GOES-R Series

Ground Segment (GS) Project Functional and Performance Specification (F&PS)

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GOES-R Series Ground Segment Project Functional and Performance Specification

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1 INTRODUCTION

1.1 Background

The next generation Geostationary Operational Environmental Satellites (GOES), designated the GOES-R Series, are required to provide continuity and improvement of remotely-sensed environmental data from a geosynchronous orbit, launching no earlier than 2015 with an expected operational lifetime of 15 years. The GOES-R Program, which has the responsibility to acquire and implement the GOES-R mission, is being implemented through the GOES-R Ground Segment Project (GSP) and the GOES-R Flight Project. The GSP will acquire the integrated, distributed GS that will conduct satellite operations and instrument product generation and distribution. Details about the GOES-R conceptual architecture, functionality, and operations are documented in the reference GOES-R Program Concept of Operations (P417-R-CONOPS-0008). *(CCR01519)*

1.2 Scope

This document, together with all GOES-R GS Interface Requirements Documents (IRDs) (see Ground Segment Applicable and Reference Documents List (G 417-R-LIST-0165)) and the Ground Segment Mission Assurance Requirements document (G 417-R-GSMAR-0068), specify the functional and performance requirements with which the GS **shall** comply.

Sections 4 through 9 of this specification contain the high level functional and performance requirements for the GS portion of the GOES-R Series System. The column headings of these sections indicate the GSP DOORS ID Number, the contract option number, and the developing organization responsible for each requirement, and the requirements. *(CCR01530)*

The requirements in Sections 4 through 9 of this document are allocated to developing organizations that are providing the functionality described by each requirement. *(CCR01530)*

The development effort column next to each requirement denotes antennas (ANT), GOES-R Access Subsystem (GAS), OSO, the Algorithm Working Group (AWG), the GS Contractor (GS Ktr), or ALL to allocate the requirement to one of the major development efforts. OSO and AWG requirements are explicitly identified; all organizations (ALL) indicates that the requirement applies to GS Ktr, ANT, and GAS. *(CCR01430)*

The Option column next to each requirement denotes Base, 0001, or 0002 to allocate the requirement to the baseline contract, or to one of the 2 options.

1.3 GOES-R Mission Objectives

a) To maintain GOES mission continuity and quality in environmental observations, launching no earlier than 2015 with an expected operational lifetime of 15 years *(CCR01519)*

b) To provide enhanced environmental data products

c) To improve services and data being provided to Users

d) To be responsive to technology infusion to meet evolving User needs

1.4 Specification Derivation

The GOES-R Series Level I Requirements Document (LIRD) (P 417-R-LIRD-0137) levies NESDIS requirements on the GOES-R Program. The Mission Requirements Document (MRD) (P417-R-MRD-0070) captures the program - level system requirements and allocates a subset of those to the Ground Segment Project. The Ground Segment Functional and Performance Specification (GS-F&PS) (417-R-FPS-0089), and other requirements documents (e.g., IRDs) define derived GS level requirements. Parallel documents, the GOES-R Spacecraft Functional and Performance Specification (S-F&PS) (P 417-R-PSPEC-0014), and its associated IRDs exist for the Space Segment.

1.5 Traceability

This document is configuration controlled within the GOES-R GSP DOORS database. Requirements traceability is maintained within that database.

2 DOCUMENTATION

2.1 Order of Precedence

Any inconsistency in this solicitation or contract **shall** be resolved in accordance with

Contract Clause 52.215-8 Order of Precedence.

Any inconsistency in other documents, exhibits, and attachments **shall** be resolved by giving precedence in the following order:

a) The Statement of Work
b) The Functional and Performance Specification
c) The Interface Requirements Documents
d) Other exhibits and attachments included in Section J
e) The Applicable Documents
f) The Reference Documents

Terminology applicable to this GS-F&PS is documented in the GOES-R Series Acronym and Glossary Document (P417-R-LIST-0142). In the event of conflict between terminology in this handbook and any other dictionary, the GOES-R terminology **shall** take precedence.

The full lists of applicable and reference documents, with associated document number and date of issue for each, are maintained in the Ground Segment Applicable and Reference Documents List (G 417-R-LIST-0165).

Applicable documents are Government prepared and controlled documents and industry standards documents.

Reference documents amplify or clarify the information presented in this document.

In the event of any unresolved conflict, the Contractor **shall** request conflict resolution by the Contracting Officer.

2.2 Declaration of Requirements

The following requirements terminology is used throughout this document:

a) The term "**shall**" **shall** be interpreted to mean that the function, service, or capacity described is a mandatory requirement for the GS.

b) The terms "**shall** provide the capability," "**shall** have the capability," "**shall** be capable," "**shall** enable," "**shall** permit" and "**shall** allow," **shall** be interpreted to mean that the function, service or capacity described is a mandatory requirement for the GS, but that the capability, service or capacity may not necessarily be exercised continuously (e.g., event driven, operator selected, operator initiated).

c) The term *"should"* designates a desired level of performance the Government would like to achieve.

d) All other declarative statements, including use of the term "*will"*, only designate statements of fact or intentions of the Government and are not to be interpreted as contractor requirements.

e) The term *"(TBS)"* means, "to be supplied", identifies missing or incomplete information, values, or data needed to fulfill a requirement.

f) The term *"(TBD)"* means "to be determined", identifies a missing requirement.

g) The term *"(TBR)"*, means "to be refined/reviewed", means that the requirement is subject to review for appropriateness and subject to revision.

h) Requirements that contain the word "satellite" (singular) should be interpreted to apply for all GOES-R series satellites operated in the multi-satellite environment, unless stated otherwise, consistent with GS overall requirement for concurrent multiple satellite operations.

Refer to the Statement of Work for Government and contractor responsibilities associated with TBSs, TBDs, and TBRs.

3 GOES-R GROUND SEGMENT DESCRIPTION

3.1 GOES-R Ground Segment Overview

Section 3 describes the GOES-R GS in terms of the high-level physical architecture, notional functional architecture, and external interfaces.

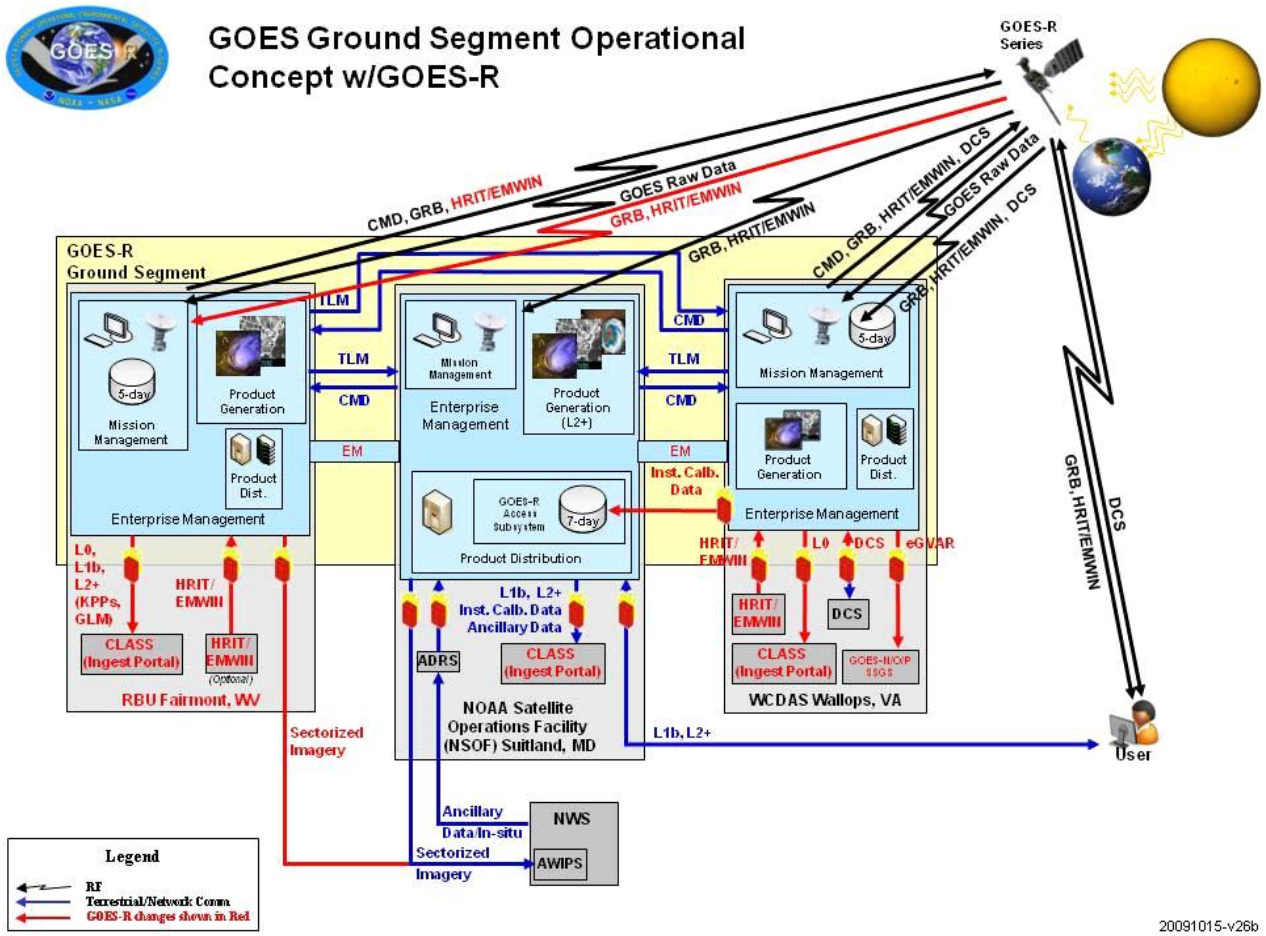


Figure 1: GOES-R Ground Segment Overview ***(CCR01457, CCR01661)***

The GOES-R Ground Segment will operate from three sites. The NOAA Satellite Operations Facility (NSOF) in Suitland, MD will house the primary Mission Management (MM), and selected Product Generation (PG), and Product Distribution (PD) functions. The Wallops Command and Data Acquisition Station (WCDAS), located in Wallops, VA, will provide the primary space communications services, EM and MM functions, and selected PG and PD functions. The third site is a geographically diverse remote backup facility (RBU), located at Fairmont, WV. It will function as a completely independent backup for the MM and selected PG and PD functions for the production of Key Performance Parameters (KPPs) and GOES Rebroadcast (GRB) data, and will be capable of concurrent and remote operations from the NSOF and the WCDAS. The RBU will have visibility to all operational and on-orbit spare satellites. The KPPs consist of: cloud and moisture imagery: CONUS, Full Disk, and Mesoscale, and sectorized products. The Enterprise Management (EM) function is integrated across all ground segment components and locations. *(CCR01659)*

The Ground Segment will include separate development and integration and test (I&T) environments for the purposes of ongoing development, improvement, and integration throughout the GOES-R mission. Portions of these environments will be located at both NSOF and WCDAS to support local site development, integration, and test activities.

The satellites will be commanded throughout their mission lifetime from the NOAA Satellite Operational Control Center (SOCC) located at NSOF with the ground station radio frequency (RF) interface located at the WCDAS, or the RBU. The engineering telemetry streams are received by the WCDAS and ground relayed to the SOCC for processing and monitoring. The raw sensor data is received by the WCDAS, processed, reformatted, and rebroadcast through the GRB transponder.

The raw sensor data are received by the WCDAS, processed by the PG function at the WCDAS to create L1b and some L2+ products, and rebroadcast through the GRB transponder. The GRB data are then received at the NSOF where the PG function will create the rest of the L2+ products. The L1b and L2+ products are then either sent directly or made available to users. At the RBU the raw sensor data will be received through its RF interface and processed by the PG function at the RBU. The RBU will be limited to the production of data to support distribution via GRB and the production of KPPs.

The GOES-R Series system will provide the following unique payload services (UPS):

a) HRIT/EMWIN: EMWIN is a service that includes watches, warnings, forecasts, graphics, and other hydro-meteorological products provided by the National Weather Service (NWS). The High Rate Information Transmission (HRIT) data stream is comprised of satellite imagery, DCS products, derived products from GOES and Polar programs, and weather analysis and forecast maps from the NWS. OSD creates and merges the data streams (one for each of GOES East and GOES West) and provides to the GOES-R GS as an Intermediate Frequency (IF) signal for uplink. *(CCR01457)*

b) DCS: The GOES DCS is a relay system used to collect information from earth-based platforms. These platforms transmit an electronic signal, containing the environmental data observed by the sensors on the platform, at predefined wavelengths and times. The transponder on board the GOES-R satellite will detect this signal, and then continuously rebroadcasts it so that it can be picked up by the ground equipment only located at the WCDAS.

c) SARSat: The GOES SARSat transponder will receive emergency beacon transmissions for relay to ground stations responsible for search efforts.

The GOES-R series will support the transmission of GOES-R data in the emulated GVAR (eGVAR) format to facilitate the GOES user transition from GOES-N to GOES-R. eGVAR contains GOES-R data products packaged in the legacy GOES-N GVAR format and is transmitted to the GOES-N Ground System for broadcast.

The GOES-R GS will directly provide GOES-R data to the Advanced Weather Interactive Processing System (AWIPS). AWIPS is a computer workstation and communication network that serves as the nerve center of operations of all NWS Weather Forecast Offices (WFO) and NWS River Forecast Centers (RFC). Currently, the GOES-N system does not have its own interface to AWIPS. Instead, the Environmental Satellite Processing Center (ESPC) provides GOES data to the AWIPS. Unlike the GOES-N Ground System, the GOES-R GS will have the capabilities to interface with AWIPS.

GOES-R will employ CLASS services to provide archive services for GOES-R data. CLASS provides the archive and access services for the collection, archiving and dissemination of environmental data collected by a variety of in situ and remote sensing observing systems.

3.2 GOES-R Ground Segment Requirements Functional Decomposition

The GOES-R GS requirements fall into four primary functional categories: MM, PG, PD and EM. These categories have been defined as a basis for grouping functional attributes of the GS, and are not intended to imply an implementation of the GS. Necessary interface and support functions are included within the GS. The GS encompasses more than hardware and software systems, it includes the processes, services and personnel required to accomplish a set of functional tasks.

3.3 GOES-R Ground Segment Role

The details and descriptions of each of the elements of the GOES-R GS (MM, PG, PD, and EM) are provided in the GOES-R GS Concept of Operations.

3.4 GOES-R Ground Segment External Interfaces

The GOES-R Ground Segment is expected to interface to the following entities:

a) GOES-R Space Segment

b) GOES-R Launch Segment

c) Unique Payload Services (EMWIN/LRIT, DCS) *(CCR01457)*

d) Ancillary Data Relay System (ADRS) (OSD)

e) Office of Satellite Development (OSD) Comprehensive Large Array-data Stewardship System (CLASS) (OSD)

f) Advanced Weather Interactive Processing System (AWIPS) (NWS)

g) GOES-N/O/P Ground System for eGVAR

h) GOES-R Access Subsystem *(CCR01513)*

3.5 Government-Furnished Property

The Government will provide resources as defined in the GOES-R Government Furnished Property List.

3.5.1 Facilities

The GS facilities, including power, environmental controls, and floor space, will be provided by the Government.

3.5.2 Antennas

The GS Antenna System, including the RF equipment to the IF switch, will be provided as GFP to the GS Contractor. The Antenna System Vendor will procure, install and deliver this equipment to the GSP. Once delivered, this equipment will be turned over to the GS Contractor to integrate into the GOES-R GS.

3.5.3 Communications

Communications required for the GOES-R GS will be purchased/leased by OSO. The interface to the communications circuits at a distribution frame will be located at the communications service provider's demarcation point. Interface descriptions, circuit types, and supported data rates for connections to the circuits terminated at the distribution frame will be provided by the GS contractor to the Government. All CSU/DSUs, multiplexers, modems, and other related communications equipment on the service provider side of the demarcation point will be provided by OSO. Wide-area network inter-site communications required for the GOES-R GS will be purchased/leased by OSO. *(CCR01530)*

3.5.4 Product Distribution

The GS Product Distribution element consists of a core GS product distribution capability and a GOES-R Access Subsystem (GAS). *(CCR01513)*

3.5.4.1 Core GS Product Distribution

The core GS Product Distribution capability is developed by the GS contractor and is responsible for the following:

a) Sending sectorized cloud and moisture imagery products to the Advanced Weather Interactive Processing System (AWIPS)

b) Sending GOES-R data and products to the GAS for distribution to users.

c) Sending selected GOES-R data and products to CLASS

d) Transferring the GRB data stream to MM

e) Sending the eGVAR data stream to the GOES-N/O/P Spacecraft Support Ground System (SSGS). *(CCR01513)*

3.5.4.2 GOES-R Access Subsystem

The GOES-R Access Subsystem (GAS) is responsible for distributing GOES-R data and products to users. It consists of a user access point and a revolving temporary 7-day store. The GOES-R Access

Subsystem will be designed, developed, and transitioned by OSD as part of the Environmental Satellite Processing and Distribution System (ESPDS) with support from the GSP for GS integration. *(CCR01513)*

