS elements at ASF from the outset, with no transition. ...
- f. JPL
JPL will have no EOS instrument role until the ADEOS-2 SEAWINDS launch, which is beyond the maximum ground rule. JPL will provide operations staff that, with training and technical support from the ECS contractor, will operate the ECS from the outset, with no transition. ...
- g. ORNL
ORNL has no EOS platform responsibility, and no other flight project support responsibility. ORNL will provide operations staff that, with training and technical support from the ECS contractor, will operate the ECS from the outset, with no transition.
- h. NSIDC
NSIDC will not receive level 0 data, but will have AM-1 Level 2 and 3 product generation responsibilities and will be totally dependent on operational interactions with other DAACs who will provide Level 1 EOS data to NSIDC. Thus a transition of responsibility for performing operations from the ECS Contractor to the NSIDC DAAC will be made after successful completion of the Assessment Period after AM-1 launch.
- i. SEDAC
SEDAC will receive ECS information management service software that will support interoperability of SEDAC with the other DAACs and technical

assistance in installation of this software in the SEDAC environment. SEDAC will adapt/interface this software with other SEDAC systems as needed.

B.3 Operations Position Analysis

...

In all cases, where a position transition, the ECS contractor must provide required training, including on-the-job technical support continuing after the transition as needed.

B.3.1 Prime Shift Positions

The following positions should be provided by the DAACs from the outset (i.e., should not be part of the ECS Contract): Security

The following positions do not transition from the ECS Contractor to the DAACs (but may be wholly or partially redefined as described in the comments that follow): ECS Site Manager, Secretary/Administrator, Property Management, Operational Readiness and Performance Assurance, Performance Analyst, ECS System Quality Assurance, Resource Controller, Algorithm Integration and Test Support, Sustaining Engineering, Software Maintenance, System Testing.

The following positions do transition: Quality Assurance, Logistics Manager, ILS Analyst, Algorithm Development Support, Operations Supervisor, Production Scheduler, Data Base Administrator.

In all cases, it should be noted that especially at the smaller DAACs one person may perform more than one of these “positions”. They do not map one to one to a staffing requirement.

Some specific comments follows:

- a. Security: Should from outset be provided by DAAC security personnel, where DAAC capabilities and procedures provide sufficient security of personnel, facilities, and equipment as required by the ECS contract.
- b. Logistics Manager: This position transitions to the DAAC for all operational requirement, otherwise ECS support continues for those requirements unique to continued ECS maintenance responsibility (spares procurement, etc.).
- c. ILS Analyst, Equipment Support Representative, Inventory Clerk, Site ILS Support: As above, post transition, limit to logistics required to support Hughes maintenance responsibility.
- d. Algorithm Integration and Test Support: This position does not transition, but is redefined to be technical support to DAAC staff. Interfacing with users on access to the ECS is a DAAC responsibility; this position will support the DAAC staff.

- e. Algorithm Development Support: This position should be redefined as technical support to DAAC staff, and transition to DAAC.
- f. Sustaining Engineering: This position does not transition, it is essential to preserving the integrity of the overall ECS as an integrated system, but DAAC personnel must participate in analysis of requirements, problems, anomalies, and formulation of recommended solutions.
- g. Performance Analyst: The Performance Analyst at each DAAC uses the LSM to monitor local system performance and participates with the SMC Performance Analyst in monitoring overall ECS system-wide performance. The analysts will alert DAAC and/or Project management to circumstances that may require coordination between DAACs, possibly with Project participation.

B.3.2 Shift Positions

The following positions do not transition from the ECS Contractor to the DAACs (but may be wholly or partially redefined as described in the comments that follow): DAAC Assistance.

The following positions do transition: Hardware Equipment Maintenance (as cost effective), QA/Production Monitor, Data Ingest Technician, Archive Manager, Data Distribution Technician and Mail Clerk, Computer Operator, Ground Controller, Data Specialist.

Some specific comments follow:

- a. Hardware Equipment Maintenance: One year after launch of the AM1 platform, transition to DAAC if ESDIS Project, DAAC, and ECS Contractor agree that this is most cost effective.
- b. DAAC Assistance: This position, previously called “User Assistance”, is redefined to be technical support to DAAC user services personnel.

