

194-219-SE1-002

## EOSDIS Core System Project

# Interface Requirements Document Between EOSDIS Core System (ECS) and MITI ASTER GDS Project

*Internal Review*

October 1994 May 1995

Hughes Applied Information Systems  
Landover, Maryland

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## Preface

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This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. Changes to this document also require Government approval prior to acceptance and use. Changes to this document shall be made by document change notice (DCN) or by complete revision.

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## Abstract

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The Earth Observing System Data and Information System (EOSDIS) Core System (ECS) involves the collection and distribution of data from space and ground based measurement systems to provide the scientific basis for understanding global change. Using ECS as their window to the EOSDIS, the international science community is able to access data from a distributed archive in the United States and from other international Earth Science support systems. To accomplish this mission, it is necessary for ECS to interface to a wide variety of external systems. This document represents the requirements to provide an interface between ECS and the Japan Ministry of International Trade and Industry (MITI) Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Ground Data System (GDS) Project.

The ECS contractor team used the process described in the ECS Methodology for Definition of External Interfaces document to develop these interface requirements. Memoranda of Understanding (MOUs), Project Implementation Agreements (PIAs), the Earth Science Data and Information System (ESDIS) Project—Level 2 Requirements, and the Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System (the ECS Level 3 requirements document) were used in the methodology to evolve this formal Interface Requirement Document (IRD).

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## Change Information Page

List of Effective Pages			
Page Number	Issue		
TBS	TBS		
Document History			
Document Number	Status/Issue	Publication Date	CCR Numbers
193-219-SE1-002	Preliminary	August 1993	94EC-0018
194-219-SE1-002	Preliminary	April 1994	
194-219-SE1-002	Errata	May 1994	94-0066 and 94-0070 TBS
194-219-SE1-002	Original	October 1994	
TBS	TBS	TBS	

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# 1. Introduction

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## 1.1 Identification

This Interface Requirement Document (IRD), Contract Data Requirement List (CDRL) item 039, whose requirements are specified in Data Item Description (DID) 219/SE1, is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-60000). It defines the interface requirements between ECS and Japan's Ministry of International Trade and Industry (MITI) Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Ground Data System (GDS) Project.

## 1.2 Scope

ASTER is a facility instrument provided by MITI under an agreement with NASA. MITI has assigned responsibility for the design, development, procurement, testing, and operating of the ASTER GDS to Earth Remote Sensing Data Analysis Center (ERSDAC). Japan Resources Observation System Organization (JAROS) has been assigned responsibility for the design, development, procurement, testing, and delivery of the ASTER instrument.

This IRD defines all of the system data interfaces that exist between ECS and the ASTER GDS. Other documents also exist that pertain to EOSDIS/ASTER GDS interfaces (such as implementation schedules, and operations and testing interfaces). These documents are listed in Section 2 - Applicable Documents. In the future, ECS also plans to deliver the ECS Security Plan (DID 214/SE1). Portions of this document will address security aspects related to ECS external interfaces. ~~Segment/Element Release Plans (DID 307/DV2) are planned to be developed to further detail ECS implementation schedules.~~

This IRD will be approved under the signature of the ESDIS Project Manager.

## 1.3 Purpose and Objectives

This document is written to formalize the ECS interpretation and general understanding of the interface between ECS and the ASTER GDS. For ECS, this document provides a clarification and elaboration of the ECS/ASTER GDS interface requirements from the Functional and Performance Requirements for the EOSDIS Core System. It is meant to stand alone as a total document and contains more detail than a Level 3 requirements specification.

The objective of this document is to provide a focus for defining related Interface Control Document(s) (ICDs) which are jointly developed by ESDIS and ERSDAC to cover each major subsystem interface identified in this IRD.

This document provides a point of mutual control of external interface definitions between ECS and the ASTER GDS. Changes to this IRD may be proposed by either ESDIS or the ASTER GDS Project. Changes to this IRD will be approved and controlled by a Configuration Control

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Board (CCB) which will be established with equal representation from ESDIS and the ASTER GDS Project, and chaired by NASA.

## 1.4 Status and Schedule

This document will be submitted to the ECS Contractor CCB as a final IRD. As a formal contract deliverable with approval Code 1, this document requires Government review and approval prior to acceptance and use. At the Government's option, this document may be designated to be under full Government CCB control.

Changes may be submitted for consideration by Contractor and Government Configuration Control Boards (CCBs) under the normal change process at any time.

## 1.5 Document Organization

This Interface Requirements Document is organized as described below

- |           |  |
|-----------|--|
| Section 1 | Introduction - Introduces the IRD's scope, purpose, objectives, status, schedule, and document organization.   |
| Section 2 | Related Documentation - Provides a bibliography of reference documents for the IRD organized by parent, applicable, and information subsections.   |
| Section 3 | Systems Description - Provides an overview of both systems and a discussion of the system components involved in the interface. A context diagram depicting the functional interfaces is also included.  |
| Section 4 | Data Flow Descriptions- Provides a discussion of how the interface is used from an operational point of view. A table is also provided to summarize the data flow interfaces.                            |
| Section 5 | Functional and Performance Interface Requirements - Requirements are sorted for presentation by denoting functional or performance type. Traceability to parent documents is also noted in this section. |
| Section 6 | Interface Control Documentation Plan - Identifies and summarizes the ICD(s) that will spawn from this IRD.   |

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## 2. Related Documentation

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### 2.1 Parent Documents

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

	Memorandum of Understanding Between the United States National Aeronautics And Space Administration and the Ministry of International Trade and Industry of Japan concerning Cooperation in the Flight of the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) on the NASA Polar Orbiting Platform and Related Support for an International Earth Observing System, (current version) (under development)
	Project Implementation Agreement, Volume II - Ground Data System, Advanced Spaceborne Thermal Emission and Reflection Radiometer and ESDIS and EOS-AM Projects, (current version) (under development)
GSFC 423-41-02	Goddard Space Flight Center, Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System, June 1994
GSFC 423-10-01-1	Goddard Space Flight Center, Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements, May 21, 1993
GSFC 423-41-01	Goddard Space Flight Center, EOSDIS Core System Statement of Work, May 21, 1993
<del>194-301-DV1-002</del> <del>301-CD-002-003</del>	<del>EOSDIS Core System Project, System Implementation Plan for the ECS Project, June 1994</del>
193-208-SE1-001	EOSDIS Core System Project, Methodology for Definition of External Interfaces, <del>June 1994</del>

### 2.2 Applicable Documents

The following documents are referenced herein and are directly applicable to this document. In the event of conflict between any of these documents and this document, this document shall take precedence.

194-219-SE1-005	EOSDIS Core System Project, Interface Requirements Document Between EOSDIS Core System (ECS) and Science Computing Facilities, <del>June 1994</del>
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540-022 Goddard Space Flight Center/MO&DSD, Earth Observing System (EOS) Communications (Ecom) Interface Requirements Document, March 1993

GSFC 423-16-01 EOSDIS Core System Project, Data Production Software and Science Computing Facility (SCF) Standards and Guidelines, January 14, 1994

GSFC 423-35-01 Goddard Space Flight Center, EOS Data and Operations System (EDOS) and EOS Communications (ECOM) Requirements, CH-19, March 1992

GSFC-423-16-02 EOSDIS Core System Project, PGS Toolkit Requirements Specification for the ECS Project, Final, October 1993

101-101-MG1-001 EOSDIS Core System Project, Project Management Plan for the EOSDIS Core System, ~~July 1993~~

194-102-MG1-001 EOSDIS Core System Project, Configuration Management Plan for the ECS Project, ~~March 1994~~

194-809-SD4-001 EOSDIS Core System Project, PGS Toolkit Users Guide for the ECS Project, Version 1, Final, ~~May 1994~~

193-205-SE1-001 EOSDIS Core System Project, Science Users Guide and Operations Procedure Handbook for the ECS Project, ~~August 1993~~

~~194-402-VE1-001~~  
402-CD-001-002 EOSDIS Core System Project, System Integration and Test Plan for the ECS Project, ~~June 1994~~ Volume 1: Interim Release 1 (IR-1), Final

402-CD-002-002 EOSDIS Core System Project, System Integration and Test Plan for the ECS Project, Volume 2: Release A, Final

~~194-308-DV2-001~~  
308-CD-001-003 EOSDIS Core System Project, Software Development Plan for ECS, ~~May 1994~~

194-202-SE1-001 EOSDIS Core System Project, Standards and Procedures for the ECS Project, ~~June 1994~~

194-106-MG1-001 EOSDIS Core System Project, Schedule Management Plan for the ECS Project, September 1994

194-107-MG1-006~~XXX~~ EOSDIS Core System Project, Level 1 Master Schedule for the ECS Project, May 1994

193-501-PA1-001 EOSDIS Core System Project, Performance Assurance Implementation Plan (PAIP) for the ECS Project, March 1994

101-001-CO2-001 EOSDIS Core System Project, Unclassified Automated Information Resources Security Plan for the ECS Project, ~~October 1993~~

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<u>307-CD-001-002 &amp; 329-CD-001-002</u>	<u>EOSDIS Core System Project, Flight Operations Segment (FOS) Release Plan and Development Plan for the ECS Project</u>
<u>307-CD-002-002 &amp; 329-CD-002-002</u>	<u>EOSDIS Core System Project, Science Data Processing Segment (SDPS) Release Plan and Development Plan for the ECS Project</u>
<u>307-CD-003-002 &amp; 329-CD-003-002</u>	<u>EOSDIS Core System Project, Communications and System Management Segment (CSMS) Release Plan and Development Plan for the ECS Project</u>

## 2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding.

	Martin Marietta Corporation, ASTER Instrument Flight Operations Understanding (Preliminary), August 1993
	Goddard Space Flight Center, Earth Observing System Mission Operations Concept Document, March 1993
193-219-SE1-008	EOSDIS Core System Project, Interface Requirements Document Between EOSDIS Core System and Program Support Communications Network, Draft, August 1993
<del>194-604-OP1-001</del>	<del>EOSDIS Core System Project, ECS Operations Concept Document for the ECS Project, Working Draft, August 1994</del>
<u>604-CD-001-003</u>	<u>EOSDIS Core System Project, Operations Concept for the ECS Project: Part 1 -- ECS Overview, Final Draft</u>
<u>604-CD-002-001</u>	<u>EOSDIS Core System Project, Operations Concept for the ECS Project: Part 2B -- ECS Release B, Annotated Outline</u>
194-219-SE1-019	<del>EOSDIS Core System Project, Interface Requirements Document Between EOSDIS Core System and EOS AM-1 Flight Project, September 1994</del>
540-028	Goddard Space Flight Center/MO&DSD, Earth Observing System (EOS) Communications (Ecom) Operations Concept Document, March 1993
560-EDOS-0106.0002	Goddard Space Flight Center/MO&DSD, Earth Observing System (EOS) Data and Operations System (EDOS) Operations Concept, December 1992
560-EDOS-0211.0001	Goddard Space Flight Center/MO&DSD, Interface Requirements Document Between EDOS and the EOS Ground System (EGS) Elements, Preliminary, February 1994

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## 3. Systems Descriptions

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### 3.1 Systems Relationship Overview

The ECS and the ASTER GDS will work together to provide ground support for mission operations and science data processing for the ASTER instrument onboard the EOS AM-1 spacecraft. This support includes spacecraft and instrument mission operations (planning, scheduling, control, monitoring, and analysis), science data processing (data processing, distribution, and archival), and ground system communications and management. In addition, the ASTER GDS will be interoperable with ECS so that an EOSSIS user or ASTER GDS user will be able to view the data holdings and order production data of the other system. Sections 3.2 and 3.3 provide overall views of the ECS and the ASTER GDS Project to form a basis for understanding the interface requirements between them. Figure 3-1 presents a context diagram for the ECS/ASTER GDS interface. Note that the user interfaces for Data Search & Request and Data Product delivery in this diagram depict only the interfaces related to ECS/ASTER GDS data interoperability.

### 3.2 EOSSIS Core System (ECS)

#### 3.2.1 ECS Overview

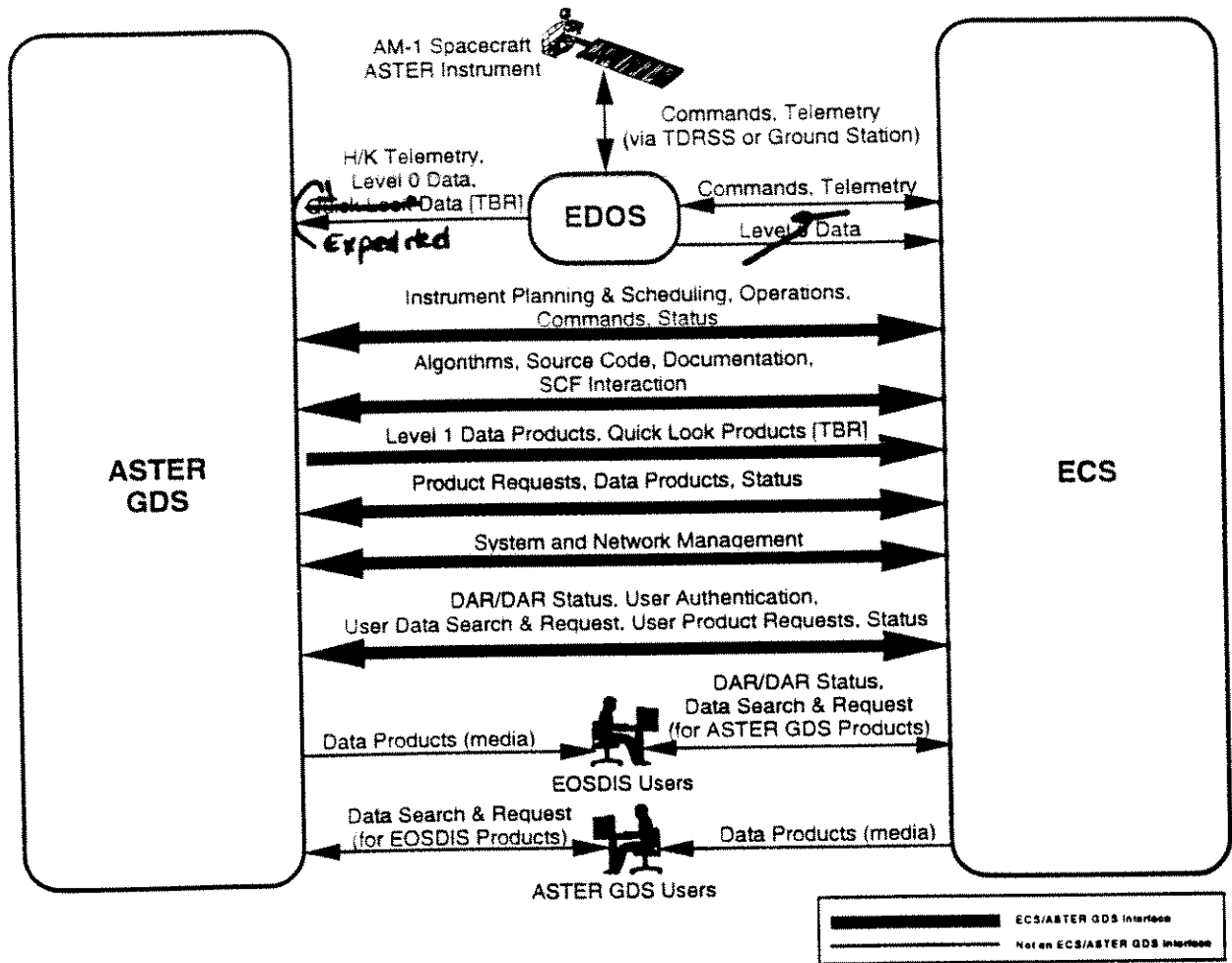
The ECS is a component of the EOSSIS. ECS supports the planning, scheduling, and control of U.S. EOS spacecraft and instruments. In addition to fully supporting the EOS series, the ECS provides information management and data archive and distribution functions for other NASA Earth science flight missions, NASA instruments flown on non-NASA spacecraft, and for other NASA held Earth science data.

