

SGSS Contract Data Item List (CDRL)

Baseline

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**National Aeronautics and
Space Administration**

**Goddard Space Flight Center
Greenbelt, Maryland**

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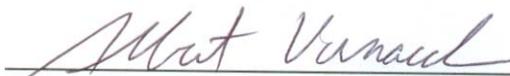


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Preface

This document is under the configuration management of the Space Network Ground Segment Sustainment (SGSS) Project (Code 458) Configuration Control Board (CCB). Configuration Change Requests (CCRs) to this document shall be submitted to the SGSS Project CCB, along with supportive material justifying the proposed change. Changes to this document shall be made by Documentation Change Notice (DCN) or by complete revision.

Direct all comments, questions, or suggestions regarding this document to:

Space Network Ground Segment Sustainment (SGSS) Project
Code 458
Goddard Space Flight Center
Greenbelt, MD 20771

Change Information Page

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Section 1 Introduction

This document provides the Contract Data Requirements List (CDRL) of the Data Items (DI) that shall be provided by the SN Ground Segment Sustainment (SGSS) contractor as data deliverables in support of the SGSS development. Section 1.0 includes the introduction and the description of the CDRL document. Section 2.0 provides definitions for the identification, delivery and acceptance of the CDRL DIs. Section 3.0 provides a summary listing of the CDRL DIs with the related identification number, proposal inclusion, acceptance, and submission information. Section 4.0 provides the Data Item Description's (DIDs) for each CDRL DI in Section 3.0.

Section 2 Identification, Reference, Delivery, and Acceptance

The transmittal letter and/or email for all deliverables shall be addressed to the SN Ground Segment Sustainment Contracting Officer at:

Jonathon D Wingerberg
NASA/Goddard Space Flight Center, Code 210.M,
Greenbelt, MD 20771

The following definitions and instructions apply to Tables 1 through 11 in Section 3.0.

2.1 ID Column

The information in the ID column identifies the Data Item by functional category and a sequential number within that category. The data item prefixes and the associated functional categories are listed below.

Data Item Prefix	Functional Category
PM	Project Management
CM	Configuration Management
PS	Project Security
SE	System Engineering
RE	Review Packages
SW	Software Development
HW	Hardware Development
IT	Integration and Test
MA	Mission Assurance
TR	Training
MO	Maintenance and Operations

2.2 Title

The CDRL Title describes the required data, or document that is traceable to specific elements of the functional category breakdown structure.

2.3 Reference

The reference is the Statement of Work (SOW) or other requirement associated with the Data Item.

2.4 Proposal

An “X” in this column indicates that a preliminary version of the Data Item shall be included with proposal.

2.5 Contract Submission

Submission information contained within this column will include:

2.5.1 Maturity Information

Preliminary: The initial submission of an item. To be completed with available information as of the time of preparation for the due date.

Update: The best up-to-date information available at the time. Any updates shall require the same "approval/review" process as was required for the previous submissions.

Final: The complete thorough submission of an item for approval, review, or information.

2.5.2 Terminology

Meanings/definitions for terminology used in the CDRL are as follows:

Term	Meaning/Definition
shall	designates a requirement
will, is	designate statements of fact
TBD	“To Be Determined”, applied to a missing requirement means that the contractor determines the missing requirement.
TBR	“To Be Reviewed”. This is applied to requirements or values that are subject to review by the Government and the contractor. The “TBR” merely provides an indication that the value has the potential to change in a future modification.
TBS	“To Be Supplied”, identifies missing or incomplete information, values, or data needed to fulfill a requirement. The Government will furnish values for items identified by a TBS. The Government will provide a date or milestone for each TBS requirement”.
SGSS Contractor Development (SGSSCD)	Applied to the SGSSCD architecture and functionality being provided directly by the SGSS contractor, hereafter referred to as “contractor”.
ATP	Authority to Proceed
ATO	Authority to Operate
DACA	days after contract award
Monthly	By the 15th of each month or as required or as modified by the Contract Office (CO).
Bi-weekly	Submitted with Bi-weekly Status Reports by Tuesday close of business or as modified by CO.

Weekly	Submitted weekly by Friday close of business or as modified by CO.
Days	Calendar days, unless indicated otherwise.
As Generated	After each initial edition, revision, addition. Items that are critical to schedule, performance, or interface shall be transmitted to SGSS Project within 48 hours of generation.
As Required	Items updated and delivered as required at the direction of the CO.

2.5.3 Electronic Delivery Format

Unless otherwise indicated under Hard Copy Deliverables, all data items **shall** be delivered in electronic format to a SGSS Project specified web portal. Electronic deliverables **shall** be delivered in the following formats unless otherwise approved by the CO:

- Text Documents: Microsoft (MS) Word and PDF
- Presentations: MS PowerPoint
- Spreadsheets: MS Excel
- Database: Delimited ASCII files accompanied by a database schema document defining tables and entries.
- Schedules: MS Project
- Schematics and Drawings: PDF and MS Visio
- Photographs: JPEG or current industry standard.
- Video: Any readily available open standard (e.g., AVI, MPEG)

The contractor shall use the current version or the most recent previous version of the above formats.

Electronic format deliverables shall have file names that indicate the CDRL number and the contract submission type (i.e., CDRL-PM-01-Initial).

The title page of all CDRLs shall contain the CDRL number, contract submission type and the date.

2.5.4 Hard Copy Deliverables

The number of hard copy deliverables, is indicated in the Hard Copy column. All hardcopy deliverables **shall** be delivered to:

SGSS Project Documentation Manager
Address (TBS)

Hard Copy deliverables include data that is typed, drawn or printed on paper using common conventional practices. If required, the original, a reproduction, or the record copy **shall** be produced or reproduced, for distribution as printed copies.

2.6 Contract Acceptance Code

The following codes apply to all submissions of the CDRLs (i.e., preliminary, final, and updates) as identified in Table 2.

A –Approval: Documents in this category **shall** require submission to the SGSS Project within the time specified and written approval prior to Contractor implementation. Requirements for resubmission **shall** be as specified in letter(s) of disapproval. The SGSS Project will act on items requiring approval within 30 days of receipt of the item.

R –Review: Documents in this category **shall** be submitted to the SGSS Project within the time period specified, and will be subject to evaluation. These documents **shall** be implemented upon issuance unless otherwise noted. However, when an evaluation reveals inadequacies in a document, the Contractor **shall** correct the document as required.

I –Information: Documents in this category will be used by the SGSS Project to determine current project status and progress and for future planning requirements.

2.7 Format

Unless otherwise specified in the individual Data Item Description, contractor format is acceptable.

2.8 Documentation Change Procedures

The documentation change procedures are as follows:

- The contractor **shall** issue documentation change notices (DCNs) whenever minor changes or updates occur in data items that have been delivered to the Government.
- Change bars **shall** be used to indicate changes or updates.
- When major changes to a document are made, a complete revision of the document **shall** be issued and delivered to the Government.

2.9 Document Markings

Documents containing materials or information covered and controlled by International Trafficking in Arms Regulations (ITAR) or Export Administration Regulation (EAR) regulations, as determined by the contractor, **shall** be so marked on the cover and on pages containing such materials. Documents containing contractor Proprietary materials or information, as determined by the contractor, **shall** be so marked on the cover and on pages containing such materials.

Documents **shall** not be unnecessarily or unjustifiably marked with restrictive or limiting labels, nor **shall** such labeling be applied frivolously.

Section 3 Contract Data Requirements List

The Contract Data Requirements List is represented in Tables 1 through 11. For an explanation of terms and definitions see Section 2.0.

3.1 Project Management

Table 1 – SGSS Contract Data Requirements List – Project Management								
ID	Title	Ref ¹	Prop ²	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
PM-01	Project Management Plan (PMP)	SOW 112, 114,3.13.2		30 DACA	90 DACA			A
PM-02	Risk Management Plan (RMP)	SOW 133		30 DACA	90 DACA	As required		A
PM-03	Integrated Master Schedule (IMS)	SOW 115, 242 3.13.2	*		30 DACA	monthly		A
PM-04	Subcontract Management Plan	SOW 414, 415,523		30 DACA	90 DACA	As required		A
PM-05	Earned Value Management System (EVMS) Plan	SOW 418, 216, 3.4.2			IBR-6 weeks			R
PM-06	Monthly Project Status Review (MPSR)	SOW 241, MAR 210, 284			Monthly			I
PM-07	Weekly Status Reports	SOW 586			Every week			I
PM-08	Meeting Minutes	SOW 417		Meeting + 3 day				R
PM-09	Contract Performance Report (CPR)	SOW 130			After the 15 th day of the month of	On the 15 th day of the month		R

¹ SOW or MAR Reference

² Draft Due with Proposal

Table 1 – SGSS Contract Data Requirements List – Project Management

ID	Title	Ref ¹	Prop ²	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
					contract award			
PM-10	Cost Analysis Data Requirements (CADRe)	SOW 584		60 DACA	90 DACA	PDR-45d, CDR+45d, Project Delivery +90d		A
PM-11	Integrated Baseline Review (IBR) Data Package	SOW 126, 516		IBR–6 weeks	IBR	Upon approved rebaseline		R
PM-12	Financial Reports	SOW 585			Monthly per NPR 9501.2D Quarterly per NPR 9501.2D	10th business day after accounting period close for Monthly 15 days preceding the QTR being reported for the quarterly report		R
PM-13	Discrepancy Report (DR)	SOW 3.9 SOW 916, 378,387, MAR 117, 180, 230			As Generated			CAT I&II – A Cat III & V – R
PM-14	Action Items	SOW 526			As Generated			CAT I&II – A Cat III & V – R
PM-15	Option Management and Implementation Plan	SOW 620 SOW 621		30 calendar Days After Option Start	60 Days after Option Start			A
PM-16	Life cycle cost model and prediction report	SOW 629		PDR – 30 calendar days	CDR – 30 calendar days	As required		R

3.2 Configuration Management

Table 2 – SGSS Contract Data Requirements List – Configuration Management								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
CM-01	Configuration Management Plan (CMP)	SOW 139		60 DACA	90 DACA	As required		A
CM-02	SGSS Document Tree	SOW 593		SRR-2 weeks	PDR-2 weeks	CDR – 2 weeks		R
CM-03	SGSS Drawing Tree	SOW 594		PDR-2 weeks	CDR-2 weeks	CDR + 30 calendar days PRESHIP – 1 week		R
CM-04	Configuration Item Identification List (CIIL)	SOW 551		PDR-2 weeks	CDR-2 weeks	CDR + 30 calendar days PRESHIP		R
CM-05	Configuration Control Board Minutes	SOW 546			As generated			R
CM-06	Engineering Change Requests	SOW 592			As generated			Class 1 = A Class 2 =R
CM-07	Inventory Database	SOW 258, 687			90 DACA	Update annually		I
CM-08	Waiver Request	SOW 144 MAR 102			As generated			A

3.3 Project Security

Table 3 – SGSS Contract Data Requirements List – Project Security								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
PS-01	IT Systems Security Plan	SOW 196		SRR-2 weeks	PDR	CDR, every 3 years and whenever a significant system changes occurs		A
PS-02	IT Systems Security Assessment	SOW 198		PDR-2 weeks	ATO-3 months	Annually and whenever a significant system change occurs		A
PS-03	IT Security Risk Assessment	SOW 618		PDR-2 weeks	ATO-3 months	Every 3 years and whenever a significant system change occurs		A
PS-04	IT Contingency Plan	SOW 199		PDR-2 weeks	ATO-3 months	CDR and whenever a significant system changes occurs		A
PS-05	Certification and Accreditation Support Documentation	SOW 200		PDR-2 weeks	ATO – 3 weeks	Every 3 years and whenever a significant system change occurs		A
PS-06	Interconnection Security Agreement	SOW 825		PDR-2 weeks	ATO- 3 weeks	CDR, When there are external interface changes or significant system changes		R
PS-07	Project Security Plan	SOW 626, 182		90 DACA		Every 3 years and whenever a significant project change occurs		A

3.4 Systems Engineering

Table 4 – SGSS Contract Data Requirements List – Systems Engineering								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
SE-01	Systems Engineering Management Plan (SEMP)	SOW 261, 264, 820		30 DACA	SRR – 2 weeks			A
SE-02	SGSS Verification and Validation Plan (V&VP)	SOW 290, 671, 4.5.1, MAR 257, 259	*	SRR – 3 weeks	PDR – 3 weeks	As required		A
SE-03	SGSS Concept of Operations (Con Ops)	SOW 473, 629		Con Ops Document with Element Level Scenarios 90 DACA CI Level Scenarios as required Element PDR – 3 weeks	System Level Scenarios 90 DACA Con Ops Doc with Element Level Scenarios as required Element CDR – 3 weeks	System and Element Level Con Ops PDR – 3 weeks CDR – 3 weeks CI Level Scenarios – as required		A
SE-04	SGSS Element Requirements Specification	SOW 629		SRR-2 Weeks	Element PDR-3 weeks	Element PDR+ 60 Calendar days		A
SE-05	SGSS Software Requirements Specifications	SOW 629, 695		Element Level: SRR – 3 weeks	Element Level: SWRR – 3	Element Level: PDR + 60 calendar days CI Level: CDR + 60		R

Table 4 – SGSS Contract Data Requirements List – Systems Engineering

ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
				CI Level: Element PDR – 3 weeks	weeks CI Level: Element CDR – 3 weeks	calendar days		
SE-06	SGSS Hardware Requirements Specifications	SOW 629, 689		Element Level: SRR + 90 calendar days CI Level: Element PDR – 3 weeks	Element Level: Element PDR – 3 weeks CI Level: Element CDR – 3 weeks	Element Level: PDR + 60 calendar days CI Level: CDR + 60 calendar days		R
SE-07	Requirements Verification Traceability Matrix	SOW 385, 851, MAR 113, 114	*	90 DACA	SRR-3 weeks	PDR – 3 weeks, CDR – 3 weeks, TRR – 3 weeks, PRESHIP – 3 weeks		R
SE-08	SN External Interface Control Documents	SOW 279, 280, 629		90 DACA	SRR – 3 weeks	MDR – 3 weeks PDR – 3 weeks CDR – 3 weeks TRR-2weeks		A
SE-09	Engineering Peer Review Plan	SOW 305 4.4.2		ATP + 30 calendar days	ATP + 90 calendar days	As required		R
SE-10	Technology Development Plan	SOW 368, MAR 278		SRR – 2 weeks	PDR – 3 weeks	CDR – 3 weeks		A
SE-11	SGSS Architecture Description Document (ADD)	SOW 629, 817		System Level ADD to Element Level : 90 DACA	System Level ADD to Element Level: SRR - 3 weeks	System Level: As required. Element and Lower Levels: Element CDRs – 2		R

Table 4 – SGSS Contract Data Requirements List – Systems Engineering

ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
				Sub-Element and Lower Levels: SRR – 3 weeks	Sub-Element and Lower Levels: Element PDRs – 3 weeks	weeks		
SE-12	Technical Study, Trade Study and Analysis Reports	SOW 836, 165, 167, 818 4.3.3		Initial Studies per SOW 836 PDR-3 weeks Other Studies As required	Initial Studies per SOW 836 CDR-3 weeks Other Studies As required	As required		R
SE-13	Modeling and Simulation Plan	SOW 285, 286, 659		SRR- 3 weeks	CDR – 3 weeks	CDR + 60 calendar days		R
SE-14	Modeling and Simulation Analysis Report	SOW 287			As required	As required		R
SE-15	Engineering Drawings	SOW 915 MAR 248		CDR – 1 week	1 week prior to Preship Review(s)	As required		I
SE-16	Engineering Peer Review Data Packages	SOW 307			AS required			R
SE-17	Software and Systems Metrics Report	SOW 820; MAR 270, 227, 228, 229		SRR+30		monthly		I
SE-18	SGSS Internal Interface Requirements Document	SOW 279, 280, 629		SRR – 3 weeks	PDR –3 weeks	CDR - 3 weeks		R

Table 4 – SGSS Contract Data Requirements List – Systems Engineering

ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
SE-19	SGSS Internal Interface Control Document	SOW 279,280,629		PDR – 3 weeks	CDR –3 weeks	TRR-2 weeks		R
SE-20	Technology Readiness Assessment Report (TRAR)	SOW 640		SRR – 2 weeks	PDR – 2 weeks			R
SE-21	Make Versus Buy Plan	SOW 819, MAR 268, 127, 172, 184 187, 236, 242, 250 257, 258 259, 260		PDR-3 weeks	CDR-3 weeks	As required		A

3.5 Review Packages

Table 5 – SGSS Contract Data Requirements List – Review Packages								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
RE-01	Systems Requirements Review (SRR); SGSS Data Package	SOW 549		SRR – 4 weeks	SRR + 30 calendar days		40 Color 60 B&W	R
RE-02	Software Requirements Review (SWRR); SGSS Data Package	SOW 562, 658		SWRR – 2 weeks	SWRR + 30 calendar days		10 Color 20 B&W	R
RE-03	Preliminary Design Review (PDR); SGSS Data Package	SOW 549		PDR – 2 weeks	PDR + 30 calendar days		40 Color 60 B&W	R
RE-04	Element Preliminary Design Review (PDR); SGSS Data Package	SOW 562, 658		Element PDR – 2 weeks	Element PDR + 30 calendar days		10 Color 20 B&W	R
RE-05	Element Critical Design Review (CDR) ; SGSS Data Package	SOW 658		Element CDR – 2 weeks	Element CDR + 30 calendar days		10 Color 20 B&W	R
RE-06	Critical Design Review (CDR) ; SGSS Data Package	SOW 549		CDR – 2 weeks	CDR + 30 calendar days		40 Color 60 B&W	R

Table 5 – SGSS Contract Data Requirements List – Review Packages

ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
RE-07	Mission Operations Review (MOR) data package	SOW 549,		MOR-2 weeks	MOR+30 calendar days		40 Color 60 B&W	R
RE-08	Systems Integration Review (SIR) Data Package	SOW 843		SIR – 2 weeks	SIR + 30 calendar days		10 Color 20 B&W	R
RE-09	Production Readiness Review – First Article Review (PRR); SGSS Data Package	SOW 914		PRR – 2 weeks	PRR + 30 calendar days		10 Color 20 B&W	R
RE-10	Pre-Shipment System Review (Preship) Data Package	SOW 549		Preship – 2 weeks	Preship + 30 calendar days		40 Color 60 B&W	R
RE-11	Test Readiness Review (TRR) Data Package	SOW 869		TRR- 2 weeks	TRR + 30 calendar days		10 Color 20 B&W	R
RE-12	Operational Readiness Review (ORR) Data Package	SOW 456, 549		ORR – 2 weeks	ORR +30 calendar days		40 Color 60 B&W	R
RE-13	Final Acceptance Review (FAR) Data Package	SOW 549		FAR – 2 weeks	FAR + 30 calendar days		40 Color 60 B&W	R

3.6 Software Development

Table 6 – SGSS Contract Data Requirements List – Software Development								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
SW-01	Software Development and Management Plan (SDMP)	SOW 371		90 DACA	120 DACA			A
SW-03	Software Element Design Description	SOW 629, 695		Element PDR– 3 weeks	Element CDR – 3 weeks	CDR – 2 weeks		R
SW-04	SGSS Database Design Descriptions	SOW 629, 697		Element PDR– 3 weeks	Element CDR – 3 weeks	CDR – 2 weeks		R
SW-05	Software Data Dictionary	SOW 629		PDR – 3 weeks	CDR – 3 weeks	CDR + 30 Calendar days		R
SW-06	Software Test Plan (STP)	SOW 436		PDR- 2weeks	CDR-2weeks	As required		A
SW-07	Software Maintenance Manuals	SOW 483		First delivery – 3 weeks	2 weeks prior to SGSS Acceptance review	As required		A
SW-08	Software Users Manuals	SOW 510		First delivery – 3 weeks	2 weeks prior to SGSS Acceptance review	As required		A

Table 6 – SGSS Contract Data Requirements List – Software Development

ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
SW-09	SGSS Software Design Description	SOW 694			For each software delivery	As required		R

3.7 Hardware Development

Table 7 – SGSS Contract Data Requirements List – Hardware Development								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
HW-01	SGSS Hardware Design Descriptions	SOW 688, 629		PDR- 3 weeks	CDR – 3 weeks	CDR – 2 weeks		R
HW-02	Hardware Element Design Description	SOW 689		Element PDR- 2weeks	Element CDR- 2weeks	As required	40 Color Final Only	R
HW-03	Hardware Test Plan	SOW 698		PDR- 2weeks	CDR-2weeks	As required		A
HW-04	Hardware Maintenance Manual	SOW 829		First delivery – 3 weeks	2 weeks prior to SGSS Acceptance review	As required	40 Color Final only	A
HW-05	Hardware Users Manual	SOW 510		First delivery – 3 weeks	2 weeks prior to SGSS Acceptance review	As required		A

3.8 Integration and Test

Table 8 – SGSS Contract Data Requirements List – Integration and Test								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
IT-01	Integration and Test Plan	SOW 671 8.2		PDR – 2 weeks	CDR – 2 weeks	CDR + 60 calendar days and as required		A
IT-02	Detailed Test Plans	SOW 868, 878		60 calendar days prior to test	TRR / Test – 2 weeks	As required		A
IT-03	Detailed Test Procedures	SOW 868		60 calendar days prior to test	TRR / Test – 2 weeks	As required		A
IT-04	Post Test Reports	SOW 868		Test + 2 weeks		As required		R

3.9 Mission Assurance

Table 9 – SGSS Contract Data Requirements List – Mission Assurance								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
MA-01	Mission Assurance Implementation Plan	MAR 112, 272		30 Calendar DACA	90 Calendar DACA	As Required		A
MA-02	Software Quality Assurance Plan	MAR 220, 5.2		60 DACA	PDR – 2 Weeks	As Required		A
	Software Quality Assurance Plan – Monitor and Audit Schedule	MAR 220, 5.2		60 DACA	FAR	Quarterly		R
MA-03	Quality Manual	MAR 116		60 Calendar DACA	90 Calendar DACA	As Required		R
MA-04	System Safety Program Plan	MAR 133, 135, 137, 138, 139, 140		SRR	CDR – 3 weeks	As Required		A
MA-05	Safety Requirements Compliance Checklist	MAR 141		PDR – 3 weeks	CDR – 3 weeks	As required		A

Table 9 – SGSS Contract Data Requirements List – Mission Assurance								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
MA-06	Safety Assessment Report	MAR 286, 143, 145, 146, 147, 148, 150, 151, 152		PDR – 4 weeks	PSR – 4 weeks	CDR – 4 weeks, and as required, at minimum prior to each start of “Shadow Operations”		A
MA-09	Safety Variance	MAR 154, 155		As Soon As Identified	As soon as identified			A
MA-11	Probabilistic Risk Assessment and Reliability, Maintainability and Availability Program Plan	MAR 161, 162, 163, 164 167, 178, 211 222, 233		60 DACA	SRR – 30 calendar days	Monthly Progress Updates		A
MA-12	Reliability, Maintainability and Availability Model and Predictions Report	MAR 162 171, 206, 207, 209, 210, 232		SRR – 3 weeks	PDR – 3 weeks	CDR – 3 weeks		R
MA-13	Maintainability Demonstration Report	MAR 172, 173		PSR – 3 weeks	ORR – 3 weeks	FAR and As Required		R
MA-14	Operational Availability Report	MAR 168		First ORR – 1 week	FAR -1 week	Weekly until FAR		R

Table 9 – SGSS Contract Data Requirements List – Mission Assurance

ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
MA-15	Probabilistic Risk Assessment	MAR 162, 184, 185, 186		SRR +90 days	CDR – 3 weeks	PDR – 3 weeks , and as required		A
MA-16	Failure Mode and Effects Analysis (FMEA)	MAR 187, 188, 189,190, 191, 193, 194, 195, 196, 197,198, 199		SRR – 3 weeks	CDR – 3 weeks	3 weeks prior each Critical Milestone Review		R
	Critical Items List (CIL)	MAR 187, 190, 191, 197		SRR – 3 weeks	CDR – 3 weeks	3 weeks prior each Critical Milestone Review		R
MA-17	Fault Tree Analysis (FTA), Qualitative	MAR 200, 202		SRR – 3 weeks	CDR – 3 weeks	As required		R
	Fault Tree Analysis (FTA), Quantitative	MAR 201, 202			With PRA analysis	As required		R
MA-18	EEE Parts List	MAR 247		PDR – 2 Weeks	CDR – 2 Weeks	As Required		R

Table 9 – SGSS Contract Data Requirements List – Mission Assurance								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
MA-19	Worst Case Analysis	MAR 205 MAR 269		PDR – 3 weeks	CDR – 3 weeks	Within 30 calendar days of change		R
MA-20	Trend Analysis	MAR 212 MAR 213 MAR 234		SRR – 3 weeks	FAR -2 weeks	Monthly until FAR		R
MA-21	Limited-Life Items List	MAR 214, 215		PDR – 3 weeks	CDR – 3 weeks	Within 30 calendar days of change		R
MA-22	Lead-free Control Plan	MAR 256		60 calendar DACA	SRR +90 calendar days	As Required		A
MA-23	ESD Control Plan	MAR 264		PDR – 2 Weeks	CDR – 2 Weeks	As Required		A
MA-24	Parts Stress Analysis	MAR 290			CDR - 45 days	Within 20 days of change		R
MA-25	Workmanship Plan	MAR 289		PDR - 3 weeks	CDR – 3 weeks	As required		A

3.10 Training

Table 10 – SGSS Contract Data Requirements List – Training								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
TR-01	Training Plan	SOW 501		PDR – 2 weeks	CDR – 2 weeks			A
TR-02	Training Documentation	SOW 504, 508		8 weeks before first training session	3 weeks before first training session	As required		A
TR-03	Wall Chart	SOW 509		CDR – 2 weeks	CDR + 30 calendar days	As required		R

3.11 Maintenance and Operations

Table 11 – SGSS Contract Data Requirements List Maintenance and Operations								
ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
MO-01	Transition Plan	SOW 420, 671, 443, 444, 445, 468	*	SRR – 2 weeks	PDR – 2 weeks	CDR and As required		A
MO-02	Maintenance and Sustainment Plan	SOW 481, 632		CDR– 2 weeks	ORR – 30 calendar days			R
MO-03	Maintenance Records	SOW 482		One month after start of I&T	Monthly			I
MO-04	Logistics Analysis and Support Plan	SOW 493, 494, 496,497,498, MAR 175		PDR	CDR	As Required		A
MO-05	Space Network User’s Guide (450-SNUG)	SOW 835, 842		MOR – 3 weeks	FAR – 3 weeks			A
MO-06	Space Network Handbook (450-HDBK-SN)	SOW 835, 842		MOR – 3 weeks	FAR – 3 weeks			A
MO-07	Operations Handbook	SOW 517, 842, 644		MOR- 3 weeks	3 weeks prior to ORR	As required	6	A

Table 11 – SGSS Contract Data Requirements List Maintenance and Operations

ID	Title	Ref (1)	Prop (2)	Contract Submission				Contract Acceptance Code
				Preliminary	Final	Updates	Hard copy	
MO-08	Operations and Maintenance Manual	SOW 517, 842,		MOR – 3 weeks	3 weeks prior to ORR	As required	6	A
MO-09	Mission Operations Procedures	SOW 629, 842, 510,		MOR – 2 weeks	ORR – 2 weeks		6	A
MO-10	Computer Operator Manuals	SOW 510		First Hardware Delivery to Site – 3 weeks	ORR-2 weeks	As Required, FAR – 2 weeks		I
MO-11	Computer Programming Manuals	SOW 510		First Hardware Delivery to Site – 3 weeks	ORR – 2 weeks	As Required, FAR – 2 weeks		I
MO-12	Firmware Support Manual	SOW 510		First Hardware Delivery to Site – 3 weeks	ORR – 2 weeks	As Required, FAR – 2 weeks		I
MO-13	Installation Plan	SOW 700		PRESHIP – 30 calendar days	ORR-2 weeks	As required		A
MO-14	Release Package	SOW 700		Preship – 3 weeks	ORR-3 weeks	As required		R

Section 4 Data Item Descriptions

4.1 Project Management

4.1.1 Project Management Plan (PMP)

DATA ITEM DESCRIPTION		2. NUMBER	PM-01
1. TITLE	Project Management Plan (PMP)	3. DATE	

4. DESCRIPTION/PURPOSE

Describes how the Project is organized and managed. It provides the management structure, its system of operation, responsible lines of communications, budgets and schedules, initial project risks, approach for managing project data, plan for project resources including labor, machinery/equipment, materials and methods, as well as, staff training needed and a description of stakeholder involvement.

5. DATA REQUIREMENTS

The Project Management Plan (PMP) shall comply with NPR 7120.5D.

