324-CD-004-001

EOSDIS Core System Project

Flight Operations Segment (FOS) Release A Integration and Test (I&T) Reports for the ECS Project

December 1996

Hughes Information Technology Corporation
Upper Marlboro, Maryland

Flight Operations Segment (FOS) Release A Integration and Test (I&T) Reports for the ECS Project

December 1996

Prepared Under Contract NAS5-60000
CDRL Item 056

APPROVED BY

Deborah P. Dunn 12/6/96

Debbie Dunn, FOS CCB Chairman Date
EOSDIS Core System Project

Hughes Information Technology Corporation
Upper Marlboro, Maryland

324-CD-004-001

This page intentionally left blank.

Preface

The contents of this document define the integration and test reports for the Flight Operations Segment (FOS). It addresses the FOS Release A Preliminary Dry Run Test Period held prior to formal testing, and defines the reporting format for the FOS Release A formal test phase results which will be provided in the Overall System Acceptance Test Report Document (#412/VE2). Thus, this document addresses the data item descriptions for CDRL 056 - 324/DV3.

This document is a contract deliverable with an approval code of 3. This document is delivered to NASA for information only, but is subject to approval as meeting contractual requirements.

Any questions should be addressed to:

Data Management Office
The ECS Project Office
Hughes Information Technology Corporation
1616 McCormick Dr.
Upper Marlboro, MD 20774-5372

This page intentionally left blank.

Change Information Page

List of Effective Pages	
Page Number	**Issue**
Title	Original
iii through viii	Original
1-1 through 1-2	Original
2-1 through 2-2	Original
3-1 through 3-18	Original
4-1 through 4-6	Original
AB-1 through AB-6	Original

Document History			
Document Number	**Status/Issue**	**Publication Date**	**CCR Number**
324-CD-004-001	Original	December 1996	96-1372

This page intentionally left blank.

Contents

Preface

1. Introduction

1.1 Identification 1-1

1.2 Scope 1-1

1.3 Purpose 1-1

1.4 Status and Schedule 1-2

1.5 Document Organization 1-2

2. Related Documentation

2.1 Parent Documents 2-1

2.2 Applicable Documents 2-1

2.3 Information Documents 2-1

2.3.1 Information Documents Referenced 2-1

2.3.2 Information Documents Not Referenced 2-2

3. FOS Release A Dry Run Test Results

3.1 FOS Test Program Context 3-1

3.2 FOS Testing During the Dry Run Phase 3-3

3.2.1 FOS Test Results - Pass 1 3-4

3.2.2 FOS Test Results - Pass 2 3-6

3.2.3 FOS Test Results - Pass 3 3-10

3.3 FOS Requirements Status 3-15

3.4 FOS Non-Conformance Report (NCR) Status 3-16

4. FOS Release A Formal Test Reporting

4.1 FOS Release A Formal Test Context 4-1

4.2 FOS Test Report Objectives 4-1

4.2.1 Reporting General Results 4-1

4.2.2 Reporting Individual Test Case Results 4-1

4.2.3 Requirements Summary Results 4-2

4.2.4 NCR Summary Results 4-3

4.2.5 Test Report Appendices 4-3

4.2.6 Sample Test Report - Individual Test Case 4-3

Abbreviations and Acronyms

Figures

3-1 FOS Release A Test Suite and Test Order 3-2

3-2 FOS Test Results - Pass 1 3-4

3-3 FOS Test Results - Pass 2 3-7

3-4 FOS Test Results - Pass 3 3-11

Tables

3-1 FOS Release A Test Suite 3-2

3-2 FOS Level 4 Requirements Status 3-16

3-3 FOS RBR Requirements Status 3-16

3-4 Opened NCRs by Dry Run Pass 3-17

3-5 Closed NCRs by Dry Run Pass 3-17

3-6 NCR Summary Status 3-17

1. Introduction

1.1 Identification

This document is the final version of the Flight Operations Segment (FOS) Release A Integration and Test (I&T) Reports for the ECS Project, which is item 056 on the Contract Data Requirements List (CDRL) and defined by Data Item Description (DID) 324/DV3 under contract NAS5-60000.

1.2 Scope

This document summarizes the FOS integration and test results for the Release A Dry Run period as presented at the FOS Consent to Ship Review (CSR). It also focuses on the approach that will be taken to report on test results for the formal FOS Release A test period as statused at the FOS Release Readiness Review (RRR) and reported via the FOS Overall System Acceptance Test Report Document (#412/VE2) .

In particular, the FOS System and Segment Integration and Test Reports for the ECS project details the FOS system status from a subsystem standpoint, as well as reporting on compliance with the Release A requirements as specified in the Functional and Performance Requirements Specification (#423-41-02), non mission-specific level 4 requirements as specified in the FOS Requirements Specification for the ECS Project, Volume 1 (#304-CD-001-003) and mission-specific Level 4 requirements as specified in the FOS Requirements Specification for the ECS Project, Volume 2 (#304-CD-004-003).

This document is under the FOS Configuration Control Board (CCB) and is the final release A submittal. Changes to these volumes must be approved by this CCB prior to inclusion in the document.

This document reflects the February 7, 1996 Technical Baseline maintained by the contractor configuration control board in accordance with ECS Technical Direction No. 11, dated December 6, 1994.

1.3 Purpose

This document describes the FOS Release A Dry Run status as reported at the FOS CSR and outlines the information which will be made available in CDRL item 071: the ECS Overall System Acceptance Test Report (#412/VE2) available one month following RRR. It focuses on providing test results from various perspectives: FOS system, subsystem, level 4 requirements, Requirements by Release (RBR), and Interface Requirements Document (IRD) requirements.

1.4 Status and Schedule

The submittal of DID 324/DV3 meets the milestone specified in CDRL of the National Aeronautics and Space Administration (NASA) contract NAS5-60000. This submittal was reviewed at RRR; subsequent changes to the document will be incorporated into the ECS Overall System Acceptance Test Report document (#412/VE2).

1.5 Document Organization

Section 1 provides the scope and document organization.

Section 2 provides a list of applicable documents, which were used directly or indirectly in the preparation of this document.

Section 3 defines the FOS Release A Dry Run test results. It includes a detailed description of test status for each test pass, as well as detailing the Non-Conformance Report (NCR) and requirement pass/fail status.

Section 4 identifies the content of the formal test report. It includes general information provided in the report, a definition of the test report template and a sample test report for an individual test case.

The section Abbreviations and Acronyms contains an alphabetized list of definitions for abbreviations and acronyms used in this volume.

2. Related Documentation

2.1 Parent Documents

The parent documents are the documents from which this FOS Integration and Test Reports' scope and content are derived.

304-CD-001-003	Flight Operations Segment (FOS) Requirements Specification for the ECS Project, Volume 1: General Requirements
304-CD-004-003	Flight Operations Segment (FOS) Requirements Specification for the ECS Project, Volume 2: AM-1 Mission Specific
322-CD-010-001	Flight Operations Segment (FOS) Integration and Test Procedures for the ECS Project, Release A
423-41-02	Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System

2.2 Applicable Documents

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

319-CD-001-003/ 402-CD-004-001	Flight Operations Segment (FOS) Release Plan and Development Plan for the ECS Project

2.3 Information Documents

2.3.1 Information Documents Referenced

The following documents are referenced herein and amplify or clarify the information presented in this document. These documents are not binding on the content of the FOS Integration and Test Reports for the ECS Project.

194-201-SE1-001	Systems Engineering Plan for the ECS Project
194-202-SE1-001	Standards and Procedures for the ECS Project
193-208-SE1-001	Methodology for Definition of External Interfaces for the ECS Project
308-CD-001-006	Software Development Plan for the ECS Project
194-401-VE1-002	Verification Plan for the ECS Project
194-415-VE1-002	Acceptance Testing Management Plan for the ECS Project

501-CD-001-004	Performance Assurance Implementation Plan for the ECS Project
194-502-PA1-001	Contractor's Practices and Procedures Referenced in the PAIP for the ECS Project
604-CD-001-004	Operations Concept for the ECS Project, Part 1--ECS Overview
604-CD-002-003	Operations Concept for the ECS Project, Part 2B--Release B
604-CD-003-002	Operations Concept for the ECS Project, Part 2A--Release A

2.3.2 Information Documents Not Referenced

The following documents, although not referenced herein and/or not directly applicable, do amplify or clarify the information presented in this document. These documents are not binding on the content of the FOS Integration and Test Plan for the ECS Project.

104-CD-001-004	Data Management Plan for the ECS Project
193-105-MG3-001	Data Management Procedures for the ECS Project

3. FOS Release A Dry Run Test Results

This section contains detailed results for the FOS Release A Dry-Run Period, held from October 1 to November 6, 1996 at the ECS facility at GSFC.