Appendix D. Customer/Contractor Integrated Organization Concept

Section 3 describes an organizational concept in which ECS establishes its organization in parallel with the host center's organization. For example, each DAAC is assumed to have an existing organization under the leadership of the DAAC Manager. The ECS organization is structured to parallel the DAAC's organization, but under the control of the ECS On-Site Manager. While coordination and cooperation between the two organizations occurs at all levels, the DAAC Manager works through the ECS On-Site Manager to institute policies, procedures, and tasking.

This section provides an integrated alternative that can be used at the DAACs, SMC and/or EOC. This alternative has the advantage of shortening the lines of communication from the host organization manager to the ECS individual who will respond. It may also reduce the number of managers and supervisors by integrating the two organizations.

From an ECS Contractor perspective, however, it has one significant disadvantage. The ECS contract requires the Contractor to perform specific tasks and meet specific functional and performance requirements. In particular, paragraph H.30 of the contract states:

H.30 TOTAL SYSTEM PERFORMANCE RESPONSIBILITY

- (a) By executing this contract, the Contractor agrees to assume total system performance responsibility (TSPR) for the ECS in accordance with the requirements of the specifications set forth in Section C. Such specifications set forth the performance requirements of the ECS.

Accordingly, notwithstanding any conflict or inconsistency which hereafter may be found between achievement of the aforesaid performance requirements and adherence to the Contractor's proposed design for the ECS, the Contractor hereby warrants that the ECS to be delivered hereunder shall meet as a minimum the performance requirements as delineated in said specifications.

- (b) The Contractor's responsibilities for TSPR are as follows:
- (1) Be responsible for the implementation of a fully operational ECS in accordance with the performance requirements specified in the specifications set forth in Section C; and,
 - (2) Be responsible for the installation, integration, and operation of any Government-furnished property into the ECS.

(End of clause)

Should ECS have difficulty satisfying this contractual requirement, it may be necessary for an ECS Manager to directly task ECS employees for extended periods rather than work through the host organization's management chain.

However, the remainder of this section assumes:

- The host organization desires an integrated team approach; and
- Issues such as the TSPR can be overcome.

D.1 ECS Maintenance and Operations Office

The ECS M&O Office, shown as Maintenance and Operations in Figure D-1, is integral to the ECS Contractor's project office. Integration with its Customer counterpart, the ESDIS Project Office is not feasible.

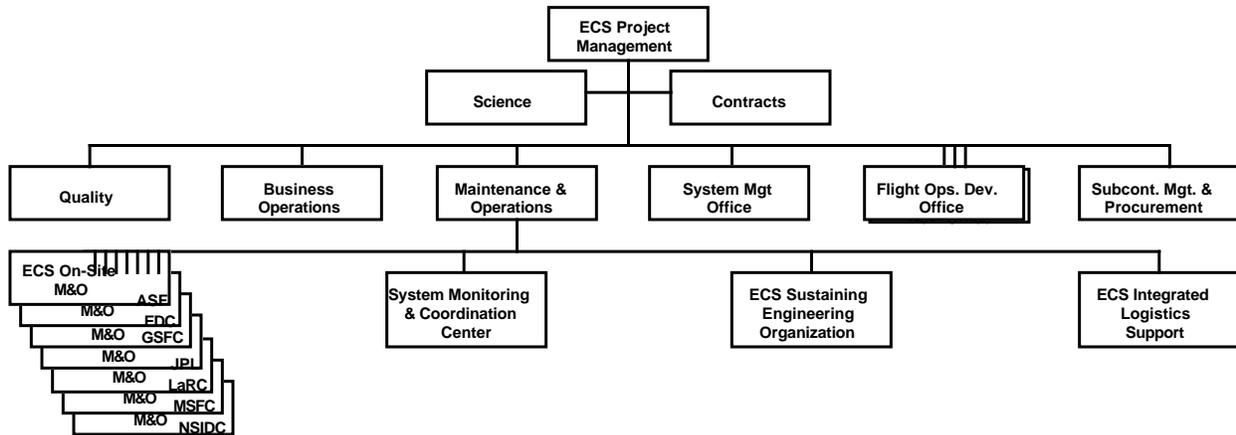


Figure D-1. ECS Contractor Project Office

The Maintenance and Operations Office is composed of M&O management and support personnel as well as the ECS organization managers at the DAACs SMC, and SEO as shown in Figure D-2. EOC M&O is part of the FOS Development Office.

