Deep Space Mission System

Development and Deployment Plan: CCG Unification Task (Phase 2)

Configuration Control Group (CCG) Subsystem Plans

DSMS No. **803-242 Rev. A**
Issue Date: October 24, 2002
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Jet Propulsion Laboratory
California Institute of Technology

Deep Space Mission System

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Configuration Control Group (CCG) Subsystem Plan

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Document Change Log

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Initial	06/06/02	All	New document.
A	10/24/2002	Sec 2.1, 2.2, 3.2.3, 4.4, 4.5, 5.3, 5.4, 6, 7, 14, 15.2, 16.1, App A.	Update per PDR

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Section 1: Introduction

1.1 Purpose

This document establishes the Development and Deployment Plan (DDP) for the CCG Unification task (Phase 2). The CCG Unification Task is a part of the Deep Space Mission Systems (DSMS) Antenna Renewal/Sustaining Project. The task is funded by the Antenna and Microwave Office within DSMS Engineering Office 940. Work is being delivered under ECR 02.0007. This document defines the processes, standards, and policies which will govern the execution of the task throughout the entire task life-cycle.

This document will be reviewed and revised as deemed necessary by the Project Element Manager during the life of the task. At a minimum, the document will be reviewed following the PDR and CDR, and also whenever significant changes occur in the task plans.

Section 2: Referenced Documents

The following documents, and revisions, form a part of this DDP Plan to the extent specified within the content of this document. The document versions listed are the governing documents for the task. Acceptance of revisions released during the execution of the task will be negotiated with the PEM, DSMS Engineering Office, and DSMS Operations Office.

2.1 Specifications

824-016 DSCC Antenna Microwave Subsystem, Functional Requirements Document, Rev. G, July 10, 2002. (legacy)

834-016 DSCC Antenna Microwave Subsystem, Functional Requirements Document, Rev. TBD, Not Issued. (future document)

820-16 DSN System Requirements; Detailed Software Interfaces, current modules as of 7/8/02 on http://jaguar.jpl.nasa.gov

820-17 DSN System Requirements; Detailed Hardware Interfaces, current modules as of 7/8/02 on http://jaguar.jpl.nasa.gov

820-19 DSMS Interface Design Standards, current modules as of 7/8/02 on http://jaguar.jpl.nasa.gov

2.2 Standards, Guidelines, and Procedures

D-4000 JPL Software Management Standards Package, 12/01/1988 (http://dmie.jpl.nasa.gov/cgi/doc-list.pl?docnumber=D-4000)

D-10401 JPL Guidelines for Reviews, August 15, 1998

810-001 DSMS Documentation Structure, Standards and Definitions, DSMS Standard Practice, Rev. K, February 21, 2002

813-011 DSMS Service Capability Development (SCD) Process Definition, Service Capability Development Standard Practice, March 20, 2002

813-021 DSMS Document Process Procedures, September 7, 1999

813-022 DSMS Drawing Process and Procedures, SCD Standard, April 17, 2000

813-101 Guidelines For SCD Reviews : Service Capability Development (SCD) Standard Practices, Rev. A, March 2, 2001

813-106 Preparation Guide for Implementation and Quality Plans, May 30, 1997

813-110 Preparation of Operator's manuals for DSN Subsystems, November 1, 2000

813-112 DSMS Testing Standards and Guidelines, November 12, 2001

813-125 DSN Hardware Transfer and Delivery Procedures, June 20, 2001

813-126 DSN Software Transfer and Delivery Procedures, to be released.

813-202 Design Requirements for DSN Equipment, January 5, 2001

813-203-VOL-1 DSN Drawing Format and Content Standards: VOL 1, Equipment, September 17, 2001

820-061 DSMS Subsystem, Configuration Item, and Responsibility Definition: DSMS System Engineering Standard, Rev B, March 25, 2002.

821-308 TMOD Security Requirements, August 12, 1999

2.3 Reference Documents

Task web-site: http://eis.jpl.nasa.gov/ccg

Section 3: Project Description

3.1 Objectives and Background

The key objective of this task (CCG Unification-Phase 2) is to modernize Microwave Controller hardware by replacing the existing OS/2 computers and to integrate into new monitor and control architecture by responding to 820-19 MON requirements.

3.2 Requirements and Constraints

3.2.1 Constraints

The task is funded by the Antenna and Microwave Office within DSMS Engineering Office 940. The task will be accomplished by Section 333. The task will be conducted in accordance with "DSMS Service Capability Development" policy and the associated "Service Capability Development" procedures (see reference 813-011 "DSMS Service Capability Development (SCD) Process Definition, Service Capability Development Standard Practice") . In addition, significant JPL policies, procedures, and standards that apply will be identified in this document.

3.2.2 Requirements

The task will implement the functional requirements defined in the *DSCC Antenna Microwave Subsystem, Functional Requirements Document,* 824-16. Exceptions will be noted in design reviews and in the requirements compliance summary in this document.

3.2.3 Dependencies on Other Tasks

This task requires the following to be delivered or ready for testing by the dates specified:

- Require DCC (DTT) MON2 subsystem to be ready for testing at DTF21 by April 2004 and installed at all antennas by September 2004.

- Need NMC with latest Solaris version and MSPA support to be ready for testing at DTF21 by April 2004 and to be installed at each antenna by September 2004.

- Require CCG DSN Unification Task (Phase 1) to be completed and installed at:
  - DSS27 by September 2004
  - DSS24 by December 2004.
  - DSS34 and 54 by March 2005.

- Require DSS 55 implementation task (CCG Hardware) to be completed and installed at DSS-55 by March 2005.

3.2.4 Assumptions

- The USC will not be required to send any monitor data to the legacy NRT or its replacement, the MIA.

Section 4: Implementation Plan

4.1 General

The Phase 2 of CCG Unification task will implement a microwave controller system for all DSCC DSN antennas. This task will implement the following:

- Develop new Microwave Subsystem Controller (USC) Software.
  - Single program set for all DSN antennas configurable at runtime.
  - Establish UWV USC as a MON-2 compliant subsystem.
    - Positive closed-loop control
    - monitor by exception
    - Auto Configuration capability via Spacecraft specific tables
    - Remote Restart via "BOOT" operator directive
    - UDS type displays
    - Monitor Data Publish/Subscribe Mechanism

- Replace the UGC OS/2 PCs with SUN Solaris computers at each antenna.
  - This will eliminate the obsolete IBM OS/2 operating system.
  - The SUN Solaris platform will be similar to and will be using the same "Common Software" and "Utilities" that the consolidated Uplink Task and the Antenna Controller Replacement Task use.

- Replace Maintenance laptops with new UMT laptops (includes new software)

4.1.1 Implementation

The software and hardware will be designed and implemented under the direct cognizance of the JPL software and hardware CDEs. The software development effort will encompass development of C language source code and include inherited software and COTS (Commercial of the Shelf) software. The host platforms are SUN Sparc and PC. The operating systems involved are SUN/Solaris and Windows. The SUN/SOLARIS source code developed will be in compliance with the NSP Uplink Task Coding Standards (http://eis.jpl.nasa.gov/cmddev/design/#practices).

The software design and development plan will utilize an incremental approach. The plan will pre-define the capabilities required at each build and each build will be tested to confirm that the required functionality is present. Any anomalies or other problems with the expected functionality will be recorded by the test team and maintained by configuration management tool.

The operability aspects of the implementation will be discussed directly with operations personnel at each DSCC and the OE. On-site delivery will include training in the operation and maintenance of the new equipment.

4.2 Organization Roles and Responsibilities

The task Organization Chart is shown in Figure 4-1. Role statement of each major functional work assignment within the task is described in this section. The Task is composed of nine work elements, each one led by a cognizant engineer reporting to the USC software CDE. The cognizant engineer for each work element is responsible for the technical, schedule, and budget performance for that work element.

USC Software CDE – responsible for the technical oversight of the task. The cognizant engineer from each work element reports technical progress to the USC Software CDE. The cognizant engineers also report schedule progress. The USC Software CDE reviews and approves all technical design and implementation decisions.

Antenna Renewal Work Area PEM – responsible for the overall conduct of the task. Responsible for insuring that the task adheres to all applicable DSMS and JPL standards. Responsible to the DSMS program office for the schedule and budget progress of the task.

System/Service Development Engineer – responsible to insure that the task goals, requirements, designs, and implementation are not in conflict with any DSMS directions.

System/Service Manager – responsible for providing funding and reporting of task status to the DSMS Engineering Manager.

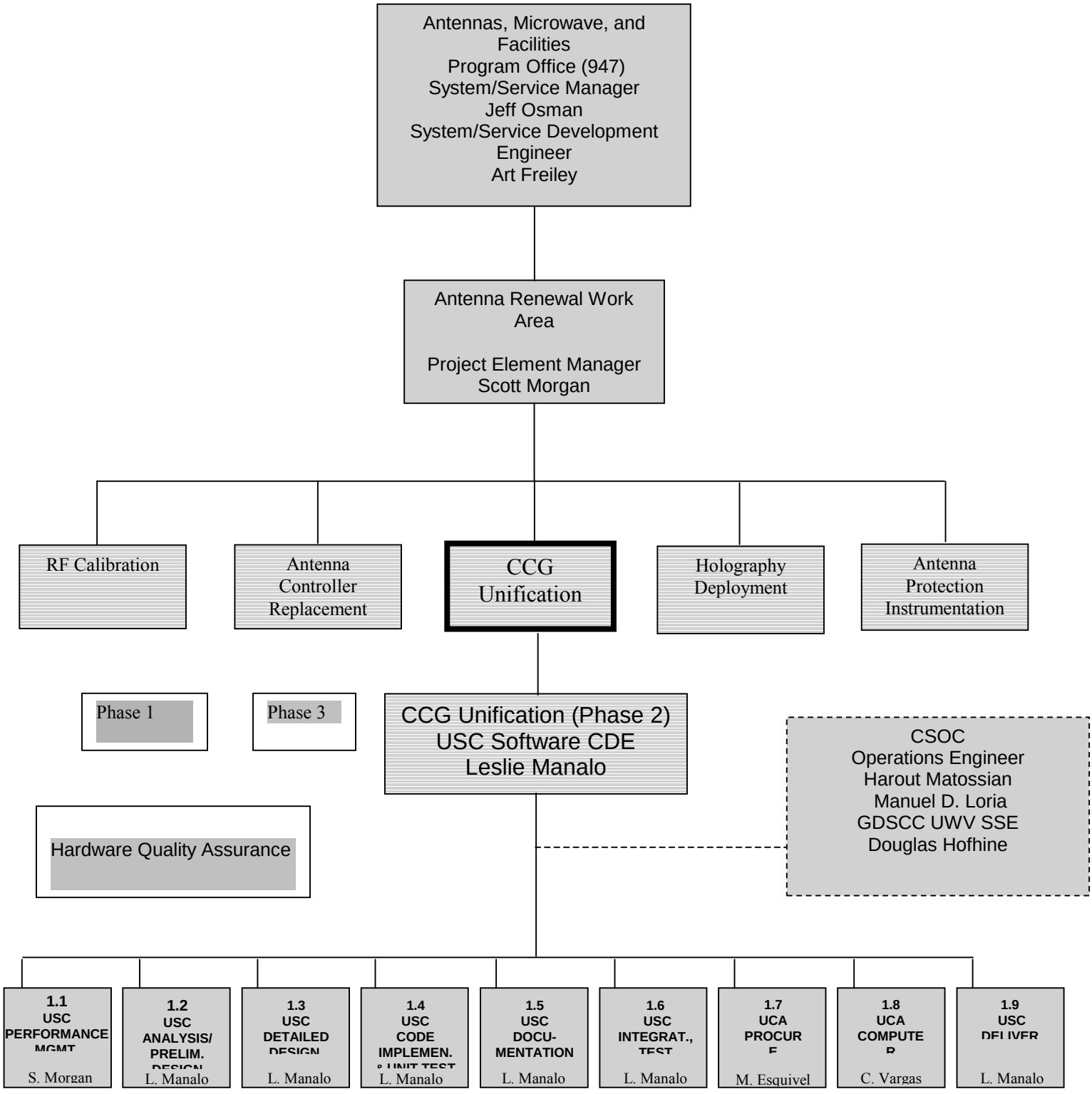

Figure 4-1: CCG Unification (Phase2) Organization

4.3 Functional Block Diagram

The Phase 2 of CCG unification task will implement third generation Configuration Control Group (CCG) throughout DSN. The functional diagram of the Third generation CCG is shown in Figure 4-2.