The PMP shall address the overall organization, management approach, and structure of the SGSS Project including its interrelationships with the parent company and subcontractors, and the relationship with the Government.

The PMP shall describe how and where the project will operate during all phases of the contract.

The PMP shall delineate how the requirements of the Statement of Work (SOW) will be achieved and include a description of planned activities for identifiable SOW requirements.

The PMP shall describe (or reference the Risk Management Plan):

- The concept of the nature of the tasks and related risks.
- Discuss the likelihood of the risk occurrence and the approach to risk avoidance and/or solution.
- Address the degree to which proposed procedures are proven through similar experience.

The PMP **shall** include graphic representations (e.g. communication flow diagrams, logic networks, organizational structure charts) to reduce the amount of narrative material.

The PMP **shall** provide an organizational chart(s) and sufficient supplemental narrative to describe the proposed organizations for carrying out the Project. The organization chart will show the inter-relationships of technical management, business management, and subcontract management (from lower level through intermediate management to top-level management) with detailed explanations of:

- 1) The authority of the SGSS contractor Project Manager relative to other ongoing projects and applicable support organizations within the company structure. Discuss the project Manager's control over essential resources and functions necessary to accomplish the work.

- 2) How and by whom interdepartmental work will be monitored and the authority of the Project Manager over interdepartmental work.
- 3) Process to be followed by the Project Manager in obtaining decisions beyond his/her authority and in resolving priority conflicts for resources and functions not under the Project Manager's direct control such as personnel, finances, and facilities.
- 4) Roles, responsibilities and authority matrix to at least one level below the project manager.
- 5) The proposed SGSS Ground Mission Assurance organizational structure, including staffing plans, reporting channels, authority and responsibilities, and management visibility.
- 6) The requirements and available numbers of personnel (i.e., technical, test, manufacturing and system safety/quality assurance/ reliability/ configuration management personnel) for this project and the approach for addressing the shortfalls.
- 7) The independence of the system safety/quality assurance functions.
- 8) The communication lines between the project organization and the Government counterparts and the method of communication

The PMP **shall** provide contractual procedures proposed for the Project to effect administrative and engineering changes, describing any differences from existing procedures.

The PMP **shall** describe (or provide references to the Earned Value Management Plan) Earned Value Management techniques to be employed in minimizing project costs and schedule impacts, including controls to be exercised over subcontractors and suppliers.

The PMP **shall** explain/describe the schedule administration/control.

The PMP **shall** describe how the schedules are developed, maintained and updated.

The Project Management Plan **shall** explain the internal review cycle of the scheduling process.

The PMP **shall** explain the internal audit/review process that ensures that scheduling data reported to the Government accurately reflects the work status.

The PMP **shall** describe (or reference the Subcontractor Management Plan) how subcontracts will be managed and reviewed.

The PMP **shall** address the design review process including formal Peer Reviews.

The PMP **shall** include a description of all task and functional narratives required to address the requirements of the SOW and the events and activities.

The PMP **shall** describe the level of the Project organization CMMI qualifications.

The PMP shall capture the core activities necessary to accomplish project requirements.

The PMP shall include a staffing plan which shows staff levels over time by skills

The PMP shall contain selected Narratives (or references the Systems Engineering Management Plan (SEMP), etc.) to correlate the required processes to the achievement of the Significant Accomplishments and Accomplishment Criteria. The schedule for completing PMP activities is the Integrated Master Schedule (IMS).

The PMP in conjunction with the project control plans (e.g., Risk Management Plan, Earned Value Management Plan, etc.) **shall** be a single plan for the entire core effort, including associate and/or major subcontractor activities.

The PMP shall be consistent with the SOW and other project control plans (e.g., Risk Management Plan, IMS, and EVMS, including the Work Breakdown Structure (WBS).

Events in the PMP **shall** include key decision points in the project.

Events in the PMP **shall** clearly define expected maturity at a specific point in the project, as decision points for continued activity.

Events in the PMP **shall** mark the initiation or conclusion of major project activity.

Events in the PMP **shall** be logically sequenced and **shall** include demonstration milestones, major reviews, model and simulation results, or product deliveries, and other key decision points.

The PMP **shall** include definitions of each Event.

Significant Accomplishments **shall** be completed prior to entering or exiting an Event. Within each Event, Significant Accomplishments **shall** be grouped to ensure the PMP correctly addresses the interrelationships among functional disciplines. Significant Accomplishments **shall** provide Government insight into the process for achieving requirements of the SOW.

Significant Accomplishments in the PMP **shall** be sequenced in a manner that ensures a logical path is maintained throughout the effort and tracks against Events.

Each Significant Accomplishment in the PMP **shall** be defined by one or more Accomplishment Criteria:

- 1) Deed result at a specified Event which defines maturity;
- 2) Discrete step in a significant process; and
- 3) Description of interrelationship between different functional disciplines.

The PMP shall include a separate section to address the applicable preceding requirements for the simulator element(s).

The PMP **shall** include a project improvement process.

The PMP **shall** include any requirements for onsite office space.

4.1.2 Risk Management Plan (RMP)

DATA ITEM DESCRIPTION		2. NUMBER	PM-02
1. TITLE	Risk Management Plan (RMP)	3. DATE	

4. DESCRIPTION/PURPOSE

The purpose of the Risk Management Plan (RMP) is to define the continuous risk management strategy and process by which the project staff identifies, evaluates and minimizes the risks associated with project, and/or mission goals

5. DATA REQUIREMENTS

The Risk Management Plan shall comply with ISO-17666 dated 01 Apr 2003 (untailored) and NPR 8000.4.

The RMP **shall** include:

- 1) **An Introduction.** Specify the project risk objectives and policy toward risk. Explain the purpose, scope, assumptions, constraints, key ground rules, and policy pertaining to the project continuous risk management process.
- 2) **Process Overview.** Provide an overview of the continuous risk management process and information flow; describe how the continuous risk management process integrates and relates to other project management and system engineering activities. Include general risk mitigation strategies to be employed throughout project life cycle.
- 3) **Organization Plan.** Show the organization, roles, and responsibilities of project, customer, and supplier key personnel with regard to continuous risk management. Document how team members will be trained in the application of risk management methodology.
- 4) **Process Details.** Provide the risk management process details and related procedures, methods, tools, and metrics. Include here (or in an Appendix) the specific methodologies to be used for activities of continuous risk management (i.e., identify, analyze, plan, mitigate, track, control, communicate and document). Include the process to be used for continual assessment of the project Risk Profile. Describe how risk information will be communicated both internally to the project staff and throughout the Government management chain. The process should also include a definition of risk measures to monitor the status of the risks along with time intervals for risk monitoring and reassessment. Sources of the risk should be identified long with the approach for organizing, categorizing, comparing, and consolidating risks.
- 5) **Documentation of Risks.** Specify the format and data elements that will comprise the project Risk List (and/or Risk Database), how configuration control will be applied, and how the list will be used and updated. Tell how team members will be able to access the current list at any time. Include in the RMP the initial set of identified risks and the action plan (for research, acceptance, tracking, or mitigation) for each risk.
- 6) **Key Interfaces:** Describe the relationship and interface of the continuous risk management process to schedule, financial, Earned Value Management, and other business reporting systems.

- 7) **Appendix.** Material that is too detailed or sensitive to be placed in the main body of text may be placed in an appendix or included as reference. Include the appropriate reference in the main body of the text. Appendices may be bound separately, but are considered to be part of the document. Include an alphabetized list of the definitions for abbreviations and acronyms used in this document. Include an alphabetized list of definitions for special terms used in the document (i.e., terms used in a sense that differs from or is more specific than the common usage for such terms).

4.1.3 Integrated Master Schedule (IMS)

DATA ITEM DESCRIPTION		2. NUMBER	PM-03
1. TITLE	Integrated Master Schedule (IMS)	3. DATE	

4. DESCRIPTION/PURPOSE

Schedules are used to plan, monitor, communicate status, and control project activities, including pertinent resources and facilities, necessary to accomplish assigned tasks in compliance with the SGSS SOW. The IMS will provide the contractor's time-phased plan, current status, key milestones, task interdependencies, and major development phases necessary to accomplish the total scope of work (i.e., White Sands Complex (WSC), Second TDRSS Ground Terminal (STGT), etc.). The schedule will be used to provide management insight into contractor status, potential problem areas, and critical path identification, which will serve as the basis for evaluating contractor performance. The baseline IMS will be the basis for evaluating the schedule impact of government-directed changes on the agreed upon system Delivery Date (DD). All items denoted with ** shall be delivered with the proposal as a draft version of the CDRL.

5. DATA REQUIREMENTS

**The IMS shall comply with NPR 7120.5D and the NASA Scheduling Management Handbook (http://evm.nasa.gov/docs/handbooks/SchedMgmtMar2007/NASA_SMH_DRAFT_rev 16 April 2009 version).

The IMS **shall be developed using the Critical Path Method-based scheduling technique.

The IMS **shall consist of the schedule baseline and the current schedule updated each reporting period.

The IMS **shall** relate actual progress to the baseline and contain the current forecast for the remaining tasks.

The IMS **shall be reported in MS Project.

An Integrated Master Plan (IMP), in accordance with NASA Schedule Management Handbook, shall be developed to specify the management of the integrated master schedule. If the contractor uses an approved different process other than the one specified in the NASA Scheduling Management Handbook, then the same process should be detailed in the Schedule Management Plan.

The IMS **shall include tasks necessary to accomplish the total scope of work as defined in the WBS including the space segment and ground segment.

The IMS **shall also include all logical relationships (interdependencies) between tasks.

Schedules **shall** contain the approved baseline schedule as well as current forecasted dates and shall be traceable to the approved WBS.

All key milestones **shall be clearly identified including: contract milestones, design reviews, readiness reviews, and receivables/deliverables among subsystems/organizations (including subcontractor effort).

**Milestones shall be logically linked to related tasks.

The project schedule shall be created and maintained in a manner that supports automated time phasing of tasks, a logic driven critical path, schedule assessment, and trend analysis capabilities.

The IMS shall contain the following elements:

- 1) ****Activities detailed by task with early start and finish, and late start and finish dates (including subcontractor effort).**
- 2) Activity durations **shall** not exceed 20 work days (exceptions must be explained in the Contractor Schedule Assessment Report).
- 3) With the exception of the project start and finish milestones, for any activity or milestone without a predecessor or successor activity must provide an explanation in the Contractor Schedule Assessment Report.
- 4) ****Clearly identified schedule reserve.**
- 5) ****Clearly identified Need dates for Installation Accountable Government Property (IAGP).**
- 6) ****“As Soon As Possible” activity and milestone constraints (exceptions must be explained in the Contractor Schedule Assessment Report).**
- 7) ****“Finish to Start” activity relationships (exceptions must be explained in the Contractor Schedule Assessment Report).**
- 8) ****Realistic work calendars (indicating working and non-working periods)**
- 9) A month-end status date (i.e. “data date” or “as of date”)
- 10) ****Activities associated with major items, components, or definable subassembly, such as printed wiring assembly (PWA). Fabrication schedules detailed to the subassembly level, and the PWA level, showing substantive milestones.**
- 11) ****An assembly/test flows that depict sequences of fabrication, assembly, integration and test for components, elements, and systems, that include quality assurance test points and associated inspection level requirements.**

The IMS deliverable **shall** include the following items extracted from the IMS database. All data contained in these items shall be consistent (i.e. vertically and horizontally integrated), and based on the same data/status date:

- 1) ****Summary Master Schedule.** One page, top level, Gantt-type summary document arranged by WBS that reflects all contract and major/mission milestones, major project phases (i.e., design, fabrication, integration, assembly, etc.) and major end item deliveries.
- 2) **IMS Database.** Consisting of schedule data for all WBS elements. The logic network database serves as the basis for identification of project critical paths as well as critical schedule analysis.

The entire scope of work **shall** be broken into schedule tasks and milestones at a consistent level of detail to allow discrete progress measurement and visibility into the overall development, fabrication, integration, assembly, test, and delivery phase of each end item deliverable.

Additionally, all schedule tasks/milestones **shall** be integrated with the appropriate sequence relationships to provide a total end-to-end logic network leading to each end item delivery.

This database **shall** contain all contract and controlled milestones, key subcontractor milestones, end item delivery dates, key data delivery dates, and key IAGP need dates.

The IMS Database **shall** contain the appropriate task coding attributes necessary to provide

sort, select, and summarization capabilities for, but not limited to, WBS element, project phase, and indefinite quantity indefinite delivery (IDIQ) tasks.

- 3) **Total Slack/Float Report.** The Total Slack/Float Report **shall** be an extract from the IMS Database and include all tasks and milestones with 10 workdays or less of total slack (float).

The Total Slack/Float Report **shall** be submitted in a waterfall format and organized in manner such that the path with the least amount of slack is delineated first and followed by each successive path according to total slack values. This report should provide any additional information needed for understanding and analyzing critical path and its related activities.

- 4) **Contractor Schedule Assessment Report.** The Contractor Schedule Assessment Report **shall** contain a count of the total number of tasks, milestones and non-detail (e.g., summary, hammock, rollup, etc.) activities contained in the schedule, a count of the number of completed tasks and milestones, a count of the number of tasks and milestones to be completed, a count of the number of tasks and milestones that have no predecessor and/or successor relationships, a count of the total number of tasks and milestones that have a total float (slack) value greater than 25% of the remaining duration of the total project schedule, a count of the total number of non-detail (e.g., summary, hammock, rollup, etc.) activities that have any predecessor or successor logical relationships, and a count of the total number of tasks and milestones that have forced or fixed dates.

The Contractor Schedule Assessment Report **shall** contain narratives explaining changes and impacts to the critical path and total slack/float report listed in Item 3 above.

The Contractor Schedule Assessment Report **shall** contain narrative explanations for contract milestones, major milestones, mission milestones, and Project Control Milestones (PCMs) that have been delayed by more than 10 calendar days into the future from their baseline dates.

PCMs **shall** be identified and negotiated with the project office.

These narratives **shall** include a proposed work-around schedule detailing how the contractor plans to recover the lost schedule time.

- 5) **Project Control Milestone Charts.** A PCM trend chart shall be submitted.

This chart shall consist of control milestones and forecasted early completion and shall display historical slips trend.

A PCM cumulative trend chart **shall** be submitted.

This chart **shall** consist of the baseline PCMs and their corresponding early finish dates, actual PCMs completed to date, and forecast PCMs for the remaining effort and their corresponding early finish.

- 6) **Schedule Revision Log (Schedule Change Control Log).** The Contractor **shall** maintain and deliver a Schedule Revision Log documenting all IMS changes (baseline and current forecast) and their rationale (task additions, deletions, duration adjustments, changes to logic, constraints,

activity relationships, etc.).

- 7) **Weekly I & T Schedule.** A weekly I & T schedule **shall** be submitted in Contractor format containing prior week and the work planned for the next two weeks organized by shift.

**The IMS shall include a separate section to address the applicable preceding requirements for the simulator elements(s).

4.1.4 Subcontract Management Plan

DATA ITEM DESCRIPTION		2. NUMBER	PM-04
1. TITLE	Subcontract Management Plan	3. DATE	

4. DESCRIPTION/PURPOSE

Describes how the subcontracts are organized and managed. It provides the management structure, its system of operation, and responsible lines of communications.

5. DATA REQUIREMENTS

The Subcontract Management Plan shall comply with NPR 7120.5D and NPR 7150.2.

The Subcontract Management Plan **shall** provide descriptions on Subcontract Administration including: Subcontract Management Recourses/Qualification, Subcontractor Selection Criteria and Process for Coordinating, Integrating and Controller Contractors.

The Subcontract Management Plan **shall** provide an organizational chart(s) and sufficient supplemental narrative to describe the line of communication and authority:

- 1) The authority of the SGSS contractor PM relative to other ongoing projects and applicable support organizations within the company structure. Discuss the project manager's control over essential resources and functions necessary to accomplish the work.
- 2) How and by whom interdepartmental work will be monitored and the authority of the project manager over interdepartmental work.
- 3) Process to be followed by the project manager in obtaining decisions beyond his/her authority and in resolving priority conflicts for resources and functions not under the project manager's direct control such as personnel, finances, and facilities..

The Subcontract Management Plan **shall** describe the problem resolution process.

The Subcontract Management Plan **shall** describe the approach, and criteria used to determine the make/buy decisions to achieve the best value.

The Subcontract Management Plan **shall** describe the risk management approach for subcontractor specific risks or provide appropriate references to the risk management plan.

The Subcontract Management Plan **shall** describe the quality assurance approach for subcontractor's products and processes.

The Subcontract Management Plan shall provide a list of the subcontractors, the dollar value of the subcontract, the subcontract or responsibilities, and the CI's affected by the subcontract.

The Subcontract Management Plan shall describe the process for monitoring and controlling subcontractor performance including the implementation of corrective actions and subcontract termination

The Subcontract Management Plan shall ensure that acceptance testing or formal reviews are conducted on the subcontractor's subcontract deliverables. The frequency, coverage, and content of acceptance testing and reviews shall be documented in the subcontractor's PMP. Acceptance testing and review methods shall be documented, e.g., demonstration, analysis, inspection, test and review results shall be

verified by the contractor to ensure products meet requirements and a test or review report shall be prepared to document acceptance testing or review results.

The Subcontract Management Plan shall describe the process by which changes to the subcontractor's SOW, subcontract terms and conditions, and other commitments are controlled.

The subcontractor management plan shall describe the processes and deliverables (e.g., transition plans, training reports, Integration and Test Plan, etc.) that will be used to transition acquired products into the overall system.

4.1.5 Earned Value Management System (EVMS) Plan

DATA ITEM DESCRIPTION		2. NUMBER	PM-05
1. TITLE	Earned Value Management System (EVMS) Plan	3. DATE	

4. DESCRIPTION/PURPOSE

A fully validated EVMS is required as per NPR 7120.5D.

5. DATA REQUIREMENTS

The EVMS Plan shall comply with:

- NPR 7120.5D, Program/Project Management Processes and Requirement
- NFS 1852.234-2, Earned Value Management System
- American National Standards Institute/Electronic Industries Association (ANSI/EIA)748-B

The Contractor **shall** provide evidence of EVMS certification or, if not certified, the system certification status and outstanding actions for certification.

The EVMS Description **shall** be available in hardcopy or electronic media format upon request.

In the EVMS Plan and supporting documentation, the Contractor **shall** describe the project or project's implementation of its earned value management system.

The EVMS Plan **shall** demonstrate the use and understanding of the contract's overall financial and project management system with regard to EVMS at all levels of management.

The EVMS Plan **shall** identify policies, methods, procedures, and training utilized to meet the requirements of NPR 7120.5D and NPR 9501.2D (NF533).

The EVM Plan **shall** address processes for managing technical scope, schedule, cost and risk; for conducting variance analysis for identifying corrective actions; and for developing ongoing and comprehensive estimates at completion.

The EVMS Plan **shall** address the flow down of requirements to all major subcontracts consistent with the criteria and requirements defined in NPR 7120.5D.

The EVMS Plan **shall** ensure that the system provides for the results of all analyses based on EVM to be linked to or associated with the contractor's Risk Management System (as applicable). Any cost and/or schedule risk being managed by the contractor's Project Manager **shall** correlate the results of the EVM analysis process to track, manage, and mitigate risk.

The EVM Plan shall address the traceability of each work package to a project requirement in the WBS Dictionary

Revision to the EVMS Plan may be required at the Government's request if a change in the EVM system architecture occurs or in the event of a major contract modification.

4.1.6 Monthly Project Status Review (MPSR) Data Package

DATA ITEM DESCRIPTION		2. NUMBER	PM-06
1. TITLE	Monthly Project Status Review (MPSR) Data Package	3. DATE	

4. DESCRIPTION/PURPOSE

The Monthly Project Status Review (MPSR) Data Package provides management with a means for directing and monitoring the Project to ensure that the Project effort is being properly controlled. To present accomplishments compared to planned activities and recommendations on issues or concerns.

5. DATA REQUIREMENTS

The Monthly Project Management Status Review (MPSR) **shall** include all aspects of the effort covered by the contract. The Project Management Status Review documentation that **shall** be distributed to the attendees at the review **shall** consist of the agenda, presentation material, including detailed back-up material as needed, and documentation of action items and responses to action items, including supporting data as needed. The Monthly Project Management Stats Review shall also include all aspects of the effort covered by subcontractors.

The MPSR presentation **shall** include, but not be limited to the following subjects:

- 1) Accomplishments since last review and open action items.
- 2) Project status with issues and anticipated resolution.
- 3) Earned Value Reporting.
 - Schedule
 - Top level schedule
 - Plan vs. Actual
 - Critical Path
 - Schedule Risks
 - Reserve Trend
 - Critical Milestones
 - Schedule impacts with mitigation plans.
 - Discussion of the plans 2 months in advance.
- 4) Cost.
 - Cumulative-to-date Earned Value Data
 - Current period Earned Value Data
 - Variance analyses and Corrective Action (as applicable)
 - Trend data, both for Cumulative-to-date and Current period, for the past 12 reporting periods.

- Independent Estimate At Complete (IEAC) data and analysis
 - Variance At Complete (VAC) data and analysis
- 5) Technical Status issues and concerns.
 - System and elements, status and activity including key component activity and status
 - 6) Open contract items.
 - 7) Mission Assurance status.
 - 8) Action item Summary.
 - A review of the status of all open Action Items and all Action Items closed since the last MPSR.
 - 9) Outstanding Proposals.
 - 10) Milestone events depicting critical items of project status for the succeeding month with a report on the previous month's milestone events.
 - 11) Subcontract Management.
 - New Subcontract initiated in this period with responsibilities with respect to CIs
 - Critical Subcontractors performance
 - Issues and risks
 - 12) Business issues, including personnel changes.
 - 13) Technical Performance Measurements (TPMs) Status.
 - 14) Software and Systems Metric report that contains at a minimum progress tracking measures and trends on (at least) a CI basis for the following types of measures:
 - Software size
 - System and Software functionality
 - Number of software requirements and their change status
 - Design/Code complexity index at CSU, CSC, and CSCI levels
 - Source code production rate estimates versus actuals
 - Number of Software Change Requests/Problem Reports and their status
 - Effort data (staffing profile) estimates versus actual
 - 15) Hardware Progress Report.
 - Hardware Size
 - Status Change
 - Problem Report and Status
 - Schedule Update
 - Corrective Actions (where applicable)
 - 16) Status of the Configuration Control Board (CCB).
 - 17) A risk report in accordance with the RMP including:

- Description of the risk, including primary causes and contributors, actions embedded in the project or project to date to reduce or mitigate the risk, and information collected for tracking purposes.
- A risk projection or waterfall chart showing the anticipated future changes in risk levels based on the achievement of project milestones or events, risk mitigation actions, and the impact of potential mitigation actions not yet approved.
- Primary consequences should the undesired event occur.
- Estimate of the probability of occurrence (qualitative or quantitative) together with the uncertainty of the estimate and the effectiveness of any implemented risk mitigation measures.
- Additional risk tracking information including risk originator (person who initially identified the risk), risk classification (e.g., technical, cost, or schedule), risk owner (person responsible for tracking/mitigating risk), and risk timeframe (time period when mitigation action needs to be initiated).
- Potential additional risk mitigation measures, which includes a comparison of the cost of risk mitigation versus the cost of occurrence multiplied by the probability of occurrence.
- Characterization of a risk as “acceptable” or closed that is supported by a rationale (with the concurrence of the Government) and that all reasonable mitigation options (within cost, schedule, and technical constraints) have been instituted and/or that risk has been reduced.

4.1.7 Weekly Status Report

DATA ITEM DESCRIPTION		2. NUMBER	PM-07
1. TITLE	Weekly Status Report	3. DATE	

4. DESCRIPTION/PURPOSE

The Weekly Status Report provides contract status reporting and oversight.

5. DATA REQUIREMENTS

The Weekly Status Report shall summarize the status of the contract in summary form as of close of business the preceding Friday and will include the following areas:

- 1) Technical work completed against the work planned.
- 2) Planned technical activities for the next two weeks.
- 3) Upcoming meetings with government involvement for the next week.
- 4) Current and perceived issues against agreed upon issues list.
- 5) New issues.
- 6) Staffing vs. plan.
- 7) Informal financial status vs. plan and trends for each major element that is likely to cause a cost overrun that exceeds a 5% threshold with a discussion of corrective actions.
- 8) Informal schedule vs. plan and trends for each major element that is likely to cause a schedule slip that exceeds a 5% threshold with a discussion of corrective actions.
- 9) A discussion of any major changes in activities.
- 10) GIDEP alerts applicable to SGSS.

4.1.8 Meeting Minutes

DATA ITEM DESCRIPTION		2. NUMBER	PM-08
1. TITLE	Meeting Minutes	3. DATE	

4. DESCRIPTION/PURPOSE

Meeting minutes report the results of meetings.

5. DATA REQUIREMENTS

Meeting Minutes **shall** identify:

- 1) Objective
- 2) Topics addressed with summary of key points and any conclusions or recommendations
- 3) Attendee List
- 4) Government direction
- 5) Action Items (also included in the MAID)
- 6) Issues and Risks
- 7) Plan for any follow-on meeting(s).

Meeting Minutes shall be prepared and delivered for all meetings and/or discussions.

The contractor **shall** post the Meeting Minutes on the contractor's electronic data portal

4.1.9 Contract Performance Report (CPR)

DATA ITEM DESCRIPTION		2. NUMBER	PM-09
1. TITLE	Contract Performance Report (CPR)	3. DATE	

4. DESCRIPTION/PURPOSE

The Contractor Performance Report (CPR) provides the monthly status of performance data and estimates at completion identifies approved changes to the Performance Measurement Baseline, and reports variances and projected variances at completion, including explanatory analysis. The contractor reporting of performance data is to include subcontractor data with appropriate analysis where applicable.

5. DATA REQUIREMENTS

The CPR shall comply with:

- NPR 7120.5D, NASA Program and Project Management Processes and Requirement
- NFS 1852.234-2, Earned Value Management System
- DI-MGMT-81466A, Contract Performance Report dtd 3/30/2005
<https://acc.dau.mil/CommunityBrowser.aspx?id=19544>
- Department of Defense Earned Value Management Implementation Guide (EVMIG) (website:
<https://acc.dau.mil/CommunityBrowser.aspx?id=19577>)

The CPR **shall** include data pertaining to all authorized contract work, including both priced and unpriced effort that has been authorized at a not-to-exceed amount in accordance with the Contracting Officer's direction.

The CPR **shall** separate direct and indirect costs and identify elements of cost for all direct reporting.

The CPR shall include data pertaining to subcontracted work efforts.

The CPR **shall** include Formats 1 – 5 (DD Form 2734/1-5), down to a WBS Level 4. A lower level of reporting may be required for elements that are classified as special interest technical, schedule, or cost risk areas.

Earned value performance measurement data for Government and/or contractor-identified medium risk and high risk WBS items **shall** be reported on Format 1 of the monthly CPR until such time as both Government project management and the Contractor agree that they no longer represent medium risk or high risks.

This reporting **shall** be at a level where the risk resides in the WBS. For medium risk and high risk elements lower than Level 4, specific narrative variance analyses are not required unless specified as special interest.

To ensure an integrated approach to risk management, the data provided by the CPR **shall** be consistent with the WBS, IMS, Risk Management Processes, Plans and Reports (where required), Probabilistic Risk Assessment Processes and Reports (where required), the Cost Analysis Data Requirement (CADRe) and the Monthly/Quarterly Contractor Financial Management Reports (533M/Q).

The Financial Management Reports **shall** include reconciliation between the 533Q and the Contractor Performance Report. This reconciliation may be included within the required CPR Formats.

CPR formats **shall** be completed according to the instructions outlined in DI-MGMT-81466A and the following forms: Format 1 (DD Form 2734/1); Format 2 (DD Form 2734/2); Format 3 (DD Form 2734/3); Format 4 (DD Form 2734/4); and Format 5 (DD Form 2734/5). Samples of these forms are available at: <https://acc.dau.mil/CommunityBrowser.aspx?id=19543>.

SGSS variance analysis thresholds will initially be 5% of cumulative cost and schedule to date. The variance analysis thresholds may change once the SGSS Project personnel evaluate the contractor's schedule and cost performance, and risk. Special emphasis should be placed in the variance analysis on cost and schedule growth linked to technical risks (e.g., technology development efforts; design engineering; integration; complexity; project management; systems engineering; duration constraints; etc.) identified by both the government and contractor.

Contractor format may be substituted for CPR formats whenever they contain all the required data elements at the specified reporting levels in a form suitable for NASA management use.

The CPR **shall** be submitted electronically and followed up with a signed paper copy.