#### 3.2.2 ECS Segments

ECS is composed of three segments defined to support three major operational areas: flight operations, science data processing, and communications/system management. The ECS segments are described below:

- a. The Flight Operations Segment (FOS) manages and controls the U.S. EOS spacecraft and instruments. The FOS includes the EOS Operations Center (EOC), which is responsible for mission planning, scheduling, control, monitoring, and analysis in support of mission operations for U.S. EOS spacecraft and instruments other than ASTER. Communications for EOS spacecraft and instrument commands will go through the EOC, which coordinates with external systems such as the ASTER Instrument Control Center (ICC). The EOC also will monitor the ASTER instrument in support of the ASTER ICC. The EOC is located at the Goddard Space Flight Center (GSFC).

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**Figure 3-1. ECS/ASTER GDS Context Diagram**

- b. The Science Data Processing Segment (SDPS) provides a set of ingest, processing, and distribution functions for science data and a data information system for the entire EOSDIS. The SDPS processes data from the EOS instruments to Level 1-4 data products. The SDPS also provides short- and long-term storage for EOS, other Earth observing missions, and other related data, software, and results, and distributes the data to EOSDIS users. The SDPS contains a distributed data and information management function and user services suite for the ECS, including a catalog system in support of user data selection and ordering. The SDPS also performs the functions required for constructing EOSDIS User Data Acquisition Requests (DARs) for the ASTER instrument. The SDPS provides the ASTER DARs to the ASTER SDPS for further processing, obtains EOSDIS ASTER DAR status and schedule from the ASTER SDPS, and forwards this information to EOSDIS users. SDPS elements that support the ECS/ASTER GDS interface are primarily located at the Earth Resources Observation System (EROS) Data Center (EDC) DAAC in Sioux Falls, South Dakota.

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- c. The Communications and System Management Segment (CSMS) provides overall ECS management of ECS ground system resources, provides communications/networking services for an extensive science data communications network, and manages the interfaces to the EOS Communications (Ecom) network, the NASA Communications (Nascom) Operational Local Area Network (NOLAN), and the NASA Science Internet. The CSMS also includes the EOSDIS Science Network (ESN), which consists of a dedicated internal ECS Wide Area Network (WAN) with circuits provided by the Program Support Communications Network (PSCN); Local Area Networks (LANs) at each of the DAACs and the EOC to support ECS operations; connections to International Partners (IPs); and interfaces at DAACs with Ecom, NOLAN, and NSI. The CSMS ~~System Management Center~~ Monitoring and Control (SMC), along with local system management capabilities at DAAC sites and the EOC, provides system management services for ECS ground system resources. Most of the operations staff is considered part of the SDPS or FOS, including Local System Management (LSM) operators.

### **3.3 MITI ASTER Project**

#### **3.3.1 ASTER GDS Overview**

The ASTER GDS has been defined as a hierarchy of segments, subsystems, and components. Three ASTER GDS segments are defined to support three major operational areas: the ASTER Operation Segment (AOS), the Communications and System Management Segment (CSMS), and the Science Data Processing Segment (SDPS). The segments are further divided into ASTER GDS functional elements to provide the support required by the operational segments. The major elements of the ASTER GDS are described briefly below.

##### **3.3.1.1 ASTER Operations Segment**

The AOS manages the ASTER instrument operations and controls the ASTER instrument through the EOC. The AOS elements are the Instrument Control Center (ICC), including the Instrument Control Operation Subsystem, the Instrument Analysis Support Subsystem, and the Instrument Support Terminal (IST). The ICC is responsible for the operations of the ASTER instrument. It performs planning, scheduling, commanding (via EOSDIS), and monitoring. The IST is defined as a facility that connects the ASTER Science Team Leader to the ICC in support of instrument operation.

##### **3.3.1.2 ASTER Communications and System Management Segment**

The ASTER CSMS provides system resource management, communications services, and a data information system for the entire ASTER project. The CSMS includes the Ground System Management Subsystem (GSMS), and the ASTER Data Network (ADN). The GSMS provides system management services for the ASTER GDS elements, plus coordination of ground system operations within and between these elements. The ADN provides an internal network for communications among the ASTER GDS elements, a network interface to the science user network, network services at the application layer <TBR>, and a network management facility.

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### 3.3.1.3 ASTER Science Data Processing Segment

The ASTER SDPS provides a set of processing and distribution elements for ASTER science data, a direct receiving element for ASTER raw data, and a software implementation system for the entire ASTER Product Generation Subsystem (PGS). The ASTER SDPS elements include the PGS, consisting of the Data Processing Subsystem (DPS), the Data Analysis Subsystem (DAS) and other subsystems, the Information Management Subsystem (IMS), the Direct Downlink (DDL) Receiving Station (DRS) (TBR), the ASTER Data Archive and Distribution Subsystem (DADS), and the Software Implementation Support Subsystem (SISS). The PGS and DADS facilities process the data from Level 0 data up to standard higher data products, provide short- and long-term storage for the ASTER project, and distribute the data to users. The IMS provides a data and information management service including a catalog system in support of user data selection and ordering.

### 3.3.2 ASTER Instrument Description

The ASTER instrument will provide high-resolution images of the land surface and clouds for climatological, hydrological, biological, and geological studies. The ASTER instrument has three major, independently commandable subsystems: visible and near infrared (VNIR), short-wave infrared (SWIR), and thermal infrared (TIR). VNIR, SWIR and TIR will have the capability to image the same 60 km imaging swath with pointing capability in the cross-track direction within the range of 272 km. The three radiometers are used together to acquire dayside images for pre-planned targets during the observation period for up to 16 minutes. TIR and SWIR are used for imaging nightside targets for up to 2 minutes of observation each.

VNIR provides images in three visible and near-infrared bands—centered at 0.56, 0.66, and 0.81 micrometers ( $\mu\text{m}$ )—with a spatial resolution of 15 meters (m). VNIR has two telescopes: a nadir-looking telescope operating in all three bands, and a backward-looking telescope operating in the 0.81  $\mu\text{m}$  band only. VNIR can be pointed across track at any angle up to 24 degrees.

SWIR provides images in six short-wave infrared bands between 1.65 and 2.40  $\mu\text{m}$  with a spatial resolution of 30 m. SWIR can be pointed across the track at any angle up to 8.55 degrees in either direction.

TIR provides images in five thermal infrared bands between 8.30 and 11.30  $\mu\text{m}$  with a spatial resolution of 90 m. TIR can be pointed across the track at any angle up to 8.55 degrees in either direction by rotating its scan mirror.

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## 4. Data Flow Descriptions

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### 4.1 Overview

The ECS/ASTER GDS interfaces are summarized in Table 4-1. Throughout this section, the data flows are identified by the numbers used in this table. These data flow numbers are enclosed in brackets after the first reference to the data flow. Issues associated with an interface also are identified in brackets, and are described in more detail in Appendix B.

The data flow descriptions are organized into eight categories and are discussed in Sections 4.2 through 4.9. These categories include Pre-Mission Interfaces; DAR Handling; Planning and Scheduling/Command Load Generation; Instrument Operations; Science Data Handling; User Search and Request Interface; Product Request and Delivery; and Network Management.

The data flow concepts discussed in the following paragraphs represent the current ECS understanding of the ECS/ASTER GDS interface. ~~At the time this IRD was prepared, ERSDAC had not yet selected a contractor for the ASTER GDS.~~ The data flow descriptions provided in this section are based on the assumption that the functionality of the ASTER GDS segments (AOS, SDPS, and CSMS) will be similar to that of their ECS counterparts (FOS, SDPS, and CSMS).

ECS/ASTER GDS interfaces for international data exchange will be accomplished via electronic networks and postal delivery. There will be three levels of electronic communications support between EOSDIS elements and the ASTER GDS: the Ecom/Nascom Level of Service will be used to support mission critical communications; the EOSDIS Internal Network Level of Service, supported by ESN, will be used to support mission essential communications; and EOSDIS External Network Level of Service, supported by the NASA Science Internet (NSI) and other Internet providers, will be used to support scientific, programmatic, and administrative communications. A trans-Pacific link will provide the required connectivity between the U.S. West Coast gateway and the ASTER GDS for Ecom and ESN communications. Details regarding responsibility for the trans-Pacific link are TBD [Appendix B - Issue 1]. Science data products (including Level 0 and Level 1 data products) exchanged between the EOSDIS and ASTER GDS will routinely be delivered on media via postal delivery (expected delivery within 7-10 days) [Appendix B - Issue 3]. The ECS/ASTER GDS logical communications interfaces and the associated Levels of Service are shown in Figure 4-1.



Table 4-1. ECS/ASTER GDS Data Flows (1 of 7)

From	To	Data Flow	Description	Communications Link
ASTER GDS	ECS (EDC DAAC)	[1] ECS-SCF Interaction	Includes data flows associated with data production software development <del>coordination for QA, product reprocessing, and</del> calibration coefficient updates, etc. Refer to the IRD Between ECS and SCFs for identification and description of flows.	Refer to the IRD Between ECS and SCFs.
ECS (EDC DAAC)	ASTER GDS	[2] ECS-SCF Interaction	Includes data flows associated with data production software development, <del>coordination for QA, product reprocessing, and</del> calibration coefficient updates, etc. Refer to the IRD Between ECS and SCFs for identification and description of flows.	Refer to the IRD Between ECS and SCFs.
ASTER GDS	ECS (EDC DAAC)	[3] Algorithms, Source Code, Documentation	All algorithms, source code and documentation used by ASTER GDS to generate ASTER standard products.	Tape (postal delivery)
ECS (EDC DAAC)	ASTER GDS	[4] Algorithms, Source Code, Documentation	All algorithms, source code and documentation used by ECS to generate ASTER standard products.	Tape (postal delivery)
ECS	ASTER GDS	[5] Long Term Science Plan	Long Term Science Plan provided to ECS by the Senior Project Scientist and IWG.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[6] Long Term Instrument Plans	Long Term Instrument Plans which are developed by the Instrument Teams, provided to ECS by the Senior Project Scientist and the IWG, and available to all PIs/TLs.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[7] EOC Operations Data Base	Includes spacecraft (including ASTER) telemetry formats, ASTER command formats, procedures, limits, constraints, activity definitions, and associated information including housekeeping data conversion tables.	Ecom-Gateway-Japanese Networks [Issue-4]
ASTER GDS	ECS	[8] ASTER Operations Data Base	Includes ASTER telemetry formats, ASTER command formats, procedures, limits, constraints, activity definitions, and associated information including housekeeping data conversion tables.	Ecom-Gateway-Japanese Networks [Issue-4]

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**Table 4-1. ECS/ASTER GDS Data Flows (2 of 7)**

From	To	Data Flow	Description	Communications Link
ASTER GDS	ECS	[9] Instrument Information/ Constraints	Information about the operational constraints of the ASTER instrument. Used by the ECS SDPS DAR development software to constraint-check user DAR inputs.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[10] ASTER DARs	Data Acquisition Requests for the ASTER instrument.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[11] DAR Status Request	Query for status of an ASTER DAR.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[12] DAR Status	Status of ASTER DARs.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[13] Planning & Scheduling Requests	Requests for ASTER instrument activities and updates. Includes ASTER Instrument Resource Profiles, Instrument Resource Deviation Lists, Instrument Activity Lists, Instrument Activity Deviation Lists, and "What-If" Queries ("What-If" Queries are coordinated with the EOC prior to submission.)	Ecom-Gateway-Japanese Networks [Issue-4]
ECS	ASTER GDS	[14] Integrated Plans & Schedules	AM-1 plans and schedules which include schedules for activities for the AM-1 spacecraft and all instruments. Includes the Preliminary Resource Schedules, Detailed Activity Schedules, Planning & Scheduling Request Rejections, and "What-If" Results.	Ecom-Gateway-Japanese Networks [Issue-4]
ECS	ASTER GDS	[15] Planning Aids	Planning and scheduling aids (includes predicted orbit, etc.).	Ecom-Gateway-Japanese Networks [Issue-4]
ASTER GDS	ECS	[16] Inter-Instrument Coordination	Text message exchange to coordinate instrument planning and operations.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[17] Inter-Instrument Coordination	Text message exchange to coordinate instrument planning and operations.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[18] Command Load Generation Status	Notification of problems or conflicts associated with generation of the integrated command load, or command load report resulting from successful load generation. The command load report contains Absolute Time Command (ATC) load contents.	Ecom-Gateway-Japanese Networks [Issue-4]

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**Table 4-1. ECS/ASTER GDS Data Flows (3 of 7)**

From	To	Data Flow	Description	Communications Link
ECS	ASTER GDS	[19] Instrument Command Uplink Status	Status that indicates the following information: command receipt at EOC, command validation by EOC, and command receipt by AM-1 (CLCW, successful command load, command counter increment, etc.).	Ecom-Gateway-Japanese Networks [Issue 4]
ASTER GDS	ECS	[20] Real time command groups requests	Command request including mnemonics or groups of mnemonics for ASTER instrument commanding that are received and uplinked by the EOC ( <u>under FOT control</u> ) while in real time (communications) contact with AM-1.	Ecom-Gateway-Japanese Networks [Issue 4]
ASTER GDS	ECS	[21] Pre-planned command groups	Mnemonics or groups of mnemonics, previously defined by the ASTER instrument team and stored at the EOC. Used during pre-defined contingency situations.	Ecom-Gateway-Japanese Networks [Issue 4]
ECS	ASTER GDS	[22] Instrument Command Notification (Contingency)	Data that indicates the following: instrument command uplink status, and command receipt at the ASTER instrument.	Ecom-Gateway-Japanese Networks [Issue 4]
ECS	ASTER GDS	[23] Spacecraft Status	Information on spacecraft activities, anomalies, or status that is of interest to ASTER operations.	Ecom-Gateway-Japanese Networks [Issue 4]
ASTER GDS	ECS	[24] Instrument Status	Instrument Status information, such as instrument anomaly notifications, instrument analysis/trending results, etc.	Ecom-Gateway-Japanese Networks [Issue 4]
ECS	ASTER GDS	[25] Mission Status Reports	Reports containing spacecraft and mission status information. Includes mission plan and schedule information.	Ecom-Gateway-Japanese Networks [Issue 4]
ASTER GDS	ECS (EDC DAAC)	[26] Instrument History Data	<del>History Log Data and associated metadata. Covers instrument operations information, including command history and instrument status.</del>	<del>Tape (postal delivery)</del>
ASTER GDS	ECS (EDC DAAC)	[27] Level 1a Data and Associated Info	Level 1a data with any associated ancillary data, metadata, and browse.	Tape (postal delivery)
ASTER GDS	ECS (EDC DAAC)	[28] Quick Look Level 1 (TBD) Data [TBR - see Appendix B Issue 11]	Level 1 (TBD) data which was generated from an EDOS Level 0 Quick Look Expedited Data Set. Includes associated ancillary data, metadata, and browse.	ESN-Gateway-Japanese Networks

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**Table 4-1. ECS/ASTER GDS Data Flows (4 of 7)**

From	To	Data Flow	Description	Communications Link
ASTER GDS	ECS	[29] ASTER GDS Data Availability Schedule	Product delivery schedule for an ASTER product.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[30] ECS Data Availability Schedule	Product delivery schedule for an EOSDIS product.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[31] Schedule Adjudication	<del>ECS/ASTER GDS coordination for the explanation and resolution of data processing and data delivery scheduling conflicts.</del>	<del>ESN-Gateway-Japanese Networks</del>
ASTER GDS	ECS	[32] Schedule Adjudication	<del>ECS/ASTER GDS coordination for the explanation and resolution of data processing and data delivery scheduling conflicts.</del>	<del>ESN-Gateway-Japanese Networks</del>
ECS	ASTER GDS	[33] Repaired/ Refined Orbit Data	Orbit data which was repaired or refined by the GSFC FDF and provided to the ECS. Repaired data is supplied only during anomalies.	Tape (postal delivery) [Issue 3]
ECS	ASTER GDS	[34] Repaired/ Refined Attitude Data	<del>Attitude data which was repaired or refined by the GSFC FDF and provided to the ECS. Repaired data is supplied only during anomalies.</del>	<del>Tape (postal delivery) [Issue 3]</del>
ECS	ASTER GDS	[35] Dependent Validates	Information used to identify ECS data products and valid lists for variables.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[36] Dependent Validates	Information used to identify ASTER GDS data products and valid lists for variables.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[37] Directory Metadata	High-level information on whole EOSDIS data sets which can be searched by ASTER GDS users to determine EOSDIS data holdings.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[38] Directory Metadata	High-level information on whole ASTER GDS data sets which can be searched by EOSDIS users to determine ASTER GDS data holdings.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[39] Inventory Search Requests	User query of ASTER GDS inventory.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[40] Guide Search Requests	User query of ASTER GDS guide.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[41] Browse Requests	User query of ASTER GDS browse data.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[42] Inventory Search Results	ASTER GDS inventory data provided in response to user query.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[43] Guide Search Results	ASTER GDS guide data provided in response to user query.	ESN-Gateway-Japanese Networks