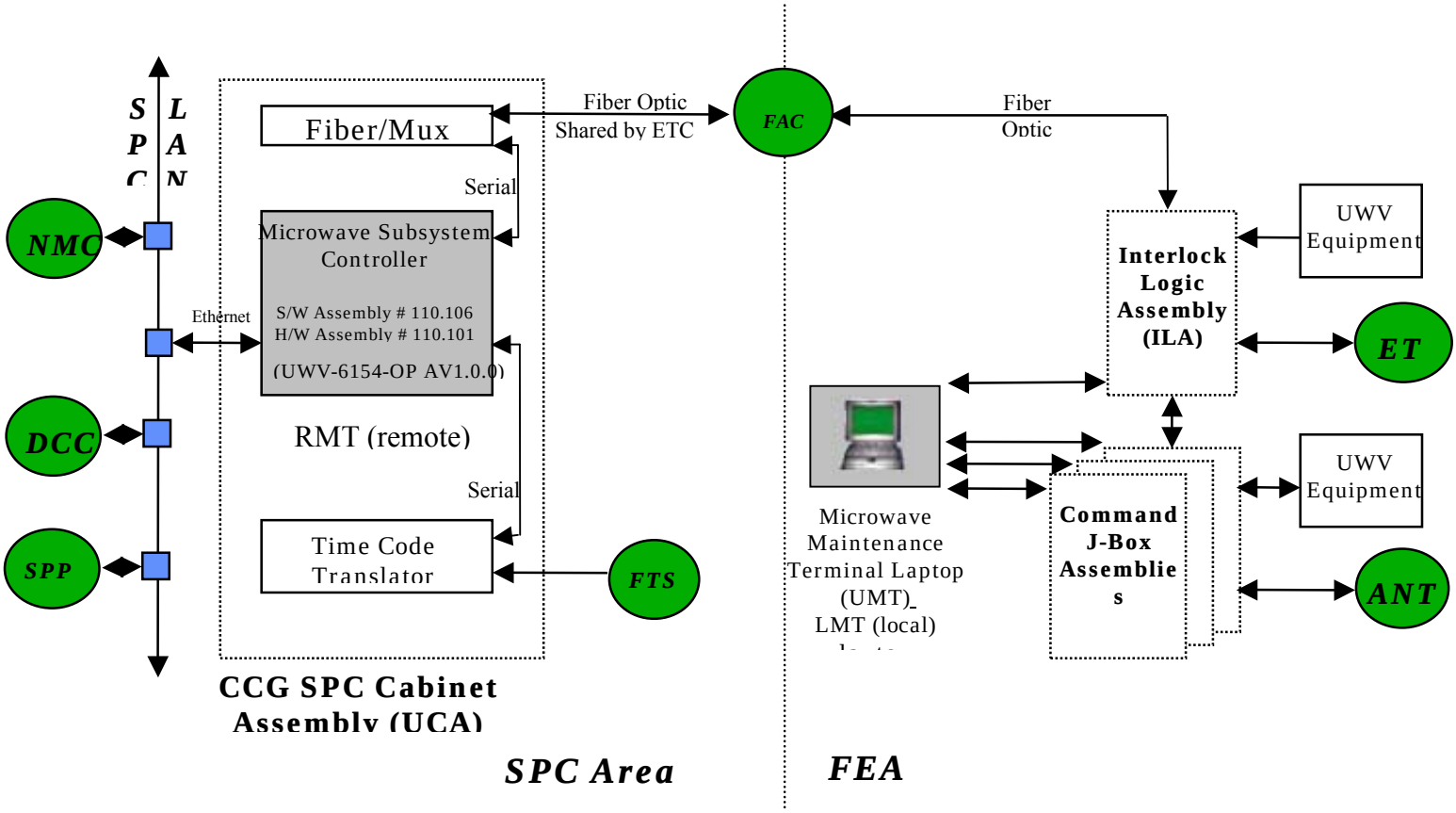

Figure 4-2: Third generation CCG

4.4 Deliverables

4.4.1 Reviews

See Section 6.

4.4.2 Demonstrations

- Development/Implementation Demos
  - •Demo 1 (Hardware Interface) in March 2003
  - •Demo 2 (MON2 / NMC Interface) in August 2003
  - •Demo 3 (Monitor & Control Functions) in December 2003
  - •Demo 4 (Full End-to-End functionality) in May 2004

4.4.3 Documents

The CCG Unification Task Phase 2 will deliver the documents identified in sections 5.3 and 5.4

4.4.4 Modkits

The following three software and two hardware MODKITs will be delivered by this task.

• Microwave Subsystem Control Software (USC) (CI: 110.106) Modkit following the 813-126 standard
- Engineering Change Request (ECR)
- Engineering Change Order (ECO)
- Software Transfer Agreement (SWTA)
- USC Release Description Document (USC-RDD)
- Software Test Document – (per D-4000 standard for STP1/2)
- Software Operators Manual (SOM)
- QA Certification
- CD-ROM containing SPMC released Microwave Subsystem Controller (USC) software
  - UWV-6154-OP
  - UWV-6154-TB
- Security scans as described in 813-126, 813-112, and 821-308.

Delivered to: network.

• USC Display Software (USCD) (CI: 110.107) Modkit following the 813-126 standard
- Engineering Change Request (ECR)
- Engineering Change Order (ECO)
- Software Transfer Agreement (SWTA)
- QA Certification
- CD-ROM containing SPMC released Microwave Subsystem Controller Display (USCD) software
- Security scans as described in 813-126, 813-112, and 821-308.

Delivered to: network.

• Microwave Maintenance Terminal Software (UMT) (CI: 110.108) Modkit following the 813-126 standard
- Engineering Change Request (ECR)
- Engineering Change Order (ECO)
- Software Transfer Agreement (SWTA)
- UMT Release Description Document (UMT-RDD)
- Software Test Document – (per D-4000 standard for STP1/2)
- UMT Operation and Maintenance Manual (UMT-UG)
- QA Certification
- CD-ROM containing SPMC released Microwave Maintenance Terminal (UMT) software
  - UWV-6222-TP
- Security scans as described in 813-126, 813-112, and 821-308.

Delivered to: network.

• Microwave Control Assembly (UCA) (CI: 110.101) Modkit following the 813-125 JPL standard
- Engineering Change Request (ECR)
- Engineering Change Order (ECO)
- EDCL, ETA & shipping request to DLF
- SUN Solaris Hardware (1 per antenna)
- Hardware Installation Procedure (HIP)

- QA Certification
- Hardware Technical Manual (TM)
- UCA Cabinet Assembly Drawings

Delivered to: each station and DTF-21.

• Microwave Subsystem Cables (CI: 110.6) Modkit following the 813-125 JPL standard

- Engineering Change Request (ECR)
- Engineering Change Order (ECO)
- EDCL, ETA & shipping request to DLF
- Cable Package
- UCA Cable Drawings
- QA Certification

Delivered to: each station.

4.4.5 Spares and Maintenance Equipment

The following MESKIT will be delivered by this task based on the Maintenance and Sparing Agreement (MSA).

• Microwave Control Assembly (UCA) (CI: 110.101) MESKIT following the 813-125 JPL standard
  – Engineering Change Request (ECR)
  – Engineering Change Order (ECO)
  – MDCL & shipping request to DLF
  – UMT Laptop (2 per complex, 1 network spare)
  – SUN Solaris hardware Spare (1 at CDSCC, 2 at GDSCC, MDSCC), 1 net spare to DLF
  – QA Certification

4.4.6 Support Products

- Initial set of auto-configuration tables for each spacecraft at each antenna (delivered to OE)

4.5 Removed Configuration Items

4.5.1 Assemblies

- 110.102 UGC Microwave Generic Controller Software
- 110.105 UGC Microwave Generic Controller Tables

4.5.2 Documents

See Section 5.8.

4.6 Work Breakdown Structure

The top level of the Task work breakdown structure is shown in Figure 4-3, and detailed below. The task is composed of nine work units that are overseen and coordinated by the JPL CDE.

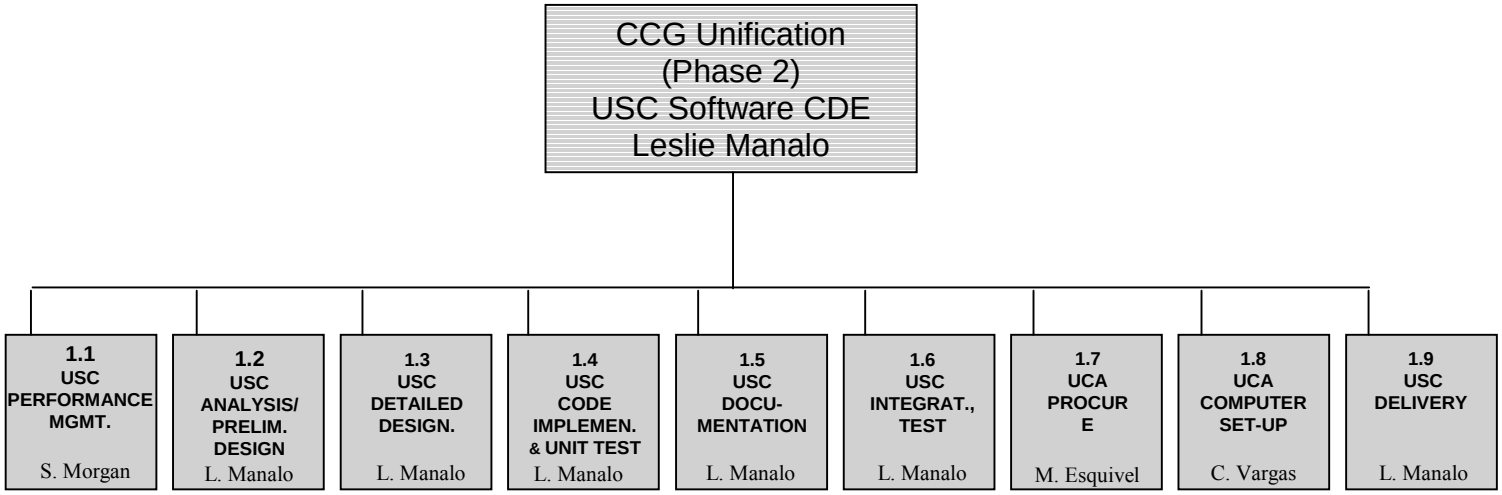

Figure 4-3: Work break Down Structure

4.7 Work Agreements

The Task WAs for the entire task are identified by their respective JPL account number, as listed in the table below. More detail on the work performed in each area and the dependencies for each work area can be found in the MS Project schedule on the task web-page.