3.5.5 Scientific Algorithms

The process for developing scientific algorithms to produce individual L1b and L2+ products (Atmosphere, Land, Ocean, and Space Weather) will require the participation of multiple organizations (instrument vendors, Flight Project, AWG, GS contractor, and the GSP). After Government review, the Government will provide individual Algorithm Packages, containing the algorithm design documents, test data, and other information, to the GS contractor as GFP.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1150			**4** GROUND SEGMENT WIDE REQUIREMENTS		
GSFPS-2430			***4.1 Overview***		
GSFPS-1152			Section 4 specifies segment-wide operational, functional, and performance requirements, which are allocated to the GOES-R GS as an end-to-end system. Segment-wide requirements for facilities, security, reliability, maintainability, and availability (RMA), design and construction, verification and validation, and external interfaces are also included in this section.		
GSFPS-1154			***4.2 Physical Deployment and Remote Operability***		
GSFPS-2719			The GOES-R GS functionality will be installed and operated at three sites. The NOAA Satellite Operations Facility (NSOF) in Suitland, MD and the Wallops Command and Data Acquisition Station (WCDAS) at Wallops, VA, are facilities that host current GOES systems. Together they will serve as the GOES-R primary facilities for operations. The third site will be a geographically-diverse Remote Backup Facility (RBU), located at Fairmont, WV, which will host a subset of the GS functionality and enable continuity of operations. *(CCR01659)*		
GSFPS-1158			***4.2.1 Primary Facilities***		
GSFPS-1160	All	Base	GS functionalities described in this GS F&PS, with exception of the RBU and connecting networks **shall** be deployed at the WCDAS and NSOF facilities (“the GS primary facilities”).	Constrains the location of all GS functionality to WCDAS and NSOF unless specifically identified as RBU-located. Functionality must reside at these locations in order to meet user/operator needs and to interface with legacy operations as directed by NOAA/NESDIS.	
GSFPS-3146	All	Base	The GS at NSOF **shall** include the primary Mission Management (MM), Enterprise Management (EM), and selected Product Generation (PG) and Product Distribution (PD) functions.	This aligns with current GOES operations and future NESDIS concepts of operations.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3147	GS Ktr*(CCR-01430, 01511)*	Base	The GS at WCDAS **shall** include the primary space communications services, EM and MM functions, and selected PG and PD functions.	This aligns with current GOES operations and future NESDIS concepts of operations.	
GSFPS-1162	All*(CCR-01430, 01511, 01530)*	Base	The GS **shall** include all functionalities necessary for the production, RF uplink, and reception of GRB at the WCDAS facility.	WCDAS must be able to create GRB without dependence on other sites. This aligns with current GOES operations and future NESDIS concepts of operations.	
GSFPS-1164	All(*CCR-01430, 01511, 01530)*	Base	The GS **shall** include all functionalities necessary for the reception of GRB at the NSOF facility.	GRB is the only source of L1b data at NSOF. This is required to create higher-level products via the data contained in the GRB stream. GRB data will be the source for higher level product generation.	
GSFPS-1166	All *(CCR-01290)*	Base	The GS functionality resident at NSOF **shall** be operable from NSOF.	All functions at NSOF can be operated locally without dependence on other sites. This ensures that the operators at a given site have the capability to operate independently of each other.	
GSFPS-2946	GS Ktr OSO*(CCR-01430, 01511)*	Base	The GS functionality resident at WCDAS **shall** be operable from WCDAS.	All functions at WCDAS can be operated locally without dependence on other sites. This ensures that the operators at a given site have the capability to operate independently of each other.	
GSFPS-1170	GS Ktr, OSO*(CCR-01430, 01511)*	Base	The GS **shall** provide the capability to operate all WCDAS-deployed functionalities remotely from the NSOF.	Since the primary control operations occur at NSOF, NSOF must also be capable of operating WCDAS functions remotely. This capability could be used for contingency situations or for other non-emergency operations.	
GSFPS-2604	All	Base	The GS **shall** meet functional and performance specifications for two GOES-R satellites simultaneously except as noted in the element descriptions.	The GS capabilities must support simultaneous operations for operational GOES-East and GOES-West satellites.	
GSFPS-1172			***4.2.2 Remote Backup Facility***		
GSFPS-1174	GS Ktr, OSO*(CCR-01430, 01511)*	Base	The GS RBU functionality **shall** be deployed at Fairmont, WV. *(CCR01659)*	The GS RBU location was determined based on proximity to NSOF, geographic coverage, and non-interference with other RF carriers as documented in multiple trade studies. The GS is currently using Fairmont, WV as the RBU location for planning purposes. Once a decision is finalized, the location may be reviewed.	
GSFPS-1176	GS Ktr, OSO*(CCR-01430, 01511)*	Base	The GS RBU functionality **shall** be remotely operable from the NSOF.	The RBU will not be staffed with operations personnel, so remote operations from the primary facilities will be required. This capability will be used for contingency situations or for other non-emergency operations.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2431	GS Ktr, OSO*(CCR-01430, 01511)*	Base	The GS RBU functionality **shall** be remotely operable from the WCDAS.	The RBU will not be staffed with operations personnel, so remote operations from the primary facilities will be required. This capability may be used for contingency situations where certain elements of the RBU need to be operated by WCDAS personnel or for other non-emergency operations.	
GSFPS-1178	GS Ktr, OSO*(CCR-01430, 01511)*	Base	The GS RBU functionality **shall** be operable from the GS RBU.	The RBU must have operator interfaces at the facility in the event that local RBU operations are required.	
GSFPS-2605	GS Ktr, OSO*(CCR-01430, 01511)*	Base	The GS RBU **shall** operate without on-site staff, except in the case of continuity of operations deployments.	During routine operations, the RBU will not be staffed with operations personnel. Some maintenance personnel may be available either on-site or on-call, depending on the implementation and RMA approach for the RBU.	
GSFPS-1186	GS Ktr	Base	The GS RBU **shall** provide all PG functions necessary to produce KPPs identified in Appendix A.	The RBU will not produce all L2+ products. However, it must be capable of producing mission-critical cloud and moisture imagery products as listed in Appendix A. This ensures the continuity of KPP production during a NSOF and/or WCDAS outage.	
GSFPS-1188	GS Ktr*(CCR-01430, 01511)*	Base	The GS **shall** include all functionalities necessary for the production, RF uplink, and reception of GRB at the RBU.	This ensures the continuity of GRB during a NSOF and/or WCDAS outage.	
GSFPS-1190	GS Ktr, OSO*(CCR-01430)*	Base	The GS RBU **shall** provide all PD functions necessary to distribute KPPs to AWIPS as specified in the GOES-R Series Ground Segment (GS) to Advanced Weather Interactive Processing System (AWIPS) Interface Requirements Document (IRD) (P417-R-IRD-0160). *(CCR01366)*	KPP distribution includes the sectorization and distribution of cloud and moisture imagery via AWIPS to the AWIPS demarcation point as described in the GS-to-AWIPS IRD. This ensures the continuity of KPP product distribution during a NSOF outage.	RBU L2+ PD capability will be limited to KPP distribution to AWIPS.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3103	GS Ktr, OSO*(CCR-01430, 01511)*	Base	The GS **shall** be capable of supporting the following single functions or combination of functions at the RBU: a) Space - Ground Communications b) Command Generation and Telemetry Data Processing c) Raw (instrument) Data Processing to Level 0 d) Mission Operations to include real-time console operations, offline engineering and trending, bus and instrument health and safety monitoring, anomaly detection and resolution and procedure development e) Signal Monitoring f) Mission Scheduling and Planning g) Orbit Determination and Maneuver Planning h) Image Navigation and Registration Monitoring i) Routine Instrument Calibration Support and Product Monitoring j) Production of Level 1b Products and GLM k) Generation of KPPs l) GRB Assembly and Rebroadcast m) Sectorized Product Distribution to AWIPS n) Archiving (e.g., telemetry, EM events) o) 5-day temporary revolving storage p) Distribution of data to CLASS q) HRIT/EMWIN uplink r) Enterprise Management *(CCR01457)*	This list of functions is a subset of GS capabilities to be provided by the RBU. Since the RBU will not provide a complete MM, PG, PD, or EM backup, this list breaks down the element functionality into a more granular functional level. The intent is that each of these functions will be independently usable at the RBU, such that one function could fail-over to the RBU without the need to fail over the entire set of NSOF or WCDAS operations. Failover by function is in response to contingency planning and failover strategies being employed by current operations. These include failover of KPP production and distribution if NSOF KPP processing goes down, however, remote SOCC operations may still be accomplished from the NSOF. Failover by function allows more flexibility in the use of the RBU to meet availability requirements in the event of maintenance downtime without full failover.	
GSFPS-1192			***4.3 Ground Segment Maintainability***		
GSFPS-1204	All	Base	The GS design **shall** enable hardware and software maintenance of the GS while maintaining compliance with the functional and performance requirements of the GOES-R Series System.	The GS must remain within specifications while undergoing maintenance. This includes maintaining availability and MaxTTRS within specifications.	
GSFPS-1206	All	Base	The GS **shall** include diagnostic tools to support maintenance of all internal GS interfaces.	Diagnostic tools are to be delivered with the GS to support its interfaces. These tools will enable the maintainer to diagnose interface issues without the need for additional support.	
GSFPS-1208	All	Base	The GS **shall** include diagnostic tools to support maintenance of all external GS interfaces.	Diagnostic tools are to be delivered with the GS to support its interfaces. These tools will enable the maintainer to diagnose interface issues without the need for additional support.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2432	All	Base	All elements of the GS **shall** make all locally collected performance and status measurements available to EM.	The Enterprise Management element will collect and monitor all performance and status for all GS systems, subsystems, components, and configuration items. If an element is collecting performance and/or status metrics, those will be available to the EM element as well.	
GSFPS-2433	All	Base	All elements of the GS **shall** make all locally detected hardware and software event messages available to EM. *(CCR01474)*	The Enterprise Management element will collect and monitor all anomalies for all GS systems, subsystems, components, and configuration items. If an element is performing anomaly detection and reporting, those reports will be available to the EM element as well.	
GSFPS-2434	All	Base	All elements of the GS **shall** make resource operational status and performance data available to EM, including: resource utilization (processing, storage, network and communications status), processing throughput, equipment configuration and availability, data accounting, data processing status, transfer status, and product status, to support operations, trending, and performance analyses. *(CCR01474)*	This describes a set of status and performance data types that will be made available to EM. Other requirements such as GSFPS-2432 and GSFPS-2433 may impose additional data types as the GS is designed and implemented.	
GSFPS-3001	All *(CCR-01430)*	Base	The GS **shall** have the capability to export any operator designated file to removable media (e.g., thumb drive, compact disk, tape, etc.).	Allows any file to be copied from the system (as permitted by security requirements). This may be needed for offline analysis or for other uses.	
GSFPS-3002	All *(CCR-01430)*	Base	The GS **shall** have the capability to store any operator designated file to removable media (e.g., thumb drive, compact disk, tape, etc.).	Allows any file to be copied from the system (as permitted by security requirements). This may be needed for offline analysis or for other uses.	
GSFPS-1374	GS Ktr*(CCR-01430, 01511)*	Base	The GS **shall** permit an operator to install or upgrade software from any site within the GS.	Software modifications within the GS can occur from any GS authorized site to any other site. This requirement provides for software at NSOF or RBU to be installed/upgraded from WCDAS, software at WCDAS and RBU to be installed/upgraded from NSOF, and software at NSOF/WCDAS to be installed/upgraded from RBU. This may also include access from the GS Factory, Satellite Factory, and/or other locations as defined by the GSP. This enables the consolidation of software maintenance and/or development activities if desired by the operations personnel. It also enables rapid patch deployment or software distribution via a unified mechanism, improving configuration management capabilities and potentially reducing costs.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3003	GS Ktr*(CCR-01430, 01511)*	Base	The GS **shall** enable access and inspection of software at any site, from any other site.	Software access and inspection within the GS can occur from any GS authorized site to any other site. This requirement provides for software at NSOF or RBU to be accessed and inspected from WCDAS, software at WCDAS and RBU to be accessed and inspected from NSOF, and software at NSOF/WCDAS to be accessed and inspected from RBU. This may also include access from the GS Factory, Satellite Factory, and/or other locations as defined by the GSP. This enables the consolidation of software maintenance and/or development activities if desired by the operations personnel. It also enables rapid inspection of software via a unified mechanism, improving configuration management capabilities and potentially reducing costs.	
GSFPS-3004	GS Ktr*(CCR-01430, 01511)*	Base	The GS **shall** enable modification of software at any site from any other site.	Software modifications within the GS can occur from any GS authorized site to any other site. This requirement provides for software at NSOF or RBU to be modified from WCDAS, software at WCDAS and RBU to be modified from NSOF, and software at NSOF/WCDAS to be modified from RBU. This enables the consolidation of software maintenance and/or development activities if desired by the operations personnel. It also enables rapid patch deployment or software distribution via a unified mechanism, improving configuration management capabilities and potentially reducing costs.	
GSFPS-3005	GS Ktr*(CCR-01430, 01511)*	Base	The GS **shall** enable testing of software at any site from any other site.	Software testing within the GS can occur from any GS authorized site to any other site. This requirement provides for software at NSOF or RBU to be tested from WCDAS, software at WCDAS and RBU to be tested from NSOF, and software at NSOF/WCDAS to be tested from RBU. This may also include access from the GS Factory, Satellite Factory, and/or other locations as defined by the GSP. This enables the consolidation of software maintenance and/or development activities if desired by the operations personnel. It also enables testing and troubleshooting of software via a unified mechanism, improving configuration management capabilities and potentially reducing costs.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3006	GS Ktr*(CCR-01430, 01511)*	Base	The GS **shall** enable distribution of software at any site, from any other site.	Software distribution can occur between any GS authorized combination of sites. The GS will have interfaces and connectivity that enable this distribution. Because of this, software development and maintenance activities may be consolidated, which could reduce costs and improve configuration management capabilities.	
GSFPS-3133	All *(CCR-01290)*	Base	The GS **shall** provide information and diagnostic tools, to include an online knowledge base, to isolate faults internal to the GS.	The GS will enable operators to isolate and diagnose GS faults. Tools that enable this will be provided as part of the GS by the development contractor.	
GSFPS-1210			***4.4 Ground Segment Availability***		
GSFPS-1212			Operational availability is the fraction of time that the GOES-R Ground Segment (or a specified functionality contained within) is fully functional over a discrete 30-day period. This includes the GOES-R facilities, antennas, and networks out to the extent of the demarcations as defined in the IRDs. Maximum time to restore service (MaxTTRS) requirements are considered to be met at the 99.9 percentile (e.g., if an outage occurs, there is a 0.999 probability that service will be restored within the specified interval).		
GSFPS-1214	All	Base	The GS **shall** operate continuously for the life of the GOES-R System.	The GS operates without interruption or scheduled halts in operations because the satellites are operating continuously.	
GSFPS-1216	All	Base	The GS **shall** have a minimum Operational Availability of 0.989 over the GOES-R System lifetime, except for functionality for which a higher Operational Availability has been specified.	The GS is required to have a system availability of 0.989 to support operational requirements. Because of this, the overall GS availability must be at least 0.989. However, many mission critical functions (described below) have a higher availability that takes precedence over this value.	Operational Availability = Total uptime / Total time
GSFPS-2910	All	Base	The GS **shall** have a MaxTTRS of 120 minutes for functions other than those for which a shorter MaxTTRS has been specified.	All functions within the GS must be restored to operational status within a maximum of 120 minutes. However, many mission critical functions (described below) have a more stringent maximum time to restore service that takes precedence over this value.	
GSFPS-3210	GS Ktr	Base	The GS **shall** have a minimum overall Operational Availability of 0.999901 over the GOES-R System lifetime. *(CCR01506)*		
GSFPS-3211	GS Ktr	Base	The GS **shall** have a minimum overall Operational Availability of 0.99989 at the primary sites over the GOES-R System lifetime. *(CCR01506)*		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1220	GS Ktr	Base	The GS **shall** have a minimum Operational Availability of 0.99988 for mission management functionality, averaged over a 30-day period.	All of the Mission Management subsystem's functionality must be available 0.99988 of the time. If one Mission Management function is unavailable, then the period of unavailability counts against the Mission Management subsystem availability. In other words, the availability of all of the functions within the subsystem comprise the availability of the overall set, and so the availability of each function must exceed the availability of the subsystem. This helps minimize the downtime of the subsystem and ensure its availability for system operations. Availability value supports 5 minutes of outage time per month (43195 minutes of uptime/43200 total minutes)=.99988.	
GSFPS-2907	GS Ktr	Base	The GS **shall** have a MaxTTRS of 5 minutes for mission management functionality.	If a function is lost that supports Mission Management functionality, it must be restored within a time period such that full MM functionality is restored within 5 minutes in response to operational requirements.	
GSFPS-3007	GS Ktr	Base	The GS **shall** have a minimum Operational Availability of 0.99988 for functionality associated with the generation and GRB distribution of products, averaged over a 30-day period.	All of the GS functionality associated with GRB generation and distribution must be available 0.99988 of the time. If one function is unavailable, then the period of unavailability counts against the overall subsystem availability. In other words, the availability of all of the functions comprises the availability of the overall set. This helps minimize the downtime of the subsystem and ensure its availability. Availability value supports 5 minutes of outage time per month (43195 minutes of uptime/43200 total minutes)=.99988.	
GSFPS-3008	GS Ktr	Base	The GS **shall** have a MaxTTRS of 5 minutes for functionality associated with the generation and GRB distribution of products.	If a GS function is lost that supports GRB generation and distribution, it must be restored within a time period such that full GRB functionality is restored within 5 minutes.	
GSFPS-1222	GS Ktr	Base	The GS **shall** have a minimum Operational Availability of 0.99861 for functionality associated with the generation of sectorized cloud and moisture imagery products, averaged over a 30-day period.	All of the GS functionality associated with sectorized cloud and moisture imagery product generation must be available 0.99861 of the time. If one function is unavailable, then that period of unavailability counts against the overall subsystem availability. In other words, the availability of all of the functions comprises the availability of the overall set. This helps minimize the downtime of sectorized cloud and moisture imagery generation. Availability value supports 60 minutes of outage time per month (43140 minutes of uptime/43200 total minutes)=.99861.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1224	GS Ktr, OSO*(CCR-01430)*	Base	The GS **shall** have a minimum Operational Availability of 0.99861 for functionality associated with the delivery of sectorized cloud and moisture imagery products, as specified in the GS to AWIPS IRD, to the AWIPS demarcation point, averaged over a 30-day period.	All of the GS functionality associated with sectorized cloud and moisture imagery product generation must be available 0.99861 of the time. If one function is unavailable, then that period of unavailability counts against the overall subsystem availability. In other words, the availability of all of the functions comprises the availability of the overall set. This helps minimize the downtime of sectorized cloud and moisture imagery distribution to the AWIPS demarcation point. Availability value supports 60 minutes of outage time per month (43140 minutes of uptime/43200 total minutes)=.99861.	
GSFPS-2909	GS Ktr, OSO*(CCR-01430)*	Base	The GS **shall** have a MaxTTRS of 60 minutes for functionality associated with sectorized cloud and moisture imagery products data collection, processing, and distribution to the AWIPS demarcation point.	If a GS function is lost that support cloud and moisture imagery sectorization and distribution, it must be restored within a time period such that full functionality is restored within 60 minutes.	
GSFPS-2827	GS Ktr *(CCR-01430)*	Base	The GS **shall** have a minimum availability of 0.9998 for components associated with the generation of non KPP Level 2+ products, averaged over a 30 day period. *(CCR01506)*	All of the GS functionality associated with non-KPP L2+ product generation must be available 0.9998 of the time. If one function is unavailable, then that period of unavailability counts against the overall subsystem availability. In other words, the availability of all of the functions comprises the availability of the overall set. This helps minimize the downtime of those functions required for non-KPP L2+ product generation activities. *(CCR01654)*	
GSFPS-2905	GS Ktr *(CCR-01430)*	Base	The GS **shall** have a minimum Operational Availability of 0.999919, averaged over a 30-day period, for those functions associated with the distribution of End Products to the GOES-R Access Subsystem. *(CCR01506)*	All of the core GS functionality associated with non-KPP L2+ product distribution must be available 0.99 of the time. If one function is unavailable, then that period of unavailability counts against the overall subsystem availability. In other words, the availability of all of the functions comprises the availability of the overall set. This helps minimize the downtime of those functions required for non-KPP L2+ product distribution activities.	
GSFPS-3746	GAS		The GAS **shall** have a minimum Operational Availability of 0.999, averaged over a 30-day period, for those functions associated with the distribution of End Products via the GOES-R Access Subsystem. *(CCR01513)*	All of the GS functionality associated with non-KPP L2+ product distribution must be available 0.99 of the time. If one function is unavailable, then that period of unavailability counts against the overall subsystem availability. For this reason, the GAS operational availability has to be higher (0.999), since the overall availability is a product of the underlying elments and subsystems. This helps minimize the downtime of those functions required for non-KPP L2+ product distribution activities.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3009	GS Ktr, OSO*(CCR-01430, 01511)*	Base	The GS **shall** have no single point of failure at any site in mission management functionality.	Redundancy is necessary in mission critical functionality such as Mission Management. Designing a system to avoid single point failures helps minimize the likelihood of a catastrophic failure that jeopardizes the system's health and safety.	
GSFPS-2435	All	Base	The GS **shall** have no single point of failure at any site in L0, L1b, GLM, GRB, and sectorized cloud and moisture imagery product generation and distribution functionality.	Redundancy is necessary in mission critical functionality such as these. Designing a system to avoid single point failures helps minimize the likelihood of a catastrophic failure that jeopardizes the system's ability to generate the key data products that GOES-R will produce and provide them to the user.	
GSFPS-2913	All	Base	The GS **shall** be designed such that a failure in any function of the system does not impact the ability of redundant, back-up, or contingency instances of the functionality to perform the function. *(CCR01409)*	Intended to limit the potential for cascading failures due to common failure modes. If a function fails at NSOF, it must not also fail at RBU for the same reason at the same time. Independence of operations between primary, backup, and contingency instances helps to increase the system's operational availability.	
GSFPS-2911	GS Ktr, OSO, GAS*(CCR-01430, 01511)*	Base	The GS **shall** isolate anomalies by function and by site.	Intended to limit the potential for cascading failures due to an anomaly at a given site in a given function. The intent is that a failure is limited to the function in which it occurred and at the site in which it occurred. This will help to increase overall system operational availability.	
GSFPS-1230	GS Ktr	Base	The GS **shall** initiate transmission of failover configuration messages for a given function to a functionality's backup site upon detection of a loss of that functionality at the primary site.	This requires the failover process to begin immediately upon detection of a failure, instead of waiting for fault isolation. The failover process may be terminated prior to the completion of failover, but it must be initiated as soon as the failure is detected in order to meet the stringent MaxTTRS requirements.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3104	GS Ktr	Base	The GS **shall** be capable of issuing directives for failover to the RBU of any single function or combination of functions including the following: a) Space - Ground Communications b) Command Generation and Telemetry Data Processing c) Raw (instrument) Data Processing to Level 0 d) Real-time Mission Operations console operations e) Production of Level 1b Products and GLM Product f) Generation of KPPs g) GRB Assembly and Rebroadcast h) Sectorized Product Distribution to AWIPS i) Archiving (e.g., telemetry, EM events) j) 5-day temporary revolving storage	Identifies the directives that will be required for RBU failover. This list is not intended to be comprehensive, and it is anticipated that lower level requirements will identify additional functions that will support failover via directives to the RBU. These are a subset of GSFPS-1618.	
GSFPS-3010	GS Ktr	Base	The GS **shall** complete failover to the RBU of any function supported by the RBU within 5 minutes of failover initiation unless failover sequence is intentionally halted.	The failover process between one of the primary sites and the RBU must complete within 5 minutes in order to meet MaxTTRS requirements. However, the failover sequence must also have the capability to be intentionally halted, which would likely be used by the operator if a primary site failure was fixed within the 5 minute timeline or if additional diagnostic work was required and failover might endanger the system's health and safety. The vendor is expected to define lower level requirements to address holdoff timers and priorities for failovers within a site and between sites.	
GSFPS-2947	GS Ktr, OSO*(CCR-01430, 01511)*	Base	The GS RBU **shall** be capable of transitioning to operational status within 5 minutes.	This parallels GSFPS-3010 in that the RBU must be capable of becoming operational within 5 minutes in order to meet the MaxTTRS requirements above.	
GSFPS-3011	GS Ktr *(CCR-01430, 01511)*	Base	The GS facilities **shall** maintain synchronization with each other such that historical data is not required to transition to operational status.	GS facilities that shift between primary and backup status (for most functions WCDAS/NSOF - RBU, but also WCDAS - NSOF in some instances) must maintain data synchronization such that transition from one site to another can occur without the need for updates prior to becoming operational. Continual synchronization of data is the primary intent of this requirement.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3012	GS Ktr, OSO *(CCR-01430, 01511)*	Base	The GS RBU **shall** transition to backup status for a given function once the primary responsibility for that function has returned to the primary facility or upon intentional termination of a failover sequence.	Ensures that only one instance of a function has primary responsibility for the function at any given time.	
