108-EMD-001

EOSDIS Maintenance and Development Project

Program Management Plan for the EMD Project

Revision 01

November 2004

Raytheon Company
Upper Marlboro, Maryland

Program Management Plan
EMD Project

Revision 01

November 2004

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Preface

This document is a formal contract deliverable. It requires Government review and approval within 10 business days. Changes to this document will be made by document change notice (DCN) or by complete revision.

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Contents

Preface

1. Description and Purpose

1.1 Introduction 1-1

1.2 Identification 1-1

1.3 Document Overview 1-1

2. Applicable Documents

2.1 Customer Documents 2-1

2.1.1 Contract Control Documents 2-1

2.1.2 General Specifications and Standards Documents 2-1

2.2 Contractor Documents 2-1

2.3 Raytheon and Garland Polices and Standards 2-2

2.4 General Specifications and Standards Documents 2-2

3. Program Overview

3.1 Product Overview 3-1

3.1.1 Life Cycle Phase Definition 3-2

3.1.2 Key Deliverables 3-2

3.2 Initial Risks and Constraints 3-3

3.3 Program Strategy 3-3

3.3.1 Development Life Cycle Model 3-4

3.3.2 IMP / IMS Approach 3-4

3.3.3 Decision Making Process 3-5

3.4 Organizational Structure and Responsibilities 3-5

3.4.1 Organizational Hierarchy 3-5

3.4.2 Roles and Responsibilities 3-6

4. Planning and Control

4.1 Program Management Overview 4-1
4.2 Communications Management 4-1
4.3 Scope Management 4-6
4.3.1 Scope Verification 4-8
4.3.2 Scope Control 4-8
4.4 Performance Management 4-12
4.4.1 Metrics Strategy 4-12
4.4.2 Work Breakdown Structure (WBS) 4-17
4.4.3 Cost Management 4-18
4.4.4 Schedule Management 4-20
4.4.5 Earned Value Management System (EVMS) 4-21
4.5 Risk and Opportunity Management 4-21
4.6 Quality Management 4-22
4.7 Resource Management Plan 4-23
4.7.1 Capital Planning 4-23
4.7.2 Facilities / Security Plan 4-23
4.7.3 Property Management 4-25
4.7.4 Staffing 4-26
4.7.5 Training 4-26

5. Program Execution

5.1 Systems Engineering 5-1
5.2 Hardware Development 5-2
5.3 Software Development 5-2
5.4 Configuration Management (CM) and Software Configuration Management (SCM) 5-5
5.5 Data Management 5-6
5.6 Systems Integration and Test (I&T) 5-7
5.7 Integrated Logistics Support (ILS) 5-8

5.8 Regulatory Compliance 5-8
5.9 Supply Chain Management 5-9
5.10 Deployment and Product Support 5-9

6. Program Transition and Closure

7. Template Audit Process

List of Figures

3.1-1. The EOSDIS System Context 3-2
3.4.1-1. The Raytheon Company Organization 3-6
3.4.2-1. EMD Organization 3-8

List of Tables

2-1. EMD Contract Documents 2-1
2-2. EMD Contract Documents 2-1
2-3. EMD Area Documents 2-1
4.4.1-1. EMD Technical Metrics 4-13
4.4.1-2. EMD Schedule, Cost, Business, and Customer Satisfaction Metrics 4-15
4.4.2-1. EMD Work Breakdown Structure (WBS) to Level 3 4-17
4.4.3.1-1 EMD Estimating Methodologies 4-18

Appendix A. Acronyms Definitions

Appendix B. Program Management IPDS Tailoring Matrix

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1. Description and Purpose

1.1 Introduction

This document is the Program Management Plan (PMP) for the Earth Observing System Data and Information System (EOSDIS) Maintenance and Development (EMD) contract. It will identify, establish, and maintain the required documents detailing policy, organizations, engineering tasks, processes, and the necessary documentation to be prepared to effectively manage the EMD contract to ensure achievement of the required performance, life cycle costs, and schedule maintenance.

1.2 Identification

This document is a required deliverable under the EMD Contract (NAS5-03098). It is identified as Item 008 of the Contract Data Requirements List (CDRL), whose requirements are specified in Data Item Description (DID) EMD-PMP.

1.3 Document Overview

The purpose of the PMP is to identify the EMD program's policies and processes with the goal to achieve required program performance. The scope of the PMP includes all program planning and execution activities. All other program plans are addressed at a summary level in the PMP and derive their direction from the PMP. The PMP derives its authority from the Garland policy 760, Program Planning Process, which provides direction and implementation of a structured approach to Program Management.

The overall organization of the PMP is to address 1) program overview containing risks, constraints, strategy, and organizational structure, 2) planning and control processes, 3) program execution processes, and 4) transition and program closeout plans.

All program plans are reviewed by the EMD Change Control Board to ensure program commitments are well understood. The PMP policies and processes reflect the required processes as set forth in the Raytheon Integrated Program Development System (IPDS) as tailored and approved by the requisite system experts. The Program Manager is responsible for ensuring the IPDS tailoring was completed, the tracking of that completion, and the implementation of the applicable task descriptors.

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2. Applicable Documents

2.1 Customer Documents

2.1.1 Contract Control Documents

Table 2-1. EMD Contract Documents

Control Number	Document Name
813-PL-028-001	Task Plan containing EMD Statement of Work (SOW) for Task 101, ECS SDPS Maintenance, and Contract Data Requirements List (CDRL) for EMD Task 101, dated 1 Aug 03. This document contains Interface Control Document requirements.
423-41-02, Contract NAS5-60000	Functional and Performance Requirements Specification for the EOSDIS Core System, Revision D
IEEE Standard 730	Software Quality Assurance Plans
423-10-23	EOSDIS Security Policy and Guidelines
NPG2810.1	Security of Information Technology
NASA-STD-8719.13A	NASA Software Safety Standard
NASA-STD-2201-93	NASA's Software Assurance Standard

2.1.2 General Specifications and Standards Documents

Table 2-2. EMD Contract Documents

Control Number	Document Name
NPG 4200.1	NASA Procedures and Guidelines Equipment Management Manual
NPG 7120.5A	NASA Program and Project Management Processes and Requirements

2.2 Contractor Documents

Table 2-3. EMD Area Documents (1 of 2)

Control Number	Document Title
START UP DOCS	
EMD-PP-1	Transition Plan
EMD-SMDP-2	Software Maintenance and Development Plan (SMDP)
EMD-PP-3	Hardware Maintenance and Development Plan (HMDP)

Table 2-4. EMD Area Documents (2 of 2)

Control Number	Document Title
EMD-SQAP-4	Software Quality Assurance Plan (SQAP)
EMD-PP-5	Property Management Plan
EMD-RMP-6	Risk Management Plan (RMP)
EMD-SMP-7	EMD Security Management Plan
EMD-PM-17	Procurement Management Plan
EMD-CMP-19	Configuration Management Plan (CMP)
813-PL-028-001	Safety and Health Plan (Submitted as part of Raytheon's 7 Oct 02 EMD Proposal in response to NASA RFP5-03186/179)
813-PL-028-001	Small Business Subcontracting Plan (Submitted as part of Raytheon's 7 Oct 02 EMD Proposal)
MONTHLY DOCS	
EMD-MPR-10	Monthly Progress Reports (MPRs)
EMD-533-11	Contractor Cost Report – 533 Requirements
EMD-MCMR-12	Manpower Report
EMD-MPP-20	Monthly Patch Plan
AS NEEDED DOCS	
EMD-CSR-13	Consent to Ship Review Package
EMD-PSR-14	Pre-ship Review Package
EMD-LRR-15	Lessons Learned Review Package
EMD-RSR-16	Release Status Review Package
EMD-SEP-18	System Enhancement Proposals
EMD-IRR-21	Incremental Release Review Package
EMD-EMD-23	ECS SDPS Documentation Package

2.3 Raytheon and Garland Polices and Standards

These policies may be found at:

- Garland: http://www.gar.esys.com/sop/garland.htm (requires access code)
- Landover: http://dmserver.gsfc.nasa.gov/EMD_PAL/index.html

2.4 General Specifications and Standards Documents

- ISO 9000. Raytheon processes and practices are ISO 9001:2000 and AS9100 compliant.

3. Program Overview

This section of the PMP will provide an overview of the EMD program, initial risks and constraints, program strategy, organizational structure and responsibilities, and the EMD program decision-making process. This document is reviewed annually for currency and updated as needed.

3.1 Product Overview

The EOS Data and Information System (EOSDIS) manages data from NASA's Earth Science research satellites and field measuring programs, providing data archiving, distribution, and information management services. EOSDIS uses a distributed, open system architecture. This permits allocation of EOSDIS elements to various locations to take best advantage of different institutional capabilities and science expertise. EOSDIS consists of five major components:

1. Distributed Active Archive Centers (DAACs)
2. Science Investigator-led Processing Systems
3. Networks
4. EOS Data and Operations System (EDOS)
5. EOSDIS Core System (ECS)

ECS provides the "core" common capabilities and infrastructure required for performing planning and scheduling, command and control, product generation, information management, data archiving and distribution, and user access to data held by EOSDIS. To perform this mission, ECS consists of two main segments: the Science Data Processing Segment (SDPS) and the ECS Mission Operations Segment (EMOS). The EMD contract is responsible for maintenance and new development of the SDPS.

The SDPS is the central data repository for the EOS Ground Segment. It is deployed at four DAACs located at: Goddard Space Flight Center, MD; Eros Data Center, SD; Langley Research Center, VA; and National Snow and Ice Data Center, CO.

The primary purposes of the SDPS are to 1) provide data archiving and distribution capabilities for EOS Data; 2) generate science products from EOS observations; 3) accept science products produced by Principal Investigators and International Partners; 4) accept ancillary and supplementary data products for storage and distribution; 5) provide interfaces to instrument and interdisciplinary investigators' Science Computing Facilities (SCFs), which develop science data processing software and support scientific research; and 6) interface with non-SDPS systems (e.g. the EOS Data Gateway) for customer search and order of data.

Figure 3.1-1 shows the SDPS in context with the whole EOSDIS Ground Segment.

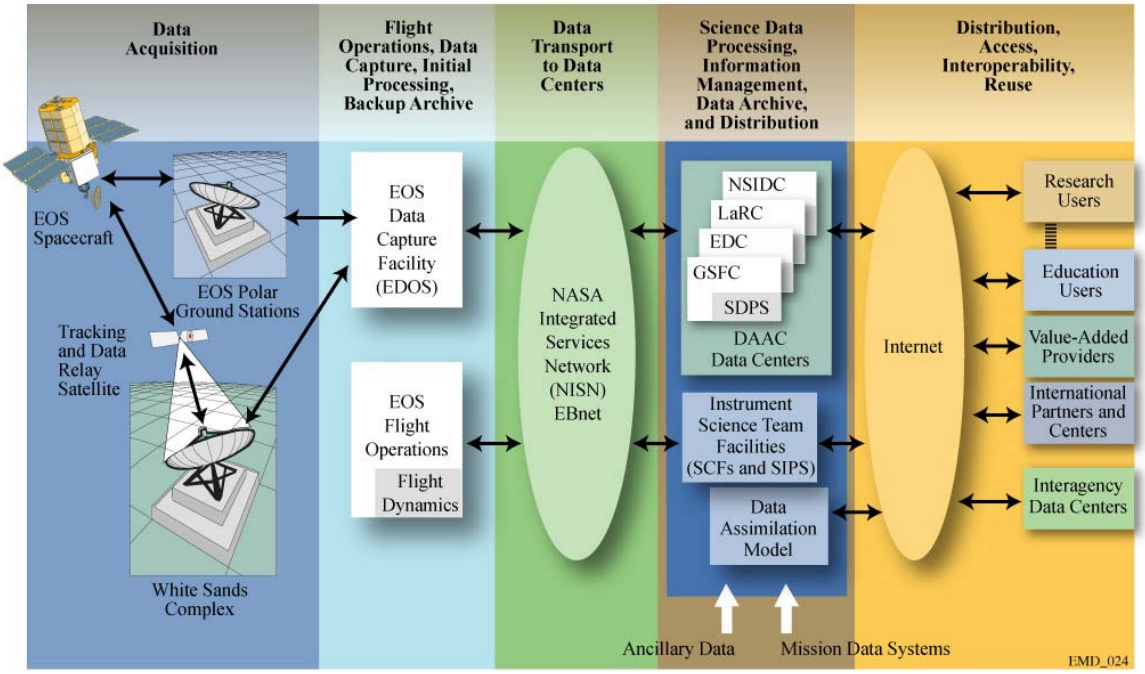

Figure 3.1-1. The EOSDIS System Context

3.1.1 Life Cycle Phase Definition

The SDPS component of the ECS program is now in the Operations and Support life-cycle phase. The system is now considered operational and deployed. The EMD contract is an indefinite delivery/indefinite quantity contract. The first task, Task 101—ECS SDPS Maintenance, is the core task on the contract and is responsible for ongoing sustaining engineering of the SDPS system. It is not all inclusive of the sustaining engineering requirement, but includes a level of effort staff to resolve software and hardware non-conformance reports in a priority order as identified by system users. It does not include technology insertion, Commercial-Off-The-Shelf (COTS) software and hardware upgrades and refresh as existing systems evolve, and system enhancements. These activities are to be accomplished as additional tasks. The original ECS SDPS program was designed, developed, integrated, tested, verified, validated, and deployed under the auspices of the ECS Contract that ended 31 Oct 03.

3.1.2 Key Deliverables

The key deliverables on the EMD contract are defined in each task. The key deliverables for the core task are the contract deliverables from the CDRL as identified in section 2.2, software releases, patches, test executables, technical directives, and associated documentation for deploying software and hardware changes associated with non-conformance reports (NCRs). Delivery dates are planned as required and reported in a monthly delivery plan.

3.2 Initial Risks and Constraints

The initial assessment of risk for EMD includes technical performance, schedule, and cost risks. The highest risk on the program is in the category of cost and how it could affect technical performance. The bid rates for EMD were less than the current forward pricing rates used to baseline the work. In order to meet cost on the program, fewer Raytheon hours were planned requiring the program to improve productivity in order to meet the proposed performance metrics. Several mitigation plans are in work. In the area of schedule performance, the program will be measured against meeting internal schedules for system deliveries. Program personnel need to better assess outside factors when planning deliveries and system upgrades. This is a low risk for the program since the program is operational and new functionality is not required to meet system requirements. Major opportunities present themselves in the area of process improvement, technology insertion and system enhancements associated with future tasks, developing a staff with more breadth and depth in its skill set, and savings associated with better than anticipated hardware and maintenance purchase prices.

3.3 Program Strategy

The strategy for executing the EMD program is to achieve mission success by providing the customer with a world-class Earth Science Data Information, Processing and Distribution System in support of furthering the goals of the Earth Science Enterprise Mission. The system capabilities are to include state-of-the art technology application and process streamlining to further enhance System Engineering, Systems Integration, and Operations and Maintenance and reduce overall system cost. To achieve this strategy, the Raytheon team will:

- Provide highly qualified and knowledgeable engineers capable of employing world class, state--of-the-art software engineering
- Effectively use a tailored Integrated Master Plan and Master Schedule to ensure all appropriate Raytheon Integrated Product Development System (IPDS) program requirements are planned, tracked, and monitored through completion
- Execute the program using Capability Maturity Model Integrated (CMMI) Maturity Level 3 processes that will improve performance
- Ensure continual improvement is a mantra across the program by using the Raytheon 6Sigma methodology
- Use tools that streamline required work and provide increased insight into program cost and schedule performance
- Engage a clear cut decision-making process to ensure timely decisions are made at the right levels

Other related objectives for the EMD program will be to:

- Develop key interfaces within NASA, other Government organizations, and the Science community to strengthen commitment and expand opportunities for Earth Science data application
- Enhance information exchange with NASA Headquarters personnel, the ESDIS Program Office, and new ECS Applications Users to further business opportunities
- Play a key role with NASA in developing a strategic architecture using ECS as the evolutionary system towards achieving the next generation Science Data System
- Expand Earth Science users into other Federal organizations
- Negotiate additional Task Orders to achieve full value of the EMD Contract The ultimate goal for EMD is to win the follow-on contract to EMD.This strategy and execution plan

will be reviewed at least annually by the Program Management Team and updated as events dictate.