D.2 Distributed Active Archive Center ECS On-Site Maintenance and Operations

ECS provided functionality and capacities varies from DAAC to DAAC, and over time. Functionality is driven by the ECS SOW and EOSDIS Core System (ECS) Requirements Specification. For example, Product Generation System (PGS) resources are not provided at ASF and ORNL. Capacities are driven by Appendix C of the Specification¹⁶ which specifies the platforms and instruments processing and data storage volumes. In addition, the ECS On-Site organization may evolve from the parallel structure described in Section 3.2 to this organization, or tailor the two approaches to meet local needs.

Figure D-3 shows the ECS On-Site organization chart that supports integration of ECS personnel into the DAACs' organizations. A "matrix" organization is established at each DAAC. Personnel supervision and administration is performed by the ECS On-Site project office. Technical direction of ECS personnel is provided by the integrated DAAC organization.

¹⁶ Technical analyses may be based on other product sets.

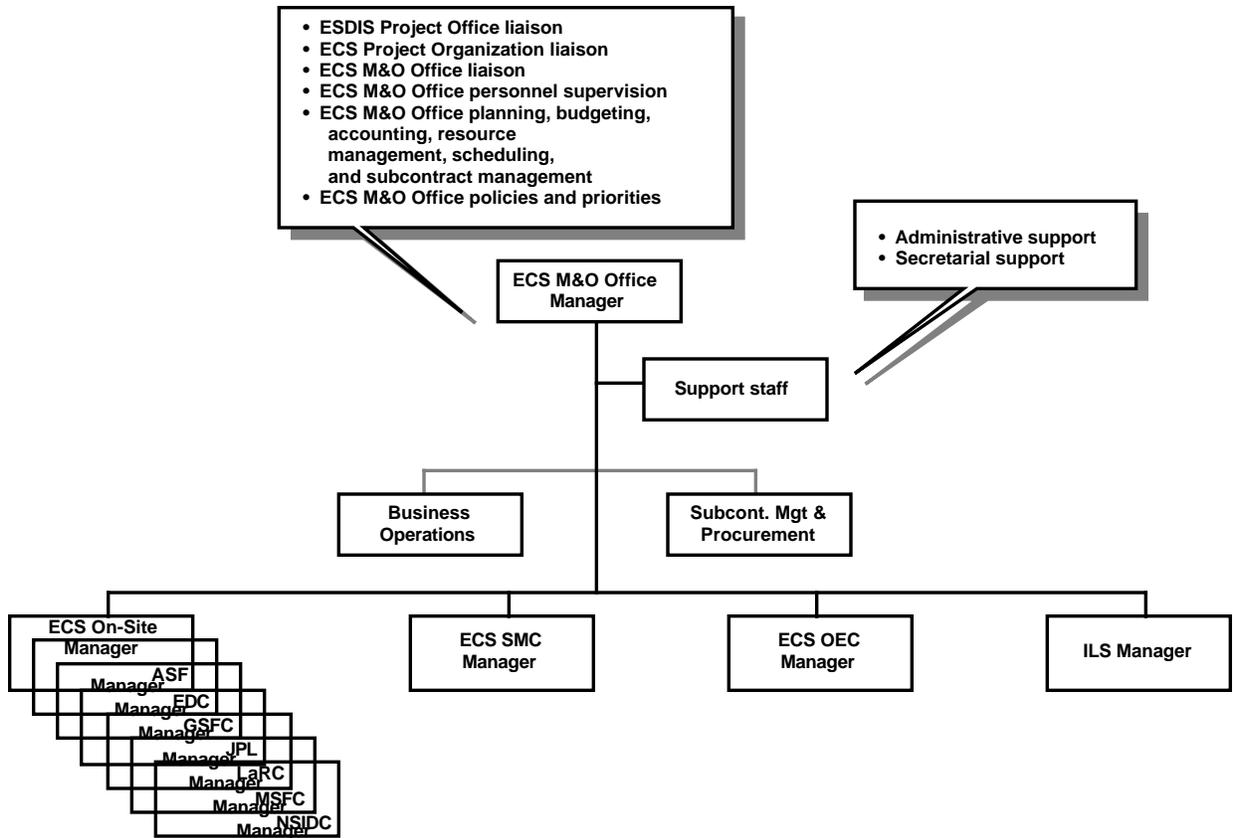


Figure D-2. ECS Maintenance and Operations Office Organization

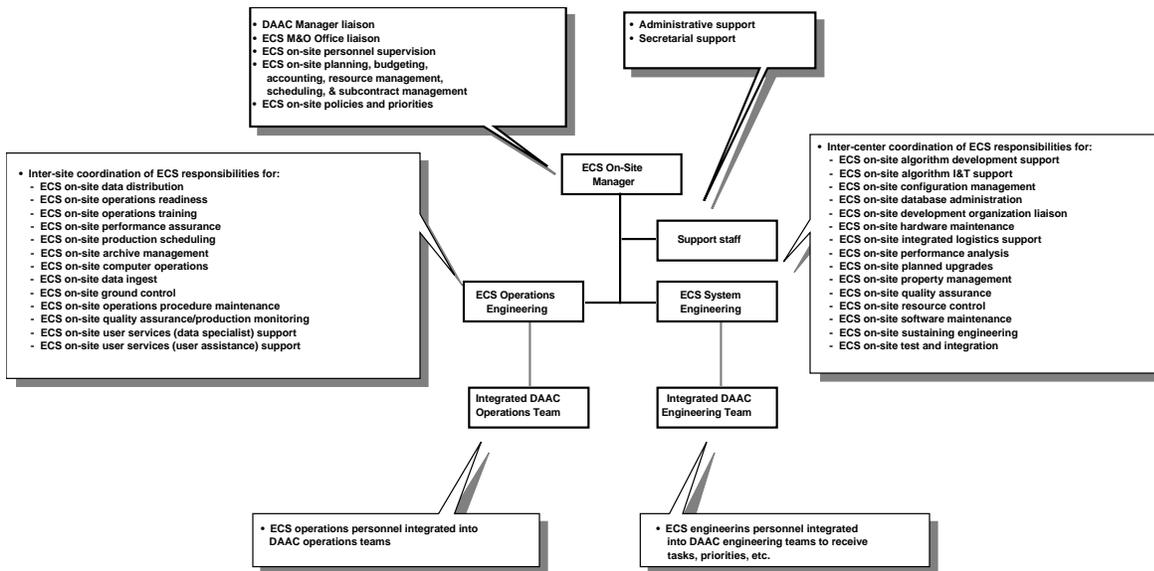


Figure D-3. ECS On-Site Project Office Organization

The following sections assume that non-ECS personnel staff key positions for operations and engineering. These personnel are assumed to provide technical direction to ECS personnel that:

- Reflects the policies and priorities of the DAAC Manager, and
- Is consistent with the ECS SOW and funding.

In the event a member of the ECS staff provides the technical direction function for the DAAC Manager, those duties must be consistent with the ECS SOW and funding.