GSFPS-1232	GS Ktr, OSO *(CCR-01430, 01511)*	Base	The GS RBU **shall** retain primary responsibility for a function during handover back to the primary facility until successful handover has been completed.	Ensures that exactly one instance of a function always has primary responsibility for the function at any given time. Terminating the primary responsibility too early could result in an unsuccessful handover of responsibility for that function.	
GSFPS-1180	GS Ktr, OSO *(CCR-01430, 01511)*	Base	The GS RBU **shall** be capable of operating independently of functionalities deployed at WCDAS and NSOF during failover events, while still meeting all applicable functional and performance requirements.	During a failover, the RBU's functionality must be self-contained and not rely on any associated functions at one of the primary sites. Additionally, the RBU must continue to meet any functional and performance requirements.	
GSFPS-2603	GS Ktr, OSO *(CCR-01430, 01511)*	Base	The GS **shall** be able to failover functionality between sites on a function-by-function basis, while maintaining continuity of operations.	The approach for failover is on a per-function (rather than a per-site) basis, so that part of an element's functionality could be operating at the primary site and another part could be operating at the backup for a particular function. This also requires that operations continue as described in the handover requirements.	
GSFPS-1239			***4.5 Latency and Refresh***		
GSFPS-1241			GS product latency and refresh requirements as applied from ingest from the antenna IF switch to ingest of the GOES-R Access Subsystem and other external interfaces as defined in the appropriate IRDs, which vary by product, are located in Appendix A of this GS F&PS. *(CCR01511)*		
GSFPS-2437			GOES-R Access Subsystem-allocated Ground Latency requirements, which vary by product, are located in Appendix B of this GS F&PS. *(CCR01291)*		
GSFPS-2948		0001	GS product latency and refresh requirements as applied from the antenna IF switch to the ingest of the GOES-R Access Subsystem and other external interfaces as defined in the appropriate IRDs, which vary by product, are located in Appendix D of this GS F&PS. *(CCR01511)*		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3148			GS product latency and refresh requirements, as applied from the antenna IF switch to the AWIPS demarcation point, are located in Appendix E of this GS F&PS. *(CCR01511)*		
GSFPS-3198	All	Base	The GS **shall** produce all End-Products in accordance with the definitions in Appendix A as applied through Appendices A-E. *(CCR01292)*	Applies definitions found in Appendix A to the product generation requirements.	
GSFPS-2786	All *(CCR-01414)*	Base	The GS **shall** capture, process, store, and make available a minimum of 99.9% of all theoretically available observable data downlinked from each GOES-R satellite when the system is operationally available, averaged over a 30-day period. *(CCR01513)*	Quantifies the performance for the processing of the collected data from the satellite from receipt at the GS antenna through the completion of data handling.	
GSFPS-2439	GAS *(CCR-01430)*		The GAS **shall** meet the GOES-R Access Subsystem-allocated Ground Latency requirements in Appendix B when the system is operationally available. *(CCR01291, CCR01414, CCR01513)*	Establishes the latency allocation for GAS on a per-End Product basis.	
GSFPS-1245			***4.6 Verification and Validation***		
GSFPS-1252	All	Base	The GS **shall** accommodate testing of both nominal operations and failure scenarios, including automated responses to out-of-limit conditions.	Enables both testing of normal conditions and testing to failure. Tests will generate notifications in the same manner as the operational system.	
GSFPS-1254	All	Base	The GS **shall** include automated tests for validating and verifying GS functional capabilities and performance after repairs or modifications.	Automated test capabilities following modification will speed up the process of bringing modified components back on-line.	
GSFPS-1256	All	Base	The GS **shall** permit an operator to monitor and control built-in tests.	Permits manual control and awareness of test activities.	
GSFPS-1258	All	Base	The GS **shall** include monitoring test points and indicators to support function verification, performance analysis, and fault isolation.	Physical and logical test points and indicators enable more specific testing and help to identify failures or issues with the system during test and verification.	
GSFPS-1262	All	Base	The GS design **shall** prevent disruption to the operational system from activities such as upgrades, routine and preventive maintenance, internal integration and testing, and external interface testing.	The system's design must consider ongoing operations during upgrades. The intent is that non-operational activities must not impact operations.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1263			***4.7 Segment-wide Requirements***		
GSFPS-2918	All	Base	The GS **shall** be designed to utilize the International System of Units (SI, metric measurement system), in concurrence with NPD 8010.2, Use of the SI (Metric) System of Measurement in NASA Programs.	SI units are a NASA standard to avoid confusion of units.	This does not apply to mechanical fasteners, component part drawings and specifications or civil/architectural drawings or specifications. *(CCR01530)*
GSFPS-2445	All	Base	The GS **shall** comply with the NOAA Enterprise Architecture Technical Reference Model (TRM). *(CCR01501)*	The GS will be a part of the larger NOAA/NESDIS enterprise architecture and security architecture. Aligning the GS and NOAA/NESDIS reference models will help support integration and interoperability.	
GSFPS-3738			The Federal Enterprise Architecture and NOAA Enterprise Architecture, Volume I provide guidelines for the GS architecture. *(CCR01501)*		
GSFPS-3105	All *(CCR-01290)*	Base	The GS **shall** have the capability to retrieve stored and on-line data, files, messages, and information.	Once the GS stores an item, it will need to be able to retrieve it from storage.	
GSFPS-1618	GS Ktr	Base	The GS **shall** produce ground directives that control elements within the GS.	Allows operators to manage and control the operation of the Ground Segment and to change the Ground Segment state as needed based on conditions, anomalies, and faults.	A ground directive is an instruction issued to affect the configuration or state of the Ground Segment at the component (Computer Software Configuration Item (CSCI)), subsystem, element, or system level based on operational conditions or in response to an anomaly or fault. A ground directive may be issued by an operator via HMI or by an automated system response via script or procedure. Ground directives may be constrained to a particular element (e.g. directives controlling configuration within EM, MM, PG, or PD) or apply across elements (e.g. EM controlling configuration within other elements and MM controlling external resources such as antennas). *(CCR01666)*
GSFPS-1620	GS Ktr	Base	The GS **shall** create and store ground directives for inter-site control of GS elements. *(CCR01666)*	Allows operators to manage and control the operation of the Ground Segment and to change the Ground Segment state as needed based on conditions, anomalies, and faults.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1264			***4.7.1 Security***		
GSFPS-1266	All	Base	The GS **shall** comply with all security requirements for a Major Application rated as High Impact as outlined in NIST-SP-800-53, the Department of Commerce IT Security Program Policy, and the NOAA IT Security Manual. *(CCR01643)*	According to the FIPS 199 Security Categorization that was performed, the GS has been categorized as a High-impact system. Therefore in accordance with FIPS 200, the GS must implement the security controls for a High impact system as denoted in NIST SP 800-53.	
GSFPS-2440	GS Ktr, OSO *(CCR-01430, 01511)*	Base	The GS **shall** have multi-layered security (Defense in Depth) as defined in NIST SP 800-82. *(CCR01305, CCR01455)*	As the MM function will be using telecommunications equipment rated at a High Impact-Sensitive but Unclassified level (e.g., NSA approved encryption devices), a defense in depth approach must be applied to ensure the proper safety and security of the GOES-R satellite. NIST SP 800-82 is referenced as it provides the requisite guidance that should be followed to ensure the proper isolation and controls will be implemented.	
GSFPS-3207	GS Ktr	Base	The GS **shall** provide the capability for physical network isolation of the full capability to command and control the satellite, process telemetry, and produce and uplink the GRB. *(CCR01506)*		
GSFPS-3203	GS Ktr	Base	The GS **shall** be designed such that the mission management functionality meets all security controls recommended for a Control Network with stringent security requirements as defined in NIST SP 800-82. *(CCR01305, CCR01455)*	NIST SP 800-82 describes 4 different recommendations for securing SCADA systems. Since GOES-R is a National Critical Infrastructure system that controls an asset that's not easily replaced (spacecraft) it was deemed the most restrictive security architecture that still allows for network connectivity. NIST referrers to this as a system that requires "stringent" security controls.	
GSFPS-3204	GS Ktr	Base	The GS mission management functionality **shall** comply with the security recommendations for a Supervisory Control and Data Acquisition (SCADA) system found in NIST SP 800-82. *(CCR01455)*	The GOES-R GS MM functionality was designated a SCADA system by NESDIS senior management based on its long life span and because it's part of the National Critical Infrastructure. NIST SP 800-82 provides additional guidance for securing systems with long life spans.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2441	All	Base	The GS **shall** operate correctly as intended on systems using National Checklist Program Common Configurations such as the Federal Desktop Core Configuration.	The Cyber Security Research and Development Act of 2002 tasked NIST to "develop, and revise as necessary, a checklist setting forth settings and option selections that minimize the security risks associated with each computer hardware or software system that is, or is likely to become widely used within the Federal Government." As a result, NIST has developed the National Checklist Program which includes lists of common security configurations such as the FDCC. These checklists may include security configuration files, security documentation, and security policy directives applicable to a given system. The FDCC, an OMB (U.S. Office of Management and Budget) mandate, requires that all Federal Agencies standardize the configuration of approximately 300 settings on each of their Windows XP and Vista Computer.	
GSFPS-3118	All	Base	GS systems **shall** implement common security configurations using the following order of precedence: a) NOAA b) DOC c) NIST d) Defense Information Systems Agency (DISA) e) Center for Internet Security (CIS) *(CCR01304)*	As the GOES-R GS is considered a federally owned and operated system it must comply with federal guidance. Since the system is operated by NOAA as a part of the Department of Commerce, those regulations take precedence. NIST guidance must be complied with in accordance with the Federal Information Security Management Act of 2002. DISA is a leading authority in IT security for the DoD and has developed several guides (i.e., STIGS) that serve as an authoritative resource for implementing sound IT security configurations and settings. The Center for Internet Security (CIS) is a non-profit enterprise whose mission is to help organizations reduce the risk of business and e-commerce disruptions resulting from inadequate technical security controls. The CIS also provides a resource for best practices that should be considered when configuring IT security controls and mechanisms into critical systems such as the GOES-R GS.	
GSFPS-2442	All	Base	The GS **shall** allow system operation, maintenance, update and/or patching of software without altering configuration settings from the approved National Checklist Program Common Configurations such as the Federal Desktop Core Configuration.	As cited for GSFPS-2441, NIST has developed a National Checklist Program and therefore it is important that as the vendor rolls out patches and software updates they will be in compliance with the common configurations that NIST publishes for the particular OS' or databases that the GS will be using.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2443	All	Base	The GS **shall** be designed to enforce the principle of "least privilege" so that authenticated users are limited to accessing only those system objects required for the normal performance of their duties. *(CCR01305)*	NIST 800-53 Security Control AC-6, Least Privilege requires that the GS enforce the most restrictive set of rights/privileges or accesses needed by users (or processes acting on behalf of users) for the performance of specified tasks. Therefore, the GS should be designed to ensure the concept of least privilege and thus ensure that normal user access prevents them from having administrative privileges.	
GSFPS-1491	GS Ktr *(CCR-01430, 01511)*	Base	The GS **shall** employ multi-factor identification and authentication that is separate from the administrative network, per NISTSP 800-82, Draft Guide to Industrial Control Systems (ICS) Security. *(CCR01305)*	As the MM function will be using telecommunications equipment rated at the National Security level a defense in depth approach must be applied to ensure the property safety and security of the GOES-R satellite. Multi-factor authentication will help ensure that data integrity is maintained and will greatly reduce the risk of system compromise due to unauthorized access.	
GSFPS-3132	GS Ktr *(CCR-01430, 01511)*	Base	The GS **shall** employ smart card login in accordance with Homeland Security Presidential Directive 12 (HSPD-12). *(CCR01305)*	HSPD-12 establishes a mandatory, Government-wide standard for secure and reliable forms of identification issued by the Federal Government to its employees and contractors (including contractor employees). This includes two factor authentication and the use of smart card technology (for facility access as well as system access to include logins). Therefore to ensure that when the GS goes into an operational state it must support DOC/NOAA compliance with HSPD-12.	
GSFPS-3200	All	Base	The GS **shall** include anti-malware and Host-based Intrusion Prevention System (HIPS) functions within the development, integration and test, and operations environments. *(CCR1304)*	Required in the Operations and I&T environments per NIST, DOC and NOAA. Required for the Development environment to determine any impacts on latency and sizing, as the security software does use CPU cycles, memory, and hard drive space. Also mitigates risk of an un-detected virus in Dev being introduced into the I&T environment as the software is promoted into that environment.	
GSFPS-1267			***4.7.2 Telecommunications***		
GSFPS-1269	All	Base	The GS **shall** operate per IPv6 standards as given in RFC2460 - Internet Protocol, Version 6 (IPv6) Specification.	The Government is transitioning to IPv6 for all new IT systems. This is a downward directed requirement from the Department of Commerce to ensure that the GS is compatible with future networks and architectures.	
GSFPS-2611	OSO		The GS command and control circuits **shall** have a service level rating of Critical.	The Critical service level rating is an agreement that provides 0.9999 availability for terrestrial comm. circuits for command and control between sites. Circuit does not imply a networking implementation, only a capability to provide bandwidth (i.e., circuits may be virtual, muxed, etc, as long as they meet the appropriate service levels and other performance requirements).	Critical SLA is defined as per the GSA NETWORX contract.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2612	OSO		The GS data circuits **shall** have a service level rating of Routine.	Other data circuits have a routine availability of 0.999. These will be used for non-command and control functions. Circuit does not imply a networking implementation, only a capability to provide bandwidth (i.e., circuits may be virtual, muxed, etc, as long as they meet the appropriate service levels and other performance requirements).	Routine SLA is defined as per the GSA NETWORX contract.
GSFPS-2448	OSO		The GS circuits **shall** provide bandwidth to transport required products for all GOES-R series satellites.	This is for bandwidth required within the GS and to get the products to the GS demarcation point. This does not imply a requirement to transport products beyond the GS demarcation point. Circuit does not imply a networking implementation, only a capability to provide bandwidth (i.e., circuits may be virtual, muxed, etc, as long as they meet the appropriate service levels and other performance requirements).	
GSFPS-2613	OSO		Each GS circuit procured **shall** satisfy the capacity, performance, and protocol specifications that are documented in the applicable interface control document (ICD).	Ensures that the GS data circuits meet the interface requirements specified in the ICDs, both internal and external. Circuit does not imply a networking implementation, only a capability to provide bandwidth (i.e. circuits may be virtual, muxed, etc, as long as they meet the appropriate service levels and other performance requirements).	
GSFPS-3199	All	Base	The GS **shall** conduct all routine intra-element and inter-element communications via network connections. *(CCR01341)*	Ensures that routine communications occur electronically (without the need for a human to transfer data manually from one network to another).	
GSFPS-1271			***4.7.3 Accessibility***		
GSFPS-1273	All	Base	The GS **shall** be accessible to individuals with disabilities as required by Section 508 of the Rehabilitation Act (29 USC 749d) as amended.	Federally mandated requirement to enable use of the system.	
GSFPS-1274	All	Base	The GS **shall** meet or exceed the requirements given in 36 CFR Parts 1193, Telecommunications Act Accessibility Guidelines and 1194, Electronic and Information Technology Accessibility Standards.	Federally mandated requirement to enable use of the system.	
GSFPS-2615	All	Base	The GS **shall** provide the capability for the operator to send to displays, printers, and files any of the following: spacecraft, instrument, or Ground Segment data and information used or generated by a GS function.	Ensures that any indicated data can be accessed for display, storage, and printing.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1278			***4.7.4 Electromagnetic Interference***		
GSFPS-1280	All	Base	The GS **shall** comply with the electromagnetic interference (EMI) requirements of FCC rules CFR 47, Part 15, Subpart B, Sections 15.107 and 15.109 for Class A or B conducted and radiated emissions.	Ensures that the GS meets FCC guidelines for EMI compliance.	
GSFPS-1282			***4.7.5 Operational Integrity***		
GSFPS-1284	All	Base	The GS **shall** perform all functions, including those occurring simultaneously, with no interference with or performance degradation of any other GOES-R segment functionality.	Intent is that any GS operations do not have a negative impact on the Space or Launch Segment functionality of the system.	
GSFPS-1286	All	Base	The GS **shall** perform all functions, including those occurring simultaneously, with no interference with or performance degradation of any other functionality within the GS.	The GS must operate in such a way that one function does not impact another. This includes development, I&T, and operational functions.	
GSFPS-1288	All	Base	The GS **shall** perform all functions, including those occurring simultaneously, with no interference with or performance degradation of any other NOAA ground system.	The GS must operate without negatively impacting other NOAA ground systems.	
GSFPS-1289			***4.7.6 Time References***		
GSFPS-1291	All *(CCR-01430)*	Base	The GS **shall** use the Coordinated Universal Time (UTC) reference for all time-of-day related data processing.	Ensures that local time is not used and prevents time zone issues by mandating a standard time.	
GSFPS-1293	All *(CCR-01430)*	Base	The GS **shall** provide time and date annotation with a resolution of at least 10 microseconds.	Detailed time and date annotation will be needed for GS operations.	
GSFPS-3013	All *(CCR-01430)*	Base	The GS **shall** synchronize all nodes at the primary facility utilizing the timing signal from the timing system resident at each respective primary facility location.	Provides a common time reference for all nodes at the primary facilities. NSOF and WCDAS will each have a time reference source that the GS will use for time synchronization.	
GSFPS-2449	GS Ktr*(CCR-01430, 01511)*	Base	The GS **shall** synchronize all nodes at the RBU utilizing the timing signal from the timing system resident at the RBU.	The GS will have a time reference source at the RBU to synchronize all nodes at RBU.	
GSFPS-2450	All *(CCR-01430)*	Base	No two nodes in the GS **shall** vary by more than 5 microseconds from the site master clock.	Limits the variation of the time between nodes to half of the 10 microsecond resolution described above.	
GSFPS-1294			***4.7.7 Reserved (CCR01473)***		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2616			***4.7.8 Extensibility, Modularity, and Scalability***		
GSFPS-2617	All	Base	The GS **shall** be extensible to operate up to four (4) satellites simultaneously.	Provides room for growth if future GOES operations continue to use the GS or if the GOES-R series is expanded to additional satellites (per Space Segment options for -T and -U).	
GSFPS-2618	GS Ktr, ANT, OSO *(CCR 01513)*	Base	The GS **shall** be implemented such that all elements can be independently scalable by at least 300% to accommodate any future growth, including the exercise of contract options.	Each element of the GS must be designed in a way that allows for 300% growth to support future mission needs. Meets the intent of the previous 100% scalability requirement, with the addition of Options 1 and 2.	
GSFPS-3745	GAS		The GAS **shall** be scalable by at least 100% to accommodate any future growth. *(CCR01513)*	The GAS must be designed in a way that allows for 100% growth to support future mission needs.	
GSFPS-2622	All	Base	Individual GS computer processor CPU utilization **shall** not exceed 70%, averaged daily.	This prevents bottlenecks in the system by overloaded processors.	The 70% referenced in this requirement is in addition to the 50% reserve capacity.
GSFPS-2623	All	Base	Individual GS computer processor memory utilization **shall** not exceed 50%, averaged daily.	This prevents memory bottlenecks in the system.	The 50% referenced in this requirement is in addition to the 50% reserve capacity.
GSFPS-2771	All	Base	The GS **shall**, with the baseline delivery as well as with deliveries associated with any exercised contract options, size all processing, storage and throughput for at least 50% reserve capacity of that necessary to meet performance requirements.	In addition to the requirements above limiting CPU and memory utilization, the system must be delivered such that it is sized for 50% additional processing, memory, storage, and other performance characteristics in order to accommodate post-delivery activities or unplanned growth.	
GSFPS-2625	All	Base	The GS **shall** use modular hardware (Line Replaceable Units) and software that allows changes and enhancements to be performed without interfering with GS operations.	Hardware and software will be "hot-swappable," "plug-and-play," and modular in order to minimize impact to ongoing operations if a unit is upgraded or otherwise modified.	
GSFPS-2626	All	Base	GS hardware **shall** use functional modules that allow replacement to improve performance, reliability or for other reasons.	Hardware will be designed such that it can be upgraded or replaced on a module-by-module basis, which supports a higher system availability and improved maintainability.	
GSFPS-2764	All	Base	The GS **shall** be modular/plug-and-play such that it will accommodate individual algorithm changes, as well as the deletion of existing and the addition of new algorithms, without the need for recompilation of other software modules.	GS software designs for product generation algorithms will be stand-alone and modular so that algorithm changes, along with additions and deletions of algorithms, can occur without impacting the system.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3751	GAS		The GAS **shall** accommodate individual product and data changes, as well as the deletion of existing and the addition of new products and data, without the need for recompilation of software modules. *(CCR01513)*	The GAS software needs to be designed so product and data changes can be easily managed and implemented without impacting the system or requiring recomplition of software. Recompilation and deployment of software entails complete development, I&T, and deployment and would greatly inhibit product and data changes.	
GSFPS-2792	All	Base	The GS **shall** be designed such that it is modular, extensible, extendable and open.	General requirement to design the system using best practices to ensure room for future growth and changes to the system.	
GSFPS-3014	All	Base	The GS **shall** provide the capability for increased automation of GS operations throughout the life of the program.	The system will be designed such that new automation features can be implemented or added throughout the life of the system. It will have automation features that may be disabled at the beginning of operations but that may be enabled at some point in the system's life cycle. This enables changes in operations concepts and NOAA staffing approaches if desired.	
GSFPS-3092	All	Base	The GS development and Integration and Test (I&T) environments **shall** be independently and simultaneously fully functional from the IF Switch through the GS.	Both the development and I&T environments must be fully functional for the full range of GS functions with the exception of the antennas. They must be independent of each other and of the GS.	
GSFPS-3214	GS Ktr	Base	The GS **shall** be extensible such that new software components that call existing services may be added with minimal baseline impacts. *(CCR01506)*		
GSFPS-3215	GS Ktr	Base	The GS **shall** be modular such that existing software components can be replaced with minimal baseline impacts. *(CCR01506)*		
GSFPS-3093	All	Base	The GS elements **shall** each have independent and simultaneously fully functional Development and I&T environments from the element inputs through outputs, with the MM demarcation point at the IF Switch.	The development and I&T environments for each element must be fully functional independent of each other and of other environments for the full range of GS functions with the exception of the antennas..	
GSFPS-3121			***4.7.9 Configuration Management System***		
GSFPS-3122	All	Base	The GS **shall** capture, manage, and update the baseline configuration of the GS hardware and software. *(CCR01305)*	CMART will provide configuration management for the GS hardware and software baseline.	
GSFPS-3123	GS Ktr	Base	The GS configuration management system **shall** include maintenance history accounting that enables tracking, and reporting at the component, subsystem, element and GS levels.	CMART enables configuration management at multiple levels, including versioning and other information to provide a historical record of the baseline and changes over time.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3124	GS Ktr	Base	The GS configuration management system **shall** enable sharing/linking anomaly reporting and status, software build, and history information such that configuration management system information may be queried and reported by information (data fields) contained in each of those functions.	CMART will provide an integrated capability that consolidates administrative processes that affect the baseline and provides logical traceability and searchable access to all of that information.	
GSFPS-3125	GS Ktr	Base	The GS configuration management system **shall** enable reporting and tracking of data by, at a minimum: a) Anomaly/Incident Report Identifier b) Hardware/Software CI Identifier c) Hardware component identifier d) Subsystem identifier e) Element identifier f) Software Build Identifier g) Software Version Number h) COTS identifier/nomenclature i) Operator j) Date range k) Problem type l) Verification event	This is the minimum set of parameters necessary to record, track, and report CM of GS operations activities. Other data types may be included as system development progresses.	
GSFPS-3126	GS Ktr	Base	The GS configuration management system's anomaly tracking capability **shall** include, at a minimum, the capabilities of the existing anomaly tracking systems.	Ensures that the developed system will be at least as capable as existing system (CATS). Also supports the transition of legacy data to CMART.	
GSFPS-2819			***4.8 Development Environment***		
GSFPS-2828	All *(CCR-01430)*	Base	The GS **shall** provide a development environment for GS software development and checkout for all GS elements.	The development environment is an offline environment that will be used by the GS as described below.	
GSFPS-3743			Each GS development effort will provide a component of the GS development environment. *(CCR01513)*		
GSFPS-2829	GS Ktr	Base	The GS development environment **shall** support L1b Calibration and Validation (Cal/Val), L1b algorithm maintenance, and L2+ algorithm/parameter maintenance as well as the software development for all GS elements.	Provides a dedicated non-operational environment that replicates the GS operational environment to enable maintenance and software development without impacting ongoing operations.	