3.3.1 Development Life Cycle Model

Software development under EMD is driven by new Task Orders that add requirements for new capabilities or enhancements to the current system. Three alternative software life-cycle approaches may be used for the addition of capabilities to the system: Formal, Incremental, or using Operational Support Software (OSS). The Formal development process employs a traditional waterfall methodology that incorporates a peer review process after preliminary design, detailed design, and code and unit test. Formal documentation is produced, and verification is witnessed. This approach is typically used for capabilities that involve significant modification of core SDPS functions, or where rigorous design, development, documentation, and verification are required. The Incremental development approach uses an iterative process that includes a series of prototype or incremental deliveries of a capability to a DAAC. It can be used when requirements are not well known or where a capability could have significant operational impact and early feedback is warranted. The OSS development process relaxes the normal requirements for peer reviews, acceptance test, and the comprehensive documentation required by EMD-EDP-23. Typically, it is used for the development of non-mission critical EMD requirements, and may involve the reuse of components provided by non-EMD organizations.

3.3.2 IMP / IMS Approach

The Integrated Master Plan (IMP) and Integrated Master Schedule (IMS) are closely aligned to ensure program execution. During the EMD proposal process, the team reviewed and tailored IPDS for an IMP. A second tailoring session was conducted following Contract Award and Task Order Authorization. This tailoring identified each line item by task number, title, statement of work (SOW) reference, contract deliverables (CDRLs) affected, integrated product teams (IPTs) impacted, work breakdown structure (WBS) association, IMS updated with task, and associated critical milestones. Using this process, all requirements identified in the IPDS were assessed for

applicability to EMD and then identified for completion as needed. Interlinking the IMS to the IMP ensures the key activities and milestones are scheduled and tracked for completion. The IMS is formally updated weekly, but often updated by the engineers on a daily basis or as events transpire. The tool used for schedule management is Primavera. A scheduling engineer resides in the Program Control office and works with the Control Account Managers (CAMs) to ensure schedule activities are properly entered and updated with status on a weekly basis. The Program Management team authorizes changes to the IMP and IMS using a formal Budget Change Request process, which will be discussed in more detail in Section 4, Planning and Control.

The IMS is a living document and can be reviewed by accessing the Primavera project group ESMP, subproject titled EMD1.

3.3.3 Decision Making Process

Formal decision making procedures are described in EMD project instruction, Decision & Analysis Resolution (DAR). The following triggers require formal DAR evaluation:

- Projected or actual slippage of key program milestones
- Projected cost over-run by more than 10% of the task order value in the current award fee period
- High risks as identified by the Risk Management Program
- Make or buy decision
- A red metric rating on a key program metric area as defined in the Program Management Plan for two sequential months or more

Technical decisions and oversight are the responsibility of the Architecture Review Board (ARB), which is described in Architecture Review Board project instruction.

3.4 Organizational Structure and Responsibilities

3.4.1 Organizational Hierarchy

The Raytheon Organization is depicted in Figure 3.4.1-1. The EMD contract is a key program in the Raytheon Information Technology Solutions Business Area.

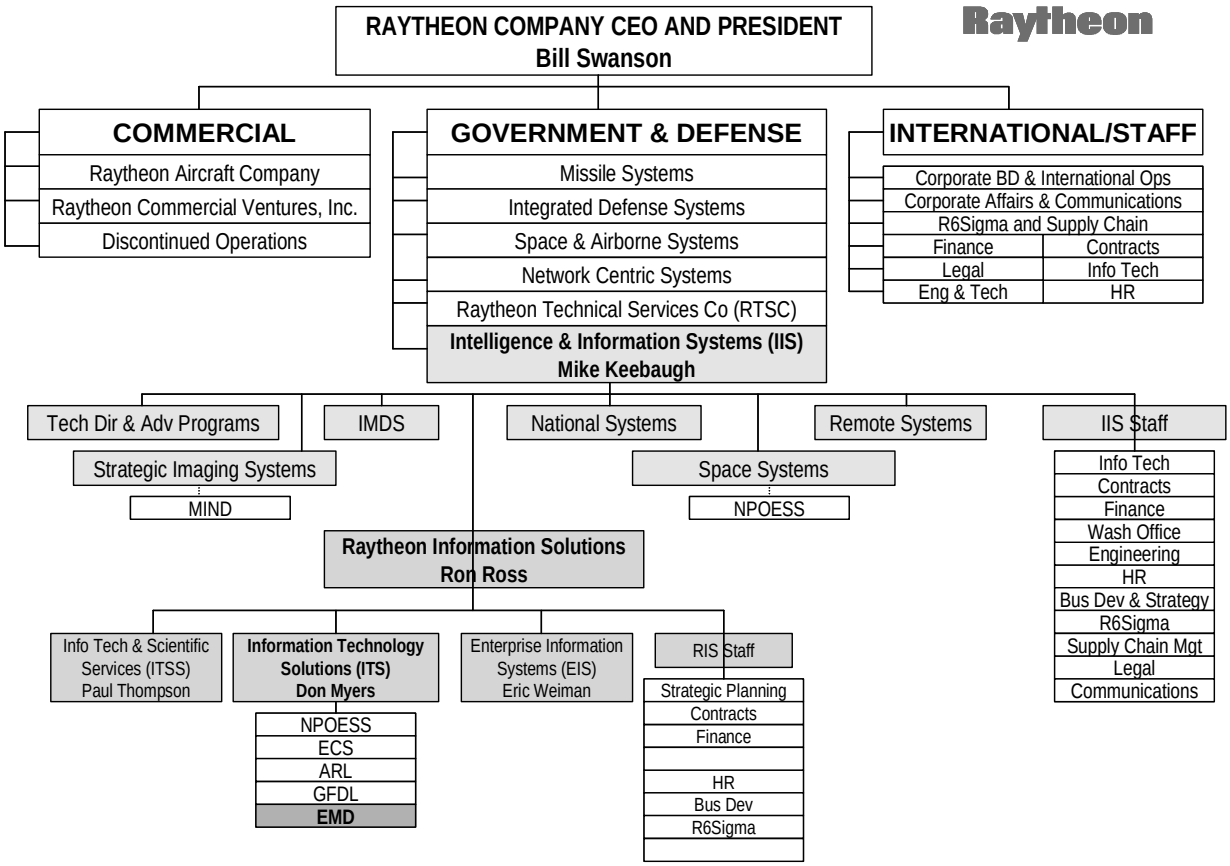

Figure 3.4.1-1. The Raytheon Company Organization

3.4.2 Roles and Responsibilities

The EMD contract, as an Indefinite Delivery/Indefinite Quantity (IDIQ) type contract with multiple tasks, will be managed using both integrated product teams (IPTs) and cross product teams (CPTs). Refer to Figure 3.4.2-1 for an organization chart for EMD and ECS tasks.

An IPT is an integrated multidisciplinary team of people working together to meet common objectives and organized around a product or specific service. The IPT is responsible for the charter, budget, and planning within boundaries established by the Program Manager. The IPT Leader is accountable for cost, schedule, product performance, and quality; and reports directly to the EMD Program Manager. As such, the IPT owns the resources to perform the work. Each Task Order will form its own IPT, and may have subordinate IPTs within it to perform specialized functions. For example, the IPT for Task 101, SDPS Maintenance, is responsible for performing the specific service of sustaining engineering for all SDPS components. Smaller IPTs within this task include custom code maintenance, COTS maintenance, operations deployment, and DAAC support.

CPTs are generally not responsible for developing deliverable products or a one time specific service. They normally provide similar services across many IPTs. Functions that apply to multiple tasks on the EMD Contract will be managed by CPTs. Resources from the IPTs make up the CPTs as necessary to perform these functions. The following teams will be providing support across all EMD Task Orders: Program Management, System Engineering and Integration Team (SEIT)/Architecture Review Board (ARB), Test and Integration, Installation and Transition, Configuration Management, and Infrastructure.

- The Program Management Team (PMT) provides management oversight during all task life cycle phases and ensures that adequate support services are available for all tasks. Each individual element of the PMT constitutes a small IPT for resource ownership and management. The principal members of the PMT are the Raytheon Program Manager (PM), the Deputy Program Manager dual-hatted as the Task Leader (TL) for Task Order 101, the Technical Director (TD), the Chief Engineer (CE), Program Control, Supply Chain Management, Contracts, Risk and Process Improvement, Data Management, Quality Assurance, and the NASA ESDIS PMT.
- The SEIT ARB CPT provides technical oversight over the SDPS requirements architecture and design, ensures the integrity of the technical baseline, prioritizes incoming work, and optimizes resources and schedules across tasks.
- The Test and Integration CPT manages the test facilities and oversees required performance, regression, and formal testing.
- The Installation and Transition CPT plans and executes installation processes and procedures across all tasks.
- The Configuration Management (CM) Team plans and executes CM processes and procedures across all tasks.
- The Infrastructure Team provides requested building infrastructure support across all tasks.

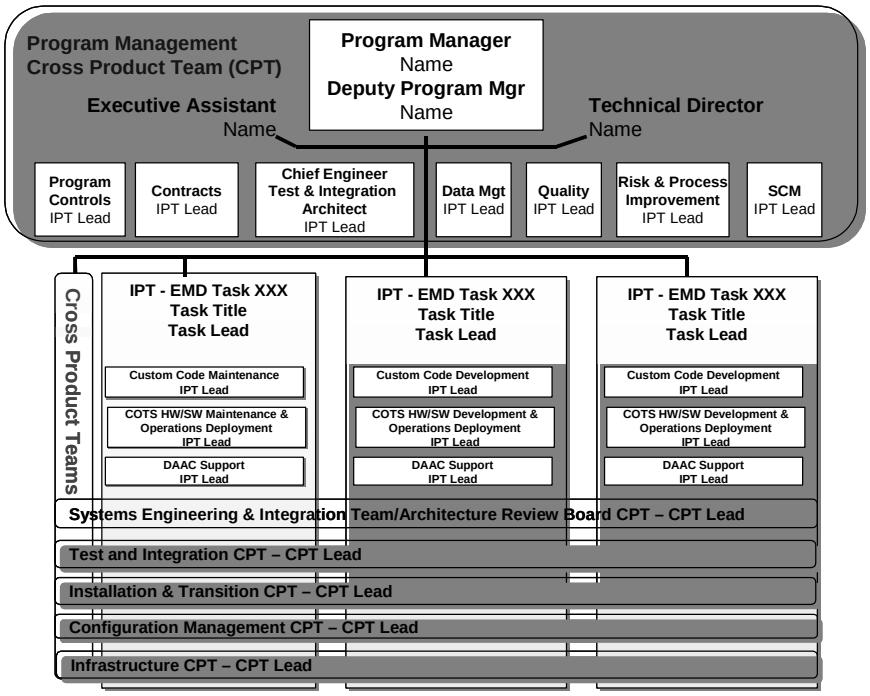

Figure 3.4.2-1. EMD Organization

Raytheon brings system engineering and software maintenance experience to bear from our successful development, deployment, and maintenance of the ECS SDPS system. Our subcontractor team members have the following roles and responsibilities:

- Electronic Data Systems, Inc (EDS) will provide support in the area of COTS procurement, logistics, property management, hardware integration and maintenance, and infrastructure support.
- L3 Government Services (L3GS) will provide support to the NASA science community in their use of ECS tools and software. They also support Science Data Processing Toolkit maintenance and training.
- Acquisition Technologies Integration (ATI) brings some of the most senior and proven ECS architects and software developers.
- SGT, Science Systems Applications Inc. (SSAI), Earth Resources Technology, Inc. (ERT), and COMSO are small business team members who bring on board expertise in software development, system integration and test, DAAC operations and support, material procurement, and earth science support.
  - SGT will provide computer infrastructure and test support, Verification Database (VDB) maintenance, and on site DAAC engineering support.
  - SSAI will provide test support and on site DAAC engineering support.

- ERT will perform custom software maintenance and help desk support.
- COMSO will provide COTS procurement support.

3.4.2.1 Program Management Responsibilities

The program manager is the customer's primary point of contact and Raytheon's focal point for the program. The program manager has total responsibility within Policy constraints for program execution and decisions and has the resources necessary to successfully complete program-related activities. The program manager has direct access to senior management and the directors of other organizations involved in the execution of this program and provides the necessary leadership to transform the group of individuals working on the program into a team that works interdependently to attain program objectives.

3.4.2.2 Program Management Support

Many of the supporting organizations are integrated into the PMT CPT, such as program control, data management, contracts, and supply chain management.

Other supporting organizations include:

- Financial management for annual operating plan, sales, and bookings forecasts; indirect budget management; and rate adjustments and impacts.
- Engineering matrix management for engineering resource planning and career progression.
- Facility Management for management of the EMD facility floor space.
- Security for maintaining facility security.
- Environmental Health and Safety for ensuring a safe and healthy work environment for program personnel.

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4. Planning and Control /

EMD activities are planned, monitored, and controlled through the use of several integrated plans and processes. Areas addressed include program monitoring and control processes, measurement against the plan, program commitments, program risk management against the plan, project data against the plan, data management, corrective action plans.

4.1 Program Management Overview

EMD is an ID/IQ contract with both development and maintenance tasks associated with the NASA ESDIS program office. Task Order 101, the contract's anchor task, provides scope for sustaining engineering activities for the SDPS. Gate 5 (Start-Up Review) was successfully held on September 29, 2003. Gates 6 (Internal System Functional Review), Gate 7 (Internal Preliminary Design Review), Gate 8 (Internal Critical Design Review), Gate 9 (Internal Test/Ship Readiness Review), and Gate 10 (Internal Production Readiness Review) are not applicable to SDPS on EMD, as they were performed on the ECS contract during the system's development phase. Gate 11 (Transition and Closure) will be performed at the conclusion of the EMD Contract and is addressed in Section 6.

4.2 Communications Management

Communications management includes the timely and appropriate generation, collection, dissemination, storage, maintenance, and ultimate disposition of program information to relevant stakeholders.

4.2.1 Stakeholders and Their Requirements

The stakeholders associated with the EMD contract include the following:

Group Type	Stakeholder
Customer	NASA HQ and NASA ESDIS
Sponsor	Raytheon IIS/RIS/ITS
Senior Level Management	ITS Site Manager, RIS President, IIS General Manager
Partners	Raytheon IIS/SSD and RTSC/ITSS
Suppliers	EDS, ERT, SGT, ATI, SSAI, L-3 GSI, COMSO
BD Personnel	RIS/ITS BD
Integrated Product Teams (IPTs)	EMD Task Orders as a whole broken down to sub IPTs below:
	EMD Custom Code Maintenance and Development
	EMD COTS HW/SW Maintenance and Development
	EMD Operations Deployment
	EMD DAAC Support
	EMD Prototypes and Studies

Group Type	Stakeholder
Cross Product Teams (CPTs)	EMD PM CPT (Program Management, Program Control, Contracts, Chief Engineer, Data Management, Quality Assurance, Risk Management, Supply Chain Management)
	EMD SEIT/ARB CPT
	EMD Test & Integration CPT
	EMD SW Installation and Transition CPT
	EMD Configuration Management CPT
	EMD Infrastructure CPT

Attachment A addresses Stakeholder information requirements and program involvement.

4.2.2 Program Data Repositories and Artifacts

Formal program documentation is controlled as described in the CDRL EMD-CMP-19. Other program artifacts such as contract correspondence, reports, meeting minutes, planning artifacts, presentations, memos, ad hoc documents describing the program, lessons learned, reviews with upper management, results of measurement activities, performance reports, risk information, and subcontract information are filed as softcopy on a common server in the Landover Facility as well as in individual private folders. Program personnel are granted access to information based on their need to know the information. Groups have been established to allow read only, read/write, or no access to common folder information.

4.2.3 Meeting Planning and Management

One of our principal methods for communicating status and activities on EMD is the effective use of meetings. As such, planning and managing meetings with forethought is required. Good meeting practices exercised on EMD include setting agendas, identifying meetings by purpose/location/type of information exchanged and participants, keeping direction and focus during meeting, tabling other issues for another meeting, achieving meeting goals/decisions, managing Action Items from meetings, and documenting meeting results and key points of contact for Raytheon and Suppliers.

The following meetings and preparation activities are typical for the EMD program.

- Internal staff meetings: Managers assess activities within their areas of responsibility with standing staff meetings and note items of interest to the Program Team. These issues are presented concisely for information purposes. If the issue presents a problem-solving situation, a separate meeting is scheduled. Meeting minutes are taken and posted.
- Status meetings with supplier personnel: Usually performed at a monthly subcontractor program review, Subcontractor team members provide the program status with sufficient time for Program Management to review prior to the meeting. Program Management reviews the presentation prior to the meeting to ensure status and issues have already been considered for discussion. The briefing material represents the documentation artifact.
- Program Status Reviews: Program reviews are typically performed on a monthly basis. The PM team reviews the presentation material prior to delivery to either the customer or

senior Raytheon management. The briefing material represents the documentation artifact.