D.2.1 ECS On-Site Manager Functions

ECS On-Site Manager provides liaison with DAAC management and staff to ensure that ECS Contractor staffing (both number of individuals as well as skill mix) at the DAAC is consistent with the DAAC Managers' priorities, the ECS Contract SOW, and ECS Contract funding. ECS On-Site Management also represents the concerns of the DAAC's management within ECS to ensure that issues are properly identified and prioritized.

The ECS On-Site Manager has the following major functional responsibilities:

- DAAC Manager liaison — provide a point of contact to the DAAC Manager and staff on all ECS On-Site M&O organization performance and staffing activities;
- ECS M&O Office liaison — provide management liaison to ECS M&O Office staff including ECS staff at other DAACs, the SMC, the EOC, the SEO, the parent ECS M&O organization, and development and support organizations;
- ECS On-Site personnel supervision — provide tasking, hiring, termination, time keeping, promotions, performance appraisals, salary adjustments, discipline, etc.,
- ECS On-Site planning, budgeting, accounting, resource management, scheduling and subcontract management — provide financial management and reporting on the ECS On-Site M&O organization; and
- ECS On-Site policies and priorities — ensure that ECS On-Site personnel are performing in accordance with ECS policies and priorities as driven by DAAC needs; ensure that company, ECS, DAAC and/or Building 32, procedures and policies (including, but not limited to, finance, personnel, logistics access, property management, security, health, and safety) are properly followed.