GSFPS-2830	All *(CCR-01430)*	Base	The GS development environment **shall** be capable of hosting the GS operational baseline software.	The development environment needs to be able to host an complete version (current, historical, or future/development) of the GS for use/checkout prior to promotion, performance analysis, etc.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2309	All *(CCR-01430)*	Base	The GS development environment **shall** be sized such that the simultaneous execution of all elements of the GS software baseline will meet operational performance requirements.	Sizing and performance of the development environment will support the same functional and performance requirements of the operational GS.	
GSFPS-2914	GS Ktr *(CCR-01430, 01511)*	Base	The portion of the GS development environment at WCDAS **shall** provide access to all data necessary for the offline execution of any single process or set of processes (including implemented algorithms) nominally resident at WCDAS.	This ensures that development activities for WCDAS-based functions and processes can occur at WCDAS.	
GSFPS-2831	GS Ktr	Base	The GS development environment **shall** provide the selectable capability to capture and store logs, configurations, performance data, and other artifacts associated with development activities.	This provides the development environment with sufficient capabilities to conduct development activities. The term "selectable" indicates that these functions may be turned on or off as needed for a particular activity.	
GSFPS-2832	All *(CCR-01430)*	Base	The GS development environment **shall** provide tools to enable the change, recompilation, and execution of any segment/module of the source code from any GS element.	The development environment will be used to modify GS element source code. This supports the checkout of those modifications through the environment.	
GSFPS-2833	All *(CCR-01430)*	Base	The GS development environment **shall** provide the capability to develop, modify and checkout the integrated operation of all GS databases, tables and configuration files.	Before being placed into operations, modifications to or newly developed mission critical capabilities need to be checked out. The development environment provides this capability.	
GSFPS-2834	All *(CCR-01430)*	Base	The GS development environment **shall** utilize the same configuration management and version control tools as the operational environment.	The development environment, as part of the whole GS, uses the CMART.	
GSFPS-2835	GS Ktr	Base	The portion of the GS development environment at NSOF **shall** have at least 25 TB of dedicated storage for use by the Government.	This is sized such that 17 day's worth of data required for and resulting from full product generation at NSOF can be stored on the development environment for playback and test.	
GSFPS-2836	GS Ktr	Base	The portion of the GS development environment at WCDAS **shall** have at least 2 TB of dedicated storage.	This is sized such that approximately 36 hours of L0 data and L1b products can be stored locally for playback and test.	
GSFPS-2837	GS Ktr	Base	The GS development environment **shall** include C/C++ and Fortran 90/95 compilers.	This supports current algorithm maintenance activities.	
GSFPS-2838	GS Ktr	Base	The GS development environment **shall** include Java, and Perl and shell scripting languages.	This supports current algorithm maintenance activities.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2839	All *(CCR-01430)*	Base	The GS development environment **shall** have the capability to export compiled code segments and associated configuration and other support files to the integration and test (I&T) environments following established configuration management (CM) processes. *(CCR01471)*	This provides a transfer mechanism from the development environment to the operational and I&T environments for promotion of code and associated items developed on the development environment.	
GSFPS-2840	All *(CCR-01430)*	Base	The GS development environment **shall** be physically or logically segregated from other GS environments such that data and developed/compiled code transfers can only be initiated from the I&T environment. *(CCR01537)*	Helps to prevent accidental migration of code from the development environment to the operational and I&T environments. The higher-security environment will always control the transfer, so the other GS environments will pull from the dev environment.	
GSFPS-2842	All *(CCR-01430)*	Base	The GS development environment **shall** provide tools to monitor and display GS software execution performance and compare relative to F&PS performance requirements.	Monitoring development code performance is necessary for operators/developers to know that the system meets operational requirements.	
GSFPS-2843	GS Ktr *(CCR-01430, 01511)*	Base	The GS development environment **shall** provide local workstation operator/developer access and control at WCDAS.	Provides access and control of the development environment at WCDAS so that activity can occur locally.	
GSFPS-2844	All *(CCR-01430)*	Base	The GS development environment **shall** provide local workstation operator/developer access and control at NSOF.	Provides access and control of the development environment at NSOF so that activity can occur locally.	
GSFPS-2311	GS Ktr	Base	The GS development environment **shall** provide the capability to modify, execute, and checkout algorithms individually or in groups, to support the verification and validation of product quality requirements and product generation performance.	The development environment will be used to support the verification and validation of algorithm upgrades throughout the life cycle of GOES-R. Individually is necessary to check out 'plug-and-play' module changes, and groups may be necessary to test a product thread (precedence-dependent). Also includes full PG to stress test GS.	
GSFPS-2738	All *(CCR-01430)*	Base	The GS development environment **shall** be physically or logically segregated from other GS environments such that instances of any portion of the GS software baseline executing on the development environment cannot interfere with nor degrade the performance of software executing on any other environment.	Ensures physical and logical non-interference between the development environment and the I&T and operational environments.	
GSFPS-2317	GS Ktr	Base	The GS development environment **shall** provide the capability to capture, store, and export output of the offline execution of any single or set of algorithms.	The development environment will be used to support the verification and validation of algorithm upgrades throughout the life cycle of GOES-R. This capability supports the offline analysis and results reporting of such activities.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3015	GS Ktr	Base	The GS development environment **shall** have the capability to replay Transfer Frames from the 5-day revolving temporary storage back as a separate virtual satellite flow.	The Dev Environment must interface with the 5-day raw data store, receive data, and emulate operational data flows, distinct from other live and simulated data sources.	Fill packets are included in the 5-day store.
GSFPS-2820	GS Ktr	Base	The GS development environment **shall** have access to engineering telemetry data as it becomes available to the GS.	Engineering telemetry data will be immediately available to the development environment in order to conduct development activities using "live" data.	
GSFPS-2821			***4.8.1 Calibration/Validation / WCDAS Product Maintenance***		
GSFPS-2847	GS Ktr	Base	The portion of the GS development environment located at WCDAS **shall** have local access to L0 data as it becomes available to the GS at WCDAS.	Access to live data enables realistic testing and is a source for on-line radiometric CAL development/monitoring.	
GSFPS-2848	GS Ktr	Base	The portion of the GS development environment at WCDAS **shall** have local access to all input and output data and products as they are processed by the GS.	Access to live data enables realistic testing.	
GSFPS-2849	GS Ktr	Base	The GS development environment **shall** be capable of producing products nominally generated at WCDAS from L0 data, using existing and modified implemented algorithms and calibration coefficients, via local operator/developer access at WCDAS.	The development environment must be flexible to enable testing of algorithms. Needs to be capable of operating identically to current operational environment and to be able to test modifications.	Nominally generated a WCDAS implies L1b and GLM products.
GSFPS-2850	GS Ktr	Base	The portion of the GS development environment located at WCDAS **shall** be capable of ingesting and processing GOES-R compatible format L0 test data sets.	An interface to introduce test data sets into the WCDAS development environment will be needed to conduct development and test activities.	
GSFPS-2851	GS Ktr	Base	The GS development environment **shall** have the Interactive Data Language (IDL) and image processing software (e.g. ENVI) installed.	This software is required by AWG to support cal/val activities and the testing of new and modified algorithms.	
GSFPS-2852	GS Ktr	Base	The portion of the GS development environment located at WCDAS **shall** have the capability to make and checkout changes to the calibration coefficients.	Maintenance of the calibration coefficients is a function of the WCDAS development environment	
GSFPS-2853	GS Ktr	Base	The GS development environment **shall** provide the capability to make updated calibration coefficient databases available to the operational and I&T environments following established CM procedures.	Via CMART, the development environment will provide updated calibration coefficients to the other GS environments. Allows for the promotion of the calibration coefficient databases to the I&T environment.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2854	GS Ktr	Base	The portion of the GS development environment at WCDAS **shall** make products produced on the development environment available for analysis and local storage.	In order to analyze the output of modified algorithms and/or cal/val activities, the WCDAS development environment will need to provide the capability to store and review capabilities for the products under review (L1b and GLM, including GRB and eGVAR processing).	
GSFPS-2855	All *(CCR-01430)*	Base	The GS development environment **shall** provide a removable media capability at each site.	This allows development environment users to copy test files, output, etc to removable media for offline analysis.	
GSFPS-2856	GS Ktr *(CCR-01430, 01511)*	Base	The GS development environment **shall** provide for security-compliant thin-client (virtual machine) access to the development environment from external algorithm maintenance or Cal/Val facilities. (Note: Thin client is defined to mean that no local software applications are transferred to or run on the remote client machine).	This enables STAR and AWG algorithm development and cal/val team members to access the development environment remotely, while still maintaining a secure development environment. Also ensures that the client-side machines do not require any modification to access the development environment capabilities.	Thin client is defined to mean that no local software applications are transferred to or run on the remote client machine.
GSFPS-2313	GS Ktr	Base	The GS development environment **shall** provide access to all data necessary for the offline execution of any single L2+ algorithm or set of algorithms.	This capability supports algorithm testing and ca/val. The development environment needs to be able to test individual algorithm threads or stressing cases.	"All data necessary" includes time-synchronized ancillary data, parameter databases, etc.
GSFPS-2915	GS Ktr	Base	The GS development environment **shall** host tools, provided by the Government to support algorithm maintenance and calibration /validation activities.	The development environment will have additional computing resources (processing power, storage, etc) to host standard tools required by AWG.	
GSFPS-3102	GS Ktr	Base	The portion of the GS development environment at WCDAS **shall** be capable of ingesting and processing GOES-R compatible format L1b test data sets for those L2+ end-products nominally resident at WCDAS.	This capability supports testing for GLM, which is a L2+ product included in the GRB and developed at WCDAS.	
GSFPS-2822			***4.8.2 Level 2+ Algorithm Maintenance***		
GSFPS-2857	GS Ktr	Base	The portion of the GS development environment located at NSOF **shall** provide local access to L1b and L2+ data and products from the GRB as they become available to the GS at NSOF. *(CCR01286)*	Access to live data enables realistic testing.	
GSFPS-2858	GS Ktr	Base	The portion of the GS development environment located at NSOF **shall** provide access to operational L2+ products as they are produced.	Access to live data enables realistic testing.	
GSFPS-2859	GS Ktr	Base	The portion of the GS development environment located at NSOF **shall** provide local access to ancillary data as it becomes available to the GS at NSOF.	Access to live data enables realistic testing.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2860	GS Ktr	Base	The portion of the GS development environment located at NSOF **shall** be capable of producing L2+ products using modified L2+ algorithms, modified algorithm parameters and alternate ancillary data.	The development environment allows for modification of implemented algorithms, parameters, and ancillary data to assess operational impact.	
GSFPS-2861	GS Ktr	Base	The portion of the GS development environment located at NSOF **shall** be capable of ingesting and processing GOES-R compatible format L1b test data sets.	An interface to introduce test data sets into the NSOF development environment will be needed to conduct development activities.	
GSFPS-2862	GS Ktr	Base	The portion of the GS development environment located at NSOF **shall** make L2+ products produced on the development environment available for developer analysis and local storage in the development environment.	In order to analyze the output of modified algorithms and/or cal/val activities, the NSOF development environment will need to provide storage and review capabilities for the products under review.	
GSFPS-2863	GS Ktr	Base	The portion of the GS development environment located at NSOF **shall** have the capability to make and checkout changes to run-time configurable algorithm parameters on the development environment.	Allows for the offline analysis; modification; and code and unit test in order to conduct informal testing during development.	
GSFPS-2864	GS Ktr	Base	The GS development environment **shall** provide the capability to export updated run-time configurable algorithm parameters to the operational and I&T environments following established CM procedures.	Via CMART, the development environment will provide updated run-time configurable algorithm parameters to the other GS environments. Allows for the promotion of the run-time configurable algorithm parameters to the I&T environment.	
GSFPS-2823			***4.9 Integration and Test Environment***		
GSFPS-2865	All *(CCR-01430)*	Base	The GS **shall** provide an environment to support software I&T for all GS elements.	This environment is necessary to conduct software I&T in a separate environment from the development and operational systems. It must support I&T for all elements.	
GSFPS-2866	GS Ktr	Base	The GS I&T environment **shall** be capable of processing all GOES-R data.	In order to support I&T for all elements, the environment needs to be capable of performing the same functions as the operational environment, including processing all GOES-R data types.	
GSFPS-3154	GS Ktr	Base	The GS I&T environment **shall** have access to engineering telemetry data as it becomes available to the GS.	Engineering telemetry data will be immediately available to the I&T environment in order to conduct I&T activities using "live" data.	
GSFPS-2867	All *(CCR-01430)*	Base	The GS I&T environment **shall** provide operator access and control.	Provides the operator with an interface to conduct I&T environment activities.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2868	All *(CCR-01430)*	Base	The GS I&T environment **shall** be sized such that the execution of all elements of the GS software baseline simultaneously will meet operational performance requirements.	This allows the I&T environment to conduct realistic performance test activities and to mimic the operational environment under nominal operating conditions and scenarios.	A secondary benefit is for the I&T environment to be capable of operating as a backup operational string during contingency operations.
GSFPS-3739	All	Base	The GS I&T environment **shall** have the capability to export compiled code segments and associated configuration and other support files to the operational environment following established configuration management (CM) processes. *(CCR01471)*		
GSFPS-2869	All *(CCR-01430)*	Base	The GS I&T environment **shall** be physically or logically segregated from other GS environments such that instances of any portion of the GS software baseline executing on the I&T environment cannot interfere with nor degrade the performance of software executing on any other environment.	Helps to prevent accidental migration of code from the I&T environment to the operational or development environments.	
GSFPS-3756	GAS		The GAS I&T environment **shall** provide the capability to interact with the GS in accordance with the GOES-R Ground Segment (GS) To GOES-R Access Subsystem (GAS) Interface Requirements Document (IRD) (G417-R-IRD-0196). *(CCR01513)*	Allows GAS and GS software and hardware modifications to the ground segment to be tested across the GS-to-GAS interface and verified, regression tested, etc. prior to being deployed to the operational environment.	
GSFPS-3127	All *(CCR-01430)*	Base	The GS I&T environment **shall** utilize the same software configuration management and version control tools as the operational environment.	Using common software CM and version control tools helps manage code between the environments.	
GSFPS-2870	All *(CCR-01430)*	Base	The GS I&T environment **shall** provide tools to monitor and display software execution performance and compare relative to GS-F&PS performance requirements.	Diagnostic tools are needed to support software performance during I&T activities. These provide the capability to measure system performance against GS requirements.	
GSFPS-2871	GS Ktr	Base	The GS I&T environment **shall** be capable of exporting product generation output data to the development environment.	Moving PG output data from the I&T environment to the development environment allows for testing of code under development and incorporates a feedback loop between the development and I&T activities. Provides access to a live data stream for development.	
GSFPS-2872	All *(CCR-01430)*	Base	The GS I&T environment **shall** be capable of the operational implementation of GS software, including databases and algorithms, following established configuration management processes, and without disruption of mission operations.	The I&T environment must support testing of the operational GS software, databases, and algorithms. It must follow software CM processes. It also must not impact ongoing operations.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2319	GS Ktr	Base	The GS I&T environment **shall** have the capability to capture and store cumulative offline product generation output from 36 hours of continuous processing.	36 hours of I&T storage (one day plus margin) ensures that any diurnal anomalies can be captured during the I&T execution window and identified during test data playback.	
GSFPS-3740	GS Ktr	Base	The GS **shall** have the capability to replay transfer frames from the 5-day revolving temporary storage into the I&T environment as a separate virtual satellite flow. *(CCR01471)*		
GSFPS-1246	All *(CCR-01430)*	Base	The GS I&T environment **shall** accommodate independent element and subsystem tests, end-to-end tests, integration and verification activities, certification and accreditation security tests, without interfering with ongoing operations.	The I&T environment must support testing at multiple levels from subsystem to end-to-end system tests. These tests must not interfere with current operations.	
GSFPS-1248	All *(CCR-01430)*	Base	The GS I&T environment **shall** provide the selectable capability to capture and store logs, configurations, performance data, and other artifacts associated with test activities.	The I&T environment needs to log test activities through these capabilities. It is selectable so that not all test activities need to be logged. The logged activities are operator-definable.	
GSFPS-1250	All *(CCR-01430)*	Base	The GS I&T environment **shall** accommodate test and verification of planned modifications under operational-equivalent conditions.	The I&T environment must be capable of checkout and requirements verification of modifications that will be run on the operational system while subjected to operational conditions and prior to promotion to the operational environment.	
GSFPS-1260	All *(CCR-01430)*	Base	The GS I&T environment **shall** accommodate input and output of test data via removable physical media.	The I&T environment will require user interface ports to load test or proxy data into and copy output data from in order to perform testing and analysis.	
GSFPS-2994			***4.10 Operator Human-Machine Interface***		
GSFPS-3016	All *(CCR-01430)*	Base	The GS **shall** provide a capability for information entry and editing.	High-level requirement for all human-machine interface requirements.	
GSFPS-3017	GS Ktr	Base	The GS **shall** display any single page simultaneously and independently at any number of viewing locations, as designated by the operator.	GS information needs to be available to multiple users at multiple workstations concurrently in order to conduct GS operations.	
GSFPS-3018	GS Ktr	Base	The GS **shall** provide the capability to create, customize, and maintain display page and graph definitions.	GS operators will have the capability to store display page and graph preferences in order to replicate their profile "look and feel" at any workstation (maintain an operator profile across workstations).	
GSFPS-3019	All *(CCR-01430)*	Base	The GS **shall** provide for the definition of abbreviated keyboard entries for executing operator directives.	This allows for the creation of user-defined "macros".	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3020	GS Ktr	Base	The GS **shall** display up to ten (10) parameters on a single graph.	This allows for graph customization with as many as 10 data sources.	
GSFPS-3021	All *(CCR-01430)*	Base	The GS **shall** have consistent operator human-machine interfaces for functions within the GS.	Standardization of the operator "look and feel" simplifies operations of the GS, helping to reduce operator error and training requirements	
GSFPS-3022	All *(CCR-01430)*	Base	The GS **shall** provide access to available functions through a human-machine interface, allowing the operator to access tools and information and to perform actions.	All GS functions should be available to the operator via the HMI.	
GSFPS-3023	All *(CCR-01430)*	Base	The GS **shall** have consistent visual and audible alarms for segment, elements, and subsystems.	Standardization of the operator "look and feel" simplifies operations of the GS, helping to reduce operator error and training requirements.	
GSFPS-3024	All *(CCR-01430)*	Base	The GS **shall** generate event messages for all GS and satellite events.	Event messages help with operator and EM situational awareness of the system state and activities.	
GSFPS-1332	All *(CCR-01430)*	Base	The GS **shall** allow the operator to configure the format and contents of displays.	Customization of the operator's "look and feel" increases operator productivity and ease of use of the GS, helping to reduce operator error and training requirements	
GSFPS-1334	All *(CCR-01430)*	Base	The GS **shall** display information in text and graphical formats.	Required for Section 508 compliance.	
GSFPS-1344	All *(CCR-01430)*	Base	The GS **shall** acknowledge operator inputs within 0.5 seconds.	This requirement ensures that an operator will not continue to make the same input while the system is processing. Acknowledgement may be as simple as the cursor turning to an hourglass.	
GSFPS-1346	All *(CCR-01430)*	Base	The GS **shall** update displays of rapidly changing information at a maximum of twice per second.	This ensures that the operator can read and process rapidly changing information, rather than just seeing a stream of information.	
GSFPS-1362	GS Ktr	Base	The GS **shall** permit an operator to enable and disable individual EM reporting status and alarms.	This allows the operator to turn on or off alarms depending on current activities, the operator's role, and mission needs.	
GSFPS-1444	All *(CCR-01430)*	Base	The GS **shall** produce formatted hardcopy of displays, files, logs, and query responses upon operator request.	This requirement allows the operator to quickly produce paper records of system state and activities.	
GSFPS-1448	All *(CCR-01430)*	Base	The GS **shall** display notification of all non-nominal conditions to the GS operators.	Notifications of non-nominal conditions alert the operator to system issues.	
GSFPS-3114	All *(CCR-01430)*	Base	The GS **shall** retain critical events on the display until acknowledged by the operator.	Requiring operator acknowledgement of critical events ensures that the operator does not miss a warning or other critical message.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1452	All *(CCR-01430)*	Base	The GS **shall** generate notification messages indicating at least three (3) levels of severity, based on authorized operator-configurable conditions and criteria.	Binning notification messages into three configurable levels of significance provides additional information management capabilities for the operator. These are not the same Severity Levels as defined in CMART.	
GSFPS-2634	All *(CCR-01430)*	Base	The GS **shall** permit the display of a minimum of 20 active windows, including text and graphics displays, on a single operator session.	In order to work with multiple data sources, the operator must not be limited in the number of windows in use at any given time.	
GSFPS-1654	All *(CCR-01430)*	Base	The GS **shall** provide for the tabular and graphical display of data according to default and operator-specified display characteristics.	The operator will be able to customize display characteristics of data.	
GSFPS-1299			**5 ENTERPRISE MANAGEMENT REQUIREMENTS**		
GSFPS-1301			***5.1 Overview***		
GSFPS-1303			Section 5 specifies the requirements associated with the Enterprise Management (EM) functional element - those requirements pertaining to oversight and supervision of the whole GS.		
GSFPS-1305			In the EM context, supervision is defined as the ability to monitor, report, and provide capability for an operator response to anomalous conditions. GS operators at all sites will have access to the EM functionality for insight to their local site and to the distributed GS components, infrastructure, and interfaces. As the EM functionality receives status and other information provided by the distributed GS functions, operators will be able to monitor, trend, and perform other supervisory activities. While direct control of various systems will be implemented within the individual elements, the EM function provides operators with necessary insight to manage the end-to-end GS.		
GSFPS-1308			***5.2 General Enterprise Management***		
GSFPS-2451	GS Ktr	Base	The GS **shall** collect a heartbeat status for all components (hardware and software) in the GS.	Heartbeat status provides timely (i.e., within several seconds) information about the up/down status of each component, which is a core part of EM awareness of the GS status and aids in fault detection.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2452	GS Ktr	Base	The GS **shall** provide complete reports of data associated with all detected anomalies for all GS components (hardware and software). *(CCR01536)*	Requires GS EM to assemble data/info related to any anomaly that involves any component, and make that information available as a report to operators. 'Complete' report includes any data necessary to describe the anomaly, i.e., anomaly-dependent. Associated "data" means whatever data/info necessary to describe the anomaly, minimum of component ID, time-stamp, and statement of status. This is assumed to be an automatic report. Capability should be configurable so can customize when/how get reports.	This is an automatic report.
GSFPS-1310	GS Ktr	Base	The GS EM functions **shall** be interoperable with GOES-R elements located at facilities hosting GS functions.	Interoperability means the functions work together and can exchange/use information. EM functions must be interoperable with all other parts of the GS, regardless of site, to provide operators with visibility across GS and capability to supervise GS functions.	
GSFPS-1312	GS Ktr	Base	The GS **shall** provide EM functions to GS operators located at any facility hosting GS functions.	Operator access and privileges are independent of GS site, and only constrained by their access privileges and system status. EM functions should be available at all GS sites so that operators, upon successful login, can perform full range of authorized actions regardless of site from which they log in.	
GSFPS-1314	GS Ktr	Base	The GS **shall** permit operators at each facility hosting GS functions to access EM functions for GS elements at that facility, independent of the connectivity status of the other facilities hosting GS functions.	While EM must have broad, multi-site capability and visibility, it should not be designed with site-to-site dependencies. This requirement ensures that within a single GS site, operators will be able to use full EM functions for the subsystems at that site.	
GSFPS-2627	GS Ktr	Base	The GS **shall** capture event messages of EM events.	This requires that EM retain a full record of events related to monitored components (including EM software & hardware). There is a dependency on the criteria used to define events.	