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**Table 4-1. ECS/ASTER GDS Data Flows (5 of 7)**

From	To	Data Flow	Description	Communications Link
ASTER GDS	ECS	[44] Browse Results	ASTER GDS browse data provided in response to user query.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[45] Inventory Search Requests	User query of ECS inventory.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[46] Guide Search Requests	User query of ECS guide.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[47] Browse Requests	User query of ECS browse data.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[48] Inventory Search Results	ECS inventory data provided in response to user query.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[49] Guide Search Results	ECS guide data provided in response to user query.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[50] Browse Results	ECS browse data provided in response to user query.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[51] Product Request	Request for an ASTER GDS data product.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[52] Product Generation Request	Request for generation of an ASTER GDS data product. Includes an associated product distribution request.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[53] Product Delivery Status	Status of a user product request or product generation request for an ASTER product.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[54] Product Delivery Status Request	Request for status of a previously-submitted product request or product generation request.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[55] Product Request	Request for an ECS data product.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[56] Product Generation Request	Request for generation of an ECS data product. Includes an associated product distribution request.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[57] Product Delivery Status	Status of a user product request or product generation request for an ECS product.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[58] Product Delivery Status Request	Request for status of a previously-submitted product request or product generation request.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[59] Level 1b - Level 4 Data Products	Level 1b - Level 4 data sets and associated ancillary data, metadata, and browse produced by the ASTER GDS and provided to ECS on request.	Tape (postal delivery)

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**Table 4-1. ECS/ASTER GDS Data Flows (6 of 7)**

From	To	Data Flow	Description	Communications Link
ECS	ASTER GDS	[60] Level 0 - Level 4 Data Products	Level 0 - Level 4 data sets and associated ancillary data, metadata, and browse provided to ASTER GDS on request.	Tape (postal delivery)
ECS	ASTER GDS	[61] Ancillary	Ancillary data sets (and associated metadata) provided to ASTER GDS on request and used as an input to perform ASTER GDS product generation.	Tape (postal delivery) [Issue 3]
ECS	ASTER GDS	[62] Correlative	Correlative data sets (and associated metadata) provided to ASTER GDS on request and used by ASTER GDS in interpretation or validation of ASTER data products.	Tape (postal delivery) [Issue 3]
ASTER GDS	ECS	[63] ASTER GDS Network Management Information	Status, schedule, and fault isolation network management information.	ESN-Gateway-Japanese Networks (or Voice)
ECS	ASTER GDS	[64] ECS Network Management Information	Status, schedule, and fault isolation network management information.	ESN-Gateway-Japanese Networks (or Voice)
ASTER GDS	ECS	[65] ECS Network Management Information Request	Request for status, schedule, and fault isolation ECS network management information.	ESN-Gateway-Japanese Networks (or Voice)
ECS	ASTER GDS	[66] ASTER GDS Network Management Information Request	Request for status, schedule, and fault isolation ASTER GDS network management information.	ESN-Gateway-Japanese Networks (or Voice)
ECS	ASTER GDS	[67] ECS User Authentication Request	ECS request for ASTER GDS authentication of an EOSDIS user attempting to access ASTER GDS services.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[68] ECS User Authentication Information	ASTER GDS response to an ECS User Authentication Request.	ESN-Gateway-Japanese Networks
ASTER GDS	ECS	[69] ASTER GDS User Authentication Request	ASTER GDS request for ECS authentication of an ASTER GDS user attempting to access ECS services.	ESN-Gateway-Japanese Networks
ECS	ASTER GDS	[70] ASTER GDS User Authentication Information	ECS response to an ASTER GDS User Authentication Request.	ESN-Gateway-Japanese Networks

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**Table 4-1. ECS/ASTER GDS Data Flows (7 of 7)**

From	To	Data Flow	Description	Communications Link
ECS	ASTER GDS	[71] Orbit/attitude Data Anomaly Notification	Notification to ASTER GDS that an anomaly has been detected in the AM-1 spacecraft ancillary data, and repaired orbit and/or attitude data will be provided to ASTER GDS upon receipt from the GSFC FDF.	ESN-Gateway-Japanese Networks (or Voice)
ASTER GDS	ECS	[72] Ancillary	Ancillary data sets (and associated metadata) provided to ECS on request and used as an input to perform ECS product generation.	Tape (postal delivery) [Issue 3]
ASTER GDS	ECS	[73] Correlative	Correlative data sets (and associated metadata) provided to ECS on request and used by ECS in interpretation or validation of EOSDIS data products.	Tape (postal delivery) [Issue 3]
ASTER GDS	ECS	[74] ASTER GDS System Management Information	Information on ASTER GDS system activities (such as special tests, maintenance, or system faults) that may affect the ASTER GDS interface with ECS.	ESN-Gateway-Japanese Networks (or Voice)
ECS	ASTER GDS	[75] ECS System Management Information	Information on ECS system activities (such as special tests, maintenance, or system faults) that may affect the ECS interface with ASTER GDS.	ESN-Gateway-Japanese Networks (or Voice)

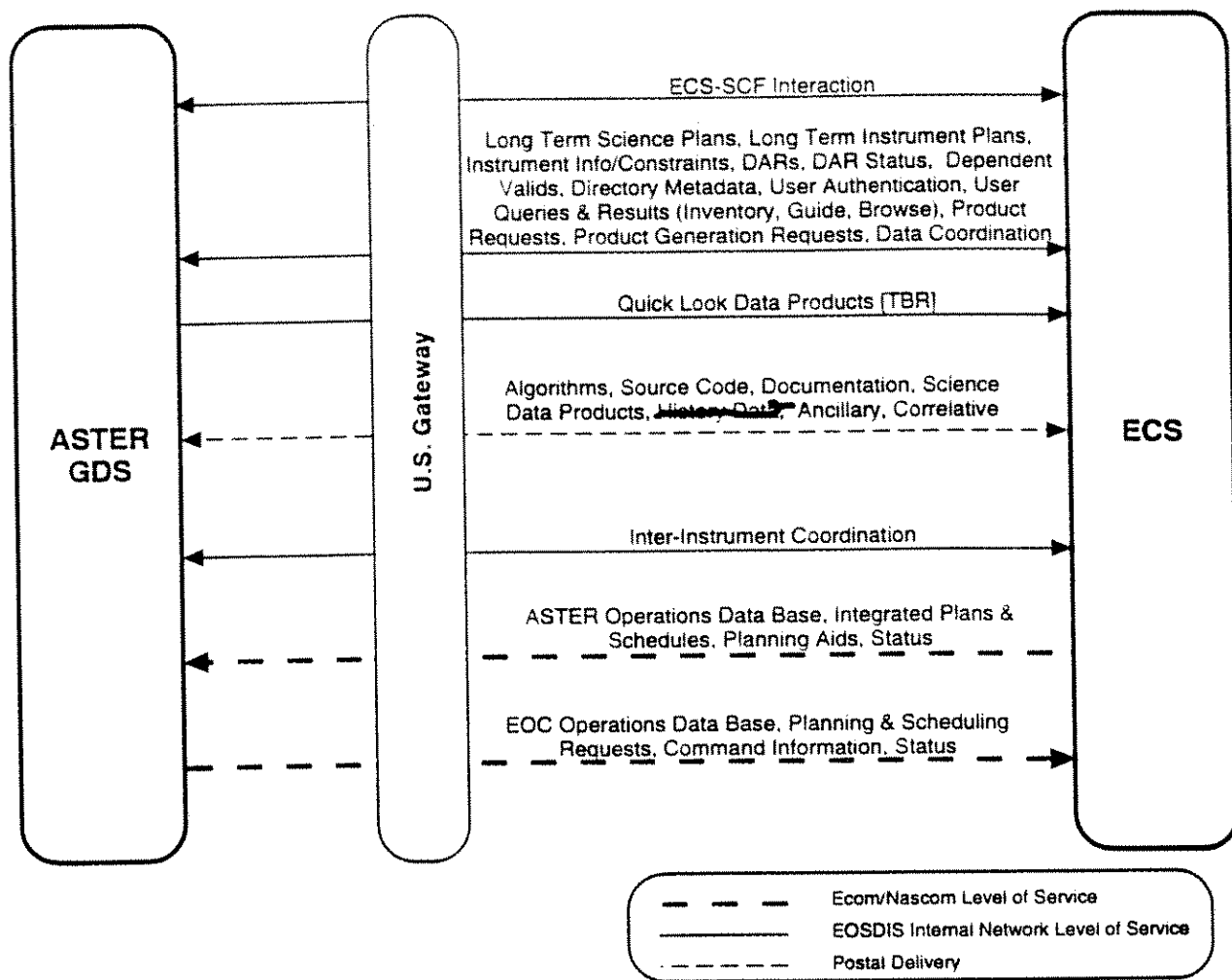
## 4.2 Pre-Mission Interfaces

Data flows associated with pre-mission interfaces are described below and are depicted in Figure 4-2. These interfaces are established pre-mission (i.e., before AM-1 launch) and continue through the life of the mission, as required to support software and data base maintenance activities.

### 4.2.1 Science Software Delivery

For science software development, the ASTER GDS performs functions similar to those of a Science Computing Facility (SCF). In this regard, the standard ECS/SCF interfaces, as documented in the IRD Between ECS and Science Computing Facilities will apply to the ECS/ASTER GDS interface [Table 4-1, Data Flows 1 and 2] [Issue 6]. The ECS/SCF IRD identifies the set of data flows for SCF coordination. The data flows that apply to the ECS/ASTER GDS interface are those data flows associated with of data production software delivery, product quality assurance (QA), data product reprocessing, and calibration coefficient updates, etc.

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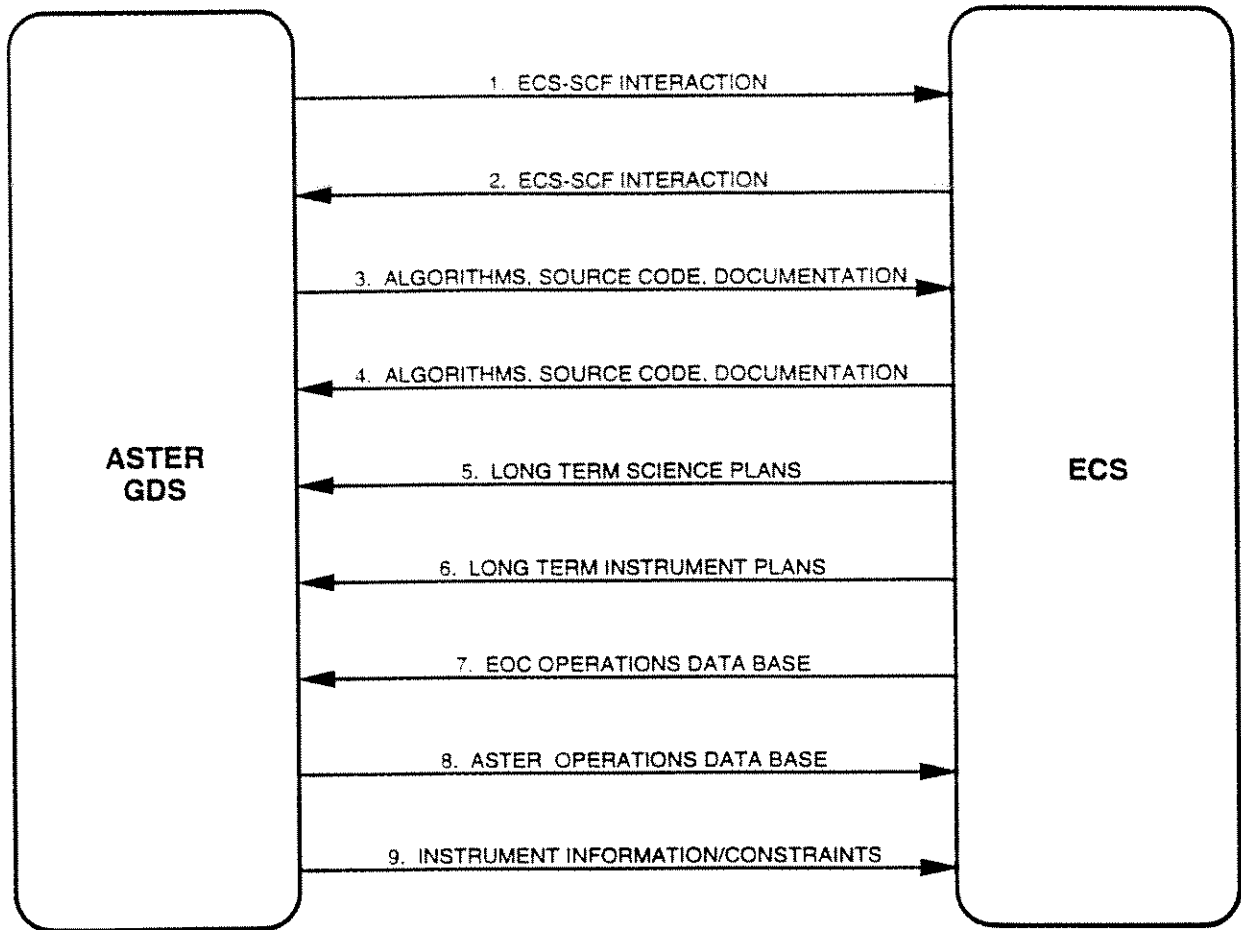


**Figure 4-1. ECS/ASTER GDS Communications Levels of Service**

Science software for the generation of ASTER standard products will be developed based on algorithms developed by ASTER Science Team (AST) members in Japan and the U.S. Operationally, ASTER GDS is expected to perform standard Level 1 processing for ASTER science data. Higher level (Level 2 +) standard product generation, using science software based on U.S. AST algorithms, will be performed by ECS at EDC DAAC. In addition, higher level product generation using Japan's science software will be performed by ASTER GDS. All algorithms, source code, and documentation associated with the generation of ASTER standard products will conform to ECS standards and will reside at both ASTER GDS and ECS (at EDC DAAC) [Table 4-1, Data Flows 3 and 4]. The data exchanges associated with science software delivery will occur via postal shipment at a time consistent with ECS and ASTER GDS integration and test (I&T) schedules.

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**Figure 4-2. Pre-Mission Data Flows**

#### 4.2.2 Long Term Planning

The AST will be responsible for development of the ASTER Long Term Instrument Plan (LTIP) for ASTER data acquisition. The AST presents the ASTER LTIP to the EOS Investigator Working Group (IWG), which includes all the selected interdisciplinary Principal Investigators (PIs), instrument PIs, lead U.S. co-investigators, and Facility Instrument Team Leaders (TLs). As a member of the IWG, the AST TLs also work with the EOS Senior Project Scientist to develop the EOS Long Term Science Plan (LTSP). The LTSP and LTIPs provide guidelines and policy information for mission and instrument science operations. The Senior Project Scientist provides the LTSP and associated LTIPs for the various EOS instruments to ECS for archive and distribution. Updates to the LTSP and LTIPs are handled in a similar manner. The LTSP [Table 4-1, Data Flow 5] and LTIPs [Table 4-1, Data Flow 6] will be distributed via ECS to the ASTER GDS, as required, throughout the life of the mission.

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### 4.2.3 Operations Data Base

ASTER/EOC data base creation and distribution will be an iterative process that begins pre-mission and continues through the life of the mission. Before launch, the ASTER Instrument Project will provide an ASTER-unique operations data base to the AM-1 spacecraft manufacturer. The ASTER operations data base will contain instrument telemetry formats, command formats, procedures, limits, constraints, activity definitions, and associated information. The AM-1 spacecraft manufacturer will merge this information with the spacecraft data base and the operations data bases for the other AM-1 instruments to form the AM-1 project data base. This project data base will be provided to the EOC for testing and operations.

The EOC will deliver an EOC Operations Data Base containing information relevant to ASTER operations to the ASTER ICC [Table 4-1, Data Flow 7]. This Data Base Information will contain instrument data base parameters for ASTER and spacecraft data base parameters for AM-1. The ASTER ICC uses this information for processing ASTER and AM-1 housekeeping telemetry, and for developing ASTER instrument command groups. If the EOC changes any spacecraft values in the data base that are relevant to ASTER (such as new limits on a spacecraft parameter), the EOC will provide the ASTER ICC with the updates.