The American National Standards Institute (ANSI) X12/XML standards (transaction sets 839 for cost and 806 for schedule), the United National Electronic Data Interchange for Administration, Commerce and Transport (EDIFACT, <http://www.unece.org/trade/untid/>) equivalent, , or any other electronic delivery method deemed acceptable to the SGSS Project Office **shall** be used for Electronic Data Interchange.

4.1.10 Cost Analysis Data Requirements (CADRe)

DATA ITEM DESCRIPTION		2. NUMBER	PM-10
1. TITLE	Cost Analysis Data Requirements (CADRe)	3. DATE	

4. DESCRIPTION/PURPOSE

The Cost Analysis Data Requirement (CADRe) documents the programmatic, technical, and life cycle cost information for Category I and Category II Flight Systems and Ground Support Projects. It is the NASA version of the Department of Defense Cost Analysis Requirements Document (CARD). The CADRe is for both internal project use and for independent cost estimating. The CADRe is a Project-level requirement and follows a product-oriented WBS.

The NASA Project Manager is responsible for the CADRe. Typical projects will make five CADRe submissions across the project life cycle (<http://ceh.nasa.gov/downloadfiles/Web%20Links/CADRe%20Info.ppt>, page 8). The CADRe requirements for the SGSS Project are flowed down through this DID.

The CADRe comprises three parts:

Part A contains general descriptive information about the project.

Part B contains hardware and software technical parameters necessary to estimate the project's life cycle cost.

Part C contains the project's life cycle cost estimate (LCCE). Part C represents the Project's cost estimate and the Project Manager is responsible for collecting the inputs from the various participants including Full Cost elements and submitting an integrated cost estimate.

5. DATA REQUIREMENTS

The CADRe shall comply with:

- NPR 7120.5D, NASA Program and Project Management Processes and Requirements
- NASA Cost Estimating Handbook (www.ceh.nasa.gov)

The required data for submission by the Contractor is CADRe Part B spreadsheet technical data required for the SGSS Project to complete the full CADRe and some detailed cost data to support Part C. Most of these data will be available through technical documents presented at the PDR, CDR., etc. and cost data provided through NF533 and Contractor Performance Reports. The Part B Template and other information are available at ceh.nasa.gov.

4.1.11 Integrated Baseline Review (IBR)

DATA ITEM DESCRIPTION		2. NUMBER	PM-11
1. TITLE	Integrated Baseline Review (IBR)	3. DATE	

4. DESCRIPTION/PURPOSE

An Integrated Baseline Review (IBR) is a joint assessment conducted by the Government PM and the contractor to verify the realism and accuracy of the Performance Measurement Baseline (PMB). This involves verifying the technical content of the baseline and assessing the realism and accuracy of the related resources (performance budget and IMS [Integrated Master Schedule]). The IBR is unlike the Validation Review (VR) that focuses on EVMS compliance with ANSI/EIA-748. Instead the IBR focuses on assessing the realism of the baseline. (DoD EVM Implementation Guide (October 2006), Section 2.4.1, p. 55)

5. DATA REQUIREMENTS

An IBR Data Package **shall** be submitted in accordance with the IBR objectives stated above.

The Contractor Data Package **shall** contain the following:

- 1) Project/Business Management and Control Account Notebooks that incorporates the data products requested by the Project Office (hard copy and electronic copy)
- 2) A baselined electronic version of the Integrated Master Schedule
- 3) Contractor Earned Value (EV) Process Documentation (hardcopy and electronic)
- 4) Two months of EV Performance data

The Contractor **shall** ensure proper flow down of this requirement to subcontractors per NPR7120.5D.

The formal IBR **shall** be scheduled no later than (NLT) 90 calendar days after contract award and, as needed, after the exercise of significant contract options, or NLT 60 calendar days after a significant funding or work scope realignment. The data package shall be delivered not less than six weeks prior to the IBR.

The following outlines the contents of a typical IBR Notebook:

Refer to APPENDIX A at the end of this DID's Document for EVM Acronyms.

- 1) Project Management Data Notebook
 - Earned Value Management EVM Top Level Authority
 - Brief overview of EVM process.
 - Organization Charts – flow down as needed including EVM from subcontracts
 - Internal communication and action planning structure
 - Top Level Planning and Baseline assumptions
 - Project Percentages Level of Effort (LOE) versus Discrete Tasks)
 - Project WBS

- Project Element of Cost (EOC)Repository Assignment Matrix
 - Top Level Project Work Authorization and Cost Account Package (CAP)
 - Project technical scope – flow down from SOW to Managers and Control Account Managers(CAMs)
 - Estimate at Completion (EAC) assumptions if different from negotiated Budget at Completion (BAC) values
 - CPR Submittals
 - Project Schedule
 - Top level with vertical and horizontal traceability
 - Critical path
 - Risk Management approach
 - Current Top Risks
 - Integrated Product Team (IPT) Risk list and Self Assessment Procedures
 - Management Reserve (MR)levels and approach
 - Undistributed budgets(UB), if any, and their work assignments
 - Funding Profile
 - Subcontractor Management Plan, if applicable
 - Management review or reporting cycle
 - Technical/Schedule/Cost/Risk Plan and Status
 - EVM flow-down
 - IBR results
 - Any other key programmatic
- 2) Control Account Management (CAM) Data Notebook:
- Technical Scope/Cost:
 - a. Organization chart for the Cost Account (CA)
 - b. Show location in Responsibility Assignment Matrix with budget amounts
 - c. Location in Contract Statement of Work
 - d. Work Authorization Documentation: trace to authorized budget
 - Show how work gets authorized from high to low levels
 - e. Time Phased Control Account Plan
 - WPs and PPs
 - Resource loading of task: work packages and planning packages
 - f. Baseline Metrics
 - Phased dollars by element of cost breakdown

- Phased workforce profiles (WYEs)
- g. Labor Reports
- h. Schedules:
 - Flow-down of intermediate schedule into detailed schedules
 - Including any project critical path
 - Key handoffs
 - Schedule Metrics
- i. Risk List:
 - Current or anticipated risks in this CA or IPT
- j. Earned Value Methodology:
 - EV techniques and rationale
 - Cost performance report (≥ 2 months)
 - Variance analysis reporting if applicable
 - Internal communication and action planning

4.1.12 Financial Management Reports

DATA ITEM DESCRIPTION		2. NUMBER	PM-12
1. TITLE	Financial Management Reports	3. DATE	

4. DESCRIPTION/PURPOSE

To provide data necessary for a) projecting costs and hours to ensure that dollar and labor resources realistically support project and project schedules; b) evaluating contractors' actual cost and fee data in relation to negotiated contract value, estimated costs, and budget forecast data; c) planning, monitoring, and controlling project resources; and d) accruing cost in NASA's accounting system.

5. DATA REQUIREMENTS

The Monthly and Quarterly Financial Reports **shall** be prepared in accordance with NPR 9501.2D, the NASA Contractor Financial Management Reporting (1852.242-73) clauses and as supplemented by Financial Management Reporting (GSFC 52.242-90).

Financial Management Reports **shall** be provided down to WBS level #4. A lower level of reporting may be required for elements that are identified as technical, schedule, cost and risk areas as well as to support the occasional special analyses (GAO or IG audits, project-level Cost Analysis Data Requirements).

4.1.13 Discrepancy Report (DR)

DATA ITEM DESCRIPTION		2. NUMBER	PM-13
1. TITLE	Discrepancy Report	3. DATE	

4. DESCRIPTION/PURPOSE

The purpose of the Discrepancy Report is to provide information on any discrepancy found in requirements, documents, software/hardware design, code etc.

5. DATA REQUIREMENTS

The Discrepancy Report **shall** be prepared in accordance with the Project Management Plan and software portion of the Maintenance and Sustainment Plan.

The Discrepancy Report **shall** be a configuration controlled document.

The Discrepancy Report **shall** include:

- 1) Description of the discrepancy
- 2) Identify the discrepancy area and subsystems (e.g. requirements, documents, software design, interface design or code).
- 3) Describe the environment including Requirements Number, Document number/version/date, Software platform, build/version if applicable.
- 4) Describe the impact of the discrepancy to other subsystems.
- 5) Describe the priority of the discrepancy in accordance with the following table.

Severity Category	Definition
I	<u>Critical</u> : A discrepancy that prevents test team progress or operational use of the SGSS system, or that has direct impact upon the milestone schedules. Discrepancies that prevent the use of a build or release; no work-around is possible or practical.
II	<u>Urgent</u> : A discrepancy that prohibits successful completion of one or more test variations, but is not currently affecting schedules. An operational discrepancy that can be temporarily handled procedurally, but has an adverse effect on the system. Discrepancies that are serious but that do not prevent using or testing a required capability.
III	<u>Routine</u> : A discrepancy that does not prohibit successful completion of a test. This category involves minor deviations from task or project standards
IV	All other discrepancies

- 6) Identify the phase when the discrepancy is injected.
- 7) Identify the phase when the discrepancy is detected.
- 8) If applicable, describe the steps to reproduce the problem.
- 9) If applicable identify root cause of the problem
- 10) Identify any measures to prevent and/or correct the discrepancy
- 11) Identify any measures to prevent future occurrences of the discrepancy or similar issues

4.1.14 Action Item Database (AID)

DATA ITEM DESCRIPTION		2. NUMBER	PM-14
1. TITLE	Action Item Database (AID)	3. DATE	

4. DESCRIPTION/PURPOSE

To provide responses to action items assigned to the contractor.

5. DATA REQUIREMENTS

The contractor **shall** update and submit an AID to the Government, which contains actions generated by the contractor and Government.

The AID **shall** contain at least the following sections: title, due date, creation date, description, numbering scheme, creator, assigned to, status, notes section, and importance rating (i.e. green, yellow, and red).

The contractor **shall** maintain the AID on the contractor's electronic data portal (GS Project Contractor Portal) and **shall** send notification to the SGSS document manager and Contracting Officer's Technical Representative.

4.1.15 Option Management and Implementation Plan (OMIP)

DATA ITEM DESCRIPTION		2. NUMBER	PM-15
1. TITLE	Option Management and Implementation Plan (OMIP)	3. DATE	

4. DESCRIPTION/PURPOSE

Describes how the project plan for each option exercised. It provides the management structure, its system of operation, and responsible lines of communications.

5. DATA REQUIREMENTS

The OMIP shall give a brief overview of the option and the rationale, how and where the project will operate with regard to the contract.

The OMIP shall address the overall organization, management approach, and structure of the SGSS Project plus its interrelationships with the parent company and the subcontractors, and the relationship with the Government.

The OMIP shall delineate how the requirements of the Statement of Work (SOW) will be achieved and include a description of planned activities for identifiable SOW requirements.

The OMIP shall describe the concept of the nature of the tasks and/or potential problems; discuss the approach to problem avoidance and/or solution; address the degree to which proposed procedures are proven through similar experience.

The OMIP shall provide an organizational chart(s) and sufficient supplemental narrative to describe fully the organization proposed for carrying out the Project showing inter- relationships of technical management, business management, and subcontract management, from lower level through intermediate management to top-level management with detailed.

The OMIP shall provide contractual procedures proposed for the Project to effect administrative and engineering changes, describing any differences from existing procedures.

The OMIP shall describe management techniques to be employed in minimizing project costs and schedule impacts, including controls to be exercised over subcontractors and suppliers.

The OMIP shall discuss and illustrate the proposed SGSS Ground Mission Assurance organizational structure, including staffing plans, reporting channels, authority and responsibilities, and management visibility.

The OMIP shall discuss the requirements and available numbers of technical, test, manufacturing and system safety/quality assurance/ reliability/ configuration management personnel for this project and the approach for addressing the shortfalls.

The OMIP shall explain/describe the schedule administration/control.

The OMIP shall describe how the schedules are developed, maintained, updated and reviewed.

The OMIP shall explain how internal audits/reviews ensure that scheduling data reported to the Government accurately reflects the work status.

The OMIP shall describe how subcontracts will be managed and reviewed.

The OMIP shall address the design review process including formal Peer Reviews.

The OMIP shall capture the core activities necessary to accomplish project requirements including associated costs.

The OMIP shall contain selected Narratives (or references to the PMP, SEMP, etc.) to correlate the required processes to the achievement of the Significant Accomplishments and Accomplishment Criteria.

The OMP shall contain the schedule for completing IMP activities in the Integrated Master Schedule (IMS).

The OMIP shall be a single plan for the entire core effort, including associate and/or major subcontractor activities.

The OMIP shall be consistent with the SOW, PMP, IMS, and WBS.

Events in the Option Management Plan **shall** include key decision points in the project.

4.1.16 Life Cycle Cost Model and Prediction Report

DATA ITEM DESCRIPTION		2. NUMBER	PM-16
1. TITLE	Life Cycle Cost Model and Prediction Report	3. DATE	

4. DESCRIPTION/PURPOSE

To estimate cost due to limited-life items over the lifespan of the asset and to possibly perform trades.

5. DATA REQUIREMENTS:

The Life Cycle Costing (LCC) report **shall**:

- Comply with NASA-STD-8729.1, Planning, Developing and Managing an Effective R&M Program.
- establish the initial LCC estimates performed during Formulation
- use reliability and maintainability analyses to provide essential data to perform LCC
- take failure rates and restoration times into account in projecting the logistics costs associated with the project
- be used to evaluate redundancy decisions
- be used to determine the necessary number of spares
- be updated when maintainability and reliability are changed

4.2 Configuration Management

4.2.1 Configuration Management Plan (CMP)

DATA ITEM DESCRIPTION		2. NUMBER	CM-01
1. TITLE	Configuration Management Plan	3. DATE	

4. DESCRIPTION/PURPOSE

Configuration Management Plan defines the contractor's configuration management system and approach (including policies and procedures) that will be implemented for the SGSS Project.

5. DATA REQUIREMENTS

The Configuration Management (CM) Plan **shall** be prepared in accordance with the Contractor's practices and consistent with NPR 7150 and the SGSS Project CM Plan.

The CM Plan **shall** describe in detail all configuration management processes, methods, systems, tools and procedures the contractor intends to use on the SGSS Ground Segment hardware, software, and documentation, as well as on flight software, command procedures, operations databases, and other configurable items.

The CM Plan **shall** describe how consistency between product definition, the product's configuration, and the configuration management records is achieved and maintained throughout the applicable phases of the product's life cycle by the contractor.

The CM Plan **shall** describe the contractor's approach, methodology, and application of configuration management principles and practices.

The CM Plan **shall** include descriptions of configuration management activities and procedures including Configuration Planning and Management, Configuration Identification, Configuration Change Management, Configuration Status Accounting, Configuration Verification and Audit, Configuration Management of digital data, and Configuration management of software.

The CM Plan **shall** include organizations, roles, responsibilities, resources, and programmatic and organizational interfaces.

The CM Plan **shall** include deliverables, milestones, and schedules.

The CM Plan **shall** include Subcontract flow-down.

The CM Plan **shall** describe the flow up of changes to Government Boards.

The CM Plan **shall** describe the process for generating comments to changes generated by Government Boards requiring inputs from Contractor.

The CM Plan shall ensure that all CDRLs are included in the scope of the CM Plan

The CM Plan shall include a separate section to address the applicable preceding requirements for the simulator elements(s).

4.2.2 Ground Segment Document Tree

DATA ITEM DESCRIPTION		2. NUMBER	CM-02
1. TITLE	Ground Segment Document Tree	3. DATE	

4. DESCRIPTION/PURPOSE

Provides a reference list of all SGSS Ground Segment documents.

5. DATA REQUIREMENTS

The Ground Segment Document Tree **shall** include all documents for the SGSS Ground Segment and show relationship(s), delivery phasing, and maturation phasing.

The Ground Segment Document Tree **shall** be organized and identified to serve as a ready reference list.

The Ground Segment Document Tree **shall** identify documents by name and number.

The Ground Segment Document Tree **shall** include a brief description defining the scope of each document.

The Ground Segment Document Tree updates **shall** be delivered when changes are implemented.

4.2.3 Ground Segment Drawing Tree

DATA ITEM DESCRIPTION		2. NUMBER	CM-03
1. TITLE	Ground Segment Drawing Tree	3. DATE	

4. DESCRIPTION/PURPOSE

Provides a reference list of all SGSS Ground Segment drawings.

5. DATA REQUIREMENTS

The Ground Segment Drawing Tree **shall** list all drawings for the SGSS Ground Segment.

The Ground Segment Drawing Tree **shall** be organized and identified to serve as a ready reference list.

The Ground Segment Drawing Tree **shall** identify drawings by name and number.

The Ground Segment Drawing Tree **shall** include a brief description of each drawing.

The Ground Segment Drawing Tree updates **shall** be delivered when changes are implemented.

4.2.4 Configuration Item Identification List (CIIL)

DATA ITEM DESCRIPTION		2. NUMBER	CM-04
1. TITLE	Configuration Item Identification List (CIIL)	3. DATE	

4. DESCRIPTION/PURPOSE

Helps establish a structure for controlling the configuration of the ground segment by identifying all Configuration Items (CIs) and Computer Software Configuration Items (CSCIs) used for the SGSS and correlating those CIs/CSCIs to their Specification and test requirements documents.

5. DATA REQUIREMENTS

The Configuration Item Identification List **shall** identify all SGSS CIs and CSCIs.

The Configuration Item Identification List **shall** be organized and broken down by Ground Segment-level CI and CSCI, by Element-level CI, and all CIs and CSCIs within each Element.

The Configuration Item Identification List **shall** provide the following information for each CI listed: assigned CI Number, CI top drawing number, CI nomenclature, applicable specification number, acceptance test procedure number, and the qualification test procedure number.

The Configuration Item Identification List **shall** provide the following information for each CSCI listed: assigned CSCI Number, CSCI nomenclature, NPR 7150.2 Appendix B-derived Classification of the CSCI, applicable software requirements specification number, indication of whether any part of the CSCI is safety or mission critical, acceptance test procedure number, and, if qualification tested, the qualification test procedure number.

4.2.5 Configuration Control Board (CCB) Documentation

DATA ITEM DESCRIPTION		2. NUMBER	CM-05
1. TITLE	Configuration Control Board (CCB) Documentation	3. DATE	

4. DESCRIPTION/PURPOSE

Provides visibility of all changes in configuration-controlled items and controlling documentation proposed by the contractor.

5. DATA REQUIREMENTS

The CCB Documentation **shall** include the CCB Agenda, CCB Data Packages, and CCB Minutes.

The CCB Agenda **shall** include the date, time, location, subject, sponsor, and change control number of the items to be reviewed by the board.

The CCB Data Packages **shall** be attached for each change with the precise format and content that will be reviewed by the contractor's board.

The CCB Data Packages **shall** contain all relevant background material (including written agreements and memos between the Government and the contractor) and complete technical supporting analyses.

For the purpose of the CCB Documentation Data Item, the term CCB **shall** mean the contractor's project-level CCB and any sub-board which is empowered to authorize the final disposition of an engineering change.

The CCB Minutes **shall** include the date, time, location, item subject, change control number, and CCB disposition of the changes reviewed.

The CCB Minutes **shall** include a list of actions generated from the CCB for each change.

The CCB Minutes **shall** include the date each action is to be completed.

The CCB Documentation **shall** include the change classification and affectivity for approved changes.

The CCB Documentation **shall** include a reason(s) when changes are disapproved.

4.2.6 Engineering Change Requests

DATA ITEM DESCRIPTION		2. NUMBER	CM-06
1. TITLE	Engineering Change Requests	3. DATE	

4. DESCRIPTION/PURPOSE

To facilitate the orderly processing of engineering change requests to specifications or requirements, changes to plans or procedures, specification deviations, waivers, to appropriate level of review, classification, and approval authority for disposition

5. DATA REQUIREMENTS

Consistent with the Contractor's Configuration Management Plan (CMP), the contractor shall determine the classification level of, prepare, and submit Engineering Change Requests (ECR) for Government review for all configuration changes.

ECRs shall be either Class I or Class II. In addition to the change description, the ECR shall contain sufficient information in the form of attachments, drawings, test results, etc., to allow the Government to evaluate the total impact of the proposed change. The Government

Contracting Officer may direct the contractor to prepare ECRs under the "Changes" clause of the contract. For the purposes of this Data Item, a Class I ECR is a change that:

- 1) Affects any contract requirement.
- 2) Affects schedules of deliverables to the Government.
- 3) Impacts Installation Accountable Government Property in place (i.e. facilities).
- 4) Affects configuration to the extent that changes would be required to prior deliverables in order to maintain specified performance.
- 5) Creates a Single Point Failure possibility
- 6) Impacts an external interface.

A change may be classified Class II when it does not fall within the definition of a Class I change as given above. Examples of Class II changes are:

- 1) A change in documentation only (for example, correction of errors, addition or clarifying notes or views).
- 2) A minor change in architecture software to the baseline hardware (for example, substitution with an approved alternative material) which does not affect any item listed under Class I changes.

Drawing changes that do not affect a baseline, interface, etc. Class II changes normally do not require Government CCB approval unless they are written against Government CM-controlled documents.

4.2.7 Inventory Database

DATA ITEM DESCRIPTION		2. NUMBER	CM-07
1. TITLE	Inventory Database	3. DATE	

4. DESCRIPTION/PURPOSE

Provides the annual property inventory of NASA property in the possession of the contractor.

5. DATA REQUIREMENTS

The Property Inventory **shall** provide the annual inventory of all NASA property associated with the Ground Segment contract that is in the possession of the contractor at the time of the inventory.

The Property Inventory **shall** include, for each item, the item description and quantity.

The Property Inventory **shall** include, for each item, the item identification number(s).

4.2.8 Waiver Request

DATA ITEM DESCRIPTION		2. NUMBER	CM-08
1. TITLE	Waiver Request	3. DATE	

4. DESCRIPTION/PURPOSE

The Waiver request documents variances of contract requirements that cannot be met; explains the rationale for approval of each variance.

5. DATA REQUIREMENTS

The Waiver Request shall comply with NPR 7123.1A.

Deviations and waivers are written authorizations to depart from a particular performance or design requirement for that item. Deviations are given prior to the manufacture/test of an item and waivers are given after the manufacture/test of an item.

A Waiver Request **shall** include the following information:

- 1) A statement of the specific requirement and its associated source document name and paragraph number, as applicable, for which a waiver or deviation is being requested.
- 2) A detailed technical justification for the exception.
- 3) Analyses to show the mishap potential of the proposed alternate requirement, method or process, as compared to the specified requirement.
- 4) A narrative assessment of the risk involved in accepting the waiver or deviation. When it is determined that there are no hazards, the basis for such determination should be provided.
- 5) A narrative on possible ways of reducing the impact to system performance or safety severity and probability and existing compliance activities (if any).
- 6) Starting and expiration date for waiver/deviation.

A Waiver Request **shall** be updated with the results of a decision on granting the request.

4.3 Project Security

4.3.1 IT Systems Security Plan

DATA ITEM DESCRIPTION		2. NUMBER	PS-01
1. TITLE	IT Systems Security Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The purpose of the IT Systems Security Plan is to provide an overview of the security requirements of the SGSS system and describe the controls in place or planned for meeting those requirements. The systems security plan also delineates responsibilities and expected behavior of all individuals who access the SGSS System or the information contained in the SGSS System.

5. DATA REQUIREMENTS

IT Systems Security Plan **shall** meet requirements of:

- NIST SP 800-18 Guide for Developing Security Plans for Information Technology Systems
- NIST SP 800-30 Risk Management Guide for Information Technology Systems
- NIST SP 800-34 Contingency Planning Guide for Information Technology Systems
- NIST SP 800-53 Recommended Security Controls for Federal Information Systems
- NIST SP 800-53A Guide for Assessing the Security Controls in Federal Information Systems
- NIST SP 800-47 Security Guide for interconnecting information technology Systems
- FIPS 199 Standards for security Categorization of Federal Information and information Systems
- FIPS 200 Minimum security Requirements for Federal Information and Information Systems

4.3.2 IT Systems Security Assessment

DATA ITEM DESCRIPTION		2. NUMBER	PS-02
1. TITLE	IT Systems Security Assessment	3. DATE	

4. DESCRIPTION/PURPOSE

To ensure that critical business and mission functions are not disrupted and contractual provisions provide for assessment in place.

5. DATA REQUIREMENTS

The IT Systems Security Assessment shall be conducted and reported in accordance with the following:

- NIST SP 800-53 Recommended Security Controls for Federal Information System
- NIST SP 800-53A Guide for Assessing the Security Controls in Federal Information Systems

4.3.3 IT Security Risk Assessment

DATA ITEM DESCRIPTION		2. NUMBER	PS-03
1. TITLE	IT Security Risk Assessment	3. DATE	

4. DESCRIPTION/PURPOSE

Provide assessment of the potential threats and the risks to the SGSS System from an Information Technology System perspective throughout its lifecycle.

5. DATA REQUIREMENTS

The IT Security Risk Assessment **shall** be conducted and reported in accordance with the following:

- NIST SP 800-30 Risk Management Guide for Information Technology Systems

4.3.4 IT Contingency Plan

DATA ITEM DESCRIPTION		2. NUMBER	PS-04
1. TITLE	IT Contingency Plan	3. DATE	

4. DESCRIPTION/PURPOSE

To detail the coordinated strategy that involves plans, procedures, and technical measures that enable the recovery of the SGSS system and the associated operations and data after an emergency or disruption in service.

5. DATA REQUIREMENTS

The Plan **shall** meet the requirements of:

- NIST SP 800-34 Contingency Planning Guide for Information Technology Systems

4.3.5 Certification and Accreditation Support Documentation

DATA ITEM DESCRIPTION		2. NUMBER	PS-05
1. TITLE	Certification and Accreditation Support Documentation	3. DATE	

4. DESCRIPTION/PURPOSE

To develop the documents and supporting data necessary to achieve SGSS System certification and accreditation.

5. DATA REQUIREMENTS

Certification and Accreditation support documentation **shall** include the documentation, with the format and content, specified in:

- NPR 2810.1A Security of Information Technology
- NIST SP 800-37 Guide for the Security Certification and Accreditation of Federal Systems
- NIST SP 800-30 Risk Management Guide for Information Technology Systems

4.3.6 Interconnection Security Agreement

DATA ITEM DESCRIPTION		2. NUMBER	PS-06
1. TITLE	Interconnection Security Agreement	3. DATE	

4. DESCRIPTION/PURPOSE

The purpose of the Interconnection Security Agreement(s) is to document the technical and security control requirements of interconnections between the SGSS System and IT systems that are owned and operated by different organizations.

5. DATA REQUIREMENTS

Plan **shall** meet requirements of:

- NPR 1600.1 NASA Security Program Procedural Requirements w/Change 2 (4/01/2009)
- NPR 2810.1A Security of Information Technology
- NIST SP 800-47 Security Guide for Interconnecting Information Technology Systems

4.3.7 Project Security Plan

DATA ITEM DESCRIPTION		2. NUMBER	PS-07
1. TITLE	Project Security Plan	3. DATE	

4. DESCRIPTION/PURPOSE

To provide a Project Security Plan that addresses the Contractors approach to Operational Security (OPSEC), Physical, Information/IT (as it relates to the protection of NASA Sensitive but Unclassified information), Personnel, Communications Security (COMSEC) and Industrial Security of the SGSS System and their development facilities.

5. DATA REQUIREMENTS

Plan **shall** meet requirements of:

- HSPD-12 Homeland Security Presidential Directive 12
- NPR 1600.1 NASA Security Program Procedural Requirements w/Change 2 (4/01/2009)
- NPR 2810.1A Security of Information Technology
- National Industrial Security Program Operating Manual (NISPOM)
- DD254 Contract Security Classification Specification

4.4 Systems Engineering

4.4.1 Systems Engineering Management Plan (SEMP)

DATA ITEM DESCRIPTION		2. NUMBER	SE-01
1. TITLE	Systems Engineering Management Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The contractor approved Systems Engineering Management Plan (SEMP) will serve as the contractor's planned method of identifying and conducting all system engineering related activities under this contract.

5. DATA REQUIREMENTS

The SEMP **shall** describe the overall lifecycle including the major systems engineering activities for each phase.

The SEMP **shall** include the content required by NPR 7123.1A, Appendix D. In those instances where Appendix D content is included in other deliverable documents, a reference to the location of such content is sufficient.

The SEMP **shall** describe the system engineering activities that support the SGSS development activities for which the contractor is responsible.

The SEMP **shall** describe the system engineering and integration activities that **will** support the system engineering and integration of the total SN Ground Segment (SNGS) capabilities and interfaces.

The SEMP **shall** describe how the contractor's system engineering activities **shall** interface to the SGSS Project system engineering activities.

The SEMP **shall** include approach for performing the system engineering activities especially where subcontracts are planned.

The SEMP **shall** describe methods utilized for communicating systems engineering activities, progress, status and results. (Include any periodic meeting or working groups.)