- Technical exchange and engineering status meetings: Technical exchange meetings occur daily, weekly, and monthly. These discussions follow an established agenda, which identifies the reason for the meeting and the intended outcome from the discussion. Minutes are taken and posted.

4.2.4 Information Archives

Principal data repositories on EMD include both formally controlled (CM/DM controlled) and informally controlled (common drive access). The following repositories/archives are used on EMD:

Repository	Application	Type of Data	Owner
ABC++	ABC++	Software documentation generator	Custom Code (CC)
Acceptance Test Files	Hardcopy & Softcopy	Test Plans, Test Cases, Procedures, Criteria Logs, Execution forms. Final with signatures	Integration and Test (I&T)
CCR Files	Hardcopy & Softcopy	All CCRs submitted with approval evidence	Configuration Management (CM)
CDMTS Database	FoxPro	DM document status tracking, SCDV and ECS CCB CCR status tracking	CM
ClearCase	ClearCase	Custom Code, some modified COTS, inventory maintenance data	CM
Non-Conformance Report and Corrective Action (NRCA) System,	DDTS	Nonconformance Reports, Enhancement Requests and Data Type Records	CM
DMO Library	Hardcopy& media	Contractually required documents, hard and soft copy (on media), proposals, contract correspondence	Data Management (DM)
EBIS (900 series etc.)	Web Server	900 Series documents (configuration and tech documents), release notes	CM
EDHS	CERN Web Server	CDRLs, Tech Papers, White Papers, Review presentations	DM
ILM	Remedy	License maintenance	Inventory Logistics Management (ILM)
Internal Server	CERN Web Server	CCB, project instructions, templates and forms, subsys home pp, test home p, etc.	DM
Landover.hitc.com	Apache Web Server	Landover facility procedures	DM
Micro-frame Program Manager (MPM)	MPM, Ver 2.1	Resources and Rates	PC
M&O Server	Apache Web Server	IPT Home page and training docs	Deployment
NETAPPS Server	Unix	OSS and some COTS	CM

Repository	Application	Type of Data	Owner
Peer Review Files, Requirements	Hardcopy & Softcopy	Signed off requirement peer reviews	Systems Engineering and Integration Team (SEIT)
PM Action Item Database	MS Access	PM action items	Program Management (PM)
Primavera	Primavera	Schedules and Resources	Program Control (PC)
S: Drive	Windows NT	MPM data	PC
Software Development Folders	Hardcopy & Softcopy	Design documentation, CDRL updates, integration test plans, unit test plans etc	CC
Software Library	Manual	COTS software masters	CM
SWIT Output, Non-Synergy	Hardcopy & Softcopy	Test Plans, Execution forms and criteria logs. Final with ESDIS, IV&V et al signatures	I&T
SWIT Output, Synergy	Hardcopy & Softcopy	Test Plans, Execution forms and criteria logs. Final with ESDIS, IV&V et al signatures	I&T
T: Drive	Windows NT	13 Week report	PC
Technical Metrics Drive on Public	Windows NT	Scripts & reports	Deployment
Test Data	Unix	Test data	CM
U: Drive (Core)	Windows NT	Program artifacts, including some databases. Access is controlled.	PM
Verification Database (VDB)	Sybase and Apache	L3, IRD, L4 requirements, requirements tickets with verification criteria, test case-to-criteria mappings, test results.	SEIT
Winsight Tool	Winsight Ver 5.0	Earned Value Management (EVM) Analysis and Reports	PC

4.2.5 Internal Reviews

The following internal reviews are held on EMD:

Review	Artifact from Review	Stakeholders Involved	Purpose of Review	Content of Review	Information Supplier	Interval Between Reviews	Resulting Actions
Gate Reviews	Review Charts	Senior RTN Management	Determine readiness to proceed to next phase in program	Varies based on Gate	Program Management Team	Varies based on Gate	Approval to proceed or correct discrepancies noted in review
Monthly Opera-tions Reviews (MOR)	Review Charts	Senior RTN Management	Determine health of program	Management Issues, Cost, Schedule, & Technical	Program Management Team	Monthly	Action Items requiring resolution based on status
Peer Reviews	Meeting Minutes	Varies based on review	Internal assessment on whether decision/documentation is accurate and correct	Varies based on material being reviewed	Individual seeking approval from peer review	Varies based on material being assessed	Approval/acceptance of material presented for peer review

Review	Artifact from Review	Stakeholders Involved	Purpose of Review	Content of Review	Information Supplier	Interval Between Reviews	Resulting Actions
Risk Reviews	Meeting Minutes and Risk Nomination Forms	Program Management team and risk owners	Assess risks on programs and determine whether mitigation warranted	Review of risk nomination forms and technical discussions	Risk owner or risk identifier	Monthly	Acceptance for tracking and reporting and an approved mitigation strategy
Financial Reviews (IFR)	Review Charts	Program Management Team and Task Order IPTs	Determine financial health of program	Cost, contract, and financial performance of program	Program Management Team	Monthly	Cost/budget plan adjustments
Business Reviews	Review Materials	Program Management Team	Determine status of RTN AOP to Actual Performance	Cost and program financials & forecasts	Program Management Team	Weekly	Financial Plan/forecast adjustments
Perfor-mance Evalua-tion Board Assess-ment (PEB)	Review Materials and Subcontract Letters	Program Management Team and Task Order IPTs	Determine award fee score for subcontractor team members	Subcontractor self assessment and RTN program assessment	Subcontractor team members and IPT Leaders	Every Award Fee Period	Award Fee Letter to Subcontractor Team Members
Periodic Rolling Wave Planning	Baselined Program Plan & Presenta-tion Materials	Program Personnel responsible for executing work	Establish detail planning of Work Packages clearly identified by IPT/CAMs and general timephasing of Planning Packages.	Time-phased budget by $K and FTE	Program planners of new work	Every 6 months	Approved baseline in financial and schedule system to measure performance
Integrated Baseline Reviews (IBRs)	Baselined Program Plan & Presenta-tion Materials	Program Personnel responsible for executing work	Establish baseline to manage and measure task order performance	Time-phased budget by $K and FTE	Program planners of new work	Within 90 days after receipt of new TO	Approved baseline in financial and schedule system to measure performance
Proposal Assess-ment Board (PAB)	SEP, ROM, IAR, TP, Meeting Minutes	PAB Members and proposal/ROM/ CCR owner	Review and approve proposal or ROM for submission to customer	Varies based on type of review (CCR, proposal or ROM)	Proposal/ ROM/CCR Response owner	Weekly or as required	Approved proposal/ROM/CC R response forwarded to customer

4.2.6 External Reviews

The following external reviews are typically held on EMD.

Review	Artifact from Review	Stakeholders Involved	Purpose of Review	Content of Review	Information Supplier	Interval Between Reviews	Resulting Actions
Design Reviews	Review Charts	ESDIS and RTN Management	Determine program maturity and progress	Varies based on Design Phase	Program Management and Design Development Team	Varies based on Designs	Approval to accept and proceed to next phase in program
Test Readiness /Result Reviews	Review Charts	ESDIS and RTN Program Management, Development and Test Teams	Determine maturity and readiness of the developed product prior to beginning major test events	Status of Software Integration Testing	Software and Hardware Development Team	Conducte d prior to major test events	Approval to accept and proceed to major test event

Review	Artifact from Review	Stakeholders Involved	Purpose of Review	Content of Review	Information Supplier	Interval Between Reviews	Resulting Actions
Audit Reviews			Audit the product satisfaction of the physical and/or functional requirements			Conducted prior to delivery and/or prior to system sell-off	Approval to accept and proceed to delivery
Daily Status and Risk Reviews	Review Charts	ESDIS and RTN Management Teams	Keep current on technical status of activities and resolve issues as they arise	Technical schedule and activities of individual task orders	Task Order Leader and sub IPT leads on team	Weekly	Technical actions as they arise during review—mostly for information dissemination
Program Management Reviews (PMR)	Review Charts	ESDIS and RTN Management Teams	Determine financial and technical health of program	Technical, cost, and schedule performance of program	Program Management Team	Monthly	Technical and Cost plan adjustments as necessary

4.2.7 Action Item Management /

EMD action items are managed using different tools and methods. Those actions identified in standing meetings such as the PMR, LEPG, or Planning Meeting are reviewed and updated weekly from the minutes. Actions derived outside a standing meeting are entered into a locally developed tool and reviewed weekly and brought to the attention of the PMT when the suspense dates approaching.

4.3 Scope Management

EMD, as a Task Order contract, requires Program Management to identify, manage, and execute multiple task orders simultaneously. The Raytheon EMD Team works closely with ESDIS to ensure that the activities and functions performed on the EMD Program are in line with their objectives and within the scope of the existing task orders. The anchor task order on the EMD contract is Sustaining Engineering excluding technology insertion and large operating system upgrades.

When existing scope on the contract does not support ESDIS' needs, new work is authorized as either a new task order or modification to an existing task order. Raytheon recommends new work via System Enhancement Proposals (SEPs) and Rough Order of Magnitude (ROM) estimates. NASA authorizes new work via a Task Plan Request (TPR) using either a NASA-generated Statement of Work as the basis for developing the proposal or an SEP or ROM previously generated by Raytheon. When the proposal has been reviewed and approved for cost and technical compliance, NASA approves implementation of a new task order or task order modification. Existing work is rigorously managed to ensure NASA requirements are met on time and within schedule constraints identified in the Task Order using EMD project instructions for program management and control.

Customer Satisfaction. Customer satisfaction is paramount on the EMD contract. The Customer is involved in all aspects of the program throughout its duration. Their involvement starts with the Statement of Work (SOW), which documents their business and technical needs, goals, preliminary requirements, and the tasks to be performed from their viewpoint. Customer clarification of business needs and negotiation of project deliverables is key to setting realistic expectations for the project. Planning is a cooperative effort between management, project personnel, the customer, and stakeholders. Good interaction among these participants is essential to focusing the proper technical perspective on the analysis of the customer's needs. The customer's requirements are refined into component requirements, which are documented in the requirement Ticket and are furnished for customer review and comment prior to implementation.

To keep ESDIS and stakeholders informed and involved in EMD, a Communication Plan outlines ESDIS, stakeholder, and EMD team roles and responsibilities in the program regarding communications interface. The types of communication to convey program goals and status are outlined in the table below. An X in the column means the person(s) is to participate in the communication exchange. The table in Paragraph 4.2.6 provides more detailed information regarding specific communication forums used on EMD.

Communication Type	ESDIS	Stakeholders	EMD Team
Daily Status Reporting (presented as needed)	X	X	X
Technical Status Reviews and Reports	X	X	X
Cost Status Reviews and Reports	X	X	As needed
Project Documentation (CDRLs, SOW)	X	X	As needed
Technical Management Reviews (Monthly)	X	X	As needed
Cost Management Reviews (Monthly)	X	X	As needed
Decision Analysis and Resolution	X	X	As needed
Problem Reporting and Tracking	X	As needed	X
Risk Management and Status	X	As needed	As needed
Process Improvement and Results	As needed	As needed	As needed

To establish a strong customer relationship built upon trust, the PM will demonstrate strong customer focus by:

- Listening to the voice of the customer at all times
- Understanding the customer's real priorities
- Understanding how the customer is measuring project performance
- Taking good notes in meetings and reviews
- Keeping a log and notes of telephone communications
- Reviewing the action item list at the end of each meeting or telephone communication
- Making sure there is agreement on all items

To ensure the EMD program is satisfying customer requirements, metrics will be used to measure program performance. Please review the Paragraph 4.4.1 for an overview of program metrics. The Quality organization provides an independent assessment of customer satisfaction in the form of a monthly report to the Quality Performance Index (QPI).

4.3.1 Scope Verification

Scope verification is the process of obtaining formal acceptance of the program scope by the stakeholders. This is normally completed as part of the proposal effort. New Task Orders or modifications to existing Task Orders are normally authorized by ESDIS as a result of a previously submitted Raytheon Task Plan Proposal or System Enhancement Proposal in response to an ESDIS Task Plan Request or recently identified system deficiency. As a result, all new work is normally reviewed, discussed, negotiated, and adjusted prior to the formal issuance of the new Task Order.

4.3.2 Scope Control

Scope control addresses how approved EMD scope changes are controlled. When a new Task Order or modification to an existing Task Order is received, the Technical Director or Chief Engineer performs a quick analysis to determine if it is line with previously agreed on direction or whether clarification is warranted before we accept it and start work.

If the new Task Order is not in line with the previously agreed upon scope, the PM determines the cause of the misunderstanding and resolves it to the customer's satisfaction. Usually new scope is thoroughly vetted with the customer's technical representatives and Project Manager prior to approval and final authorization. The PM makes every effort to respond to the customer's requirements and requests.

The only way for Raytheon to start work on a new requirement is following receipt and acceptance of a contractual Task Order modification to the EMD contract. New work is not started following informal verbal direction.

Following acceptance of the new work, the PM assigns an IPT Task Leader (TL) to do the detailed assessment and planning. The TL will review and assess the original estimate submitted as the basis for the new work, perform pre-planning to establish the planning artifacts, and complete the baseline planning using processes required for detailed planning. EMD Program Management project instructions for Developing Proposals, Developing Basis of Estimates, and EMD Planning address these activities in more detail.

Following approval of the baseline plan, task execution commences. These activities are managed and tracked each day using status reviews and reports, as well as technical, cost, and schedule metrics, which would have been identified as part of the detailed planning process. Data for these metrics are identified, collected, analyzed, and reported to track task progress. Paragraph 4.4.1 addresses required program metrics. When a predetermined threshold is exceeded, the metrics trigger management action. This might include resource, priority, or schedule adjustments. At the completion of the task, the Task Leader ensures all close-out requirements have been met and conducts a lessons learned session, if warranted.

When performance deviates from the baseline plan by 10% or more, a variance report is triggered and corrective action is immediately performed to mitigate the impact of the plan deviation. The corrective action is based on the type of deviation. Technical and schedule deviations result in proposed alternative technical solutions and re-planning of the effort. Cost deviations result in a detailed cost analysis with proposed cost solutions and a control account re-

planning as necessary. All variance reports are documented as part of the Earned Value Management requirement. Variance reports identify the description of the variance (cost or schedule/technical), the cause of the variance (root cause), and the impact to the program (recoverable or not recoverable). Variances are tracked and reported to the customer on a monthly basis until the problem has been resolved or mitigated to the full extent possible.

Significant changes to the cost and schedule baseline are managed via the Baseline Change Request (BCR) that is generated by the Program Control Analyst, approved by the owning Control Account Manager (CAM), reviewed by the Program Control Director, and approved by the Program Manager. Following the baseline approval, no movement of funds between Work Breakdown Structure elements will be made without full disclosure to the customer.

Re-baselines are only performed at the express direction of the customer. They are done when the plan and work products are no longer aligned. Re-baselines are normally performed when a program's cost exceeds its baseline plan resulting in the earned value management information no longer being an effective management tool. However, EMD presents the unique challenge where the Award Fee for Service tasks is final for each Period and where the cost, schedule, and technical scope encompass only the work, budget, and schedule for that period. This means that under-runs in the budget do not carry forward from prior Award Fee periods. To capture this budget and scope for future use, a re-baseline is necessary. In this regard, re-baselines may be implemented for EMD's Service-type tasks without negative quality or Award Fee impact.

When directed by ESDIS to re-baseline, EMD will reset all appropriate accounts back to a Cost Performance and Schedule Performance index of 1.00. This will erase all under-runs and over-runs from prior periods. All re-baseline changes are fully documented in the Program Control baseline.

The charter of the Architecture Review Board is to provide technical oversight for tasks on the EMD contract. The ARB reviews technical approaches associated with task orders to ensure that long-term goals are sustained, operability and performance are maintained, and that the approach is strategically and architecturally consistent with the rest of the system. When a new task order is initiated, the ARB convenes to review the technical approach, schedule and cost constraints, implementation and testing approaches, proposed milestones, and risks associated with task execution. The ARB will also convene to review specific technical approaches that have impacts on operations. ARB review is mandatory during the planning and initiation of new tasks, and may be convened at the discretion of the Chief Engineer or the Technical Director for other technical topics.