Figure D-3 shows a support staff providing the following functions:

- Administrative support — support personnel administration; support planning, budgeting, accounting, resource management, scheduling and contract management activities; and
- Secretarial support — provide typing, filing, expense reports, mail distribution, meeting scheduling, etc.

Figure D-3 shows an ECS Operations Engineering function that provides:

- Local engineering and coordination of ECS operational issues — collect operational issues, requests, requirements, priorities, etc.; work with DAAC operations organizations

to support effective and proper tasking of ECS Contractor employees; monitor ECS employee performance; and

- Inter-site coordination of all ECS operations functions — represent DAAC operational issues within ECS.

Figure D-3 also shows and ECS System Engineering function that provides:

- Local engineering and coordination of ECS engineering issues — collect engineering issues, requests, requirements, priorities, etc.; work with DAAC engineering organizations to support effective and proper tasking of ECS Contractor employees; monitor ECS employee performance; and
- Inter-site coordination of all ECS engineering functions (see section 3.2).

As shown by Figure D-3, a “dotted line” connection exists between the ECS On-Site Project Office and the integrated DAAC organization(s). The “dotted line” represents the collection of ECS related issues, requests, requirements, priorities, etc., by the ECS Project Office. The local site engineering and coordination tasks performed by the ECS Operations Engineering and ECS System Engineering functions provide a central collection point for ECS issues. The functions identify and work problems cooperatively with the DAAC organization’s technical management and supervision. The functions also support the ECS On-Site Manager by collecting performance statistics, identifying ECS issues, and providing a resource for the ECS On-Site Manager to respond to local problems.

The inter-site coordination tasks assigned to the ECS Operations Engineering and ECS System Engineering functions provide a central point for cross-center coordination of ECS TTs, CCRs, procedures, etc.

The “dotted line” also represents personnel administration, ECS and company instructions, information flow, etc., to and from ECS employees that are integrated in a technical sense with the DAAC organization.

D.2.2 ECS On-Site Operations

Consistent with the ECS SOW, the ECS Contractor’s operations personnel provide ECS operations functions at each DAAC. These personnel are integrated into the DAAC operations organization and take their technical direction (consistent with the ECS SOW) from the DAAC’s operations supervisor.

The DAAC operations organization keeps the ECS Operations Engineering function at the DAAC informed on ECS related problems, issues, priorities, training requirements, etc., and supports ECS-wide activities as needed and tasked by the DAAC.

D.2.3 ECS On-Site Engineering and Support

The ECS Contractor’s engineering personnel provide ECS engineering and support functions. In the integrated organization concept, tasking and prioritization is provided directly to ECS engineers and technicians by DAAC supervisors. This tasking is in accordance with the ECS SOW and funding.

The DAAC engineering organization keeps the ECS System Engineering function at the DAAC informed on ECS related problems, issues, priorities, training requirements, etc., and supports ECS-wide activities as needed and tasked by the DAAC.

D.3 SMC Maintenance and Operations Organization

The ECS Contractor provide science operations and planning support under the direction of the Government SOM and the Project Scientist. An integrated organization is basically in place because the ECS Contractor provides essentially all of this organization's resources. See Section 3.3 for a description of this ECS organization.

D.4 EOC Maintenance and Operations Organization

The ECS Contractor provides flight operations and mission planning support under the direction of the Government MOM and the Project Scientist. The EOC is part of the FOS Development organization. However, EOC system needs (e.g., communications, system management, etc.) are supported by the SEO. See Section 3.4 for a description of this ECS organization.