The SEMP **shall** list communication tools that are planned (e.g. meeting makers, tracking tools, email, and websites).

The SEMP shall identify the specific TPMs to track during the project

The SEMP shall include a separate section to address the applicable preceding requirements for the simulator elements(s).

4.4.2 SGSS Verification and Validation Plan (V&VP)

DATA ITEM DESCRIPTION		2. NUMBER	SE-02
1. TITLE	SGSS Verification and Validation Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The Verification and Validation Plan documents the approach and methodology that the implementation contractor intends to use to verify and validate functionality, performance, and compliance with the Level three requirements. Data and results gathered during execution of this verification effort are used to determine compliance with Level three requirements. All items denoted with ** shall be delivered with the proposal as a draft version of this CDRL.

5. DATA REQUIREMENTS

**The V&VP shall document the approach and methodology necessary to verify and validate functionality, performance and compliance with level 3 requirements.

**The V&VP shall comply with NPR 7123.1A..

The following definitions for the Methods of Verification shall be used:

- Test – Measurement of performance to show compliance with specified requirement.
- **Analysis – Predicted performance using calculations to show compliance with specified performance.
- Inspection – visual proof of existence of specified characteristics of properties
- **Demonstration – observed compliance of functional operation or behavior with that specified

**The V&VP shall include a separate section to address the applicable preceding requirements for the simulator elements(s).

4.4.3 SGSS Concept of Operations (Con Ops)

DATA ITEM DESCRIPTION		2. NUMBER	SE-03
1. TITLE	SGSS Concept of Operations (Con Ops)	3. DATE	

4. DESCRIPTION/PURPOSE

The Concept of Operations (Con Ops) document describes the proposed Ground Segment in terms of the user needs it will fulfill, its relationship to existing systems or procedures, the spacecraft operational needs and the external operational interfaces.

5. DATA REQUIREMENTS

The Con Ops describes the proposed system in terms of the user needs it will fulfill, its relationship to existing systems, and its intended use during operations.

The Con Ops shall be complementary and consistent with the architecture description document and the requirements development. It shall be used as a way to communicate the system during operations and shall facilitate a common understanding among stakeholders including users, operators and the SN project.

The contractor shall provide a plan for developing operational scenarios and evolving the scenarios during each phase of the project.

The Con Ops shall be narrative in form and include graphics, functional flow diagrams, operational scenarios, data flow diagrams, and timelines to the maximum extent possible.

The Con Ops shall be a living document and be updated as the design matures. It shall include a plan for future detailed scenario development.

The Con Ops shall describe how the system will interact and interface with the current SN operating environment, procedures, and personnel, It shall describe the impacts to the users, current operational environment and organization, and describe what changes will need to be made.

The Con Ops shall describe the operational systems from the user(s), operators, maintenance, SN Project, TDRS and other relevant stakeholder points of view.

The Con Ops shall describe the system characteristics from an operation perspective identifying constraints and assumptions

The operational scenarios shall describe how the system is perceived to operate during all phases of operations. Operational scenarios shall be developed in at least each of the following categories: User, TDRS, Test, Maintenance, Continuous Operations, Contingency, and Mission Analysis. An initial set of operational scenarios categories shall include:

- User including user services, user requests, user tracking, Real Time Reconfiguration Requests (GCMRs), user playback
- TDRS including TDRS acquisition
- Test including End-to-End Test with MOC, TDRS, and user s/c, medium loop, long loop, pre-service checkout, New User Checkout
- Maintenance including preventive maintenance, hardware, software, firmware.

- Continuous Operations including TDRS State of Health, SGSS State of Health, BRTS scheduling
- Contingency including remote backup, demand maintenance, TDRS ETO,
- Mission Analysis including Offline Mission Analysis, Offline Engineering Analysis, TDRS Performance Analysis, Ground Segment Performance Analysis and User Performance Analysis.

4.4.4 SGSS Element Requirements Specifications

DATA ITEM DESCRIPTION		2. NUMBER	SE-04
1. TITLE	SGSS Element Requirements Specifications	3. DATE	

4. DESCRIPTION/PURPOSE

Specifies the requirements for each Element described in the contractor’s Architecture Description Document, the requirements allocation to the subsystems or end items associated with that Element, and the methods to be used to ensure that each requirement has been met.

5. DATA REQUIREMENTS

The SGSS Element Requirements Specifications shall include:

- Introduction, Purpose and Scope
- Applicable and Reference Documents
- Element Functional Overview
- General Element Functional and Performance Requirements
- Facilities
- Functional and Performance Requirements allocation by subsystem/end item
- Reliability, Maintainability and Availability Requirements
- Identified interfaces to be further specified in the applicable IRD or ICD.

Each requirement must include, at minimum, the following attributes:

- Project Unique ID
- Requirement Title
- Requirement Text
- Requirement Rationale
- Technical Point of Contact
- Requirement Status
- Traceability
- Cross-Reference to Architecture Element or Interface
- V&V Method

Contractor equivalent format is acceptable.

The Ground Segment Element and Infrastructure Requirements Specification **shall** be delivered in a CRADLE compatible format that includes linked interrelationships with all higher and lower level specifications.

4.4.5 SGSS Element Software Requirements Specifications

DATA ITEM DESCRIPTION		2. NUMBER	SE-05
1. TITLE	SGSS Element Software Requirements Specifications	3. DATE	

4. DESCRIPTION/PURPOSE

The SGSS Software Requirements Specification details the software performance, interface, operational, and quality assurance requirements for each CSCI and the methods to be used to ensure that each requirement has been met.

5. DATA REQUIREMENTS

The SGSS Software Requirements Specifications **shall** comply with requirements of NPR 7150.2, NASA Software Engineering Requirements. Contractor equivalent format is acceptable.

The SGSS Software Requirements Specification **shall** be delivered for all contractor-developed software. The SGSS Software Requirements Specifications **shall** be delivered in a CRADLE compatible format that includes linked interrelationships with all higher and lower level Descriptions.

Each requirement must include, at minimum, the following attributes:

- Project Unique ID
- Requirement Title
- Requirement Text
- Requirement Rationale
- Technical Point of Contact
- Requirement Status
- Traceability
- Cross-Reference to Architecture Element or Interface
- V&V Method

The SGSS Software Requirements Specifications **shall** list the number, title, revision and date of all documents referenced in the specification.

The SGSS Software Requirements Specifications **shall** specify all the CSCI requirements. Each requirement **shall** include the following, if applicable:

- 1) Each requirement shall itemize the requirements associated with each capability of the CSCI. A "capability" is defined as a group of related requirements. The requirements shall specify required behavior of the CSCI and shall include applicable parameters (e.g. response times, throughput times), and allowable deviations based on operating conditions. The requirements shall include, as applicable, required behavior under unexpected, not allowed, or "out of bounds" conditions, requirements for error handling, and any provisions to be incorporated into the CSCI to provide continuity of operations in the event of emergencies.

- 2) If the CSCI is required to operate in more than one state or mode, the specification **shall** identify and define each state and mode.
- 3) The specification **shall** identify, if any, the required external interfaces of the CSCI. The requirements **shall** include the following, as applicable:
 - Requirements on the type of interface (such as real-time data transfer etc.) to be implemented
 - Required characteristics of individual data elements that the CSCI must provide, store, send, access, receive, etc., such as Data Type, Format, Units, Accuracy and precision
 - Required characteristics of communication methods that the CSCI must use for the interface, such as Communication links, Message formatting, Data transfer rate, Safety/security/privacy considerations etc.
 - Required characteristics of protocols the CSCI must use for the interface, such as Priority/layer of the protocol, Packeting, Legality checks, error control, and recovery procedures etc
 - Other required characteristics, such as physical compatibility of the interfacing entities such as dimensions, tolerances, loads, plug compatibility, etc.), voltages, etc.
- 4) The specification **shall** specify the requirements, if any, the internal interface to the CSCI.
- 5) The specification **shall** specify the requirements, if any, the data internal to the CSCI such as databases and data files to be included in the CSCI.
- 6) The specification **shall** identify the adaptation requirements, if any, concerning installation-dependent data to be provided by the CSCI (such as site-dependent latitude and longitude, site-dependent state tax codes etc) and operational parameters that the CSCI is required to use that may vary according to operational needs
- 7) The specification **shall** identify the safety requirements, if any, concerned with preventing or minimizing unintended hazards to personnel, property, and the physical environment.
- 8) The specification **shall** identify the security and privacy requirements. , if any, concerned with maintaining security and privacy.
- 9) The specification **shall** specify the computer resource requirements including:
 - Computer hardware requirements
 - Computer software requirements
 - Software quality factors such as performance, reliability, maintainability and availability requirements if applicable
 - Constrains on the design and implementation of the CSCI. These requirements may be specified by reference to appropriate commercial or military standards and specifications.
 - Training and Personnel related requirements.
- 10) The specification **shall** identify additional CSCI requirements, if any, not covered in the previous paragraphs.

The SGSS Software Requirements Specifications **shall** define a set of qualification methods and **shall** specify for each requirement to ensure that the requirement has been met. Qualification methods may include Demonstration, Test, Analysis or Inspection.

The SGSS Software Requirements Specifications **shall** contain any general information that aids in understanding this specification (e.g., acronyms, abbreviations, and their meanings, background information, glossary, rationale).

4.4.6 SGSS Hardware Requirements Specifications

DATA ITEM DESCRIPTION		2. NUMBER	SE-06
1. TITLE	SGSS Hardware Requirements Specifications	3. DATE	

4. DESCRIPTION/PURPOSE

The SGSS Hardware Requirements Specification details the hardware model/version performance, interface, operational, and quality assurance requirements for each HWCI and the methods to be used to ensure that each requirement has been met.

5. DATA REQUIREMENTS

The SGSS Hardware Requirements Specifications **shall** comply with requirements of DI-IPSC-81431A. Contractor equivalent format is acceptable.

The SGSS Hardware Requirements Specification **shall** be delivered for all contractor-developed software.

4.4.7 Requirements Verification Traceability Matrix

DATA ITEM DESCRIPTION		2. NUMBER	SE-07
1. TITLE	Requirements Verification Traceability Matrix	3. DATE	

4. DESCRIPTION/PURPOSE

The SGSS Requirements Verification Traceability Matrix (RVTM) summarizes the flow-down of requirements from the system level to the configuration item level, including the allocation of requirements by operational site and by incremental delivery. It also provides documentation of the verification method and result for each requirement. All items denoted with ** shall be delivered with the proposal as a draft version of this CDRL

5. DATA REQUIREMENTS

**The RVTM shall stipulate how each requirement will be verified and summarize the current status of compliance/non-compliance with requirements.

For each requirement in every SGSS Element Requirements Specification document, the RVTM shall provide the following information:

- **Unique requirement identifier
- Requirement text
- Element name
- Configuration Item name
- Requirement reference source
- **Allocation of the requirement to the various operational site(s)
- **Allocation of the requirement, or portions thereof, to each of any incremental deliveries per the Contractor's "master build plan" (see SE-11 and IT-01) DCN 001
- Level of Assembly
- Verification result for each applicable allocation and for the requirement overall
- **Verification success criteria
- **Verification method
- Verification date
- Test plan and procedure (s)
- Location
- Current status
- Test results and/or report reference number

- Associated discrepancy report
- Parent requirement
- Child requirement
- Responsible person/group for verification

All items denoted with ** shall be delivered as part of the draft version.

4.4.8 SN External Interface Control Documents

DATA ITEM DESCRIPTION		2. NUMBER	SE-08
1. TITLE	SN External Interface Control Documents	3. DATE	

4. DESCRIPTION/PURPOSE

The SN External Interface Control documents describe Ground Segment Interface architecture and design and the methods to be used to ensure that each requirement has been met.

5. DATA REQUIREMENTS

For interfaces involving hardware-to-hardware and hardware-to-external factors (facilities, mission elements, etc), the document shall contain the content specified in DI-SESS-81314A. For hardware-to-software or software-to-software cases, DI-IPSC-81436A, Interface Design Description shall be used.

Contractor equivalent format is acceptable.

Ground Segment Interface Control Documents **shall** be delivered in a CRADLE compatible format that includes linked interrelationships with all higher and lower level Descriptions.

4.4.9 Engineering Peer Review (EPR) Plan

DATA ITEM DESCRIPTION		2. NUMBER	SE-09
1. TITLE	Engineering Peer Review (EPR) Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The Peer Review Plan is used to identify the methodology and scope of the contractor's peer review process.

5. DATA REQUIREMENTS

The Engineering Peer Review Plan **shall** describe the contractor's approach to comply with NPR 7123.1A, Appendix G-20; NPR 7150.2, Section 4.3; and GPR 8700.6B.

The Engineering Peer Review Plan **shall**:

- 1) Describe the scope of the EPR process.
- 2) Describe the peer review process, including roles and responsibilities, nominal agenda, and Request for Action (RFA) generation, tracking, and closure process.
- 3) Identify the concepts, designs, functional elements, subsystems, configuration items, software and systems engineering products that will be Peer Reviewed. Any major products excepted from the EPR process shall be identified, with appropriate rationale
- 4) Ensure that all designs have been peer reviewed and defects corrected prior to any development
- 5) Ensure that all of the developed code has been peer reviewed and defects corrected prior to the beginning of any testing
- 6) Identify a schedule or associated milestones for the EPRs.

4.4.10 Technology Development Plan

DATA ITEM DESCRIPTION		2. NUMBER	SE-10
1. TITLE	Technology Development Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The Technology Development Plan describes any proposed development of enabling technology necessary to meet the SGSS requirements.

5. DATA REQUIREMENTS

The Technology Development Plan **shall** comply with NPR 7123.1A - NASA Systems Engineering Processes and Requirements Table G-19 - Technology Readiness Levels (TRL) in assessing the readiness of any proposed enabling technology.

The Technology Development Plan shall describe any proposed technology assessed at Technology Readiness Level (TRL) 6 or below.

The Technology Development Plan shall describe the resources needed for the technology development including any equipment, facilities/laboratories and personnel requirements.

The Technology Development Plan shall describe the top-level schedule for the technology development.

The Technology Development Plan shall describe the technology development process and milestones.

4.4.11 SGSS Architecture Description Document (ADD)

DATA ITEM DESCRIPTION		2. NUMBER	SE-11
1. TITLE	SGSS Architecture Description Document (ADD)	3. DATE	

4. DESCRIPTION/PURPOSE

The Architecture Description Document (ADD) provides formal documentation of the detailed design concept and system description from the system level to the configuration item level. The ADD includes a series of operational, system, and technical standards views to present functional and physical representations of the SGSS system and its internals, including diagrams illustrating interfaces, relationships, and flows, plus tabular and narrative material to further describe the diagrams.

5. DATA REQUIREMENTS

The contractor shall document the proposed architecture in an Architecture Description Document (ADD) that formally describes the proposed system. The ADD consists of text and diagrams, using views from the Department of Defense Architecture Framework version 1.5 (DoDAF 1.5), as specified in:

- DoDAF Version 1.5 Volume I: Definitions and Guidelines, April 23, 2007
- DoDAF Version 1.5 Volume II: Product Descriptions, April 23, 2007
- DoDAF Version 1.5 Volume III: Architecture Data Description, April 23, 2007

Beyond the minimum required set of views listed below, additional views are welcomed to the extent that they aid in understanding the architecture and tracing it to requirements. The minimum set of expected DoDAF views is:

- AV-1 for overall architecture
- AV-2 for overall architecture
- OV-2 diagrams of operations to subsystem detail
- OV-3 table of operations to subsystem detail
- OV-5 diagram(s) of functional decomposition hierarchy to the configuration item detail
- OV-5 diagrams of operational flows and interfaces to subsystem detail
- OV-6c diagrams of operational flows and interfaces to subsystem detail
- SV-1 diagram of physical implementation to subsystem detail
- SV-2 diagram of physical implementation to subsystem detail
- SV-4 flow diagrams for SN monitoring, control, and all SN service flows
- SV-5 table mapping the SV-4 functions to OV-5 activities
- SV-8 of physical implementation build up by site (i.e., System-Level Master Build Plan)
- SV-10c diagram to identify latency of monitoring, control, and SN service flows
- TV-1 containing the technology standards, formats, and specifications used between subsystems

Additionally, SN service data flows between the User MOC and User Platform shall be documented in conformance with the Communications Viewpoint from the Consultative Committee for Space Data Systems (CCSDS) Reference Architecture for Space Data Systems (RASDS):

- CCSDS Reference Architecture for Space Data Systems, Draft for Recommended Practice, CCSDS 311.0-M-1, Consultative Committee for Space Data Systems, September 2008

4.4.12 Trade Study and Analysis Reports

DATA ITEM DESCRIPTION		2. NUMBER	SE-12
1. TITLE	Trade Study and Analysis Reports	3. DATE	

4. DESCRIPTION/PURPOSE

To document the results of trade studies and other analyses performed to validate the system design.

5. DATA REQUIREMENTS

The Contractor shall document all system studies, analyses, trades, and risk assessments necessary to develop and optimize the SGSS design; to integrate the SGSS system and its elements into, and interface with, the Space Network; and to support SGSS verification and validation.

Reports of studies, analyses, trades, and assessments can be in Contractor format, and shall include at minimum:

- 1) Background/Purpose of the Study, including Requirement(s), TBR(s)/TBD(s), Issue(s) and/or Risk(s) addressed;
- 2) Assumptions and Ground Rules, including constraints and requirements
- 3) Approach
 - General Approach / Methodology
 - Analytical Models and Tools Employed
 - Initialization Data Used
 - Metrics used for assessing alternatives
- 4) Trade space considered, including description of implementation alternatives
- 5) Summary of Results and Key Findings
- 6) Conclusions
 - Proposed Requirement Change(s)
 - Issue(s) impacted by analysis
 - Risk(s) impacted by analysis
 - Impact(s) to other internal elements or external entities
 - New issue(s) identified
 - Impacts to contract cost, schedule and/or performance baselines
 - Recommendations with supporting rationale
- 7) References

4.4.13 Modeling and Simulation Plan

DATA ITEM DESCRIPTION		2. NUMBER	SE-13
1. TITLE	Modeling and Simulation Plan	3. DATE	

4. DESCRIPTION/PURPOSE

Describe the proposed Modeling and Simulation capabilities and how they will be utilized for prototyping, design, verification/validation, operations, maintenance, sustaining engineering and training purposes.

5. DATA REQUIREMENTS

The Modeling and Simulation Plan **shall** affirm the contractor's intent to ensure that software models and simulations developed or delivered under this contract comply with the tenets of NPR 7150.2.

The contractor shall describe its capabilities and approach to develop and use simulation and modeling capabilities to support potential improvements in SNGS performance (e.g., latency and availability) and efficiency (automation).

The contractor shall identify the software models, simulators, and emulators it intends to employ in the design, development, verification and/or validation of the SGSS system, or as a deliverable component thereto.

For each identified model, simulator or emulator the contractor shall indicate the:

- Intended use;
- Fidelity level (along with a justification for the characterization);
- Source (Contractor-developed, purchased/obtained from *[source]*, Government-furnished specific for this effort);
- Heritage (if applicable);
- Risk association (i.e., risks associated with developing/obtaining the model or simulation, and/or risk(s) mitigated by use of the model or simulation);
- Relationship to the contractor's verification / validation of system requirements (if applicable);
- Need date / milestone;
- Deliverable status under this contract;
- Estimated sustaining cost (e.g., licensing fees), if required for ongoing operations and maintenance activities.

The contractor shall provide the schedule, dependencies and resources associated with each model, simulation or emulation to be developed or purchased/obtained.

4.4.14 Modeling and Simulation Analysis Report

DATA ITEM DESCRIPTION		2. NUMBER	SE-14
1. TITLE	Modeling and Simulation Analysis Report	3. DATE	

4. DESCRIPTION/PURPOSE

To report the results of simulation activities.

5. DATA REQUIREMENTS

The Modeling and Simulation Analysis Report **shall** contain:

- 1) Simulation and Analyses ground rules and assumptions;
- 2) Reference documents;
- 3) Objective(s) of analysis
- 4) Scope of analysis including specific Ground Segment element and/or capabilities included in analysis.
- 5) Inputs including test case descriptions
- 6) Outputs including:
 - Statistical distribution, if applicable and error analyses.
 - Results and conclusions including potential impact on design and risk decisions;
- 7) All calculations relevant to the analysis;
- 8) Recommendations to correct any problems or potential problems noted during the analysis.

4.4.15 Engineering Drawings

DATA ITEM DESCRIPTION		2. NUMBER	SE-15
1. TITLE	Engineering Drawings	3. DATE	

4. DESCRIPTION/PURPOSE

To provide layouts and engineering drawings that documents the as-built hardware to support operations and maintenance.

5. DATA REQUIREMENTS

The Engineering Drawings **shall** be prepared in accordance with the contractor's approved quality procedures that implement industry best practices, such as:

- ANSI/IEEE 91, Graphic Symbols for Logic Functions
- ~~ASME Y14.5 Dimensioning and Tolerance~~
- ASME Y14.100, Engineering Drawing Practices
- IEEE 315, Graphic Symbols for Electrical and Electronic Diagrams
- ANSI Y14.15 Electrical and Electronic Diagrams.

The contractor **shall** submit engineering drawings used to procure, manufacture, assemble, integrate, and test the system down to the Configuration Item (CI) level.

Lower level drawings will be provided upon request. Included in this engineering drawing package **shall** be all reference type drawings such as layouts, schematics, diagrams, etc. Sketch type drawings **shall** not be used. All drawing changes and change notices are included under this requirement.

An indented drawing list (including drawings from subcontractors) **shall** be provided to the Government. An explanation of company procedures for locating drawings in this package **shall** be provided with this list.

All engineering drawings **shall** be made available to Government personnel via the contractor's electronic data distribution system. Drawings not available in electronic format may be submitted in hardcopy or DAC format.

4.4.16 Engineering Peer Review Data Package

DATA ITEM DESCRIPTION		2. NUMBER	SE-16
1. TITLE	Engineering Peer Review Data Package	3. DATE	

4. DESCRIPTION/PURPOSE

Engineering Peer Reviews (EPRs) focus on the design and implementation details at levels that system-level reviews cannot address. They provide a resource for Design Teams to identify potential engineering design and implementation flaws, and increase the probability of success. Applying the EPR process early and throughout the product life cycle affords the maximum advantage in terms of resource efficiency as well as design confirmation and ultimate mission success. Peer review documentation represents knowledge that may prove invaluable later.

5. DATA REQUIREMENTS

Engineering Peer Review (EPR) documentation shall be in contractor format and include content as defined in NPR 7123.1A, Appendix G-20; NPR 7150.2, Section 5.3.3.1; and GPR 8700.6B.

EPR documentation shall include a report for each EPR, issued by the EPR chairperson, including the summary impression, findings and a complete set of Requests for Action (RFAs).

4.4.17 Software and Systems Metrics Report

DATA ITEM DESCRIPTION		2. NUMBER	SE-17
1. TITLE	Software and Systems Metrics Report	3. DATE	

4. DESCRIPTION/PURPOSE

Provide an overview report of the software and systems metrics and trends.

5. DATA REQUIREMENTS

The Software and Systems Metrics Report shall provide data to the project for the assessment of software and systems cost, technical, and schedule progress in accordance with the contractor's approved Systems Engineering Management Plan.

The Software and Systems Metrics Report should contain as a minimum the following information tracked on the element basis:

- 1) Progress tracking measures, such as, but not limited to:
 - Resources such as budget and effort (planned vs. actual).
 - Development schedule tasks (e.g., milestones) (planned vs. actual).
 - Implementation status information (e.g., number of computer software units in design phase, coded, unit tested, and integrated into computer software configuration item versus planned).
 - Test status information (e.g., number of tests developed, executed, successfully passed).
 - Number of re-plans and baselines performed.
- 2) Software functionality measures, such as, but not limited to:
 - Number of requirements included in a completed build/release (planned vs. actual).
 - Function points (planned vs. actual).
 - Computer resource utilization in percentage of capacity.
- 3) Quality measures, such as, but not limited to:
 - Number of Problem Reports/Change Requests (new, open, closed, severity).
 - Review of item discrepancies (open, closed, and withdrawn).
 - Number of peer reviews/software inspections (planned vs. actual).
 - Peer review information (e.g., effort, review rate, defect data).
 - Number of software audits (planned vs. actual).
 - Software audit findings information (e.g., number and classification of findings).
 - Number of requirements verified or status of requirements validation.
- 4) Requirement volatility, such as, but not limited to:

- Number of requirements.
- Number of requirements changes (additions, modifications, deletions) per month.
- Number of “to be determined” items.

4.4.18 SGSS Internal Interface Requirements

DATA ITEM DESCRIPTION		2. NUMBER	SE-18
1. TITLE	SGSS Internal Interface Requirements	3. DATE	

4. DESCRIPTION/PURPOSE

SGSS Internal Interface Requirements Specifications specify the requirements necessary to support the interfaces internal to the SNGS (i.e., between/among Ground Segment Elements or internal to SGSS, and the methods to be used to ensure that each requirement has been met.

5. DATA REQUIREMENTS

For interfaces involving hardware-to-hardware interfaces the document shall contain the content specified in DI-SESS-81314A System/Segment Interface Control Specification. For hardware-to-software or software-to-software cases, the document shall contain the content specified in DI-IPSC-81434A Interface Requirements Specification.

Contractor equivalent format is acceptable.

The SGSS Internal Interface Requirements Specifications **shall** define the requirements for the interfaces internal to the SNGS (i.e., between/among Ground Segment Elements or internal to a Ground Segment Element.

If an internal interface for an Element or lower level item is the same as a SGSS Internal Interface, the requirements **shall** be captured in the higher order Specification and referenced in the lower one.

The SGSS Internal Interface Requirements Specifications **shall** be delivered in a CRADLE compatible format that includes linked interrelationships with all higher and lower level specifications.

4.4.19 SGSS Internal Interface Control Documents

DATA ITEM DESCRIPTION		2. NUMBER	SE-19
1. TITLE	SGSS Internal Interface Control Documents	3. DATE	

4. DESCRIPTION/PURPOSE

Describes the SGSS Interface architecture and design and the methods to be used to ensure that each requirement has been met.

5. DATA REQUIREMENTS

For interfaces involving hardware-to-hardware the document shall contain the content specified in DI-SESS-81314A. For hardware-to-software or software-to-software cases, DI-IPSC-81436A, Interface Design Description shall be used.

Contractor equivalent format is acceptable.

SGSS Interface Control Documents **shall** be delivered in a CRADLE compatible format that includes linked interrelationships with all higher and lower level Descriptions.

4.4.20 Technology Readiness Assessment Report (TRAR)

DATA ITEM DESCRIPTION		2. NUMBER	SE-20
1. TITLE	Technology Readiness Assessment Report (TRAR)	3. DATE	

4. DESCRIPTION/PURPOSE

Provide a systematic, metrics-based process and report that assess the maturity of certain technology.

5. DATA REQUIREMENTS

The Technology Readiness Assessment Report (TRAR) **shall** comply with NPR 7120.5D and 7123.1A.

The Technology Readiness Assessment Report (TRAR) **shall** follow the assessment guidelines provided in Technology Readiness Level in NPR 7123.1A, Table G-19.

The Technology Readiness Assessment Report (TRAR) **shall** describe the basic principles observed and reported

The Technology Readiness Assessment Report (TRAR) **shall** describe the Analytical and experimental critical function and/or characteristic proof of concept.

The Technology Readiness Assessment Report (TRAR) **shall** describe the Component and/or breadboard validation in laboratory environment

The Technology Readiness Assessment Report (TRAR) **shall** describe the component and/or breadboard validation in relevant environment.

The Technology Readiness Assessment Report (TRAR) **shall** describe each System/subsystem model or prototype demonstration in a relevant environment.

The Technology Readiness Assessment Report (TRAR) **shall** describe actual system completed and qualified through test and demonstration.

The Technology Readiness Assessment Report (TRAR) **shall** describe and give a conclusion on the Technology Readiness Level.

4.4.21 Make Versus Buy Plan

DATA ITEM DESCRIPTION		2. NUMBER	SE-21
1. TITLE	Make Versus Buy Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The Make vs. Buy Plan identifies each configuration item and rationale for all make/buy decisions.