3.1 FOS Test Program Context

Following successful completion of the Test Readiness Review (TRR), the FOS software was installed at the EOSDIS Operations Center (EOC) facility at GSFC and made available for Dry-Run testing (results of this effort are provided in this section). The Dry-Run test period spans from TRR through CSR. Acceptance Testing (AT) spans from CSR up to RRR. FOS implemented a multiple pass philosophy during the Dry-Run testing phase. This philosophy allowed each Release A test to be executed several times thereby demonstrating repeatability of tests, and increased test and system familiarization by the Test team. At the beginning of each pass, a series of confidence tests were run to confirm previously provided functionality was not affected by the new software. In addition, the multiple test pass philosophy facilitates NCR validation and maturity of Release A in subsequent passes.

Dry-Run testing includes the execution of functional thread tests designed to verify FOS requirements and end-to-end tests designed to ensure concurrent operational functionality.

A FOS Test status criteria was assigned to each test procedure. The test status criteria is defined as follows: ***Pass*** - All functions are operable, and the success criteria defined for the test have been successfully met; ***Partial*** - Major functionality is operable and not all success criteria defined for the test have been met; ***Fail*** - Some functions are inoperable, and testing the major functions for the test have been impeded. In an effort to evaluate the L4 requirements, a pass/fail sign off status criteria was implemented. The sign off criteria for each individual requirement is one of the following; *VP = verified - pass, VPT = verified - partial, F = verified - fail, UV = unverified, VND = verified - no data*. RBR/IRD requirements are statused by a transitive process where the status of the “child” Level 4 requirements are rolled up to status the “parent” RBR/IRD requirements (“bottom-up” review).

In addition, three End-to-End tests, INT-2000, INT-2010, and INT-2020, were executed to perform additional statusing of key RBR/IRD requirements using a “top-down” view.

A set of critical tests were identified to allow for early detection of any software problems that may have an effect on multiple subsystems. The criteria for Release A Critical Tests were those tests that exercised functionality in multiple subsystems, mimicked release Plan and Build/Thread Methodology, and could not be executed concurrently with other Release A tests. All tests conducted during this period are currently defined in the FOS Release A Integration and Test Procedures document (322-CD-010-001). Results reported in this document are a direct result of test procedure conduct using the test suite as shown in Figure 3-1 and coincide with the test case list provided in Table 3-1.

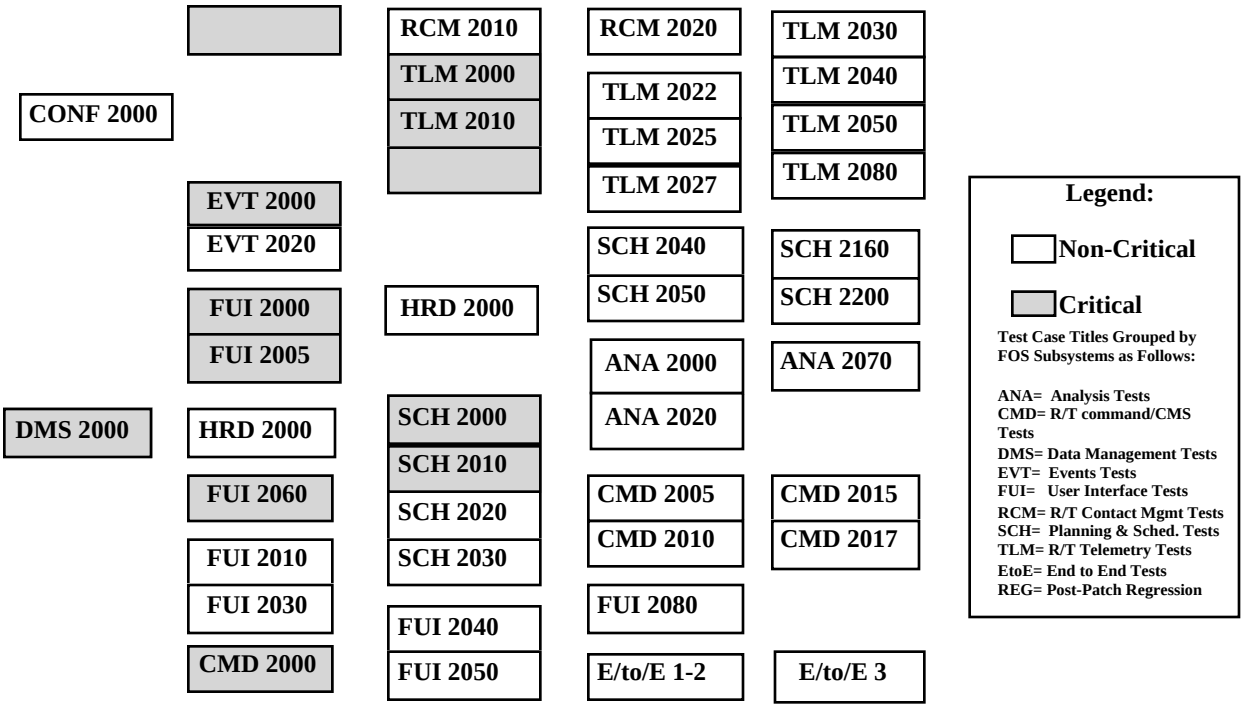

Figure 3-1. FOS Release A Test Suite and Test Order

Table 3-1. FOS Release A Test Suite

Test Title	Test Name	Associated Thread
DMS-2000	Database Ingest, Format and Validation	Database
EVT-2000	Event Message Processing	Real-time Events
EVT-2020	Event History Request	Real-time Events
FUI-2000	Control Window Manipulation	General User Interface
FUI-2005	ECL Directives	User Interface Directives
FUI-2010	PROC Builder	User Interface Directives
FUI 2030	Request Preplanned Command PROC	User Interface Directives
FUI-2040	Time Selector	User Interface Tools
FUI-2050	HELP Tool	User Interface Tools
FUI-2060	Realtime Alphanumeric Display	User Interface Tools
FUI-2080	Screen Management	User Interface Tools
SCH-2000	Activity Definer Tool	Scheduling
SCH-2010	BAP Definer Tool	Scheduling
SCH-2020	General Scheduler and Timeline	Scheduling
SCH-2030	ASTER Interface Filter	Scheduling
SCH-2040	ATC Load Generation	Scheduling

Table 3-1. FOS Release A Test Suite (cont.)

Test Title	Test Name	Associated Thread
SCH-2050	Microprocessor Loads	Scheduling
SCH-2160	Relative Time Sequence Load Generation	Scheduling
SCH-2200	Table Load Validation and Generation	Scheduling
RCM-2000	Logical String Configuration and Control	RTS/String Initialization
RCM-2010	NCC GCMR Request Processing	RTS/String Initialization
CMD-2000	Command Authorization	RT/Ground Script Commanding
CMD-2005	Ground Script Control	RT/Ground Script Commanding
CMD-2010	Manual Command Processing	RT/Ground Script Commanding
CMD-2015	Ground Script Command Processing	RT/Ground Script Commanding
CMD-2017	Ground Script Manipulation	RT/Ground Script Commanding
TLM-2000	Decommutation - Health and Safety/Standby Telemetry	RT Telemetry Monitoring
TLM-2010	Decommutation - Housekeeping Telemetry	RT Telemetry Monitoring
TLM-2020	Engineering Unit Conversion	RT Telemetry Monitoring
TLM-2022	I&Q Channel Data Receipt	RT Telemetry Monitoring
TLM-2025	Multi-byte Parameter Processing	RT Telemetry Monitoring
TLM-2027	Limits Processing	RT Telemetry Monitoring
TLM-2030	Realtime Telemetry Data Dropout	RT Telemetry Monitoring
TLM-2040	Realtime Telemetry Graph Display	RT Telemetry Monitoring
TLM-2050	Realtime Telemetry Tables	RT Telemetry Monitoring
TLM-2080	Realtime Telemetry Archive	RT Telemetry Monitoring
ANA-2000	Telemetry History Request/Dataset Generation	Telemetry History
ANA-2020	User Specified Statistics Request/Dataset Generation	Telemetry History
ANA-2070	Analysis Request Management	Telemetry History
HRD-2000	EOC Hardware	Hardware
INT-1	End-to-End Test #1	N/A
INT-2	End-to-End Test #2	N/A
INT-3	End-to-End Test #3	N/A

3.2 FOS Testing During the Dry Run Phase

The objective of the FOS Dry-Run phase was to ensure the compliance of FOS software to RBR and L4 requirements, complete test procedures, and ensure integrity of the FOS software following software patch delivery. The Dry-Run test period consisted of three passes, with each pass reflecting a software patch delivery to the EOC facility at GSFC. Each pass contributed to the maturity of the Release A software. In each case, these patches were necessary for testing to continue; more importantly, thorough regression testing was completed following each patch delivery. Regression testing, which included test “CON-2000A” and the suite of critical tests,

was performed during the re-integration and re-installation phases to ensure the integrity of the patch being delivered.