If an ASTER data base change is required after AM-1 launch, the ASTER data base administrator issues a data base change request to the EOC data base administrator. If approved, the ASTER ICC provides the updated ASTER Operations Data Base directly to the EOC [Table 4-1, Data Flow 8]. The EOC uses this data base information to develop and deliver new data bases for operations at the EOC and the ASTER ICC.

### 4.2.4 DAR Development Data Bases

The ECS SDPS will establish a data base of information that will be required to assist EOSDIS users in submitting ASTER DARs. The ECS SDPS will configure this DAR development data base based on the instrument information and constraints provided by the ASTER ICC prior to AM-1 launch [Table 4-1, Data Flow 9]. This includes descriptive information on the ASTER instrument, default settings for instrument configurable parameters, context and range-of-values information for instrument configurable parameters, and other instrument constraints. It is expected that this data base will be static. Infrequent minor updates may be accommodated after launch, based on new information learned about instrument operational capabilities and constraints.

## 4.3 DAR Handling

At launch, ASTER will have a list of planned data acquisition targets that will be agreed to by the Senior Project Scientist and the AST. Additions and changes to the ASTER target list will occur via DARs, which may be submitted by approved users. ASTER DARs also include a special subset of DARs that are termed Targets of Opportunity (TOOs). A TOO is a DAR that requires some form of special handling to schedule in a time shorter than that normally allowed.

The ECS SDPS will provide displays to guide EOSDIS users in the development of DARs for the ASTER instrument. The ECS SDPS will use an internal data base to perform high level

range-of-value and reasonableness checks on DAR parameters as they are input by the user. These DAR parameters include information on the instrument configuration at the time of the data take(s), as well as specifying the desired target area for the observation(s). The user also may submit a product generation request to specify particular instructions for data processing after the data are acquired. Similarly, requests for ~~quick look~~ expedited processing [TBR] and product distribution requirements also may be made through the SDPS as part of the DAR process.

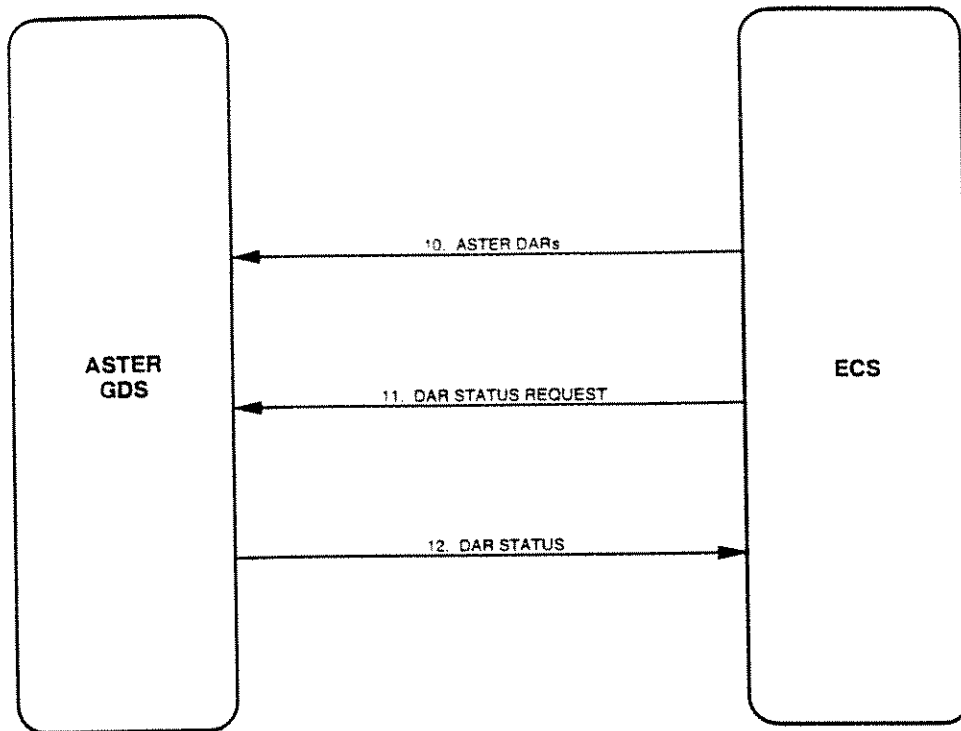
EOSDIS ASTER DARs that pass the SDPS validation checks will be stored in the ECS SDPS and transmitted to the ASTER IMS [Table 4-1, Data Flow 10]. If special data processing by the ASTER SDPS is requested, the associated product generation request [Table 4-1, Data Flow 52] also will be forwarded to the ASTER IMS. The product generation request will include an associated product distribution request. The ASTER IMS will store all DARs submitted for the ASTER instrument, including EOSDIS ASTER DARs that it receives by way of the ECS SDPS, as well as the Japan ASTER DARs that the Japanese users will input directly into the ASTER IMS. (Note that the ECS SDPS will only store ASTER DARs from EOSDIS users. ECS will not have access to ASTER DARs which Japanese users provide to the ASTER IMS.) The ASTER IMS will forward the ASTER DARs to the ASTER ICC for processing.

The ASTER ICC, under guidance of the AST, will accept or deny the DARs based on approved guidelines and priorities. Targets associated with accepted DARs will be added to the approved acquisition target list. The ASTER ICC will provide DAR status to users via the ASTER IMS, identifying specific DARs as accepted, scheduled, deleted, satisfied, rescheduled, etc. The latest DAR status changes will be provided to the ASTER IMS as updated information becomes available. An EOSDIS user may query the status of a specific EOSDIS ASTER DAR from the ECS SDPS at any time. The ECS SDPS, in turn, will forward a DAR Status Request [Table 4-1, Data Flow 11] to the ASTER IMS. The ASTER IMS responds with the requested DAR Status information [Table 4-1, Data Flow 12] [Issue 9], which the ECS SDPS makes available to the user. DAR handling interfaces are depicted in Figure 4-3.

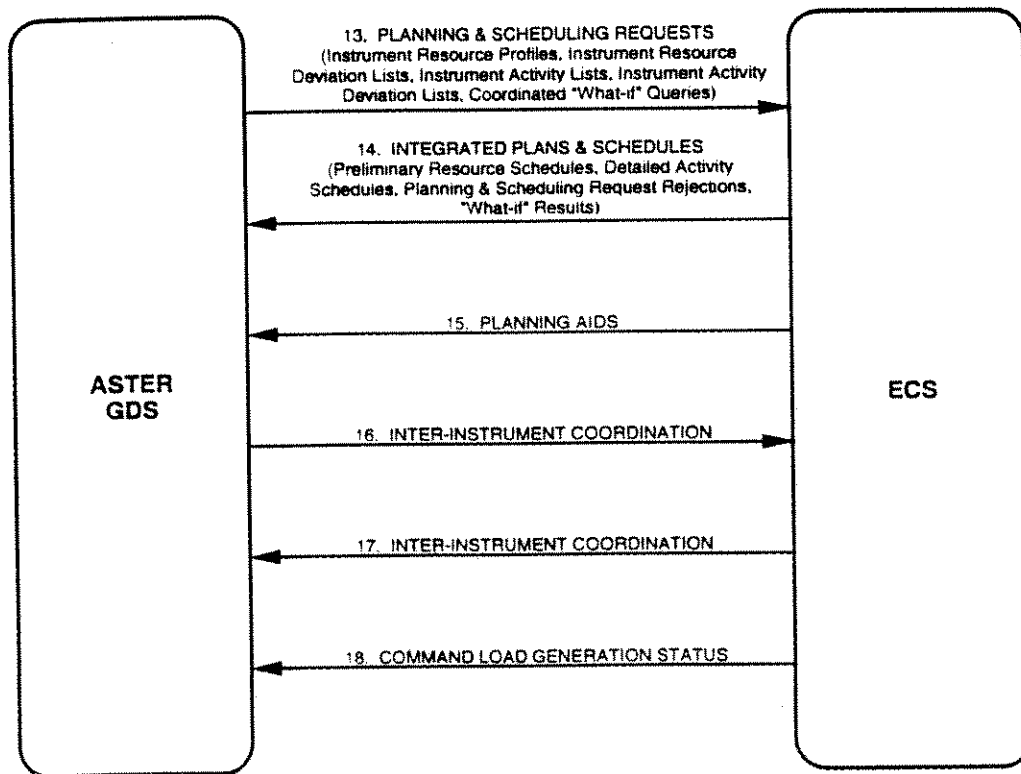
#### **4.4 Instrument Planning and Scheduling/Command Load Generation**

The following paragraphs describe the activities associated with the exchange of Planning & Scheduling Requests [Table 4-1, Data Flow 13] and Integrated Plans & Schedules [Table 4-1, Data Flow 14] between the EOC and the ASTER ICC. Planning and Scheduling/Command Load Generation interfaces also are shown in Figure 4-4. (Note that as the ECS and ASTER GDS systems are further defined, it may be determined that some of the specific planning and scheduling products discussed in the following paragraphs may not be required.)

On a routine basis, the EOC will provide the ASTER ICC with Planning Aids [Table 4-1, Data Flow 15] to assist in the generation of planning and scheduling requests. These planning aids include orbital information such as predicted ephemeris and Tracking and Data Relay Satellite System (TDRSS) view periods for the AM-1 spacecraft. ASTER requirements for planning aids are negotiated with the AM-1 Project and documented in the ASTER Instrument Flight Operations Understanding (IFOU) document, an Operations ICD between ASTER and the AM Project.



**Figure 4-3. DAR Handling Data Flows**



**Figure 4-4. Planning and Scheduling/Command Load Generation Data Flows**

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Each week, the ASTER ICC will formulate and submit to the EOC an ASTER Instrument Resource Profile covering the planned activities for the target week occurring approximately 3-4 weeks in the future. The Instrument Resource Profile will be based upon data collection priorities defined in the ASTER LTIP, DARs, AST inputs, and instrument maintenance tasks. Updates to the Instrument Resource Profile, in the form of Instrument Resource Deviation Lists, will be accepted by the EOC up to 3 weeks prior to the target week. The Instrument Resource Profile/Instrument Resource Deviation Lists<sup>1</sup> will establish planned ASTER instrument activities and/or data volume needs which will be used by the EOC to negotiate TDRSS contact times. Throughout the planning and scheduling process, the ASTER ICC may exchange inter-instrument coordination information [Table 4-1, Data Flows 16 and 17] with the EOC, as necessary. This interface dialog may be used to coordinate instrument activities, such as jitter, that could involve or affect other instruments.

After negotiating the TDRSS schedule for AM-1, the EOC will provide a Preliminary Resource Schedule to the ASTER ICC. This will occur approximately 7 days prior to the start of the target week. The Preliminary Resource Schedule represents an initial integrated schedule, including TDRSS contact times, spacecraft subsystem activities, and any activities that were included in the AM-1 Instrument Resource Profiles. If the TDRSS scheduling process results in a conflict with the original ASTER Instrument Resource Profile, notification of the conflict, along with the reason, will be sent to the ASTER ICC.

Based on the weekly Preliminary Resource Schedule, the ASTER ICC will develop Instrument Activity Lists<sup>2</sup> covering the ASTER instrument operations for each day of the target week. Each ASTER activity consists of one or more command mnemonics. ~~[Appendix B—Issue 10]~~ The Instrument Activity Lists also will identify such things as Direct Down Link (DDL) requests, ~~quick-look~~ expedited processing requirements [TBR], and instrument activities associated with DARs. Each Instrument Activity List will cover a 24-hour period and will be transmitted to the EOC ~~approximately 4 days in advance of the target day~~ in accordance with the timeline defined in the Operations ICD. Changes to the Instrument Activity List, in the form of an Instrument Activity Deviation List, ~~also may be submitted to the EOC up to 2 days prior to the target day~~ in accordance with the timeline defined in the Operations ICD.

On a daily basis, the EOC will integrate the ASTER Instrument Activity List with the activity lists of the other AM-1 instruments and spacecraft subsystems, creating a conflict-free 24-hour Detailed Activity Schedule. The EOC will provide the Detailed Activity Schedule to the ASTER ICC approximately 2 days before the start of the target day. If scheduling constraints result in conflicts with the original ASTER Instrument Activity List, notification of the impacts, along with the reasons, also will be sent to the ASTER ICC. The EOC will not unilaterally change ASTER activities. The EOC and ASTER ICC will confer to resolve conflicts identified in the scheduling process. If a conflict between AM-1 instruments cannot be resolved between the EOC and the ASTER ICC, the Senior Project Scientist (or his representative) will be contacted

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<sup>1</sup>Instrument Resource Profiles and Instrument Resource Deviation Lists are equivalent to ASTER Short-Term Schedules (STS).

<sup>2</sup>Instrument Activity Lists and Instrument Activity Deviation Lists are equivalent to ASTER One-Day Schedules (ODS).

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for further clarification. (Note that conflicts at this stage will be rare.) Conflicts which occur at this stage between ASTER activities and spacecraft activities will be resolved by the Mission Operations Manager (MOM).

To assist in conflict resolution analysis, the ASTER ICC also may submit "What-If" Activity Lists to the EOC to analyze the impact of alternative instrument activities on the integrated schedule, without actually affecting the Detailed Activity Schedule. These "What-If" Activity Lists are coordinated with the EOC prior to submission. Results of the "What-if" Activity List exercise will be forwarded to the ASTER ICC by the EOC. "What-if" Activity Lists may be coordinated with the EOC and submitted during all phases of schedule development.

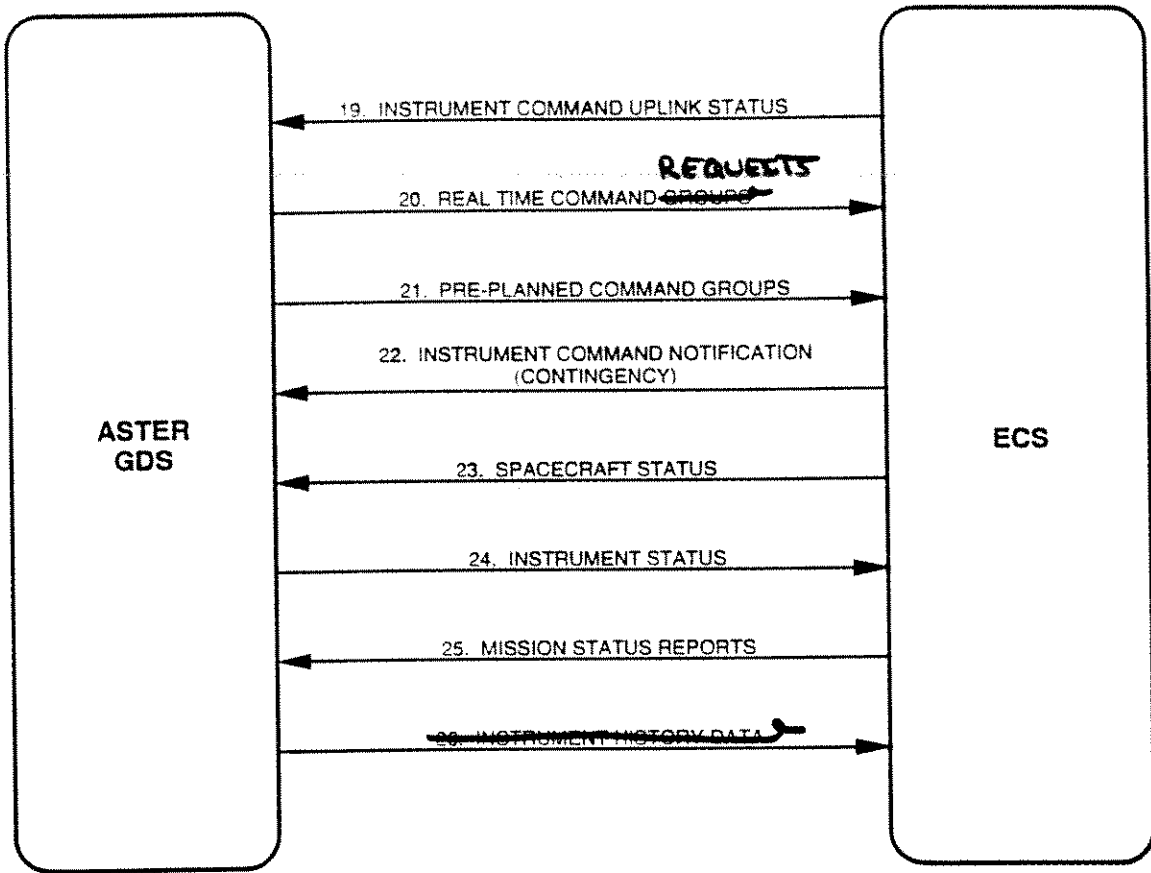
The ASTER Instrument Activity List contained in the Detailed Activity Schedule will include all ASTER activities for the target day. The Instrument Activity List will be used by the EOC for generating the AM-1 integrated command load. ~~[Appendix B—Issue 10]~~ The EOC will notify the ASTER ICC of Command Load Generation Status [Table 4-1, Data Flow 18]. This will include notification of any conflicts or problems which may arise during command load integration and validation. The status also may include a command load report, indicating the results of successful command load generation.