5. DATA REQUIREMENTS

The Contractor shall document its make versus buy plan and the rationale for such decisions. The plan shall include at minimum:

- 1) Table of configuration items (CI), grouped by functional element and containing:
 - CI project unique identifier
 - CI name
 - Intended source of the CI
 - Rationale summary
 - Criticality with rationale for criticality
- 2) The Make vs. Buy Plan shall specifically identify:
 - Single or sole source suppliers with a backup plan
 - Long lead materials
 - Critical items as identified in the CIL and elsewhere
 - Other high-risk items as identified by the Contractor
 - Vendor control approach, including flow down of technical and product assurance requirements.
- 3) In the event that a formal trade study was conducted to establish the Make vs. Buy decision, a study report shall be provided in accordance with CDRL SE-016. The make vs. buy trade study shall discuss:
 - Scope and ground rules of the study,
 - Evaluation criteria,
 - Alternative solutions considered,
 - Evaluation methods.
- 4) For each software COTS components an assessment of:
 - the risk that the vendor will discontinue support of the component,
 - the impact of discontinuation on the SGSS System,

- possible mitigation strategies (e.g., source escrow, alternate CONOPs, replacement software, etc.), and
- The cost of implementing the mitigation strategies.

4.5 Review Packages

4.5.1 System Requirements Review (SRR) Package

DATA ITEM DESCRIPTION		2. NUMBER	RE-01
1. TITLE	System Requirements Review (SRR) Package	3. DATE	

4. DESCRIPTION/PURPOSE

The SRR examines the functional and performance requirements defined for the SGSS (and its Elements) and ensures that the requirements and the selected concept will satisfy the Segment and higher-level requirements. The objectives of the SRR are to confirm that: (a) SGSS requirements have been logically and fully allocated to each Element and in turn to their respective subsystem level or below, (b) all allocated requirements are verifiable, and, (c) all allocated requirements are traceable to their corresponding SGSS level requirement. Additionally, the SRR shall: (a) demonstrate that the architecture/design is acceptable, (b) that the SGSS system design fulfills the mission objectives and can be built within the constraints posed, (c) ensure that a verification concept and preliminary verification program are defined, (d) establish end item acceptance criteria, and (e) ensure that adequate detail information exists to support initiation of further development or acquisition efforts.

5. DATA REQUIREMENTS

The SRR data package **shall** comply with the SRR requirements of NPR 7123.1A Appendix G.4 and Appendix G.5 that are identified for the types of goods and services being provided by the SGSS contractor.

4.5.2 Software Requirements Review (SWRR) SGSS Input Package

DATA ITEM DESCRIPTION		2. NUMBER	RE-02
1. TITLE	Software Requirements Review (SWRR) SGSS Input Package	3. DATE	

4. DESCRIPTION/PURPOSE

The objectives of the SWRRs is: 1)Review of a CSCIs’ requirements as specified in the Software Requirements Specification and the Interface Requirements Specification(s), and the establishment of the allocated baseline for preliminary design of CSCIs.

5. DATA REQUIREMENTS

The data package(s) **shall** include:

- 1) Functional overview of the CSCIs, including inputs, processing, and outputs of each function.
- 2) Overall CSCI performance requirements, including those for execution time, storage requirements, and similar constraints.
- 3) Control flow and data flow between each of the software functions that comprise the CSCIs.
- 4) All interface requirements between the CSCIs and all other configuration items both internal and external to the Element.
- 5) Qualification requirements that identify applicable levels and methods of testing for the software requirements that comprise the CSCIs.
- 6) Applicable Mission Assurance requirements and how they have/will be addressed.
- 7) Any special delivery requirements for the CSCIs.
- 8) Quality factor requirements; i.e., Correctness, Reliability, Efficiency, Integrity, Usability, Maintainability, Testability, Flexibility, Portability, Reusability, and Interoperability.
- 9) Functions and characteristics of the computer system(s) within the overall Element.
- 10) Milestone schedules.
- 11) Updates since the last review to all previously delivered software related CDRL items.
- 12) Any actions or procedures deviating from approved or baseline plans.

4.5.3 Preliminary Design Review (PDR) Package

DATA ITEM DESCRIPTION		2. NUMBER	RE-03
1. TITLE	Preliminary Design Review (PDR) Package	3. DATE	

4. DESCRIPTION/PURPOSE

The objectives of the PDR are to: (a) ensure that all SGSS requirements have been allocated, the requirements are complete, and the flow-down is adequate to verify SGSS performance; (b) show that the proposed design is expected to meet the functional and performance requirements; (c) show sufficient maturity in the proposed design approach to proceed to final design; (d) show that the design is verifiable and that the risks have been identified and characterized, and where appropriate, mitigation plans have been defined; (e) show that the management processes are sufficient to support development and operations; (f) show that the cost estimates and schedules indicate that the SGSS will be ready to launch and operate on time and within budget and that the control processes are adequate to ensure remaining within allocated resources.

5. DATA REQUIREMENTS

The SGSS PDR data package **shall** comply with the PDR requirements of NPR 7123.1A, Appendix G.7 that are identified for the types of goods and services being provided by the SGSS contractor.

4.5.4 Element PDR Packages

DATA ITEM DESCRIPTION		2. NUMBER	RE-04
1. TITLE	Element PDR Packages	3. DATE	

4. DESCRIPTION/PURPOSE

The objectives of the Element PDRs are to: (a) ensure that all Element requirements have been allocated, the requirements are complete, and the flow-down is adequate to verify Element performance; (b) show that the proposed design is expected to meet the Element functional and performance requirements; (c) show sufficient maturity in the proposed design approach to proceed to final design; (d) show that the design is verifiable and that the risks have been identified and characterized, and where appropriate, mitigation plans have been defined.

5. DATA REQUIREMENTS

The Element PDR data packages **shall** comply with the PDR requirements of NPR 7123.1A, Appendix G.7 that are identified for the types of goods and services being provided by the SGSS contractor.

4.5.5 Element CDR Data Packages

DATA ITEM DESCRIPTION		2. NUMBER	RE-05
1. TITLE	Element CDR Data Packages	3. DATE	

4. DESCRIPTION/PURPOSE

The objectives of the Element CDRs are to demonstrate that: (a) all of the Element design are compliant with functional and performance requirements, (b) the verification approach is viable and will confirm compliance with all requirements, (c) risks have been appropriately identified and mitigated or are on track for timely mitigation, (d) the design is sufficiently mature to proceed with manufacturing, coding, unit test, fabrication, integration, etc.

5. DATA REQUIREMENTS

The Element CDR data packages **shall** comply with the CDR requirements of NPR 7123.1A, Appendix G.8 that are identified for the types of goods and services being provided by the SGSS contractor.

4.5.6 Critical Design Review (CDR) Package

DATA ITEM DESCRIPTION		2. NUMBER	RE-06
1. TITLE	Critical Design Review (CDR) Package	3. DATE	

4. DESCRIPTION/PURPOSE

The CDR should represent a complete and comprehensive presentation of the entire final design. The objectives of the CDR are to demonstrate that: (a) all aspects of the design are compliant with functional and performance requirements; (b) the verification approach is viable and will confirm compliance with all requirements; (c) risks have been appropriately identified and mitigated or are on track for timely mitigation; (d) the design is sufficiently mature to proceed with full scale development; (e) the management processes are sufficient to support development and operations support; and (f) the schedules and cost estimates indicate that the SGSS will be ready to support launch and operate on time and within budget and that the control processes are adequate to ensure remaining within allocated resources.

5. DATA REQUIREMENTS

The SGSS CDR data package **shall** comply with the CDR requirements of NPR 7123.1A, Appendix G.8, that are identified for the types of goods and services being provided by the SGSS contractor.

4.5.7 Missions Operations Review (MOR) Data Package

DATA ITEM DESCRIPTION		2. NUMBER	RE-07
1. TITLE	Missions Operations Review (MOR) Data Package	3. DATE	

4. DESCRIPTION/PURPOSE

The Mission Operations Readiness (MOR) Review establishes the adequacy of plans and schedules for ground systems and flight operations preparation in order to justify readiness to proceed to implement the remaining required activities. The MOR is held to examine mission operations status. It is typically held subsequent to completion of detail design and fabrication activity but prior to initiation of major integration activities of flight or ground system elements.

5. DATA REQUIREMENTS

The Mission Operations review Data Package shall include:

- 1) Linkage of SGSS requirements to SN mission requirements and functionally allocated, traceable and verifiable
- 2) Major constraints associated with flight and ground systems have been fully accommodated within the operations concept
- 3) A complete and baselined Operations Concept Document
- 4) Preliminary Operations Documentation including:
 - Operations Handbook (MO-7)
 - Operations and maintenance manual (MO-08)
 - Mission Operations Procedures (MO-09)
 - SN Users Guide (MO-05)
 - SN Users Handbook (MO-06)
- 5) Local Operating Procedures Documents
- 6) Mission Rules
- 7) Operations Agreements
- 8) Mission Readiness Test Plan and Test Requirements Database have been prepared.
- 9) Personnel and physical security considerations have been defined and are compatible with all applicable requirements.
- 10) Mission Ops Plans for all routine ops scenarios; areas from which contingency ops requirements will arise are identified.
- 11) Approach to mission planning and scheduling
- 12) Preliminary plans for mission routine health and safety monitoring, user services, and contingency, safe-mode, and decommissioning scenarios

- 13) Adequate planning has been completed for the successful definition, development, verification, validation and configuration management of all operations procedures.
- 14) The development approach for receipt of interim databases and operating procedures from users
- 15) The approach for off-line parameter trending.
- 16) The data archival, retrieval, and reporting approach with anomaly reporting is integrated into these plans.
- 17) Operations Team roles, responsibilities, staffing levels (including timing of and numbers during initial phase-in as well as for each mission phase), certification requirements, and training approach
- 18) Plans for preparing for operations through the use of classroom training, mission simulations, flight rehearsals, and network exercises
- 19) Plans for integrating TDRS experts in a manner that creates a unified mission operations team.
- 20) Validation plans including
 - activities with the flight system
 - Simulations and rehearsals, using the end-to-end flight and ground system and involving the entire mission operations team including stress induced operational situations based upon anticipated and unanticipated contingencies and anomalies.

4.5.8 Systems Integration Review (SIR) Data Package

DATA ITEM DESCRIPTION		2. NUMBER	RE-08
1. TITLE	Systems Integration Review(SIR) Data Package	3. DATE	

4. DESCRIPTION/PURPOSE

A Systems Integration Review (SIR) ensures that the system is ready to be integrated and that segments, components, and subsystems are available and ready to be integrated into the system. It also ensures integration facilities, support personnel, and integration plans and procedures are ready for integration. The SIR is a project-level engineering review.

5. DATA REQUIREMENTS

The SIR Package **shall** address the readiness of the involved organizations to execute the Ground Segment installation, integration, and testing activities at the system level.

The SGSS SIR data package **shall** comply with the SIR requirements of NPR 7123.1A, Appendix G.10.

4.5.9 Production Readiness Review (PRR) Package(s)

DATA ITEM DESCRIPTION		2. NUMBER	RE-09
1. TITLE	Production Readiness Review (PRR) Package(s)	3. DATE	

4. DESCRIPTION/PURPOSE

The Production Readiness Review (PRR) determines the readiness of the system developers to efficiently produce the required number of systems. It ensures that the production plans; fabrication, assembly, and integration enabling products; and personnel are in place and ready to begin production.

5. DATA REQUIREMENTS

The SGSS PRR data package **shall** comply with the PRR requirements of NPR 7123.1A, Appendix G.9, that are identified for the types of goods being provided by the SGSS contractor

4.5.10 Pre-shipment System (Preship) Review Package

DATA ITEM DESCRIPTION		2. NUMBER	RE-10
1. TITLE	Pre-shipment System (Preship) Review Package	3. DATE	

4. DESCRIPTION/PURPOSE

The Pre-Ship System (Preship) Review verifies the completeness of the specific end products in relation to their expected maturity level and assesses compliance to stakeholder expectations. The Pre-Ship examines the system, its end products and documentation, and test data and analyses that support verification. It also ensures that the system has sufficient technical maturity to authorize its shipment to the designated operational facility.

5. DATA REQUIREMENTS

The SGSS Preship package data package **shall** comply with the System Acceptance Review requirements of NPR 7123.1A, Appendix G.12.

The SGSS Preship Review shall demonstrate that the overall integration, test and transition plan for the delivery increment is well-defined and has been coordinated with the Operations and Maintenance contractor.

4.5.11 Test Readiness Review (TRR) Data Package

DATA ITEM DESCRIPTION		2. NUMBER	RE-11
1. TITLE	Test Readiness Review (TRR) Data Package	3. DATE	

4. DESCRIPTION/PURPOSE

The Test Readiness Review (TRR) will determine that adequate plans, procedures, resources, test cases, and criteria have been established prior to initiating the Level 5 and Level 6 testing activities at the operational site for each incremental delivery. The TRR(s) also will show that the testing supports the applicable verification requirements. The TRR is a project-level engineering review and ensures that the test article (hardware/software), test facility, support personnel, and test procedures are ready for testing and data acquisition, reduction, and control.

5. DATA REQUIREMENTS

The TRR Package(s) **shall** be consistent with the SGSS

Integration and Test Plan and the Software Management and Development Plan.

If the TRR Package(s) include multiple test events, individual test plans and procedures may be generated as appendices to the Release Test Readiness Review Package(s) or included as separate sections within the Package(s).

Each TRR review shall include a summary of test results from the previous level of testing.

Each release or test level TRR Package **shall** include the functional and performance requirements being tested.

Each release or test level TRR Package **shall** include, for functional and performance capabilities not being verified in whole or part, the criteria for demonstrating acceptability for subsequent Project testing, operational, or operational support activities.

Each release or test level TRR Package **shall** include the plans and schedule for testing activity and address the compatibility with on-going operational activities.

Each release or test level TRR Package **shall** include a summary of test cases, simulators, emulators, and special test equipment required to support testing.

The SGSS TRR data package **shall** comply with the TRR requirements of NPR 7123.1A, Appendix G.11

4.5.12 Operational Readiness Review (ORR) Package(s)

DATA ITEM DESCRIPTION		2. NUMBER	RE-12
1. TITLE	Operational Readiness Review (ORR) Package(s)	3. DATE	

4. DESCRIPTION/PURPOSE

The Operational Readiness Review (ORR) examines the actual system characteristics and the procedures used in operation of the system, or incremental deployment of the system; it ensures that all system and support hardware, software, personnel, procedures, and user documentation accurately reflect the deployed state of the system. Incremental operational readiness reviews will be provided as necessary to support incremental deployment.

5. DATA REQUIREMENTS

The ORR Packages shall include the results of prior Increment ORRs.

The Release ORR data package shall include a list of any requirements that have not been successfully verified and validated during the testing and V&V activities

The ORR data package shall include a list of those items that could not be tested and verified

The SGSS ORR data package shall comply with the ORR requirements of NPR 7123.1A, Appendix G.13.

4.5.13 Final Acceptance Review (FAR)

DATA ITEM DESCRIPTION		2. NUMBER	RE-13
1. TITLE	Final Acceptance Review	3. DATE	

4. DESCRIPTION/PURPOSE

To ensure that the deliverable contract end-items are in accordance with contract requirements prior to Government acceptance.

5. DATA REQUIREMENTS

This Acceptance Data Package, as a minimum, shall be comprised of the following:

- 1) Updated versions of all specifications, design documents, operations support documentation and maintenance documentation.
- 2) As-built configuration list
- 3) Software components lists, including third-party software
- 4) Hardware platforms and components lists (i.e. workstations, PCs, etc.)
- 5) Test Log Book and reports (including total operating time and cycle records)
- 6) Open item lists (including reasons for being open)
- 7) Safety compliance data package
- 8) Functional and Performance tests results
- 9) Operational test results
- 10) Anomaly reports and disposition information
- 11) Updated Performance Verification Matrix and Summary of all Performance Verification results.
- 12) Validation results showing compliance with Ground Segment Requirements.
- 13) Reliability Predictions
- 14) Mission operations constraints.
- 15) Updated Operations Procedures

4.6 Development

4.6.1 Software Development and Management Plan (SDMP)

DATA ITEM DESCRIPTION		2. NUMBER	SW-01
1. TITLE	Software Development and Management Plan (SDMP)	3. DATE	

4. DESCRIPTION/PURPOSE

The Software Development and Management Plan (SDMP) define contractor activities required to develop and manage all software.

5. DATA REQUIREMENTS

The SDMP shall comply with requirements of NPR 7150.2, NASA Software Engineering Requirements.

The SDMP shall include a table showing the compliance with NPR 7150.2.

The SDMP shall list the number, title, revision and date of all referenced documents.

The SDMP shall address firmware

The Software Development and Management Plan shall describe the relationship of the SDMP to other project management plans.

The SDMP shall provide plans and processes for software development activities, such as software development processes, methods, standards, and resource utilization.

The SDMP shall provide detailed descriptions of all software development activities, including but not limited to:

- 1) Software development planning and oversight, including:
 - Resource management
 - Configuration management
 - Corrective action process
 - Technical and management reviews
- 2) Requirements analysis, including:
 - Role in system requirements analysis
 - Software requirements analysis
- 3) Software design, including:
 - Role in system design
 - Software architecture
 - Detailed design
- 4) Software development and implementation, including:

- Standard tools
- 5) Software test, including:
- Unit testing
 - Integration testing
 - Qualification/verification testing

The Software Development and Management Plan shall detail any modified processes as they apply to re-used code.

The Software Development and Management Plan shall detail any modified processes as they apply to COTS software.

The Software Development and Management Plan shall detail any modified processes as they apply to firmware.

The Software Development and Management Plan shall detail the processes for “dead” code.

The Software Development and Management Plan shall contain any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

The Software Development and Management Plan shall include a separate section to address the applicable preceding requirements for the simulator elements(s).

4.6.2 Software Element Design Description

DATA ITEM DESCRIPTION		2. NUMBER	SW-03
1. TITLE	Software Element Design Description	3. DATE	

4. DESCRIPTION/PURPOSE

This data item thoroughly describes element-wide design decisions, the architecture, and detailed design needed to implement the software element.

5. DATA REQUIREMENTS

The Software Element Design Description **shall** comply with requirements of NPR 7150.2, NASA Software Engineering Requirements.

A Software Element Design Description **shall** be delivered for all software elements.

The SGSS Software Design Description **shall** list the number, title, revision and date of all referenced documents.

The SGSS Software Design Description **shall** describe the element-wide design decisions including behavioral design and other decisions affecting the selection and design of the element such as those for safety, security, or privacy.

The SGSS Software Design Description **shall** describe the element architectural design. If part or all of the design depends upon system states or modes, this dependency shall be indicated. The element architectural design **shall** include a minimum of the following:

- 1) CSCI components: Identify the software units and describe the static relationship(s), describe the CSCIs planned utilization of computer hardware resources.
- 2) Concept of execution: Describe the concept of execution and dynamic relationship among the software units. It shall include diagrams and descriptions showing the dynamic relationship of the software units.
- 3) Interface design: Describe and identify the interfacing entities (e.g. software units, systems, configuration items, users, etc.). Describe both interfaces among the software units and their interfaces with external entities such as systems, configuration items, and users.
- 4) Design conventions needed to understand the design.
- 5) Software Unit Description: Describe software unit design decisions and constraints.
 - Unit design decisions, if any, such as algorithms to be used, if not previously selected
 - Any constraints, limitations, or unusual features in the design of the software unit
 - The programming language to be used and rationale for its use if other than the specified CSCI language(s) and language paradigm(s).
 - If the software unit consists of or contains procedural commands, a list of the procedural commands and reference to user manuals or other documents that explain them
 - If the software unit contains, receives, or outputs data, a description of its inputs, outputs, and other data elements and data element assemblies, as applicable. If the software unit is a

database, a corresponding Database Design Description (DBDD) shall be referenced; interface characteristics may be provided here or by referencing the corresponding Interface Design Description(s).

- If the software unit contains logic, the logic to be used by the software unit, include the following information as applicable: initialization, response time, sequence of operations, exception and error handling etc.

A SGSS Software Design Descriptions **shall** contain any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.6.3 SGSS Database Design Description

DATA ITEM DESCRIPTION		2. NUMBER	SW-04
1. TITLE	SGSS Database Design Description	3. DATE	

4. DESCRIPTION/PURPOSE

The Database Design Description (DBDD) describes the design of a database, that is, a collection of related data stored in one or more computerized files in a manner that can be accessed by users or computer programs via a database management system (DBMS). It can also describe the software units used to access or manipulate the data.

The DBDD is used as the basis for implementing the database and related software units. It provides the acquirer visibility into the design and provides information needed for software support.

5. DATA REQUIREMENTS

The DBDD shall comply with requirements of NPR 7150.2, NASA Software Engineering Requirements.

The DBDD shall list the number, title, revision and date of all referenced documents.

The DBDD shall present database-wide design decisions, decisions about the database's behavioral design and other decisions affecting further design of the database.

The DBDD shall describe the inputs that the database will accept (display, reports, etc.), availability, security, privacy, backup and restoration, repacking, sorting, indexing, and synchronization.

The DBDD shall describe the detailed design of the database including:

- 1) Characteristics of individual data elements in the database design, such as data type, size, unit, range, accuracy, priority/timing/frequency, security and privacy.
- 2) Characteristics of data element assemblies (records, messages, files, arrays, displays, reports, etc.) in the database design, such as Name, their structure (number, order, grouping), Medium, Visual and auditory characteristics of displays and other outputs, Relationships among assemblies (sorting, access), Security and privacy constraints, sources.
- 3) A graphical illustration of the database record structure.

The DBDD shall identify each software element that accesses or manipulates a database.

The DBDD **shall** contain any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.6.4 Software Data Dictionary

DATA ITEM DESCRIPTION		2. NUMBER	SW-05
1. TITLE	Software Data Dictionary	3. DATE	

4. DESCRIPTION/PURPOSE

The software data dictionary provides detailed descriptions of all system parameters.

5. DATA REQUIREMENTS

Software Data Dictionary shall comply with requirements of NPR 7150.2, NASA Software Engineering Requirements.

The Software Data Dictionary **shall** provide detailed description, by element, of all system parameters, data, databases, files, and tables, describing the relationships to other data, origin, usage, structure, format, and configurable status.

The Software Data Dictionary shall include the format, default values and location of all system parameters.

4.6.5 Software Test Plan (STP)

DATA ITEM DESCRIPTION		2. NUMBER	SW-06
1. TITLE	Software Test Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The Software Test Plan describes the plans for software component level testing, software integration testing, and software qualification testing. The plan includes a description of the software test environment to be used for testing, identifies the tests to be performed, and provides schedules for environment, development, and test activities. The plan provides an overview of software testing, test schedules, and test management procedures.

5. DATA REQUIREMENTS

The STP shall comply with NPR 7150.2, NASA Software Engineering Requirements.

The STP shall address the testing of all delivered software.

The STP shall be consistent with the SGSS Integration and Test Plan (CDRL IT-01).

The STP shall list the number, title, revision and date of all referenced documents.

The STP shall describe the software test environment such as test sites, software items, hardware and firmware, proprietary nature, government's rights, and licensing.

The STP shall describe the installation, testing, and control/maintenance of the software test environment. The STP shall describe the participating organizations for each test.

The STP shall describe the personnel and organizational resources required.

The STP shall identify the number, type, and skill level of personnel needed during the test period at the test site(s), the dates and times they will be needed, and any special needs, such as multi-shift operation and retention of key skills to ensure continuity and consistency in extensive test programs.

The STP shall describe the orientation and training to be given before and during the testing.

The STP shall describe the tests to be performed including test levels (CSCI level or system level), test types (e.g. timing tests, erroneous input tests, maximum capacity tests), any test conditions, and shall explain the planned sequence for progressive or cumulative tests.

The STP shall identify and describe the data recording, reduction, and analysis procedures to be used during and after the tests identified in this STP.

The STP shall describe the planned tests including:

- 1) Item(s) to be tested
- 2) Describe a test:
 - Test objective
 - Test level (e.g., CSCI level, element level, system level)
 - Test type or class

- Qualification method(s) (e.g., analysis, demonstration, test, inspection)
- Identifiers of all tested requirements
- Special test needs (for example, 48 hours of continuous facility time, use of a special input or database)
- Assumptions and constraints, such as anticipated limitations on the test due to system or test conditions--timing, interfaces, equipment, personnel, database, etc.
- Safety, security, and privacy considerations associated with the test
- Planned regression testing

The STP shall describe the test schedules including a schedule for each test site activities including preparation, conducting and reviewing the tests, any planned retesting etc.

The STP shall provide any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.6.6 Software Maintenance Manuals

DATA ITEM DESCRIPTION		2. NUMBER	SW-07
1. TITLE	Software Maintenance Manuals	3. DATE	

4. DESCRIPTION/PURPOSE

This data item provides information to aid in analyzing, debugging, modifying, testing and loading the software. This includes a description of any support hardware, software and tools required to maintain the software.

5. DATA REQUIREMENTS

The Software Maintenance Manuals shall comply with NPR 7150.2, NASA Software Engineering Requirements.

The Software Maintenance Manuals shall be organized by element.

The Software Maintenance Manuals shall include the following information:

- 1) Description of the target hardware
- 2) Description of the operating system(s) used on the target hardware, including appropriate reference manuals.
- 3) Description of the compilers and linkers needed to maintain the software, including appropriate reference manuals.
- 4) Description of test tools needed to verify the software including appropriate reference manuals
- 5) Description of support software that is integrated into the system.
- 6) Provide any technical details that are needed to modify or patch the software.
- 7) Describe any patches that currently exist. This includes listings of the source code and the procedures to compile, link, test, and load the patch.
- 8) Provide the procedures that are needed to build and install a new release of the software.

The Software Maintenance Manuals shall provide any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.6.7 Software User Manual(s)

DATA ITEM DESCRIPTION		2. NUMBER	SW-08
1. TITLE	Software User Manual(s)	3. DATE	

4. DESCRIPTION/PURPOSE

The Software User Manual(s) provide detailed instructions on the use of the software.

5. DATA REQUIREMENTS

The Software User Manual(s) shall comply with NPR 7150.2, NASA Software Engineering Requirements.

The Software User Manual(s) shall be organized by system functionality.

The Software User's Manual(s) shall list the number, title, revision, and date of all referenced documents.

The Software User's Manual(s) shall provide a brief description of the intended uses of the software application, the operations environment, organization and overview of operation, contingencies and alternate states and modes of operation, security and privacy, and assistance and problem reporting.

The Software User's Manual(s) shall identify all software files, hardware, software, manual operations, and other resources needed for a user to operate the software, including as applicable: identification of computer equipment, communications equipment, any manual or procedures that must be present, and any other resources or equipment that must be present.

The Software User's Manual(s) shall identify points of contact and procedures to be followed to obtain assistance and report problems encountered in using the software.

The Software User's Manual(s) shall contain step-by-step tutorials describing common system functions.

The Software User's Manual(s) shall contain descriptions for:

- 1) Software and systems capabilities, such as system administration requirements, capabilities, and privileges. If applicable, any remote access capabilities, where the capabilities can be accessed from, and the processes for establishing remote access and establishing access priorities.
- 2) Any conventions used by the software, such as the use of colors in displays, the use of audible alarms, the use of abbreviated vocabulary, and the use of rules for assigning names or codes.
- 3) All processing procedures
- 4) Any related batch, offline, or background processing performed by the software that is not invoked directly by the user. Any user responsibilities to support this processing shall be specified.
- 5) Any procedures for creating and retaining backup data that can be used to replace primary copies of data in event of errors, defects, malfunctions, or accidents.
- 6) Detailed procedures for restart or recovery from errors or malfunctions occurring during processing and for ensuring continuity of operations in the event of emergencies.

- 7) All error messages, diagnostic messages, and information messages that can occur while accomplishing any of the user's functions. The meaning of each message and the action that should be taken after each such message shall be identified and described.
- 8) All configuration and data base files that are used to tailor or control the software

The Software User's Manual(s) shall provide any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.6.8 SGSS Software Design Description

DATA ITEM DESCRIPTION		2. NUMBER	SW-09
1. TITLE	SGSS Software Design Description	3. DATE	

4. DESCRIPTION/PURPOSE

The SGSS Software Design Description describes the system level software design decisions and architecture for SGSS.

5. DATA REQUIREMENTS

The SGSS Software Design Description shall comply with NPR 7150.2, NASA Software Engineering Requirements.

The SGSS Software Design Description shall include a system level design overview that contains:

- 1) Design Methodology
- 2) Design Overview
- 3) Design Studies
- 4) Design Issues
- 5) Hardware Interfaces

The SGSS Software Design Description shall describe the system software architecture, including at a minimum the following:

- 1) A listing of all software elements in the system, identifying the element, its basic functionality, whether it is COTS or custom, and any allocated performance requirements. Each element should have a corresponding Software Element Design Description (CDRL SW-03).
- 2) A system architecture diagram showing all software elements and their relationships.
- 3) A mapping of system software elements to system hardware elements.
- 4) Concept of execution: Describe the concept of execution and dynamic relationship among the software elements. It shall include diagrams and descriptions showing the dynamic relationship and data flows between software elements.
- 5) Interfaces: Describe and identify the interfaces between software elements, between software elements and external entities, and between software elements and hardware elements.