During this phase the test team was responsible for running test procedures to verify functionality (requirements) and maintaining test logs throughout the test. They documented all problems via NCRs, and completed requirement check off (i.e., pass, fail, etc.) for RBR/IRD and L4 requirements. Complete requirement check off began with Pass 3 with an emphasis on re≠ verifying all the requirements post-CSR. Throughout the entire Dry-Run phase, the test team worked closely with development, QA, System, and CM groups.

3.2.1 FOS Test Results - Pass 1

The FOS Release A Dry Runs were scheduled by concurrent critical functionality. The objective of the first pass was to establish a consistent configuration and to verify and identify critical path NCRs. Following the functional thread test schedule, only 26 out of 44 tests were performed (60%). Three tests failed, two tests completely passed, and twenty-one tests passed with minor flaws in associated functionality (see Figure 3-2). The following paragraphs describe the functionality noted during this pass.

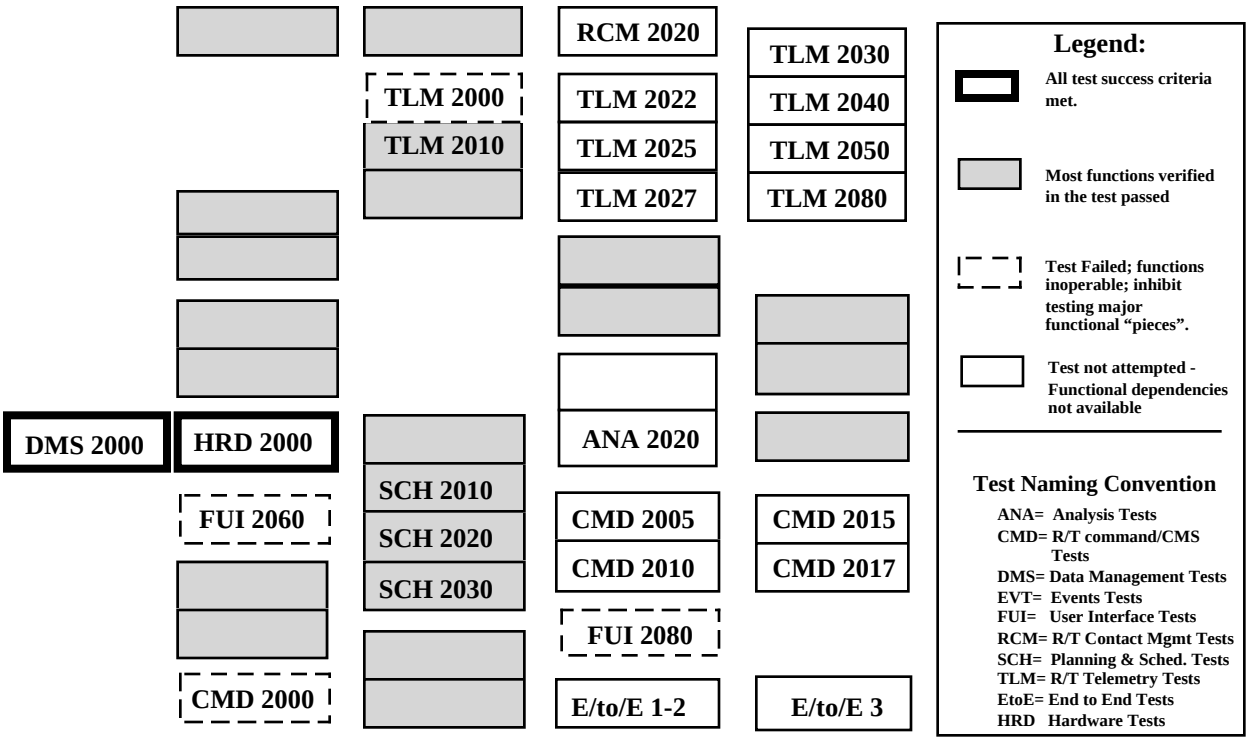

Figure 3-2. FOS Test Results - Pass 1

DMS - Able to allocate the required disk space, initialize the database and associated tables. Able to ingest the telemetry and command definition files provided by the spacecraft contractor. The definition files were moved from the /fos/am1/test/pdb/input/001 directory into the Sybase database. Able to run DMS scripts to invoke telemetry and command validation.

EVT - Initialization of real-time operational processes invoked event messages which were subsequently displayed. Events in the archive were retrieved upon event history requests via Netscape.

RCM - Initialization of real-time processes invoked the real-time server default logical string resources. The GCMR disposition and status information generated by the NCC emulator mirrored in event messages.

FUI - The control window contained access to a list of procedures and tools. A command line area allowed the user to issue directives. The 20 most recent command line inputs were available for display and editing. The three-line event area displayed the most recent three event messages only, in UTC order. Directives were syntax checked and incorrectly entered directives were not executed. The ability to open and create new PROCs through the use of the Procedure Builder and Directive Builder was available. PROCs were stored by type, spacecraft, and/or instrument. The user was able to select either an epoch time, a start/stop time/event or duration, and an interval time. Valid start/stop times/events or duration intervals were based on calendar date and time, north/south equator crossing, orbital day/orbital night, loss of signal/acquisition of signal, last N hours, and last N orbits. Interval times were based on every N orbits, passes, hours, days, weeks, and months. All valid time duration and interval times, entered by the user, were accepted by the Time Selector utility. The HELP tool was available very several windows.

TLM - The housekeeping telemetry header and data mnemonics were decommutated as specified and match data driven values. Values as seen on multiple user stations matched data driven values. Static conditions were disabled from alphanumeric telemetry displays upon active data periods. The EU values for limited real-time telemetry types matched conversions for telemetry driver applied raw data, and the EU values were displayed via telemetry display pages.

SCH - The Activity Definer Tool was used to create an activity for a given spacecraft subsystem or instrument. The activity contained an associated command sequence with relative times, command parameters, modes transitions, ECL directives and command procedures. The BAP Definer Tool was used to create, save, modify and delete a BAP for a selected spacecraft subsystem or instrument. The BAP defined an activity sequence with off-set times and associated command parameters. A BAP definition was created, the user was able to ‘Save’ the BAP, use the ‘Open’ option to recall the BAP, make modifications, rename the BAP using the ‘Save As’ option and ‘Delete’ to delete the BAP from the resource model pool. Able to initialize the PAS name server, resource model, general scheduler and timeline processes (if not already initialized).

Upon initialization of the general scheduler and timeline, the respective windows were displayed at the workstation. Able to use the general scheduler to schedule activities, commands and command procedures against the master plan of the mission timeline. Scheduling was conducted in impact and non-impact modes. The user was able to process ASTER STS and scheduling

against the master plan for SCHEDULE mode. The user was able to select a portion of the PAS timeline master plan and generate a DAS. The DAS was sent to the CMS Schedule Controller process for expansion and ATC load generation. The FOS provided the user with a capability to ingest a MP load content file into the EOC (ingest is internal during release A2). Following successful ingest the MP contents file were validated and used by CMS to generate a MP uplink load. A user was able to select a Table Template using the FUI provided, and modify the contents to create a limited sized Table load. The Table Load contents were validated against the Table buffer characteristics defined in the Project Data Base. An uplink load, image load, and a load report, load contents file, and load catalog entry associated with that table load were generated. Confirmation was given when the invalid load contents are detected during the validation process. Binary conversion of table load contents conformed to Mil STD 1750A. The user had the capability to generate RTS load contents using a CMS test driver. Upon load generation an uplink file, an image file, and a report was stored by CMS in the appropriate CMS loads and reports directories. Able to update the load catalog entry and send it to DMS.

ANA - The queue was able to hold 10 requests. Each request displayed the request name and a status. When selecting a parameter for analysis, the user was able to filter according to spacecraft IDs, subsystems, instruments, and ground systems. One or more instruments and spacecraft subsystems were selected for one spacecraft as a filter criteria.

HRD - All FOS hardware components located at the EOC met performance and standards specified by the aggregate set of hardware requirements.

Software discrepancies impeded the completion of the remaining 19 tests. These non≠ conformance issues included:

TLM - Telemetry decommutation errors were occurring.

FUI - User-defined rooms, help pages, and test tools were unavailable. Alphanumeric page displays were malfunctioning.

CMD - Connection faults with CMD and FUI (limited commanding capability) were evident. No CMD tests were performed.

One hundred and fifty-five NCRs were written and entered into DDTS by the FOS and ATO test organizations during the test effort and fifteen NCRs were verified as fixed.