Baseline changes associated with scope changes are reviewed and approved via the Change Control Board (CCB). The CCB is the approval gate for changes to the EMD technical baseline, to include requirements and operations concepts, integration and test plans and results, and hardware and software configuration mappings. Configuration change requests that document the requested baseline change are submitted under sponsorship of the originating task lead. CCRs are logged and circulated for review to stakeholders, and then approved at the CCB. Engineering change orders that implement the CCR are tracked for closure, to record the completion of the baseline change.

The COTS Software Maintenance IPT is responsible for continually monitoring vendor plans to determine the end of maintenance and end of life dates for each COTS product, as well as interdependencies between COTS products that would require multiple upgrades. Prioritization and planning of upgrades is performed by the COTS IPT, with review by SEIT, and is based on the overall risk to operations of allowing COTS versions to age. Resources to perform the upgrade are allocated primarily from the COTS IPT, but are also drawn from the Test and the Infrastructure CPTs. The number of upgrades to be performed per year is based on the complexity of each upgrade and the level of effort allocated to COTS upgrades under Task 101.

Custom software maintenance activities are initiated by capturing and prioritizing modification requests from system users. The EMD Help Desk and SDPS Trouble Ticket system together provide the front line of support to system users. In addition, the SDPS NCR system, implemented with the Distributed Defect Tracking System tool (DDTS), is used by EMD engineers to identify problems found within the engineering environment.

After modification requests (MRs) have been captured, the Problem Review Board (PRB) assesses the impact of the reported problems and routes them for analysis by maintenance engineers. Each DAAC prioritizes outstanding MRs for work by EMD engineers and communicates these priorities in weekly telecons that include ESDIS, the Deployment IPT, and SEIT. The Deployment IPT, with oversight by ESDIS and SEIT, develops a consolidated priority list that reflects the DAACs' individual inputs. The maintenance engineers within the Custom Code Maintenance IPT work on MRs in priority order to the greatest extent possible, given the resources and expertise available. The Operations Deployment IPT updates the EMD priority list each week and publishes the updated priority list to the DAACs and ESDIS.

After prioritization of MRs, work flows from maintenance engineers to the Software Installation and Test and Integration CPTs. This flow is described in more detail in Section 3.8, Technical Approach to System Development.

Hardware maintenance on EMD is primarily implemented through long-term maintenance agreements with hardware vendors (e.g., ADIC, SGI, Sun). As part of a contract package, service vendors include their corporate and EMD-specific maintenance and quality plans. The plans are integrated with and driven by overall EMD system maintenance plans and address preventive maintenance, diagnostics, corrective maintenance, customer service alert procedures, quality engineering, response time commitments, and escalation procedures.

EMD is based on an open-systems architecture making maximum use of commercial-off-the-shelf-components (COTS). As a result, the hardware design activities are limited to the selection, deployment, and maintenance of COTS hardware components. The process for selecting and deploying COTS hardware during the execution of new task orders is analogous to EMD software development processes. During planning, major milestones associated with the task are provided and baselined as constraints upon the delivery. To ensure requirements will be met, operations concepts, deployment and software requirements, interoperability between COTS hardware and software components, network and peripheral connectivity requirements, and estimated CPU and memory consumption are used to determine hardware selection. Each requirement is given a weight based on its relative importance to assist in the hardware selection trade off decisions for the final design. A site survey is also executed to ensure that all sites

identified for deployment can accommodate any additional footprint, power, and cooling requirements. Following design approval by the Architecture Review Board, a Bill of Materials (BOM) is generated containing the detailed inventory of all COTS hardware and software components to be obtained. A configuration change request is generated for the procurement and presented to the EMD change control board (CCB) for approval. When the COTS products are delivered, they are inventoried in the EMD integrated logistics support system, and tagged for property management. Hardware and firmware are "burned-in" prior to delivery and installation, if required. All EMD deployments to the sites are accompanied by a Pre-Ship Review (PSR), which is executed according to processes maintained by the Operations Deployment IPT. Hardware PSRs include installation and configuration instructions and any transition procedures if applicable. After the PSR is conducted and burn-in is complete, the new COTS hardware and software are delivered to the site and installed.

At each site (DAACs, SMC, Landover facility), a Local Maintenance Coordinator (LMC) is designated, who coordinates day-to-day support with the site's operations management. It is the LMC who coordinates, and interacts directly with, the maintenance vendors. The LMC reports problems to the Landover facility, but is able to work with the maintenance vendors to resolve the problems immediately using Maintenance Work Orders (MWOs).

Maintenance records and metrics will be reviewed by the Failure Review Board (FRB), which includes representatives from SEIT, COTS Maintenance, Procurement, and ESDIS. The board meets as needed, and reviews metrics, validates performance against availability (Ao) and mean down time (MDT) baselines per site and per function/thread, and recommends and/or initiates corrective measures.

4.3.2.1 Contract Management

The Contract Administrator is Raytheon's official point of contact for proposal negotiations and contract management with the customer. The Contract Administrator supports the Program Manager by interpreting the contract requirements and by accomplishing or coordinating the administrative and reporting requirements of the contract. The Contract Administrator also monitors the contract funding and performance and brings all problematical issues, either existing or potential, to the attention of both the Program Manager and the Contracts Manager. Contract Administration also includes proposing, negotiating, and implementing modifications or task orders issued under the contract, coordinating with the Program Manager and with the customer regarding delivery issues, supplier/subcontractor issues, contract interpretation, payment issues, requests for equitable adjustments (REAs), claims, disputes, requests for information, the submission of data items required by the contract and closure activity at the end of the contract. After receipt of the contract, the Contract Administrator carefully reads the Special and General Provisions to identify each clause that requires an administrative action after contract award.

4.3.2.2 Work Authorization

The Program Manager and Deputy Program Manager authorize work to be performed on the program. Work is authorized via Primary Work Authorization and Secondary Work Authorization (SWA). The Primary Work Authorization (PWA) is provided by the Contracts

Organization in the form of a Contract Brief. The SWA for a new Task Order is a letter signed by the Program Manager to the IPT TL assigned the budget allocation. For modifications or changes to existing baselined tasks, a BCR is used to document and approve distribution of budget within the baselined plan. The work is verified complete based on the type of activity baselined. Level of effort work is deemed complete at the end of the existing period of performance of the work. Discrete activities are deemed complete based on the type of performance achieved and reported by the Control Account Manager. Work authorizations are closed with a letter to the customer indicating completion of the work and status of all control accounts and final deliverables.

4.4 Performance Management

Metrics are a key measurement of success on EMD. Technical, cost, schedule, and business metrics are collected on a monthly basis and reported to the customer. The following sections include the metric strategy used on EMD, a short synopsis of the EMD Work Breakdown Structure (WBS) as directed in the SOW, and cost and schedule management activities.

4.4.1 Metrics Strategy

On EMD, Raytheon uses performance metrics as a means of determining whether the program is meeting its goals and requirements. Raytheon anticipates that these metrics, as well as other information, will be used by ESDIS in measuring program performance. There are five categories of metrics collected for EMD: Technical, Schedule, Cost, Business, and Customer Satisfaction. All metrics are collected monthly except for the Customer Satisfaction Award Fee scores, which is tracked by Award Fee period.

Technical Metrics. Raytheon has developed metrics in response to specific program goals that were determined in conjunction with ESDIS. While the goals are expected to be constant across the program, it is possible that the metrics may be refined over time, either by improving the formula for measurement, or by changing the thresholds for performance. For instance, Raytheon's ability to respond to priority nonconformance reports (NCRs) is based on the complexity of the NCR, and it has been our experience that enhancements are more complex to resolve than problems with existing functionality. As the number of enhancements on the priority list increases, Raytheon may be less able to quickly resolve priority list issues. For instance, a DAAC may decide to perform less distribution because it is engaged in a specific reprocessing campaign. Operations specific issues must be taken into consideration in the evaluation of these metrics. Program technical goals for the Sustaining Engineering task order and their specific corresponding metrics to be provided to NASA are contained in Table 4.4.1-1.

Table 4.4.1-1. EMD Technical Metrics (1 of 2)

TECHNICAL PERFORMANCE					
Goal: Ensure higher priority problems receive more attention than lower priority problems.					
#	**Focus Area**	**Key Metric**	**E**	**N**	**M**
1*	Delivery	Average number of days from SMC TT to Deliver for Sev 1 NCRs for Eng SW and TEs	≤ 2	3-5	> 6
2*	Delivery	Average number of days Priority Date to Deliver for Top 25 NCRs for patches and TEs	≤ 55	56-80	≥ 81
3*	Delivery	Average number of days Priority Date to Deliver for Top 75 Priority NCRs	≤ 65	66-93	≥ 94
4*	Fix Time	Average days to fix Severity 1 & Top 25 NCRs	≤ 40	41-60	≥ 61
5*	Fix Time	Average days to fix Priority NCRs	≤ 50	51-70	≥ 71
6*	Fix Time	Percentage of total number of hours spent fixing all Priority NCRs	85-100%	75-84%	≤ 74%
7	Fix Time	Percentage of total number of hours spent fixing Severity 1 & Top 25 NCRs	Not Defined	Not Defined	Not Defined
8	Fix Time	Percentage of total number of hours spent fixing Priority NCRs > 25	Not Defined	Not Defined	Not Defined
9	Fix	Percentage of all NCRs fixed that are on the Priority List	65-100%	50-64%	≤ 49%
10	Aging	For NCRs on the Top 25 list, average days on the DAAC List	0-45	46-65	≥ 66
11	Aging	For NCRs on the Top 75 list, average days on the DAAC list	Not Defined	Not Defined	Not Defined
Goal: Ensure information flow between the DAACs and Landover facilitates quick problem resolution.					
#	**Focus Area**	**Key Metric**	**E**	**N**	**M**
1	Information	Average number of requests for information per delivery (TEs and patches), which require information	0-1	2-4	≥ 5
2	Throughput	Days from SMC trouble ticket to NCR	1-1.9	2-2.9	≥ 3
3	Not a Bug	Proportion of NCRs & TTs resolved as not a bug	0-1.5%	16-25%	≥ 25%
Goal: Ensure DAACs are providing accurate, consistent guidance to the Landover Team.					
#	**Focus Area**	**Key Metric**	**E**	**N**	**M**
1	Information	Rating of accuracy and consistency of basic NCR information received from DAACs on a scale of 1 to 4	3-4	2	≤ 1
2	Volatility	Changes in DAACs relative ranking of Top 25 NCRs	Not Defined	Not Defined	Not Defined

Table 4.4.1-1. EMD Technical Metrics (2 of 2)

Goal: Ensure Problems are fixed correctly the first time without causing other problems.					
#	**Focus Area**	**Key Metric**	**E**	**N**	**M**
1	Rework	Percentage of NCR SW fixes that failed at the DAACs	≤ 1%	1%	≥ 2%
2	Rework	Percentage of NCR SW fixes that failed by Test	≤ 3%	3.1-5.9%	≥ 6%
3	Not a Bug	Percentage of NCRs designated as NAB and disputed by DAACs	≤ 2%	2.1-4.9%	≥ 5%
4	Breakage	Number of installation NCRs generated for patches	0	1-2	≥ 3
5	Breakage	Number of installation NCRs generated for COTS from DAAC	0	1-2	≥ 3
6	Breakage	Percentage of new NCRs resulting from patches from DAAC	≤ 3%	4-6%	≥ 6%
7	Breakage	Number of new NCRs resulting from TEs from DAAC	0	1-2	≥ 3
Goal: Minimize Operations perturbations to DAACs due to patches and TEs.					
#	**Focus Area**	**Key Metric**	**E**	**N**	**M**
1	Frequency	Number of Patches delivered during the period			
2	Frequency	Number of TEs delivered during period			
3	Size	Average number of NCRs in TEs (prioritized and non-priority)	≤ 1	1.1-2.9	≥ 3
4	Installation Time	Average number of days all DAACs require to install patches in OPS modes			
5	Installation Time	Average number of days first DAAC requires to install TEs in OPS modes			
Goal: DAACs should close NCRs in a timely fashion.					
#	**Focus Area**	**Key Metric**	**E**	**N**	**M**
1	Closure	Average time for DAAC to test & verify NCR from receipt of fix in patch (days)., D-> V state	≤ 21	21.1 – 35.9	≥ 36

Raytheon delivers these metrics as part of its Monthly Progress Report (MPR), DID #010 EMD-MPR-10, and briefs key metrics* to ESDIS during monthly Program Management Review to ensure that they receive adequate visibility and discussion.

Schedule, Cost, Business, and Customer Satisfaction Metrics. Raytheon has developed additional metrics to monitor schedule, cost, and business performance. These goals and their specific corresponding metrics are contained in Table 4.4.1-2.

Table 4.4.1-2. EMD Schedule, Cost, Business, and Customer Satisfaction Metrics (1 of 2)

COST AND BUSINESS MANAGEMENT PERFORMANCE					
SUPPLY CHAIN MANAGEMENT					
Goal: Ensure Subcontractors are effectively managed.					
	Focus Area	**Key Metric**	**E**	**N**	**M**
1	SCM	Submit Subcontractor modifications to PM for signature and approval with minimal corrections required	0	1-2	≥ 3
2	SCM	Submit monthly status reports on performance against subcontractor goals with reasons for not achieving contract plan	Submitted Early (E)	Submitted On Time (OT)	Submitted Late or Not At All (L/NS)
Goal: Execute an effective Mentor Protégé program					
	Focus Area	**Key Metric**	**E**	**N**	**M**
1	Mentor Protégé	Submit monthly Mentor Protégé status reports to the EMD PM showing measurable progress	E	OT	L/NS
Goal: Execute the Subcontractor Performance Sharing					
	Focus Area	**Key Metric**	**E**	**N**	**M**
1	SCM Goal	Achieve Small Disadvantaged 10% Business Goal	> 10%	9.5-10%	< 9.5%
CONTRACTS MANAGEMENT					
Goal: Perform Contracts Management Effectively and Efficiently					
	Focus Area	**Key Metric**	**E**	**N**	**M**
1	Contr Doc	Response time (in days) to Task Plan Requests	≤ 1 day early	0-1 day late	≥ 2 days late
2	Contr Rep	Response time to NASA Contracts Officer Requests	≤ 1 day early	0-1 day late	≥ 2 days late
EHS					
Goal: Execute an effective Environmental, Health, and Safety program					
	Focus Area	**Key Metric**	**E**	**N**	**M**
1	Safety	Conduct monthly safety audits	100%	90-100%	≤ 90%
2	Safety	Conduct monthly safety reminders	100%	90-100%	≤ 90%

Table 4.4.1-2. EMD Schedule, Cost, Business, and Customer Satisfaction Metrics (2 of 2)

PROGRAM CONTROL					
Goal: Improve Cost Reporting					
	Focus Area	**Key Metric**	**E**	**N**	**M**
1	Cost Reporting	Submit timely EMD Contract required cost reports (533M/Q Reports)	Submitted Early	Submitted OT	Submitted Late
2	Cost Reporting	Submit quality 533M/Q Cost Reports to NASA	3 consecutive months with 0 Errata	1-2 consecutive months with 0 Errata	Any Errata
3	Cost Reporting	Submit timely Spend Plans and Variance Explanations	Submitted Early	Submitted OT	Submitted Late
4	Cost Reporting	Submit quality Spend Plans and Variance Explanations	3 consecutive months with 0 Errata	1-2 consecutive months with 0 Errata	Any Errata
5	Cost Reporting	Submit initial drafts of the IFR/PMR to PM for reviews in a timely manner prior to the formal presentation	≥ 1 day early	1 day early	Same day as presentation
6	Cost Reporting	Submit initial drafts of the IFR/PMR to PM for reviews in a timely manner prior to the formal presentation	≥ 1 day early	1 day early	Same day as presentation
Goal: Identify, plan, and manage costs and resources effectively					
	Focus Area	**Key Metric**	**E**	**N**	**M**
1	Cost Realism	Cumulative current AF Period CPI	≥ 1.00	.930-.999	≤ .929
2	Schedule Perf	Cumulative current AF Period SPI	≥ 1.00	.930-.999	≤ .929
3	Baseline Mgt	Promptly baseline new work	≤ 1 month	2 months	≥ 2 months

PROCESS IMPROVEMENT					
Goal: Improve Program processes with quantifiable results.					
	Focus Area	**Key Metric**	**E**	**N**	**M**
1	Cost/Benefit	Achieve quantifiable Cost/Benefit to the program	≥ $1.5M	$1-1.49M	< $1M
2	Specialists	Achieve Specialist Certification of EMD Raytheon staff	≥ 60%	41-59%	≤ 40%

RISK MANAGEMENT					
Goal: Effectively handle/mitigate risks					
	Focus Area	**Key Metric**	**E**	**N**	**M**
1	Risk Mgt	Maintain sufficient MR coverage of potential risks	≥ 100%	90-99%	≤ 90%
2	Risk Mgt	Assess program risks regularly	> 1 / month	1 / month	< 1 / month

QUALITY ENGINEERING					
Goal: Ensure Quality Engineering results in high customer satisfaction					
	Focus Area	**Key Metric**	**E**	**N**	**M**
1	Cust Sat	Raytheon Quality Performance Index	950-1000	800-949	< 800
2	Cust Sat	Award Fee scores	≥ 95%	94-86 %	≤ 85%

Raytheon tracks these metrics principally for internal purposes as part of monthly status tracking and briefs the results to the EMD Team during periodic All Hands meetings. Cost performance is briefed to ESDIS during the monthly Program Management Reviews.