The SGSS Software Design Description shall be consistent with the Software Element Design Descriptions, the Database Design Description and the SGSS Hardware Design Description.

The SGSS Software Design Description shall include a description of each software element that contains, at a minimum:

- 1) Functional description
- 2) Software design decisions

- 3) Processing overview (e.g. logic, algorithms)
- 4) Data architectures
- 5) Any constraints, limitations, or unusual features in the design of the software element

The SGSS Software Design Description shall include a description of each user interface, including intended users, functionality and driving requirements.

The SGSS Software Design Description shall include an overview of critical or driving requirements and the design features selected to meet those requirements.

The SGSS Software Design Description shall include a “Day in the Life” scenario that traces typical operational functions through the system software architecture.

The Software Design Description shall include a tree of software specifications and design descriptions.

The Software Design Description shall provide any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.6.9 SGSS Hardware Design Description

DATA ITEM DESCRIPTION		2. NUMBER	HW-01
1. TITLE	SGSS Hardware Design Description	3. DATE	

4. DESCRIPTION/PURPOSE

The SGSS Hardware Design Description describes the system level hardware design decisions and architecture for SGSS.

5. DATA REQUIREMENTS

The SGSS Hardware Design Description shall describe the system-wide design decisions including behavioral design and other decisions affecting the selection and design of HWCI such as those for safety, security, or privacy.

The SGSS Hardware Design Description shall describe the system architectural design, including at a minimum the following:

- 1) A listing of all hardware elements in the system, identifying the element, its basic functionality, whether it is COTS or custom, and any allocated performance requirements. Each element should have a corresponding Hardware Element Design Description (CDRL HW-02).
- 2) A system architecture diagram showing all hardware elements, their connections and indicating redundancy.
- 3) Concept of execution: Describe the concept of execution and dynamic relationship among the hardware elements. It shall include diagrams and descriptions showing the dynamic relationship and data flows between hardware elements.
- 4) Interfaces: Describe and identify the interfaces between hardware elements and between hardware elements and external entities

The SGSS Hardware Design Description shall contain any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.6.10 Hardware Element Design Description

DATA ITEM DESCRIPTION		2. NUMBER	HW-02
1. TITLE	Hardware Element Design Description	3. DATE	

4. DESCRIPTION/PURPOSE

The Hardware Element Design Description thoroughly describes element-wide design decisions, the architecture, and detailed design needed to implement the hardware for this element.

5. DATA REQUIREMENTS

The SGSS Hardware Element Design Descriptions shall be delivered for all hardware elements.

The SGSS Hardware Element Design Descriptions shall describe the element-wide design decisions including behavioral design and other decisions affecting the selection and design of the element such as those for safety, security, or privacy.

The SGSS Hardware Element Design Descriptions shall describe the process and tradeoff criteria used to select COTS components.

If the element contains custom components, the SGSS Hardware Element Design Descriptions shall provide detailed rationale and analysis describing why custom components were used instead of COTS components.

The SGSS Hardware Element Design Descriptions shall include, or reference in another CDRL, analysis to support any performance requirements (including timeliness, capacity, availability and reliability) allocated to this hardware element.

The SGSS Hardware Element Design Descriptions shall describe the element architectural design. If part or all of the design depends upon system states or modes, this dependency shall be indicated. The architectural design shall include a minimum of the following:

- 1) **HWCI components:** Identify the hardware units and describe the static relationship(s).
- 2) **Concept of execution:** Describe the concept of execution and dynamic relationship among the hardware units. It shall include diagrams and descriptions showing the dynamic relationship of the hardware units.
- 3) **Interface design:** Describe and identify the interfacing entities. Describe both interfaces among the hardware units and their interfaces with external entities such as software units, systems, configuration items, and users.
- 4) **Detailed Design:** Describe design conventions needed to understand the design.
- 5) **Hardware Component Description:** Describe hardware component design decisions and constraints, including at a minimum the following information:
 - Hardware component design decisions.
 - Hardware element drawings and schematics.
 - Any constraints, limitations, or unusual features in the design of the hardware component.

- If the hardware component contains procedural commands, a list of the procedural commands and reference to user manuals or other documents that explain the procedural commands.
- If the hardware component contains, receives, or outputs data, a description of its inputs, outputs, and other data elements and data element assemblies, as applicable.

The SGSS Hardware Element Design Descriptions shall contain any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.6.11 Hardware Test Plan (HTP)

DATA ITEM DESCRIPTION		2. NUMBER	HW-03
1. TITLE	Hardware Test Plan (HTP)	3. DATE	

4. DESCRIPTION/PURPOSE

The Hardware Test Plan (HTP) describes the plans for hardware component testing, hardware integration testing, and hardware performance testing. The plan describes the test environment to be used for testing, identifies the tests to be performed, and provides schedules for environment, development, and test activities. The plan provides an overview of hardware testing, test schedules, and test management procedures.

5. DATA REQUIREMENTS

A Hardware Test Plan (HTP) shall be delivered for all hardware elements.

The Hardware Test Plan shall be consistent with the SGSS Integration and Test Plan (CDRL IT-01).

The Hardware Test Plan shall describe the relationship, if any, of the HTP to related project management plans.

The Hardware Test Plan shall describe the hardware test environment such as test sites, software items, interfaces, test data, hardware and firmware.

The Hardware Test Plan shall describe the installation, testing, and control/maintenance of the hardware test environment.

The Hardware Test Plan shall describe the participating organizations.

The Hardware Test Plan shall describe the personnel and organizational resources. The Hardware Test Plan shall identify the number, type, and skill level of personnel needed during the test period at the test site(s), the dates and times they will be needed, and any special needs, such as multi-shift operation and retention of key skills to ensure continuity and consistency in extensive test programs.

The Hardware Test Plan shall describe the orientation and training to be given before and during the testing.

The Hardware Test Plan shall describe the tests to be performed including test levels (CSCI level or system level), test types (e.g. timing tests, erroneous input tests, maximum capacity tests), any test conditions, and shall explain the planned sequence for progressive or cumulative tests.

The Hardware Test Plan shall identify and describe the data recording, reduction, and analysis procedures to be used during and after the tests identified in this HTP.

The Hardware Test Plan shall describe the planned tests including:

- 1) Item(s) to be tested such as a CSCI, subsystem, system, or other entity.
- 2) Describe a test:
 - Test objective
 - Test level (e.g., CSCI level, element level, system level)

- Test type or class
- Qualification method(s) (e.g., analysis, demonstration, test, inspection)
- Identification of all requirements addressed by this test with cross-reference to the RTVM as appropriate.
- Special test needs (for example, 48 hours of continuous facility time, extent of test, use of a special input or database)
- Assumptions and constraints, such as anticipated limitations on the test due to system or test conditions--timing, interfaces, equipment, personnel, database, etc.
- Safety, security, and privacy considerations associated with the test

The Hardware Test Plan shall describe the test schedules including a schedule for each test site activities including preparation, conducting and reviewing the tests, any planned retesting etc.

The Hardware Test Plan shall provide any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.6.12 Hardware Maintenance Manuals

DATA ITEM DESCRIPTION		2. NUMBER	HW-04
1. TITLE	Hardware Maintenance Manuals	3. DATE	

4. DESCRIPTION/PURPOSE

The Hardware Maintenance Manuals provide information to aid in analyzing, debugging, modifying, and testing the hardware. This includes a description of any support hardware, software and tools required to maintain the hardware.

5. DATA REQUIREMENTS

The Hardware Maintenance Manuals shall be organized by element.

The Hardware Maintenance Manuals shall include the following information:

- Description of procedures to identify and isolate hardware faults
- Description of replacement and / or repair procedures
- Description of hardware self test features
- Description of test tools needed to verify the Hardware including appropriate reference manuals

The Hardware Maintenance Manuals **shall** provide any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.6.13 Hardware User Manual(s)

DATA ITEM DESCRIPTION		2. NUMBER	HW-05
1. TITLE	Hardware User Manual(s)	3. DATE	

4. DESCRIPTION/PURPOSE

The Hardware User Manual(s) provide detailed instructions on the use of the Hardware.

5. DATA REQUIREMENTS

The Hardware User Manual(s) shall be organized by system functionality.

The Hardware User's Manual(s) shall list the number, title, revision, and date of all referenced documents.

The Hardware User's Manual(s) shall provide a brief description of the intended uses of the hardware, the operations environment, organization and overview of operation, contingencies and alternate states and modes of operation, security and privacy, and assistance and problem reporting.

The Hardware User's Manual(s) shall identify points of contact and procedures to be followed to obtain assistance and report problems encountered in using the hardware.

The Hardware User's Manual(s) shall contain step-by-step tutorials describing hardware functions.

The Hardware User's Manual(s) shall provide any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.7 Integration & Test

4.7.1 Integration and Test Plan

DATA ITEM DESCRIPTION		2. NUMBER	IT-01
1. TITLE	Integration and Test (I&T) Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The Integration and Test (I&T) Plan is the comprehensive document which defines and documents at a high level the overall integration and testing program to achieve the plan defined in the CDRL SE-02 (Verification and Validation plan).

5. DATA REQUIREMENTS

In addition to addressing the requirements in the SOW the I&T plan shall address the following:

The I&T Plan shall comply with NPR 7150.2, NASA Software Engineering Requirements.

The I&T Plan shall define entrance and exit criteria for each test level

The entrance criteria for unit test shall include the requirement that all unit code has completed an inspection / peer review.

The unit level test plan shall ensure testing of all paths and branches in the developed code

The I&T plan shall require successful completion of the lower level tests as entrance criteria to the next level of testing

The I&T Plan shall address the types of testing conducted throughout the I&T Project. Types of testing shall include:

- 1) Electrical Interface Tests
 - Before the integration a configuration item into the next higher hardware assembly, electrical interface tests shall be performed to verify that all interface signals are within acceptable limits of applicable performance specifications.
- 2) Functional Tests
 - Functional tests shall be conducted. A functional test verifies that all functions of the system are operating properly.
- 3) Regression Testing
 - Regression testing shall be performed after updates and changes are moved into the testing environment to ensure that previously tested features continue to operate properly.
- 4) Comprehensive Performance Tests
 - The CPT shall be a detailed demonstration that the hardware meets its functional, performance, and interface requirements within allowable tolerances. The CPT shall

demonstrate the continuity of operations of all redundant capabilities and fail over functions

- At the system level, the CPT shall demonstrate that, with the application of known stimuli, the system will produce the expected responses. At lower levels of assembly, the test shall demonstrate that, when provided with appropriate stimuli, internal performance is satisfactory and outputs are within acceptable limits.
- CPT shall be performed on the fully integrated system before shipping to the operational site, and before transition into operations
- CPT shall be repeated periodically following the resolution of Discrepancy Reports

5) Mission Readiness Tests

The Contractor shall plan to conduct a formal Test Readiness Review (TRR) at least 5 calendar days prior to commencement of each testing level.

The I&T Plan shall include a separate section to address the applicable preceding requirements for the simulator element(s).

4.7.2 Detailed Test Plan(s)

DATA ITEM DESCRIPTION		2. NUMBER	IT-02
1. TITLE	Detailed Test Plan(s)	3. DATE	

4. DESCRIPTION/PURPOSE

The Detailed Test Plan(s) document the detailed testing plans, for the tests supporting the Ground Segment Integration and Support Activities.

The Scope of the Detailed Test Plan(s) includes both hardware and software.

5. DATA REQUIREMENTS

The Detailed Test Plan(s) shall comply with NPR 7150.2, NASA Software Engineering Requirements.

For each level of testing, Test Plans, Test Procedures and Test Reports shall be delivered in accordance with the following table:

Test level	Test Plan	Test Proc. Due 60 days prior to test	Test Report/Data Due NLT 30 days after test completion
Level 1 (Unit)	A	*	*
Level 2 Sub element	A	*	*
Level 3 (Element)	A	*	*
Level 4 (System)	A	A	I
Level 5 (On-Site System)	A	A	I
Level 6 (Transition)	A	A	I

* shall be available upon request
A = approval, I= Information only

Test Plans shall be delivered in accordance with the following table:

Level 1 Test Plan	90 calendar days before test
Level 2 Test Plan	90 calendar days before test
Level 3 Test Plan	90 calendar days before test
Level 4 Test Plan	90 calendar days before test
Level 5 Test Plan	30 calendar days prior to System Integration Review - draft 90 calendar days prior to Pre-Ship Review - final
Level 6 Test Plan	CDR – draft 90 calendar days prior to Pre-ship Review - final

Test plans shall include the requirements to be tested, the tests used to validate that the requirement has been satisfied, traceability of the test to the requirements, test objectives, a description of the test, a description of the configuration of the unit under test, test methodology, pass/fail criteria, the environment in which the test will be run, the data required for the test, the expected results, and special operational conditions required. Test plans shall include test cases, test scenarios, test procedures to be executed to demonstrate compliance with the appropriate levels. Test plans shall include test summary, test requirements, test description, test environment, roles and responsibilities, reporting requirements, test methods, test control including quality check points.

These test plans shall include the relevant portion of the traceability matrix demonstrating satisfactory compliance to the requirements allocated to that sub-element and the contractor's certification that each requirement has been met.

Test procedures shall include test configuration, including unit under test, GSE, and other instrumentation, test input, detailed, step by step instructions for executing tests, measurements to be taken, predicted values expected, test parameters, pass/fail criteria, quality control checkpoints, safety provisions and cautions,

Test reports shall provide a comprehensive record that documents/summarizes the results of the as-run test procedure. The Test Report shall identify

- 1) which test objectives were accomplished,
- 2) a comparison of predicted performance verses measurements,
- 3) a summary of test results,
- 4) A list of discrepancies found during testing.

The Detailed Test Plan(s) shall provide traceability to the Integration and Test Plan.

The Detailed Test Plan(s) and Procedures **shall** include, by reference, the associated Software or Hardware Test Plan(s) and Procedures.

4.7.3 Detailed Test Procedures

DATA ITEM DESCRIPTION		2. NUMBER	IT-03
1. TITLE	Detailed Test Procedures	3. DATE	

4. DESCRIPTION/PURPOSE

The Detailed Test Procedures document the step by step testing process, for the tests supporting the SGSS Integration and Support Activities.

The Scope of the Procedures includes both hardware and software.

5. DATA REQUIREMENTS

The Detailed Test Procedures **shall** comply with NPR 7150.2, NASA Software Engineering Requirements. See DID for IT-02 for description of IT-03 requirements

4.7.4 Post-Test Report

DATA ITEM DESCRIPTION		2. NUMBER	IT-04
1. TITLE	Post-Test Report	3. DATE	

4. DESCRIPTION/PURPOSE

The Post-Test Report provides a comprehensive record that documents/summarizes the results of the as-run test procedure. The Post-Test Report identifies which test objectives were accomplished, how well predicted performance was verified by the test data, and annotates any other significant events which occur during testing.

5. DATA REQUIREMENTS

The Post-Test Report shall comply with NPR 7150.2, NASA Software Engineering Requirements.

Post-Test Reports shall provide a comprehensive record that documents/summarizes the results of the as-run test procedure. The Test Report shall identify which test objectives were accomplished, a comparison of predicted performance verses measurements, and a summary of test results, a list of discrepancies found during testing.

Post-test reports are required for all test activities identified in the Detailed Test Plans and Procedures (IT-02 and IT-03). Contents of these reports shall include, as a minimum:

- 1) A copy of the As Run Test Procedure.
- 2) Evidence of Quality Assurance acceptance data.
- 3) Test equipment calibration data (Not required for routine test equipment calibrations), Anomaly report listing and copies (Including status/resolution if completed by submittal).
- 4) For shortfalls in meeting test objectives and/or performance requirements, recommended corrective actions including retesting, test modifications, requirements waivers or changes, or hardware and/or software changes.
- 5) Identification of all software and hardware items tested.
- 6) Version numbers of all software used in the test, including software installed on tested hardware components as well as test drivers, mission simulators, interface simulators, etc.
- 7) Identification of all test data used.
- 8) Identification of the executed tests, including cross-references to the Detailed Test Plans and Procedures (IT-02 and IT-03).
- 9) Actual sequence of test operations including dates and times.
- 10) Summary of the test results and an assessment of the quality and acceptability of the item tested, including pass/fail criteria and performance against the criteria.
- 11) Summary of validated and non-validated requirements.
- 12) Summary of any deviations from the test procedures.

13) Summary of non-conformances occurring during the test and the resolution and corrective actions or mitigations taken.

14) Trends in the performance of critical components.

Test Reports shall be provided in accordance with the I&T test plans (IT-02)

4.8 Mission Assurance

4.8.1 Mission Assurance Implementation Plan

DATA ITEM DESCRIPTION		2. NUMBER	MA-01
1. TITLE	Mission Assurance Implementation Plan (MAIP)	3. DATE	

4. DESCRIPTION/PURPOSE

The Mission Assurance Implementation Plan (MAIP) documents the Contractor's plan for implementing a system safety and mission assurance program.

5. DATA REQUIREMENTS

The MAIP shall cover:

- All hardware and software that is designed, built, or provided by the Contractor and its subcontractors, or furnished by the government, from project initiation through mission operations

The MAIP shall include a traceability matrix for the mission assurance requirements.

The MAIP shall include a separate section to address the applicable preceding requirements for the simulator elements(s).

4.8.2 Software Quality Assurance Plan

DATA ITEM DESCRIPTION		2. NUMBER	MA-02
1. TITLE	Software Quality Assurance Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The Software Quality Assurance Plan documents the Contractor's Software Quality Assurance roles and responsibilities, surveillance activities, supplier controls, record collection, maintenance and retention, training, and risk management.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 7.2
- NASA-STD-8739.8, NASA Standard for Software Assurance

Reference Documents:

- IEEE Standard 730-2002, Software Quality Assurance Plans
- CMMI Guidelines for Process Integration and Product improvement, 2nd Ed., SEI Series in Software Engineering

Preparation Information:

The Software Quality Assurance Plan (SQAP) shall follow the format:

- Purpose
- Reference documents and definitions
- Management
- Documentation
- Standards, practices, conventions, and metrics
- Monitor and Audit Schedule
- Software Reviews
- Test
- Measurement, Analysis and Improvement
- Problem Reporting and Corrective Action
- Preventive Action
- Tools, techniques, and methodologies
- Media control
- Supplier control

- Records, collection, maintenance, and retention
- Training
- Risk Management
- SQAP Change procedure and history

The SQAP shall include a separate section to address the applicable preceding requirements for the simulator elements(s).

4.8.3 Quality Manual

DATA ITEM DESCRIPTION		2. NUMBER	MA-03
1. TITLE	Quality Manual	3. DATE	

4. DESCRIPTION/PURPOSE

The Quality Manual documents the Contractor's quality management system

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 4.1

Reference Documents:

- SAE AS9100 Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing
- ISO 10013 Quality Manual Development Guide

The Contractor shall prepare a Quality Manual addressing applicable requirements of AS9100; refer to ISO 10013 Quality Manual Development Guide for guidelines on preparation of a quality manual.

4.8.4 System Safety Program Plan

DATA ITEM DESCRIPTION		2. NUMBER	MA-04
1. TITLE	System Safety Program Plan (SSPP)	3. DATE	

4. DESCRIPTION/PURPOSE

The System Safety Program Plan (SSPP) describes the tasks and activities of system safety management and engineering required to identify, evaluate, and eliminate or control hazards to the hardware, software, and system design by reducing the associated risk to an acceptable level throughout the system life cycle.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 5.2.1
- NPR 8715.3C, NASA, General Safety Program Requirements
- NASA-STD-8719.13B, Software Safety Standard

Reference Documents

- MIL-STD-882D Standard Practice for System Safety

The Contractor shall prepare a SSPP that describes the development and implementation of a system safety program that complies with the requirements of NPR 8715.3C, General Safety Program Requirements Justification.

The Contractor shall:

- Define the roles and responsibilities of personnel
- Provide a safety audit schedule
- Define the required documentation, applicable documents, and completion schedules for analyses, reviews, and safety packages
- Address support for Reviews, Safety Working Group Meetings and TIMs
- Provide for early identification and control of hazards to personnel, facilities, support equipment, and the SGSS system during product development, including design, implementation, and test.
- Address compliance with industrial safety requirements imposed by NASA and OSHA design and operational needs (e.g., NASA-STD-8719.9, Lifting Devices and Equipment) and contractually imposed project unique obligations
- Address software safety so as to identify and mitigate safety-critical software products in compliance with NASA-STD-8719.13B, NASA Software Safety Standard by the following:
 - Identification of software related hazards
 - Identification of hazard controls that are implemented with software
 - Identification and tracking of software safety requirements
 - Verification results and approved waivers and exceptions for software safety requirements
 - Verification of safety discrepancy disposition approvals

4.8.5 Safety Requirements Compliance Checklist

DATA ITEM DESCRIPTION		2. NUMBER	MA-05
1. TITLE	Safety Requirements Compliance Checklist	3. DATE	

4. DESCRIPTION/PURPOSE

The checklist indicates for each requirement, whether the proposed design is compliant, non-compliant but meets intent, non-compliant, or if the requirement is not applicable. An indication other than compliant will include rationale.

5. DATA REQUIREMENTS

- MAR Paragraph 5.2.2

The Contractor shall prepare a compliance checklist of all design, test, analysis, and data submittal requirements.

The following shall be included:

- Criteria and requirement.
- System
- Indication of compliance, noncompliance, or not applicable
- Resolution
- Reference

4.8.6 Safety Assessment Report

DATA ITEM DESCRIPTION		2. NUMBER	MA-06
1. TITLE	Safety Assessment Report	3. DATE	

4. DESCRIPTION/PURPOSE

The Safety Assessment Report will identify safety features of the hardware, software, and system design as well as procedural, hardware, and software related hazards that may be present in the SGSS. This includes specific procedural controls and precautions that should be followed. The Safety Assessment Report will include the following information:

- 1) The safety criteria and methodology used to classify and rank hazards, including assumptions upon which the criteria or methodologies were based or derived, to include the definition of acceptable risk.
- 2) The results of hazard analyses and tests used to identify hazards in the system including:
 - Those hazards that still have a residual risk and the actions that have been taken to reduce the associated risk to a level contractually specified as acceptable
 - Results of tests conducted to validate safety criteria, requirements, and analyses
 - Hazard reports documenting the results of the system safety program efforts to include a list of all significant hazards along with specific safety recommendations or precautions required to ensure safety of personnel, property, or the environment. NOTE: Categorize the list as to whether or not the risks may be expected under normal or abnormal operating conditions.
 - Any hazardous materials generated by or used in the system
 - The conclusion, including a signed statement, that all identified hazards have been eliminated or their associated risks controlled to levels contractually specified as acceptable and that the system is ready to test, operate, or proceed to the next phase
 - Recommendations applicable to hazards at the interfaces of the SGSS with other systems, as required

The Safety Assessment Report shall ensure the evolution of the PHA and the OHA as the project matures.

5. DATA REQUIREMENTS

The Contractor shall prepare a Safety Assessment Report.

- 1) The initial delivery of the Safety Assessment Report 4 weeks prior to PDR shall include the PHA and the Software Safety Analysis.
- 2) The update of the Safety Assessment Report 4 weeks prior to CDR shall include an updated PHA, updated Software Safety Analysis and the OHA
- 3) The final delivery of the Safety Assessment Report shall include an updated PHA, updated Software Safety Analysis, an updated OHA and the VTL.

- 4) Updates of the Safety Assessment Report shall be delivered prior to each start of “Shadow Operations”.

Preliminary Hazard Analysis:

The Preliminary Hazard Analysis (PHA) is used to obtain an initial risk assessment and identify safety critical areas of a concept or system. It is based on the best available data, including mishap data from similar systems and other lessons learned.

Applicable Documents:

- NPR 8715.3C, NASA General Safety Program Requirements
- NASA STD 8719.13B, Software Safety Standard

Reference Documents:

- NASA GB 8719.13, Software Safety Guidebook
- MIL-STD-882, Standard Practice for System Safety

The Contractor shall evaluate hazards associated with the proposed design or function for severity, probability, and operational constraints.

The Contractor shall identify safety provisions and alternatives that are needed to eliminate hazards or reduce their associated risk to an acceptable level.

Operations Hazard Analysis:

The Operations Hazard Analysis (OHA) shall demonstrate that hazards related to the operation of hardware and test equipment during integration and test activities have been addressed with respect to facility safety requirements.

Applicable Documents:

- NASA-STD-8719.9 Standard for Lifting Devices and Equipment

The OHA shall include the following information:

- 1) Introduction – a summary of the major findings of the analysis and the proposed corrective actions and definitions of special terms, acronyms, and abbreviations.
- 2) System Description – a description of system hardware and configuration, with a list of subsystem components and schedules for integration and testing
- 3) Analysis of Hazards
- 4) List of real or potential hazards to personnel, equipment, and property during I&T processing
- 5) The following information shall be included for each hazard:
 - System Component/Phase – the phase and component with which the analysis is concerned; e.g., system, subsystem, component, operating/maintenance procedure, or environmental condition.
 - System Description and Hazard Identification, Indication:
 - a. A description of expected results from operating the component/subsystem or performing the operating/maintenance action.
 - b. A complete description of the actual or potential hazard resulting from normal actions or equipment failures; indicate whether the hazard will cause personnel injury and equipment damage.

- c. A description of the safety hazards of software controlling hardware systems where the hardware effects are safety critical.
 - Effect on System – the detrimental effects of an uncontrolled hazard on the system
 - Risk Assessment.
 - Caution and Warning Notes – a list of warnings, cautions, procedures required in operating and maintenance manuals, training courses, and test plans
 - Status/Remarks – the status of actions to implement hazard controls.
 - References (e.g., test reports, preliminary operating and maintenance manuals, and other hazard analyses)

Verification Tracking Log:

The Verification Tracking Log provides documentation of a Hazard Control and Verification Tracking process as a closed-loop system to ensure that safety compliance has been satisfied in accordance to applicable launch range safety requirements. The VTL provides documentation that demonstrates the process of verifying the control of all hazards by test, analysis, inspection, similarity to previously qualified hardware, or any combination of these activities.

All verifications that are listed on the hazard reports **shall** reference the tests/analyses/inspections.

Results of these tests/analyses/inspections **shall** be available for review and submitted in accordance with the contract schedule and applicable launch site range safety requirements.

The VTL **shall** contain the following information in tabular format:

- Hazard Report #
- Safety Verification #
- Description (Identify procedures/analyses by number and title)
- Constraints on Operations
- Independent Verification Required (e.g., mandatory inspection points)
- Scheduled Completion Date

4.8.7 Safety Variance

DATA ITEM DESCRIPTION		2. NUMBER	MA-09
1. TITLE	Safety Variance	3. DATE	

4. DESCRIPTION/PURPOSE

A Safety Variance documents a safety requirement that cannot be met and the rationale for approval of a waiver, exception, or deviation as defined in NPR 8715.3C.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 5.4

The Contractor shall include the following information from the review of a variance request:

- A statement of the specific safety requirement and its associated source document name and paragraph number for which a variance is requested.
- A technical justification for the variance.
- Analyses to show the mishap potential of the proposed alternate requirement, method, or process as evaluated against the specified requirement.
- An assessment of the risk involved in accepting the variance; when it is determined that there are no hazards, the basis for such determination should be provided.
- A narrative on possible ways of reducing hazards severity and probability and existing compliance activities.
- Starting and expiration dates for variance, if applicable.