GSFPS-2628	GS Ktr	Base	The GS **shall** store event messages of all GS and satellite events for the life of the mission.	This requires that all event messages that are reported to the EM, regarding both ground and flight system events, are archived for the life of the mission in order to support trending, anomaly investigations, and other retrospective analyses. Quantity depends on the criteria used to define events.	
GSFPS-3106	GS Ktr	Base	The GS **shall** provide the capability for immediate element operator access to an operator-configurable subset of element-level event messages for a period of 90 days. *(CCR01655)*	Allows for a different solution for 90-day storage that does not require access to the lifetime storage. "Immediate" to be consistent with GSFPS-1350 and other 'online' access performance requirements. Element operators have visibility and control over their respective element's reporting to EM.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2629	GS Ktr	Base	The GS **shall** selectively filter EM event messages for forwarding to EM based on operator definition.	This provides operator control of the event filtering function, so that filtering is configurable and operator (with appropriate privileges) can specify which subset of events are used for higher-level activities. "Forwarding to EM" can be interpreted as one EM function providing that information to other EM functions (e.g., display, storage).	
GSFPS-2630	GS Ktr	Base	The GS **shall** forward filtered event messages of EM events to the EM.	This provides limits on the impact of 'event' definitions, such that a large set of EM-internal events that can be defined, monitored, and used at a low level internally, but filters would specify the subset of events to be used for higher-level EM functions (e.g., operator display, archive). "Forwarding to EM" can be interpreted as one EM function providing that information to other EM functions (e.g., display, storage).	
GSFPS-1360	GS Ktr	Base	The GS **shall** permit an operator to manually override any EM automated control process or operational constraint.	This permission is provided through operator privileges. Operator override of processes and constraints/rules is necessary for infrequent situations (which may include maintenance, subsystem failures, and non-nominal configurations), when it has been determined that those controls or constraints will adversely impact the situation.	
GSFPS-1316			***5.2.1 Enterprise Management Data Management***		
GSFPS-1318	GS Ktr	Base	The GS **shall** display EM data to GS operators located at any facility hosting GS functions.	Operator access and privileges should be independent of GS site, and only constrained by their access privileges and system status. EM data and information should be available at all GS sites so that operators, upon successful login, can view and manage data regardless of site from which they log in.	
GSFPS-1320	GS Ktr	Base	The GS **shall** provide for an operator retrieval of stored and online EM data.	Allows operator to access, based on privileges, the EM data and information that is in both local ("online") storage and in long-term archive storage. Retrieval means getting that content from wherever it is and providing it to the requesting operator's location (workstation), and the intent is that it be provided in a usable form.	
GSFPS-1324	GS Ktr	Base	The GS **shall** export at operator request, selected EM data, EM logs, and software on removable physical media.	Allows operator, based on privileges, to send a copy of EM data, information, and software from wherever it is (whether long-term archive, local memory, or screen display) to any of the available physical media types. The intent is also that it be exported in a form that permits its appropriate use elsewhere (e.g., software can be reloaded and used, display printouts are human-readable).	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1326	GS Ktr	Base	The GS shall retrieve, display, export, store for the life of the mission, and print operator-selected EM logs, EM reports, and EM data associated with all GS and satellite events.	Regarding 'events', this specifies the capability for the operator to identify EM contents (logs, reports, data) to be retrieved, displayed, exported, and/or printed. This augments GSFPS-1320 and GSFPS-1324. This does not overlap GSFPS-2628 regarding long-term storage of event messages, but rather enhances through additional operator-specified storage of EM reports, logs, and data associated with an event.	
GSFPS-1336	GS Ktr, GAS *(CCR-01430)*	Base	The GS **shall** monitor and display the GOES-R Access Subsystem interface status. *(CCR01513)*	Ensures that EM will provide the capability to monitor and display status of the GOES-R Access Subsystem interface.	
GSFPS-1338	GS Ktr	Base	The GS **shall** display any EM-generated report via the operator HMI.	Ensures that any report generated by the EM functions will be viewable by an authorized operator on the workstation to which they are logged in, and the contents should be formatted to be understandable by the operator.	
GSFPS-1340	GS Ktr	Base	The GS **shall** generate reports of operator-selected EM data for an operator-selected time-span.	The operator must be able to define reports (collections of data and information) that include desired contents. The content characteristics that the operator should be able to choose include, at a minimum, data type and time. The resulting report should include all EM contents that fit the criteria.	
GSFPS-3107	GS Ktr	Base	The GS **shall** have the capability to retrieve, display, trend, export (reports), store for the life of the mission, and print (reports) of performance measurements.	Regarding 'performance measurements' (which are to be defined), this is needed so that such information can be used by operators in a variety of ways, both within the GS (retrieve, display, trend, store) and external (export and print reports). Long-term storage requirement permits trending and later analysis of all such measurements.	
GSFPS-2731	All *(CCR-01430)*	Base	The GS **shall** require operator action to recover from manual interventions.	This is associated with GSFPS-1360, such that any operator intervention of an automated process, configuration, or rule can only be ended by an additional operator action. This prevents any subsequent system process (e.g., a time-driven executable) from altering the state that the operator intervention established.	
GSFPS-1342			***5.2.2 Enterprise Management Performance***		
GSFPS-1348	All *(CCR-01430)*	Base	The GS **shall** provide operator notification of any monitored non-nominal condition within three seconds (3-seconds) of detection of the condition.	This is considered a reasonable maximum for the system to notify the operator, and does not include the time required to detect the non-nominal condition. Notification is assumed to provide useful information to operator interface(s).	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1350	GS Ktr	Base	The GS **shall** retrieve and display within 10 seconds operator selected EM data and logs created within the last 90 days.	This is considered a reasonable maximum for the system to find, retrieve, and display the EM items that are requested. It assumes that this recent (90day) data is available within the GS and not on external media. It does not bound the quantity of data/information that can be requested.	
GSFPS-1352			***5.3 Enterprise Supervision***		
GSFPS-1358	GS Ktr	Base	The GS **shall** concurrently supervise the GS functions located at all facilities hosting GS functions.	This provides operator with current status information for all of distributed GS and requires that GS be supervised as a whole system rather than site-by-site.	
GSFPS-1364	GS Ktr	Base	The GS **shall** validate operator ground directive requests against allowable configurations.	This protects the GS against directives that would change needed configurations or adversely impact GS operations by checking any requests against a set of allowable configurations. This does not preclude operator override, but would be first step in determining the need for additional operator action.	
GSFPS-1366	All *(CCR-01430)*	Base	The GS **shall** permit an operator to configure GS network functions.	This provides operators with configuration control over network functions within the boundaries of the GS, within the constraints of allowable configurations and operator privileges, which is part of overall GS operations.	
GSFPS-1370	All *(CCR-01430)*	Base	The GS **shall** permit an operator to change selected configurations for supervised hardware or software.	This provides operators with configuration control over components of the GS, within the constraints of allowable configurations and operator privileges, which is part of overall GS operations.	
GSFPS-1372	GS Ktr	Base	The GS **shall** permit an operator to change selected EM configuration and control parameters.	This is similar to GSFPS-1370 and provides operators with configuration control over EM components within the GS, given the constraints of allowable configurations and operator privileges, which is part of overall EM operations. This includes delineating supervised components and degree of supervision and reporting.	
GSFPS-1376	All *(CCR-01430)*	Base	The GS **shall** maintain established access privileges for different categories of GS operators and users.	This requires role-based access control, rather than an individual person's identity. For example, certain operator category(ies) may be given rights to perform network or security functions, or to have command authority. 'Maintain' means the capability to administer the privileges (and all related actions).	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1378	All *(CCR-01430)*	Base	The GS **shall** supervise access by operators at any GOES-R site.	This means that the GS must monitor and support operator access, at all GOES-R sites. Use of "GOES-R site" means this applies beyond three GS sites to include GS access from contractor facility, spacecraft site, and authorized remote access (i.e., any place to which access is extended). Use of "supervise" means that there is no assumption that EM will include the security control of access, though that is not excluded.	
GSFPS-1382	GS Ktr	Base	The GS **shall** monitor and display GS resource operational status and performance, including; resource utilization (processing, storage, network and communications status), processing throughput, equipment configuration and availability, data accounting, data processing status, and product status, to support operations, trending, and performance analyses. *(CCR01286)*	Monitoring of lowest-level GS resources (hardware, software, networks, etc.), refreshed at reasonable intervals, is necessary to provide EM functions and operators with timely information about status and performance. This data and information can then enable EM conditional operations and anomaly responses, be logged and stored, be analyzed and trended, and provide content for operator displays.	
GSFPS-1384	GS Ktr	Base	The GS **shall** monitor and display the status and performance of processes, including the satellite communications links, MM, EM, PG, PD, antenna subsystems, and external interfaces.	Monitoring of lowest-level GS processes and interfaces, refreshed at reasonable intervals, is necessary to provide EM functions and operators with information about GS status and performance. This data and information can then enable EM conditional operations and anomaly responses, be logged and stored, be analyzed and trended, and provide content for operator displays.	
GSFPS-1388	GS Ktr	Base	The GS **shall** provide for correlation of failures to identify and process events such as cascading failures.	This correlation is required to assist operators in responding to anomalies and failures more quickly and correctly. The intent is to use EM's broad knowledge of GS components, configurations, and component relationships to rapidly identify and provide information regarding potential relationships between individual anomalies.	
GSFPS-1390	GS Ktr	Base	The GS **shall** monitor applications communications status between components of the GS, both between facilities and within each facility.	This requires the monitoring functionality to track status (function and performance) at the applications communications layer, down to the component level within the whole GS. This supports analysis, trending, and anomaly resolution.	
GSFPS-1392	GS Ktr	Base	The GS **shall** monitor network communications status between components of the GS, both between facilities and within each facility.	This requires the monitoring functionality to track status (function and performance) at the network communications layer, down to the component level connections across the whole GS. This supports analysis, trending, and anomaly resolution.	
GSFPS-1394	GS Ktr	Base	The GS **shall** capture and store CPU resource usage performance measurements for 90 days.	While this information is monitored, the capture and short-term storage of this information is needed to support trending, performance analysis, and anomaly resolution.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1396	GS Ktr	Base	The GS **shall** capture and store CPU loading performance measurements for 90 days.	While this information is monitored, the capture and short-term storage of this information is needed to support trending, performance analysis, and anomaly resolution.	
GSFPS-1398	GS Ktr	Base	The GS **shall** capture and store memory usage performance measurements for 90 days.	While this information is monitored, the capture and short-term storage of this information is needed to support trending, performance analysis, and anomaly resolution.	
GSFPS-1400	GS Ktr	Base	The GS **shall** capture and store disk access performance measurements (read and write) on a process basis for 90 days.	While this information is monitored, the capture and short-term storage of this information is needed to support trending, performance analysis, and anomaly resolution.	
GSFPS-1404	GS Ktr	Base	The GS **shall** capture and store network usage performance measurements on a physical link basis for 90 days.	While this information is monitored, the capture and short-term storage of this information is needed to support trending, performance analysis, and anomaly resolution.	
GSFPS-1406	GS Ktr	Base	The GS **shall** capture and store disk usage performance measurements on a hardware LRU basis for 90 days.	While this information is monitored, the capture and short-term storage of this information is needed to support trending, performance analysis, and anomaly resolution.	
GSFPS-1420	GS Ktr	Base	The GS **shall** collect and store reliability events for satellite and GS LRUs for the life of the mission.	Reliability events must be identified and stored long-term in order to calculate RMA requirement compliance, perform trending, and plan for logistics.	
GSFPS-1422	GS Ktr	Base	The GS **shall** collect and store reliability events by hardware LRU for the life of the mission.	A subset of GSFPS-1420. Reliability events must be identified and stored long-term in order to calculate RMA requirement compliance, perform trending, and plan for logistics.	
GSFPS-2950	GS Ktr	Base	The GS **shall** collect and store reliability events by software configuration item (CI) and version identifier for the life of the mission.	Reliability events must be identified and stored long-term in order to calculate RMA requirement compliance, perform trending, and plan for patching.	
GSFPS-1424	GS Ktr	Base	The GS **shall** record planned outages for maintenance and upgrades as events.	This ensures that a record of scheduled outages are stored for the life of the mission and can be factored into RMA calculations and trend analyses.	
GSFPS-1426	GS Ktr	Base	The GS **shall** collect and store reliability event duration for each reliability event for the life of the mission.	Reliability event durations must be identified and stored long-term in order to calculate MaxTTRS requirement compliance, perform trending, and plan for logistics.	
GSFPS-1428	GS Ktr	Base	The GS **shall** differentiate anomalies by severity level.	This provides an indication to the operators, and is recorded in logs and event messages, about the level of the GS problem and its potential impact. EM anomaly severities are determined when EM is configured (and do not mean the CMART-defined severity levels) and are adjustable by an operator in accordance with GSFPS-1366, GSFPS-1370, GSFPS-1372.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1430	GS Ktr	Base	The GS **shall** capture and store logs of network events, configuration changes, and status information for the life of the mission.	This information is specific to Networks. It must be put in long-term archive because it provides situational information and is necessary to interpret other GS status and event information. The information is also used for trending, anomaly resolution, and other analyses.	
GSFPS-1432	GS Ktr	Base	The GS **shall** capture and store logs of events, configuration changes, and status information for the life of the mission.	This applies to whole GS. The information must be put in long-term archive because it provides situational information and is necessary to interpret other GS status and event information. The information is also used for trending, anomaly resolution, and other analyses.	
GSFPS-1438	All *(CCR-01430)*	Base	The GS **shall** report GS performance against the latency and refresh criteria established in Appendix A, B, C, D, and E of the GS-F&PS.	This reporting is necessary for determination of compliance with product requirements contained in these appendices. This implies that the system is able to determine its own level of performance against each refresh or latency criterion.	
GSFPS-1440	GS Ktr	Base	The GS **shall** provide the capability to perform short- and long-term trend analysis of system, network, and communications performance.	Trend analysis must be a system capability because the data to be analyzed are internal to the GS (and for security purposes may have to remain there) and because it is likely that the GS operators will be the ones performing the analyses as part of their work. Variable-duration trends are required to identify variations and patterns that occur over different spans of time.	
GSFPS-1442	GS Ktr	Base	The GS **shall** provide the capability to perform analysis of the resource impact of system, network, and communications modifications, enhancements, and reallocations.	Resource impact analysis is necessary in order to plan ("what-if") and schedule ground activities to have minimal disruption to operations, resources, and personnel.	
GSFPS-1450	GS Ktr	Base	The GS **shall** page designated personnel of non-nominal conditions and alerts (e.g., satellite, instrument, and GS conditions, alerts, and alarms) based on operator defined recipients.	Established GOES processes use an existing paging service in order to alert and inform operators of situations when they are away from their workstations. The GS must be able to use that paging service and provide appropriate information to operator-defined pager numbers.	Paging service will be provided GFP.
GSFPS-1454	GS Ktr	Base	The GS **shall** annotate and display notification messages with time and date of generation.	Date and time stamps are necessary for the notification messages to be correlated to other events, retrieved from storage, and understood by operators.	
GSFPS-1456	GS Ktr	Base	The GS **shall** store notification messages in a way that enables retrieval by operator-selectable attributes, including type, time, text string, and anomalous component identification. *(CCR01660)*	Notification messages will contain important information and the GS will generate many of these according to defined criteria, so there must be a way for operators to search and find messages that are related or relevant according to the specified characteristics.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1458	GS Ktr	Base	The GS **shall** maintain visual notifications until the non-nominal condition is cleared.	Because some message and event logs usually only show the most recent messages (older information quickly scrolls off the screen), notifications for alarms and other non-nominal conditions must be displayed in a different way that gives the operator time to see and respond and persists until the need for operator action is gone.	
GSFPS-3108	GS Ktr	Base	The GS **shall** store notification messages for a period of 90 days.	Short-term storage is needed to permit time for any analysis of the messages or other use. Reports or information related to anomalies still has the option of being designated for long-term archive.	
GSFPS-1462	GS Ktr	Base	The GS **shall** capture and store fault isolation information at the GS system and subsystem level, for both hardware and software CIs, for a period of 90 days.	Short-term storage is needed to permit time for any analysis of the information. Information related to anomalies still has the option of being designated for long-term archive.	
GSFPS-1464	GS Ktr	Base	The GS **shall** autonomously evaluate all supervised elements to identify anomalous conditions.	The intent is to reduce the low-level supervision responsibilities of the operators and instead have the GS apply its knowledge of nominal conditions and the information gathered from broad EM monitoring to identify faults, failures, and other anomalies. These would then be communicated to operators through messages, alerts, alarms, and other methods.	
GSFPS-1466	GS Ktr	Base	The GS **shall** autonomously initiate diagnostics to aid in isolating internal faults, using safeguards to prevent diagnostic operations from affecting other operations.	The intent is to reduce the low-level diagnostic responsibilities of the operators and instead have the GS apply its knowledge of configurations to the information gathered from EM monitoring to identify the sources of faults, failures, and other anomalies. Such diagnostics must not adversely affect nominal operations or availability.	
GSFPS-1468	GS Ktr	Base	The GS **shall** send fault recovery directives to GS systems and subsystems.	The intent is for the GS to be able to correct a number of detected faults and failures through predefined, approved directives (e.g., reboot a server), thus reducing the operator workload by automating some recovery procedures.	
GSFPS-1470	GS Ktr	Base	The GS **shall** provide information to isolate faults between GS systems and external interfaces.	The intent is for the GS to contribute to fault identification when it occurs at external interfaces and to reduce the low-level diagnostic responsibilities of the GS operators. The GS must apply its knowledge of interface conditions, to the extent of the information gathered, to help identify faults, failures, and other anomalies.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2824	GS Ktr	Base	The GS **shall** supervise integration and test environment functions.	The intent is for EM functions to monitor and report on the status and performance of GS functions (both Hardware & Software) as implemented within this environment, to enable not only operator management of that environment but also support of testing and anomaly resolution efforts.	
GSFPS-2845	GS Ktr	Base	The GS **shall** supervise development environment functions.	The intent is for EM functions to monitor and report on the status and performance of GS functions (both Hardware and Software) as implemented within this environment, to enable not only operator management of the environment but also support of development, testing, and anomaly resolution efforts.	
GSFPS-3209	GS Ktr	Base	The GS **shall** include the capability for automated workflow management, automated hardware and software discovery, automated service model maintenance, and automated root cause analysis. *(CCR01506)*		
GSFPS-3213	GS Ktr	Base	The GS configuration management system **shall** include the capability for configurable automated trouble ticket initiation, configurable automated failure recovery, and configurable automated operator/group notification. *(CCR01506)*		
GSFPS-1471			***5.4 Common Support Services***		
GSFPS-1489	GAS *(CCR-01430)*		The GAS **shall** make user account information accessible to GS operations personnel for queries and EM report generation. *(CCR01513)*	Allows operators to have access to authorized user information as part of user services, anomaly resolution, help desk services, and security. The information must be searchable in order to identify the desired accounts and information, and must be able to be output as reports for review within the GS or use outside the GS.	
GSFPS-1495			***5.5 Ground Segment Infrastructure***		
GSFPS-1496			***5.5.1 External Interface Supervision***		
GSFPS-1498	GS Ktr	Base	The GS **shall** supervise GS interfaces to external elements, up to the GOES-R demarcation as defined in the GS IRDs.	Extends EM supervision to the full extent of the GS, including all aspects of its external interfaces (e.g., router, server, distribution process, etc.). Demarcation points are defined in IRDs and the GS F&PS.	
GSFPS-1500	GS Ktr	Base	The GS **shall** supervise applications communications status between external elements and the GS.	Allows the GS to monitor and report the status of the GS external interfaces at the application layer, to the extent that such status is known from the GS side of the interface.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1502	GS Ktr	Base	The GS **shall** supervise network communications status between external elements and the GS.	Allows the GS to monitor and report the status of the GS external interfaces at the network layer, to the extent that such status is known from the GS side of the interface.	
GSFPS-1503			***5.5.2 Ground Segment Security Monitoring***		
GSFPS-1505	GS Ktr	Base	The GS **shall** manage operational networks consistent with all security and access control requirements.	Ensures that the GS will apply and enforce up-to-date security and control access constraints to all networks used for GS operations. Intent is to apply to all GS networks and environments.	
GSFPS-1509	GS Ktr	Base	The GS **shall** alert operations personnel of security incidents.	Ensures that the GS will support NOAA rules on the reporting of security incidents by identifying incidents and alerting operators about the incidents (as well as other functions required by security guidelines).	
GSFPS-1511	GS Ktr	Base	The GS **shall** correlate data from GS specific host-based and network-based intrusion prevention and detection system and firewalls.	Allows the GS to establish relations between data from various sources, which will help with security incident prevention, detection, and investigation.	
GSFPS-1514			**6 MISSION MANAGEMENT REQUIREMENTS**		
GSFPS-1516			***6.1 Overview***		
GSFPS-1518			Section 6 specifies the Mission Management (MM) function of the GOES-R GS. MM comprises the hardware, software, and mission operations support functions required to safely and reliably control and communicate with the satellite, monitor satellite systems performance, and capture all raw instrument data necessary for production of mission data.		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1520			***6.2 Operational View***		
GSFPS-1522			MM encompasses all operational functions of the spacecraft and instruments as follows: a) Mission operations to include: console operations, offline engineering and trending, bus and instrument engineering telemetry and performance monitoring, anomaly detection and resolution, procedure development, spacecraft resource accounting, special operation. b) Spacecraft telemetry data storage for the life of the mission and remote access to telemetry. c) Mission planning and scheduling. d) Spacecraft navigation (orbit and attitude determination and maneuver planning). e) Space-Ground communications. f) Antennas. g) Uplink services and monitoring. h) Downlink services and monitoring. i) Raw instrument data pre-processing and temporary storage. j) Level 0 (L0) processing. k) Image Navigation and Registration (INR) operations. l) Routine instrument calibration and L1b product monitoring. m) Flight Software (FSW) management. n) Flight operations simulation.		
GSFPS-1548			***6.3 General Mission Management***		
GSFPS-1550	GS Ktr	Base	The GS **shall** manage the GOES-R Satellite Series throughout the life of the mission.	Ensures the capabilities to operate the GOES-R satellites, and to produce and deliver products are available throughout the life of the mission. Also ensures the GS is designed for longevity.	
GSFPS-2454	GS Ktr	Base	The GS **shall** maintain the Satellite Telemetry and Command Databases for the life of the mission. *(CCR01660)*	Ensures the GS maintains the capability to generate, issue, and store commands, and receive and analyze telemetry through the use of a database for the life of the mission.	
GSFPS-1552	GS Ktr	Base	The GS **shall** perform satellite instrument calibration.	Ensures the GS is able to determine and apply calibration parameters in order to meet requirements.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1554	GS Ktr	Base	The GS **shall** perform mission planning and scheduling.	Ensures the Ground Segment is able to plan all tasks needed for flight operations, including routine and special operations. The planning process will be used to generate a de-conflicted schedule of activities (includes routine and short-term scheduling changes) for execution.	
GSFPS-2455	GS Ktr	Base	The GS **shall** collect performance measurements on MM including telemetry (TLM) limits, event messages, command (CMD) configurations, RF/IF signal quality, continuity and status.	Collects the status information on MM that can be reported to EM and used in MM.	
GSFPS-2456	GS Ktr	Base	The GS **shall** report on MM performance measurements.	Ensures the GS is capable of providing the MM state information in a format usable to operators and EM.	
GSFPS-2631	GS Ktr	Base	The GS **shall** accommodate a minimum of 100 concurrent MM operator sessions, each capable of performing real-time commanding and telemetry monitoring, spacecraft operations, scheduling, and off-line telemetry analysis functions.	Ensures the Ground Segment has the capacity (with both connectivity and interactive response performance) to allow a large number of operators to perform their functions at the same time.	