4.4.2 Work Breakdown Structure (WBS)

NASA defined the EMD Contract WBS in the EMD Request for Proposal and subsequently in the Statement of Work. Reference the EMD WBS Dictionary for a detailed description of each element to Level 4. The WBS is tailored as a joint effort given inputs from the stakeholders and the customer when new work is received. The WBS to Level 3 is provided in Table 4.4.2-1.

Table 4.4.2-1. EMD Work Breakdown Structure (WBS) to Level 3 (1 of 2)

Level 1	Level 2	Level 3	Description
10x			Task Order 10x, Task Order Title
	1		EMD Program Management
		1.1	Program Office
		1.2	Program Control
		1.3	Supply Chain Management
		1.4	Configuration Management and Data Management
		1.5	Quality Engineering
		1.6	Property Management
		1.7	Security
	2		Transition of Maintenance and Development Responsibilities
		2.1	Transition Specific Program Management
		2.2	Transition – SDPS Maintenance (Reserved)
	3		Maintenance
		3.1	Custom Code Maintenance and Deployment
		3.2	COTS Software Maintenance and Deployment
		3.3	Hardware COTS Maintenance
	4		Development
		4.1	Custom Code Development and Deployment
		4.2	COTS Software Development and Deployment
		4.3	Hardware COTS Development
	5		System Engineering
		5.1	Enhancements Summary
		5.2	Task Development Planning
	6		Science Support
		6.1	Science Office
		6.2	Science Applications
	7		Operations Support
		7.1	DAAC Operations Support
		7.2	Operations Training

Table 4.4.2-1. EMD Work Breakdown Structure (WBS) to Level 3 (2 of 2)

Level 1	Level 2	Level 3	Description
	8		Studies and Prototyping
		8.1	Prototype Custom Code and Deployment
		8.2	Prototype COTS Software and Deployment
		8.3	Prototype Hardware COTS
		8.4	Studies, Analyses, and Trades

4.4.3 Cost Management

Cost management includes the processes needed to ensure EMD is completed within the approved budget. This includes ensuring a realistic estimate of the costs to perform the required tasks and developing an accurate time-phased budget baseline to perform the EMD tasks.

4.4.3.1 Cost Estimates and Budget Allocation

Developing cost estimates is an on-going activity on EMD due to the nature of the Task Order contract. There are two types of estimates developed on EMD: a detailed priced cost estimate and a Rough Order of Magnitude (ROM) estimate. Detailed project instructions on Developing proposals, Developing Basis of Estimates, Developing ROMs, and Developing Software Estimates provide specific direction for performing each of these activities. When a Task Plan Request is received from NASA or Raytheon decides to submit a System Enhancement Proposal or other unsolicited proposal, the Program Manager chooses a Proposal Manager or ROM Coordinator to develop the proposal or ROM and resulting estimates. EMD estimates address all the elements of cost and are documented in Basis of Estimates (Proposals) or Impact Analysis Reports (ROMs). Estimates are reviewed regularly to ensure productivity factors, lines of code estimates, and labor grades were appropriately chosen for authorized work. As deltas to original estimates are determined, they are incorporated for future estimating and existing budget baseline adjustments. Estimates are normally developed by the individuals with the technical expertise to understand the type and scope of the work. Estimating methodologies available for use on EMD are addressed in Table 4.4.3.1-1.

Table 4.4.3.1-1 EMD Estimating Methodologies (1 of 2)

Characterization of the Work	Example Type of Activity for Estimation	Potential Estimating Methodologies
Level of effort for Management	Program Management, Program Control, Supply Chain Management, Contracts Office	1. Percent of FTEs managed 2. Percent of management hours to the total program hours 3. Percent of management hours to the total engineering hours 4. Specify the tasks to be performed using historical data
Level of effort for system support	Infrastructure or Help Desk	Number of equipment serviced from an actual account.

Table 4.4.3.1-1 EMD Estimating Methodologies (2 of 2)

Characterization of the Work	Example Type of Activity for Estimation	Potential Estimating Methodologies
Level of effort for sustaining engineering	Non-conformance Report (NCR) Work-off	1. Using established program metrics derived from program actual performance—must reference source data. 2. Number of like tasks from an actual cost account.
Discrete software development	Full System Release	Industry standard calibration such as COCOMO—requires assumptions and calibrating.
Discrete systems engineering	Technology Insertion	Number of like tasks from an actual cost account.
Level of effort for systems engineering and integration and test	Sustaining Engineering	1. Comparison of like tasks by taking an account with historical hours and remove those hours not applicable to new scope to attain a metric. 2. Using established program metrics derived from program actual performance—must reference source data.

When the estimators have completed their basis of estimate, the pricing analysts assist them in translating the required labor hours, material, and other direct costs into cost and price. The Proposal Assessment Board (PAB) and Raytheon Gate 4 attendees are responsible for approving the basis of estimates and proposals prior to submission to the customer. ROMs need only be approved by the PAB since they are not binding estimates.

4.4.3.2 Cost Controls

Once the proposal has been accepted and authorized as a new Task Order, Raytheon proceeds with developing a time-phased budget baseline. The original basis of estimates (BOEs) are used to allocate budget to the functional accounts performing the work. Each of the accounts has a Control Account Manager (CAM), who is responsible for executing the prescribed work for that account on budget and within schedule. The CAM works with the Program Control Analyst (PCA) in setting up the budget by month. This involves identifying the resources to perform the work and the material to be purchased. When the budget has been allocated to the full period of performance for the scope identified in the task order, the baseline plan is peer reviewed and approved by the Program Manager and the customer in an Integrated Baseline Review. Smaller tasks and modifications to tasks are reviewed and approved in the standing Planning Meeting. The Program Office provides charge numbers to the resources to start collecting costs against the baselined accounts. On a monthly basis, the status of each account is reported to the Program Manager and Customer. The baseline is maintained through strict control of the budget using the Budget Change Request (BCR). This document identifies the funds to be moved (to and from accounts), the period the funds will be moved, and the necessary approvals from the CAM, PCA, Task Leader, and Program Manager. Earned value management is used to measure performance and is addressed in more depth in paragraph 4.4.5. Significant variances to the baseline plan are reviewed monthly and reported to Program Management and the customer. Performance metrics are derived from the earned value management system and reported in monthly NASA 833 Cost Reports. Cost performance is presented to the customer in monthly Program Management

Reviews Executive Session charts using customer-directed excel graphs and charts, wInsight graphs and tables, and detailed resource analysis. Program Management Reviews are delivered as part of the Monthly Progress Report CDRL. EMD project instructions have been developed to address Earned Value and Baseline Management to include the process for planning baselines using the Rolling Wave approach, developing Latest Revised Estimates and Estimates at Completion (EAC), and cost reporting requirements. Program costs are reviewed monthly in the Internal Financial Review (excludes the customer) and the Program Management Review (includes the customer).

Several automated tools are used to assist with cost control and reporting. They are:

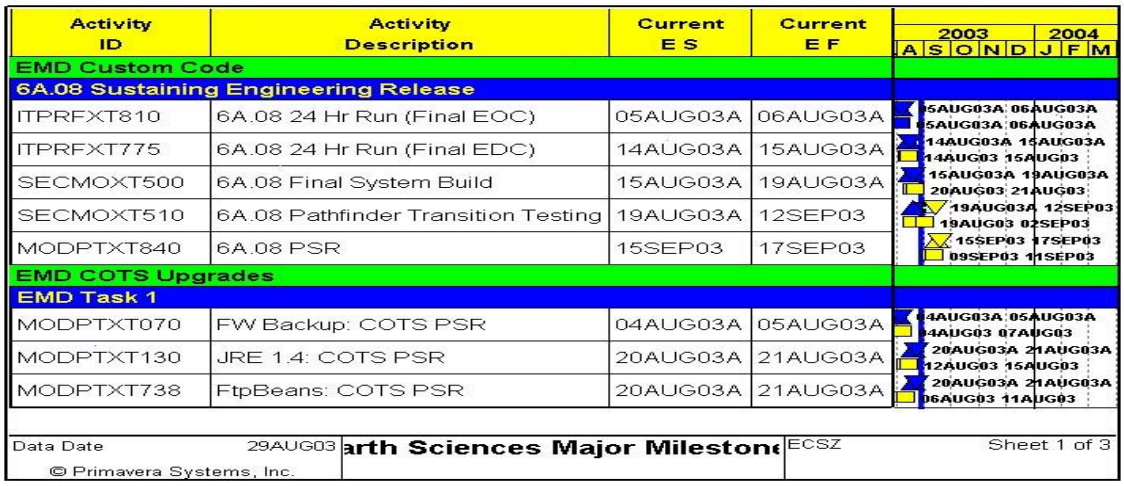
- MPM for Windows v.2.1 as the primary financial database
- Primavera Project Planner (P3) for project scheduling
- Winsight v.5.0 for performing EVM analysis and preparing reports
- Winsight v.5.0 for administering the Winsight tool.
- MPM Connect for transferring data from MPM to Winsight.
- Control 8 for forecasting purposes
- JAMIS for timekeeping and accounting queries
- Impromptu for extracting JAMIS data from the cost data warehouse (CDW)

4.4.4 Schedule Management

An integrated master schedule (IMS) is maintained for EMD that depicts high-level milestones for each of the Tasks. The P3 schedule included below shows an actual high-level schedule for Task 101 activities only. This schedule will be updated and briefed to ESDIS each week. As new tasks are added to the schedule, their milestones will be included in the high level schedule. Milestones/activities for all tasks combined are reviewed at the contract level to identify any conflicts with resources.

In addition, a schedule will be maintained for each Task with all activities required to complete the work in the task. These schedules will be maintained in P3 and will be used by the IPTs to manage their work.

A detailed Program Control (PC) project instruction titled Schedule Development, Analysis, and Control addresses specific responsibilities and processes for schedule activities.



Activity ID	Activity Description	Current E S	Current E F
EMD Custom Code			
6A.08 Sustaining Engineering Release			
ITPRFXT810	6A.08 24 Hr Run (Final EOC)	05AUG03A	06AUG03A
ITPRFXT775	6A.08 24 Hr Run (Final EDC)	14AUG03A	15AUG03A
SECMOXT500	6A.08 Final System Build	15AUG03A	19AUG03A
SECMOXT510	6A.08 Pathfinder Transition Testing	19AUG03A	12SEP03
MODPTXT840	6A.08 PSR	15SEP03	17SEP03
EMD COTS Upgrades			
EMD Task 1			
MODPTXT070	FW Backup: COTS PSR	04AUG03A	05AUG03A
MODPTXT130	JRE 1.4: COTS PSR	20AUG03A	21AUG03A
MODPTXT738	FtpBeans: COTS PSR	20AUG03A	21AUG03A

4.4.5 Earned Value Management System (EVMS)

Raytheon measures progress by using earned value management (EVM) methodology against a well planned financial and schedule baseline, use of performance-based metrics, and a focused process improvement program to assess process performance on a regular basis.

- • Although EVM is not a requirement on EMD, Raytheon is a strong proponent of this methodology for measuring a program's cost and schedule performance. It is not strictly necessary for a level of effort task, such as Task Order 101; however, it will be an effective tool for all end-item task orders.

- • Raytheon uses a comprehensive set of metrics to ensure that EMD work is aligned with ESDIS goals and priorities. These metrics will enable Raytheon and ESDIS to evaluate and improve the quality, productivity, and effectiveness of products and services, and to measure the Raytheon team's performance on the program. These metrics are addressed in more detail in Section 4-4-1.

Refer to Paragraph 4.2.5 and 4.2.6 for an overview of how Raytheon reports progress on EMD tasks.

4.5 Risk and Opportunity Management

Risk and opportunity management is the systematic process of identifying, analyzing, and responding to program risks and program opportunities. Risk is exposure to the chance that the planned quality, technical performance, schedules, or cost of an undertaking will not be achieved. An opportunity is the opposite of a risk, the potential for improving technical, cost and/or schedule performance within a project. Risk and Opportunity go hand in hand. Risk management includes maximizing the probability and consequences of positive events and minimizing the probability and consequences of adverse events to program objectives.

Risk Management is addressed in detail in the PM project instruction titled Risk and Opportunity Management and the EMD Risk Management Plan. Please refer to these documents for additional information on Risk Management.

4.6 Quality Management

Quality Assurance (QA) provides confidence that the program will satisfy relevant quality standards through planned and systematic program audit, monitoring and evaluation activities implemented within the Landover quality management system. QA determines if program results comply with relevant quality standards, which is accomplished by monitoring specific program activities, i.e., product planning and development, status and peer reviews, testing, and documentation to identify process and product defects and monitor corrective action to eliminate root cause of unsatisfactory results.

The Software Quality Assurance Plan (SQAP), 104-EMD-001**,** establishes the Quality Assurance (QA) program for the ECS Maintenance and Development (EMD) contract. The SQAP addresses the organization, responsibilities, procedures, methods and tools employed by the Raytheon Team in maintaining, sustaining, and enhancing the EOSDIS Core System (ECS) under the EMD contract. This plan describes the QA organization and the activities applicable for the EMD Program. In accordance with IEEE Std-730-2002, this plan covers EMD QA activities performed by members of the QA organization. In addition, it references activities monitored by QA that are performed by other organizations or functions.

QA activities are performed in accordance with defined process descriptions documented in Landover Facility Procedures addressing the following:

- ISO Implementation Map identifies and maps specific processes to the ISO 9001:2000/AS9100 standards at the Landover facility.

- Quality System Management Review establishes a procedure for management review of the suitability and effectiveness of the Information Technology Systems (ITS) quality management system (QMS).

- Software QA Program Planning describes the process for developing a Software Quality Assurance Plan (SQAP) defining the management and implementation of a planned software QA approach that is implemented for ITS programs.

- The Quality Engineering Deficiency Reporting process establishes how Quality Engineers document the results of audits, product evaluations, and cited deficiencies and follow-up the resulting disposition to ensure deficiencies are corrected.

- The QMS Records process identifies and establishes guidelines for the control of records required by the AS9100 and ISO 9001:2000 standards or that directly support the ITS QMS.

- The Internal Quality System Audits establish documented procedures for planning and implementing internal quality audits against AS9100 and ISO 9001, to verify whether

quality activities and related results comply with ITS policies and procedures and to determine the effectiveness of the QMS.

- The Quality Assurance Audit and Product Evaluation procedures provide guidance to Quality Assurance Engineers (QAEs) on conducting consistent and objective quality assurance audits and product evaluations.

- The QA Evaluation Criteria Procedure provides guidance on developing objective evaluation criteria, based on applicable standards and documented processes, to be used to conduct audits and product evaluations.

- The QA Status and Metrics Reporting provides guidance and format to QAEs for documenting QA activity, status, and metrics and developing consistent reports..

- The Corrective and Preventive Action defines corrective and preventive action and identifies the processes that support the Raytheon Landover Facility QMS.

The following automated office tools are used to assist with QA:

- Microsoft Access - the QA Database is used to monitor, track, and report on Landover QA activity (audits, evaluations and discrepancy reports) and the Corrective and Preventive Action Report (C/PAR) database is used as a closed-loop system to document and track external audit nonconformance results.

- Microsoft Excel is used to collect and analyze QA metrics and to generate monthly reporting.

4.7 Resource Management Plan

The resource plans address what physical resources (people, equipment, material, facilities) and what quantities of each are needed, when they are needed to perform program activities and the method for updating the plan.

4.7.1 Capital Planning

There are no capital expenditures required for EMD.

4.7.2 Facilities / Security Plan

EMD is physically performed in five locations, four of which are provided by the Government.