4.8.8 PRA and RMA Program Plan

DATA ITEM DESCRIPTION		2. NUMBER	MA-11
1. TITLE	PRA and RMA Program Plan	3. DATE	

4. DESCRIPTION/PURPOSE

This provides for the planning and implementation of the Probabilistic Risk Assessment (PRA) and Reliability, Maintainability and Availability (RMA) Program Plan for hardware and software.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 6.1, 6.2 and 7.3
- NPD 8720.1, NASA Reliability and Maintainability (R&M) Program Policy
- NASA-STD-8729.1, Planning, Developing and Managing an Effective Reliability and Maintainability (R&M) Program.
- NPR 8705.5, PRA Procedures for NASA Programs and Projects
- IEEE-Std – 1633, IEEE Recommended Practice on Software Reliability

Reference Documents:

- AMSAA TR 652, AMSAA Reliability Growth Guide

The PRA and RMA Program Plan **shall** include:

- A discussion of how the Contractor intends to implement and comply with PRA and RMA program requirements.
- Charts and statements describing organizational responsibilities and functions conducting each task to be performed as part of the PRA and RMA Program.
- A summary (matrix or other brief form) that indicates for each requirement, the organization responsible for implementing and generating the necessary documents.
- Identify the approval, oversight, or review authority for each task.
- Narrative descriptions, time or milestone schedules, and supporting documents describing the execution and management plan for each task.
- Documentation, methods, procedures, and reporting specific to each task in the plan, including measures to ensure reliability growth

4.8.9 RMA Model and Predictions Report

DATA ITEM DESCRIPTION		2. NUMBER	MA-12
1. TITLE	RMA Model and Predictions Report	3. DATE	

4. DESCRIPTION/PURPOSE

Reports the structured, disciplined approaches to quantitatively analyze SGSS reliability, availability and maintainability (including hardware and software) in order to:

- assist with the evaluation of alternative design concepts
- reduce design, operation and maintenance costs
- determine the feasibility of achieving required reliability, availability and maintainability
- validate that the SGSS design meets the requirements specification

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 6.1, 6.8 and 7.3
- NASA-STD-8729.1, Planning, Developing and Managing an Effective Reliability and Maintainability (R&M) Program

Reference Documents:

- MIL-HDBK-217, Military Handbook – Reliability Prediction of Electronic Equipment
- Telcordia SR-332 v2, Reliability Prediction. Procedure for Electronic Equipment
- MIL-HDBK-472, Military Standardization Handbook – Maintainability Prediction

The RMA Model and Predictions Report shall:

- document the methods and results of comparative reliability assessments including mathematical models, reliability block diagrams, failure rates, failure definitions, degraded operating modes, trade-offs, assumptions, and any other pertinent information used in the assessment.
- Incorporate, through and as directed by the SGSS Project Office, information and findings as provided by the IAGP vendors for those subsystems.
- List the subassemblies and units to be assessed.
- Document the methods and results of quantitative system availability assessments including availability allocation, mathematical models, operating and maintenance modes, trade-offs, assumptions, and any other pertinent information used in the assessment process.
- Provide a model for use in quantitative assessment of system and subsystem availability addressing the following availability measures: inherent availability, operational availability, and achieved availability.

- Document the methods and results of maintainability assessments, including definitions used in quantitative maintainability measurements, maintainability allocations, mathematical models, maintainability predictions, maintenance and logistics concepts, for which hardware/software is designed (and under which COTS items have been selected).
- contain maintainability predictions related to each associated level of maintenance based on the performance of similar systems, test data, MIL-HDBK- 472 or equivalent, unless otherwise approved by the Government
- Document maintainability models and maintenance activity block diagrams for maintainability allocations, to assess the feasibility of maintenance activities within the limitations of segment design and operation, and to augment systems engineering tradeoff studies and alternative concepts/configurations.
- Be made at a stated level of confidence.

4.8.10 Maintainability Demonstration Report

DATA ITEM DESCRIPTION		2. NUMBER	MA-13
1. TITLE	Maintainability Demonstration Report	3. DATE	

4. DESCRIPTION/PURPOSE

Provides the results, conclusions, data analysis, and records of SGSS maintainability demonstration used to verify, demonstrate and evaluate both quantitative and qualitative maintainability characteristics.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 6.1
- NASA-STD-8729.1, Planning, Developing and Managing an Effective Reliability and Maintainability (R&M) Program

The Maintainability Demonstration Report shall:

- Document the test or demonstration methodologies, assumptions, methods and conditions of the demonstration, methods of evaluating the data obtained and comparison of the conditions with those anticipated in operations, and any other pertinent information including how equipments and environment is representative of the operational configuration. Note: The maintainability demonstration may be integrated with other tests, if approved by the SGSS PM.
- include evaluation of diagnostic capability fault detection and isolation as well as maintenance time and man-hours characteristics, as applicable; scenario(s) to be followed for the test addressing the skill levels of maintenance personnel to be used in the test, and the makeup of the test team; and ground rules with respect to such factors as: instrumentation failures; maintenance due to secondary failures; technical manual or support equipment usage or adequacy; personnel numbers and skill; cannibalization, maintenance inspection; government furnished equipment usage; and maintenance time limits.
- Provide statistical confidence calculations and the underlying statistical basis of the demonstration and results obtained, including specific identification and discussion of objectives demonstrated satisfactorily and those not demonstrated satisfactorily.
- Provide contractor's conclusions, corrective action anticipated, recommendation to correct deficiencies, and suggested improvements based on evaluation of the demonstration results.
- Include all analysis, supporting data, and all data sheets.

4.8.11 Operational Availability Report

DATA ITEM DESCRIPTION		2. NUMBER	MA-14
1. TITLE	Operational Availability Report	3. DATE	

4. DESCRIPTION/PURPOSE

The Operational Availability Report tracks the availability of the system, subsystem down to the LRU on a weekly basis beginning with the transition to “Shadow Operations” of the first subsystem.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 6.1

The Operational Availability report shall:

- List the failures of equipment to the LRU / software package with at minimum the following information: date, service outage time, MTTR and logistics time and all other delay time.
- Determine and report the operational availability for each service as defined in the Systems Requirement Document and the maintainability during the preceding week.
- Determine and report the cumulative operational availability for each service as defined in the Systems Requirement Document.

4.8.12 Probabilistic Risk Assessment

DATA ITEM DESCRIPTION		2. NUMBER	MA-15
1. TITLE	Probabilistic Risk Assessment	3. DATE	

4. DESCRIPTION/PURPOSE

The Probabilistic Risk Assessment provides a structured and disciplined approach to: analyzing system risk; supporting management decisions; improving safety, operations, performing maintenance and upgrades; improving performance; reducing costs.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 4.3
- NPR 8705.5A Probabilistic Risk Assessment (PRA) Procedures for NASA Programs and Projects
- NPR 8715.3C NASA General Safety Program Requirements

Reference Documents:

- PRA Procedures Guide for NASA Managers and Practitioners, (<http://www.hq.nasa.gov/office/codeq/doctree/praguide.pdf>)

The PRA **shall** be performed in accordance with NPR 8705.5 and include the following:

- 1) The objective and scope of the PRA
- 2) End-states-of-interest to the decision-maker,
- 3) Definition of the project phases and success criteria,
- 4) Initiating event categories,
- 5) Top level scenarios,
- 6) Initiating and pivotal event models (e.g., fault trees and phenomenological event models), including:
 - assessments of common cause failure modes
 - assessments of hardware and software failures
 - operations of the TDRSS
 - transition of the system to operations
- 7) Data development for probability calculations,
- 8) Integrated model and quantification to obtain risk estimates,
- 9) Assessment of uncertainties,
- 10) Summary of results and conclusions, including a ranking of the lead contributors to risk.

4.8.13 Failure Mode and Effects Analysis (FMEA) and Critical Item List (CIL)

DATA ITEM DESCRIPTION		2. NUMBER	MA-16
1. TITLE	Failure Mode and Effects Analysis (FMEA) and Critical Item List (CIL)	3. DATE	

4. DESCRIPTION/PURPOSE

The Failure Mode and Effects Analysis (FMEA) and Critical Item List (CIL) are used to evaluate design against requirements, to identify single point failures and hazards, and to identify modes of failure within a system design for hardware and software for the early mitigation of potential catastrophic and critical failures.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 6.4
- SAE ARP 5580, Recommended Failure Modes and Effects Analysis (FMEA) Practices for Non-Automobile Applications

Reference Documents:

- GSFC Flight Assurance Procedure, FAP P-302-720, Performing a Failure Mode and Effects Analysis

The FMEA Report shall include the following:

- A discussion of the approach of the analysis, methodologies, assumptions, results, conclusions, and recommendations.
- Objectives
- Level of the analysis
- Ground rules
- Functional description
- Functional block diagrams
- Reliability block diagrams
- Equipment analyzed
- Data sources used
- Problems identified
- Single-point failure analysis, to include the root cause, mitigation, and retention rationale for those with severity categories 1, 1R, 1S, 2 or 2R.
- Corrective actions

- Work sheets identifying failure modes, causes, severity category, and effects at the item, next higher level, and project level, detection methods, and mitigating provisions.
- Critical Items List (CIL) for severity categories 1, 1R, 1S, 2, and 2R, including item identification, cross-reference to FMEA line items, and retention rationale. Appropriate retention rationale may include design features, historical performance, acceptance testing, manufacturing product assurance, elimination of undesirable failure modes, and failure detection methods.

4.8.14 Fault Tree Analysis (FTA)

DATA ITEM DESCRIPTION		2. NUMBER	MA-17
1. TITLE	Fault Tree Analysis (FTA)	3. DATE	

4. DESCRIPTION/PURPOSE

The Fault Tree Analysis (FTA) is used to assess mission failure from the top-level perspective. Undesired top-level states are identified and combinations of lower-level events are considered to derive credible failure scenarios. The technique provides a methodical approach to identify events or environments that can adversely affect mission success and provides an informed basis for assessing system risks for hardware and software.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 6.5
- NPR 8715.3C, NASA General Safety Program Requirements
- NASA-STD-8719.13B, Software Safety Standard

Reference Documents:

- NASA Fault Tree Handbook with Aerospace Applications (<http://www.hq.nasa.gov/office/codeq/doctree/fthb.pdf>)

The mission FTA Report shall contain:

- Analysis ground rules including definitions of undesirable end states
- References to documents and data used
- Fault tree diagrams
- Results and conclusions

4.8.15 EEE Parts List

DATA ITEM DESCRIPTION		2. NUMBER	MA-18
1. TITLE	EEE Parts List	3. DATE	

4. DESCRIPTION/PURPOSE

To provide a list of EEE parts that may be selected for use in custom-built hardware or Modified-Off-The Shelf (MOTS) equipment.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 9.1
- GSFC EEE-INST-002 Instructions for EEE Parts Selection, Screening, and Qualification (NASA/TP—2003–212242) <http://nepp.nasa.gov/DocUploads/FFB52B88-36AE-4378-A05B2C084B5EE2CC/EEE-INST-002_add1.pdf>

The EEE Parts List shall contain the following information:

- Hardware component identity to the circuit board level
- Complete part number (i.e. DSCC part number, SCD part number, with all suffixes)
- Manufacturer's Generic Part number
- Manufacturer (not distributor)
- Part Description (please include meaningful detail)
- Procurement Specification
- Comments and clarifications, as appropriate
- Estimated quantity required (for procurement forecasting)

4.8.16 Worst Case Analysis

DATA ITEM DESCRIPTION		2. NUMBER	MA-19
1. TITLE	Worst Case Analysis	3. DATE	

4. DESCRIPTION/PURPOSE

The Worst Case Analysis demonstrates design margins in electronic and electrical circuits, optics, and electromechanical and mechanical items.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 6.7
- NPD 8720.1, NASA Reliability and Maintainability (R&M) Program Policy
- NASA-STD-8729.1, Planning, Developing and Managing an Effective R&M Program

Reference Documents:

- MIL-HDBK-1250A, Corrosion Prevention and Deterioration control in electric components and circuits

The Worst Case Analysis Report shall include the following:

- Address worst case conditions performed on each component.
- Discuss how each analysis includes the project life.
- Discuss consideration of critical parameters at maximum and minimum limits.
- The effect of environmental stresses on the operational parameters being evaluated.
- Assessment of corrosion compatibility, when the environment warrants.

4.8.17 Trend Analysis

DATA ITEM DESCRIPTION		2. NUMBER	MA-20
1. TITLE	Trend Analysis	3. DATE	

4. DESCRIPTION/PURPOSE

A Trend Analysis is used to augment the reliability predictions with reliability growth data obtained during the development, testing, and operational phases for software starting with software requirement definition, and to ensure reliability growth for hardware during the operational phase.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 6.9 and 7.3
- NASA-STD-8729.1, Planning, Developing and Managing an Effective R&M Program.

Reference Documents:

- AMSAA TR 652, AMSAA Reliability Growth Guide

The Trend Analysis Report shall:

- Use of a structured and controlled data acquisition and analysis process providing the necessary information to perform trend analysis on the failure behavior of the subject equipment and/or software and to support root cause analyses of failure situations and corrective actions.

4.8.18 Limited-Life Items List

DATA ITEM DESCRIPTION		2. NUMBER	MA-21
1. TITLE	Limited-Life Items List	3. DATE	

4. DESCRIPTION/PURPOSE

The Limited-Life Items List tracks the selection and application of limited-life items and the predicted impact on mission operations and required or preventive maintenance action.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 6.10

Preparation Information:

- The Contractor shall prepare and maintain a list of life-limited items and their predicted impact on mission operations.
- The list shall include number of occurrences in the system, expected life, required life, MTBF or failure rate, duty cycles, and rationale for selecting and using the item.
- LRUs with MTBF < 10000hrs, or mechanical/electromechanical items with B₁₀ life of less than 10000 hrs shall be included in the Limited Life Item List

4.8.19 Lead-Free Control Plan

DATA ITEM DESCRIPTION		2. NUMBER	MA-22
1. TITLE	Lead-Free Control Plan	3. DATE	

4. DESCRIPTION/PURPOSE

To reduce the risk of failures in all equipment due to tin whiskers.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 9.4
- NPD 8730.2, NASA Parts Policy
- GEIA-STD-0005-02, Standard for Mitigating the Effects of Tin Whiskers in Aerospace and High Performance Electronic Systems
- GEIA-STD-0005-01, Performance Standard for Aerospace and High Performance Electronics Systems Containing Lead-free Solder

The lead-free control plan shall:

- be designed and implemented in accordance with GEIA-STD-0005-02, Level 2C requirements.
- describe how the lead-free control plan is organized and managed
- define the test and audit procedures, including subcontractors
- define the mitigation techniques
- define the reporting standards on the audit and mitigation

4.8.20 ESD Control Plan

DATA ITEM DESCRIPTION		2. NUMBER	MA-23
1. TITLE	ESD Control Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The ESD Control Plan defines the plan for minimizing ESD during development, integration and test, and operations support activities.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 12.1
- ANSI/ESD S20.20-2007 For the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)

The ESD Control Plan shall comply with ANSI/ESD-S20.20-2007

The ESD Control Plan shall:

- Describe the scope of the ESD Program;
- Describe the tasks, activities, and procedures necessary to protect ESD sensitive items at or above a specified sensitivity level;
- Identify organizational responsibilities for the tasks and activities;
- List directive or supportive documents used in the ESD Program.
- The ESD susceptibility of planned parts, assemblies and equipment and their required protection levels.
- Include a listing of the specific type of ESD protective materials and equipment used in the Program.

4.8.21 Parts Stress Analysis

DATA ITEM DESCRIPTION		2. NUMBER	MA-24
1. TITLE	Parts Stress Analysis	3. DATE	

4. DESCRIPTION/PURPOSE

The Parts Stress Analysis provides EEE parts stress analyses for verifying circuit design conformance to derating requirements; demonstrates that environmental operational stresses on parts comply with project derating requirements.

5. DATA REQUIREMENTS

Applicable Documents:

- MAR Paragraph 6.6
- GSFC EEE-INST-002 <http://nepp.nasa.gov/DocUploads/FFB52B88-36AE-4378-A05B2C084B5EE2CC/EEE-INST-002_add1.pdf>
- NASA Parts Selection List <http://nepp.nasa.gov/npsl/index.htm>

Preparation Information:

The Parts Stress Analysis Report **shall** contain:

- Analysis ground rules
- Reference documents and data used
- Results and conclusions including:
 - Design trade study results
 - Parts stress analysis results impacting design or risk decisions
- Analysis worksheets; the worksheets at a minimum **shall** include:
 - Part identification (traceable to circuit diagrams)
 - Assumed environmental (consider all expected environments)
 - Rated stress
 - Applied stress (consider all significant operating parameter stresses at the extremes of anticipated environments)
 - Ratio of applied-to-rated stress

4.8.22 Workmanship Plan

DATA ITEM DESCRIPTION		2. NUMBER	MA-25
1. TITLE	Workmanship Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The Workmanship Plan provides a description of use of NASA workmanship and applicable Industry workmanship standards for MOTS and custom built hardware.

Reference Documents:

NASA-STD-8739.1	Workmanship Standard for Staking and Conformal Coating of Printed Wiring Boards and Electronic Assemblies
NASA-STD-8739.2	Surface Mount Technology
NASA-STD-8739.3	Soldered Electrical Connections
NASA-STD-8739.4	Crimping, Interconnecting Cables, Harnesses, and Wiring
NASA-STD-8739.5	Fiber Optic Terminations, Cable Assemblies, and Installation
IPC-J-STD-001D	Requirements for Soldered Electrical and Electronic Assemblies (Class 3 Requirements)
IPC-2221	Generic Standard on Printed Board Design
IPC-2222	Sectional Design Standard for Rigid Organic Printed Boards
IPC-2223	Sectional Design Standard for Flexible Printed Boards
IPC-2225	Sectional Design Standard for Organic Multichip Modules (MCM-L) and MCM-L Assemblies
IPC A-600	Acceptability of Printed Boards (Class 3 requirements)
IPC-6011	Generic Performance Specification for Printed Boards (Class 3 requirements)
IPC-6012	Qualification and Performance Specification for Rigid Printed Boards (Class 3/A requirements)
IPC-6013	Qualification and Performance Specification for Flexible Printed Boards (Class 3 requirements)
IPC-6015	Qualification and Performance Specification for Organic Multichip Module (MCM-L) Mounting and Interconnecting Structures
IPC-6018	Microwave End Product Board Inspection and Test

Preparation Information:

The Workmanship Plan **shall** address:

- MOTS and custom built hardware, including Cabling, Connectors and Harnesses
- Mission critical and non-mission critical hardware

4.9 Training

4.9.1 Training Plan

DATA ITEM DESCRIPTION		2. NUMBER	TR-01
1. TITLE	Training Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The Training Plan describes the approach required to obtain knowledge to operate and maintain the SGSS through all life cycle phases and states.

The purpose of the Training Plan is to define the training strategy, management tasks, resources, allocations, and training requirements for the SGSS project. It will provide a detailed plan for the management of the resources needed to accomplish the goals, approach and plan for “bringing personnel up-to-date” on the operation, maintenance and use of the new systems and interfaces.

5. DATA REQUIREMENTS

Reference Documents:

- NPR 7150.2 – chapter 4
- NPR 7123.1A – chapter 3

The Training Plan shall comply with NPR 7150.2, NASA Software Engineering Requirements, and NPR 7123.1A, NASA System Engineering Processes, and Requirements.

The Training Plan shall:

- 1) Describe the approach for training and certification.
- 2) Address the number of knowledgeable and qualified trainers required for all aspects of training including operations, maintenance, and administration.
- 3) Describe training facility requirements.
- 4) Address the development and distribution of resources needed for training (i.e., operation manuals, user guides, Instructor manuals, system diagrams, flow charts, and software).
- 5) Describe the training certification process and requirements for each level of training (i.e., entry level to management/supervisory level).
- 6) Provide schedules for each training segment (i.e., timeframe for each training course).
- 7) Outline the criteria for the development and implementation of assessments (exams/test) associated with the training and certification process.
- 8) Include a graphical presentation (flow diagram) of the training process from course introduction to certification for each level of training.
- 9) Detail the number of people to be trained by skill
- 10) Detail the training schedule of classes and certification to train the required number of people

The Training Plan shall include a separate section to address the applicable preceding requirements for the simulator elements(s).

4.9.2 Training Documentation/Resources

DATA ITEM DESCRIPTION		2. NUMBER	TR-02
1. TITLE	Training Documentation/Resources	3. DATE	

4. DESCRIPTION/PURPOSE

The Training documentation/resources provides information essential to the training and certification process required to operate, support, and maintain SGSS through all life cycle phases and states.

The Training documentation/resources should provide a description of the purpose and intended use of each resource.

5. DATA REQUIREMENTS

Reference Documents:

- NPR 7150.2 – chapter 4
- NPR 7123.1A – chapter 3
- NPD 2820.1

The Training Documentation shall comply with NPR 7150.2, NASA Software Engineering Requirements, NPR 7123.1A, NASA System Engineering Processes and Requirements, and NPD 2820.1, NASA Software Policy.

The course Training Documentation/Resources shall consist of visual and instructional material for all areas of the SGSS system operations, maintenance, and administration. Training materials shall support the training of all operations and maintenance personnel.

The Training Documentation/Resources shall:

- 1) Detail the general functions and operation of the interfaces, equipment, software, and systems used in training.
- 2) Outline each aspect and detail required for each task/job to be performed to the proficiency level required for certification.
- 3) Include Train-the-Trainer manuals, Instructor manuals, student guides, maintenance manuals, and software guides.
- 4) Include Assessments/Exams developed for the proficiency level required for certification and review.
- 5) Address the software necessary to precipitate training, including software development, off-the-shelf and training simulation modes.
- 6) Be modularized, individualized, and use multimedia learning resources, when appropriate.
- 7) Include audio and video recordings of each training session
- 8) Provide a Training Library/Repository of all key training and applicable documents, manuals, and diagrams. The Training Library/Repository shall:

- Set the level of permission for access to specific material. (i.e., Instructor manuals, diagrams, SBU, etc.)
- Provide a time/date stamp/log of user activity (i.e., initial login).
- Provide the date the document was input into the system and the date the document was baselined.
- Provide category listing (i.e., Networks, etc.)
- Provide a search engine (i.e., document number, title, keyword, category, etc.)
- Administrator Interface (i.e., for upload of materials to library/repository, user management, etc.)
- Accept electronic formats for upload and distribution (i.e., PDFs, MSWord, HTML)
- Allow for printing/publishing of documents/resources.
- Allow for export (download) of documents/resources.

4.9.3 Wall Charts

DATA ITEM DESCRIPTION		2. NUMBER	TR-03
1. TITLE	Wall Charts	3. DATE	

4. DESCRIPTION/PURPOSE

The Wall Chart provides a graphical representation of the SGSS Functional and Data Flow Architecture and the breakpoints for training certification levels.

5. DATA REQUIREMENTS

The Wall Charts shall be generated in a format suitable for large scale products.

The Wall Charts shall depict the SGSS functional and data flow architecture.

The Wall Charts shall:

- 1) Be readable by a group within an academic setting/classroom (i.e., 27h x 37w).
- 2) Be applicable for the course of study.
- 3) Provide various wall charts (i.e., functional and data flow elements down to the subsystems and below, principle internal and external interfaces, etc.).
- 4) Provide narrative annotations.

4.10 Maintenance and Operations

4.10.1 Transition Plan

DATA ITEM DESCRIPTION		2. NUMBER	MO-01
1. TITLE	Transition Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The purpose of the Transition Plan is to define the transition to operations activities and associated milestones for the transition of the Ground Segment to an operational capability and the transfer of responsibility from the contractor to Government personnel. All items denoted with ** shall be delivered with the proposal as a draft version of this CDRL.

5. DATA REQUIREMENTS

The Transition Plan shall comply with requirements of NPR 7123.1A, NASA Systems Engineering Processes and Requirements, the updated Space Network User's Guide, 450-SNUG, and the updated Space Network Handbook, 450-HDBK-SN.

The Plan shall include conditions to be met prior to transition, any phasing of transition, inclusion of over-the-shoulder monitoring on the part of both Government personnel prior to transition and Contractor personnel just prior to Government acceptance.

The Plan shall include the iterative nature of the SGSS transition activities during which the operational lead for SGSS operational testing shall pass from the contractor to the Government.

The Plan shall include steps taken to ensure that the safety of the SGSS and all TDRS is maintained through the transition process.

The Plan shall describe the continuing contractor operations support activities.

**The Plan shall include a transition to operations schedule including milestone events, consistent with the Project Management Plan, detailing the entrance, success, and exit criteria.

**The schedule shall be developed to a level that demonstrates an understanding of the complexity of the SGSS integration and transition to operations as well as the specific activities required to transition new SGSS capabilities at each SN location.

The plan shall identify all new operational procedures for both ground based and space based assets, along with detailed mapping of SGSS procedures to current/existing SNGS procedures as required in MO-07, Operations Handbook.

The Plan shall include:

- 1) The relationship, if any, of the Transition Plan to other plans.
- 2) The number, title, revision, and date of all documents referenced in this document.
- 3) The Support Resources - Identify and describe the resources needed to support the transition to operations.

- 4) ****Personnel** - describe the personnel required to support the transition to operations, including anticipated number of personnel, types and levels of skills and expertise. Provide an organization chart depicting the proposed Transition and Operations Support organization.
- 5) Other resources –identify any additional resources that may be required.
- 6) Interrelationship of activities - identify the interrelationships of the activities identified in the preceding paragraphs. A figure may be used to show the interrelationships.
- 7) Procedures - describe all procedures, including lessons learned, for supporting the transition to operations activities.
- 8) ****Training** – describe the developer’s plans for training that specifically addresses the transition to operations This section shall include:
 - The schedule, duration, and location for the training
 - The delineation between classroom training, computer based/simulation training, and “hands-on” training
 - Provision (either directly or by reference) for:
 - a. Familiarization with the operational capabilities of the SGSS hardware and software capabilities as they directly relate to operational activities, i.e. TDRS monitor and control and user services monitoring.
 - Anticipated areas of change to operational capabilities - describe anticipated areas of change to the existing operational capabilities and/or procedures.
 - ****Transition planning.** This section shall be divided into a series of paragraphs and architectural views as needed to describe the developer's plans for transitioning the deliverable hardware and software to an operational capability and ultimately to full operations. This section shall address the following:
 - a. All activities to be performed during transition to operations, including, but not limited to:
 - ******(1) processes (e.g., action item identification and resolution, test and transition schedule, problem report identification and resolution, working groups and integrated product teams)
 - (2) equipment
 - ******(3) remote sites (GRGT)
 - (4) security
 - (5) information assurance
 - (6) communications
 - (7) CRYPTO
 - ******(8) resource planning/scheduling
 - ******(9) training systems (MTF)
 - (10) data rights
 - ******(11) simulation certification
 - ******(12) technical order validation/verification

- (13) operations and maintenance suitability
 - *(14) operations and maintenance readiness (e.g., maintenance training, spares)
 - (15) transition tools as applicable
 - *(16) strategies
 - (17) contingencies.
- b. The Contractor's plan shall be consistent with its proposed PMP, IMS and SOW.
 - c. These activities may include planning/coordination meetings; development of individual detailed test scenarios, cases and plans, preparation of procedures to be delivered to the Government; , verification of the procedures with operations concurrence and checkout of the operational hardware and software; and training of additional support personnel.
 - d. **b. Roles and responsibilities of all participants and expected results for each activity
 - e. **c. Schedules and milestones for conducting the transition to operations activities. These schedules and milestones shall be compatible with the IMP and IMS.
- Success Criteria – define the activities/steps of each transition activity that has to be met in order to insure a successful transition of a particular capability to operations.
 - The specific activities to transition

The Transition Plan shall provide any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.10.2 Maintenance and Sustainment Plan

DATA ITEM DESCRIPTION		2. NUMBER	MO-02
1. TITLE	Maintenance and Sustainment Plan	3. DATE	

4. DESCRIPTION/PURPOSE

Provide the maintenance and sustaining engineering approach for all hardware and software for the period of performance. The plan shall cover full maintenance until successful completion of the FAR and then describe the sustaining engineering support for the remaining period of performance

5. DATA REQUIREMENTS

The Maintenance Plan shall comply with the NASA System Engineering Handbook, NASA/SP-2007-6105, and section 4.4.

The Plan shall include a section for hardware and a section for software

The Plan shall include:

- 1) Description of the approach and processes to be applied to maintenance and sustainment of all hardware and software for which the Implementation Contractor and the O&M Contractor has maintenance responsibility.
- 2) Identification of maintenance and sustainment skill requirements
- 3) Staffing levels by skills per quarter throughout the period of performance
- 4) Identification of the predictive and preventive maintenance (PM) for all systems/equipment and provides a means for scheduling its accomplishment.
- 5) A system of records to document all maintenance, including both PM and corrective maintenance, as well as modifications.
- 6) Specific reports to be provided.
- 7) The approach for configuration control or a reference to the CM Plan.
- 8) Specific maintenance training requirements and schedules.
- 9) The process for maintaining visibility and control of system problems using discrepancy reports or similar mechanisms.
- 10) Identification of the approach to maintaining the sites' critical functions in addition to the general off-site maintenance support.
- 11) Identification of a list of equipments for maintenance records.
- 12) Maintenance Analysis
- 13) Level of Repair Analysis

For 12) and 13) above:

- These analyses shall address all applicable levels of maintenance for the ground station(s) and the SGSS hardware.
- These analyses shall support a recommended repair level; repair vs. discard-at-failure decision, spares provisioning, and maintenance planning.

The plan shall describe how the maintenance provider for products will be selected and the dates of warranty or maintenance contract expiration.

The Maintenance and Sustainment Plan shall include a separate section to address the applicable preceding requirements for the simulator elements(s).

4.10.3 Maintenance Records

DATA ITEM DESCRIPTION		2. NUMBER	MO-03
1. TITLE	Maintenance Records	3. DATE	

4. DESCRIPTION/PURPOSE

Establish and maintain maintenance records for SGSS.