3.2.2 FOS Test Results - Pass 2

During the FOS Release A Dry run Pass 2 period, 40 out of 45 tests were completed (90% - the post-patch confidence test CON-2000 was added to the FOS Release A Test suite during this pass). The objective of pass #2 was to execute the confidence test to ensure that existing functionality was not affected by the new software. All tests were to be executed again and thread testing continued starting with the critical areas (i.e., command, telemetry, alpha-numeric etc.). NCR fixes, in the new patch, were to be verified. No tests failed, twelve tests completely passed, and twenty-eight tests passed with minor flaws in associated functionality (see Figure 3-3). Testing of the SDPS interface to the EOC, telemetry tables, telemetry graphs,

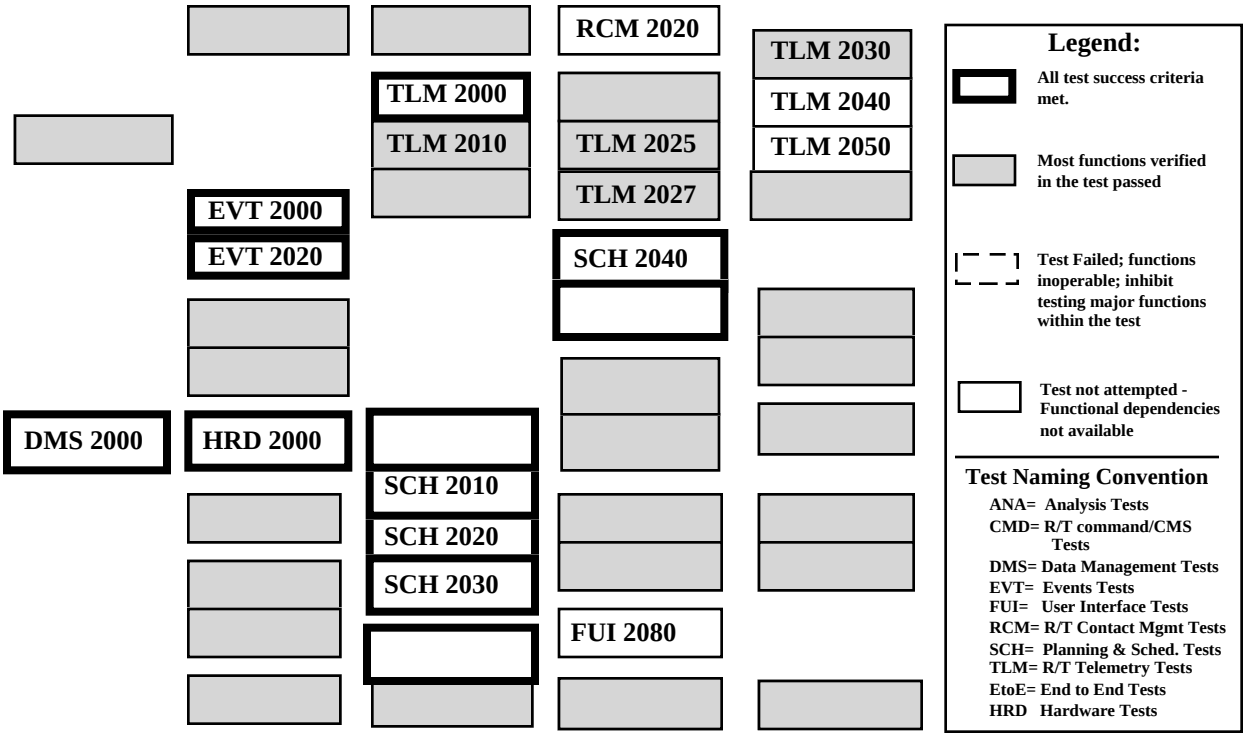

Figure 3-3. FOS Test Results - Pass 2

and user defined rooms were not attempted due to known problems in those areas. Software discrepancies noted in the real-time table, real-time graph and user-defined room areas resulted in the decision of producing an emergency patch for these areas. Thirty-nine NCRs were written and entered into DDTS by the FOS and ATO test organizations during the test effort. Seventy≠ five NCRs were verified as fixed. The following paragraphs describe the functionality noted during this pass.

DMS - Allocated the required disk space, initialized the database and associated tables. Ingested the telemetry and command definition files provided by the spacecraft contractor. The definition files were moved from the appropriate directory into the Sybase database. Were able to successfully run DMS scripts to invoke telemetry and command validation.

EVT - DMS generated events that are displayed by FUI via the Event Display Window; events generated and displayed are representative of the FOS subsystems; the user was able to filter events displayed at the event graphical timeline window based on user selected filter criteria; the graphical timeline updated according to event messages being displayed; when a period in the timeline was selected, the event display scrolled to the event that corresponded to that period in time.

RCM - Initialization of real-time processes invoked the real-time server default logical string resources; logical string configuration activity invoked via STRING ECL directives are accurately portrayed by configuration status displays; Any existing logical string may be

connected via STRING ECL directive entry by one or more users; all attempts to connect to non≠existing strings were denied. All incorrectly specified ECL STRING directives were disallowed.

GCMR disposition and status information generated by the NCC emulator is mirrored in event messages; values for incoming status/disposition messages match the number received by the FOS; event messages describing accept/reject information in the GCM status message mirror the accept/reject information received by the NCC emulator.

FUI - User had access, through the control window, to a list of available rooms, windows, procedures, and tools; The Control window contains a command line area that allows the user to issue directives; The 20 most recent command line inputs are available for display and editing; Windows in the room may be modified by use of the mouse; The three-line event area displays the most recent three event messages only, in UTC order; Three-line event filtering matches the filter options selected by the user; Three line event area selections affect only the user station where the filtering is performed. All three line event area filtering affects the three-line event area only. All ECL directives entered are verified for syntax and that a syntax error text box was displayed for all ECL directives that are entered incorrectly; incorrectly entered directives were not executed; all ECL directives entered were verified for the appropriate user privileges prior to execution; ECL directives that are entered without the appropriate user privileges were not executed and result in an error message being displayed at the user workstation; all ECL directive entries, regardless of syntax or privileges are displayed in the event history window with the appropriate time tag, event type, event ID, and event message. User had the ability to open and create new PROCs through the use of the Procedure Builder and Directive Builder; to insert directives, conditional constructs and operator functions into a procedure; to store PROCs by type, spacecraft, and/or instrument; to execute syntax checking; to verify the validate display; and to print procedures. The user was able to select either an epoch time, a start/stop time/event or duration, and an interval time. Valid start/stop times/events or duration could be based on calendar date and time, north/south equator crossing, orbital day/orbital night, loss of signal/acquisition of signal, last N hours, and last N orbits. Interval times could be based on every N orbits, passes, hours, days, weeks, and months. All valid time duration and interval times, entered by the user, were accepted by the Time Selector utility and all incorrectly specified duration or time intervals resulted in error messages. The HELP utility was accessible from any user station window. HELP data retrieval could be canceled. All HELP navigational schemes were available (i.e., hypertext forward, hypertext trace back, page forward, page backward, jump to home page, and search/find keyword).

TLM - All health and safety, housekeeping, and standby telemetry header and data mnemonics were decommutated as specified and match data driven values. Values as seen on multiple user stations matched data driven values. Static flags were disabled from alphanumeric telemetry displays upon active data periods. Telemetry decommutation and EU converted values as displayed on alphanumeric display pages matched scripted values as output on the I channel. Telemetry processing on I channel was not degraded as a result of simultaneous telemetry processing. Limit conditions were displayed on all alpha-numeric pages. All parameters were marked as static upon data dropout time-out period (i.e., 5 seconds). Any mnemonic not being supplied with data values for any time period greater than one master cycle was marked as STATIC. All real-time telemetry archive files were generated during archive-enabled periods

except for standby Q channel. Each archive file name was appended with the UTC time of the first generated packet. Packets were archived in chronological order. Data integrity was not degraded during the archive process. No data was archived during archive-disabled periods.

SCH - Through the use of the Activity Definer Tool, a user was able to create an activity for a given spacecraft subsystem or instrument. The user was able to include in the activity, an associated command sequence with relative times, command parameters, mode transitions, ECL directives and command procedures. Once the activity was defined, the user was able to 'Save' the activity, use the 'Open' option to recall it, make modifications, rename it using the 'Save As' option and then delete the activity from the pool of available activities. Through the use of the BAP Definer Tool, an authorized user was able to create, save, modify and delete a BAP for a selected spacecraft subsystem or instrument. The user was able to include in the BAP a defined activity sequence with off-set times and associated command parameters. Once the BAP definition was created, the user was able to 'Save' the BAP, use the 'Open' option to recall the BAP, make modifications, rename the BAP using the 'Save As' option and then use the 'Delete' option to delete the BAP from the resource model pool. The test conductor was able to initialize the PAS name server, resource model, general scheduler and timeline processes (if not already initialized).