Occasionally, late changes will need to occur after the Detailed Activity Schedule is formed. The EOC will be able to accept an approved TOO or late change, in the form of an Instrument Activity Deviation List. Concepts and time frames for TOO and late change scheduling are discussed in more detail in the ECS Operations Concept Document for the ECS Project and the Operations ICD.

## 4.5 Instrument Operations

Instrument operations data flows are shown in Figure 4-5. During normal operations, the EOC and ASTER ICC will have two real time contacts with the AM-1 spacecraft each orbit. During the real time contact, the EOC will be responsible for issuing spacecraft and instrument commands. This includes the integrated command load, which will normally be uplinked once per day. Nominally, the command load will cover ~~a TBD (for example, 30-hour)~~ the time period specified in the Operations ICD. The EOC will verify receipt of the command load by the AM-1 spacecraft and will provide the ASTER ICC with associated Instrument Command Uplink Status information [Table 4-1, Data Flow 19].

Normally, all ASTER commanding will be handled by the integrated command load. There may be unusual circumstances, such as instrument activation or instrument contingencies, when the ASTER ICC may request permission the FOT to command the ASTER instrument in real time. ~~Upon EOC authorization,~~ The ASTER ICC will transmit real time command groups requests [Table 4-1, Data Flow 20] ~~[Issue 7]~~, in the form of command mnemonics or named command procedures to the EOC. The EOC will provide to the ASTER ICC Instrument Command Uplink Status information for any ASTER real time commands groups received uplinked by the EOC. The EOC will format and transmit validated commands to the AM-1 spacecraft via EDOS. The EOC will verify command receipt at the spacecraft for all commands (integrated load and real time commands). The ASTER ICC will verify correct command receipt and execution by the ASTER instrument for all ASTER commands (integrated load and real time commands).



**Figure 4-5. Instrument Operations Data Flows**

During anomaly situations, the EOC Flight Operations Team (FOT) may be required to issue emergency/contingency commands for the ASTER instrument. This type of contingency commanding will normally be accomplished by the FOT issuing pre-planned commands, which the ASTER ICC has previously supplied to the EOC. Pre-planned command groups [Table 4-1, Data Flow 21] reference mnemonics or groups of mnemonics that will be stored at the EOC for use during pre-defined situations. The ASTER ICC will be informed when the EOC FOT performs ASTER emergency/contingency commanding via Instrument Command Notification messages [Table 4-1, Data Flow 22]. The Instrument Command Notification message will indicate the instrument command uplink status, and verification of command receipt at the spacecraft.

ASTER command execution will be verified at the ASTER ICC by monitoring instrument housekeeping telemetry, which the ASTER ICC receives from EDOS. The ASTER ICC will notify the EOC of any discrepancies between anticipated and observed command execution.

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Both the EOC and ASTER ICC will receive and monitor critical spacecraft and instrument real time housekeeping telemetry parameters. ASTER critical parameters will be specified in the ASTER Data Base Information [Table 4-1, Data Flow 8] which will be provided to the EOC by the ASTER ICC. The EOC and the ASTER ICC will provide each other with Spacecraft Status [Table 4-1, Data Flow 23] or Instrument Status [Table 4-1, Data Flow 24] information upon detection of any unusual or anomalous conditions which may affect spacecraft or instrument operations. After each contact, the ASTER ICC also will provide the EOC with status information which includes the "as-flown" ASTER instrument operations timeline.

Periodically, the EOC and ASTER ICC may exchange updated Spacecraft and Instrument Status information. These reports may incorporate information obtained during off-line analysis, such as spacecraft or instrument status and trending information, success or failure of spacecraft maneuvers, spacecraft clock drift measurements, etc. The EOC also will provide the ASTER ICC with periodic AM-1 Mission Status Reports [Table 4-1, Data Flow 25]. These reports may contain such information as overall spacecraft and mission status, scheduled versus actual target observations, etc.

~~The ASTER SDPS will provide ASTER Instrument History Data (including associated metadata) [Table 4-1, Data Flow 26] [Issue 8] to the EDC DAAC for archival. This data will include a history of instrument operations, including commands sent, indications of successful or failed commands, data quality assessment, as well as information on the current status of the ASTER instrument. This data (covering a 24 hour period) will be available for postal pickup within 7 days of receipt at the ASTER ICC. EOC history data also will be archived at the GSFC DAAC. This data is available to the ASTER GDS upon request.~~

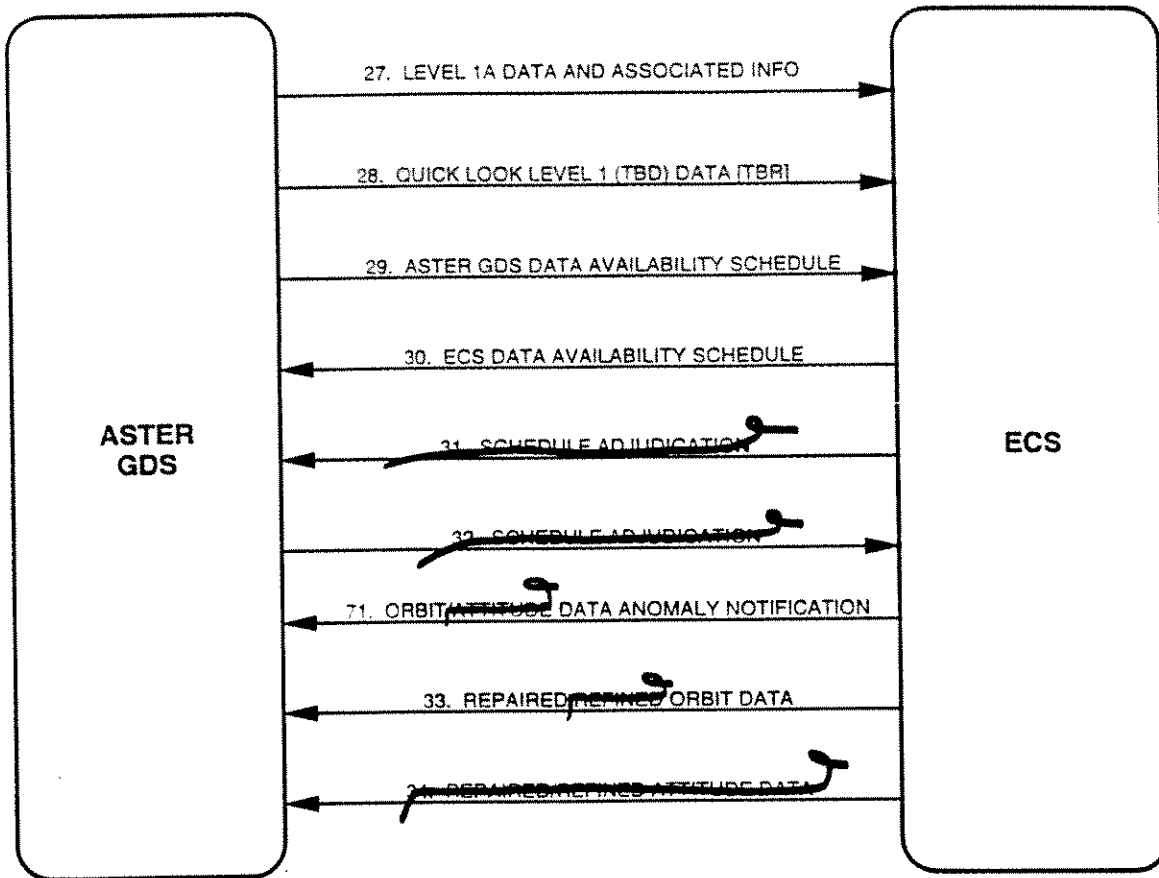
## 4.6 Science Data Handling

Data flows associated with ASTER science data handling are shown in Figure 4-6 [Appendix B - Issue 5]. All ASTER science data will be downlinked from the AM-1 spacecraft and forwarded to EDOS for Level 0 processing. EDOS will construct the ASTER Level 0 Production Data Set (PDS) from the raw science data stream, and make the data set available for postal pickup within 21 hours of the observation. EDOS also will provide a complete set of spacecraft and instrument housekeeping data as part of the Level 0 PDS. The contents of the ASTER Level 0 PDS (~~e.g., one TDRSS contact, one spacecraft orbit~~) will be negotiated between the ASTER instrument team and EDOS. ~~All ASTER Level 0 data will be transmitted to the ECS EDC DAAC for permanent archive.~~

Up to 5 2 per cent of the raw science data stream may be flagged (via spacecraft command) for quick look Level 0 expedited processing by EDOS [TBR - Issue 11]. EDOS will deliver the Quick Look Expedited Data Set (QEDS) via electronic transmission to the ASTER GDS ~~within 1 hour of the end of the TDRSS contact~~. QEDSs are limited to one TDRSS Service Session (TSS). All QEDS data will also be retained by EDOS for normal production data (PDS) processing.

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**Figure 4-6. Science Data Handling Data Flows**

The ASTER SDPS will begin data production upon receipt of the Level 0 data from EDOS. It is expected that the ASTER SDPS will be responsible for the routine generation ASTER Level 1a products. It is also expected that the ASTER SDPS will be responsible for the production of the higher level ASTER products (i.e., Level 1b and above) associated with the algorithms developed by the Japan AST. ASTER Level 1a products, including associated ancillary data, metadata, and browse files [Table 4-1, Data Flow 27] will be available for postal pickup at the ASTER SDPS within 24 hours following the receipt of the corresponding Level 0 PDS from EDOS, and delivered to the ECS EDC DAAC. The EDC DAAC will use the ASTER Level 1 data sets as input for the production of the higher level ASTER standard products associated with algorithms developed by the U.S. AST. Quick look ASTER Level 1 (TBD) data [Table 4-1, Data Flow 28] produced by the ASTER SDPS also will be available for transmission to the ECS EDC DAAC electronically within 3 hours of receipt of the EDOS QDS [TBR - Issue 11]. The ASTER SDPS will provide the ECS SDPS with a Data Availability Schedule [Table 4-1, Data Flow 29] which will specify the expected delivery schedule for ASTER GDS products. ~~If the expected product delivery time is not agreeable to ECS, a Schedule Adjudication dialog [Table 4-1, Data Flows 31 and 32] will take place between ECS and ASTER GDS to resolve the conflict.~~

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In the event of an on-board AM-1 spacecraft anomaly, it is possible that the GSFC FDF may be required to ~~refine or~~ repair the spacecraft orbit ~~or attitude~~-data that will normally be supplied in the telemetry ancillary data packets. To minimize impacts to ASTER GDS data production schedules, ECS will provide to the ASTER GDS an Orbit/~~Attitude~~ Data Anomaly Notification [Table 4-1, Data Flow 71] when it has been determined that an anomaly has occurred, and repaired data will be generated by the FDF. ECS will supply this repaired/~~refined~~ orbit ~~or attitude~~-data [Table 4-1, Data Flows 33 ~~and~~ 34] to the ASTER GDS via postal delivery [Issue 3] as soon as possible after the data are obtained from FDF.

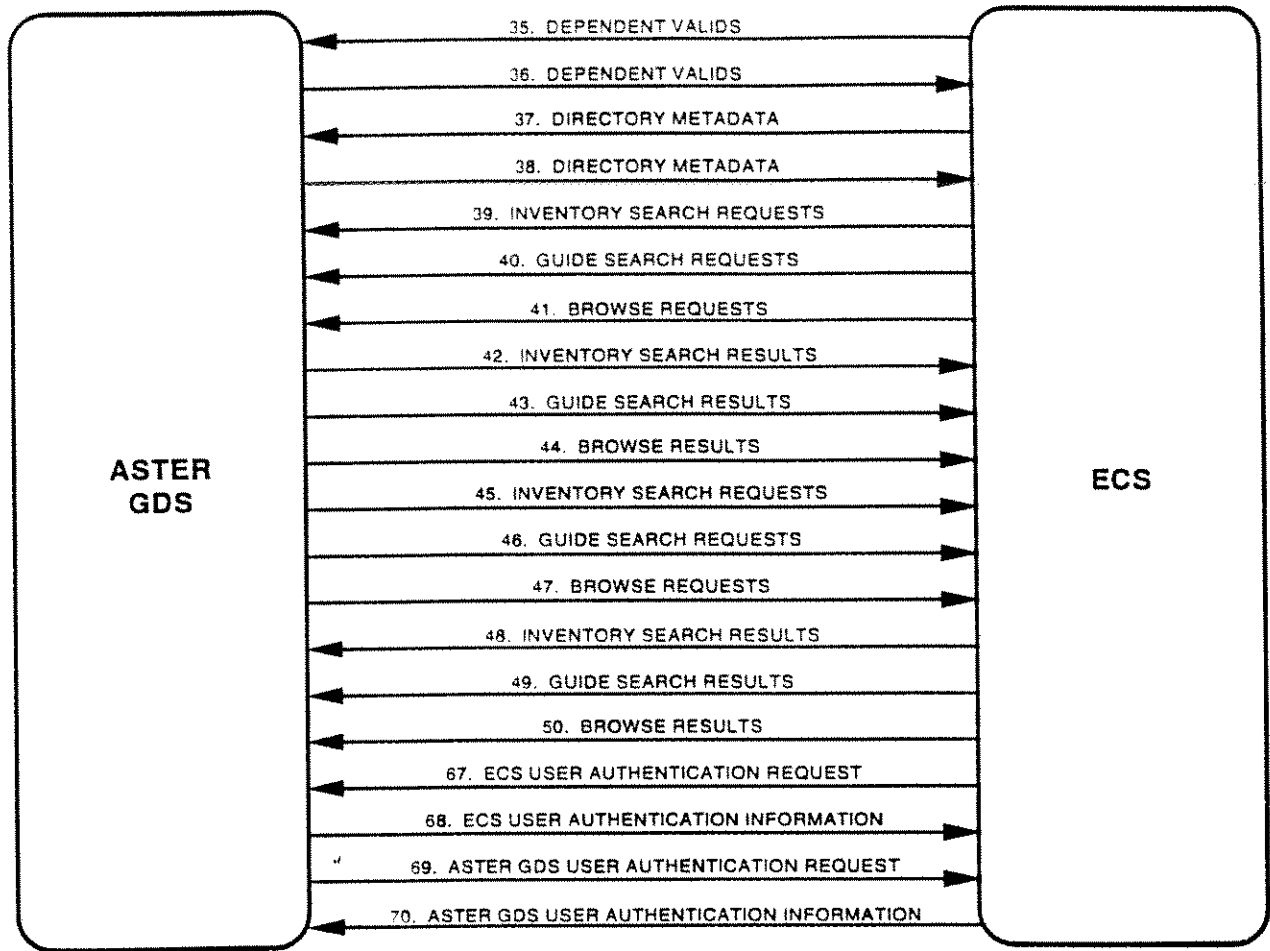
#### 4.7 User Search and Request Interface

The ASTER GDS and ECS will support two-way Level 3 interoperability. These data flows are shown in Figure 4-7. This will allow EOSDIS users and ASTER GDS users to have access to data products archived at ECS and ASTER GDS, respectively. ECS and ASTER GDS will exchange Dependent Validity [Table 4-1, Data Flows 35 and 36] which will be used to identify information about data products, including valid lists for variables. ECS and ASTER GDS information servers will support Level 3 interoperability through the exchange of standard search protocols. Both ECS and ASTER GDS will have the capability to exchange Directory Metadata [Table 4-1, Data Flows 37 and 38] in order to maintain or provide access to directory entries for ECS and ASTER GDS data sets. Users may search the Directory Metadata and submit queries against available inventory, guide, and browse data.