5. DATA REQUIREMENTS

The maintenance records shall comply with requirements of NPR 7150.2, NASA Software Engineering Requirements.

Starting at the first delivery of hardware, the Contractor shall maintain SGSS maintenance records for hardware defined in the maintenance plan (item 9 in DID MO-02).

The maintenance records shall at least include the following:

- 1) Operating log for each piece of equipment. Data shall include, as applicable, on/off times, operating time, down time for each maintenance/repair event, equipment rack access records (times opened/closed, purpose, identification of individuals), and failure frequency data
- 2) Configuration logs for each piece of equipment. Data shall at least include a current configuration list for the equipment, dates and times of equipment or LRU installation and removal, and serial numbers of LRUs removed for repair and for the replacement LRUs
- 3) A system of maintenance work orders and fabrication/repair records covering pertinent data, including LRU identification, diagnostic data, repair operations and steps, repair time duration, hardware disposition and routing, spare parts availability (and resupply delays), test procedure for repaired item and test results

The maintenance records shall be maintained and stored in a readily accessible, identifiable and retrievable form. The records shall be retained at all equipment locations for the duration of the contract. The maintenance records shall be available for Project Office inspection in response to specific Project Office requests.

4.10.4 Logistics Analysis and Support Plan

DATA ITEM DESCRIPTION		2. NUMBER	MO-04
1. TITLE	Logistics Analysis and Support Plan	3. DATE	

4. DESCRIPTION/PURPOSE

Describe the Logistics Plan for the SGSS to establish and determine the Logistics Support Analysis (LSA) required for the system.

5. DATA REQUIREMENTS

The Logistics Plan shall comply with requirements in NPR 7120.5D, NASA Space Flight Program and Project Management Requirements and NPD 7500.1B, Program and Project Logistics Policy.

The Logistics Plan shall include:

- 1) A description of the Logistics Support Analysis and any use or tailoring of MIL-STD-1388.2b for this purpose
- 2) Reuse Analysis (such as legacy SN equipment), if applicable
- 3) Inventory with specified locations
- 4) Technology Refresh/Enhancement plans and schedules for RF chain hardware, other customized hardware, COTs hardware, custom software and COTS software.
 - Technology refresh / enhancement plans and schedules shall ensure that the current or previous version of COTS software is maintained in the SGSS operational system.
- 5) Sparing Analysis and Plan including justification for the spares recommended for the SGSS and a Spares Provisioning Plan with schedule ties to the Technology Refresh cycles.

Logistic Support Analysis (LSA) shall be conducted for site(s), element and infrastructure, and end item. LSA candidate items will be determined by the Contractor in coordination with the Government. Additional items may be provided by the Government. The analysis shall provide inputs for the logistics planning that ensure adequate resources (including spares, facilities and opportunities for technology refresh) are available to support the SNGS for the entire life cycle.

The analysis shall support establishment of hardware reuse requirements, if applicable, technology enhancement/refresh opportunities, cost improvement opportunities, and licensing and vendor support requirements.

The Logistics Plan shall describe the logistics Support Analysis including but not limited to:

- 1) A brief description of the LSA objectives and their relationships to major program requirements and how they will be satisfied.
- 2) A description of the organization planned for management of the LS program, and the internal interfaces between the LS organization and other elements of the Contractor's organization, as well as with the Ground Segment Project Office.
- 3) How the logistics support will be supported from the contractor's facility and from activities established at the operational locations.

- 4) The cost and schedule for establishing the logistics support capability required for the GS, especially for the Technology Refresh and Ground Segment spares.

4.10.5 Space Network User's Guide

DATA ITEM DESCRIPTION		2. NUMBER	MO-5
1. TITLE	Space Network User's Guide	3. DATE	

4. DESCRIPTION/PURPOSE

This document describes the customer services provided by the National Aeronautics and Space Administration (NASA) Space Network (SN) and guides the customer through the process of obtaining support from the SN.

5. DATA REQUIREMENTS

The Space Network User's Guide shall be updated to reflect the post-SGSS Space Network Ground Segment and its User services.

4.10.6 Space Network Handbook

DATA ITEM DESCRIPTION		2. NUMBER	MO-6
1. TITLE	Space Network Handbook	3. DATE	

4. DESCRIPTION/PURPOSE

This SN Handbook is intended to provide high-level descriptions of these SN elements as a companion document to the existing SN User's Guide (SNUG). While the User's Guide contains the details of how an SN customer could obtain SN services, with a particular emphasis on the interfaces between the customer and the SN, this Handbook contains new as well as additional descriptions of the TDRSs, the components of the ground terminals, user signal flow and dedicated elements as well as the external supporting elements. The Handbook, however, does not go into the mathematical descriptions of satellite communications via the TDRSS, as may be found in the SNUG. In addition, the Handbook contains a comprehensive list of acronyms and an extensive Glossary of Telecommunications Terms.

5. DATA REQUIREMENTS

The Space Network Handbook shall be updated to reflect the post-SGSS Space Network Ground Segment and its User services.

4.10.7 Operations Handbook

DATA ITEM DESCRIPTION		2. NUMBER	MO-07
1. TITLE	Operations Handbook	3. DATE	

4. DESCRIPTION/PURPOSE

The Operations Handbook describes the functional capabilities and use of the SGSS Elements, subsystems, components, and infrastructure. The Operations Handbook is used by system operators to learn what the SGSS capabilities are and how to perform each capability, and it is used by the hardware and software maintenance team to understand the methodology and design of the SGSS which helps with hardware and software maintenance support.

5. DATA REQUIREMENTS

The Operations Handbook shall comply with requirements of NPR 7120.5D, NASA Space Flight Program and Project Management Requirements.

The Operations Handbook shall contain the following required information needed to understand and use the SGSS Element, Subsystem, Component, and infrastructure hardware and software:

- 1) Provide detailed mapping of all existing SNGS operational procedures to SGSS procedures.
- 2) Screen-shots of all critical Operator Interfaces (GUIs) and detail the usage of all GUI.
- 3) Detailed descriptions of the functionality provided by each operator accessible SGSS Element, Subsystem, component, and infrastructure
- 4) Step-by-step instructions (with the use of the screen-shots) on how to use the operator interfaces to achieve these functionalities
- 5) Indicate how to bring up each Element, Subsystem, component, and infrastructure function, including cold and warm starts
- 6) Detail the various modes of operation based on access control, and show screen-shots indicating the difference in screen activations based on an operator's role
- 7) Provide a list of all alerts or notifications produced by each Element, Subsystem, component, and infrastructure along with their meanings and recommended responses.
- 8) Provide a list and description of all SGSS activities that are available to be planned and processed by the SGSS Element, Subsystem, component, and infrastructure functions.
- 9) Provide details on anomaly resolution within the GS, including operational procedures, scenarios, personnel involved and their roles and responsibilities. Include references, as appropriate to the SGSS Contingency Operations Procedures
- 10) Provide a list of all operator roles supported by each Element, Subsystem, component, and infrastructure and the privileges associated with each role
- 11) Description of any automated functionality and procedures for manual intervention and/or ratification actions
- 12) Provide a complete list of operations agreements

- 13) Provide a description of the SGSS shifts and operator roles and staffing for each shift
- 14) Indicate recovery methods for each Element, Subsystem, component, and infrastructure in cases of irrevocable errors or faults
- 15) Indicate data types expected within each field of each Element, Subsystem, component, and infrastructure GUI
- 16) Provide details of the interface operations between the SGSS and the legacy SGSS system and/or facilities
- 17) Provide details of the interface operations between the SGSS Element, Subsystem, component, and infrastructure and all external interfaces.
- 18) Provide recommended SGSS software and hardware maintenance plans and checklists.
- 19) Identify maintenance support activities for SGSS Element, Subsystem, component, and infrastructure.
- 20) Provide operator checklists for all SGSS Element, Subsystem, component, and infrastructure functionalities covering routine, anomaly, and contingency operations.
- 21) Provide a complete set of local operations procedures by site
- 22) Contact listing in front of Handbook for key operational organizations and personnel.
- 23) Appendix – Data Dictionary - Provide a data dictionary, by subsystem, of information about all system parameters, data, databases, files, and tables, describing the relationships to other data, origin, usage, structure, format, and configurable status

Handbook(s) shall be produced in several formats:

- 1) Paper version.
- 2) Electronic version with hyperlinks from table of contents to associated sections
- 3) Electronic version shall be searchable
- 4) Both formats above shall be structured by SGSS Element, Subsystem, component, and infrastructure, then by operations and operations support, then by topic, then by location.
- 5) Tailored versions of Handbook shall be produced for each operational SGSS location identifying the operational and operations support information for the functionalities available from the particular location.

4.10.8 Operations and Maintenance Manuals

DATA ITEM DESCRIPTION		2. NUMBER	MO-08
1. TITLE	Operations and Maintenance Manuals	3. DATE	

4. DESCRIPTION/PURPOSE

To provide Operations and Maintenance documentation to support the operations and maintenance of the Ground Segment.

5. DATA REQUIREMENTS

The Operations and Maintenance manuals shall comply with requirements of NPR 7120.5D, NASA Space Flight Program and Project Management Requirements.

The Operations and Maintenance manuals shall be organized by:

- 1) Site
- 2) Element(s) and infrastructure
- 3) Functional capabilities supporting operator use and/or intervention
- 4) Functional capabilities requiring maintenance

The Operations and Maintenance Manuals shall provide information similar to that provided by the Operations handbook at a more detailed level tailored to the specific function for which the manual is written.

The Operations and Maintenance Manuals shall include:

- 1) Screen-shots of all critical Operator Interfaces (GUIs) and detail the usage of each GUI.
- 2) Detailed descriptions of the functionality provided by each operator accessible SGSS Element, component, and infrastructure.
- 3) Step-by-step instructions (with the use of the screen-shots) on how to use the operator interfaces to achieve these functionalities
- 4) Indicate how to bring up each Element, component, and infrastructure function, including cold and warm starts
- 5) Detail the various modes of operation based on access control, and show screen-shots indicating the difference in screen activations based on an operator's role
- 6) Provide a list of all alerts or notifications produced by each Element, component, and infrastructure along with their meanings and recommended responses.
- 7) Provide a list and description of all SGSS activities that are available to be planned and processed by the SGSS Element, component, and infrastructure functions.
- 8) Provide details on anomaly resolution within the GS, including operational procedures, scenarios, personnel involved and their roles and responsibilities.
- 9) Provide a list of all operator roles supported by each Element, component, and infrastructure and the privileges associated with each role

- 10) Description of any automated functionality and procedures for manual intervention and/or ratification actions
- 11) Provide a description of the SGSS shifts and operator roles and staffing for each shift
- 12) Indicate recovery methods for each Element, component, and infrastructure in cases of irrevocable errors or faults
- 13) Indicate data types expected within each field of each Element, component, and infrastructure GUI
- 14) Provide details of the interface operations between the SGSS and the legacy SGSS system and/or facilities
- 15) Provide details of the interface operations between the SGSS Element, component, and infrastructure and all external interfaces.
- 16) Provide recommended SGSS software and hardware maintenance plans and checklists.
- 17) Identify maintenance support activities for SGSS Element, component, and infrastructure.
- 18) Provide operator checklists for all SGSS Element, component, and infrastructure functionalities covering routine, anomaly, and contingency operations.
- 19) Contact listing in front of Handbook for key operational organizations and personnel
- 20) Include copies of manufacturer hardware/factory manuals.
- 21) Appendix - list of element event messages and associated notifications and alerts that the subsystem can generate and associated diagnostic and contingency procedures including fault recovery and isolation information

Manuals **shall** be produced in several formats:

- 1) Paper Version.
- 2) Electronic version with hyperlinks from table of contents to associated sections
- 3) Electronic version shall be searchable
- 4) Both formats above shall be structured by SGSS Element, Subsystem, component, and infrastructure, then by operations and operations support, then by topic, then by location.
- 5) Tailored versions of Handbook shall be produced for each operational SGSS location identifying the operational and operations support information for the functionalities available from the particular location.

The Operations and Maintenance Manual shall include a separate section to address the applicable preceding requirements for the simulator elements(s).

4.10.9 Missions Operations Procedures

DATA ITEM DESCRIPTION		2. NUMBER	MO-09
1. TITLE	Missions Operations Procedures	3. DATE	

4. DESCRIPTION/PURPOSE

To provide detailed description of operations procedure and contingency identification, detection, and developer's recommended response to deviations from expected operational modes of the SGSS.

5. DATA REQUIREMENTS

The Missions Operations Procedures shall comply with requirements of NPR 7123.1A, NASA Systems Engineering Processes and Requirements.

The Mission Operations Procedures shall provide the detailed procedures required to configure, maintain health and safety, and operate SN

The Mission Operations Procedures shall list the mission rules

The Mission Operations Procedures shall provide the Nominal and the Contingency Operations Procedures.

The Nominal Operations Procedures shall describe in flow chart form and text description for every use of SGSS performance data to assure the SGSS is operating within expected conditions. Appropriate executable procedures shall be provided.

The Contingency Operations Procedures shall describe in flow chart form and text description for the immediate actions to be taken by the operations staff when each of these expected conditions is not true. Appropriate executable procedures shall be provided.

The Contingency Operations Procedures shall include exact data to be monitored and all directives to be sent or actions to be taken.

The Contingency Operations Procedures flow charts shall highlight operations including fail-over procedures and possible single points of failure existing in the as-built SGSS.

For each redundant device, component, and system, SGSS Contingency Operations Procedures shall describe how the unit is switched to its backup unit and all operational impacts of performing the switch to the backup side.

4.10.10 Computer Operations Manuals (COM)

DATA ITEM DESCRIPTION		2. NUMBER	MO-10
1. TITLE	Computer Operations Manuals (COM)	3. DATE	

4. DESCRIPTION/PURPOSE

Provides computer operations manuals for the full SGSS, including both contractor-procured and developed items.

5. DATA REQUIREMENTS

The Computer Operations Manuals (COM) Scope section shall include computer system identification, computer system overview, and document overview.

The COM Identification paragraph shall contain the manufacturer's name, model number, and any other identifying information for the computer system to which the COM applies.

The COM Computer System Overview paragraph shall briefly state the purpose of the computer system to which the COM applies.

The COM Document Overview paragraph shall summarize the purpose and contents of the manual and shall describe any security or privacy considerations associated with its use.

The COM Reference Documents section shall list the number, title, revision, and date of all documents cited in this manual.

The Reference Documents section shall identify the source for all documents not available through normal Government stocking activities.

The COM Computer System Operation section(s) shall include separate descriptions and instructions for computer system preparation, power on and off, computer system initiation,

system shutdown, operating procedures (per mode), input/output procedures and media, monitoring procedures and indicators, problem handling, security, failover and contingency procedures, and any other operator procedures.

The COM shall incorporate, through and as directed by the SGSS Project, operations information from GFP vendors for those subsystems.

Safety precautions, marked by WARNING or CAUTION, shall be included where applicable.

The COM shall identify problems that may occur in any step of SGSS operation.

The COM shall state the error messages or other indications accompanying problems and describe the automatic and manual procedures to be followed for each occurrence, including, as applicable, evaluation techniques, conditions requiring computer system shutdown, procedures for on-line intervention or abort, steps to be taken to restart computer system operation after an abort or interruption of operation, and procedures for recording information concerning a malfunction.

The COM shall describe diagnostics that may be performed to identify and troubleshoot malfunctions in the computer system.

The COM shall summarize the diagnostic features of the computer system, including error message syntax and hierarchy for fault isolation and the purpose of each diagnostic feature.

The COM shall describe the diagnostic procedures to be followed for the computer system, including the identification of hardware, software, or firmware necessary for executing each procedure. The step-by-step instructions for executing each procedure, and the diagnostic messages and the corresponding required action.

The COM shall describe the diagnostics tools available for the computer system, whether hardware, software, or firmware, identify each tool by name and number, and describe the tool and its application

The Manuals shall be produced as a three ring binder with tabs correlated to table of contents listings.

The Manuals shall be produced as a searchable electronic version with hyperlinks from table of contents to associated sections.

The Manuals shall be structured by location, then by SGSS Element, Subsystem, component, and infrastructure, then by operations and operations support, and then by topic.

Tailored versions of the Manuals **shall** be produced for each operational SGSS location identifying the operational and operations support information for the functionalities available from the particular location.

4.10.11 Computer Programming Manuals

DATA ITEM DESCRIPTION		2. NUMBER	MO-11
1. TITLE	Computer Programming Manuals	3. DATE	

4. DESCRIPTION/PURPOSE

Provide information to support operations, sustainment, and modification of SGSS computer hardware.

5. DATA REQUIREMENTS

SGSS Computer Programming Manuals shall include the content specified in DoD DI-IPSC-81447.

SGSS Computer Programming Manuals shall incorporate, through and as directed by the SGSS Project, contents and information from COTS vendors, even if sustainment and maintenance remain the responsibilities of those vendors.

SGSS Computer Programming Manuals shall be structured by location, then by SGSS Element, Subsystem, component, and infrastructure, then by topic.

Tailored versions of the Manuals shall be produced for each operational SGSS location.

SGSS Computer Programming Manuals shall be produced as a searchable electronic version with hyperlinks from table of contents to associated sections.

SGSS Computer Programming Manuals shall be delivered also as three ring binders with tabs correlated to table of contents listings.

The SGSS Computer Programming Manual shall include a separate section to address the applicable preceding requirements for the simulator elements(s).

4.10.12 Firmware Support Manuals

DATA ITEM DESCRIPTION		2. NUMBER	MO-12
1. TITLE	Firmware Support Manuals	3. DATE	

4. DESCRIPTION/PURPOSE

Provide information to support operations, and modification of delivered firmware.

5. DATA REQUIREMENTS

GS Firmware Support Manuals shall include the content specified in DoD DI-IPSC-81448.

GS Firmware Support Manuals shall incorporate, through and as directed by the SGSS Project, contents and information from GFP vendors, even if sustainment and maintenance remain the responsibilities of those vendors.

SGSS Firmware Support Manuals shall be structured by location, then by SGSS Element, Subsystem, component, and infrastructure, then by topic. Tailored versions of the Manuals shall be produced for each operational SGSS location.

SGSS Firmware Support Manuals shall be produced as a searchable electronic version with hyperlinks from table of contents to associated sections.

SGSS Firmware Support Manuals shall be delivered also as three ring binders with tabs correlated to table of contents listings.

4.10.13 Installation Plan

DATA ITEM DESCRIPTION		2. NUMBER	MO-13
1. TITLE	Installation Plan	3. DATE	

4. DESCRIPTION/PURPOSE

The purpose of this data item is to define the contractor’s approach to preparing and delivering hardware and software to the user’s site(s).

5. DATA REQUIREMENTS

The Installation Plan shall comply with NPR 7150.2, NASA Software Engineering Requirements.

The Installation Plan shall include all delivered software and hardware at each site.

The Installation Plan shall list the number, title, revision and date of all referenced documents.

The Installation Plan shall be consistent with the SGSS Integration and Test Plan (CDRL IT-01).

The Installation Plan shall provide a general description of the installation process to provide a frame of reference for the remainder of the document.

The Installation Plan shall include a list of sites for hardware and software installation, the schedule dates, and the method of installation.

The Installation Plan shall list any support materials needed for the installation.

The Installation Plan shall describe the Contractor’s plans and schedule for training personnel who will operate and/or use the software installed at user sites. Reference may be made to other documents, such as training plans.

The Installation Plan shall describe in general terms each task involved in the installation.

Each task description shall identify the organization that will accomplish the task.

The Installation Plan shall describe the number, type, and skill level of the personnel needed during the installation period, including the need for multi-shift operation, clerical support, etc.

The Installation Plan shall provide an overview of the security and privacy considerations associated with the system.

The Installation Plan shall present a schedule of tasks to be accomplished during installation. It shall depict the tasks in chronological order with beginning and ending dates of each task and supporting narrative as necessary.

The Installation Plan shall provide an inventory of the hardware and software needed to support the installation.

The Installation Plan shall detail the physical facilities and accommodations needed during the installation period.

The Installation Plan shall present the data update procedures to be followed during the installation period.

The Installation Plan shall detail the installation procedures for each site or set of sites, including the step-by-step procedures for accomplishing the installation. Reference may be made to other documents, such as user manuals. Safety precautions, marked by WARNING or CAUTION, shall be included where applicable.

The Installation Plan shall contain any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.).

4.10.14 Release Package

DATA ITEM DESCRIPTION		2. NUMBER	MO-14
1. TITLE	Release Package	3. DATE	

4. DESCRIPTION/PURPOSE

A release package is submitted with each software and hardware install. Six items comprise release delivery package: (1) a delivery letter, (2) a software version description, (3) the software on appropriate media, and (4) hardware version description, (5) hardware configuration (6) accompanying documentation.

5. DATA REQUIREMENTS

Release Package shall comply with requirements of NPR 7150.2, NASA Software Engineering Requirements.

A Release Delivery Package shall be submitted with each install.

The Release Delivery Package shall include: (1) a delivery letter, (2) a software version description, (3) the software on appropriate media, and (4) hardware version description, (5) hardware configuration (6) accompanying documentation.

The software portion of the delivery letter shall contain the following information:

- 1) Description of Delivery Contents
- 2) Special Operating Instructions
- 3) List of Resolved Discrepancy Reports and Change Requests.
- 4) List of Unresolved Discrepancy Reports and Change Requests.
- 5) Copy of Resolved Discrepancy Reports and Change Requests.
- 6) Copy of Unresolved Discrepancy Reports and Change Requests.
- 7) Matrix of requirements addressed by this release (may be done by reference to mapping of requirements identified in requirements specification document).
- 8) Release History Summary Matrix.
- 9) Inventory of the Delivered Media –Produce the inventory from the media themselves.
- 10) List of Release Documentation, e.g. users guide procedures.

The software delivery media shall contain copies of all delivered software on media as agreed to by the Contractor and the Government.

The version description shall comply with the requirements defined in NPR 7150.2.

The accompanying documentation shall include updated copies of all applicable documentation, as agreed with the Government.

Each software and hardware component shall be cross referenced to the inventory data base (CDRL CM-10) and the Configuration Item Identification List (CDRL CM-05).

In addition, each software component shall be cross referenced to the Software Element Design Description (SW-03).

The Release Package shall provide any general information that aids in understanding this document (e.g., background information, glossary, rationale, acronyms, abbreviations etc.)

Appendix A Acronyms

Acronym	Description
ADD	Architecture Description Document
AETD	Applied Engineering and Technology Directorate
AID	Action Item Database
AMSAA	Army Material Systems Analysis Activity
ANSI	American National Standards Institute
ATO	Authority to Operate
ATP	Authority to Proceed
AV-	DoDAF Architecture View
AVI	audio-video interleave
B&W	Black and White
BAC	Budget at Completion
BRTS	Bilateration Ranging and Transponder System
CA	Cost Account
CADRe	Cost Analysis Data Requirements
CAM	Control Account Management
CAMs	Control Account Managers
CAP	Cost Account Package
CAT	Category
CCB	Configuration Control Board
CCR	Configuration Change Request
CCSDS	Consultative Committee for Space Data Systems
CDR	Critical Design Review
CDRL	Contract Data Item List
CI	Configuration Item
CIIL	Configuration Item Identification List
CIL	Critical Items List
CM	Configuration Management

Acronym	Description
CMMI	Capability Maturity Model Integrated
CMP	Configuration Management Plan
CO	Contracting Office
COM	Computer Operations Manuals
COMSEC	Communications Security
Con Ops	Concept of Operations
COTS	Commercial off-the-shelf
CPR	Contract Performance Report
CPT	Comprehensive Performance Tests
CSC	Computer Software Component
CSCI	Computer Software Configuration Items
CSU	Computer Software Unit
DACA	Days after contract award
DBDD	Database Design Description
DBMS	database management system
DCN	Document Change Notice
DD	Delivery Date
DD (form)	Department of Defense
DI	Data Items
DID	Data Items Description
DI-IPSC-	DoD Data Item Description
DI-SESS-	DoD Data Item Description
DoDAF	Department of Defense Architecture Framework
EAC	Estimate at Completion
EAR	Export Administration Regulation
ECR	Engineering Change Requests
EDIFACT	Electronic Data Interchange FACT
EEE	Electrical, Electronic, and Electromechanical
EOC	Element of Cost
EPR	Engineering Peer Review

Acronym	Description
ESD	Electrostatic Discharge
ETO	Emergency Time Out
EV	Earned Value
EVM	Earned Value Management
EVMS	Earned Value Management System
FAR	Final Acceptance Review
FMEA	Failure Mode and Effect Analysis
FTA	Fault Tree Analysis
GAO	Government Accountability Office
GCMR	Ground Control Message Request
GEIA	Government Electronic Industrial Association Standard
GFP	Government Furnished Property
GIDEP	Government – Industry Data Exchange Program
GRGT	Guam Remote Ground Terminal
GSFC	Goddard Space Flight Center
GUI	Graphic User Interface
HDBK	Handbook
HSPD	Homeland Security Presidential Directive
HTML	Hypertext Markup Language
HTP	Hardware Test Plan
HW	Hardware Development
HWCI	Hardware Configuration Item
I&T	Integration and Test
IAGP	Installation Accountable Government Property
IBR	Integrated Baseline Review
ICD	Interface Control Document
IEEE	Institute of Electrical and Electronics Engineers
IG	Inspector General
IMP	Integrated Master Plan

Acronym	Description
IMS	Integrated Master Schedule
IPT	Integrated Product Team
IRD	Interface Requirements Document
ISO	International Standards Organization
IT	I&T and Transition to Operations
IT	Internet
ITAR	International Trafficking in Arms Regulations
LCC	Life Cycle Costing
LCCE	life cycle cost estimate
LOE	Level of Effort
LRU	Line Replacement Unit
M/Q	Monthly/Quarterly
MA	Safety and Mission Assurance
MAR	Mission Assurance Requirement
MDR	Mission Design Review
MIL-STD	Military Standard
MO	Maintenance and Operations
MOR	Mission Operations Review
MPEG	Moving Pictures Expert Group
MPSR	Monthly Project Status Review
MR	Management Reserve
MS	Microsoft
MTF	Maintenance and Training Facility
MTTR	Mean Time To Repair
NASA	National Aeronautics and Space Administration
NISPOM	National Industrial Security Program Operating Manual
NIST	National Institute of Standards Technology
NLT	No later than
NPD	NASA Policy Directive

Acronym	Description
NPR	NASA Procedural Requirements
OHA	Operational Hazard Analysis
OMIP	Option Management and Implementation Plan
ORR	Operational Readiness Review
OSHA	Occupational Safety and Hazard Association
OV-	DoDAF Operational View
PC	Personal Computer
PCM	Project Control Milestones
PDF	Project Data Formatter
PDR	Preliminary Design Review
PHA	Preliminary Hazard Analysis
PM	Project Manager/Management
PMP	Project Management Plan
PP	Project Plans
PRA	Probabilistic Risk Assessment
Preship	Pre-Ship System Review
PS	Project Security
PVP	Verification and Validation Plan
PWA	printed wiring assembly
QTR	Quarter
R&M	Reliability and Maintainability
RASDS	Reference Architecture for Space Data Systems
RE	Review Packages
RFA	Request for Action
RMP	Risk Management Plan
RVTM	Requirements Verification Traceability Matrix
SAE	Society of Automotive Engineers
SAP	Software Quality Assurance Plan
SDMP	Software Development and Management Plan
SE	System Engineering

Acronym	Description
SEI	Software Engineering Institute
SEMP	Systems Engineering Management Plan
SGSS	Space Network Ground Segment Sustainment
SIR	Systems Integration Review
SN	Space Network
SNGS	SN Ground Segment
SNUG	SN User's Guide
SOW	Statement of Work
SRR	Systems Requirements Review
SSPP	System Safety Program Plan
STGT	Second TDRSS Ground Terminal
SV-	DoDAF Systems and Services View
SW	Software Development
SWRR	Software Requirements Review
TBD	To Be Determined
TBS	To Be Supplied
TDRS	Tracking and Data Relay Satellite
TIMs	Technical Interchange Meeting
TPM	Technical Performance Measurements
TR	Training
TRAR	Technology Readiness Assessment Report
TRL	Technology Readiness Levels
TRR	Test Readiness Review
TS	Technical Studies
TV-	DoDAF Tech Standards View
UB	Undistributed budgets
VAC	Variance At Complete
VTL	Verification Tracking Log
WBS	Work Breakdown Structure
WP	Work package

Acronym	Description
WSC	White Sands Complex
WYE	Work year equivalent
X12	Electronic Data Interchange Format
XML	Extensible Markup Language