100712-51.101.00.3.8473 USC Performance Management (WBS #: 1.1)

Description: Work area is responsible for the oversight of the entire task. Specifically, hold all reviews, book-keep schedule reserves, and insure that demonstration software is built through S/W CM.

Inputs: Status from all other task work areas, review materials, source code for CM.

Outputs: Status reports, reviews, CM-built software for demonstrations.

100712-51.101.00.3.8474 USC Analysis/Preliminary Design (WBS #: 1.2)

Description: Work area is responsible for conducting a preliminary operability meeting and creating the preliminary design of USC and UMT. Creation of PDR material is included.

Inputs: Comments on operability from operators and OEs.

Outputs: Operability meeting report. PDR material.

100712-51.101.00.3.8475 USC Detailed Design (WBS #: 1.3)

Description: Work area is responsible for conducting a final operability meeting and creating the detailed design of USC and UMT. Creation of CDR material is included.

Inputs: Comments on operability from operators and OEs.

Outputs: Operability meeting report. CDR material.

100712-51.101.00.3.8476 USC Code, Implement, Unit Test (WBS #: 1.4)
Description: Work area is responsible for implementation of the USC and UMT software. USC software will be implemented in a sequence of 4 builds with fifth re-work period after the 4th build.
Inputs: Detailed design.
Outputs: Source code to CM for builds.

100712-51.101.00.3.8477 USC Documentation (WBS #: 1.5)
Description: Work area is responsible for documentation associated with the task.
Inputs: Design material.
Outputs: Interface agreements, SOM, STP-1/2, RDD, SSD, Training Material, Hardware drawings and documentation

100712-51.101.00.3.8478 USC Integration Test (WBS #: 1.6)
Description: Work area is responsible for the integration of the USC, Work is arranged around the 4 software demonstrations.
Inputs: Software
Outputs: Integration reports. Anomaly reports.

100712-51.101.00.3.8479 UCA Hardware Procurement (WBS #: 1.7)
Description: Work area is responsible for the purchase of all commercial hardware, for development and delivery, and the purchase/creation of required cables.
Inputs: Commercial hardware requirements.
Outputs: Purchase requisitions, purchase orders, commercial hardware. Cables.

100712-51.101.00.3.8480 UCA Computer Setup (WBS #: 1.8)
Description: Work area is responsible for configuration of all computers, for development and delivery. DSMS required security scan is also included.
Inputs: USC hardware (COTS)
Outputs: Configured computers. Configuration instructions.

100712-51.101.00.3.8481 USC Delivery (WBS #: 1.9)
Description: Work area is responsible for the delivery of software and hardware for the entire task, following the applicable DSMS standards. This includes down-time planning, modkit creation, on-site installation and test, and on-site training.
Inputs: Deliverable hardware and software.
Outputs: Configured computers. Configuration instructions.

4.8 Inputs to the Task

4.8.1 Input

DSCC Antenna Microwave Subsystem, Functional Requirements Document, 824-16.
Funding.
CM support in the form of the CCC/Harvest tool, backups, and expertise – provided by the DSMS program office.

4.8.2 Station Participation

Station participation will be solicited as follows:

- Preliminary Design Review and associated Peer Reviews: board participation
- Critical Design Review and associated Peer Reviews: board participation.
- Operability review participation
- Teleconferences and e-mail on specific design discussions

- CCG Unification Design phase:
  - feedback on display design (2 meetings)
  - feedback on operational design (with above)
- CCG Unification Test phase:
  - participate in integration testing in lab.
  - participate in Acceptance testing in lab and on site.

4.9 Customer-Supplied Product Plan

No customer supplied equipment, software, or other product is required in support of implementation of this Task.

4.10 Facilities

The deliverable units will go through integration testing in 238-439 and DTF21. Test space is anticipated at DTF21 for USC computer, no special resources are required at DTF-21. The Acceptance Testing will be performed at the station in the present location of the current UGC(s). No new space, power, computer network, or other requirements are anticipated at any of the three DSCC complexes.

4.11 Risk Assessment

The following major risk areas have been identified:

•Technical difficulties (new Operating System and new standards)
- Risk rating: medium
- Risk mitigation:
  - Maximize use of inherited design and CMN libraries
  - Recommend increased schedule reserves and margins in the design, implementation, and integration work areas.
  - Create early prototype (test code) for hardware interface

•Dependencies on NMC & MCIS libraries to run on Solaris 8
- Risk rating: Low
- Risk mitigation:
  - Develop USC to compile and run under Solaris v2.5.1 as well as Solaris 8
  - Develop modular and interchangeable OS interfaces if version conflict occurs.

•CMN library inherited from Uplink task has no defined maintenance and support plan
- Risk rating: Low (for current implementation)
- Accept the risk

•Resource Availability due to the continuous support of current UGC
- Risk Rating: Medium
- Risk mitigation:
  - New developer is being trained to modify and deliver UGC tables

Section 5: Documentation Plan

5.1 General

This section lists and describes the documents that will be generated by the Task, in conformance with 810-001, DSMS Documentation Structure, Standards and Definitions and also in conformance with the task's desire to provide sufficient documentation to better enable maintenance and future upgrades.

5.2 Engineering Standards

All documentation shall be produced in accordance with JPL D-43, DSMS No. 810-001, DSMS Documentation Structure, Standards and Definitions and release according to "813-021 - DSMS Document Process Procedures".

Hardware documents will be produced in accordance with the following standards**:** 813-203, Volume 1 , DSN Drawing Format and Content Standards, Volume 1, Equipment

Software documents will be produced in accordance with the D-4000 JPL Software Management Standards Package. Software Operator's Manuals will be produced in accordance with 813-110 Preparation Guide for DSN Software Operator's Manuals.

The delivered and modified hardware will be documented with DSN User Drawings. All top assembly drawings will be updated to correctly reference the new and modified hardware. If the only modification to a lower assembly or item drawing or document is the 'next assembly' or
'used on' information, the drawing or document will not be modified but rather an ECI will be written.

PDMS standard practices will be followed. Drawings will be released or obsolesced in accordance with 813-022 (D-16597) *DSMS Drawing Process Procedures.*

After all installations for a subnet are complete, many documents and drawings associated with this equipment will be obsolete. A complete list of documents and drawings which will be obsolete after the task is complete will be identified in the CDR, a preliminary list is in section 4.4.1.

Subsystem documents will be produced in accordance with the D-4000 JPL Software Management Standards Package.

Transfer documents for both hardware and software will be produced in accordance with 813-125 and 813-126, respectively.

5.3 Software Documentation

–Operators Manual

- •837-044 , USC Software Operators Manual (USC-SOM)
- •837-0000xx , UMT Users Guide (UMT-UG)

–Installation Manuals

- •888-000132 , USC Release Description Document (USC-RDD)
- •888-0000xx , UMT Release Description Document (UMT-RDD)

–Test Documents

•889-000269-Vol-01, UWV (USC and UMT) Software Test Design and Procedure (per D-4000 standard for STP-1 and STP-2 type documents)

•889-0000269-Vol-02 , Software Test Design and Procedure – Results (per D-4000 standard for STP-3 type documents)

–Internal Interfaces

•884-0000xx , USC-UDS Internal Monitor Data, Software Interface Specification (SIS1/2)

–Design Documents

•884-000074-Vol-01, USC Software Specification Document, Volume 1, Architectural Design (SSD-1)

•884-000074-Vol-02, USC Software Specification Document, Volume 2, Detailed Design (SSD-2)

–External Interfaces

•820-16, Software Interface Agreements

- 0328-DCC-USC
- 0299-NMC-USC
- 0327-NSS-USC
- 0349-AA-USC

-Training Materials

-838-0000xx, CCG Phase 2 Training Materials

5.4 Hardware Documentation

–Installation Manuals

•868-0000xx , Hardware Installation Procedure (HIP)

•Hardware Technical Manuals (TMs)

–Drawings

-9612260-1, CCG Cabinet Assembly Drawing, Rev. G

–Internal interfaces

•864-0000xx , UWV Configuration Control Group (CCG), Software/Hardware Interface (HSD)

–External Interface Agreements

- 820-17 , Hardware Interface Agreements (Modify Existing)
  - Update DFT-10-162E
  - Update MON-5-123C
  - Update TRK-2-102
  - Update TRK-2-155A
  - Update GCF-8-503A
  - Update FAC-11-501D

-Technical manuals

- OMM 867-00041, Rev. A. (This will include the contents of the current OMM-03739 and OMM-03740).

5.5 Maintenance and Sparing Agreement (per 813-125)

Maintenance and sparing agreements per 813-125.

5.6 Documentation Release

All documents shall be released through the DSMS CM document release process, in accordance with the format and signature requirements of 813-001.

5.7 Project Quality Records

The task will maintain quality records on the task web-site. These shall include:

Review materials
Review minutes/notes/reports
Schedules
Preliminary Design documentation
Integration test procedures and results document

The web site content will be controlled by the USC Software CDE. The material will be preserved until the CCG Unification task, Phase 2 is completed.

The task will also produce those quality records required by the SCD procedures (see document 813-011). These quality records will be maintained as identified in 813-011.

5.8 Obsolete Documents

The following documentation will be obsolete at the conclusion of the task.

– Operators Manual
- SOM-DBU-5529-OP

–Installation Manuals
- RDD-DBU-5529-OP, Microwave Generic Controller (UGC) Operating Program- Release Description Document (RDD)
- RDD-DBU-5529-SP, Microwave Generic Controller (UGC) System Program- Release Description Document (RDD)
- RDD-DBU-5529-TB, Microwave Generic Controller (UGC) Station dependent Tables and Displays Software- Release Description Document (RDD)

- Test Plans
- STP1/2-DBU-5529-OP, Software Test Plan (one per antenna)

–820-16 Software Interface Agreements
- DMC–UWV (MON-5-133)
- NMC–UWV/UGC (MON-5-133A)
- UWV-DRX (TLM-3-103)
- UWV-DRX (TLM-3-103A)
- 0250-DCC-UGC

-Drawings
- None.

- Commercial Manuals and TM's
- TBD, if any.

Section 6: Review Plan

Reviews will be conducted in conformance with documents D-10401 and 813-101 "Guidelines For SCD Reviews: Service Capability Development (SCD) Standard Practices" unless otherwise specified. Reviews conduced in preparation for the formal reviews are held as Detailed Technical Reviews, Peer Reviews, or in the form of meetings as noted below. The contents and results of all reviews will be posted to the task web-site.

Operations representatives, both complex-based and Pasadena-based, will be invited to all reviews.