Upon initialization of the general scheduler and timeline, the respective windows were displayed at the workstation. Once the general scheduler and timeline windows were displayed, the test conductor was able to use the general scheduler to schedule activities, BAPs, commands and command procedures against the master plan of the mission timeline. Scheduling was conducted in impact, non-impact and oversubscribe modes. The test conductor was able to manipulate the timeline in terms of time and resources being displayed. At the conclusion of the test, the test conductor was able to access the DMS provided browser tool and verify that PAS events were generated throughout the test and sent to DMS for history logging purposes. The test conductor was able to demonstrate the ASTER STS and ASTER ODS processing and scheduling against the master plan for SCHEDULE mode and against the "what-if" plan for ANALYSIS mode. The user was able to select a portion of the PAS timeline master plan and generate a DAS. The DAS was sent to the CMS Schedule Controller process for expansion and ATC load generation. ATC load generation consisted of the generation of the binary load, load report, integrated report and an update to the load catalog. Step 10 of the test procedure was used during post-test analysis to determine the success of the ATC load generation process. Upon completion of the ATC load generation, CMS returned a generation complete status to the PAS load generator process. The user was able to invoke a FUI request for CMS to generate a ground schedule that corresponded to the start and stop time of the DAS used for ATC load generation. The CMS process recognized an erroneous DAS and return an error message to the user as opposed to processing the DAS.

The test conductor demonstrated that the FOS provides the user with a capability to ingest a MP load content file into the EOC (ingest is internal during release A2). Following successful ingest, the user demonstrated that the MP contents file was valid and used by CMS to generate a MP uplink load. CMS generation of the uplink load was invoked by a successful request from FUI Load Manager. The user demonstrated that CMS is capable of generating the load report and load image files, updating the load catalog with an entry for the uplink load, and storing the

uplink load, load report, load image and load contents file in the DMS database. The user also demonstrated that CMS and FUI were logging events to DMS during the execution of this test. A user was able to select a Table Template using the FUI provided, and modify the contents to create a Table load. Once the Table Load contents were validated against the Table buffer characteristics defined in the Project Data Base an uplink load, image load, and a load report, load contents file, and load catalog entry associated with that table load were generated. The user was notified when the invalid load contents was detected during the validation process. Binary conversion of table load contents must conformed to Mil STD 1750A.

ANA - The analysis request queue was able to hold 10 requests. Each request displayed the request name and status. When selecting a parameter for analysis, the user was able to filter according to spacecraft IDs, subsystems, instruments, and ground systems.

HRD - All FOS hardware components located at the EOC met performance and standards specified by the aggregate set of hardware requirements.

CMD - Verified that all unauthorized requests for command authorization are rejected and authorized requests are granted. The user was limited to the number of CAC requests. Reviewed event history to confirm all reassignments of CAC privileges. Verified there is a single point of command throughout the duration of the test. Verified the FUI subsystem recognizes command directives entered by a user with CAC privilege. Successfully demonstrated the CAC capabilities to select a valid ground script, initiate execution of the ground script, manipulate ground script by suspending, resuming and terminating the ground script via user directives. The ground script processed command directives for the spacecraft. The FOS software validated all command mnemonic according to the PDB definitions. The authorized user was able to send real-time commands manually via the Command Control Window (CCW). Verified the transfer frame header coincided with the information provided in the CCSDS document. The authorized user was able to send real-time commands via ground script (that was generated from a Detailed Activity Schedule (DAS)) using the CCW.

Software discrepancies impeded the completion of the remaining 4 tests. These non-conformance issues include:

Testing of the SDPS interface to the EOC.

TLM - Telemetry tables and graphs were malfunctioning.

FUI - User-defined rooms had development and configuration problems.

CMD - User was unable to send sub-mnemonic or critical commands

An emergency patch for these areas resulted. Thirty-nine NCRs were written and entered into DDTS by the FOS and ATO test organizations during the test effort and 106 NCRs were closed.

3.2.3 FOS Test Results - Pass 3

During the FOS Release A Dry Run Pass 3 period, 44 out of 45 tests were completed (98% - the post-patch confidence test CON-2000 was re-run during this pass). The objective of pass #3 was to continue execution of the confidence test to ensure that existing functionality was not affected

by the new software. All tests, affected by the new software, were to be executed again and thread testing continued. In addition, the requirements traceability document was to be completed for each test executed and NCR fixes verified. Four tests failed, thirty tests completely passed, and eleven tests passed with minor flaws in associated functionality (see Figure 3-4) Testing of the SDPS interface to the EOC was not attempted due to known problems in that area. Software discrepancies introduced as part of the previous patch were noted in the following areas: command procedures, multi-byte parameter decommutation, telemetry graphs, and analysis statistics reports. This information was reported at the FOS CSR, where it was agreed to provide an emergency patch during the FOS Acceptance Test Phase. One-hundred and twelve NCRs were written by the FOS and ATO test organizations during the test effort. The following paragraphs describe the functionality noted during this pass.

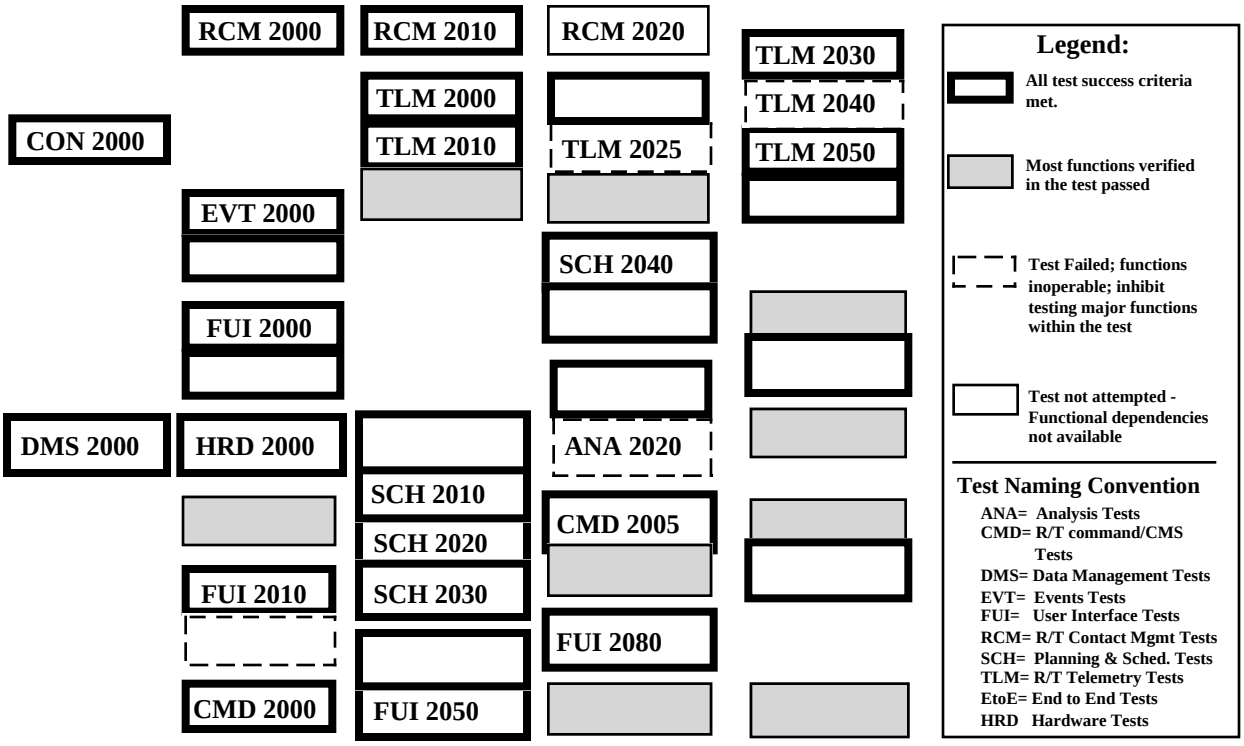

Figure 3-4. FOS Test Results - Pass 3

DMS - Allocated the required disk space, initialized the database and associated tables. Ingested the telemetry and command definition files provided by the spacecraft contractor. The definition files were moved from the appropriate directory into the Sybase database. The user was able to run DMS scripts to invoke telemetry and command validation.

EVT - DMS generated events that are displayed by FUI via the Event Display Window; events generated and displayed are representative of the FOS subsystems; the user was able to filter events displayed at the event graphical timeline window based on user selected filter criteria; the

graphical timeline updates according to event messages being displayed; when a period in the timeline is selected, the event display scrolls to the event that corresponds to that period in time.

RCM - Initialization of real-time processes invoked the real-time server default logical string resources; logical string configuration activity invoked via STRING ECL directives are accurately portrayed by configuration status displays; Any existing logical string may be connected via STRING ECL directive entry by one or more users; all attempts to connect to non≠ existing strings were denied. All incorrectly specified ECL STRING directives are disallowed. GCMR disposition and status information generated by the NCC emulator is mirrored in event messages; values for incoming status/disposition messages match the number received by the FOS; event messages describing accept/reject information in the GCM status message mirror the accept/reject information received by the NCC emulator.