If an EOSDIS user wishes to search the ASTER GDS system, the ECS will provide an ECS User Authentication Request [Table 4-1, Data Flow 67] to the ASTER GDS. The ASTER GDS will respond with ECS User Authentication Information [Table 4-1, Data Flow 68] providing the access privileges granted. EOSDIS users will be able to submit queries (Inventory Search Requests, Guide Search Requests, Browse Requests) [Table 4-1, Data Flows 39, 40, and 41] for ASTER GDS products to the ECS SDPS. The ECS SDPS will pass the user query to the ASTER GDS SDPS, which will respond with the search results (Inventory Search Results, Guide Search Results, Browse Results) [Table 4-1, Data Flows 42, 43, and 44]. The ECS SDPS presents the search results to the EOSDIS user.

Similarly, if an ASTER GDS user wishes to search the ECS system, the ASTER GDS will provide an ASTER GDS User Authentication Request [Table 4-1, Data Flow 69] to ECS. ECS will respond with ASTER GDS User Authentication Information [Table 4-1, Data Flow 70] providing the access privileges granted. ASTER GDS users also will be able to submit queries (Inventory Search Requests, Guide Search Requests, Browse Requests) [Table 4-1, Data Flows 45, 46, and 47] for ECS products to the ASTER GDS SDPS. The ASTER GDS SDPS will pass the user query to the ECS SDPS, which will respond with the search results (Inventory Search Results, Guide Search Results, Browse Results) [Table 4-1, Data Flows 48, 49, and 50]. The ASTER GDS SDPS presents the search results to the ASTER GDS user.

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**Figure 4-7. User Search and Request Data Flows**

## 4.8 Product Request and Delivery

Data flows associated with product request and delivery are shown in Figure 4-8. An EOSDIS user may submit a Product Request or a Product Generation Request for an ASTER GDS product to the ECS SDPS. The ECS SDPS will pass the Product Request [Table 4-1, Data Flow 51] or Product Generation Request [Table 4-1, Data Flow 52] to the ASTER GDS. The Product Generation Request will include an associated product distribution request. The ASTER SDPS will respond with Product Delivery Status information [Table 4-1, Data Flow 53], which the ECS SDPS forwards to the user. The EOSDIS user also may query the status of a Product Request which was previously submitted to ASTER GDS. The ECS SDPS will pass the Product Delivery Status Request [Table 4-1, Data Flow 54] to the ASTER GDS SDPS. The ASTER GDS SDPS, again, responds with Product Delivery Status information, which will be forwarded to the user by the ECS SDPS.

Likewise, an ASTER GDS user also may submit a Product Request or a Product Generation Request for an ECS product to the ASTER GDS SDPS. The ASTER GDS SDPS will pass the Product Request [Table 4-1, Data Flow 55] or Product Generation Request [Table 4-1, Data Flow

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56] to the ECS. The Product Generation Request will include an associated product distribution request. The ECS SDPS will respond with Product Delivery Status information [Table 4-1, Data Flow 57], which the ASTER GDS SDPS forwards to the user. The ASTER GDS user also may query the status of a Product Request which was previously submitted to ECS. The ASTER GDS SDPS will pass the Product Delivery Status Request [Table 4-1, Data Flow 58] to the ECS SDPS. The ECS SDPS, again, responds with Product Delivery Status information, which will be forwarded to the user by the ASTER GDS SDPS.

ECS and ASTER SDPS also may submit Product Requests or Product Generation Requests to each other for data sets (e.g., Level 1b- Level 4 products from ASTER GDS [Table 4-1, Data Flow 59]; Level 0-Level 4 [Table 4-1, Data Flow 60], ancillary [Table 4-1, Data Flows 61 and 72], or correlative data [Table 4-1, Data Flows 62 and 73]) to support generation and/or validation of ASTER or other EOSDIS data products. As with the user requests, Product Delivery Status Requests and Product Delivery Status information also may be exchanged. ECS and ASTER GDS will provide Data Availability Schedules [Table 4-1, Data Flows 29 and 30] to identify the expected delivery schedule for these products. ~~Should the delivery schedule be unacceptable for production, ECS and ASTER GDS will engage in a Schedule Adjudication [Table 4-1, Data Flows 31 and 32] dialog to resolve the conflict.~~

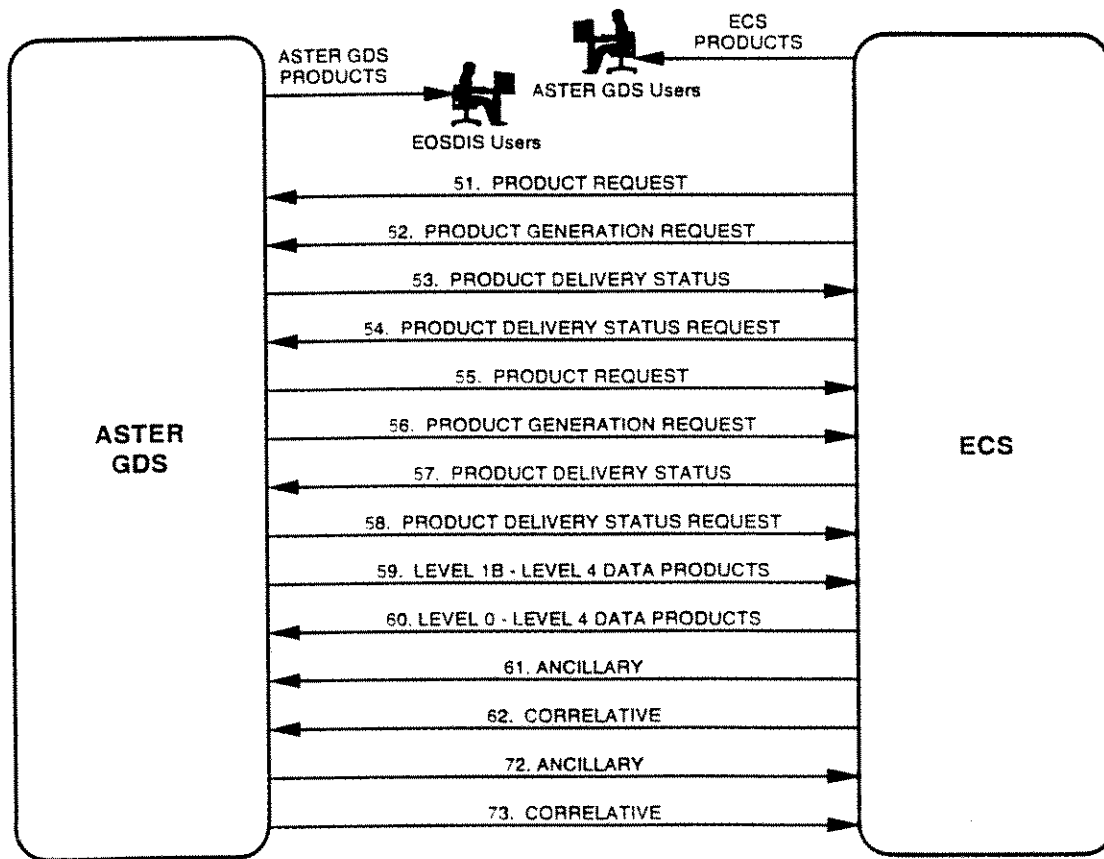


Figure 4-8. Product Request and Delivery Data Flows

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Both ECS and ASTER GDS will deliver their data products directly to the user (requester) of the data. The receiver of the data will be responsible for data delivery expenses, such as the cost associated with media and shipping.

#### 4.9 System and Network Management

The ECS CSMS and ASTER GDS CSMS will interface to exchange network management information [Table 4-1, Data Flows 63 and 64] associated with communications between the ASTER GDS and the ECS. In particular, this involves status, schedule, and fault isolation coordination associated with Japanese network and ESN network interfaces for mission essential communications. The interface for ECS/ASTER GDS network management is shown in Figure 4-9. Network management information may be supplied when status changes, or upon request [Table 4-1, Data Flows 65 and 66]. ECS and ASTER GDS also will exchange system management information, as necessary, to inform each other of system activities (such as special tests, maintenance, or system faults) that may affect ECS/ASTER GDS interfaces [Table 4-1, Data Flows 74 and 75].

Status, schedule and fault isolation information related to mission critical flight operations communications involving spacecraft or instrument operations will be coordinated among the EOC, ASTER ICC, and other EOSDIS components (EDOS or Ecom), as appropriate.

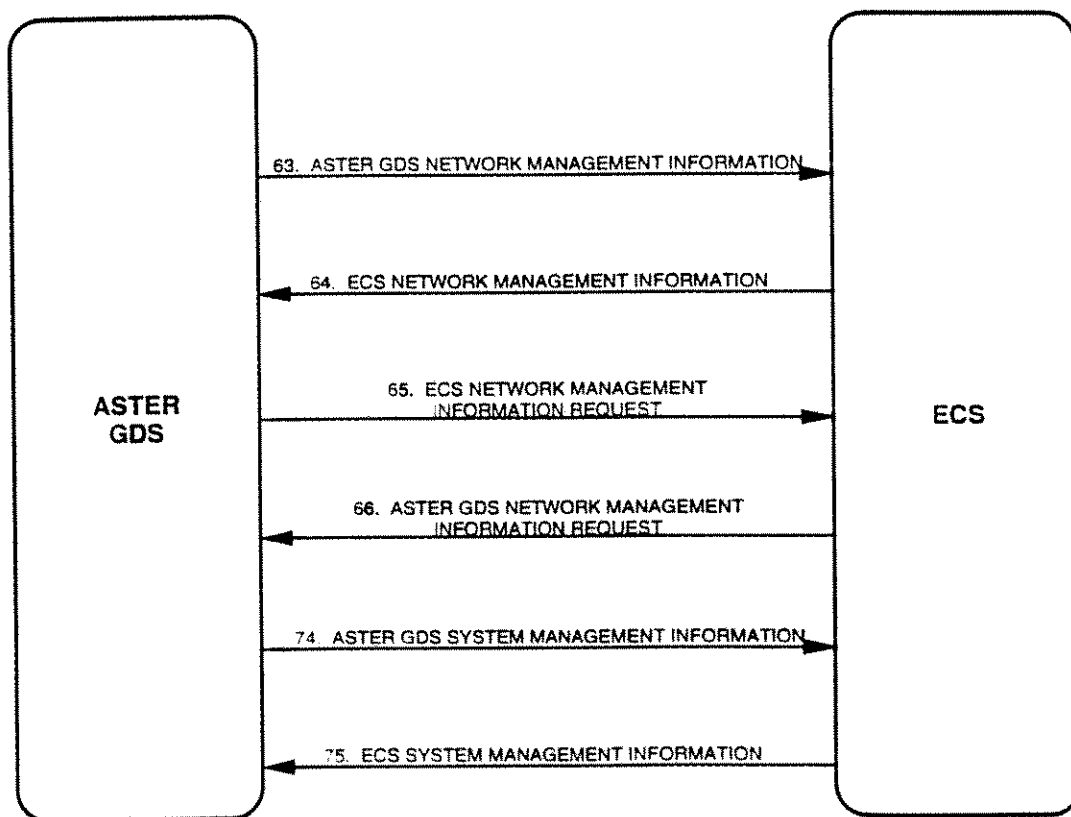


Figure 4-9. Network Management Data Flows

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# 5. Functional and Performance Interface Requirements

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## 5.1 Requirements Traceability

The functional and performance interface requirements identified in this document will be traced to the following parent documents:

- a. Functional and Performance Requirements Specification for the EOSDIS Core System
- b. Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements
- c. Project Implementation Agreement, Volume II - Ground Data System, Advanced Spaceborne Thermal Emission and Reflection Radiometer and ESDIS and EOS-AM Projects
- d. Memorandum of Understanding Between the United States National Aeronautics And Space Administration and the Ministry of International Trade and Industry of Japan concerning Cooperation in the Flight of the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) on the NASA Polar Orbiting Platform and Related Support for an International Earth Observing System

Appendix A, Table A-1 of this document provides a listing of each IRD requirement by requirement number and an identification of its parent requirements as found in these documents. Parent requirements will be identified by requirement number or, in the case where a parent requirement comes from a document that does not have numbered requirements (e.g., ASTER Project Implementation Agreement), the parent will be identified by the lowest level section number in the parent document.

## 5.2 Pre-Mission Functional Interface Requirements

### 5.2.1 Science Software Delivery Interface Requirements

- ASTER-0010 ECS and ASTER GDS shall conform to the IRD Between EOSDIS Core System and Science Computing Facilities with regard to the passing of data production software; and calibration coefficients, ~~data product quality assurance information and other data~~ between the two systems in support of data production software development for standard ASTER data products. {Issue-6}
- ASTER-0020 ASTER GDS shall have the capability to send and ECS (EDC DAAC) shall have the capability to receive all algorithms, source code, and documentation used by the ASTER GDS to process ASTER Level 0 data to Level 1 and higher level standard products.

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ASTER-0030 ECS (EDC DAAC) shall have the capability to send and ASTER GDS shall have the capability to receive all algorithms, source code, and documentation used by ECS to process ASTER Level 1 data to higher level standard products.

### 5.2.2 Long Term Planning Interface Requirements

ASTER-0040 ECS shall have the capability to send and ASTER GDS shall have the capability to receive EOS Long Term Science Plans.

ASTER-0045 ECS shall have the capability to send and ASTER GDS shall have the capability to receive EOS Long Term Instrument Plans.

### 5.2.3 Operations Data Base Interface Requirements

ASTER-0050 ASTER GDS shall have the capability to send and ECS shall have the capability to receive requests for updates to the ASTER operations data base.

ASTER-0060 ECS shall have the capability to send and ASTER GDS shall have the capability to receive an updated EOC operations data base, containing at a minimum, spacecraft and instrument telemetry formats, limits, and associated information and ASTER instrument command formats and associated information.

### 5.2.4 DAR Development Data Base Interface Requirements

ASTER-0100 ASTER GDS shall have the capability to send and ECS shall have the capability to receive information on ASTER instrument operations and constraints that may be applicable to DAR specification. The ASTER instrument constraint information shall include (at a minimum):

- a. descriptive information for the ASTER instrument
- b. default settings for instrument configurable parameters
- c. range of values for instrument configurable parameters
- d. instrument constraint information

### 5.3 DAR Handling Functional Interface Requirements

ASTER-0110 ECS shall have the capability to send and ASTER GDS shall have the capability to receive DARs for the ASTER instrument. DARs shall contain the following information, at a minimum:

- a. Observation number
- b. Experimenter identification

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- c. Experimenter address
- d. Investigation identification
- e. Scientific discipline
- f. Observation repetition period
- g. Tolerance in observation time
- h. User priority
- i. Scheduling priority and target of opportunity flag
- j. Descriptive text
- k. Location data expressed in terms of longitude and latitude as earliest start coordinates and latest stop coordinates
- l. Earliest start time
- m. Latest stop time
- n. Minimum coverage required
- o. Maximum coverage desired
- p. Number of instruments involved in the investigation
- q. Which instruments are involved in the investigation
- r. Associated product generation request and product distribution request.
- s. Pointing angle
- t. Calibration requirements
- u. Coordination requirements
- v. Data transmission requirements
- w. Illumination requirements (day/night)
- x. Specific time of observation
- y. Sun angle
- z. Direct downlink option

ASTER-0120

ASTER GDS shall have the capability to send and ECS shall have the capability to receive DAR status, when requested by ECS. [Issue 9] DAR status shall include such information as confirmation or rejection of the DAR, and notification of DAR scheduling and completion, to include at a minimum:

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- a. Date and time
- b. Instrument ID
- c. DAR ID
- d. Request status
- e. Implementation schedule
- f. If rejection, then the reason for the rejection.

ASTER-0130 ECS shall have the capability to send and ASTER GDS shall have the capability to receive queries for the current status of ASTER DARs which were previously submitted to the ASTER GDS by ECS.

#### 5.4 Planning & Scheduling/Command Load Functional Interface Requirements

ASTER-0200 ECS shall have the capability to send and ASTER GDS shall have the capability to receive planning aids (e.g., predicted orbit data, and spacecraft maneuver information).

ASTER-0210 ASTER GDS shall have the capability to send and ECS shall have the capability to receive ASTER instrument resource profiles and instrument resource deviation lists (when a resource profile exists)<sup>3</sup>.