D.5 SEO Maintenance and Operations Organization

The ECS SEO organization, housed at GSFC Building 32, provides a system-wide M&O function that is responsive to the ESDIS Project Office. Where the ECS On-Site, ECS SMC, and ECS EOC M&O organizations are focused on the issues, tasks and priorities of the individual centers, the ECS SEO provides a system perspective on maintenance, sustaining engineering and training. Supported by the other M&O organizations, the ECS SEO organization also provides the focus for development organization interactions.

There is no existing ESDIS Customer organization that corresponds to the SEO so an integrated organization can not be established. See Section 3.5 for a description of this ECS organization.

D.6 ILS Maintenance and Operations Organization

The ECS ILS organization provides system-wide oversight of all ILS activities through the duration of the ECS. There is no existing ESDIS Customer organization that corresponds to the ILS M&O Organization so an integrated organization can not be established. See Section 3.6 for a description of this ECS organization.

Abbreviations and Acronyms

ADC	Affiliated data center
AM-1	EOS AM Project spacecraft 1, morning spacecraft series — ASTER, CERES, MISR, MODIS and MOPITT instruments
A _o	Operational availability
ASF	Alaska SAR Facility
CAM	Cost Account Manager
CBB	Contract budget base
CCB	Configuration Control Board
CCR	Configuration Change Request
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CIESIN	Consortium for International Earth Science Information Network
CM	Configuration Management
cmi	Continuous Measurable Improvement
COTR	Contracting Officer Technical Representative
COTS	Commercial off-the-shelf
CSMS	Communications and System Management Segment
CSR	Consent to Ship Review
DAAC	Distributed Active Archive Center
DID	Data Item Description
Ecom	EOSDIS Communications System
ECS	EOSDIS Core System
EDC	EROS Data Center
EDF	ECS Development Facility
EDHS	ECS Data Handling System
EDOS	EOSDIS Data and Operations System
EOC	EOS Operations Center
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System

EP CSR	Evaluation Package Consent to Ship Review
EP	Evaluation package
EPRR	Evaluation Package Readiness Review
EROS	Earth Resources Observation System
ESA	European Space Agency
ESDIS	Earth Science Data and Information System Project
ESN	EOS Science Network
ETM	ESDIS Technical Manager
ETR	Element Test Review
FOS	Flight Operations Segment
FOT	Flight Operations Team
FRCB	Financial Recap Contract Brief
GFE	Government Furnished Equipment
GSFC	Goddard Space Flight Center
HAIS	Hughes Information Technology Corporation
I&T	Integration and test
ICD	Interface Control Document
IDR	Interim Design Review
ILS	Integrated Logistics Support
ILSMT	ILS Management Team
ILSPM	ILS Program Manager
IP	Installation Plan
IP	International Partner
IRD	Interface Requirements Document
IV&V	Independent Verification and Validation
IWG	Investigator Working Group
JPL	Jet Propulsion Laboratory
LaRC	Langley Research Center
LOE	Level of Effort
LRU	Line Replaceable Unit
LSM	Local System Manager

M&O	Maintenance and Operations
MAW	Minor Assist Work
MDT	Mean Down Time
MOM	Mission Operations Manager
MR	Management Reserve
MR	Manufacturing Request
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
NSIDC	National Snow and Ice Data Center
ODC	Other data center
OEM	Preliminary equipment manufacturer
ORNL	Oak Ridge National Laboratory
PDR	Preliminary Design Review
PHS&T	Packaging, Handling, Storage and Transportation
PMB	Performance Measurement Baseline
PO	Purchase order
QA	Quality Assurance
RE	Responsible Engineer
RID	Review Item Discrepancy
RIR	Release Initiation Review
RMA	Reliability, maintainability, availability
RRR	Release Readiness Review
SAR	Synthetic Aperture Radar
SCDO	Science & Communications Development Office
SCF	Science Computing Facility
SDPS	Science Data Processing Segment
SDR	System Design Review
SEDAC	Socioeconomic Data and Applications Center
SEO	Sustaining Engineering Organization
SMC	System Monitor and Coordination Center

SMO	System Management Office
SOM	System Operations Manager
SOW	Statement of Work
TAG	Technical Assistance Group
TRMM	Tropical Rainfall Measuring Mission
TT	Trouble Ticket
UWG	User Working Group
WAD	Work Authorization and Delegation
WBS	Work Breakdown Structure