- Raytheon building at 1616 McCormick Drive, Upper Marlboro, MD (Raytheon leased Facility also known as the Raytheon Landover Facility)

- Building 32-Goddard Space Flight Center, Greenbelt MD (Gov Facility)

- Land Processing Data Active Archive Center, Sioux Falls, SD (Gov Facility)

- Langley Research Center, Langley AFB, VA (Gov Facility)

- National Snow and Ice Data Center, Boulder, CO (University Facility)

The principal location for performing software maintenance and development is the Raytheon building in Upper Marlboro MD.

For additional familiarization, Facilities has published two Landover Facility Procedures addressing their processes for the following:

- Facilities Staff Roles and Responsibilities provides facility personnel guidance in carrying out their overall responsibilities and tasks to support Landover facility operations.
- Facility Office Space Guidelines establishes the guidelines for standard office sizes and basic office furnishings at the Landover site.

The EMD security program is implemented and maintained in accordance with 423-10-23, EOSDIS Security Policy and Guidelines Document, and NPG 2810.1, Security of Information Technology. The security program addresses the guidance provided in Section 2.7.6 of the Task 101 SOW. Security responsibility rests with the Science Data Processing System (SDPS) computer security officer (CSO), who is a member of the System Engineering and Integration Team (SEIT). The CSO is responsible for ensuring that all aspects of the SDPS security requirements are met.

Security activities are led by Raytheon with an emphasis on consensus with the DAACs. DAAC security administrators, ESDIS security staff, and EMD security staff exchanges information through active working groups. The implementation of a security activity is the responsibility of the DAACs with guidance or assistance provided as required from EMD program security staff. EMD personnel are responsible for security changes in the ECS Development Facility (EDF) and System Management Center (SMC). Biannual security scans by the ESDIS IV&V at the DAACs and at the EDF are supported. Security efforts are not limited to maintaining the current posture, but are directed toward continuously improving the security posture of EOSDIS assets.

EMD physical, personnel, information, communications, and IT security represent special concerns that justify their own suite of documentation. While security responsibility is that of the CSO, all offices or organizations of the EMD project must be sensitive to security issues. The major project documents associated with EMD security are:

- EMD Security Management Plan (DID #007, EMD-SMP-7)
- EDF Risk Management Plan
- Contingency Plan for the EDF

The DAACs are responsible for their corresponding Risk Management and Contingency Plans. The EMD Security Plan promulgates the overall EMD security policies and will include, but not be limited to, discussions of the following areas:

- SDPS Security Architecture. The SDPS security architecture evolved from a three-layer architecture to its current four-layer architecture with the implementation of the Perimeter Services provided by the high-performance Portus ES proxy firewalls. The four-level

architecture includes border services, perimeter services, enterprise services, and host services. We will continue to evolve the SDPS architecture as necessary to maintain the current levels of protection, as well as to react to changes in the network security environment.

- • Security Engineering Processes. EMD security objectives will be to maintain and upgrade the security features of SDPS hardware and software to assure the system's integrity and to protect its data holdings. SDPS security engineering personnel will continue to interface with NASA, ESDIS, and the DAACs on security issues, while maintaining the integrity of the PVC, VATC, and the SMC. The DAACs will be responsible for their own security under EMD, with the assistance and guidance of the EMD CSO.

4.7.3 Property Management

DID EMD-PP-5, Property Management Plan, and its companion NASA Procedures and Guidelines (NPG) 4200.1E, Equipment Management Manual, define the minimum content of the plan by which the Raytheon Team will provide property management services for the EMD SDPS at the EMD DAACs, the SMC, and the Raytheon Landover Maintenance Facility. The current Property Management Plan for the ECS Project, 602-CD-001-004, June 2002, has been reviewed and already meets the requirements of EMD-PP-5. The Property Management Plan for the ECS Project addresses management of ECS Contractor-acquired commercial off-the-shelf (COTS) hardware and software and government-furnished property (GFP), including management of Contractor-acquired property and GFP in which the ECS Contractor has direct maintenance responsibility, until NASA accepts it.

Documented project instructions and work instructions are in place and require minor updates to accommodate changes required by EMD contract. At a minimum, the following project instructions are immediately applicable to implementing the strategies, direction and actions specified in the Property Management Plan:

- COTS Product Receiving, Inspection and Verification Procedures
- ILS Facility Planning and COTS Hardware Installation
- Control of ECS Property at Remote Sites
- COTS Software License Administration
- COTS Maintenance Support
- ECS Electrostatic Discharge
- Maintenance Data Collection System
- COTS Procurement

The Raytheon property management data system (Integrated Logistics Management-ILM) integrates inventory management, maintenance management and license management into one system. This promotes synergy among property management functions.

The Raytheon team uses causative research techniques to research inventory discrepancies. Use of this technique prevented $1.1M of losses to ECS property.

The Property Management Plan documents procedures as required by FAR 45-5 and NASA FARSUP 1852.245 in the following areas: general property management techniques; acquisition; receiving including receiving inspection, receipt processing, and receipt reporting; identification; records; property management system; movement, including intra-site relocations, inter-site relocations, external transfers and off-site vendor repairs; storage; physical inventories; reports, including quarterly reporting and annual reporting; consumption to include reporting loss, damage or destruction of EMD property, utilization to include consumables and control of pilferable material; maintenance, including warranty management and recording maintenance actions; subcontract and vendor control; disposition, including government furnished property and reporting excess government property; and property closeout.

Work is performed primarily at the Raytheon Landover Maintenance Facility specific to all GFP at the ECS DAACs, the SMC and the Landover Maintenance Facility. It is assumed that the operations contractors at the DAACs will perform their property custodian responsibilities per the EMD Property Management Plan (the document that is under ESDIS and DCMA approval).

The following metrics will be used to assess performance in the property management function:

- Processing timeliness for receipts and shipments. Goal 1 day for both actions.
- Dollar value of material lost damaged or stolen. Goal loss of less than 0.05 percent of total dollar value of inventory. This goal refers to losses that could have been prevented by the Raytheon Team due to poor record keeping and/or mishandling of material. The Raytheon team achieved this goal in the ECS contract.

4.7.4 Staffing

The EMD contract is principally staffed using ECS Contract resources. Several Raytheon ECS personnel elected to re-badge with new small business team members, which is aiding to the achievement of ESDIS small business goals. Except for on-site DAAC engineering, staff required for EMD is collocated at the Raytheon Landover facility. This facility provides all of the resources (office space, computer equipment space, and support tools) needed to execute the contract work. Specific staffing status are reported monthly in the Contractor Manpower report, DID# EMD-MCMR-12. EMD project instruction titled Staff Allocation to EMD Tasks provides a procedure for allocating staff to EMD Tasks, and revising these allocations based on Task requirements and priorities.

4.7.5 Training

Minimal technical training was identified as necessary for the execution of EMD. Management Skills, Process Change, and Process Improvement training is conducted as needed for program

personnel. Landover Facility project instruction on the ITS Training System establishes an integrated process that provides for the determination of training requirements, development and implementation of a formal training plan, and provides for the maintenance of associated training data (i.e., identification/development of courses, attendees, suppliers, costs, and schedules).

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5. Program Execution

5.1 Systems Engineering

The EMD program does not require a Systems Engineering Management Plan (SEMP). Due to the maturity of the ECS system, SEMP processes were integrated as part of the Software Maintenance and Development Plan (SMDP), the Hardware Maintenance and Development Plan (HMDP), and the EMD Security Management Plan (SMP). The areas not specifically addressed in these documents include the Requirements Management, Architecture Review, and System Performance Analysis processes, which are addressed in project instruction (PIs) and can be referenced at the EMD Process Asset Library.

- The Requirements Management process describes the processes for analyzing, allocating, tracing, developing, documenting, reviewing, verifying, validating, and maintaining EMD requirements and mission needs. The Systems Engineering and Integration Team (SEIT) is the organization established on EMD for establishing, maintaining, and executing the processes addressed in the PI.

- The role of the Architecture Review Board (ARB) supports the Decision Analysis and Resolution key process area and is responsible for technical oversight of the architecture and design for all EMD tasks providing direction and guidance to ensure that solutions and strategies are consistent with long-term goals and architectural objectives. The ARB is convened at the discretion of the Technical Director and/or the Chief Engineer who is a member of the SEIT. The ARB is also the approving authority for pre-planning inputs in accordance with the EMD Planning PI.

- System performance analyses and verification are addressed in the PI for Testing in the Performance Verification Center (PVC). The EMD program is responsible for verifying the performance goals prior to each major custom code delivery, and for updating and verifying new goals associated with perfective maintenance releases.

- EMD Release Notes Preparation Guidelines describes the contents, organizational responsibilities, and associated workflow involved in producing EMD Release notes document for all Custom Code software and COTS software releases.

- Engineering Change Order Deviation PI describes the process handling DAAC requests to deviate from EMD – ECS baseline, in response to Engineering Change Orders (ECO).

System security engineering is addressed in the EMD SMP. The SMDP addresses database design, peer review requirements, and associated documentation requirements. The HMDP addresses hardware commercial-off-the-shelf (COTS) engineering, integration, trade studies, analyses, and associated documentation requirements.

Systems engineering performance is measured using cost performance and schedule performance indicators as measured by a cost and schedule baseline in MPM and Primavera, tools used for earned value management.

5.2 Hardware Development

The EMD program publishes a Hardware Maintenance and Development Plan (HMDP), which describes the approach for hardware maintenance, development, and sustaining engineering processes, configuration control, metrics, reviews, reference documentation, and quality requirements.

The processes not specifically addressed in this document include following, which are addressed in PIs and can be referenced at the EMD Process Asset Library.

The EMD program uses the following automated tools for COTS hardware development:

- PuTTY is a SSH, Telnet and Rlogin client for 32-bit Windows systems that provide a memory-resident agent not available with commercial secure shell. It is used to establish a secure connection between Remedy Admin PC and the Remedy Unix server.
- Rational Rose a tool used for modeling object-oriented software.
- Remedy Action Request System is used for trouble ticket reporting and reviewing. Current plans include using this for ILM.
- S-Designor is a data modeling tool used in sustaining engineering of ECS databases.
- Snapshot v3.5.1 is a Unix application used to capture a pictures of GUIs with a menu pulled down on a Unix workstation for documentation purposes.
- Whazzup is a custom, system monitoring tool used to track the status of ECS modes and their custom code servers.
- WinZip is a PC based tool used for compressing and decompressing files.
- XV v3.0 is a Unix application used to capture pictures of GUIs on a Unix workstation for documentation purposes.

5.3 Software Development

The EMD program publishes a Software Maintenance and Development Plan (SMDP), which describes the approach for software maintenance, development, and sustaining engineering processes, configuration control, metrics, reviews, reference documentation, and quality requirements for the ECS SDPS.

A number of PIs have been developed providing specific detailed information/direction for software development and can be referenced in the EMD Process Assets Library.

- Software Development Files describes design and development artifacts that must be saved and file naming conventions.
- FORTRAN Coding Standards describes a standard for programming practice, styles, and conventions to be followed when implementing FORTRAN code on the EMD Project.
- C Coding Standards describes a standard for programming practice, styles, and conventions to be followed when implementing C code on the EMD Project.
- C++ Coding Standards describes a standard for programming practice, styles, and conventions to be followed when implementing C++ code on the EMD Project.
- EMD Program Design Language (PDL) Guidelines provides direction and standards for the creation of Program DesignLanguage (PDL) during the software development process. It provides information on general standards, structure and content of the header file, and structure and syntax for the actual PDL.
- Heritage Software Selection Guidelines defines the guidelines for selection of heritage software for integration into the EMD development program.
- Software Naming Conventions provides general guidelines for naming software items including source, header, binary files and class, functions, procedure, variable names, etc.
- SQL Coding Standards describes a standard for practices, styles, and conventions to be followed when implementing SQL code on the EMD project.
- Java Coding Standards describes a standard for programming practice, styles, and conventions to be followed when implementing Java code on the EMD Project.
- COTS SW Problem Resolution Procedures establishes uniform procedures for the processing of problems related to COTS SW residing on EMD systems located in the EMD Development Facility (EDF).
- Operational Directory Usage Guidelines provides guidelines and standards for EMD operational directory structures.
- EMD Merge Process defines the process for controlling the content of the EMD custom software baselines.
- EMD Peer Review Process defines work products that need to be evaluated by peer reviews and when these work products should be reviewed.
- Inspection Peer Reviews defines how an inspection is to be conducted on the EMD project.
- Routing Peer Reviews defines how a “routing” peer review is to be conducted on the EMD project.

- Walkthrough Peer Reviews defines how a walkthrough is to be conducted on the EMD project.

- Design Peer Reviews describes the contents, participants, and review criteria for reviewing design on the EMD project. This includes both preliminary and detailed design peer reviews.

- Software Work Estimate Peer Review describes the contents, participants, and review criteria for custom software work estimate peer reviews on the EMD project. This includes software work estimates for meeting existing requirements, as well as for CCRs, ROMs, or other proposals.

- Software Development Documentation Process provides how to document the process used to maintain project documents.

- Development Planning and Tracking of Operational Non-Conformance Reports (NCRs) (Sustaining Engineering) describes Development's process for planning and tracking Operational NCRs and the work needed to resolve them.

- Perl Coding Guidelines provides the foundation for coding guidelines in Perl.

- Code and Unit Test Peer Reviews describes the contents, participants, and review criteria for reviewing code and unit test peer reviews on the EMD project.

- EMD Unit Test Plan and Execution describes how unit testing will be performed on the EMD project by the developing organization.

- Installation and Test of COTS software in Functionality Lab identifies specific work instructions for any COTS installations in the EMD Development Facility Functionality Lab.

- Unit Test Database Objects Guidelines describes the contents, participants, and methodology to be implemented for unit testing database stored procedures and database code on the EMD project.

The EMD program uses the following automated tools for software development:

- Software Turnover Tracking System (STTS) is an automated report that is generated each day for use in the daily merge meeting. It provides software merge information taken from the STTS database. The report summarizes new merge form information that has been input into STTS within the past 30 days. The report is annotated in the merge meeting noting the merges that are accepted on any given day. The reports are kept in the merge log notebook kept in the functionality lab.

- Purify provides error and memory leak detection for Sun and Irix platforms. It identifies execution errors and memory leaks within applications in custom code, third party libraries and shared/system libraries.

- RogueWave software is a versatile C++ foundation class library, which is used throughout custom code. It provides single, multibyte and wide character support, time and date handling classes, multi-thread safe, generic collection classes, small talk-like collection classes.

- DBX is a very useful debugger for tracking down errors in our custom code. It is able to track the execution of the program line-by-line in the source code and report the status of every variable. DBX is provided as a standalone binary for SGI and as part of the WorkShop package for Sun.

- Java Runtime Environment (JRE) offers a reliable environment for deploying Java applications in the enterprise. The JRE provides the minimum runtime requirements for executing a Java technology-enabled application.

5.4 ConfigurationManagement (CM) and Software Configuration Management (SCM)

Configuration Management and Software Configuration Management are combined and fully addressed in the EMD Configuration Management Plan (CMP). The EMD CM/SCM approach is based on mature and proven processes executed on the ECS SDPS development contract. In addition to the CMP, several project instructions are used to ensure standardization and compliance with well-established practices. The following project instructions can be referenced at the EMD Process Asset Library.

- Physical Configuration Audit (PCA) defines the process for conducting Physical Configuration Audits in accordance with EMD schedule and contract requirements. The PCA is also used to evaluate and ensure that the approved release configuration conforms to the EMD Product baseline documentation for all DAACs and Landover controlled test environments. It also provides instructions for generating the discrepancy reports used for auditing. These reports include Custom Software, COTS Software, and Operating System patches discrepancy reports.

- Conduct of Software and Hardware PCA (OS, COTS, Custom Code) documents the Configuration Management (CM) activities and procedures, which defines “how-to”, accomplish physical configuration audits (PCA) for COTS patches, custom code, configuration parameters system releases/patches in accordance with the established PCA process.

- Conduct of Hardware PCA defines the process for conducting physical configuration audits (PCA) of COTS hardware.

- Backup of ClearCase Version Object Base Data establishes procedures for the backup of ClearCase Versioned Object Base (VOB) data.

- ECS Software Build Process Using ClearCase provides a detailed procedure of how the software build process is conducted for the EMD project.