ASTER-0220 ECS shall have the capability to send and ASTER GDS shall have the capability to receive a notification when ASTER instrument resource profile information cannot be integrated into the preliminary resource schedule.

ASTER-0230 ECS shall have the capability to send and ASTER GDS shall have the capability to receive a preliminary resource schedule. The preliminary resource schedule shall include, at a minimum, the following:

- a. Activity and DAR identifiers
- b. Resource availability and usage requirements
- c. Time constraints
- d. TDRSS schedule

<sup>3</sup>Instrument Resource Profiles and Instrument Resource Deviation Lists are equivalent to ASTER Short Term Schedules (STS).

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- ASTER-0240 ASTER GDS shall have the capability to send and ECS shall have the capability to receive instrument activity lists and instrument activity deviation lists (when an activity list exists) and any updates thereto.<sup>4</sup>
- ASTER-0250 ECS shall have the capability to send and ASTER GDS shall have the capability to receive a notification when the ASTER instrument activities cannot be integrated into the detailed activity schedule.
- ASTER-0260 ECS shall have the capability to send and ASTER GDS shall have the capability to receive detailed activity schedules and any updates. The detailed activity schedule shall include, at a minimum, the following:
- a. Instrument activities
  - b. Spacecraft activities necessary to support all instrument activities
  - c. All spacecraft activities necessary for spacecraft subsystem maintenance
  - d. Spacecraft resource requirements for each activity
  - e. Traceability of instrument activities to DARs
- ASTER-0300 ASTER GDS shall have the capability to send and ECS shall have the capability to receive, both electronically and by voice, information to facilitate, at a minimum, the following:
- a. Planning of coordinated operations
  - b. Resolution of conflicts
  - c. Exchange of instrument status
- ASTER-0310 ECS shall have the capability to send and ASTER GDS shall have the capability to receive, both electronically and by voice, information to facilitate, at a minimum, the following:
- a. Planning of coordinated operations
  - b. Resolution of conflicts
  - c. Exchange of instrument status
- ASTER-0340 ASTER GDS shall have the capability to send and ECS shall have the capability to receive "What-If" planning and scheduling inputs.
- ASTER-0350 ECS shall have the capability to send and ASTER GDS shall have the capability to receive "What-If" planning and scheduling results.

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<sup>4</sup>Instrument Activity Lists and Instrument Activity Deviation Lists are equivalent to ASTER One-Day Schedules (ODS).

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- ASTER-0410 ECS shall have the capability to send and ASTER GDS shall have the capability to receive command load generation status information, including at a minimum, the following:
- a. Spacecraft Control Computer (SCC)-stored command load report
  - b. Integrated report having orbital events, command execution times, and TDRSS contacts with candidate loads

## 5.5 Instrument Operations Functional Interface Requirements

- ASTER-0520 ASTER GDS shall have the capability to send and ECS shall have the capability to receive real time command ~~groups~~, requests [Issue-7]
- ASTER-0530 ECS shall have the capability to send and ASTER GDS shall have the capability to receive instrument command uplink status. Instrument command uplink status shall include (at a minimum):
- a. receipt of the command group at the EOC
  - b. validation status at the EOC
  - c. receipt of the command at the AM-1 spacecraft
- ASTER-0540 ASTER GDS shall have the capability to send and ECS shall have the capability to receive pre-planned command groups.
- ASTER-0550 ECS shall have the capability to send and ASTER GDS shall have the capability to receive instrument command notification when ECS issues emergency/contingency ASTER command groups.
- ASTER-0570 ASTER GDS shall have the capability to send and ECS shall have the capability to receive ASTER instrument status data.
- ASTER-0580 ECS shall have the capability to send and ASTER GDS shall have the capability to receive AM-1 spacecraft status data.
- ASTER-0590 ECS shall have the capability to send and ASTER GDS shall have the capability to receive mission status reports.
- ~~ASTER-0600 ASTER GDS shall have the capability to send and ECS shall have the capability to receive instrument history log data and associated metadata. [Issue-8]~~

## 5.6 Science Data Handling Functional Interface Requirements

- ASTER-0700 ASTER GDS shall have the capability to send and ECS (EDC DAAC) shall have the capability to receive Level 1a data products, including associated ancillary data, metadata, and browse.

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- ASTER-0710      ASTER GDS shall have the capability to send and ECS (EDC DAAC) shall have the capability to receive Quick Look Level 1 (TBD) data products, including associated ancillary data, metadata, and browse. [TBR - Issue 11]
- ASTER-0730      ECS shall have the capability to send and ASTER GDS shall have the capability to receive orbit/~~attitude~~ data anomaly notifications.
- ASTER-0740      ECS shall have the capability to send and ASTER GDS shall have the capability to receive repaired/~~refined~~ orbit data provided to ECS by the GSFC Flight Dynamics Facility.
- ~~ASTER-0750      ECS shall have the capability to send and ASTER GDS shall have the capability to receive repaired/refined attitude data provided to ECS by the GSFC Flight Dynamics Facility.~~
- ASTER-0760      ASTER GDS shall have the capability to send and ECS shall have the capability to receive data availability schedules for ASTER GDS data products which were requested by ECS.
- ASTER-0770      ECS shall have the capability to send and ASTER GDS shall have the capability to receive data availability schedules for ECS data products which were requested by ASTER GDS.
- ~~ASTER-0780      ECS shall have the capability to send and ASTER GDS shall have the capability to receive schedule adjudication data.~~
- ~~ASTER-0790      ASTER GDS shall have the capability to send and ECS shall have the capability to receive schedule adjudication data.~~

## 5.7 User Search and Request Functional Interface Requirements

- ASTER-0800      ECS shall have the capability to send and ASTER GDS shall have the capability to receive dependent valids information related to ECS data products.
- ASTER-0805      ASTER GDS shall have the capability to send and ECS shall have the capability to receive dependent valids information related to ASTER GDS data products.
- ASTER-0810      ECS shall have the capability to send and ASTER GDS shall have the capability to receive directory metadata related to ECS data products.
- ASTER-0815      ASTER GDS shall have the capability to send and ECS shall have the capability to receive directory metadata related to ASTER GDS data products.
- ASTER-0820      ECS shall have the capability to send and ASTER GDS shall have the capability to receive inventory search requests.

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- ASTER-0825 ECS shall have the capability to send and ASTER GDS shall have the capability to receive guide search requests.
- ASTER-0830 ECS shall have the capability to send and ASTER GDS shall have the capability to receive browse requests.
- ASTER-0835 ASTER GDS shall have the capability to send and ECS shall have the capability to receive inventory data search results.
- ASTER-0840 ASTER GDS shall have the capability to send and ECS shall have the capability to receive guide search results.
- ASTER-0845 ASTER GDS shall have the capability to send and ECS shall have the capability to receive browse results.
- ASTER-0850 ASTER GDS shall have the capability to send and ECS shall have the capability to receive inventory search requests.
- ASTER-0855 ASTER GDS shall have the capability to send and ECS shall have the capability to receive guide search requests.
- ASTER-0860 ASTER GDS shall have the capability to send and ECS shall have the capability to receive browse requests.
- ASTER-0865 ECS shall have the capability to send and ASTER GDS shall have the capability to receive inventory search results.
- ASTER-0870 ECS shall have the capability to send and ASTER GDS shall have the capability to receive guide search results.
- ASTER-0875 ECS shall have the capability to send and ASTER GDS shall have the capability to receive browse results.
- ASTER-0880 ECS shall have the capability to send and ASTER GDS shall have the capability to receive user authentication requests for ASTER GDS privileges of EOSDIS users.
- ASTER-0885 ASTER GDS shall have the capability to send and ECS shall have the capability to receive user authentication information specifying ASTER GDS privileges for EOSDIS users.
- ASTER-0890 ASTER GDS shall have the capability to send and ECS shall have the capability to receive user authentication requests for ECS privileges of ASTER GDS users.
- ASTER-0895 ECS shall have the capability to send and ASTER GDS shall have the capability to receive user authentication information specifying ECS privileges for ASTER GDS users.

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## 5.8 Product Request and Delivery Functional Interface Requirements

- ASTER-0900 ECS shall have the capability to send and ASTER GDS shall have the capability to receive product requests for ASTER GDS data products.
- ASTER-0905 ECS shall have the capability to send and ASTER GDS shall have the capability to receive product generation requests for ASTER GDS data products. Product generation requests will include an associated product distribution request.
- ASTER-0910 ASTER GDS shall have the capability to send and ECS shall have the capability to receive product delivery status information. Product delivery status information contains the following information, at a minimum:
- a. Requester identification
  - b. Request identification
  - c. Request status
  - d. If rejection, then the reason for the rejection
  - e. If delayed longer than the latest completion time specified by the user, adjusted start and stop times.
- ASTER-0915 ECS shall have the capability to send and ASTER GDS shall have the capability to receive requests for product delivery status.
- ASTER-0920 ASTER GDS shall have the capability to send and ECS shall have the capability to receive product requests for ECS data products.
- ASTER-0925 ASTER GDS shall have the capability to send and ECS shall have the capability to receive product generation requests for ECS data products. Product generation requests will include an associated product distribution request.
- ASTER-0930 ECS shall have the capability to send and ASTER GDS shall have the capability to receive product delivery status information. Product delivery status information contains the following information, at a minimum:
- a. Requester identification
  - b. Request identification
  - c. Request status
  - d. If rejection, then the reason for the rejection
  - e. If delayed longer than the latest completion time specified by the user, adjusted start and stop times.

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- ASTER-0935 ASTER GDS shall have the capability to send and ECS shall have the capability to receive requests for product delivery status.
- ASTER-0940 ECS shall have the capability to send and ASTER GDS shall have the capability to receive Level 0 - Level 4 data products, including associated ancillary, metadata, and browse.
- ASTER-0945 ASTER GDS shall have the capability to send and ECS shall have the capability to receive Level 1b - Level 4 ASTER data products, including associated ancillary, metadata, and browse.
- ASTER-0950 ECS shall have the capability to send and ASTER GDS shall have the capability to receive ancillary data, including associated metadata.
- ASTER-0955 ECS shall have the capability to send and ASTER GDS shall have the capability to receive correlative data, including associated metadata.
- ASTER-0960 ASTER GDS shall have the capability to send and ECS shall have the capability to receive ancillary data, including associated metadata.
- ASTER-0965 ASTER GDS shall have the capability to send and ECS shall have the capability to receive correlative data, including associated metadata.

## **5.9 System and Network Management Functional Interface Requirements**

- ASTER-1000 ECS shall have the capability to send and ASTER GDS shall have the capability to receive ECS system and network management information.
- ASTER-1005 ECS shall have the capability to send and ASTER GDS shall have the capability to receive requests for ASTER GDS network management information.
- ASTER-1010 ASTER GDS shall have the capability to send and ECS shall have the capability to receive ASTER GDS system and network management information.
- ASTER-1015 ASTER GDS shall have the capability to send and ECS shall have the capability to receive requests for ECS network management information.
- ASTER-1020 ECS shall provide (via GFP PSCN circuits) the necessary communications connections to the ASTER designated pick up points (at JPL) for the U.S. Gateway for ESN (mission success) communications.
- ASTER-1030 ASTER GDS shall provide the necessary communications connections to the trans-Pacific link.
- ASTER-1040 ECS shall provide protocol translation (TBR), termination, bridging, and routing for ESN communications interfaces to the U.S. Gateway for ASTER GDS communications.

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- ASTER-1045      ASTER GDS shall provide any necessary protocol translation, termination, bridging, and routing for ASTER GDS communications interfaces to the trans-Pacific link for ECS communications.
- ASTER-1060      ECS shall provide support for Transmission Control Protocol/Internet Protocol (TCP/IP) ~~{TBR}~~ communications protocols to the U.S. Gateway for ASTER GDS communications.
- ASTER-1065      ASTER GDS shall provide support for Transmission Control Protocol/Internet Protocol (TCP/IP) ~~{TBR}~~ communications protocols to the trans-Pacific link for ECS communications.

### 5.10 Performance Interface Requirements

- ASTER-2000      ECS functions shall have an operational availability (computed as defined in the Functional and Performance Requirements Specification for the EOSDIS Core System) of 0.96 at a minimum and a Mean Down Time (MDT) of four (4) hours or less, unless otherwise specified.
- ASTER-2030      The ECS FOS shall have an operational availability of 0.99925 at a minimum and a MDT of five (5) minutes or less for real time functions that support:
- a.      Launch
  - b.      Early orbit checkout
  - c.      Disposal
  - d.      Orbit adjustment
  - e.      Anomaly investigation
  - f.      Recovery from safe mode
  - g.      Routine real time commanding and associated monitoring for spacecraft and instrument health and safety.
- ASTER-2040      The ECS FOS shall have an operational availability of 0.992 at a minimum and a MDT of (1) hour or less for functions associated with Targets of Opportunity (TOOs).
- ASTER-2060      The ECS SDPS function of receiving science data shall have an operational availability of 0.999 at a minimum and an MDT of two (2) hours or less.
- ASTER-2080      The ECS function for gathering and disseminating management information shall have an operational availability of .998 at a minimum and an MDT of 20 minutes or less, for critical services.

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- ASTER-4000 ASTER GDS shall have an operational availability of 0.96 at a minimum and a Mean Down Time (MDT) of four (4) hours or less, unless otherwise specified. [TBD]
- ASTER-4030 ASTER GDS shall have an operational availability of 0.99925 at a minimum and a MDT of five (5) minutes or less for real time functions . [TBD]
- ASTER-4040 The ASTER GDS shall have an operational availability of 0.992 at a minimum and a MDT of (1) hour or less for functions associated with Targets of Opportunity (TOOs). [TBD]
- ASTER-4060 The ASTER GDS function of receiving science data shall have an operational availability of 0.999 at a minimum and an MDT of two (2) hours or less. [TBD]
- ASTER-4080 The ASTER GDS function for gathering and disseminating management information shall have an operational availability of .998 at a minimum and an MDT of 20 minutes or less, for critical services. [TBD]

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## 6. Interface Control Documentation Plan

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The ICD planned which corresponds to this IRD is entitled Interface Control Document Between EOSDIS Core System and ASTER GDS. This ICD will define the functional and physical design of each interface between ECS and the ASTER GDS, and will include the precise data contents and format of each interface. All modes (options) of data exchange for each interface will be described as well as the conditions required for each mode or option. Additionally, data rates, duty cycles, error conditions, and error handling procedures will be included. The sequence of exchanges will be completely described (e.g., required handshaking.) Communications protocols or physical media will be detailed for each interface. The ICD Between ECS and ASTER GDS will be controlled by ESDIS and ASTER GDS Configuration Control. Development of this ICD is the responsibility of the ECS contractor.

The ECS/ASTER GDS interfaces are currently scheduled for implementation in ECS Release A (partial implementation) and B (full implementation). The delivery plan for the ICD Between ECS and ASTER GDS is as follows:

- ECS will deliver a preliminary ICD one month prior to the ECS Release A Preliminary Design Review (PDR). This ICD will contain preliminary definitions for the ECS/ASTER GDS interfaces that will be implemented in ECS Release A.
- ECS will deliver a final ICD one month prior to the ECS ~~Release A~~ FOS Critical Design Review (CDR) (May September 1995). This ICD will contain final interface definitions for the ECS FOS/ASTER GDS interfaces that will be implemented in ECS Release A and Release B. At this time, the ICD will be placed under configuration control by the applicable CCB(s).
- ECS will deliver a preliminary update to the ICD one month prior to the ECS Release B Incremental Design Review (IDR) (July 1995). This ICD will include preliminary definitions for the ECS/ASTER GDS interfaces that will be implemented in ECS Release B.
- ECS will deliver a final update to the ICD one month prior to the ECS Release B CDR (February 1996). This ICD will be the final ICD for controlling all ECS/ASTER GDS interfaces. At this time, the final ICD will be placed under configuration control by the applicable CCBs.

It is expected that the ECS and ASTER GDS contractors will work together closely in the development of this ICD. The ICD plan presented in this document details only the formal deliveries; it is expected that additional informal reviews and information exchanges will occur, as necessary, during the ICD development process.