GSFPS-2632	GS Ktr	Base	The GS MM software **shall** be capable of supporting a minimum of four separate GOES-R Series satellites.	Ensure the Mission Management portion of the GS has the capacity (with connectivity, throughput, storage, etc.) to manage at least four GOES-R series satellites, consistent with Flight Project options for -T and -U.	
GSFPS-2633	GS Ktr	Base	The GS **shall** provide a configuration monitoring function to monitor the status and send configuration directives to all MM components and subsystems.	Ensures the GS is capable of allowing operators or an automated capability to use the Mission Management state (state collection is requirement GSFPS-2455), determine if the state requires change or adjustment (monitoring), and issue directives to modify the Mission Management state.	
GSFPS-3026	GS Ktr	Base	The GS **shall** display a new page, complete with data within 3 seconds of its selection by the operator.	Ensures the human-machine interface (HMI) is responsive to an operator-initiated information request.	
GSFPS-3027	GS Ktr	Base	The GS **shall** perform reassignment of a workstation configuration from one spacecraft to another within 30 seconds of an operator directive.	Ensures an operator is able to quickly change the workstation configuration and support another satellite without having to switch to another workstation.	
GSFPS-3028	GS Ktr	Base	The GS **shall** provide continuity of Mission Management workstation displays and processing before/after an operator log-off/log-on for the purpose of gap free change of operators.	Will preserve workstation function during operator transition (login/log-off).	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1558	GS Ktr	Base	The GS **shall** display MM data on an operator-selectable periodic basis.	Allows an operator to select the amount of time between displaying specific information allowing them to customize how they receive and monitor data, reducing the complexity and volume of information competing for attention and processing by the operator. For example, frequency of status messages or refresh rate of telemetry value.	
GSFPS-1560	GS Ktr *(CCR-01430, 01511)*	Base	The GS **shall** capture logs of all operator inputs.	Ensures the GS will retain all information about operator actions for future analysis (e.g., reconstruct sequence of events).	
GSFPS-2458	GS Ktr	Base	The GS **shall** store and have the capability to retrieve, display, and generate and export reports of all operator inputs for 90 days.	Provides access to stored information about operator actions for future analysis (e.g., reconstruct sequence of events).	
GSFPS-3087	GS Ktr	Base	The GS **shall** provide the capability for operators to access the GS Satellite Telemetry and Command Databases from all GS locations.	Consistent with operations concept for operators to perform satellite operations from any GS site.	
GSFPS-3088	GS Ktr	Base	The GS **shall** manage the configuration of the contents of the Satellite Telemetry and Command Databases.	Allows operators to maintain (e.g., read, write, update, delete) telemetry and command information from the respective databases, consistent with access privileges.	
GSFPS-3089	GS Ktr	Base	The GS **shall** provide an XTCE-compliant ingest/export function/interface for the Satellite Telemetry and Command Databases.	Defines an interface standard for the telemetry and command databases, so they may be used by the Ground Segment and efficiently shared.	
GSFPS-3090	GS Ktr	Base	The GS **shall** provide a validation function for the Satellite Telemetry and Command Databases.	Provides the capability to ensure that satellite telemetry and command databases are correct.	
GSFPS-3091	GS Ktr	Base	The GS **shall** perform line-by-line syntax checking and display of all commands and ground directives.	Ensures all commands and ground directives input by operator are correctly formatted prior to execution, by checking automatically (syntax checking) and by operator review (displaying).	
GSFPS-3095	GS Ktr	Base	The GS **shall** configuration control all mission products (e.g., schedules, spacecraft commands, command loads, and flight software) stored and created within the GS.	Ensures that no "unauthorized" changes can occur to Mission Management products and that changes only occur after a rigorous review and approval process, so all systems are in a known state and all operations can be conducted without uncertainty.	
GSFPS-3096	GS Ktr	Base	The GS **shall** import, process, and store command procedures developed externally using the GS scripting language logic statements and command blocks derived from the Satellite Telemetry and Command Database.	Ensures the Ground Segment is able to import and use command procedures, which are organized, predefined sequences of commands and telemetry checks/verifications for execution of specific flight system functions.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3138	GS Ktr	Base	The GS **shall** manage the GOES-R Mission Operations Database (MODB).	Provides for operator maintenance of the database and its contents.	
GSFPS-3139	GS Ktr	Base	The GS **shall** provide the capability for operators to access the GOES-R MODB from all GS locations.	Necessary for operator maintenance of the database and its contents.	
GSFPS-3157	GS Ktr	Base	The GS MODB **shall** be capable of being shared by all parties (operations and satellite/instrument teams) to maintain all satellite mission operations products.	Ensures all operations and satellite/instrument teams have access to the identical database.	
GSFPS-3140	GS Ktr	Base	The GS **shall** provide a validation function for the GOES-R MODB.	Ensures the Ground Segment has the capability to validate (to support or establish the certainty of) that the MODB database is correct.	
GSFPS-3141	GS Ktr	Base	The GS **shall** provide an XTCE-compliant ingest/export function/interface for the GOES-R MODB.	Defines a common way to import/export objects between the Telemetry & Command Database and the larger MODB.	
GSFPS-3142	GS Ktr	Base	The MODB **shall** be delivered as a delimited ASCII file.	Defines an content format standard for the MODB database, so it may be used by the Ground Segment and efficiently shared. ASCII format also allows the database to be viewed by other programs (i.e., text editors, spreadsheets, etc.).	
GSFPS-3158	GS Ktr	Base	The GS MODB **shall** conform to the GOES-R Flight Project Telemetry and Command Database Style Guidelines for command and telemetry mnemonic designations contained in the MODB.	Ensures the MODB database is consistent with the command and telemetry mnemonic guidelines from spacecraft vendor.	
GSFPS-3143	GS Ktr	Base	The MODB delivery **shall** include either a database schema defining tables and entries or an XML schema and tag definitions, as appropriate.	Ensures the MODB database structure and relationships between the data items is documented and can be understood. This will allow for changes later in the database based off of its currents structure with less errors and misunderstandings.	
GSFPS-3208	GS Ktr	Base	The GS **shall** be capable of operator-selectable automation of routine MM functions. *(CCR01506)*		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3159			The GS MODB will contain mission operations data items which may include: Commands, Telemetry, Packets, Conversions, Command APID Description, Database Version Name, Subsystem List, Real-Time Procedures, Instrument Tables, Instrument Symbols Of Interest, Instrument Action Codes, Instrument Onboard Scripts, Equations, Ground Data Points, Displays, Workspaces, Display Templates, Auto-Generated Displays, User, Workstation Permissions, Group Permissions, Spacecraft Onboard Processor Definitions, Spacecraft Memory Load Templates, EGSE Commands, EGSE Telemetry, EGSE Conversions, EGSE Auto-Gen Displays, EGSE Display Header Template, EGSE Test Sets, EGSE Subsystem List, Area Phase List.		
GSFPS-1562			***6.4 Satellite Engineering Telemetry Monitoring***		
GSFPS-1564	GS Ktr	Base	The GS **shall** monitor and display satellite engineering telemetry data.	Ensures the Ground Segment is capable of processing/evaluating (monitoring) telemetry data and presenting the information to operators. This is to help identify any potential faults or problems with the satellite at the earliest possible moment and bring it to the attention of operators for quick mitigation/correction.	
GSFPS-1566	GS Ktr	Base	The GS **shall** make engineering telemetry available for real time display, analysis, limit checking, and storage for the life of the mission.	Ensure Ground Segment operators are able to identify short- and long-term faults or problems with the satellite at the earliest possible moment, including performance degradation over time for the life of the system.	
GSFPS-1572	GS Ktr	Base	The GS **shall** maintain telemetry limit sets for application to engineering telemetry parameters.	Allows the telemetry values to be evaluated based on predefined ranges of values by maintaining limit sets to be used in the comparison for each telemetry parameter. Helps identify faults and problems with the satellite at the earliest possible moment.	
GSFPS-1574	GS Ktr	Base	The GS **shall** identify all out of limit conditions detected in satellite engineering telemetry.	Requires all telemetry values to be evaluated based on predefined ranges and to have any out-of-limit conditions be marked as such, which helps operators identify all faults and problems.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1576	GS Ktr	Base	The GS **shall** generate event messages to communicate the status of the satellite and elements of the MM.	Ensures that all operators and systems are aware of the current state and changes of state of functions within the Mission Management element. This ensures that operators know the condition of all Mission Management functions and if there are any faults and problems.	
GSFPS-1578	GS Ktr	Base	The GS **shall** display an emulation of the onboard command execution process for absolute time sequence (ATS) and relative time sequence (RTS) command loads.	Allows operators to monitor command sequences on a system that accurately imitates the satellite command execution process to assist in evaluating command sequences prior to execution and for fault isolation and problem solving.	
GSFPS-1580			***6.5 Event Logs***		
GSFPS-2459	GS Ktr	Base	The GS **shall** capture event messages of satellite and mission management events.	Allows operators to evaluate/review all mission management events for testing, fault isolation, and anomaly resolution. Event messages are needed for supervision.	
GSFPS-2460	GS Ktr	Base	The GS **shall** selectively filter MM event messages based on operator designation for forwarding to EM.	Allows the system to implement policies that identify specific status and event information based on selected criteria for forwarding to EM in order to reduce communications and to highlight data sub-sets from a large amount of data.	
GSFPS-2461	GS Ktr	Base	The GS **shall** forward filtered event messages of satellite and mission management events to EM.	Allows the system to implement policies that identify specific status and event information based on selected criteria for forwarding to EM in order to reduce communications and to highlight data sub-sets from a large amount of data.	
GSFPS-1584	GS Ktr	Base	The GS **shall** display satellite originated event messages.	Allows operators to view and evaluate satellite event messages.	
GSFPS-1586	GS Ktr	Base	The GS **shall** generate an event history report on operator request.	Allows operators to create and review event histories to assist in evaluating faults and problems.	
GSFPS-1588	GS Ktr	Base	The GS **shall** selectively filter event messages for display, based on operator input.	Allows operators to select subsets of event messages for evaluation and review to help in fault and problem identification and reduce information overload.	
GSFPS-1590	GS Ktr	Base	The GS **shall** maintain a database of operator-defined event types.	Allows the operator to create and use events based on operator selection in the use of filtering, and evaluating faults and problems.	
GSFPS-1592			***6.6 Remote Access to Mission Management Data***		
GSFPS-1594	GS Ktr	Base	The GS **shall** permit an operator to retrieve and display spacecraft and instrument engineering telemetry through a secure interface from remote locations.	Allows operators to review spacecraft and instrument telemetry health and status when not located at a GS-authorized site, which helps in quickly identifying any faults or problems.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3212	GS Ktr	Base	The GS **shall** provide authorized operators with remote access to telemetry analysis tools identical to those used for MM operations. *(CCR01506)*		
GSFPS-1596	GS Ktr	Base	The GS remote access function **shall** be configurable to provide other operational data that may not necessarily occur in the satellite engineering telemetry stream such as event and status messages and INR performance data.	Extends remote access information to other information types besides engineering telemetry. Allows the type and quantity of information available to remote users to include telemetry data, as well as other message and performance data. This allows an operator to better understand the condition and state of the GOES-R system and to quickly understand faults and problems.	
GSFPS-1598	GS Ktr	Base	The GS remote access function **shall** retrieve historical satellite telemetry from the GS mission-life storage.	Allows a remote operator to review and evaluate the historical status and condition of the GOES-R satellite for comparison with correct status and to quickly understand trends that could lead to faults and problems.	
GSFPS-1600	GS Ktr	Base	The GS remote access function **shall** retrieve and display satellite telemetry as received by the MM element with no more than 5 second latency.	Allows remote operators to review spacecraft and telemetry health and status with minimal delay when not located at the major facilities, which helps in quickly identifying any faults or problems.	
GSFPS-1602	GS Ktr	Base	The GS **shall** forward engineering telemetry to a secure operator access point for purposes of remote access.	Allows remote operators to review spacecraft and telemetry health and status when not located at the major facilities, which helps in quickly identifying any faults or problems.	
GSFPS-2768	GS Ktr	Base	The GS **shall** use secure one-way links for spacecraft telemetry and command systems when connecting to public networks or to networks which have connections to public networks.	Ensures communications with remote operators is secure, reducing the threat of unauthorized individuals from controlling or viewing the condition of the GOES-R satellites.	
GSFPS-1604			***6.7 Anomaly Response***		
GSFPS-2635	All *(CCR-01430)*	Base	The GS **shall** enable the operator to specify criteria for anomalies.	Allows operators to efficiently identify anomalies and to change the criteria as the satellite capabilities and capacities degrade over the life of the mission. This is a parent requirement for limit set definitions, telemetry monitoring, etc.	
GSFPS-2737	All *(CCR-01430)*	Base	The GS **shall** enable the operator to create contingency procedures.	Allows operators to anticipate and prepare for anomalies prior to their occurrence and helps mitigate faults and problems.	
GSFPS-1606	GS Ktr, GAS *(CCR-01430)*	Base	The GS **shall** manage contingency operations procedures.	Allows operators to anticipate and prepare for anomalies prior to their occurrence and helps mitigate faults and problems.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1608	All *(CCR-01430)*	Base	The GS **shall** execute contingency operations procedures.	Allows operators to execute pre-approved procedures to respond to contingencies and mitigate faults and problems.	
GSFPS-1610	All *(CCR-01430)*	Base	The GS **shall** correlate detected anomalies with an applicable contingency procedure for the operator to activate.	Allows operators to identify the appropriate contingency procedure to reduce and mitigate faults and problems.	
GSFPS-2951	GS Ktr	Base	The GS **shall** store contingency operations procedures for the life of the mission.	Storing contingency procedures allows operators to retrieve any procedures, including previous versions, that have been developed througout the life of the mission.	
GSFPS-1612	GS Ktr	Base	The GS **shall** enable the reporting of anomaly investigation results.	Helps disseminate anomaly information (e.g., associated event logs, data plots), so stakeholders and other space asset managers can make informed decisions regarding anomalies, other potential anomalies, and possibly reduce the impact of future anomalies.	
GSFPS-1614	GS Ktr	Base	The GS **shall** store anomaly investigation results for the life of the mission.	Retains anomaly information (e.g., associated event logs, data plots) for future use, so stakeholders and other space asset managers can make informed decisions regarding anomalies, other potential anomalies, and possibly reduce the impact of future anomalies.	
GSFPS-1616			***6.8 Ground Directives***		
GSFPS-1622	GS Ktr	Base	The GS **shall** execute ground directives.	Allows operators to manage and control the operation of the Ground Segment and to change the Ground Segment state as needed based on conditions, anomalies, and faults.	
GSFPS-1624	GS Ktr	Base	The GS **shall** graphically display ground directive execution.	Allows operators to manage and control the operation of the Ground Segment and to change the Ground Segment state as needed based on conditions, anomalies, and faults.	
GSFPS-1626	GS Ktr	Base	The GS **shall** display ground directives in text.	Allows operators to manage and control the operation of the Ground Segment and to change the Ground Segment state as needed based on conditions, anomalies, and faults.	
GSFPS-1628	GS Ktr	Base	The GS **shall** display ground directives synchronized with satellite commands.	Allows operators to manage and control the operation of the Ground Segment and to change the Ground Segment state as needed based on conditions, anomalies, and faults.	
GSFPS-1630	GS Ktr	Base	The GS **shall** capture and store logs of ground directives and execution for the life of the mission.	Allows operators to select and document the operations of the Ground Segment to support continuity, resolve anomalies and faults, and for historic reference.	
GSFPS-1632	GS Ktr	Base	The GS **shall** include ground directives and responses in the satellite event log as directed by the operator.	Allows operators to select and document the operations of the Ground Segment to support continuity, resolve anomalies and faults, and for historic reference.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3029	GS Ktr	Base	The GS **shall** display to the operator a list of available telemetry paths for each satellite.	Allows operators to quickly identify primary/redundant communications pathways, equipment, and configurations to constantly maintain contact with each GOES-R satellites to ensure their health and safety.	
GSFPS-3030	GS Ktr	Base	The GS **shall** allow operator designation of the telemetry path for the source of telemetry for each satellite configuration.	Allows operators to quickly identify primary/redundant communications pathways, equipment, and configurations to constantly maintain contact with each GOES-R satellites to ensure their health and safety.	
GSFPS-3031	GS Ktr	Base	The GS **shall** display to the operator a list of available command paths to each satellite.	Allows operators to quickly identify primary/redundant communications pathways, equipment, and configurations to constantly maintain contact with each GOES-R satellites to ensure their health and safety.	
GSFPS-3032	GS Ktr	Base	The GS **shall** allow operator designation of the command path for each satellite configuration.	Allows operators to quickly identify primary/redundant communications pathways, equipment, and configurations to constantly maintain contact with each GOES-R satellites to ensure their health and safety.	
GSFPS-1634			***6.9 Engineering Telemetry***		
GSFPS-1636	GS Ktr	Base	The GS **shall** receive engineering telemetry at the MM operations console within 0.5 seconds of ground receipt.	Allows operators to review spacecraft telemetry health and status with minimal delay, which helps in quickly identifying any faults or problems.	
GSFPS-1638	GS Ktr	Base	The GS **shall** capture and store all logs generated by the processing of telemetry data for the life of the mission.	Ensures the Ground Segment collects and stores telemetry processing logs for future analysis (e.g., reconstruct state and command sequences for fault analysis) and historical reference.	
GSFPS-1640	GS Ktr	Base	The GS **shall** capture all out of limit telemetry conditions.	Ensures the Ground Segment collects out-of-limit telemetry conditions for analysis (e.g., reconstruct state and command sequences for fault analysis) and historical reference.	
GSFPS-2465	GS Ktr	Base	The GS **shall** store logs of all out of limit telemetry conditions for the life of the mission.	Ensures the Ground Segment stores out-of-limit telemetry conditions for analysis (e.g., reconstruct state and command sequences for fault analysis) and historical reference for the life of the mission.	
GSFPS-2466	GS Ktr	Base	The GS **shall** have the capability to retrieve, display, export, store for the life of the mission, and print operator-selected spacecraft and instrument engineering telemetry, telemetry reports, and telemetry logs upon request of the operator.	Ensures all telemetry information can be managed and displayed to assist in efficiently and safely maintaining the GOES-R system health.	
GSFPS-1771	GS Ktr	Base	The GS **shall** process engineering telemetry as received (including normal mode and dwell mode telemetry).	Ensures the Ground Segment receives and processes satellite telemetry without delay and in the format in which the satellite produces the telemetry to ensure the health and safety of GOES-R satellites.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2640	GS Ktr	Base	The GS **shall** have the capability to retrieve an echo of the full 4/32 kbps engineering data telemetry stream from the instrument raw data stream.	Ensures the Ground Segment has an alternate method of receiving critical satellite telemetry to ensure the health and safety of GOES-R satellites. The satellite may be capable of reproducing its entire telemetry in the raw data stream, and the GS must be capable of retrieving the data from that source as well.	
GSFPS-2641	GS Ktr	Base	The GS **shall** forward engineering telemetry parameters retrieved from the instrument raw data stream to the normal MM telemetry process for display, retrieval, and storage for the life of the mission.	Ensures the Ground Segment has an alternate method of receiving critical satellite telemetry and processes the data in a manner familiar with operators to ensure the health and safety of GOES-R satellites. The satellite may be capable of reproducing its entire telemetry in the raw data stream, and the GS must be capable of retrieving the data from that source as well.	
GSFPS-1568	GS Ktr	Base	The GS **shall** convert all satellite engineering telemetry data to engineering units.	Ensures the Ground Segment transforms all engineering telemetry data into units that are meaningful and interpretable by operators to ensure the health and safety of GOES-R satellites.	
GSFPS-1652	GS Ktr	Base	The GS **shall** permit operator-selectable display of stored satellite engineering telemetry data in engineering units or raw counts.	Ensures the Ground Segment displays all satellite telemetry data in raw format and units that are meaningful and interpretable by operators to ensure the health and safety of GOES-R satellites and assist in anomaly and fault resolution for Ground Segment and satellite problems.	
GSFPS-1644			***6.10 Engineering Analysis***		
GSFPS-1646	GS Ktr	Base	The GS **shall** report spacecraft and instrument performance and trends based on collected engineering telemetry.	Ensures the Ground Segment provides all satellite performance information and trends (especially degradation) to operators to ensure the health and safety of GOES-R satellites and assist in satellite anomaly and fault resolution.	
GSFPS-1648	GS Ktr	Base	The GS **shall** generate spacecraft and instrument performance trend analyses using real-time and stored telemetry.	Ensures the Ground Segment creates all satellite performance information and trends (especially degradation) to present to operators to ensure the health and safety of GOES-R satellites and assist in satellite anomaly and fault resolution.	
GSFPS-1656	GS Ktr	Base	The GS **shall** have the ability to export data in a non-proprietary file format.	Ensures all data can be exported in a format that allows easy manipulation and imported by other programs, not tying the data or format to a particular product or vendor's family of products.	
GSFPS-3033	GS Ktr	Base	The GS **shall** trend satellite life-limited resources (e.g., component ontime, battery charge/discharge cycles, propellant remaining) for the life of the mission.	Ensures the Ground Segment creates all satellite performance information and trends (especially life-limited resource degradation) to present to operators to ensure the health and safety of GOES-R satellites and assist in satellite anomaly and fault resolution.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1658			***6.11 Flight Software Maintenance***		
GSFPS-2467	GS Ktr	Base	The GS **shall** manage access to spacecraft flight software.	Ensures that only operators in appropriate privileges and roles can access flight software.	
GSFPS-1660	GS Ktr	Base	The GS **shall** maintain knowledge of the current state of onboard satellite (spacecraft and instrument) memory contents.	Ensures that operators have access to the precise up-to-date contents of satellite memory for health & safety, memory management, and subsystem and instrument operations.	
GSFPS-1662	GS Ktr	Base	The GS **shall** manage spacecraft flight software.	Ensures the Ground Segment has the capability to create, upload, dump, compare, compile, verify, validate, and configuration control the spacecraft bus flight software (Level III parent).	
GSFPS-1664	GS Ktr	Base	The GS **shall** manage instrument flight software.	Ensures the Ground Segment has the capability to create, upload, dump, compare, compile, verify, validate, and configuration control the flight software for each instrument (Level III parent).	
GSFPS-1666	GS Ktr	Base	The GS **shall** provide for operator-initiated memory dumps from satellite processors.	Enables the Ground Segment to command the read-out of memory contents from onboard flight processors and onboard stored memory for nominal and contingency operations and to maintain the state of health of the spacecraft.	
GSFPS-1668	GS Ktr	Base	The GS **shall** process memory dumps from satellite processors for the purpose of memory verification.	Enables the Ground Segment to process the memory read-out contents from onboard flight processors and onboard stored memory to compare against the ground image to verify expected values (either commanded values such as table load contents or values expected as the result of onboard processing).	
GSFPS-1670	GS Ktr	Base	The GS **shall** maintain a current copy of each flight software image.	Component of Flight Software management needed for verification with the on-board image.	
GSFPS-1672	GS Ktr	Base	The GS **shall** maintain current copies of all satellite tables.	Component of Flight Software management needed for verification with the on-board tables.	
GSFPS-1674	GS Ktr	Base	The GS **shall** manage general satellite operations tables.	Ensures the Ground Segment has the capability to create, upload, dump, compare, verify, validate, and configuration control table loads for the spacecraft and each instrument (Level III parent).	
GSFPS-2636	GS Ktr	Base	The GS **shall** allow the operator to retrieve and utilize all stored copies of satellite flight software.	Enables FSW configuration control by the Ground Segment (child to GSFPS-1662 and GSFPS-1664) to verify, run simulations against, compare against the historical baseline, etc.	
GSFPS-2923	GS Ktr	Base	The GS **shall** generate flight software loads for uplink to the satellite.	Enables FSW upload capability by the Ground Segment to support updates, maintenance, patches, etc. (child to GSFPS-1662 and GSFPS-1664).	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1676	GS Ktr	Base	The GS **shall** verify flight software and table loads.	Enables FSW and table load verification capability by the Ground Segment to support routine operations (child to GSFPS-1674).	
GSFPS-1678	GS Ktr	Base	The GS **shall** import flight software from the Flight Software Development Environment (FSDE). *(CCR01506)*	Enables the Ground Segment to receive via an interface to the FSDE, flight software that has been developed, compiled, and tested in the FSDE.	
GSFPS-2770	GS Ktr	Base	The GS **shall** maintain synchronization of the spacecraft clock.	Enables the Ground Segment to control the onboard timing reference of the satellite.	
GSFPS-1680			***6.12 Satellite Simulator Interface***		
GSFPS-1683			The Satellite Simulator will have an interface with the GS antenna subsystem at the IF switch.		
GSFPS-2637	GS Ktr	Base	The GS **shall** provide an interface between the Satellite Simulator and the MM telemetry and command subsystem at the NSOF, WCDAS, and RBU sites.	Establishes a Ground Segment interface to the satellite simulator located at each GS site.	
GSFPS-1685	GS Ktr	Base	The GS **shall** interface with the satellite simulator via baseband data.	Defines an interface between the GS and satellite simulator at baseband (i.e. no analog modulation applied; the "straight-through" interface). The baseband interface eliminates the IF processing complexity. This is the normal simulator interface mode.	
GSFPS-1687	GS Ktr	Base	The GS **shall** send data to the satellite simulator that simulates the Ground Segment communications to the Space Segment.	Requires the GS to reproduce the same (transmit) communications characteristics via its interface with the simulator that it uses for the actual S/C.	