6.1 Preliminary Definition and Cost Reviews

Preliminary Definition and Cost Review (PDCR): completed December 12, 2001

6.2 Design Reviews

–Preliminary Operability Meeting: completed January 23 & 25, 2002
-Preliminary Design Peer Review (Product Peer Review): Completed March 22, 2002
–Preliminary Design Review (PDR): Completed April 15, 2002

–Final Operability Meeting: Completed May 17 & 23, 2002
–Critical Design Review (CDR): Scheduled October, 2002

– UMT Operability Meeting: Scheduled May, 2003
– UMT Design Peer Review: Scheduled September, 2003

6.3 Demos

–Development/Implementation Demos

- •Demo 1 (Hardware Interface): Scheduled March, 2003
- •Demo 2 (MON2 / NMC Interface): Scheduled August 2003
- •Demo 3 (Monitor & Control Functions): Scheduled December 2003
- •Demo 4 (Full End-to-End functionality): Scheduled May 2004

6.4 Delivery Reviews

- DDP Review: Completed March 21, 2002
- Downtime Readiness Reviews (DRR) for each antenna: to be held at least 30 days prior to each antenna downtime period

–Test Readiness Review (TRR) for all antennas: Scheduled September, 2004
–DSMS Delivery Review (DDR) for all antennas: Scheduled November, 2004

Section 7: Procurement Plan

The Microwave Controller Hardware and Microwave Maintenance Laptops will be replaced by this task. The following is the list of hardware procurements. In parenthesis is the FY planned for the procurement to occur:

–21 new SUN Workstation
- 1 for Development (FY02)
- 1 for DTF21 (FY03)
- 6 for Goldstone (DSS-24, 25, 26, 27, 14, 15) (FY03)
- 3 for Canberra (DSS-43, 45, 34) (FY03)
- 4 for Madrid (DSS-63, 65, 54, 55) (FY03)
- 5 spare workstation for complexes (2 GDSCC, 1 CDSCC, 2 MDSCC) (FY03)
- 1 net spare workstation (FY03)

–8 new UMTs
- 1 for Development (FY04)
- 6 for complex use (2 GDSCC, 2 CDSCC, 2 MDSCC) (FY04)
- 1 Network Spare (FY04)

–COTS Software
- list TBD

Procurements will follow all applicable JPL procurement rules and guidelines.

The selection of the type and model of SUN computer will be based on commonality with the SUN computers delivered as part of other DSMS task (e.g., Antenna Controller Replacement, NSP), to the extent that these common computers are available from the vendor at the time of procurement.

Section 8: Configuration Management Plan

All software and firmware developed for operational use by the CCG unification task (Phase 2) will use the DSMS CM system (CCC/Harvest). It should be noted that CCC/Harvest tracks all changes via an entity called "package". Packages are created for "new requirements/new functionality" (NR type package), "external anomaly reports" (AR type package), "internal anomaly reports (IAR type package). No changes can be made unless they are associated with a package.

The following CM procedures will be followed during development and for DSMS delivery:

- Implementation
  - Create a package for each individual testable software component
    - New Requirement Packages (NR) will be created based on design documents
    - Internal Anomaly Reports (IAR) will be created during and after each integration test period based on the test report
  - Developers are responsible for coding and checking-in files for each package into Harvest
  - Developers are responsible for unit testing and writing test report for each package

- Developers promote packages for integration testing after completion of coding, unit testing and code inspection

- Internal CM Builds
  - 5 official software builds will be done
  - Perform Integration testing on each official build
  - Each integration test will cover all NRs and IARs included in the build
  - Tested NRs and IARs will be promoted to Test Complete after integration test report is reviewed by team members

- SPMC Build
  - SPMC build version (green CD) will be created after all packages are promoted to Test Complete and there are no other outstanding packages
  - Acceptance testing will only be conducted with software built by SPMC.

Section 9: Quality Assurance Plan

Software quality assurance will be provide from within the task by employing various techniques during the implementation process.

- Code inspection will be done by development team upon completion of each major testable program element
- Internal anomaly Reports (IAR Packages) will be created against all major and minor problems found during testing
- Demos will be held after completion of each integration test phase (4 demos)
  - Demos will cover requirement compliance of each build
  - Demos will cover anomalies fixed in that build
- The NSP Uplink Consolidation coding-standard will be used

Hardware quality assurance, including cables, will be conducted by the JPL QA organization per the requirements of 813-125.

Section 10: Safety Plan

The CCG Unification Task (Phase 2) will not impact the manner that personnel or equipment safety is protected by the UWV subsystem. The personnel and equipment safety interlocks are all processed by the subsystem's Interlock Logic Assembly (ILA) which is not being modified in this effort.

No safety plan specific to this task is required, however, for installations at GDSCC, a "System Safety Checklist" will generated per GDSCC requirements.

Section 11: Test Plan

Testing will be conducted at various levels as defined below. All testing will be executed from documented procedures and all the results of all tests shall be entered into CM tool (CCC/Harvest). Test procedure and information associated with the CCC/Harvest packages specify the acceptance criteria for each test. Whenever possible, operations and maintenance representatives will be invited to participate in the testing, but are only required for subsystem acceptance testing.

11.1 Unit Test

Developers perform unit testing for each individual software component (CCC/Harvest Package) and provide detailed test report in the corresponding CCC Harvest package.

11.2 Integration Test

Testers perform integration testing for each individual software component (CCC/Harvest Package) and provide detailed test report in the corresponding CCC Harvest package. Each integration test will cover all completed CCC/Harvest packages included in the build, and tested NRs, ARs, and IARs will be marked complete after integration test reports are reviewed by team members. The following integration steps will be performed:

–T1: Test Hardware Communication with CCG H/W using USC_DIAG tool
–T2: Test NMC interface at DTF21 using NMC (Hardware simulator will be used)
–T3: Test USC directives and configuration handling with CCG H/W using USC_TERM (NMC Emulator)
–T4: Test complete functionalities at DTF21 using NMC
–T5 (Pre-AT): Test complete functionalities at DSS 14, 15, and 26

Integration test procedures and test results will be stored on the task web page.

11.3 Acceptance Test

Perform acceptance testing at each antenna starting with DSS 27. All overseas testing will be performed after completion of all Goldstone ATs. ATs will be conducted per the STP-1/2 and AT results will be recorded in the STP-3 document.

11.4 Operational Testing

Operational testing will be organized and conducted by the OE. This shall include actual spacecraft tracking and exercising of spacecraft tables. The OE will be responsible for insuring that the testing conducted in the Acceptance Test and the operational testing provides full functional coverage.

Section 12: Transfer Plan

All modkits, hardware and software, shall be prepared and delivered, in accordance with 813-125 and 813-126 procedures; this includes all hardware spares. The full transfer process will be used for all equipment. All transferred equipment will become the responsibility of DSMS operations.

The sequence and estimated dates for installations at specific sites can be found in Section 15.

Section 13: Training Plan

13.1 Operator Training

Operator Training will be conducted on site by a member of the development team before, during and after the Acceptance Test (AT) using hands-on experience, the SOM, and training materials

Training will be conducted for all complexes and all shifts at each complex.

13.2 Maintenance Training

Solaris USC console and UMT maintenance terminal training will be conducted by a member of the development team on site before, during and after the Acceptance Test (AT).

The OE will be trained to maintain the USC support data, including auto-configuration tables.

Training will be conducted for all complexes and all shifts at each complex.

Training materials will be captured in an 838 document.

Section 14: Budget Plan

14.1 Fiscal Resources

The summary of fiscal resources is shown in Table 4-1. The monthly breakdown is provided in the schedule.

Table 4-1: Summary of fiscal resources

	FY 02	FY 03	FY 04	FY 05	FY 06	TOTAL
Labor	305K	297K	392K	276K	30K	1,300K
Cat X Contractor	4K	26K	99K	0K	0K	129K
USC Procurements	13K	371K	62K	0K	0K	446K
Travel	0K	0K	2K	24K	0K	26K
TOTAL (no reserve)	322K	694K	555K	300K	30K	1,901K
PDR Recommended Reserves	0K	117K	124K	92K	5K	338K

14.2 Cost Estimates

The PDR cost estimate of each element in the WBS is shown in Table 14-2.

Table 14-2: PDR Cost estimate

	FY 02	FY 03	FY 04	FY 05	FY 06	TOTAL
1.1 USC Performance Management (except for reserves)	25K	27K	25K	27K	21K	125K
1.2 USC Analysis/Prelim. Design	134K	19K	0K	0K	0K	153K
1.3 USC Detailed Design	119K	56K	0K	0K	0K	175K
1.4 USC Code & Unit test	0K	164K	229K	0K	0K	393K
1.5 USC Documentations	29K	28K	164K	0K	9K	230K
1.6 USC Integration testing	0K	15K	62K	0K	0K	77K
1.7 USC Procurements	13K	377K	69K	0K	0K	459K
1.8 USC Computer Set Ups	0K	8K	4K	0K	0K	12K
1.9 USC Delivery & Training	2K	0K	2K	273K	0K	277K
TOTAL (no reserve)	322K	694K	555K	300K	30K	1,901K
PDCR Recommended Reserves	0K	117K	124K	92K	5K	338K

14.3 Staffing Profile

The following staffing profile has been derived from the master BDE for task.

	FY02	**FY03**	**FY04**	**FY05**	**FY06**
Labor JPL	**2.02**	**2.20**	**2.58**	**1.85**	**0.10**
Labor CTR (Cat X - Eng)	**0**	**0.1**	**0.45**	**0.18**	**0**

14.4 Reserves

Reserve recommendations have been provided as part of the task plan and are summarized below. The reserves identified below were based on the uncertainties in the task plan and the task member's view of the success of the risk mitigation strategies, as seen by the task members.

14.4.1 Scope

Adjustments to the scope of the task as a way to develop schedule or funding reserves have not been considered.

14.4.2 Technical Performance

Adjustments to technical performance as a way to develop schedule or funding reserves have not been considered.

14.4.3 Schedule

Schedule and resource reserves are included in the task plan (i.e., task personnel have not been assigned to any tasks in the period held for reserves – see WBS 1.1.3). These, however, are unfunded in the task plan.

WBS	Title	Schedule Reserve
1.2	USC Preliminary Design Reserves	0 days
1.3	USC Detailed Design Reserves	32 days
1.4.1.1	Build1- Reserves Including Integration Testing	41 days
1.4.1.2	Build2- Reserves Including Integration Testing	19 days
1.4.1.3	Build3- Reserves Including Integration Testing	23 days
1.4.1.4	Build4- Reserves Including Integration Testing	40 days
1.4.2	UMT Code and Integration Reserve	48 days
1.8	USC computer set up Reserves	4 days
1.9	USC Delivery Reserves	74 days
1.5	Documentation Reserve	64 days

14.4.4 Funds

Financial reserves are held by the Program Office and are not currently part of the task plan. Below are the task recommendations for funding reserves by WBS item.

WBS	Title	Funding Reserve Recommendation
1.2	USC Preliminary Design Reserves	$0
1.3	USC Detailed Design Reserves	$35,000
1.4.1.1	Build1- Reserves Including Integration Testing	$31,000
1.4.1.2	Build2- Reserves Including Integration Testing	$20,000
1.4.1.3	Build3- Reserves Including Integration Testing	$23,000
1.4.1.4	Build4- Reserves Including Integration Testing	$50,000
1.4.2	UMT Code and Integration Reserve	$37,000

1.8	USC computer set up Reserves	$2,688
1.9	USC Delivery Reserves	$66,000
1.5	Documentation Reserve	$42,000
1.7	Hardware Cost Reserve (10%)	$30,800

Section 15: Project Control and Evaluation Plan

15.1 Master Schedule

A MS Project master schedule is available at the task web page.

15.2 Reportable Milestones

All reportable milestones are shown in Table 15-1.