- Embedded Versioning conveys the method and instructions of Embedded versioning for EMD developed code.
- Custom Software Delivery defines the CM process for performing a custom software delivery for all software developed under ClearCase control for the EMD project. The ClearCase Support Group follows this process for TEs, patches, and releases (drops).
- COTS and Custom Software Preparation and Delivery process provides detail instructions for preparing Custom Code and instructions for Custom and COTS software deliveries for the EMD project. The ClearCase Support Group follows these instructions to support preparation and delivery of TEs, patches, releases (drops) and COTS software.
- Baseline Management Document Update defines the steps required for processing changes to the baseline documentation throughout the ECS project life cycle. Revision B is updated to establish an event driven process for the update and posting of ClearCase BLM technical documents and posting of other technical documents to the ECS Baseline Identification System (EBIS).
- Configuration Identification defines the steps required to identify configuration items (CI) throughout the ECS project life cycle. It also summarizes the type of CIs that are placed under Configuration Management (CM).
- ECS COTS Software Library Maintenance defines the responsibilities of the ECS COTS Software Librarian.
- ECS COTS Software Library Activities defines the activities in support of the ECS COTS Software Library Maintenance.
- COTS Tar File Verification, Preparation, Distribution, and Archiving process defines the procedures for verifying, preparing, distributing and archiving COTS Tar Files.
- Configuration Change Request Database (CCRDB) describes the CCRDB data fields and process for entering data into the CCRDB.
- Engineering Software Delivery conveys the method and instructions for delivering and tracking Engineering Software (ES). The process of delivering and tracking Engineering Software is completely automated, once a specific set of files has been established in a directory.

5.5 Data Management

The Data Management activities for the EMD Program are described in the Configuration Management Plan. In addition, the following PIs have been developed for EMD.

- Documentation Management and Control defines levels of management for EMD documentation, the roles and responsibilities for EMD DM and the interface between DM and IPT/CPTs.

- Data Identification Numbering establishes and defines procedures by which EMD documentation and data are assigned a unique identifier.

- Document Generation, Review, Release, and Maintenance establishes and defines operating procedures for production, review, approval, release and maintenance of deliverable documents.

- CDRL Document Format establishes the format for all EMD project CDRL and other deliverable documents.

- Document Delivery and Dissemination describes the process for delivering and distributing EMD documentation.

- Documentation Archiving and Storage establishes the process for archiving and storing EMD-related documentation and reference material to ensure items remain secure and retrievable.

5.6 Systems Integration and Test (I&T)

The EMD program does not publish a separate Systems Integration and Test (I&T) Plan, however, a number of PIs have been developed describing the approach used for integrating and testing EMD SDPS software in the various test environments.

- Approach for Integration and Verification Testing describes the process for performing Integration and Verification Testing on the EMD project.

- Testing in the PVC describes the performance, load verification and validation, and other testing conducted in the PVC facility in Landover.

- Systems and Integration Performance Testing defines the activities associated with performance and load testing in the Performance Verification Center (PVC) and recognizes other testing conducted in the PVC.

- Patch Testing Process describes the process and responsibilities for complete patch testing for the EMD project.

The EMD program uses the following automated tools for system integration and test:

- Common Network Tools for System Activity Reports, Top Processes, Multi Router Traffic Grapher, Network Status, and Tape Drive Status.

- Scripts for Ingest – prep_ingest, Ingest EOC_trickle, eoc_spec_verify, Collect_all_ Log_ Files, , ECS Ingest Metrics.

- Perl Scripts - for Mac to Mac Gateway ordersSCLI Orders, WHAZZUP to monitor the servers and available disk space. ECS Distribution Metrics and operability scripts are used to Capture Performance Data.

- C-Shell Script vital stats is also used to capture performance data.

- Product-Loadrunner to assist with automating tests.

5.7 Integrated Logistics Support (ILS)

The EMD program publishes a Property Management Plan (PropMP) prepared and provided by Raytheon's supplier organization, EDS. This plan describes the functions and activities necessary for managing property consistent with the EMD contract requirements, FAR 45.500, and NPG 4200.1E, Equipment Management Manual.

The following project instructions have also been developed to assist with Integrated Logistics and Property Management:

- EMD Product Receiving, Inspection, and Verification Procedures describes the process used to receive, inspect, verify, and accept COTS products procured by COTS Procurement and government-furnished property (GFP) for the EMD Project.

- ILS Facility Planning and COTS Hardware Installation defines the process of site coordination and documentation for the EMD site facility planning and COTS hardware installation.

- COTS SW License Administration & COTS Maintenance Support defines the responsibilities for COTS Software license administration and COTS Software maintenance support.

- EMD Electrostatic Discharge (ESD) Program defines the responsibilities and procedures for the EMD ESD Program in implementing the Landover Facility ESD Program defined in Electro Static Discharge Damage Prevention and Control, LFP 18-0-3.

- Maintenance Data Collection System describes the Maintenance Data Collection System (MDCS) that documents hardware and software failures at EMD DAACs, defines the functions of the Failure Review Board, and explains how the Ao and MDT are calculated to document system RMA performance.

- Property Management defines the process of receiving, documenting, controlling, and inventorying Information Technology Systems property. Property that is owned by the government or other customer is not addressed in this document. It further describes the general requirements for the verification inspection of hardware, software, and product materials received from suppliers.

- Government Furnished Information/Property (GFI/GFP) establishes requirements and responsibilities for requesting, receiving, and control of GFP and GFI.

5.8 Regulatory Compliance

Regulatory Compliance is addressed in the Property Management Plan and associated project instructions for EMD.

5.9 Supply Chain Management

The EMD program publishes a Procurement Management Plan (ProcMP) prepared and provided by Raytheon's Supply Chain Management (SCM) organization. This plan describes the functions and activities necessary for managing the subcontractor efforts.

The Raytheon IIS Vice President of Supply Chain Management (SCM) is responsible for Subcontract Management and Purchasing processes. These processes are implemented through a Supply Chain Management Integrated Program Team (IPT) approach, which is developed through the Integrated Product Development System (IPDS) process. The IPTs report to the Landover, MD Site SCM Manager. The SCM IPT members are collocated with the programs they support. IPT members may provide, as appropriate, material management, material cost control, material coordination, proposal support, and subcontract administration for the program. Supply Chain Management IPT members provide the focal point for coordination of procurement resources to complete program procurements on schedule and within budget. The allocation of direct material resources ensures the level of control needed to manage all aspects of the procurement process for the program.

SCM manages the interfaces for subcontracts, procurement, and logistics efforts. For major subcontracts and procurements a Technical Program Lead may be identified.

All EMD subcontracts are managed in accordance with published guidelines contained in the Supply Chain Procedures and Property Management Procedures. The Subcontract Administrator/Manager is responsible for monitoring every aspect of the subcontract to include planning, documenting, and tracking supplier performance.

Three PIs have been developed for Subcontract Management:

- EMD Subcontract Management describes the structure and operation of the Subcontract Management organization specific to EMD by defining roles, responsibilities, and applicable processes.

- Subcontractor Performance Evaluation Board (PEB) establishes the criteria for preparing and conducting subcontractor PEBs and evaluating subcontractor performance for an award fee evaluation period.

- EMD Project Purchase Order Supplement issues a standard form Supplement Number 3 to the IIS General Terms and Conditions of Purchase for use by ITS Supply Chain Management in procurements for the EMD Project.

5.10 Deployment and Product Support

The EMD program does not publish a separate Deployment Plan, however, a number of PIs have been developed describing the approach used for deploying operational software and COTS products to the DAACs.

- Tracking NCRs to Custom Code Baselines documents the process tracking NCRs to Custom Code Baselines. It supports EMD Release Notes Preparation Guidelines.

- EMD SDPS Sustaining Engineering and Maintenance describes the management of the sustaining engineering and maintenance process that occurs for EMD SDPS software after each drop's Consent to Ship Review.

The EMD program uses the following automated tools for deploying the software to the field locations:

- Excel is used in generating Sustaining Engineering Metrics and the OPS Priority List.
- MicroSoft Project is used to track day to day activities on small tasks.

6. Program Transition and Closure

Towards the close out of the EMD contract, the Program Management Team will develop a Shut-Down or Transition Plan to fully prepare for disposition of EMD hardware and software maintenance responsibilities from the Raytheon team. This will include planning for the transfer of the development environment, configuration control system, tools, and documentation. The ESDIS Project Office will identify requirements for the EMD Transition Plan. Raytheon will coordinate all transition activities with ESDIS ensuring a smooth transition of responsibilities with no impact to the operational readiness of Science Data Processing System (SDPS).

Raytheon will be responsible for program shut-down planning and transition, which will ensure:

- The EMD hardware and software systems, documentation, and other data (e.g., test data) are maintained and delivered as identified in the contract. Archived information is dispositioned per NASA direction.
- The Performance Verification Center (PVC), the Verification and Acceptance Test Center (VATC), and the ECS SDPS Development Facility (EDF) are transitioned to the new facility.
- All activities are completed within the stipulated transition/closure period with a demonstration of the capability to develop, deliver, and test new releases/patches into an operational environment. This will be achieved via a Capability Demonstration Test, which will have its content approved by the COTR prior to its execution. The performance test shall demonstrate that the system is ready to successfully support release development, installation and testing. The test shall be defined by ESDIS.
- Ensure COTS licensing and maintenance arrangements for software and hardware are in place at the time of transition.
- Excess equipment is properly disposed to include GFE/CFE.
- Raytheon capital equipment is effectively dispositioned.
- The responsibility for property management is fully transferred.
- All required program deliverables have been formally received and approved by ESDIS.
- Facilities requiring closure or deactivation are identified and shut down according to a detailed facilities closure plan.
- An effective destaffing/re-badging plan is developed and executed to ensure no operational impact to the SDPS system.
- A contract completion and ESDIS completion review are conducted to the satisfaction of ESDIS.

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7. Template Audit Process

The Program Management Plan was reviewed using the Garland Document Review Checklist for Maintaining a Deployed Process, Ref: PROC50.

Number:	**Process/Process Asset Name:**
1.	Review Change requests and lessons learned collected on the process. **LL: Moving from a functional organization to an IPT organization requires continuous reinforcement and consistent communication**. EMD Experience: Use of IPT Leads to manage Task Orders from start to finish quickly improved the alignment of authority and responsibility for technical, schedule, and budget issues. However, the perception of Task 101 COTS/Custom IPT leads as the "functional organization" has persisted and has caused confusion among subcontractors and support staff, who tend to look to these leads for decisions. Root Cause: 10 years of ECS culture, as well as failure—even by IPT leads—to consistently communicate in the new paradigm Corrective Action: With each new Task, clearly communicate roles and responsibilities for all aspects of the work. Reiterate throughout scheduling and staff assignments. **LL: Task Order Contracts require additional tools and closer management oversight**. EMD Experience: Task Orders can be great learning experiences for up-and-coming managers, but offer several challenges that will require additional training and improvement •Proposal costs for small tasks may be disproportionate to the task •Risk of over or under shooting budget by a significant amount is higher, since just a few hours may do it. •There is significant overhead in managing staff allocations across tasks, since small tasks will not enable additional hiring, but must come from existing staff or other contracts. Root Cause: Inexperience with Task Order management Corrective Actions: •Streamline proposals (done via Six Sigma) •Train leads and staff to review charges and charging more closely. •Use additional tools (Pivot reports, spreadsheets, P3) to manage staff across tasks**LL: If development is considered complicated, ensure estimate is based on a similar activity. Every estimate should be peer reviewed**. EMD Experience: Order Manager capability was not developed on schedule. Functionality more complicated then expected Root Cause: Estimation was not based on a similar activity and was not adequately reviewed Corrective Action(s): •Use Estimate Peer Review PI to ensure that inputs are complete prior to baseline (performed for Synergy V) •Re-review estimates at each milestone (design, C&UT) to determine whether they should be modified, reflecting potential cost and schedule risk.
2.	Compare the process description to the actual performance of the process. This Checklist will serve as objective evidence.
3.	Have changes or revisions been made to ISO, CMMI, or Raytheon requirements relevant to the process, since the last review of the process? *(Check one)* _✔__ Yes ____ No
4.	Have the purpose and/or scope changed since last revision? *(Check one)* ___ Yes __✔_ No Have any referenced documents changed? *(Check one)* ✔_ Yes ____ No Are there any changes to the document owner or coordinator assignments? *(Check one)* ✔_ Yes ____ No If you answered yes to any of the above, record the changed requirement(s) and its impact to the process. Referenced documents were updated to reflect the change in contracts from ECS to EMD. The organization

	structure changed moving from a functional organization to an IPT-led task order organization in effect changing document owners as well. Planning processes and support areas were streamlined through 6Sigma projects to reduce cycle time due to new contract requirements.
5.	Update the process. The formal release of the modified procedure serves as objective evidence. Expected Release Date: 31 Oct 04 Reason: Document is extensive and must be peer reviewed and approved by LEPG.
6.	Update or create supporting work instructions, related processes, templates and enablers. The modified and released/controlled work instructions, templates, training material, or other enablers may serve as objective evidence. Completed through LEPG review and approval.
7.	Conduct a peer review per IOP018. The peer review results serve as objective evidence. Completed through LEPG review and approval.
8.	Were the training materials reviewed? *(Check one)* ___ Yes ✔ No Were changes required? *(Check one)* ___ Yes ✔ No Change requests or modified training materials may serve as objective evidence when changes are necessary.
9.	Review changes made to the materials with the stakeholders. Meeting minutes, attendance sheets, bucksheets may be used as objective evidence. Meeting minutes and DDAF from LEPG annotating review and approval are on file.
10.	Is piloting needed? *(Check one)* ___ Yes ✔ No State the piloting approach (scope of pilot, timeframe of pilot, etc.)
11.	*(If yes above)* Results of the piloting and any modified procedures will be the objective evidence.
12.	Attach objective evidence of process owner approval or signature of the process owner as objective evidence of step 12 of PROC50. Process owner Signature and Date *signed*
13.	Control and release process. Release form, documentation in official document repository, or posting to the correct directory, etc. may serve as objective evidence of appropriate release of the documentation.
14.	Communicate the process changes to relevant stakeholders. DocuShare subscription notice, e-Leading Edge, newsletter, memos, etc. may serve as objective evidence of communicating the process to relevant stakeholders. Meeting minutes and DDAF from LEPG annotating review and approval are on file. Updated Plan forwarded to NASA.
15.	Report lessons learned per PROC735. Entry in the lessons learned repository serves as objective evidence. N/A

Once you have completed your review:

- *If your document is a Site Policy, Site Procedure, or Functional Procedure (revisions released through Engineering Release), please forward a copy of this completed form to Engineering Release, GE 7214. The process owner must sign and date step 12 above, and coordinator must sign and date here:*

  _____

- *For any other document, retain a copy of this review for objective evidence.*

Appendix A. Acronyms Definitions

Table A-1. Acronyms

Acronym	Meaning
ADIC	EMD Hardware vendor
AF	Award Fee
Ao	Operational Availability
AOP	Annual Operating Plan
ARB	Architecture Review Board
ATI	Acquisition Technologies Integrated
BCR	Baseline Change Request
BD	Business Development
BOE	Basis of Estimate
CAM	Control Account Manager
CC	Custom Code
CCB	Configuration Change or Control Board
CCR	Configuration Change Request
CCRDB	CCR Database
CDRL	Contract Data Requirements List
CDW	Cost Data Warehouse
CE	Chief Engineer
CERN	The European Laboratory for Particle Physics
CFE	Customer Furnished Equipment
CI	Configuration Item
CM	Configuration Management
CMMI℠	Standard mark for Capability Maturity Model® Integration
CMP	Configuration Management Plan
COCOMO	Constructive Cost Model
COMSO	EMD Small Disadvantaged Business
COTS	Commercial-off-the-Shelf
C/PAR	Corrective and Preventive Action Report
CPI	Cost Performance Index
CPT	Cross Product Team
CSO	Computer Security Officer
DAAC	Distributed Active Archive Center
DAR	Decision & Analysis Resolution
DBX	Debugger tool for tracking errors in custom code
DCMA	Defense Contracts Management Agency
DDTS	Distributed Defect Tracking System for COTS

Acronym	Meaning
DID	Data Item Description
DM	Data Management
DSR	Daily Status Review
EAC	Estimate at Complete
EBIS	ECS Baseline Identification System
ECO	Engineering Change Order
ECS	EOSDIS Core System
EDF	EMD Development Facility
EDHS	ECS Data Handling System
EDOS	EOS Data and Operations System
EDS	Electronic Data Systems, Inc
EMD	EOSDIS Maintenance and Development
EMOS	ECS Mission Operations Segment
EOSDIS	Earth Observing System Data and Information System
ERB	Engineering Review Board
ERT	Earth Resources Technology, Inc.
ES	Earth Science
ES	Engineering Software
ESD	Electrostatic Discharge
ESDIS	Earth Science Data and Information System
EVM	Earned Value Management
EVMS	Earned Value Management System
FARSUP	Federal Acquisition Regulation Supplement
FRB	Failure Review Board
FTE	Full Time Equivalent
GFI	Government Furnished Information
GFP	Government Furnished Property
GUI	Graphical User Interface
HMDP	Hardware Maintenance and Development Plan
HW	Hardware
IBR	Integrated Baseline Review
IAR	Internal Audit Report
ID/IQ	Indefinite Delivery/Indefinite Quantity
I&T	Integration & Test
IFR	Internal Financial Review
IIS	Intelligence and Information Systems
ILM	Integrated Logistics Management
ILS	Integrated Logistics Support
IMP	Integrated Management Plan
IMS	Integrated Management Schedule
IPDS	Integrated Product Development System
IPT	Integrated Product Team