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# Appendix A. Requirements Traceability

**Table A-1. Requirements Traceability (1 of 7)**

ECS/ASTER IRD Requirement	F&PRS for the ECS	Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements	PIA Volume II - Ground Data System ASTER, ESDIS and EOS- AM Projects	MOU Between U.S. NASA and MITI Concerning ASTER
ASTER-0010	EOSD1750 EOSD1760	621 623 644 891 892 894 954 1155 1156 1439	Appendix B	
ASTER-0020	EOSD1750 DADS0200	614 621 954 1169 338	2.3	4.2.C
ASTER-0030	EOSD1760	621 625 651		4.2.C
ASTER-0040	ICC-0040 SMC-1300	944 1158 1445 1608		
ASTER-0045	ICC-0040 SMC-1300	944 1158 1445 1608		
ASTER-0050	EOC-7015	1404 1557 1608	4.1	
ASTER-0060	EOC-7015 (derived)	1557 1608	4.1	
ASTER-0100	IMS-0280	1166		
ASTER-0110	IMS-1070 IMS-1261	596 1166	4.4	
ASTER-0120	IMS-1260 IMS-1262	1166	4.4	

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Table A-1. Requirements Traceability (2 of 7)

ECS/ASTER IRD Requirement	F&PRS for the ECS	Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements	PIA Volume II - Ground Data System ASTER, ESDIS and EOS-AM Projects	MOU Between U.S. NASA and MITI Concerning ASTER
ASTER-0130	IMS-1260 IMS-1262	1166		
ASTER-0200	EOC-2010 EOC-2040	1326 1335 1608	4.1	
ASTER-0210	EOC-2270	1098 1334 1408 1608	4.1	
ASTER-0220	EOC-2290	1334 1608	4.1	
ASTER-0230	EOC-2040 EOC-2320 EOC-2350	1098 1325 1326 1334 1550 1608	4.1	
ASTER-0240	EOC-2480	1099 1147 1268 1269 1334 1408 1550 1608	4.1	
ASTER-0250	EOC-2540	1334 1608	4.1	
ASTER-0260	EOC-2040 EOC-2550 EOC-2620	637 1325 1326 1334 1405 1608	4.1	
ASTER-0300	ICC-0050	1248 1334 1369 1551 1608		

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**Table A-1. Requirements Traceability (3 of 7)**

ECS/ASTER IRD Requirement	F&PRS for the ECS	Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements	PIA Volume II - Ground Data System ASTER, ESDIS and EOS-AM Projects	MOU Between U.S. NASA and MITI Concerning ASTER
ASTER-0310	ICC-0050	1248 1334 1369 1551 1608		
ASTER-0340	EOC-2260	571 1608		
ASTER-0350	EOC-2260	571 1608		
ASTER-0410	EOC-3160 (derived)	1431 1608	4.1	
ASTER-0520	EOC-4017	626 1147 1268 1608		
ASTER-0530	EOC-4166	1560 1608	4.1	
ASTER-0540	EOC-3200	626 1137 1147 1333 1608	4.1	
ASTER-0550	EOC-4168	1369 1560 1608	4.1	
ASTER-0570	EOC-6020	894 1160 1369 1559 1560 1608	4.1	
ASTER-0580	EOC-7125	894 1160 1243 1559 1608	4.1	
ASTER-0590	EOC-7125 6.5.1.2.1.5 Figure 6-2 Table 6-1	894 1160 1243 1559 1608	4.1	

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Table A-1. Requirements Traceability (4 of 7)

ECS/ASTER IRD Requirement	F&PRS for the ECS	Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements	PIA Volume II - Ground Data System ASTER, ESDIS and EOS-AM Projects	MOU Between U.S. NASA and MITI Concerning ASTER
ASTER-0600	DADS0150	580 623 871 1160 1608		
ASTER-0700	EOSD1770 SDPS0020 SDPS0025 DADS0200	1338 1402	3.3.4 4.3	4.2.C 5.2.C
ASTER-0710	EOSD1770 SDPS0020 SDPS0025 DADS0200	1338 1402	3.3.2 4.3	5.1.M 5.2.C
ASTER-0730	DADS2390 (derived)	1402		4.3
ASTER-0740	DADS2390	1402		4.3
ASTER-0750	DADS2390	1402		4.3
ASTER-0760	EOSD1770 PGS-0150 DADS2020	1248 1337		
ASTER-0770	EOSD1770 SDPS0110	1248		
ASTER-0780	SMC-1500 SDPS0110	1248		
ASTER-0790	SMC-1500 SDPS0110	1248		
ASTER-0800	IMS-0380	651 1167 1286 1383	3.5.1	
ASTER-0805	IMS-0120 (derived) IMS-0380 IMS-0390	651 1167 1286 1287 1383 1571	3.5.1	
ASTER-0810	EOSD1770 IMS-0380	651 1167 1286 1383	3.5.1 4.3	

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**Table A-1. Requirements Traceability (5 of 7)**

ECS/ASTER IRD Requirement	F&PRS for the ECS	Earth Science Data and Information System (ESDIS) Project – Level 2 Requirements	PIA Volume II - Ground Data System ASTER, ESDIS and EOS-AM Projects	MOU Between U.S. NASA and MITI Concerning ASTER
ASTER-0815	EOSD1770 IMS-0380 IMS-0390	651 1167 1286 1383 1571	3.5.1 4.3	
ASTER-0820	EOSD5060	651 1383	3.5.1	
ASTER-0825	EOSD5060	651 1383	3.5.1	
ASTER-0830	EOSD5060	651 1383	3.5.1	
ASTER-0835	EOSD5060	651 1165 1383	3.5.1 4.3	
ASTER-0840	EOSD5060	651 1165 1383	3.5.1 4.3	
ASTER-0845	EOSD5060	651 1165 1383	3.5.1 4.3	
ASTER-0850	EOSD5060	651 876 1383	3.5.1	
ASTER-0855	EOSD5060	651 876 1383	3.5.1	
ASTER-0860	EOSD5060	651 876 1383	3.5.1	
ASTER-0865	EOSD5060	651 1383	3.5.1 4.3	
ASTER-0870	EOSD5060	651 1383	3.5.1 4.3	
ASTER-0875	EOSD5060	651 1383	3.5.1 4.3	
ASTER-0880	SMC-5320	1174 1252 1253 1455		

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Table A-1. Requirements Traceability (6 of 7)

ECS/ASTER IRD Requirement	F&PRS for the ECS	Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements	PIA Volume II - Ground Data System ASTER, ESDIS and EOS-AM Projects	MOU Between U.S. NASA and MITI Concerning ASTER
ASTER-0885	SMC-5320	1174 1252 1253 1455		
ASTER-0890	SMC-5320	1174 1252 1253 1455		
ASTER-0895	SMC-5320	1174 1252 1253 1455		
ASTER-0900	EOSD1770 IMS-0900	1274 1341 1572	3.5.1	
ASTER-0905	EOSD1770 IMS-0900	1274 1572	3.5.1	
ASTER-0910	EOSD1770 IMS-0820 IMS-1010 (derived)	876 1248		
ASTER-0915	EOSD1770	876 1248		
ASTER-0920	EOSD1770 IMS-0780	876	3.5.1	
ASTER-0925	EOSD1770 IMS-0780	876	3.5.1	
ASTER-0930	EOSD1770 IMS-0820 IMS-1010 (derived)	876 1248 1339		
ASTER-0935	EOSD1770	876 1248 1339		
ASTER-0940	EOSD1770 SDPS0100 DADS2390	625	3.3.4	4.2.C
ASTER-0945	EOSD1770 SDPS0020 DADS0200	1274 1338 1570	3.3.4	4.2.C 5.2.C

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Table A-1. Requirements Traceability (7 of 7)

ECS/ASTER IRD Requirement	F&PRS for the ECS	Earth Science Data and Information System (ESDIS) Project -- Level 2 Requirements	PIA Volume II - Ground Data System ASTER, ESDIS and EOS-AM Projects	MOU Between U.S. NASA and MITI Concerning ASTER
ASTER-0950	EOSD1770 SDPS0100 DADS2390	625		4.3
ASTER-0955	EOSD1770 SDPS0100 DADS2390	625		4.3
ASTER-0960	EOSD1770	1248		
ASTER-0965	EOSD1770	1248		
ASTER-1000	EOSD1770 SMC-1500	1248		
ASTER-1005	EOSD1770 SMC-1500	1248		
ASTER-1010	EOSD1770 SMC-1500	1248		
ASTER-1015	EOSD1770 SMC-1500	1248		
ASTER-1020	ESN-0180	1133	3.3.2	
ASTER-1030			3.3.2	
ASTER-1040	ESN-1140	1133		
ASTER-1045				
ASTER-1060	ESN-1340	1383		
ASTER-1065				
ASTER-2000	EOSD3700	1249		
ASTER-2030	EOSD3810	1249		
ASTER-2040	EOSD3820	1249		
ASTER-2060	EOSD3900	1249		
ASTER-2080	EOSD4030	1249		
ASTER-4000				
ASTER-4030				
ASTER-4040				
ASTER-4060				
ASTER-4080				

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## Appendix B. Issues

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1. Responsibility for the trans-Pacific link between the U.S. and Japan needs to be established.
2. Ownership of the "U.S. Gateway" or router(s) at JPL and Ames Research Center that will carry ESN traffic to Japan needs to be established. Who will ECS deal with if these routers fail?

*Issue Resolved: Ownership of the U.S. Gateway is not an issue. Each U.S. network provider will use its own router to connect to the PSCN switch, just as at other sites. ESN will be responsible for monitoring its own router and interface.*

3. This IRD assumes that product delivery will always be via postal delivery. The capability for delivering low volume data products (for instance, ancillary data, correlative data, or history data) electronically should be investigated.
4. Do these data exchanges (between the ASTER ICC and the EOC) require the Ecom level-of-service?

*Issue Resolved: It is agreed that these data exchanges between the ASTER ICC and the EOC require the Ecom level-of-service, since these data exchanges are required for mission critical operations.*

5. There are several trade studies on-going in reference to the Level 1 architecture for processing ASTER Level 1 data. This IRD reflects the project baseline (Level 1a processing in Japan; all Level 1a data routinely provided to ECS on tape; Level 1b data available to ECS on request). Some of the in-progress trade studies address Level 1 processing capabilities in the U.S., and the handling of Ground Control Points (GCPs) and user-specified map projections.
6. Action items have been assigned to ECS and ERSDAC to identify the specific SCF functions that apply to the ASTER GDS/ECS interface.

*Issue Resolved: The SCF data flows that are relevant to the ASTER GDS-ECS interface are those data flows associated with data production software delivery and calibration coefficient updates. This clarification is reflected in this version of the IRD.*

7. The ASTER ICC capability for transmitting real time command groups to the EOC is under study by ERSDAC. It is not essential for the ASTER GDS to implement a real time command capability since the ASTER operations concept is to normally operate the instrument via stored commands, and the EOC has the capability to perform real time commanding during anomaly situations. ERSDAC will notify ESDIS as soon as a decision is made with regard to implementing this capability in the ASTER GDS.

*Issue Resolved: It is agreed that this IRD will not include requirements for the EOC to receive real time command groups from the ASTER ICC. The ASTER ICC may, however,*

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send real time command requests to the EOC to request the FOT to uplink a real time command to the ASTER instrument. This is reflected in this version of the IRD.

8. The ASTER GDS currently does not have requirements to provide ASTER history log data to the ECS SDPS. ASTER GDS plans to permanently archive ASTER history data at the ASTER ICC. How this data will get to ECS, or if this information is really required at ECS needs to be investigated.

Issue Resolved: It is agreed that the ASTER GDS is not required to provide instrument history files to ECS for permanent archive. It is noted that the EOC archives a complete command and housekeeping telemetry history at the GSFC DAAC.

9. The ASTER GDS currently does not have requirements to provide ECS with updated DAR status, when the status changes. ERSDAC's current concept is for ASTER GDS to provide DAR status to ECS only in response to an ECS DAR Status Request.
10. The current concept of the EOC using ASTER Activity List mnemonics to generate ASTER stored commands needs to be tracked and validated by ECS and ERSDAC. Also, it is possible that the ASTER instrument may have a command sequence which cannot be expressed in mnemonic format.

Issue Resolved: All ASTER instrument command sequences will be assigned mnemonics in the EOC data base.

11. Quick look data and Quick look products have been proposed for deletion. Instead of QDSs, the ASTER GDS may request Expedited Data Sets (EDS) from EDOS. It is assumed that ECS will receive Quick look Level 1 products based on any EDSs that the ASTER GDS receives from EDOS.

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# Abbreviations and Acronyms

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ADN	ASTER Data Network
AOS	ASTER Operations Segment
ASF	Alaska SAR Facility
AST	ASTER Science Team
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
ATC	absolute time command
CCB	Configuration Control Board
CCR	Configuration Change Request
CDR	Critical Design Review
CDRL	Contract Data Requirement List
CLCW	Command Link Control Word
CSMS	Communications and System Management Segment
DAAC	Distributed Active Archive Center
DADS	Data Archive and Distribution System
DAR	Data Acquisition Request
DCN	Document Change Notice
DDL	Direct Downlink
DID	Data Item Description
DIF	Data Interface Facility (EDOS)
DPF	Data Production Facility (EDOS)
DRS	DDL Receiving Station
Ecom	EOS Communications
ECS	EOSDIS Core System
EDC	EROS Data Center
EDOS	EOS Data Operations System
<u>EDS</u>	<u>Expedited Data Set</u>
EGS	EOS Ground System
EOC	Earth Operations Center

EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
EROS	Earth Resources Observation System
ERSDAC	Earth Remote Sensing Data Analysis Center
ESDIS	Earth Science Data and Information System
ESN	EOSDIS Science Network
F&PRS	Functional and Performance Requirements Specification
FDF	Flight Dynamics Facility
FOS	Flight Operations Segment
FOT	Flight Operations Team
GCP	ground control point
GDS	Ground Data System
GFP	Government Furnished Property
GOSIP	Government Open System Interconnection Profile
GSFC	Goddard Space Flight Center
GSMS	Ground System Management Subsystem
HAIS	Hughes Applied Information Systems
I&T	Integration and Test
ICC	Instrument Control Center
ICD	Interface Control Document
ICWG	Interface Control Working Group
IDB	Instrument Data Base
IDR	Incremental Design review
IMS	Information Management System
IP	International Partners
IRD	Interface Requirement Document
ISO	International Standards Organization
IST	Instrument Support Terminal
IWG	Investigator Working Group
JAROS	Japan Resources Observation System
JPL	Jet Propulsion Laboratory

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LAN	Local Area Network
LaRC	Langley Research Center
LSM	Local System Management
LTIP	Long Term Instrument Plan
LTSP	Long Term Science Plan
MDT	mean down time
MITI	Ministry of International Trade and Industry (Japan)
MO&DSD	Mission Operations and Data Systems Directorate (GSFC Code 500)
MOM	Mission Operations Manager
MOU	Memorandum of Understanding
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
Nascom	NASA Communications
NASDA	National Space Development Agency (Japan)
NOLAN	Nascom Operational Local Area Network
NSI	NASA Science Internet
NSIDC	National Snow and Ice Data Center
<u>ODS</u>	<u>One-Day Schedule (ASTER) (equivalent to Instrument Activity List)</u>
ORNL	Oak Ridge National Laboratory
OSI	Open Systems Interconnection
PDB	Project Data Base
PDR	Preliminary Design Review
PDS	Production Data Set
PGS	Product Generation System
PI	Principal Investigator
PIA	Project Implementation Agreement
PSAT	Predicted Site Acquisition Table
PSCN	Program Support Communications Network
QA	Quality Assurance
<del>QDS</del>	<del>Quick Look Data Set</del>
SAR	Synthetic Aperture Radar

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SCF	Science Computing Facility
SDPS	Science Data Processing Segment
SDR	System Design Review
SMC	System Management Center <u>Monitoring and Control</u>
SRR	System Requirements Review
<u>STS</u>	<u>Short Term Schedule (ASTER) (equivalent to Instrument Resource Profile)</u>
SWIR	Short-wave Infrared
TBD	to be determined
TBR	To Be Resolved, To Be Reviewed
TBS	to be supplied
TCP/IP	Transmission Control Protocol/Internet Protocol
TDRSS	Tracking and Data Relay Satellite System
TIR	Thermal Infrared
TL	Team Leader
TOO	Target of Opportunity
TSS	TDRSS Service Session
UAV	User Antenna View
U.S.	United States
VNIR	Visible and Near Infrared
WAN	Wide Area Network

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