Table 15-1: Reportable Milestones

Event/Activity	Start Date
Preliminary Operability	1/17/02
PDR	4/18/02
Final Operability Review	5/23/02
CDR	10/22/02
Code Build 1 Demo	3/26/03
Code Build 2 Demo	8/13/03
Code Build 3 Demo	12/03/03
Code Build 4 Demo	5/10/04
Code Build 5 Pre-At	9/01/04
TRR	9/29/04
DSS-27 AT	9/29/04
DDR	11/26/04

Event/Activity	Start Date
DSS-26 Installation	12/09/04
DSS-15 Installation	12/24/04
DSS-24 Installation	1/12/05
DSS-25 Installation	1/27/05
DSS-14 Installation	2/11/05
DSS-43 Installation	3/04/05
DSS-45 Installation	3/25/05
DSS-34 Installation	4/08/05
DSS-63 Installation	4/26/05
DSS-65 Installation	5/17/05
DSS-54 Installation	5/31/05
DSS-55 Installation	6/14/05
CCG Unification Task (Phase 2)	11/07/05

Actual installation dates will depend on the downtime periods assigned to the task.

The schedule for the DTF-21 modkit installation milestone is TBD.

15.3 "Just-in-Time" Schedules

N/A.

15.4 Milestone Dictionary

Definitions of the milestones noted in section 15.2 can be found in the PDR material or the MS Project schedule, both located on the task web-page.

15.5 Project Control and Evaluation

The CCG unification phase 2 task will be tracked and evaluated as follows.

- Monthly status update provide to the program office to include:
  - major accomplishments of the task over the last month

- planned accomplishments for the next month
- changes in plans that occurred during the month
- areas of concern
- budget status (actual vs. plan)

15.5.1 Metrics

Task progress versus plan will be tracked each month. This includes both technical progress and financial progress. This will be tracked in a monthly report which will be sent to the SSM.

15.5.2 Project Status

The metrics of technical and financial progress will permit the evaluation of how the task is doing relative to both its schedule and budgetary plans. Deviations in either plan will be analyzed, discussed, and reviewed to detect potential problems as early as possible. Problem resolutions that impact the overall task cost, schedule, or deliverables will be approved by the SSM.

15.6 Reporting

Monthly reports will be issued to the Program Office. A monthly status report will be written to update status on the master schedule. The updated (as to progress) master schedule will be posted on the task web site.

Section 16: Foreign Travel Plan

Task personnel will travel to MDSCC and CDSCC in support of this Task. Equivalent visits will be made to Goldstone. The task will fund all of the travel identified below for task personnel. OE travel will be provided by DSMS Operations Office. Actual travel dates will depend on the downtime periods assigned to the task.

16.1 Installation, Acceptance Test, Training, System Tests

CDSCC:

Anticipated date: 3/2/05 – 4/22/05

Personnel:

Integration and Test Engineer or CDE

Operation Engineer (OE)

MDSCC:

Anticipated date: 4/22/05-6/28/05

Personnel:

Integration and Test Engineer or CDE

Operation Engineer (OE)

Appendix A Requirements Compliance Summary

Ref.	Section	Requirements	Compliance	Task / Description
	3.2.6	**Monitor and Control**		
	3.2.6.1	***General Requirements***		
0	3.2.6.1.0	The Microwave Configuration Control Group (CCG) shall provide the monitor and control function for the Microwave (UWV) subsystem and includes the following major assemblies: the Microwave Control Assembly (UCA) which includes all the hardware, the Microwave PLC Firmware (UPLC), and the Microwave Subsystem Control Software (USC). Unless otherwise specified, these requirements apply to all major assemblies in the CCG.	Yes	General Design
1	3.2.6.1.1	The Microwave Subsystems at the 70m, 34m HEF, 34m BWG and 34m HSB sites shall each include it's own microwave configuration control group (CCG).	Yes	General Design
3	3.2.6.1.2	Included in each CCG shall be a smart controller with USC software at the SPC and controller hardware (UCA) with minimal intelligence at the antenna.	Yes	General Design

Ref.	Section	Requirements	Compliance	Task / Description
2	3.2.6.1.3	The prime purpose of the USC shall be to provide control of, and visibility into the microwave configuration for the NMC operators.	Yes	General Design
14	3.2.6.1.4	The USC functions fall into three areas: establish the subsystem configuration, monitor the subsystem elements, and displaying the configuration and certain monitor data.	Yes	General Design
4	3.2.6.1.5	The USC shall accept commands from NMC and configure the subsystem accordingly.	Yes	General Design
5	3.2.6.1.6	The configure requirements shall include setting up the test signal paths for calibrations, system performance tests (SPT) and maintenance.	Yes	USC_EX USC_MC
6	3.2.6.1.7	The USC will control switching of the test signals into and through the LNA instrumentation and monitor the status of the LNAs.	Yes	USC_EX USC_MC
7	3.2.6.1.8	All monitor and control interfaces, to both equipment and operators, shall be in accordance with the following documents. The latest versions applies unless otherwise stated in the task plan: 820-19, MON-01, Monitor and Control Services Standard. 820-19, MON-02, DSN Monitor and Control Services Practices. 820-19, MON-03, Design Requirements for DSN User interfaces. 820-19, MON-07, Uniform Display Services Standard.	Partial	See MON-2 Compliance Matrix

Ref.	Section	Requirements	Compliance	Task
8	3.2.6.1.9	Messages to and from different antenna types shall be the same for the same or similar information.	Yes	
8.1	3.2.6.1.10	The USC shall support MSPA, i.e. provide support for up to eight separate spacecraft simultaneously using multiple configuration tables with compatible configurations.	Yes	USC_EX
8.2	3.2.6.1.11	In the event that MSPA support requires the USC to configure the UWV hardware to incompatible configurations for multiple spacecraft missions, the USC shall not execute the configuration commands.	Yes	USC_EX
8.3	3.2.6.1.12	In the event of a MSPA support error, the USC shall send an error message to the NMC indicating incompatible mission requirements.	Yes	USC_EX
9	3.2.6.1.13	The USC shall provide the capability to automatically revert to the last state after a power interruption or power reset.	Partial	USC_EX, Will always return to UNASSIGNED
10	3.2.6.1.14	The USC shall detect and report faults within the UWV subsystem.	Yes	USC_MC
11	3.2.6.1.15	The USC shall provide a means for a full reset to be triggered remotely by an operator at the SPC or by any external controller. The USC shall ensure the safety of equipment and personnel during this action.	Partial	USC_TM, Only restart the software
12	3.2.6.1.16	After a reset, the USC shall be initialized and go to a state waiting for directives.	Yes	USC_MC, USC_EX
13	3.2.6.1.17	Operator's manuals shall comply with the requirements of the "Preparation of Operator's Manuals for DSN Subsystems", document 813-110.	Yes	
13.1	3.2.6.1.18	The USC shall comply with the requirements of document 821-308, "TMOD Security Requirements."	Yes	

Ref.	Section	Requirements	Compliance	Task / Description
	3.2.6.2	***Control Requirements***		
15	3.2.6.2.1	The CCG shall control all the UWV RF signal path hardware.	Yes	USC_MC
16	3.2.6.2.2	The USC shall be capable of controlling all the test signal routing switches.	Yes	USC_MC
17	3.2.6.2.3	Provisions shall be made to control up to 80 on/off items and up to 50 two-to-four-position devices.	Yes	All Tasks
18	3.2.6.2.4	The UWV shall be operable from any three locations: local at the antenna, remote at the maintenance terminal or by the NMC across the LAN.	Yes	USC_EX, USC_NI USC_TERM, USC_DIAG
19	3.2.6.2.5	Operation from the remote location shall not preclude operation from the local location, but safeguards shall be made to prevent local operation during mission operations.	Partial	Hardware Key Switch, No software safeguard can be provided
20	3.2.6.2.6	When control is at the local location, it shall be possible to lock out remote operation with a key switch.	Yes	Hardware Key Switch
21	3.2.6.2.7	Stand-alone operation shall be provided in both local and remote mode.	Yes	USC_DIAG, USC_TERM UMT
22	3.2.6.2.8	If the USC is in the maintenance mode, in local mode at the antenna or not ready, this status must be indicated to NMC.	Yes	USC_MC, USC_EX
23	3.2.6.2.9	Local control at the antenna shall not use or be dependent on the USC.	Yes	UMT

Ref.	Section	Requirements	Compliance	Task / Description
24	3.2.6.2.10	The design shall allow operators to develop and store their own configurations.	Yes	USC_EX
24.1	3.2.6.2.11	The USC assumes no responsibilities for any operator generated configurations.	Yes	
25	3.2.6.2.12	Software shall be written such that changes in the hardware configuration can be incorporated by changing table entries, rather than by rewriting the software program.	Yes	USC Tables
26	3.2.6.2.13	Stored configurations that set all devices into the desired configuration shall be the prime mode of operation.	Yes	USC_EX
27	3.2.6.2.14	The design shall allow for control of individual devices.	Yes	USC_DIAG, USC_MC
28	3.2.6.2.15	Space for up to 500 preset hardware configurations shall be provided which can be coded and stored in non-volatile memory under a unique name.	Yes	USC_EX, USC Tables
29	3.2.6.2.16	The space for hardware configuration presets shall be divided into the following classes: the NMC operator, the NSS, and local operation (maintenance and special off-line testing operations).	Yes	USC hard drive, UMT hard drive
30	3.2.6.2.17	Software shall be designed to be common to all antennas, with tables to allow for the different configurations.	Yes	General Design
31	3.2.6.2.18	Establishment of the desired configuration shall not require more than one operator directive (OD) from any user such as: NMC or local. This requirement does not limit the use of separate modification or update directives.	Yes	USC_EX

Ref.	Section	Requirements	Compliance	Task / Description
	3.2.6.3	***Monitor Requirements***		
32	3.2.6.3.1	The USC shall continuously monitor the UWV hardware.	Yes	USC_MC
32.1	3.2.6.3.2	The USC shall continuously evaluate the UWV hardware.	Yes	USC_MC
32.2	3.2.6.3.3	The USC shall continuously report on the UWV hardware.	Yes	USC_MC
32.3	3.2.6.3.4	The USC shall identify failed items to the lowest replaceable element (LRE).	Partial	USC_MC, USC_DIAG The status of all All LRE items not available
33	3.2.6.3.5	The USC shall monitor the status and position of each item that it controls and report any changes to the NMC.	Yes	USC_MC
34	3.2.6.3.6	Updated configuration data shall be sent to the NMC with every configuration change and published on a regular basis.	Yes	USC_MC, USC_EX
35	3.2.6.3.7	Provision shall be made to monitor up to a total of 100 masers and HEMTs per antenna.	Yes	Usc Libs USC_MC
36	3.2.6.3.8	Provision shall be made for monitoring of the interlocks and the status of each interlock shall be made available for display by the controller to aid in fault isolation.	Yes	USC_MC
37	3.2.6.3.9	All configuration commands, responses and statuses shall be logged and this log shall be maintained for at least 72 hours.	Yes	USC_MC