GSFPS-1689	GS Ktr	Base	The GS **shall** receive data from the satellite simulator that simulates the Space Segment to Ground Segment communications.	Requires the GS to reproduce the same (receive) communications characteristics via its interface with the simulator that it uses for the actual S/C.	
GSFPS-2468	GS Ktr	Base	The GS **shall** interface with satellite simulators to support simulation of at least three spacecraft simultaneously.	Necessary to stress test the system.	
GSFPS-2638	GS Ktr	Base	The GS interface to the Satellite Simulator **shall** conform to the Spacecraft Simulator Design Document (GS-01).	Defines the detailed physical & logical interfaces with the GFP (Flight) satellite simulator.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1691			***6.13 Image Navigation and Registration***		
GSFPS-1693			The Government will provide algorithms from the GOES-R earth pointing instrument vendors to either resample to a geo-referenced fixed grid coordinate system, for Advanced Baseline Imager (ABI) and Geostationary Lightning Mapper (GLM), or to provide geo-referenced information for INR processing. The Government will provide algorithms from the instrument vendors for the non-earth pointing instruments to geometrically locate to other coordinate systems. The ABI L1b algorithms are described in GOES-R Space Segment CDRL 80-1.		
GSFPS-1695	GS Ktr	Base	The GS **shall** receive, from the Government, geometric calibration database parameters developed by the instrument vendor. *(CCR01646)*	The Government has to provide and the GS contractor has to be able to use the geometric calibration database parameters developed by the instrument vendor for the purposes of INR. *(CCR01646)*	
GSFPS-1697	GS Ktr	Base	The GS **shall** maintain geometric calibration databases.	Ensures that the GS can functionally maintain the databases (configure, edit, configuration manage, etc.)	
GSFPS-1699	GS Ktr	Base	The GS **shall** geo-locate Earth-referenced instrument observation data in geodetic latitude and longitude.	Tasks GS with applying L1b algorithms to geolocate Earth-referenced imagery.	
GSFPS-3034	GS Ktr	Base	The GS **shall** locate Solar-referenced instrument observation data in the applicable reference frame.	Tasks GS with applying L1b algorithms to locate solar-referenced imagery.	
GSFPS-3035	GS Ktr	Base	The GS **shall** perform landmarking of L1b images for visible and ground-viewing IR optical channels.	Tasks GS with implementing landmarking techniques to measure geometric calibration (INR) accuracy. Note: this is unique to GS Ktr and not part of any Flight GFP'd "algorithm".	
GSFPS-3036	GS Ktr	Base	The GS **shall** perform landmarking using a landmark database containing landmark locations and associated feature boundary data specific to operator designated sub-satellite locations.	Lower level requirement for landmarking implementation to use geographic feature DB and that the DB be a function of station longitude (i.e. provides geographic coverage from all viewable GOES-R locations). Ensures that a database is created, populated with locations for the designated sub-satellite positions, and to allow the operator to designate which sub-satellite position to use.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1701			***6.13.1 Image Navigation and Registration Monitoring and Performance***		
GSFPS-1703	GS Ktr	Base	The GS **shall** monitor spacecraft instrument INR performance.	Ensures that GS will measure & report INR errors to support product quality assurance and anomaly resolution.	
GSFPS-2471	GS Ktr	Base	The GS **shall** autonomously monitor spacecraft instrument INR performance using predetermined landmarks from the landmark database.	Ensures landmarking will be a primary measure of INR performance (vs. some other stellar and orbital technique). Landmarking is the only quantifiable measure of INR performance.	
GSFPS-1705	GS Ktr	Base	The GS **shall** display graphical, textual, and event messages related to INR performance parameters.	Ensures full reporting of INR performance to support product quality assurance and anomaly resolution.	
GSFPS-1707	GS Ktr	Base	The GS **shall** determine corrections to INR parameters.	Requires that the GS be capable of determining what (if any) adjustments to parameters applied either onboard or in ground processing are needed to correct image navigation.	
GSFPS-1709	GS Ktr	Base	The GS **shall** report INR performance.	Hi-level requirement for GS to report INR performance to support product quality assurance and anomaly resolution.	
GSFPS-1711	GS Ktr	Base	The GS **shall** store INR performance data and processing parameters.	Ensures the retention of INR data for offline analysis and product data annotation.	
GSFPS-2472	GS Ktr	Base	The GS **shall** trend INR performance data for an operator-defined interval.	Ensures capability both to trend INR performance and to set an operator control of the interval to support off-line analysis.	
GSFPS-2245	GS Ktr	Base	The GS **shall** monitor the performance of the GOES-R Series system with respect to the image radiometry, geometry and temporal registration.	This is an umbrella requirement for a general geometric and radiometric calibration capability.	Also covered in GSFPS-3136.
GSFPS-3037	GS Ktr	Base	The GS **shall** be capable of extracting and storing pre-defined landmark regions of geo-referenced instrument detector sample data (i.e., prior to a function such as resampling).	Requires landmark determination at the raw detector sample data (vs. L1b 'imagery'). This is important to evaluate individual detector radiometric & other performance vs. this information being "lost" after data reduction in the L1b process.	
GSFPS-3038	GS Ktr	Base	The GS **shall** perform landmark recognition and measurement, by operator request, from previously stored geo-referenced instrument detector sample data.	Allows landmarking on detector sample data from stored data (i.e. the 5-day raw data store - other than real-time). Important to ascertain performance at the raw detector sample level through off-line diagnostics.	
GSFPS-3134	GS Ktr	Base	The GS **shall** monitor the performance characteristics of ABI, GLM and SUVI Image Navigation and Registration consistent with the respective instrument Performance and Operational Requirements Documents (PORDs).	INR performance requirement citing individual INR'd-instrument PORDs for detailed numerical specs.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3135	GS Ktr	Base	The GS **shall** manage ABI, GLM and SUVI Image Navigation and Registration ground-computed parameters, orbital elements and associated data consistent with the performance requirements of the instruments as described in the respective PORDs.	Management of the data and parameters is required so that they will be available for validating INR performance against the instrument PORDs operationally throughout the life of the mission (real-time and off-line).	
GSFPS-3136	GS Ktr	Base	The GS **shall** monitor the performance of the GOES-R Series system with respect to the image radiometry, geometry and temporal registration at a level of accuracy, precision, quantity, and frequency necessary to validate the instrument performance as described in their respective PORDs.	The GS has to be designed such that sufficient information is available to validate the INR performance against the instrument PORDs operationally throughout the life of the mission (real-time and off-line).	
GSFPS-1713			***6.14 GRB Product Monitoring***		
GSFPS-1715	GS Ktr	Base	The GS **shall** display operator selectable data and imagery from the received GRB data.	Hi-level capture for operator-selectable display of data received as GRB for visual performance monitoring.	
GSFPS-1717	GS Ktr	Base	The GS **shall** assess and report the quality of instrument radiometric performance.	Levies capability of the product monitoring function to determine and report the performance of instrument radiometrics (ABI).	
GSFPS-2755	GS Ktr	Base	The GS **shall** assess and report the quality of performance for all instruments.	Extends performance quality to all instruments (ABI & non-ABI)	
GSFPS-2474	GS Ktr	Base	The GS **shall** display imagery from the received GRB data selectable by source and band.	Allows product monitoring function to display data channel-by-channel (ABI) and source (other instruments) for real-time GRB product quality monitoring.	
GSFPS-1723	GS Ktr	Base	The GS **shall** assess and report the quality of the received GRB data.	Allows product monitoring function to determine & report the actual quality of the GRB RF link (physical link characteristics (e.g., bit error rate) rather than data content).	
GSFPS-2759	GS Ktr	Base	The GS **shall** be capable of monitoring any data item contained within the GRB data stream.	Allows product monitoring function to individually display any L1b product data set in GRB to support real-time product quality monitoring.	
GSFPS-2473	GS Ktr	Base	The GS **shall** receive GRB data as relayed from the GOES R Series satellites.	Ensures that no intermediate processing step, data reduction, or other manipulation of the GRB data occurs.	
GSFPS-1724			***6.15 Command Operations***		
GSFPS-2475	GS Ktr	Base	The GS **shall** process commands by satellite ID.	Ensures the GS commands the correct spacecraft.	
GSFPS-2924	GS Ktr	Base	The GS **shall** generate commands for uplink to the satellite.	The GS is responsible for commanding each satellite.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2476	GS Ktr	Base	The GS **shall** authorize only one command console to command any one GOES-R Series satellite at a time.	Prevents more than one operator from controlling a satellite.	
GSFPS-2477	GS Ktr	Base	The GS **shall** complete a switchover of any non-command mode operator position to command mode within one minute of operator initiation of the action to switch.	Performance requirement for transferring command authority between workstations to ensure continuity of command operations.	
GSFPS-1730	GS Ktr	Base	The GS **shall** generate real time commands.	Provides the capability for the GS to produce commands ad hoc as-needed for immediate uplink & execution.	
GSFPS-1732	GS Ktr	Base	The GS **shall** generate Relative Time command Sequences (RTS) for use in command loads.	Allows GS to support the satellite onboard command storage functionality.	
GSFPS-2478	GS Ktr	Base	The GS **shall** manage RTSs.	The GS has responsibility for the management of RTS loads.	
GSFPS-2479	GS Ktr	Base	The GS **shall** provide the capability to edit and validate RTSs. *(CCR01475)*	Allows RTSs to be edited and checked prior to uplink.	
GSFPS-1734	GS Ktr	Base	The GS **shall** generate Absolute Time command Sequences (ATS) for use in command loads.	Allows GS to support the satellite onboard command storage functionality.	
GSFPS-2480	GS Ktr	Base	The GS **shall** be able to maintain at least fifty ATSs for each satellite.	Establishes a reasonable minimum for number of simultaneous ATSs.	
GSFPS-2481	GS Ktr	Base	The GS **shall** provide the capability for the operator to stop an ATS during execution.	Ensures that the operator has the capability to interrupt the onboard execution of an ATS as needed to meet operational requirements or to prevent anomalies.	
GSFPS-2482	GS Ktr	Base	The GS **shall** provide tools for the development, modification, and deletion of ATSs.	Gives general management capability of ATSs to the operator.	
GSFPS-2483	GS Ktr	Base	The GS **shall** be capable of nesting command procedures to at least six levels.	Ensures that command procedures can be invoked by each other.	
GSFPS-2732	GS Ktr	Base	The GS **shall** be capable of restricting command authority to selected workstations.	Certain workstations may need to be prevented from being able to command the satellite, regardless of operator privilege.	
GSFPS-2733	GS Ktr	Base	The GS **shall** provide tools for verification and validation of ATSs.	Ensures GS can test ATSs for correctness prior to uplink. For example, to verify syntax and to validate correct spacecraft state.	
GSFPS-3111	GS Ktr	Base	The GS **shall** store ATSs and RTSs for the life of the mission.	The GS needs to archive all approved command loads for analysis and maintenance of the long-term record.	
GSFPS-2734	GS Ktr	Base	The GS **shall** be capable of transmitting encrypted commands upon operator direction.	Ensures the GS can support satellite requirements for encrypted commanding.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2484	GS Ktr	Base	The GS **shall** provide a function to expand nested procedures within a parent procedure so that all steps taken are shown in the order to be executed in print and display.	Nested procedures need to be displayed in the sequence in which they are executed.	
GSFPS-1736	GS Ktr	Base	The GS **shall** generate stored command loads with an execution time span consistent with the satellite capability.	Ensures the GS can support satellite requirements for performance of onboard storage capability.	
GSFPS-1738	GS Ktr	Base	The GS **shall** maintain in a database a selected subset of commands defined as “critical” commands.	Ensures a layer of protection on commands issued by the ground to the satellite producing changes in operational parameters that have the potential to adversely affect the health and safety of the satellite or result in irreversible changes to the operational state of the satellite.	
GSFPS-3155	GS Ktr	Base	The GS shall have the capability to exclude hazardous commands from being executed.	Permits ground test or non-flight operations commands to be permanently disabled (not possible to send to the satellite in flight).	
GSFPS-1740	GS Ktr	Base	The GS **shall** confirm operator acknowledgement prior to execution of all critical commands.	Enforces a "two-step" process for issuing critical commands, (i.e. requires that a manual acknowledgement be made before a critical command is executed onboard (consistent with satellite capability)).	
GSFPS-1742	GS Ktr	Base	The GS **shall** preclude inadvertent and unauthorized satellite commanding.	Enforces authorized command authority.	
GSFPS-1744	GS Ktr	Base	The GS **shall** perform database-defined prerequisite state checking based on telemetry before transmitting a real-time command.	Give the GS the capability to make command transmission conditional, based on received telemetry states.	
GSFPS-1746	GS Ktr	Base	The GS **shall** accommodate command generation functionality as defined in the GOES-R Spacecraft Functional and Performance Specification (P 417-R-PSPEC-0014) and Space Segment (SS) to Ground Located - Command, Control, and Communications Segment (GL-C3S) (P 417-R-IRD-0001) IRD.	Cites S/C F&PS and SS-GL-3CS IRD for details on command capability.	
GSFPS-1748	GS Ktr	Base	The GS **shall** be capable of transmitting unencrypted commands upon operator direction.	Ensures the GS can support satellite requirements for "clear-text" commanding.	
GSFPS-1750	GS Ktr	Base	The GS **shall** utilize a National Security Agency (NSA) or NIST certified encryption device compatible with the onboard decryptor to send commands to the satellite.	Requires GS to use a certified command encryption device based on Government policy.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3039	GS Ktr	Base	The GS **shall** be capable of updating (add, change, or delete) any single command in an active command schedule, including revalidation, in no more than 30 seconds.	Places a reasonable maximum time interval to allow acceptable operator control of active command schedule execution.	
GSFPS-3040	GS Ktr	Base	The GS **shall** retransmit commands that have failed to load up to a specified number of retries.	Permits automatic retransmission of commands if a verification of execution is not received, with the number controllable by the operator.	Assumes an upper limit
GSFPS-3041	GS Ktr	Base	The GS **shall** take specified action (e.g., sound alarm, issue warning message, halt schedule) after the specified number of command retries have been exhausted.	Ensures that the operator is notified if the command retry limit is exceeded.	
GSFPS-3042	GS Ktr	Base	The GS **shall** provide the capability to enter commands from a keyboard at the IF interface to the antenna system.	Permits ground station personnel to issue commands directly to the last point in the GS command path prior to the IF interface, if all-else fails in communications or GS command functionality and critical commanding is required.	
GSFPS-3043	GS Ktr	Base	The GS **shall** provide limited raw and formatted telemetry display at the IF interface to the antenna system.	Permits ground station personnel to view telemetry directly at the first point in the GS telemetry path after the IF interface, if all-else fails in communications or GS command functionality and telemetry monitoring is required.	Includes engineering telemetry
GSFPS-3044	GS Ktr	Base	The GS **shall** maintain a database of the path delays to the antenna aperture of the Ground Stations utilized for commanding each satellite.	Ensures knowledge of expected path delays to various stations (especially launch and orbit raising network stations). Needed to ensure that appropriate time intervals are established based on path selected.	
GSFPS-3045	GS Ktr	Base	The GS **shall** provide continuity of satellite commanding through change of command authority from one workstation/console to another.	Ensures that command capability is maintained at the CMD 'master' workstation until transition of 'master' to another workstation.	
GSFPS-1752			***6.15.1 Command Verification***		
GSFPS-1754	GS Ktr	Base	The GS **shall** verify by default all commands prior to being uplinked to the satellite.	Enforces fundamental capability to verify all commands prior to transmission based on standard operating procedures.	
GSFPS-1756	GS Ktr	Base	The GS **shall** verify stored command and memory (table) loads.	Enforces fundamental capability to verify all command loads prior to transmission based on standard operating procedures.	
GSFPS-1758	GS Ktr	Base	The GS **shall** verify that all software, stored command, and table loads transmitted to the satellite have been properly stored on board.	Provides capability to verify transmitted command and memory upload data after receipt by the satellite (i.e., GS maintains an image of the transmitted data and compares to an interrogation of onboard registers to verify proper upload).	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1760	GS Ktr	Base	The GS **shall** have the capability to compare and confirm all flight software, stored command and table loads transmitted to the satellite.	Provides capability to verify transmitted flight software upload data after receipt by the satellite (i.e., GS maintains an image of the transmitted data and compares to an interrogation of onboard registers to verify proper upload).	
GSFPS-1762	GS Ktr	Base	The GS **shall** verify from telemetry, command acceptance or rejection status of each command transmitted to the satellite.	Ensures fundamental capability to verify the satellite's proper receipt and processing of transmitted commands.	
GSFPS-1764	GS Ktr	Base	The GS **shall** verify via available telemetry that a command transmitted to the satellite produces a change in state consistent with successful command execution.	Provides 'end-item verify' capability (i.e., verifies bi-level or multi-state telemetry items related or associated with the command that affects them - automated check on the actual effect of the command rather than reliance on acknowledgment or a status or execute bit)	
GSFPS-1766	GS Ktr	Base	The GS **shall** allow command verification to be disabled or enabled on an individual command basis.	Gives flexibility to control command verification on an individual command basis, rather than just global. Expect to operate with command verification always "on", but may choose to disable if commanding "blind".	
GSFPS-2485			***6.15.2 Ground Command Management***		
GSFPS-2486	GS Ktr	Base	The GS **shall** provide command constraint checking consistent with the satellite telemetry and command database.	Provides the fundamental capability to associate commands with permissible states as received in telemetry, before the command is transmitted.	
GSFPS-2487	GS Ktr	Base	The GS **shall** provide for a two-step commanding mode.	Allows the command to be viewed in a display buffer at other workstations, to permit inspection and verbal validation of the proper command by other engineers and operators prior to transmission to the satellite. Command authority stays with originating workstation.	One-step commanding is not precluded.
GSFPS-2488	GS Ktr	Base	The GS **shall** route all commands through the designated primary command path.	Enforces the command to be routed through the operator-controlled path (communications configuration, etc) rather than allow the primary command path to be arbitrarily or otherwise selected by the GS	
GSFPS-2489	GS Ktr	Base	The GS **shall** enable the operator to select an Absolute Time Sequence schedule to be run on the ground or on board.	Gives the capability to start an ATS in either ground execution mode (GS initiates and controls execution) or via the onboard storage buffer.	
GSFPS-2490	GS Ktr	Base	The GS **shall** enable the operator to switch from one schedule to another.	Allows the command schedule to be controlled by the operator (selects which schedule is to be run)	
GSFPS-2491	GS Ktr	Base	The GS **shall** enable the operator to modify a schedule on the ground, upload it, and switch to the modified schedule.	Gives the operator the capability to edit, upload and execute a command schedule	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2736	GS Ktr	Base	The GS **shall** transmit real time commands within 1 second of definition by the operator.	Performance requirement constraining RT command delay to 1 sec. "Definition" here means the point at which the operator initiates execution of the command.	
GSFPS-1767			***6.16 Telemetry***		
GSFPS-1773	GS Ktr	Base	The GS **shall** interpret the value and quality flag of a telemetry point.	Fundamental capability to decode and attach a data quality measure to an individual telemetry item (derived from packet error code, etc.)	
GSFPS-1775	GS Ktr	Base	The GS **shall** enable the operator to define and maintain in a database mission-critical parameter telemetry items (safety monitors).	High-level requirement to define the 'safety monitor' function, i.e., the capability to designate telemetry items such that they trigger a distinct, high-priority alarm upon a specified state change or violation of a specified value.	
GSFPS-1777	GS Ktr	Base	The GS **shall** monitor operator-defined mission-critical parameter telemetry items (safety monitors).	Ensures GS applies the safety monitors (i.e., limits, states, etc.).	
GSFPS-1779	GS Ktr	Base	The GS **shall** display operator-defined mission-critical parameter telemetry items (safety monitors).	Ensures GS displays a safety monitor value to the operator	
GSFPS-1781	GS Ktr	Base	The GS **shall** activate a distinct audible and visual alarm based on an operator-defined set of monitored mission-critical parameter telemetry items (safety monitors).	Defines a uniquely-distinguished and exigent alarm response to safety monitor violations that will emphatically alert operators to the situation. (Consistent with current standard operations procedures)	
GSFPS-1783	GS Ktr	Base	The GS **shall** receive and process high-fidelity simulated telemetry.	Necessary to enable tests, simulations, and other activities. The GS must process simulated telemetry streams (from either Satellite Simulator or the T&C Simulator) the same as real telemetry.	
GSFPS-1785	GS Ktr	Base	The GS **shall** perform context-dependent telemetry processing.	Fundamental capability to base the handling of selected telemetry items on their received status or value of other designated telemetry items (e.g., a particular value is not flagged if its associated hardware is not 'on', etc.)	
GSFPS-1787	GS Ktr	Base	The GS **shall** perform data flagging for all telemetry parameters (including pseudo telemetry) when there has been no receipt of such telemetry for a period of time equivalent to an operator-specified multiple of the telemetry point's update rate.	Fundamental capability to flag 'static telemetry' so operators know it is not current beyond the selected update period	
GSFPS-1789	GS Ktr	Base	The GS **shall** alarm telemetry values that violate predefined database values (limit sets) as received.	High-level requirement to invoke the fundamental telemetry limit and enable the alarm function	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1791	GS Ktr	Base	The GS **shall** allow adjustments by operators with the correct privileges for any telemetry limit value defined in the telemetry database, including pseudo telemetry.	Allows operators to modify limit values on-the-fly	
GSFPS-1793	GS Ktr	Base	The GS **shall** permit operator-initiated limit adjustments, without permanent change to the telemetry database.	Allows operators to modify limit values on-the-fly without changing the database. Modification would persist until operator changes again or process is restarted.	
GSFPS-1795	GS Ktr	Base	The GS **shall** allow limit adjustments to be made in either raw or engineering units.	Allows limit value adjustments in counts or engineering data values	
GSFPS-1797	GS Ktr	Base	The GS **shall** allow an operator to display the name of the active limit set.	Allows operator to view on their workstation the currently selected limit set name. Limit sets are organized in database by name.	
GSFPS-1799	GS Ktr	Base	The GS **shall** allow an operator to display the current limit values for any telemetry parameter.	Allows operator to view currently-selected limit values on individual telemetry items	
GSFPS-1801	GS Ktr	Base	The GS **shall** allow the operator to disable and enable alarm messages.	Give the operator control over individual telemetry point limit alarms (rather than just global)	
GSFPS-1803	GS Ktr	Base	The GS **shall** indicate a change in state of bi-level telemetry parameters, as a feature of the limit set function.	In addition to 'analog value' hi/low limits, limits will be indicated for the transition of bi-level state values	
GSFPS-2009	GS Ktr	Base	The GS **shall** refresh telemetry displays at a rate consistent with satellite telemetry refresh rates.	Ensures that telemetry displays keep pace with the update rate of each satellite telemetry parameter being displayed.	Should be consistent with 2 Hz update requirement in 4.10.
GSFPS-2642			***6.16.1 Pseudo Telemetry***		
GSFPS-2643	GS Ktr	Base	The GS **shall** generate derived “pseudo telemetry” parameters based on combined or single engineering telemetry data parameters processed through user-defined algorithms (including algebraic, trigonometric, and logical operators).	High-level requirement for user-defined pseudo-telemetry, which complements source telemetry for operator display, engineering and analysis purposes.	
GSFPS-2644	GS Ktr	Base	The GS **shall** process, display, and store for the life of the mission pseudo telemetry in the same manner as normal satellite telemetry.	Ensures that pseudo-telemetry is treated exactly like source telemetry	
GSFPS-2645	GS Ktr	Base	The GS **shall** time-tag pseudo telemetry relative to the last received packet of the source telemetry parameter used in the algorithm.	Accounts for individual source telemetry items received at slightly different times or frequencies and used to produce a pseudo-telemetry point - common time tag to last received data	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2646	GS Ktr	Base	The GS **shall** update pseudo telemetry parameters at a frequency equal to the lowest frequency source telemetry parameter used in the algorithm.	Accounts for individual source telemetry items received at slightly different times or frequencies and used to produce a pseudo-telemetry point - ensures pseudotelemetry will not appear to have an artificially higher frequency	
GSFPS-2647	GS Ktr	Base	The GS **shall** provide an interface for operators to define pseudo telemetry algorithms.	Allows user-definition of pseudo-telemetry points	
GSFPS-2648	GS Ktr	Base	The GS **shall** permit user-defined pseudo telemetry items to be saved and accessed for all real time telemetry processing.	Allows user pseudo-telemetry definitions to be saved and found as needed	
GSFPS-2649	GS Ktr	Base	The GS **shall** permit the ad-hoc definition of pseudo telemetry algorithms by an operator ("on-the-fly") under a user session that will be processed until that session is closed.	Ensures pseudo-telemetry items can be defined in real-time, without a cumbersome database edit process	
GSFPS-2011	GS Ktr	Base	The GS **shall** have the capability to store at least 1000 pseudo-telemetry operator-defined algorithms as they are generated in real-time and near real-time processing.	Reasonable minimum requirement for number of pseudo-telemetry algorithms	
GSFPS-2650	GS Ktr	Base	The GS **shall** permit ad-hoc defined pseudo telemetry algorithms to be saved.	Allows ad hoc user pseudo-telemetry definitions to be saved	
GSFPS-3046			***6.16.2 Satellite State Monitoring***		
GSFPS-3047	GS Ktr	Base	The GS **shall** maintain an image of the current onboard status of each discrete commandable telemetered parameter.	High-level requirement for a 'State Monitor' function (similar to low-earth orbit mission state monitor)	
GSFPS-3048	GS Ktr	Base	The GS **shall** compare the status of discrete commandable telemetry with the ground image to determine if an uncommanded change in state has occurred.	Continuous comparison, based on received telemetry	
GSFPS-3049	GS Ktr	Base	The GS **shall** flag and report any uncommanded change in discrete telemetry in comparison with the ground image.	Reports state monitor results to operator	
GSFPS-3050	GS Ktr	Base	The GS discrete telemetry ground image compare capability **shall** be configurable by operator directive.	Permits operators to adjust ground image of state monitor (e.g., to capture an update and/or eliminate false alarms)	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1805			***6.17 Mission Planning and Scheduling***		
GSFPS-1807	GS Ktr	Base	The GS **shall** generate schedules of coordinated satellite operations, communications services, payload operations, and supporting functions for each in-flight satellite.	High-level requirement for GS to generate command schedules	
GSFPS-1809	GS Ktr	Base	The GS **shall** provide mission operations data for planning and scheduling including mission configuration, maneuver planning, and satellite activity prioritization.	Ensures that operations data, not limited by items listed in requirement, are used for the scheduling process.	