FUI - User had access, through the control window, to a list of available rooms, windows, procedures, and tools; The Control window contains a command line area that allows the user to issue directives; The 20 most recent command line inputs are available for display and editing; Windows in the room may be modified by use of the mouse; The three-line event area displays the most recent three event messages only, in UTC order; Three-line event filtering matches the filter options selected by the user; Three line event area selections affect only the user station where the filtering is performed. All three line event area filtering affects the three-line event area only. All ECL directives entered are verified for syntax and that a syntax error text box was displayed for all ECL directives that are entered incorrectly; incorrectly entered directives were not executed; all ECL directives entered were verified for the appropriate user privileges prior to execution; ECL directives that are entered without the appropriate user privileges were not executed and result in an error message being displayed at the user workstation; all ECL directive entries, regardless of syntax or privileges are displayed in the event history window with the appropriate time tag, event type, event ID, and event message. User had the ability to open and create new PROCs through the use of the Procedure Builder and Directive Builder; to insert directives, conditional constructs and operator functions into a procedure; to store PROCs by type, spacecraft, and/or instrument; to execute syntax checking; to verify the validate display; and to print procedures. The user was able to select either an epoch time, a start/stop time/event or duration, and an interval time. Valid start/stop times/events or duration could be based on calendar date and time, north/south equator crossing, orbital day/orbital night, loss of signal/acquisition of signal, last N hours, and last N orbits. Interval times could be based on every N orbits, passes, hours, days, weeks, and months. All valid time duration and interval times, entered by the user, were accepted by the Time Selector utility and all incorrectly specified duration or time intervals resulted in error messages. The HELP utility was accessible from any user station window. HELP data retrieval could be canceled. All HELP navigational schemes were available (i.e., hypertext forward, hypertext trace back, page forward, page backward, jump to home page, and search/find keyword). All default room displays matched the individual user's default room assignments. Window selection, size, and position were dynamically switched via keyboard/mouse selection. Upon user station re-initialization, the displayed room had the same appearance as it did when it was left.

TLM - All health and safety, housekeeping, and standby telemetry header and data mnemonics were decommutated as specified and match data driven values. Values as seen on multiple user

stations matched data driven values. Static flags were disabled from alphanumeric telemetry displays upon active data periods. Telemetry decommutation and EU converted values as displayed on alphanumeric display pages matched scripted values as output on the I channel. Telemetry processing on I channel was not degraded as a result of simultaneous telemetry processing. Limit conditions were displayed on all alpha-numeric pages. All parameters were marked as static upon data dropout time-out period (i.e., 5 seconds). Any mnemonic not being supplied with data values for any time period greater than one master cycle was marked as STATIC. All real-time telemetry archive files were generated during archive-enabled periods except for standby Q channel. Each archive file name was appended with the UTC time of the first generated packet. Packets were archived in chronological order. Data integrity was not degraded during the archive process. No data was archived during archive-disabled periods.

SCH - Through the use of the Activity Definer Tool, a user was able to create an activity for a given spacecraft subsystem or instrument. The user was able to include in the activity, an associated command sequence with relative times, command parameters, modes transitions, ECL directives and command procedures. Once the activity was defined, the user was able to ‘Save’ the activity, use the ‘Open’ option to recall it, make modifications, rename it using the ‘Save As’ option and then delete the activity from the pool of available activities. Through the use of the BAP Definer Tool, an authorized user was able to create, save, modify and delete a BAP for a selected spacecraft subsystem or instrument. The user was able to include in the BAP a defined activity sequence with off-set times and associated command parameters. Once the BAP definition was created, the user was able to ‘Save’ the BAP, use the ‘Open’ option to recall the BAP, make modifications, rename the BAP using the ‘Save As’ option and then use the ‘Delete’ option to delete the BAP from the resource model pool. The test conductor was able to initialize the PAS name server, resource model, general scheduler and timeline processes (if not already initialized).

Upon initialization of the general scheduler and timeline, the respective windows were displayed at the workstation. Once the general scheduler and timeline windows were displayed, the test conductor was able to use the general scheduler to schedule activities, BAPs, commands and command procedures against the master plan of the mission timeline. Scheduling was conducted in impact, non-impact and oversubscribe modes. The test conductor was able to manipulate the timeline in terms of time and resources being displayed. At the conclusion of the test, the test conductor was able to access the DMS provided browser tool and verify that PAS events were generated throughout the test and sent to DMS for history logging purposes. The test conductor was able to demonstrate the ASTER STS and ASTER ODS processing and scheduling against the master plan for SCHEDULE mode and against the “what-if” plan for ANALYSIS mode. The user was able to select a portion of the PAS timeline master plan and generate a DAS. The DAS was sent to the CMS Schedule Controller process for expansion and ATC load generation. ATC load generation consisted of the generation of the binary load, load report, integrated report and an update to the load catalog. Step 10 of the test procedure was used during post-test analysis to determine the success of the ATC load generation process. Upon completion of the ATC load generation, CMS returned a generation complete status to the PAS load generator process. The user was able to invoke a FUI request for CMS to generate a ground schedule that corresponded to the start and stop time of the DAS used for ATC load generation. The CMS process

recognized an erroneous DAS and return an error message to the user as opposed to processing the DAS.

The test conductor demonstrated that the FOS provides the user with a capability to ingest a MP load content file into the EOC (ingest is internal during release A2). Following successful ingest, the user demonstrated that the MP contents file was valid and used by CMS to generate a MP uplink load. CMS generation of the uplink load was invoked by a successful request from FUI Load Manager. The user demonstrated that CMS is capable of generating the load report and load image files, updating the load catalog with an entry for the uplink load, and storing the uplink load, load report, load image and load contents file in the DMS database. The user also demonstrated that CMS and FUI were logging events to DMS during the execution of this test. A user was able to select a Table Template using the FUI provided, and modify the contents to create a Table load. Once the Table Load contents were validated against the Table buffer characteristics defined in the Project Data Base an uplink load, image load, and a load report, load contents file, and load catalog entry associated with that table load were generated. The user was notified when the invalid load contents was detected during the validation process. Binary conversion of table load contents must conformed to Mil STD 1750A. The user had the capability to generate RTS load contents using a CMS test driver. Upon load generation the Meta Data server placed an uplink file, an image file, and a report that was stored by CMS in the appropriate CMS loads and reports directories. Able to update the load catalog entry and send it to DMS.

ANA - All of the user interface menus supporting telemetry history requests included the proper fields (parameter name, data type, start/stop time intervals, and data quality information). All illegal entries, with the exception of mnemonics, resulted in an error message and disallow dataset generation. Illegal mnemonics were left out of the dataset generation. The analysis request queue was able to hold 10 requests. Each request displayed the request name and status. When selecting a parameter for analysis, the user was able to filter according to spacecraft IDs, subsystems, instruments, and ground systems.

HRD - All FOS hardware components located at the EOC met performance and standards specified by the aggregate set of hardware requirements.

CMD - Verified that all unauthorized requests for command authorization are rejected and authorized requests are granted. Reviewed event history to confirm all reassignments of CAC privileges. Verified that there is a single point of command throughout the duration of the test. Verified that the FUI subsystem recognizes command directives entered by a user with CAC privilege. Successfully demonstrated the CAC capabilities to select a valid ground script, initiate execution of the ground script, manipulate ground script control and terminate the ground script via user directives. The ground script should process command directives for the spacecraft. The FOS software validated all command mnemonic entered via CCW according to the PDB definitions. The authorized user was able to send real-time commands manually via the Command Control Window (CCW). The authorized user should be to override the command directive when prerequisite state check fails or cancel the command directive. Any manually entered sub-mnemonic command definitions that are invalid were rejected, based on the definition in the command PDB. The user should was able to allow or cancel critical commands.

Verified the transfer frame header coincided with the information provided in the CCSDS document. The authorized user was able to send real-time commands via ground script (that was generated from a Detailed Activity Schedule (DAS)) using the CCW. The authorized user should be to override the command directive when prerequisite state check fails or cancel the command directive using the FUI interface options provided by the Command Control window. Any manually entered sub-mnemonic command definitions that are invalid should be rejected, based on the definition in the command PDB. The CAC user was able to select a valid ground script, initiate execution of the ground script, merge procedures, suspend, resume the ground script control and terminate the ground script via user directives.

Software discrepancies impeded the completion of the one remaining test. The non-conformance issues for this pass include:

Testing of the SDPS interface to the EOC was not attempted due to known problems in that area.

FUI - Command procedures syntax checking was not fully debugged.