Ref.	Section	Requirements	Compliance	Task / Description
38	3.2.6.3.10	All data logging shall be referenced to station time to an accuracy of +/- 0.1 second of the actual time of the event and obtained from the NTP.	No	USC_MC, USC_EX Data accuracy id 0~1 second
39	3.2.6.3.11	The Monitor data shall include positive closed-loop control (i.e., acknowledgement) for all controls received, including the status of any control that is still being processed or has been interrupted.	Yes	General Design
40	3.2.6.3.12	Event messages shall be sent within one second after an event occurred, notifying the NMC of all status and configuration changes.	Yes	All Tasks
41	3.2.6.3.13	If the NMC attempts control of the USC while the USC is in local control or in maintenance mode, the USC shall send a message to the NMC indicating that the USC is unavailable.	Yes	USC_MC USC_EX
42	3.2.6.3.14	A given event shall cause only a single message to be sent to the NMC.	Yes	General Design
42.1	3.2.6.3.15	All notifications to the NMC shall be time tagged.	Partial	USC_EX

Ref.	Section	Requirements	Compliance	Task / Description
	3.2.6.4	***Display Requirements***		
43	3.2.6.4.1	The USC shall generate a display for the remote maintenance terminal and send display data to the UDS display at the NMC.	Yes	General Design
44	3.2.6.4.2	The graphical displays shall present a picture of the UWV configuration to the NMC operator.	Yes	MAP display
45	3.2.6.4.3	The graphical displays shall show all switch positions and other hardware settings in their actual configuration.	Yes	All Displays
46	3.2.6.4.4	The displays shall include the configuration name.	Yes	All Displays
47	3.2.6.4.5	The display shall clearly indicate failed elements and shall be updated when conditions change.	Yes	All Displays
48	3.2.6.4.6	Displays shall show the actual position of switches, not the position that was commanded.	Yes	All Displays

Ref.	Section	Requirements	Compliance	Task / Description
	3.2.6.5	***Test Controller Capability (Delta) Requirements***		
50	3.2.6.5.1	The USC shall be able to function as a test controller, if required at a latter point in time.	No	Current design will support future upgrade
50.1	3.2.6.5.2	The test controller shall provide the capability to make measurements that require resources from other antenna subsystems The type of measurements could include system noise temperature, pointing models, tipping curves etc.	No	Current design will support future upgrade
50.2	3.2.6.5.3	The test controller shall be able to perform unattended measurements that would be under the control of the NMC.	No	Current design will support future upgrade
51	3.2.6.5.4	Analog data shall be supported by the CCG and handled as digitized analog data by the USC.	No	Current design will support future upgrade
52	3.2.6.5.5	The USC shall be able to obtain digitized analog status and instrument output data from the LNA and other UWV assemblies.	No	Current design will support future upgrade
53	3.2.6.5.6	The USC shall be able to send configuration commands to the LNA and other UWV assemblies.	No	Current design will support future upgrade

Ref.	Section	Requirements	Compliance	Task / Description
54	3.2.6.5.7	Through the Test Controller or NMC, as appropriate, the capability shall be provided to be able to start phases of tests at specific clock times.	No	Current design will support future upgrade
55	3.2.6.5.8	The Test Controller shall be able to receive the status or response for requests sent to other external subsystems.	No	Current design will support future upgrade
56	3.2.6.5.9	The Test Controller shall be able to exchange data with other external subsystems.	No	Current design will support future upgrade
57	3.2.6.5.10	The Test Controller shall provide a processing and logging capability for data requested from the LNA, CCG, UWV assemblies, BVR and ANT.	No	Current design will support future upgrade
58	3.2.6.5.11	Time tags shall be supplied by the FTS and applied to all logged data.	No	Current design will support future upgrade
59	3.2.6.5.12	For logged data, provisions shall be made for recording component serial numbers and other identifying data in header records.	No	Current design will support future upgrade
60	3.2.6.5.13	The USC shall, by an internal program and/or by a command script, be able to run special sequences involving the UWV hardware without the need for an operator.	No	Current design will support future upgrade
61	3.2.6.5.14	For tests requiring external resources, the tests shall be performed under NMC control by the use of scripts provided by the UWV. The control shall include sending appropriate commands to external subsystems, such as BVR and ANT, and retrieving required data.	No	Current design will support future upgrade

Ref.	Section	Requirements	Compliance	Task / Description
	3.2.6.6	***External Software Interfaces***		
62	3.2.6.6.1	The USC shall develop interfaces with NMC, DCC(DTT), and NSS subsystems.	Yes	By Design
	3.2.6.7	***Internal Software Interfaces***		
65	3.2.6.7.1	The USC and UCA shall define an internal interface between the CCG software and the hardware.	Yes	By Plan
	3.2.6.8	***External Hardware Interfaces***		
66	3.2.6.8.1	The CCG shall develop interfaces with the ANT, ETX, FAC/GCF, DLN, and FTS subsystems.	Yes	Existing H/W Design

Section	Req. No.	Requirement Text	Compliance	Task / Description
2.1 Automation	1	Any subsystem modification (including additions, deletions, or modifications to monitor data, directives, displays, and events) that affects automation shall be coordinated with the Automation Analyst.	Yes	
2.1	2	Subsystems shall test with NMC Automation following any subsystem changes.	Yes	AA-USC Interface Document
2.4 Self-Configuratio	1	The subsystem shall wait indefinitely for the standard connection data to become available, i.e., the subsystem should not timeout.	Yes	USC_NI
2.4	2	If the subsystem cannot complete its configuration based upon available data, it shall issue an appropriate alarm notification to the NMC under its connection functional address.	Yes	USC_EX USC_NI
2.4	3	The subsystem shall continue to accept and process directives appropriate for its state. For example, subsystem directive may be used to supply data needed to complete the subsystem's configuration.	Yes	USC_EX
2.4	4	A subsystem shall always accept an Unassign CCN from the NMC.	Yes	USC_NI USC_EX
2.5 Self-Evaluation	1	Subsystems shall evaluate their performance and report deviations to the NMC. For example, a subsystem may determine a performance deviation by comparing actual performance data against subsystem 'Standards and Limits' or by comparing the delta of actual vs. predicted	Yes	USC_MC USC_EX
2.5	2	The results of these comparisons shall be made immediately available to operations personnel through event notifications and/or monitor data.	Yes	USC_MC USC_EX

Section	Req. No.	Requirement Text	Compliance	Task / Description
2.5	3	Subsystems shall monitor their output of all products, and alert operations personnel when the required outputs are either impaired or	Yes	USC_MC USC_EX
2.6 Remote Restart	1	The specific mechanism to be used by the NMC to reset a subsystem controller shall be defined in the NMC-subsystem interface agreement.	Yes	NMC-USC Interface Document
2.7 Standard Deployment and Software	1	Subsystem files, particularly those used by the NMC, shall be identified with specific software versions.	Yes	
3.1 Subsystem Types and Functional Addresses	1	A connection-assignable subsystem controller shall have either a connection functional address or an antenna group functional address and a permanent functional address.	Yes	Antenna Functional Address = from CCN Permanent Functional Address = /fa/<domain>/usc<mm>
3.1	2	A multi-connection subsystem controller shall be capable of having multiple connection functional addresses and a permanent functional	N/A	USC single connection assignable subsystem
3.1	3	Non-assignable subsystem controllers shall only have permanent functional addresses.	N/A	USC single connection assignable subsystem
3.2.1.1 Unassigned	1	A well-behaved subsystem shall place itself into the unassigned mode following bootup or reset.	Yes	USC_NI
3.2.1.1	2	An connection-assignable subsystem in the unassigned mode shall register under its permanent functional address to receive CCNs.	Yes	USC_NI

Section	Req. No.	Requirement Text	Compliance	Task / Description
3.2.1.1	3	While in an unassigned mode, an assignable subsystem shall use its permanent functional address for all external communications.	Yes	USC_NI
3.2.1.2	1	An assignable subsystem in the assigned mode shall use the functional address supplied in the CCN as its source address in subsequent connection-related communications.	Yes	USC_NI
3.2.2 Multi-Connection Subsystems	1	The interface agreements between the NMC and a multi-connection subsystems shall define the specific assignment protocol for these subsystems.	N/A	USC single connection assignable subsystem
3.2.3 Non-Assignable subsystems	1	A non-assignable subsystem shall ensure that its permanent functional address is published in accordance with DFL-1-7.	N/A	USC single connection assignable subsystem
3.2.3	2	The subsystem shall assume an assigned communications mode following a subsystem reset/restart, such subsystem will not receive CCNs.	N/A	USC single connection assignable subsystem
3.3.3 Assigned to Assigned	1	A subsystem shall not allow a change to the connection number while in assign mode.	Yes	USC_NI
3.4 Subsystem-Provided Information	1	Subsystems shall provide the following information in their interface agreement with the NMC:	Yes	USC_EX
3.4	2	identification of subsystem type with respect to assignability (multi-connection, non-assignable or connection assignable).	Yes	NMC-USC Interface Agreement USC-DCC Interface Agreement

Section	Req. No.	Requirement Text	Compliance	Task / Description
4.2.1 Protocol and Content	1	Directives that control status or configuration parameters shall be associated with the monitor data reflecting the requested changes.	Yes	USC_EX
4.2.1	2	Subsystems shall use an estimated-time-to-complete criterion in determining what response category to use when issuing the first response to a directive. (The estimated completion times are intended to be pre-execution estimates of the completion time of the process invoked by the directive.)	Yes	USC_EX USC_MC
4.2.2 Directive Response Categories and Criteria for Use	1	If a subsystem can execute a directive within one second of receiving it, then the subsystem shall send a Completed response after executing the directive.	Yes	USC_EX
4.2.2	2	If the subsystem can expect to execute the directive within one to five seconds after receiving it, and if during this time it can receive additional directives, the subsystem shall send a Processing response within one second of receiving the directive.	Yes	USC_EX
4.2.2	3	Upon receiving a Processing response, the NMC may send a new directive immediately to begin another exchange. This second directive shall be processed concurrently.	Yes	USC_EX
4.2.2	4	Directives that control status or configuration parameters shall be associated with the monitor data reflecting the requested changes.	Yes	USC_EX
4.2.2	5	Processing of current exchanges shall follow the protocol standards independently.	Yes	USC_NI
4.2.2	6	The subsystem shall send a second response within a total of five seconds from the time it received the original directive. This second response could also be another Processing response.	Yes	USC_EX

Section	Req. No.	Requirement Text	Compliance	Task / Description
4.2.2	7	The subsystem shall continue to send responses until either a Rejected response or a Completed response is sent.	Yes	USC_EX
4.2.2	8	If, while executing a directive, the subsystem is unable to receive a second directive, the Processing/Wait response shall be sent within one second of receiving the first directive.	Yes	USC_EX
4.2.2	9	Within 15 seconds of receiving a second directive, the subsystem shall send a second directive response. This second response could also be another Processing/Wait response.	Yes	USC_EX
4.2.2	10	The subsystem shall continue to send responses until either a Rejected response or a Completed response is sent.	Yes	USC_EX
4.2.2	11	If the subsystem takes more than five seconds to execute the directive (and the Wait condition does not apply), the Started response shall be sent to the NMC within one second of receiving the directive.	Yes	USC_EX
4.2.2	12	After executing the directive, the subsystem shall send a Completion Advisory to the NMC.	Yes	USC_EX USC_MC
4.2.2	13	The subsystem shall send Progress Advisories to the NMC while the subsystem executes the directive.	Yes	USC_EX USC_MC
4.2.2	14	In cases where the directive is not executed successfully, the subsystem shall send a Deviation Advisory or a Warning Alarm.	Yes	USC_EX