Acronym	Meaning
IRD	Interface Requirements Document
IRR	Incremental Release Review
ISO	International Organization for Standardization
ITS	Information Technology Solutions
ITSS	Information Technology and Science Systems
IV&V	Independent Validation and Verification
JAMIS	Raytheon Cost Accounting System
JAVA	Software language
JRE	JAVA Runtime Envirnoment
L3 GSI	EMD Subcontractor Teammate
LFP	Landover Facility Procedure
LMC	Local Maintenance Coordinator
LRE	Latest Revised Estimate
LRR	Lessons Learned Review
M&O	Maintenance and Operations
MDCS	Maintenance Data Collection System
MDT	Mean Down Time
MPM	Microframe Project Manager
MOR	Monthly Operations Review
MPR	Monthly Progress Report
MR	Management Reserve
MS	Microsoft
MWO	Maintenance Work Order
NASA	National Aeronautics and Space Agency
NCR	Non-conformance Report
NPG	NASA Policy and Guideline
NT	New Technology
OPS	Operations
OSS	Operations Support Software
PAB	Proposal Assessment Board
PAL	Process Asset Library
PC	Program Control
PCA	Program Control Analyst or Physical Configuration Audit
PDL	Program Design Language
PEB	Performance Evaluation Board
PI	Project Instruction
PM	Program Manager
PMB	Performance Measurement Baseline
PMP	Program Management Plan
PMR	Program Management Review
PMT	Program Management Team
PRB	Problem Review Board

Acronym	Meaning
PropMP	Property Management Plan
PSR	Pre-Ship Review
PuTTY	Freeware implementation of Telnet and Secure Shell
PVC	Performance Verification Center
PWA	Primary Work Authorization
QA	Quality Assurance
QAE	Quality Assurance Engineer
QMS	Quality Management System
QPI	Quality Performance Index
REA	Request for Equitable Adjustment
RIS	Raytheon Information Solutions
RMA	Reliability, Maintainability, and Availability
RMP	Risk Management Plan
ROM	Rough Order of Magnitude (of an estimated cost)
RSR	Release Status Review
RTN	Raytheon
RTSC	Raytheon Technology Services Company
SCF	Science Computing Facility
SCLI	Science Data Server Command Line Interface
SCM	Supply Chain Management
SCDV	Science and Development CCB
SDPS	Science Data Processing System
SEIT	Systems Engineering and Integration Team
SEMP	System Engineering Management Plan
SEP	Systems Enhancement Proposal
SGI	Silicon Graphics, Inc.
SGT	EMD Small Disadvantaged Business and Mentor Protégé
SMC	System Management Center
SMDP	Software Maintenance and Development Plan
SMP	Software Management Plan
SOW	Statement of Work
SPI	Schedule Performance Index
SQAP	Software Quality Assurance Plan
SQL	Structured Query Language
SSAI	Science Systems Application Inc.
SSD	Space Systems Division
SSH	Secure Shell
STTS	Software Turnover Tracking System
SW	Software
SWA	Secondary Work Authorization
SWIT	Software Integration and Test
TCPI	To Complete Performance Index

Acronym	Meaning
TD	Technical Director
TE	Test Executable
TO	Task Order
TL	Task Leader
TP	Task Plan
TPR	Task Plan Request
VDB	Verification Database
VOB	Versioned Object Base
WBS	Work Breakdown Structure

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Appendix B. Program Management IPDS Tailoring Matrix

No.	Applicable Template Section Number	IPDS Primary Evaluation Criteria Process Element	IPDS TD Title	Accept Reject Modify	Brief Rationale for Modification or Rejection of IPDS TD	Program Document & Section
1.	All of PMP and associated plans	2-01.01.04	Project Start-Up Planning	A		
2.	All of PMP	2-02.01.09	Project Contract Compliance Plan	A		
3.	1	2-03.05.07	Update Management, Technical, And Manufacturing Detail Plans	A		
4.	1.3	2-01.02.04	Top-Level IPDP Tailoring	A		
5.	1.3	2-01.02.11	Product/Contract Item IPDP Tailoring	A		
6.	1.3	2-03.05.04	Update Integrated Product Development Process (IPDP)	A		
7.	1.3	4-03.14.10	Process Replanning	A		
8.	All of Section 2.1	2-01.01.05	Establish Project Requirements Baseline	A		
9.	2.1.1	2-01.02.02	Contract Requirements Summary	A		
10.	All of Section 3.1 Product Overview; All of Section 3.4 Org Structure, Responsibility; 4.4.2 WBS	2-01.02.08	Project Structure	A		
11.	3.2	2-01.02.12	Risk Identification, Assessment, And Handling (Initial)	A		
12.	3.3	2-01.01.14	Project Strategy	A		
13.	3.3	2-03.05.01	Update Project Strategy	A		
14.	3.3.1	2-01.02.14	Life Cycle Model Selection	A		

No.	Applicable Template Section Number	IPDS Primary Evaluation Criteria Process Element	IPDS TD Title	Accept Reject Modify	Brief Rationale for Modification or Rejection of IPDS TD	Program Document & Section
15.	3.3.1	2-03.05.08	Life-Cycle Model Next Phase Planning	A		
16.	3.3.1	5-01.04.03	Prepare For Next Increment Cycle	A		
17.	3.3.2	2-01.01.12	Critical Customer Milestone Determination	A		
18.	3.3.2	2-01.02.03	Project Master Phasing Schedule	A		
19.	3.3.2	2-01.03.01	Develop IMP-IMS Tailoring Guidance	A		
20.	3.3.2	2-01.03.02	Define IMP-IMS Requirements And Approach	A		
21.	3.3.2	2-01.03.02.01	Define IMP-IMS Structure	A		
22.	3.3.2	2-01.03.03	Create Integrated Master Plan (Imp)	A		
23.	3.3.2	2-01.03.04	Create Integrated Master Schedule (IMS)	A		
24.	3.3.2	2-01.03.04	Create Integrated Master Schedule (IMS)	A		
25.	3.3.2	2-03.05.03	Update Integrated Master Plan (Imp)	A		
26.	3.3.2	2-03.05.05	Maintain The Integrated Master Schedule (IMS)	A		
27.	3.3.2	2-01.03.02.02	Define Imp-IMS View And Data Field Requirements	A		
28.	3.3.2	2-01.03.05	Validate Integrated Master Plan And Schedule	A		
29.	3.3.3, 3.4.2.1, 4, 4.2.4, 4.3, 4.3.2, 4.3.2.1, 4.4.2, 6	2-03.01.04	Customer Interface	A		
30.	All Of Section 3.4	2-01.01.02	Initial Organization/Responsibility Assignment	A		
31.	All Of Section 3.4	2-02.01.07	Detail Organization/Responsibility Assignments	A		

No.	Applicable Template Section Number	IPDS Primary Evaluation Criteria Process Element	IPDS TD Title	Accept Reject Modify	Brief Rationale for Modification or Rejection of IPDS TD	Program Document & Section
32.	3.4.2, 3.4.2.1	2-03.01.02	Team Leadership	A		
33.	4	2-01.02.06	Develop Approach For Detail Planning	A		
34.	4.1	2-01.01.16	Complete Initial Start-Up Checklist	A		
35.	4.1	2-02.01.11	Complete Start-Up Planning	A		
36.	4.1	GATE-05	Startup Review	A		
37.	4.2	2-04.03.01	Reporting Risks	A		
38.	4.2	2-04.03.02	Inform Senior Management And Customer	A		
39.	4.2	2-04.03.03	Report On Action/Problem Tracking	A		
40.	4.2	2-04.03.04	Publish Metrics	A		
41.	All of Section 4.2	2-01.01.07	Information And Communications Management Strategy	A		
42.	All of Section 4.2	2-02.01.03	Information Management Planning	A		
43.	All of Section 4.2	2-03.01.03	Maintain Management And Functional Organization Interface	A		
44.	4.2.3	4-04.07.01	Assessment Team Formation	A		
45.	4.2.3	4-04.07.06	Regulatory Compliance Assessment	A		
46.	4.2.3	4-04.07.09	Program Compliance Evaluation	A		
47.	4.2.3, 4.2.4	2-04.02.03	Project Compliance Evaluation	A		
48.	4.2.4	2-03.01.05	Management / Milestone Reviews	A		
49.	4.3	2-02.01.02	Establish Customer Satisfaction Plan	A		
50.	4.3	2-04.01.02	Measure Customer Satisfaction	A		
51.	4.3	2-05.01.01	Project Baseline Change Control	A		
52.	4.3	2-05.01.02	Manage Change Activity	A		
53.	4.3, 4.3.2	2-06.01.06	Complete Contract Change Proposals	A		
54.	All Of Section 4.3	2-03.01.07	Project Contract Compliance Management	A		

No.	Applicable Template Section Number	IPDS Primary Evaluation Criteria Process Element	IPDS TD Title	Accept Reject Modify	Brief Rationale for Modification or Rejection of IPDS TD	Program Document & Section
55.	4.3.2	2-03.05.06	Project Re-Baseline	A		
56.	4.3.2	2-05.01.03	Preliminary Contract Change Proposals	A		
57.	4.3.2	7-01.04.04	Proposal Analysis	A		
58.	4.3.2.1	2-03.02.06	Contract Management	A		
59.	4.3.2.2	2-01.01.01	Issue Work Authorizations For Planning	A		
60.	4.3.2.2	2-01.02.10	Issue Integrated Product Team (IPT) Work Authorizations	A		
61.	4.3.2.2	2-05.01.04	Verify Completion Status Of Project Elements	A		
62.	4.4.1	2-01.01.08	Establish Metrics Strategy	A		
63.	4.4.1	2-01.04.01	Performance Measurement Baseline (PMB)	A		
64.	4.4.1	2-02.01.06	Establish Metrics Plan	A		
65.	4.4.1	2-04.01.01	Collect Project/Process Metrics	A		
66.	4.4.1	2-04.02.01	Project Metrics Evaluation	A		
67.	4.4.3	2-03.02.03	Project Finance Management	A		
68.	4.4.3.1	2-01.04.04	Definitize IPT Tasks And Establish IPT And Subcontractor Budgets	A		
69.	4.4.3.2	4-03.14.06	Cost/Control Assessment	A		
70.	4.4.4.1	2-01.03.04.01	Create Task (Activity) Network	A		
71.	4.4.4.1	2-01.03.04.02	Integrate Resources With Task (Activity) Network	A		
72.	4.4.5	2-01.02.01	Financial/Earned Value Management Planning	A		
73.	4.4.5	4-04.07.02	Performance Projection Assessment	A		
74.	4.5	2-03.05.02	Update Risk Plans	A		
75.	All of Section 4.5	2-01.01.06	Establish High Level Risk Strategy	A		
76.	All of Section 4.5	2-01.02.05	Define/Plan Risk Management Approach	A		

No.	Applicable Template Section Number	IPDS Primary Evaluation Criteria Process Element	IPDS TD Title	Accept Reject Modify	Brief Rationale for Modification or Rejection of IPDS TD	Program Document & Section
77.	All of Section 4.5	2-02.01.04	Risk Identification, Assessment And Handling (Detail Plans)	A		
78.	All of Section 4.5	2-01.04.06	Risk Identification, Assessment And Handling (Resources)	A		
79.	4.5.3	2-01.03.04.03	Analyze Risk And Mitigation Opportunities	A		
80.	4.5.5	2-04.02.02	Tracking Risks	A		
81.	4.6	2-03.02.01	Project Quality Management	A		
82.	All of Section 4.6	2-02.01.01	Project Quality Planning	A		
83.	All of Section 4.6	2-01.04.07	Assign Resources	A		
84.	All of Section 4.6, Sections 5.1 – 5.8	2-02.01.05	Establish Planning Integration With Disciplines	A		
85.	4.6.2	2-04.02.04	Corrective Action Identification	A		
86.	4.6.2	2-05.01.05	Develop Corrective Action Plan/Review Closure Plan	A		
87.	4.6.2	2-06.02.03	Develop/Implement Corrective Action Or Action Closure	A		
88.	4.7.1	2-01.04.02	Capital Planning	A		
89.	4.7.2	2-01.01.10	Near-Term Facilities	A		
90.	4.7.2	2-03.02.08	Security Management	A		
91.	4.7.2	2-01.04.03	Space And Facilities Planning	A		
92.	4.7.2	4-04.10.01	Site/Facility Layout And Documentation	A		
93.	4.7.3	2-01.02.07	GFE/GFM/GFF Planning	A		
94.	4.7.4	2-01.01.03	Preliminary Staffing Plan	A		
95.	4.7.4	2-01.04.05	Establish Long-Term Staffing Forecast	A		
96.	4.7.4	2-06.02.06	Develop/Implement Program Destaffing Plan	A		
97.	4.7.5	2-01.04.08	Project Training Planning	A		
98.	4.7.5	2-03.01.06	Train Project Personnel As Required	A		

No.	Applicable Template Section Number	IPDS Primary Evaluation Criteria Process Element	IPDS TD Title	Accept Reject Modify	Brief Rationale for Modification or Rejection of IPDS TD	Program Document & Section
99.	5	2-03.01.01	Project Management Execution And Oversight	A		
100.	5.2 (Only Model Shop Activities, No Manufacturing)	2-02.03	Create/Update Manufacturing/Operations Planning	A		
101.	5.2 (Only Model Shop Activities, No Manufacturing)	2-03.04	Manufacturing/Operations Management	A		
102.	5.4 (Located in CMP)	2-01.01.11	Establish Project Integrated Database (Project File)	A		
103.	5.8	2-01.01.13	Teaming/Critical Supplier Strategy	A		
104.	5.8	2-02.02.12	Subcontractor/Supplier Integration Planning	A		
105.	5.8	2-03.02.02	Supply Chain Management Interface	A		
106.	5.8	2-03.03.11	Subcontractor/Supplier Technical Management	A		
107.	5.8 (Located in MMP)	4-04.07.07	Procurement Compliance Assessment	A		
108.	5.8 (Located in MMP)	4-05.06.16	Procurement Compliance Assessment	A		
109.	6	2-03.01.08	Define Readiness To Transition Project Elements	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
110.	6	2-05.01.06	Transition And Closure Checklist	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
111.	6	2-03.01.09	Request For Next Increment	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
112.	6	2-05.01.07	Request For Next Evolution	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
113.	6	2-06.01.01	Evaluate Next Project Phase Options	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	

No.	Applicable Template Section Number	IPDS Primary Evaluation Criteria Process Element	IPDS TD Title	Accept Reject Modify	Brief Rationale for Modification or Rejection of IPDS TD	Program Document & Section
114.	6	2-06.01.02	Assist Customer In Developing Requirements And Acquisition Strategy	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
115.	6	2-06.01.03	Establish Post-Closure Customer Support Program	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
116.	6	2-06.01.04	Evaluate Product Enhancement Opportunities	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
117.	6	2-06.01.05	Transition Planning	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
118.	6	2-06.02.01	Project Shutdown Management	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
119.	6	2-06.02.02	Confirm Project Deliverable Completion	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
120.	6	2-06.02.04	Facilities Closeout Planning	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
121.	6	2-06.02.05	Facilities Deactivation	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
122.	6	2-06.02.07	Conduct Contract Completion Review	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
123.	6	2-06.02.08	Conduct Project Closure Review With Customer	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
124.	6	2-06.02.09	Project Shutdown Checklist	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
125.	6	7-03.02.03	Refurbish Leased Facilities	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
126.	6	7-03.02.04	Utilities Shutoff	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
127.	6	GATE-11	Transition And Closure Review	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
128.	6 (Inventory Disposal)	7-03.01.06	Contract Correspondence	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	
129.	6 (Facility Cleanup, Including Environmental Issues)	7-03.02.05	Site Cleanup	M	Program just transitioned as a start up. Detail shut down planning not required at this time.	