TLM - Multi-byte parameter decommutation and graphs were under investigation.

ANA - Analysis statistics reports were being worked out.

This information was reported at the FOS CSR, where it was agreed to provide an emergency patch during the FOS Acceptance Test Phase. One-hundred and twelve NCRs were written by the FOS and ATO test organizations during the Pass 3 test effort; 91 NCRs were closed.

3.3 FOS Requirements Status

The FOS Test Program focuses on the verification of FOS RBR requirements as specified in the Functional and Performance Requirements Specification (#423-41-02), non mission-specific level 4 requirements as specified in the FOS Requirements Specification for the ECS Project, Volume 1 (#304-CD-001-003) and mission-specific Level 4 requirements as specified in the FOS Requirements Specification for the ECS Project, Volume 2 (#304-CD-004-003). Tables 3-2 and 3-3 represent the verification status of these requirements resulting from the execution of test procedures during the Pass 3 timeframe. The rules for statusing individual RBR/IRD requirements follow.

If all “child” FOS Level 4 requirements are “verified passed” or “verified no data” and the applicable RBR/IRD End-to-End Integration test status is “verified passed” or “verified no data”, then the RBR/IRD requirement is statused as “verified passed”.

If all “child” FOS Level 4 requirements are “failed” and the applicable RBR/IRD End-to-End Integration test status is “failed”, then the RBR/IRD requirement is statused as “failed”.

If all “child” FOS Level 4 requirements are “un-verified” and the applicable RBR/IRD End-to-End Integration test status is “un-verified”, then the RBR/IRD requirement is statused as “un≠ verified”.

Otherwise, the RBR/IRD requirement is statused as “partially verified”.

Table 3-2. FOS Level 4 Requirements Status

Subsystem	Pass	Partial	Fail	Unverified	Totals
ANA	17	5	8	1	31
CMD	18	6	7	6	37
CMS	28	2	10	0	40
DMS	20	5	3	2	30
FOS	7	0	0	2	9
FUI	124	16	13	6	159
HRD	53	5	3	2	63
PAS	9	14	0	1	24
RMS	13	1	0	0	14
TLM	33	3	12	5	53
Totals	322	57	56	25	460
	70%	12%	12%	6%	

Table 3-3. FOS RBR Requirements Status

Req't Type	Pass	Partial	Fail	Unverified	Totals
AM1	2	2	0	4	8
ASTER	0	2	0	1	3
EOC	22	60	0	4	86
EOSD	18	4	0	11	33
FOS	3	1	0	0	4
ICC	27	45	1	1	74
NI	4	1	0	3	8
Totals	76	115	1	24	216
	35%	53%	1%	11%	

3.4 FOS Non-Conformance Report (NCR) Status

NCRs are generated during the dry-run and formal test period by cognizant test engineers, Quality Assurance, NASA witnesses and programmers during the dry-run and formal test periods. In general terms, NCRs are generated for any of the following general circumstances: 1) Any requirement which is not provided by the FOS software as a whole or only partially provided; 2) Any provided functional software/hardware "piece" where that "piece" is not fully functional 3) useability of the tested function does not meet operational standards.

NCRs are broken down into 3 priority categories. Level 1, 2 and 3. Level 1 NCRs are those which inhibit operational functionality, thus rendering any further testing as futile (i.e., showstoppers). Level 2 NCRs are those which inhibit a specific function from working nominally, but a workaround is available. Level 3 NCRs are those which affect "look and feel" of specific functions but do not hamper associated functionality.

Tables 3-4 through 3-6 represent the FOS NCR status resulting from the execution of test procedures during the Pass 3 timeframe.

Table 3-4. Opened NCRs by Dry Run Pass

Severity	At TRR	Pass 1	Pass 2	Pass 3	Totals
Level 1	20	28	7	3	58
Level 2	69	51	18	71	209
Level 3	107	76	14	38	235
Totals	196	155	39	112	502

Table 3-5. Closed NCRs by Dry Run Pass

Severity	Pass 1	Pass 2	Pass 3	Totals
Level 1	12	24	17	53
Level 2	12	38	45	95
Level 3	20	44	29	93
Totals	44	106	91	241

Table 3-6. NCR Summary Status

Severity	Reported	Closed	Open
Level 1	58	54	4
Level 2	209	95	114
Level 3	235	92	143
Totals	502	241	261

Note:∞Level 1 NCRs Open:

ECSed03872: Command ODF hex to decimal conversion not being done properly

ECSed03987: Submnemonics not converting ASCII to binary

ECSed03580: No SDPS connectivity

ECSed04434: Could not generate a status request; data file comes back empty.

This page intentionally left blank.

4. FOS Release A Formal Test Reporting

This section contains the format for reporting on test status of the FOS Release A Formal Test period. Included is the template for reporting formal test status which coincides with requested test reporting information as stated in CCR 96-1196, "Revise ECS I&T CDRL Delivery Schedule and DID Descriptions", dated October 22, 1996.

4.1 FOS Release A Formal Test Context

The formal test period begins following the successful completion of dry-run testing at the EOC. During this time, the FOS Release A Test Suite as defined in DID 322-CD-001-003 (FOS Integration and Test Procedures for the ECS Project) is conducted by the joint efforts of the FOS Test and Acceptance Test Organizations. The execution of the FOS Release A test suite is witnessed by cognizant NASA and Quality Assurance representatives. Results of the formal test period shall be supplied in the FOS Overall System Acceptance Test Report Document (#412/VE2); the template for providing this information is detailed in this section.

4.2 FOS Test Report Objectives

The information provided in the final revision to this document shall include an overall test status for each of the FOS subsystems, including NCR summary and requirements status. The report shall also provide a detailed description of each test, including test objectives, requirements and NCR status. Additionally, requirements matrices (i.e., RBR to L4, L4 to RBR, test case to L4, and test case to L3) will be provided as appendices.

4.2.1 Reporting General Results

This section shall provide a general description of the FOS test results. It shall contain an overall analysis of the functional capabilities provided by the FOS, including a general description of the test results for each of the FOS subsystems. This section shall also include overall requirement status for Level 4 and RBR requirements, and overall NCR status as reported at the end of the formal FOS Test period.

4.2.2 Reporting Individual Test Case Results

The FOS Test Program for Release A consists of forty-five total tests in its test suite; forty-one thread tests, three end-to-end tests and one post-patch confidence test. The results of each test shall be provided on an individual basis, with the following information provided for each test case:

Test Case Number and Title: Includes unique test identifier and test case title as it appears in the FOS Release A in DID 322-CD-001-003 (FOS Integration and Test Procedures for the ECS

Project); refer to Table 3-1 for the complete list of test case titles.

Reference to Test Documentation: Includes Document title and DID number for the applicable test procedure referenced by the test case (i.e., 322-CD-001-003 FOS Release A Integration and Test Procedures)

Test Summary: Includes a general description of overall test objectives, as described in DID 322-CD-001-003 FOS Integration and Test Procedures for the ECS Project.

Pass/Fail Assessment: Includes the assessment of individual test status; Options are 1) PASS 2) PARTIAL PASS 3) FAIL. The option specified reflects the consensus of the test team, QA and NASA representatives following the completion of the test as specified in the individual test case log. If more than one test pass is attempted, the assessment for each pass is listed.

Date of Test: Includes date, time and location of formal test conduct. If more than one test pass has occurred, date and time span of test conduct for each pass are listed.

Test Conduct Summary Includes a general description of test results including descriptions of satisfied, unsatisfied, or partially satisfied objectives. This information is repeated for tests which required multiple test passes. Also included in this section is the identification of NCRs written during the test.

Requirement Verification Status: Includes a list of the Level 4 requirements pertaining to the test case, including requirement text and pass/fail sign-off status. Sign-off keys for individual requirements are one of the following*: VP = verified - pass, VPT = verified - partial, F = verified - fail, UV = unverified, VND = verified - no data.*

Test Procedure Deviations: Includes a description of deviations or workarounds made from the test procedure during test case conduct and test steps affected by the identified deviation/workaround.

4.2.3 Requirements Summary Results

This section shall include a table identifying the total number of Level 4 requirements passed, partially passed, failed, and unverified. NCR statistics related to each FOS subsystem will be provided. The same tables described above shall be provided for RBR requirements.

4.2.4 NCR Summary Results

This section shall include tables summarizing the number of level 1, 2, and 3 NCRs written and submitted into the Distributed Defect Tracking System (DDTS) during the dry-run and formal test phases. It shall include statistics for open and closed NCRs, as well as NCR statistics relating to test phase (i.e., Pass 1, Pass 2, Pass 3, formal test).

4.2.5 Test Report Appendices

The following appendices will be provided in this section:

Appendix A: Test Case to Level 4 Requirements Status

This matrix provide the sign-off status (pass, partial pass, pass-no data, unverified, failed) for all level 4 requirements from a test case perspective.