Section	Req. No.	Requirement Text	Compliance	Task / Description
4.2.2	15	If the subsystem cannot accept a directive, the Rejected response message shall be sent to the NMC and clearly state the reason for rejecting the directive (e.g., syntax, semantics, parameter validity check,	Yes	USC_EX
4.2.2	16	The subsystem shall send the Rejected response message within one second of receiving the directive; the one second applies when Rejected is the first directive response in a directive/response exchange.	Yes	USC_EX
4.2.3 Timing Considerations	1	Limits of one second, five seconds, or fifteen seconds thereafter shall be satisfied when the subsystem transmits an appropriate directive	Yes	USC_EX
4.2.3	2	Subsystem designs shall accommodate a directive response time limit as follows: In the absence of any other I/O activity to or from the LAN(s), the response time limit is met.		
4.2.3	3	Subsystem designs shall accommodate a directive response time limit as follows: During normal I/O activity, no more than 5% of the responses are transmitted later than the nominal response time limit.	Yes	Performance test. USC_EX
4.2.3	4	Subsystem designs shall accommodate a directive response time limit as follows: The absolute maximum response time limits associated with each of the nominal response time limits (1, 5 and 15 seconds) are 3, 8, and 18 seconds. Regardless of LAN I/O activity (but assuming that all acknowledged transmissions are successful on first attempt), the response is	Yes	USC_NI USC_EX
4.3 Subsystem-Provided Information	1	In cases where closed-loop control relationships exist (i.e., a directive is associated with monitor data or specific events), such relationships shall be identified in the NMC–subsystem interface agreement.	Yes	NMC-USC Interface Agreement
4.3.1 NMC Directives List	1	Using MDDS, a subsystem CDE shall provide the information listed in Table 4-1 for each subsystem directive.	Yes	

Section	Req. No.	Requirement Text	Compliance	Task / Description
4.3.1	2	Using MDDS, a subsystem CDE shall identify the applicable program ID and version of the software associated with the directives.	Yes	
5.2.1.1 Alarms	1	Subsystems shall report, via an alarm, a subsystem anomaly for which the operator is expected to take some corrective action.	Yes	USC_EX USC_MC
5.2.1.1	2	Subsystems shall report, via an alarm, a subsystem anomaly for which the operator is expected to be aware that some corrective action is being carried out automatically.	N/A	There is no emergency alarm H/W will handle critical personnel danger with H/W interlocks
5.2.1.1	3	Subsystems shall issue the same alarm only once.	Yes	USC_EX USC_MC
5.2.1.1.1 Emergency Alarm	1	Subsystems shall issue an emergency alarm to report any condition that could result in immediate danger to personnel, major equipment, or station facilities.	N/A	There is no emergency alarm H/W will handle critical personnel danger with H/W interlocks
5.2.1.1.1	2	Subsystems shall issue an emergency alarm to report an event that could result in costly repairs or excessive restoration time, if not addressed.	Yes	USC_EX USC_MC
5.2.1.1.2 Critical Alarm	1	Subsystems shall issue a critical alarm to report any problem that, if uncorrected, will interrupt one or more data streams or otherwise jeopardize mission support.	Yes	USC_EX USC_MC
5.2.1.1.3 Warning Alarm	1	Subsystems shall issue a warning alarm to report any problem that is not critical but requires operator action to correct.	Yes	USC_EX

Section	Req. No.	Requirement Text	Compliance	Task / Description
5.2.1.1.3	2	Subsystems shall issue a warning alarm if the subsystem observes a series of minor malfunctions foreshadowing a condition that would result in significant loss of data.	Yes	USC_EX USC_MC
5.2.1.2 Advisories	1	Subsystems shall report minor malfunctions, changes in status, routine progress, etc., by issuing advisories. Operators need not act upon an advisory.	Yes	USC_EX USC_MC
5.2.1.2	2	Subsystems shall issue the same advisory only once.	Yes	USC_EX USC_MC
5.2.1.2.1 Deviation Advisory	1	Subsystems shall issue a deviation advisory to report any anomalous condition that, by itself, requires no action by the operator.	Yes	USC_EX USC_MC
5.2.1.2.1	2	Subsystems shall issue an information advisory when a deviation in performance or a transient is observed.	Yes	USC_EX USC_MC
5.2.1.2.2 Completion Advisory	1	Subsystems shall issue a completion advisory to report the completion of some expected (and therefore non-anomalous) event.	Yes	USC_EX
5.2.1.2.3 Progress Advisory	1	Subsystems shall issue a progress advisory to report an ongoing, routine (i.e., non-anomalous) activity.	Yes	USC_EX USC_MC
5.2.1.2.3	2	Subsystems shall issue progress advisories that clearly indicate whether the action is actually in process or merely in a queue.	Yes	USC_EX USC_MC

Section	Req. No.	Requirement Text	Compliance	Task / Description
5.2.1.2.3	3	Subsystems shall issue progress advisories that should include completion times (e.g., seconds remaining), when the completion time is accurate and readily available.	N/A	Switch timing is fast.
5.2.1.2.4 Log-Only Advisory	1	Subsystems shall issue a log-only advisory to report performance information which is not necessarily needed at the time it is reported, but needs to be available for review at a later time.	Yes	USC_EX USC_MC
5.2.1.2.5 Recovered Advisory	1	Subsystems shall issue a recovered advisory to inform the operator when the condition triggering an alarm no longer exists.	Yes	USC_EX USC_MC
5.2.1.3 Prompts	1	Subsystems shall issue a prompt to gain the operator's attention to inform the operator of a condition that either requires or permits some procedural step.	Yes	USC_EX USC_MC
5.2.3 Interface Agreement Negotiations	1	In the cases where closed-loop control relationships exist (i.e., an event is associated with monitor data, or a particular directive or display), such relationships shall be identified in the NMC–subsystem interface agreement.	Yes	
5.2.4 Destination of Subsystem Events	1	Connection assignable subsystems shall send events to the NMC GCE permanent functional address /fa/<domain>/gce when unassigned, and to the NMC Connection Engine (CE) functional address provided in the configuration control notification (CCN) when assigned.	Yes	USC_NI
5.2.4	2	Non-Assignable subsystems shall send events only to the NMC GCE permanent functional address.	NA	USC single connection assignable subsystem
6.2.1 Monitor Data Classification	1	Subsystem controllers shall produce monitor data describing the subsystem's status, configuration, and performance.	Yes	USC_EX

Section	Req. No.	Requirement Text	Compliance	Task / Description
6.2.3 Monitor Data	1	Monitor data parameters that report status information shall be expressed using the FORMAT_STATUS data format.	Yes	USC_EX
6.2.3	2	Monitor data parameters that report configuration information shall be reported as ASCII strings, using the FORMAT_STRING data format, with the exception of configuration parameters that contain numeric	Yes	USC_EX
6.2.3	3	Configuration information shall be encoded so that meaningful human interpretation does not require conversion by the NMC.	Yes	USC_EX
6.2.3	4	Monitor data parameters that report performance information as numeric values shall use any of the standard numeric data formats.	Yes	USC_EX
6.2.4 Design of Monitor Data	1	Monitor data of a subsystem shall be designed such that the overall subsystem status can be described by a single monitor data item.	Yes	USC_EX
6.2.4	2	Monitor data of a subsystem shall be designed such that visibility into a subsystem can be achieved by successive and ordered views which are increasingly detailed.	Yes	USC_EX USC_MC
6.2.4	3	Monitor data of a subsystem shall be designed such that status, configuration, and performance monitor data shall be provided to the extent necessary to describe the health and state of a component.	Yes	USC_EX USC_MC
6.2.4	4	Monitor data of a subsystem shall be designed such that closed-loop control can be accomplished via monitor data. For example, when a directive is issued to a subsystem, the 'result' of this directive (or failure to achieve the result) should be reflected in monitor data.	Yes	USC_EX USC_MC

Section	Req. No.	Requirement Text	Compliance	Task / Description
6.2.4	5	Closed-loop relationships between directives and monitor data shall be described in the “Description” of the monitor data.	Yes	
6.2.4	6	Monitor data of a subsystem shall be designed such that critical subsystem information is produced as monitor data.	Yes	USC_EX USC_MC
6.2.5 Subsystem State	1	Subsystems shall accurately report (via monitor data) their current status and state at all times.	Yes	USC_EX
6.2.5	2	All subsystem status or state changes shall result in the publishing of the associated monitor data by the subsystem.	Yes	USC_EX
6.2.5	3	When uncertain as to the status of the subsystem component, the more critical status value shall be reported.	Yes	USC_EX
6.2.6 Program/Version ID Standard	1	The following standard shall be adhered to when publishing program IDs: The program ID – specifically the PGMID monitor data item – is the program identification number provided by SPMC (e.g., DOA 5556 OP).	Yes	UWV-6154-OP
6.2.6	2	The following standard shall be adhered to when publishing version IDs: The version ID – specifically the VersionID monitor data item – is a concatenation of the operational revision identifier and the delivered program version numbers (e.g., BV3.0.7 or EV10.14.2.).	Yes	Version Number = AV1.0.0 USC_EX USC_NI UDS
6.3.1.1 MDS Monitor Data Specification File	1	Using MDDS, a subsystem CDE shall identify each data item to be published by the subsystem and the format of the data item.	Yes	

Section	Req. No.	Requirement Text	Compliance	Task / Description
6.3.1.1	2	Using MDDS, a subsystem CDE shall provide the applicable program ID and version	Yes	
6.3.1.2 Interface Agreements	1	All subsystem monitor data subscribed to by the NMC and the functional address(s) under which this data is published shall be defined in an interface agreement between the subsystem and the NMC.	Yes	
6.3.1.2	2	The monitor data descriptions in the interface agreement shall consist of the following information: • data item identifier (name). (All data items published under the same functional address must have unique names.) • item description • brief description of the data item. • identification of any positive closed-loop control relationship(s) (e.g., between the monitor data item and subsystem directives or events). • identification of any relationship(s) to predicts and/or standards and limits, in the case of performance data. (3) format. (4) units/precision. (5) range of values.	Yes	
6.3.1.2	3	Interface agreements with the NMC shall identify all subsystem assemblies and provide the required monitor data for each assembly.	Yes	
6.3.2 Subsystem/ Assembly Standard Monitor Data	1	Connection assignable and antenna group subsystems shall publish the monitor data defined in Tables 6-1 and 6-2, as appropriate, under the permanent functional addresses shown ion Table 6 3, independent of the assigned mode of the subsystem.	Yes	USC_EX

Section	Req. No.	Requirement Text	Compliance	Task / Description
6.3.2	2	Connection assignable and antenna group subsystems while in assigned mode shall also publish the monitor data defined in Tables 6-1 and 6-2, as appropriate, under the functional addresses provided in the assigned	Yes	USC_EX
6.3.2	3	A non-assignable subsystem shall publish the monitor data described in Tables 6-1 and 6-2, as appropriate, under the permanent functional addresses defined in Table 6-3.	N/A	USC single connection assignable subsystem
7.2.1 Types of Subsystem Displays	1	Subsystem displays shall adhere to the MON-3 standard.	Yes	UDS Displays
7.2.2 User Interface Standards	1	Subsystem displays shall be associated with an identifier that is unique among displays for that particular subsystem. (MON-3 contains a list of standard names for standard subsystem displays.)	Yes	UDS Displays
7.3.1 NMC Display Data File	1	Using MDDS, a subsystem CDE shall provide the information listed in Table 7-1 for each subsystem display.	Yes	
7.3.1	2	Using MDDS, a subsystem CDE shall identify the applicable program ID and version of the software associated with the display list.	Yes	
8.2.1 Support Data Processing	1	A MON-2 subsystem shall receive support data files from the SPPA in a predefined input directory on a predefined host.	Yes	USC_EX USC Solaris Configuration for FTP accounts
8.2.1	2	All MON-2 subsystems shall automatically process support data files stored in their 'input' directory by the SPPA.	Yes	USC_EX

Section	Req. No.	Requirement Text	Compliance	Task / Description
8.2.1	3	This automatic processing shall include parsing of the file name, verification of the file contents and format, storage of the file in the appropriate 'user' directory(s), the handling of error conditions, and the periodic purging of the support files from both the subsytem 'input' and	Yes	USC_EX
8.2.1	4	MON-2 subsystems shall automatically verify support data files to the extent possible upon their arrival at the subsystem.	Yes	USC_EX
8.2.1	5	MON-2 subsystems shall verify that the file is readable and is complete, i.e., that the last line of the file is '*=END=*'.	Yes	USC_EX
8.2.1	6	If an error is found during file verification, a MON-2 subsystem shall send a warning alarm event message to the NMC and delete the file from the subsystem 'input' directory.	Yes	USC_EX
8.2.1	7	If a required support data file is unavailable at connection configuration or if there is an ambiguity in which file to use (e.g., more that one version of a file is available), a MON-2 subsystem shall issue a critical alarm event message to the NMC.	Yes	USC_EX
8.2.1	8	MON-2 subsystems shall provide subsystem directives which allow an operator to manually identify/overwrite the specific support date file to be used by the subsystem.	Yes	USC_EX
8.2.1	9	MON-2 subsystems shall periodically purge support data files from their 'input' and 'user' directories based upon purge dates provided in each file's file name.	Yes	USC_EX
9.2.3 Printer Selection and Control	1	Printers, including a label printer, are available at each DSCC. Unix remote printer commands shall be used by the subsystem software to select and control where and how hardcopy reports will be output.	N/A	No printer is needed

Section	Req. No.	Requirement Text	Compliance	Task / Description
10.2.1 General	1	Interface agreements shall match as-built software.	Yes	
10.2.1	2	Interface agreements shall not list monitor data in the interface agreements if the data are not actually published.	Yes	
10.2.1	3	Interface agreements shall be identified with a specific program ID	Yes	
10.2.2 Functional Addresses	1	The interface agreement shall identify all functional address(s) and permanent functional addresses by which the subsystem will be identified, and under what conditions each will be used.	Yes	
10.2.3 Assignment	1	Subsystems shall provide the following information in their interface agreement with the NMC: Identification of the subsystem's assignment type, i.e., connection assignable, multi-connection or non-assignable subsystem.	Yes	
10.2.3	2	Subsystems shall provide the following information in their interface agreement with the NMC: how swaps and reboots are to be performed for the subsystem.	Yes	
10.2.4 Directives/ Responses	1	For cases where a positive closed-loop control relationship exists (i.e., specific monitor data can be used to verify the successful execution of a directive), such relationships shall be identified in the NMC–subsystem	Yes	
10.2.4	2	Subsystem directives utilized by NMC automation shall be identified in the subsystem interface agreement with the Automation Analyst.	Yes	AA-USC Interface Document

Section	Req.	Requirement Text	Compliance	Task / Description
10.2.5Event Notification	1	For cases where a positive closed-loop control relationship exist (i.e., an event is associated with monitor data, or a particular directive or display), such relationships shall be identified in the NMC–subsystem interface	Yes	
10.2.5	2	Subsystem events utilized by NMC automation shall be identified in the subsystem interface agreement with the DSN Automation Analyst.	Yes	AA-USC Interface Document
10.2.6 Monitor Data	1	All subsystem monitor data published by an assembly and subscribed to by the NMC shall be defined in an interface agreement between the	Yes	
10.2.6	2	The monitor data descriptions in the interface agreement shall consist of the following information:	Yes	
10.2.7 Subsystem Displays	1	Displays utilized by NMC automation shall be identified in the subsystem interface agreement with the Automation Analyst.	Yes	AA-USC Interface Document
11.2 Integration Testing with the NMC	1	Subsystems shall specifically perform integration tests with the NMC and with NMC Automation for each subsystem re-delivery.	Yes	
11.2	2	Subsystems shall demonstrate that subsystem test procedures address compliance with the “shall” statements in this document.	Yes	
12.2 NMC-Required Data	1	All subsystem CDEs (legacy and MON-2)shall use the MDDS to produce the subsystem’s Data Definition files.	Yes	

Section	Req. No.	Requirement Text	Compliance	Task / Description
12.2	2	The subsystem Data Definition files are subsystem-version sensitive and shall be re-delivered with each new version of subsystem software.	Yes	USC_EX USC_MC
B.2.2 Time	1	The Time format (12 bytes) can be used to represent a time measurement to a resolution of one millisecond. Time shall be expressed as a string of 12 ASCII digits containing the following information: Day of Year: 3 bytes, Min Value 001, Max Value 366 Hour: 2 bytes, Min Value 00, Max Value 23 Minute: 2 bytes, Min Value 00, Max Value 59 Second: 2 bytes, Min Value 00, Max Value 60 Millisecond: 3 bytes, Min Value 000, Max Value 999	Yes	USC_EX USC_MC
B.2.2	2	Each item shall be expressed with leading zeros and is arranged in six 16-bit words.	Yes	USC_EX USC_MC
B.2.3 Parameter Descriptor Word (PDW)	1	The validity field shall be coded as follows: 0 = The parameter has been observed; the value may be used. 1 = The parameter has not been observed, or the parameter is not applicable to this mode of operation; the value should be disregarded.	Yes	USC_EX
B.2.3	2	For status and configuration parameters, the PDW analysis field is not defined, and shall be coded as zero.	N/A	No Analog Data
B.2.3	3	For performance parameters, the analysis codes shall be used and their meanings are as follows: 0 = The subsystem has not analyzed the parameter; disregard this field. 1 = The parameter has a normal, reasonable, or expected value. 2 = High warning limit has been exceeded. 3 = High critical limit has been exceeded. 4 = Low warning limit has been exceeded. 5 = Low critical limit has been exceeded.	N/A	No Analog Data
B.2.5 Double Integer	1	The Double Integer format (32 bits) can be used to express integral quantities in the range –2,147,483,648 to +2,147,483,647 with a resolution of unity. Double integers shall be expressed in a signed two's complement notation (MSB in the first word).	N/A	No Analog Data

Section	Req. No.	Requirement Text	Compliance	Task / Description
B.2.6 Floating Point	1	The Floating Point format (32 bits) can be used to express quantities in the approximate range $\pm 2^{255}$ (about $\pm 10^{76}$) with a precision of 22 bits (over six significant decimal digits). Floating point numbers shall be expressed with a sign, a nine-bit exponent, and a 22-bit mantissa.	N/A	No Analog Data
B.2.7 Double Floating Point	1	The Double Floating Point format (48 bits) can be used to express quantities in the approximate range $\pm 2^{255}$ (about $\pm 10^{76}$) with a precision of 38 bits (over ten significant decimal digits). Double floating point numbers shall be expressed with a sign, a nine-bit exponent, and	N/A	No Analog Data
B.2.10 ASCII Floating Point	1	An ASCII floating point format (12 bytes) can be used to express quantities in the range $\pm 10^{99}$ with a precision of seven decimal digits. The quantity shall be represented as a 12-character string in the following format:	N/A	
B.2.12 Unformatted	1	Unformatted messages shall be used to report anything that cannot be expressed in any of the other formats.	Yes	
B.2.12	2	The individual interface agreements shall explain how any unformatted messages are to be constructed and interpreted.	Yes	
C.2 NMC Translator	1	DFL-1-2/890-132 subsystems shall ensure that the program/versionID transmitted (in Segment 1) actually corresponds to the software version producing the information.	N/A	USC is not a DFL-1-2/890-132 subsystem
C.6 Monitor Data	1	If a DFL-1-2/890-132 subsystem expects to poll for monitor data published by a MON-2 subsystem, the MON-2 subsystem shall ensure that the data are published under the functional address expected by the DFL-1-2/890-132 subsystem.	N/A	USC is not a DFL-1-2/890-132 subsystem
	2	CDEs of DFL-1-2/890-132 subsystems shall provide the MDS Monitor Data Definition information via the on-line MDDS.	N/A	USC is not a DFL-1-2/890-132 subsystem
C.7 Subsystem Displays	1	CDEs of DFL-1-2/890-132 subsystems shall provide the NMC Directives List File information via the on-line MDDS.	N/A	USC is not a DFL-1-2/890-132 subsystem

Appendix B Acronyms

ANT - Antenna
ATL - Active Template Library
BVR - Block V Receiver
BWG - Beam Wave Guide
CCC - Changing Config Control
CCG - Configuration Control Group
CJB - Command Junction Box Assembly
CMN - Common Software
COTS – Commercial of the Shelf
DCC - Downlink Channel Controller
DLF - DSN Logistic Facilities
DMC - DSCC Monitor and Control
DRX - DSCC Receiver Subsystem
DSCC - Deep Space Communication Complex
DSMS - Deep Space Missions System
DSN - Deep Space Network
DTF-21 - Development Test facility # 21
DTT – Downlink Tracking and Telemetry Subsystem
ECO - Engineering Change Order
ECR - Engineering Change Request
EDCL - Equipment Delivery Checklist
ETC - Exciter Transmitter Controller
ETX - Exciter Transmitter Subsystem
FAC - Facilities
FEA – Front End Area
FTS - Frequency and Timing Subsystem
HSB - High Speed Beam Wave guide Antenna Subnet
ILA - Interlock Logic Assembly
LMT - Local Maintenance Terminal
LNA - Low Noise Amplifier
LRE - Lowest Replicable Element
MCIS - Monitor & Control Infrastructure Services

MDCL - MESKIT Delivery Checklist
MDS - Monitor Data Server
MESKIT - Maintenance and Test Equipment and Spares Kit
MFC - Microsoft Foundation classes
MIA- Mission Interface Assembly
MODKIT- Modification Kit
MSPA - Multiple Spacecraft Per Antenna
NMC - NOCC Monitor and Control
NOCC - Network Operations Control Center
NRT - NOCC Real-Time Subsystem
NSS - Network Support Subsystem
OD - Operator Directive
PC - Personal Computer
PDCR - Preliminary Definition & Cost Review
PLC - Programmable Logic Controller
RMT - Remote Maintenance Terminal
SCD - Service Capability Development Process
SFOC - Space Flight Operations Center
SIM - Serial Interface ModuleSIS Software Interface Agreement
SITP - Subsystem Integration & Test Plan
SOM - Software Operational Manual
SPC - Signal Processing Center
SPT - System Performance Test
STP - Software Test Plan
SWTA - Software Transfer Agreement
TCT - Time Code Translator
TXR - Transmitter
UDS - Uniform Display Service
UGC - Microwave Generic Controller
UIA - Microwave Interlock Assembly
UMT - Microwave Maintenance Terminal
UPL - Uplink
USC - Microwave Subsystem Controller
UWV - Microwave Subsystem
WBS - Work Break Down Structure

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