Appendix B: Test Case to RBR Requirements Status

This matrix provides the status (pass, partial pass, pass-no data, unverified, failed) for all RBR requirements from a test case perspective.

Appendix C: Level 4 to RBR Test Case Matrix

This matrix shall provide the mapping of Level 4 requirements to associated RBR requirements; this matrix is used in determining RBR status (pass, partial pass, pass≠ no data, unverified, failed).

4.2.6 Sample Test Report - Individual Test Case

The following represents a sample test case report which follows the test report template guidelines defined above:

Test Case #/Title:≠	CMD-2000A Command Authorization
Reference to Test Documentation:≠	FOS Release A Integration and Test Procedures (322-CD-001-003)
Test Summary:≠	This test is designed to verify the FOS capability to support a user request for command authorization. This test demonstrates that a user is able to input the necessary ECL directives to request Command Activity Controller (CAC) privileges at the user's workstation, and that the FOS rejects any request for command authority made by a user that does not have appropriate privileges. The secondary objective of this test is to verify the FOS capability to support FUI processing of command directives that are entered manually in real time at the CAC user workstation and performs a syntax check.
Pass/Fail Assessment:≠	PASS

Date of Test:≠	12 November 1996; EOC - GSFC Building 32
Test Conduct Summary:≠	This test successfully verified the FOS capability to support a user request for command authorization. We were able to input the necessary ECL directives to request Command Activity Controller (CAC) privileges at the user's workstation. FOS rejected all requests for command authority made by a user that did not have appropriate privileges. Also verified that FOS supports FUI processing of command directives that are entered manually in real time at the CAC user workstation and performs a syntax check.
Test Procedure Deviations:≠	Steps 8a and b were redlined to reflect the corrected command format. Step 9 was updated to reflect clicking the “RESUME” button.

Requirement Verification Status (Sample)

Test Case	L4	Text	Clarification (not RTM data)	Pass /Fail	Comments
CMD-2000A	F-CMD-01310	The EOC shall permit an authorized EOC operator to issue individual commands, in real time.		VND	Since authorization is not fully functional for Release A in the truest sense of the word, this requirement could not be fully demonstrated. There is a lien against this functionality (see Lien FOS-A-007).
	F-CMD-02245	The EOC shall accept command submnemonic values specified as states.		VP	
	F-CMD-02250	The EOC shall accommodate up to eight (8) states per command.		VP	
	F-CMD-02255	The EOC shall allow for a third order polynomial conversion of submnemonic values.		VPT	Third order polynomial conversion of submnemonic values did not work. Second order polynomial conversion were successful (see NCR ECSed05031).
	F-CMD-02260	The EOC shall be capable of range checking submnemonic values entered by the user.		VP	
	F-CMD-03410	The EOC shall verify prior to acceptance of a command that the command was issued from the user currently having the command authority.		VP	
	F-RMS-01010	The EOC shall provide the capability to authorize an EOC operator to command an EOC spacecraft.		VP	
	F-RMS-01020	The EOC shall ensure a single point of command for a given spacecraft.		VP	
	F-RMS-01030	The EOC shall accept, validate, and process EOC operator requests to acquire the spacecraft command privilege.		VP	

Test Case to RBR for Reference only; for detail see Appendix B (Sample)

Test Case	RBR	Text	Interpretation	Clarification
CMD-2000A	EOC-4015#A	The EOC shall provide the capability to build real-time commands based on operator input and validate the generated commands.	A: Basic functionality provided	
	EOC-4020#A	The EOC shall merge the real-time commands supplied by the spacecraft operator, command groups, and the spacecraft and instrument memory loads into one uplink stream.	A: Basic functionality provided. Real time commands only.	
	EOC-9010#A	The EOC shall provide the capability for the operator to control the EOC functions and components, utilizing a combination of input devices.		
	ICC-6510#A	The ICC shall provide the capability for the operator to control the ICC functions and components, utilizing a combination of input devices.		

Abbreviations and Acronyms

AGS	Aster Ground System
AM	Morning (ante meridiem) --see EOS AM
ANA	Analysis
AOS	Acquisition of Signal
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer (formerly ITIR)
ATC	Absolute Time Command≠
ATO	Acceptance Test Organization≠
BAP	Baseline Activity Profile≠
CAC	Command Activity Controller≠
CCB	Configuration Control Board≠
CCSDS	Consultative Committee for Space Data Systems≠
CDRL	Contract Data Requirements List≠
CERES	Clouds and Earth's Radiant Energy System≠
CI	Configuration item
CLCW	Command Link Control Words
CM	Configuration Management
CMD	Command≠
CMS	Command Management System≠
COTS	Commercial Off-The-Shelf≠
CSCI	Computer software configuration item≠
CSMS	Communications and System Management Segment≠
CSR	Consent to Ship Review≠
CSS	Communications Subsystem (CSMS)≠
CTIU	Command and Telemetry Interface Unit≠
DAR	Data Acquisition Request≠

DAS	Detailed Activity Schedule≠
DB	Database≠
DBA	Database Administrator≠
DBMS	Database Management System≠
DDTS	Distributed Defect Tracking System≠
DFCD	Data Format Control Document≠
DID	Data item description; data ingest/distribution≠
DMS	Data Management Subsystem≠
DSN	Deep Space Network≠
DSS	Decision Support System≠
EASE	Expert Advisor State Equation≠
ECL	ECS Command Language≠
ECOM	EOS Communications≠
ECS	EOSDIS Core System≠
EDF	ECS Development Facility≠
EDOS	EOS Data and Operations System≠
EDU	EDOS Data Unit≠
EOC	EOS Operations Center≠
EOS	Earth Observing System≠
EOSDIS	EOS Data and Information System≠
ETS	EOSDIS Test System≠
EU	Engineering Unit≠
EVT	Event≠
FDF	Flight Dynamics Facility≠
FIFO	First In - First Out≠
FMG	File Management≠
FOS	Flight Operations Segment (ECS)≠
FOT	Flight Operations Team≠
FUI	FOS User Interface≠

GCMR	Ground Configuration Message Request≠
HGA	High Gain Antenna≠
HRD	Hardware≠
I&T	Integration and Test≠
ICC	Instrument Control Center≠
IP	International Partners≠
IRD	Interface requirements document≠
IST	Instrument Support Toolkit≠
JPL	Jet Propulsion Laboratory≠
LAN	Local Area Network≠
LaRC	Langley Research Center≠
LMC	Lockheed Martin Corporation≠
LOS	Loss of Signal≠
LSM	Local System Manager≠
LTIP	Long Term Instrument Plan≠
LTSP	Long Term Science Plan≠
M&O	Maintenance and Operations≠
MISR	Multi-Angle Imaging SpectroRadiometer≠
MO&DSD	Mission Operations and Data System Directorate (GSFC Code 500)≠
MODIS	Moderate Resolution Imaging Spectrometer≠
MOPITT	Measurements of Pollution in the Troposphere≠
MSS	Management and Subsystem (part of CSMS)≠
MTPE	Mission to Planet Earth≠
Nascom	NASA Communications Network≠
NASDA	National Space Development Agency (Japan)≠
NCC	Network Control Center≠
NCR	Non-Conformance Report≠
NOAA	National Oceanic and Atmospheric Administration≠
OASIS	Operations and Science Instrument Support≠

ODB	Operational Database≠
ODM	Operational Data Message≠
PAS	Planning and Scheduling≠
PDB	Project Data Base≠
PI	Principal Investigator≠
PI/TL	Principal Investigator/Team Leader≠
PROC	Procedure≠
QA	Quality Assurance≠
RBR	Requirements by Release≠
RCM	Real-Time Contact Management≠
RCTD	Return Channel Time Delay≠
RMA	Reliability, Maintainability, Availability≠
RRR	Release Readiness Review≠
RTCS	Relative Time Command Sequence≠
RTS	Relative Time Sequence≠
SCC	Spacecraft Controls Computer≠
SCF	Science Computing Facility≠
SCT	Spacecraft Time≠
SDVF	SMC Service Management Center≠
SDPS	Science Data Processing System≠
SN	Space Network≠
SSIM	Spacecraft Simulator≠
SSR	Solid State Recorder≠
TD	Target Day≠
TDRS	Tracking and Data Relay Satellite≠
TDRSS	Tracking and Data Relay Satellite System≠
TL	Team Leader≠
TLM	Telemetry≠
TOO	Target of Opportunity≠

TRR	Test Readiness Review≠
TTM	Time Transfer Message≠
TW	Target Week≠
USCCS	User Spacecraft Clock Calibration System≠
UPS	User Planning System≠
UTC	Universal Time Coordinated≠
UI	User Interface≠
WAN	Wide Area Network≠
WOTS	Wallops Orbital Tracking System≠

This page intentionally left blank.