GSFPS-1811	GS Ktr	Base	The GS **shall** plan and schedule satellite resources for routine mission operations.	Necessary for satellite operations and product generation	
GSFPS-1813	GS Ktr	Base	The GS **shall** plan and schedule special operations such as station keeping maneuvers, east-west, north-south, yaw flips, thruster flushing, engineering or science investigations outside normal operations. *(CCR01660)*	Necessary for satellite operations and product generation	
GSFPS-1815	GS Ktr	Base	The GS **shall** plan and schedule routine and special instrument calibration activities.	Necessary for satellite operations and product generation	
GSFPS-1817	GS Ktr	Base	The GS **shall** plan and schedule significant events and satellite maintenance resources up to 12 months in advance.	Performance requirement to ensure orbit maneuvers, eclipses, etc are plannable out to one year, which accommodates seasonal events.	
GSFPS-1819	GS Ktr	Base	The GS **shall** create command loads, memory (table) loads and command sequences to operate the satellite.	Necessary to support satellite operations concept and requirements	
GSFPS-1821	GS Ktr	Base	The GS **shall** create command loads with overlap periods, such that the currently executing command load can initiate the command load awaiting execution.	Allows seamless transition between command loads	
GSFPS-2495	GS Ktr	Base	The GS schedule generation function **shall** provide schedule templates to permit building schedules for ground and stored command use.	Gives capability to save template schedules (e.g., daily period framework) to populate with updated data	
GSFPS-2496	GS Ktr	Base	The GS schedule generation function **shall** perform line-by-line syntax checking of command files for verification.	Ensures command files are correctly structured before use	
GSFPS-2497	GS Ktr	Base	The GS **shall** provide a schedule execution and monitoring function which provides schedule shadowing for visual monitoring of onboard schedule command execution.	Supports current operations procedures to mimic on the ground the onboard execution of command schedules to allow operators to monitor onboard process	
GSFPS-2651	GS Ktr	Base	The GS **shall** maintain a minimum of 200 mission plans simultaneously.	Reasonable performance requirement to support multiple mission plans	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2652	GS Ktr	Base	The GS **shall** validate schedules.	Check the schedule using defined rules and constraints	
GSFPS-1823	GS Ktr	Base	The GS **shall** constraint check command loads.	Compares command loads with pre-defined rule-based conditions or constraints	
GSFPS-1825	GS Ktr	Base	The GS **shall** deconflict satellite maintenance schedules with operations.	Allows GS to check schedules against constraints and to resolve conflicts, e.g., housekeeping operations with imaging operations	
GSFPS-1827	GS Ktr	Base	The GS **shall** coordinate the storage of ATS and RTS command sequences on board the satellite.	Support the satellite capability for onboard command sequence storage and management	
GSFPS-1829	GS Ktr	Base	The GS **shall** provide coordination of control from one sequence to another on board the satellite.	Ensures continuity when switching between onboard schedules	
GSFPS-1831	GS Ktr	Base	The GS **shall** execute the procedures and rules used to perform planning and scheduling of the satellite.	High-level requirement to apply procedures & rule-based constraints when building plans & schedules (e.g., time duration checks, time order sequencing, conflict between onboard resources)	
GSFPS-2760	GS Ktr	Base	The GS **shall** generate and forward command schedules and schedule updates to the backup subsystem and confirm all transfers at the sending and receiving ends.	Ensures that all instances of the MM functions have the same, current command schedules.	
GSFPS-3051	GS Ktr	Base	The GS **shall** provide schedule templates to allow building on-demand ABI scan command schedules based on those used for Mesoscale scans.	Gives the GS the capability of building ad hoc Mesoscale scans for Mode 3 operations	
GSFPS-3052	GS Ktr	Base	The GS **shall** generate an ABI scan command schedule containing only the latitude and longitude coordinates of the center point of the requested ABI scene and the execution time.	Gives the capability to define only the simple center of the Mesoscale scene and execution time for ad hoc Mesoscale scans.	
GSFPS-3053	GS Ktr	Base	The GS **shall** use existing ABI scene swath tables for upload to the satellite.	Allows use of pre-defined scene tables	
GSFPS-3054	GS Ktr	Base	The GS **shall** generate new ABI scene swaths tables for upload to the satellite.	The GS may need to generate new ABI scene swath tables in order to meet updated coverage and schedule requirements driven by taskings.	
GSFPS-3055	GS Ktr	Base	The GS **shall** perform constraint checks to ensure that all ABI scene scans follow predefined rules to meet instrument performance requirements.	Ensures that Mesoscale scans are not commanded too close together (one still active when the next tries to start), mirror scan limits are minded, etc…	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1833			***6.18 Space-Ground Functional Communications***		
GSFPS-1855	GS Ktr	Base	The GS **shall** append a cyclical redundancy checking (CRC) integrity measure to instrument uploads consistent with the Space Segment (SS) to Ground Located - Command, Control, and Communications Segment (GL-C3S) (P 417-R-IRD-0001) IRD.	Ensures the integrity of instrument uploads to the spacecraft by utilizing CRC to detect accidental alteration of data during transmission.	
GSFPS-1857	GS Ktr	Base	The GS **shall** assess, maintain and report space-ground communications status, including data quality summary for all received data.	Enable operators to maintain, assess, and report link status and report metrics.	
GSFPS-1859	GS Ktr	Base	The GS **shall** receive, process, and route all satellite data in real-time in accordance with Consultative Committee for Space Data System (CCSDS) data standards defined in the applicable documents.	Data transportation will comply with the required data standard of CCSDS and not be delayed unnecessarily by processing.	
GSFPS-2657	GS Ktr	Base	The GS **shall** process all downlinks from a satellite concurrently.	Ensures that real-time downlinks (all bands and channels) for each satellite are processed simultaneously maintaining equal processing priority to each downlink.	
GSFPS-1863			***6.19 Launch Segment Interface***		
GSFPS-1865	GS Ktr	Base	The GS **shall** receive launch data from the Launch Segment (LS), including: launch time, time of first contact, vectors, and ephemeris, as described in LS vendor documentation.	Points to Launch Segment vendor as source for satellite data from the launch facility, and requires GS to receive and use that data, appropriate to its content.	
GSFPS-1867	GS Ktr	Base	The GS **shall** receive satellite data from the LS, while integrated at the launch site, as described in LS vendor documentation.	Points to Launch Segment vendor as source for launch data, and requires GS to receive and use that data, appropriate to its content, during critical launch phase.	
GSFPS-1869	GS Ktr	Base	The GS **shall** command the satellite through the LS interface.	Necessary for pre-launch activities and launch/early orbit operations	
GSFPS-1875	GS Ktr	Base	The GS **shall** send commands via the LS ground network.	Necessary for pre-launch activities and launch/early orbit operations	
GSFPS-1877	GS Ktr	Base	The GS **shall** receive telemetry via the LS ground network.	Necessary for pre-launch activities and launch/early orbit operations	
GSFPS-1879	GS Ktr	Base	The GS **shall** receive ranging from the LS ground network.	Necessary for pre-launch activities and launch/early orbit operations	
GSFPS-1881	GS Ktr	Base	The GS **shall** send orbital element or other acquisition data to the LS ground network.	Necessary for pre-launch activities and launch/early orbit operations	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1871			***6.20 Space Segment Interface***		
GSFPS-2499	GS Ktr	Base	The GS **shall** receive engineering telemetry data from the satellite in the factory as described in the associated Flight Segment test plan and test procedure.	This requirement is crucial to Ground Segment test, validation and development and GOES-R system-level testing. Additionally, procedure development requires engineering telemetry from the factory as early as possible.	Used in ETE tests. Will only include low rate simulated S-band (32 kbps) engineering telemetry data.
GSFPS-2500	GS Ktr	Base	The GS **shall** send satellite commands / command loads to the satellite in the factory as described in the associated Flight Segment test plan and test procedure.	This will ensure that the Ground Segment capability of commanding is validated and verified as early as possible in the development life cycle.	Used in ETE tests. Will only include low rate simulated S-band (32 kbps) engineering telemetry data.
GSFPS-1904			***6.21 Antenna***		
GSFPS-1905			The GS antenna subsystem(s), including the RF and IF interfacing equipment, will be provided as GFP to the contractor.		
GSFPS-1906	GS Ktr	Base	The GS signal path connections (uplink and downlink) **shall** interface to the antenna subsystem at the Government-furnished IF switch.	Defines the antenna subsystem demarcation	
GSFPS-1908	GS Ktr	Base	The GS **shall** interface to the antenna subsystem control component to send antenna control signals to the antenna subsystem.	Enables MM to control the antennas	
GSFPS-1910	GS Ktr	Base	The GS **shall** interface to the antenna subsystem control component to receive antenna subsystem status data.	Enables MM to know the status of antenna components	
GSFPS-1912	GS Ktr	Base	The GS **shall** monitor and report antenna equipment status, event and alarm information.	Ensures that the GS will continuously monitor health and status of the antenna and RF equipment.	For the purposes of enterprise supervision, the antenna subsystem interfaces with MM rather than EM.
GSFPS-2676	GS Ktr	Base	The GS **shall** remotely monitor, report, and control antenna operational parameters.	Ensures that the GS will have the capability to monitor, report, and control the antenna and RF equipment from any GS location.	
GSFPS-2754	GS Ktr	Base	The GS **shall** be able to configure the tracking mode of the antenna.	Allows the operator to select program track or auto track mode based on operations support requirements.	
GSFPS-1930			***6.22 Reserved (CCR01511)***		
GSFPS-1968			***6.23 Telemetry Downlink Receive***		
GSFPS-2505	GS Ktr	Base	The GS **shall** receive engineering telemetry from the satellite in the form of CCSDS Transfer Frames.	Ensures that receive system supports CCSDS.	Applies to both the high rate and low rate engineering telemetry.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2506	GS Ktr	Base	The GS **shall** verify that received engineering telemetry Transfer Frames are uncorrupted.	This requirement is necessary to ensure that the integrity of telemetry received is not compromised upon initial receipt prior to processing	
GSFPS-2507	GS Ktr	Base	The GS **shall** flag engineering telemetry Transfer Frames determined to be corrupted.	This requirement will ensure that if data is corrupted fault isolation will be easier due to a flag being set and downstream processing will know which frames are corrupted.	
GSFPS-2508	GS Ktr	Base	The GS **shall** pre-process engineering telemetry at a rate to keep pace with the receipt of Transfer Frames over the space to ground link.	Ensures that bottlenecks are not created during the processing phase and latency is not impacted.	
GSFPS-2509	GS Ktr	Base	The GS **shall** record the quality and quantity of the engineering telemetry processed through the pre-processing function, including synchronization performance, CCSDS Transfer Frame processing status, and error correction performance.	Ensures that metrics are kept on telemetry processing as a method of gauging processing reliability, trending performance, and adjusting technology refresh cycles. Also, CCSDS Transfer frame processing status provides error detection.	
GSFPS-2510	GS Ktr	Base	The GS **shall** store for the life of the mission the quality and quantity of the engineering telemetry processed through the pre-processing function, including synchronization performance, CCSDS Transfer Frame processing status, and error correction performance in a daily preprocessing performance log file.	Ensures that metrics are kept on telemetry processing for gauging processing reliability and trending performance. "Daily" log is the timespan chosen for file archive.	Contents to be time-stamped
GSFPS-3109	GS Ktr	Base	The GS **shall** allow the operator to retrieve, display, export and print all stored performance logs.	Provides capability for operator to access logs for analysis and trending.	Searchable by time stamp, at a minimum.
GSFPS-2511	GS Ktr	Base	The GS **shall** monitor the ingest of the engineering telemetry data transfer frames to include the number of Transfer Frames received in a 5 minute period, number of fill packets, and number of Transfer Frames determined to be corrupted.	To report on the processing over a 5-minute interval, which matches typical instrument cycles, giving information about telemetry received versus expected. Important because failures in preprocessing impact all products.	
GSFPS-2512	GS Ktr	Base	The GS **shall** store all received CCSDS engineering telemetry Transfer Frames in a 5-day revolving temporary storage to support anomaly resolution.	Necessary for offline trend analysis and anomaly resolution. Five-day period accommodates a three-day weekend with margin.	
GSFPS-2513	GS Ktr	Base	The GS **shall** make engineering telemetry pre-processing status information available to EM.	Provides operator insight into GS preprocessing function status from any location.	
GSFPS-1970	GS Ktr	Base	The GS **shall** receive and pre-process telemetry from the satellite.	Necessary for satellite operations and product generation	In this context, telemetry refers to all raw data from the satellite.
GSFPS-1972	GS Ktr	Base	The GS **shall** quality-check telemetry according to error detection decoding.	Necessary to determine presence of errors	In this context, telemetry refers to all raw data from the satellite.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2514	GS Ktr	Base	The GS **shall** sort housekeeping data by application ID and by virtual channel.	Necessary to use the data	
GSFPS-1974	GS Ktr	Base	The GS **shall** flag telemetry errors.	Necessary to process the telemetry correctly	
GSFPS-3057			***6.23.1 Telemetry Monitoring***		
GSFPS-3058	GS Ktr	Base	The GS **shall** implement a ground programmable telemetry monitoring function (TMON) compliant with GOES-R Spacecraft Functional and Performance Specification (P 417-R-PSPEC-0014).	This requirement will provide the GS with a programmable telemetry monitoring function that will provide high vigilance on state changes and out of limits conditions ensuring high quality health and safety monitoring to support satellite capabilities.	
GSFPS-3059	GS Ktr	Base	The GS **shall** apply corrective actions through the TMON function based on rules stored in the spacecraft flight computer's memory.	This requirement will provide the GS with a programmable telemetry monitoring function that will provide high vigilance on state changes and out of limits conditions ensuring high quality health and safety monitoring to support satellite capabilities.	
GSFPS-3060	GS Ktr	Base	The GS **shall** monitor and take action on at least 2048 telemetry points through the TMON function.	This requirement will provide the GS with a programmable telemetry monitoring function that will provide high vigilance on state changes and out of limits conditions ensuring high quality health and safety monitoring to support satellite capabilities.	Actions may include alerts, pages, operator notifications, logs, etc.
GSFPS-3061	GS Ktr	Base	The GS **shall** flag red limits through the TMON function based on action rules and red limits contained in a table residing in the flight computer’s memory.	This requirement will provide the GS with a programmable telemetry monitoring function that will flag out of limits conditions consistent with the flight computer's memory.	
GSFPS-1976			***6.24 Raw Instrument Data Pre-processing***		
GSFPS-1978	GS Ktr	Base	The GS **shall** receive raw instrument data from the satellite in the form of CCSDS Transfer Frames.	Requires the GS to receive Raw Data in CCSDS protocol. CCSDS is the space-ground communications protocol selected by GOES-R for use.	
GSFPS-2521	GS Ktr	Base	The GS **shall** store all received CCSDS raw instrument data Transfer Frames in a 5-day revolving temporary storage to support anomaly resolution.	Requires the 5-day temporary revolving storage for Raw Data Transfer Frames to support anomaly resolution and replay for the Dev and I&T Environments.	
GSFPS-1980	GS Ktr	Base	The GS **shall** verify that received raw instrument data Transfer Frames are uncorrupted.	Ensures quality check on Transfer Frame data.	
GSFPS-2515	GS Ktr	Base	The GS **shall** flag raw instrument data Transfer Frames determined to be corrupted.	Ensures that corrupted Transfer Frame data are flagged to support Level 0 processing.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2516	GS Ktr	Base	The GS **shall** pre-process raw instrument data at a rate to keep pace with the receipt of Transfer Frames over the space to ground link consistent with the Space Segment (SS) to Ground Located - Command, Control, and Communications Segment (GL-C3S) (P 417-R-IRD-0001) IRD.	Cites Flight IRD for receipt of Raw Data Transfer Frames. Want to ensure that there is a continuous real-time processing flow so that frames are not dropped.	
GSFPS-1982	GS Ktr	Base	The GS **shall** monitor, by virtual channel, the quality and quantity of raw instrument data processed through the pre-processing function.	Ensures that individual virtual channels are monitored during pre-processing to verify data quality.	
GSFPS-2517	GS Ktr	Base	The GS **shall** capture the quality and quantity measures of the raw instrument data processed through the pre-processing function, including synchronization performance, CCSDS Transfer Frame processing status, and error correction performance.	Ensures that metrics are kept on raw instrument data processing as a method of gauging processing reliability, trending performance, and adjusting technology refresh cycles. Also, CCSDS Transfer frame processing status provides error detection.	
GSFPS-2518	GS Ktr	Base	The GS **shall** store the quality and quantity measures of the raw instrument data processed through the pre-processing function, including synchronization performance, CCSDS Transfer Frame processing status, and error correction performance in a daily preprocessing performance log file.	Ensures that metrics are kept on raw instrument data processing for gauging processing reliability and trending performance. "Daily" log is the timespan chosen for file archive.	
GSFPS-1984	GS Ktr	Base	The GS **shall** monitor the status of the pre-processing function.	Ensures that the pre-processing function is monitored to enhance operator situational awareness.	
GSFPS-2522	GS Ktr	Base	The GS **shall** make instrument data pre-processing status information available to EM.	Ensures that the pre-processing function monitored data is passed to EM to enhance operator situational awareness.	
GSFPS-1988	GS Ktr	Base	The GS **shall** include mission operations data including spacecraft and instrument configuration, instrument observation data status, and ephemerides in preprocessing metadata.	Ensures that pre-processing metadata include mission operations data that may be required for downstream processing.	
GSFPS-3062	GS Ktr	Base	The GS **shall** store preprocessing metadata in the 5-day revolving temporary storage system.	Ensures the preprocessing metadata is included in 5-day temporary storage for operator retrieval for anomaly resolution.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1992			***6.24.1 Ranging Services***		
GSFPS-1994	GS Ktr	Base	The GS **shall** perform ranging through an RF link to the satellite to an accuracy of 50ns.	Performance requirement for range accuracy to support orbit range tracking, telemetry, and command (ORTT&C) capability. This is a backup capability to support the primary GPS orbit determination capability. 50 ns capability is consistent with current operational capability.	
GSFPS-2000	GS Ktr	Base	The GS **shall** provide range measurements to the orbit determination function.	Ensure that range measurement data is forwarded to the orbit determination process.	
GSFPS-3063	GS Ktr	Base	The GS **shall** perform ranging through the GRB link.	Provides a separate ranging service (supplementary to the ORTT&C service) via the GRB link.	Expected to be part of continuous nominal operations.
GSFPS-3064	GS Ktr *(CCR-01430, 01511)*	Base	The GS **shall** perform ground loop calibration for each antenna station utilized for GRB ranging. *(CCR01530)*	Ensures that range bias can be measured within the GS.	
GSFPS-3065	GS Ktr *(CCR-01430, 01511)*	Base	The GS **shall** perform ground loop calibration for each antenna station for purposes of ORT&TC ranging. *(CCR01530)*	Ensures that range bias can be measured within the GS.	
GSFPS-2002			***6.24.2 Space-Ground Communications Performance***		
GSFPS-2678	GS Ktr	Base	The GS **shall** process a minimum of eight physical command configurations for each satellite.	Performance requirement ensures that at least 8 physical communications paths are available per satellite to cover multiple configurations, especially for LOR (several different ground network stations, plus WCDAS, plus RBU, etc.)	
GSFPS-2008	GS Ktr	Base	The GS **shall** process up to eight physical telemetry stream configurations for each satellite.	Performance requirement ensures that at least 8 physical communications paths are available per satellite to cover multiple configurations, especially for LOR (several different ground network stations, plus WCDAS, plus RBU, etc.)	
GSFPS-2013			***6.25 Spacecraft Navigation***		
GSFPS-2017	GS Ktr	Base	The GS **shall** perform spacecraft attitude determination consistent with the error tolerances defined in the GIRD.	Cites General Interfaces Requirements Document to establish the performance requirement for attitude determination.	
GSFPS-2019	GS Ktr	Base	The GS **shall** monitor spacecraft attitude determination and control data.	High-level requirement to monitor attitude determination and control to ensure satellite health and safety and to independently monitor onboard performance.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2021	GS Ktr	Base	The GS **shall** verify the performance of the spacecraft attitude control system and the accuracy of the onboard attitude estimate.	Ensures that the GS verifies the onboard attitude performance.	
GSFPS-2023	GS Ktr	Base	The GS **shall** plan and execute satellite attitude maneuvers.	Ensures the GS can plan maneuvers necessary for satellite operations.	
GSFPS-2025	GS Ktr	Base	The GS **shall** perform post-launch satellite sensor and actuator alignment determination.	Ensures the GS can perform attitude sensor misalignment determination in flight.	
GSFPS-2027	GS Ktr	Base	The GS **shall** perform determination of attitude sensor biases and sensor calibration parameters.	Ensures the GS can perform attitude sensor bias and cal parameter determination in flight.	
GSFPS-2029	GS Ktr	Base	The GS **shall** perform determination of attitude actuator performance parameters.	Ensures the GS can monitor attitude actuator performance.	
GSFPS-2031	GS Ktr	Base	The GS **shall** perform attitude control system calibration.	Ensures the GS can perform attitude control system calibration outside of sensors and actuators (e.g. determine parameters for state estimation tuning, etc.)	
GSFPS-2033			***6.26 Orbit Determination***		
GSFPS-2035	GS Ktr	Base	The GS **shall** acquire two-line orbital elements to support launch and orbit raising activities.	Enables the GS to use two-line element data (e.g., NORAD, DSN, or other ground networks).	
GSFPS-2037	GS Ktr	Base	The GS **shall** acquire and process measurement data for orbit determination, including raw range measurements, spacecraft instrument observations and engineering telemetry.	Ensures the GS uses both ground-source (including both GOES data and other network) range measurements and onboard data to perform OD.	
GSFPS-2039	GS Ktr	Base	The GS **shall** plan orbit station management activities and station relocation maneuvers.	Ensures orbit maneuver planning capability for stationkeeping and satellite relocation.	
GSFPS-2041	GS Ktr	Base	The GS **shall** plan and execute satellite orbit maintenance activities.	Ensures stationkeeping maneuver planning and execution.	
GSFPS-2043	GS Ktr	Base	The GS **shall** plan and execute orbit relocation activities to change the orbit of a satellite.	Ensures station change maneuver planning and execution.	
GSFPS-2045	GS Ktr	Base	The GS **shall** plan post-operational mission orbit raising disposal activities.	Ensures end of life orbit-raising maneuver planning.	
GSFPS-2047	GS Ktr	Base	The GS **shall** execute post-operational mission orbit raising disposal activities.	Ensures end of life orbit-raising maneuver execution.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2049	GS Ktr	Base	The GS **shall** determine the orbit of each satellite during each mission phase from transfer orbit injection by the launch vehicle through verification of the final post-mission orbit-raising maneuver.	Primary requirement for the GS to perform orbit determination from launch and orbit raising through end of life.	
GSFPS-3066	GS Ktr	Base	The GS **shall** plan orbital maneuvers and maneuver sequences such that maneuver plans may be reviewed 12 months in advance.	Performance requirement for 1 yr advance orbit maneuver planning to capture seasonal events (e.g., eclipse).	
GSFPS-3067	GS Ktr	Base	The GS **shall** model orbital maneuvers with an absolute accuracy of 5% deviation relative to the predicted and actual post-maneuver delta-V.	Performance requirement for orbit maneuver prediction accuracy. 5% is a reasonable upper bound based on state of practice.	Model is expected to be much better than 5%.
GSFPS-3068	GS Ktr	Base	The GS **shall** determine spacecraft orbit within 120 meters.	Performance requirement for absolute orbit determination accuracy. Based on GSFC Flight Dynamics state of practice.	
GSFPS-3206	GS Ktr	Base	The GS **shall** have the capability to perform Orbit and Attitude Determination using star and landmark data. *(CCR01506)*		
GSFPS-3069	GS Ktr	Base	The GS **shall** quantify the performance of the GS orbit determination estimate relative to the onboard orbit estimate.	Ensures that the GS can use its orbit determination solution to compare to the onboard solution. Provide indication of onboard orbit estimate quality.	
GSFPS-3070	GS Ktr	Base	The GS **shall** perform spacecraft thruster calibration for the purpose of maneuver planning and propellant management.	Ensures that the GS maneuver planning process can calibrate thruster efficiency and track propellant resources.	
GSFPS-2051			***6.27 Level 0 Processing***		
GSFPS-2055	GS Ktr	Base	The GS **shall** ingest pre-processed instrument observation data.	Fundamental requirement to ingest data produced in the raw data pre-processing step.	
GSFPS-2057	GS Ktr	Base	The GS **shall** process pre-processed instrument observation data by virtual channel.	Ensures that pre-processed ingested data are sorted by the assigned instrument Virtual Channel (VC) .	
GSFPS-2066	GS Ktr	Base	The GS **shall** create L0 data.	High-level requirement to produce Level 0 data. Includes the ingest from the IF interface, removal of communications artifacts, and reconstruction of CCSDS Transfer Frame data zone contents into original instrument CCSDS Space Packets.	
GSFPS-2070	GS Ktr	Base	The GS **shall** monitor and report effective data compression yields.	Ensures that data compression in the L0 conversion process are monitored and reported. Knowledge of data compression yield allows the GS to monitor bandwidth utilization and efficiency. Each individual instrument CCSDS Space Packet data zone can be lossless compressed.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3110	GS Ktr	Base	The GS **shall** allow the operator to retrieve, display, and export reports of effective compression yields.	Ensures that compression yield data are available to operators.	
GSFPS-2525	GS Ktr	Base	The GS **shall** extract Instrument Calibration Data from the L0 data set (for 7-day storage and GS mission-life storage).	Ensures that Instrument Calibration Data (defined in GSFPS-2959) are available for monitoring and trending functions within the GS. These will be stored within the 7-day storage to make available locally to cal/val team (without having to go to CLASS).	
GSFPS-2080	GS Ktr	Base	The GS **shall** create L0 product metadata that includes an accounting of uncorrectable errors in the data.	Ensures that errors in the Level 0 process are recorded in metadata for use in downstream processing. Errors in the L0 data occur due to corrupted CCSDS Transfer Frames either not received (time gaps due to link loss) or not corrected as indicated by the link FEC coding.	
GSFPS-2082	GS Ktr	Base	The GS **shall** make L0 product metadata available for downstream processing.	Ensures that Level 0 metadata are available for use in L1b and higher processing.	
GSFPS-2090			***6.28 Mission Management Storage***		
GSFPS-2094	GS Ktr	Base	The GS **shall** store each copy of the satellite flight software (spacecraft and instrument) for the life of the mission.	Ensures that a complete record of the FSW images are archived over the life of the mission. Stored locally as part of configuration management function.	
GSFPS-3112	GS Ktr	Base	The GS **shall** have the capability to retrieve, display, export, and store for the life of the mission operator-selected data from the 5-day revolving temporary storage.	Allows operators the ability to select information to be stored for the life of the mission (rather than just 5 days) to ensure information is available to maintain the health and status of the GOES-R spacecraft for the life of the mission.	
GSFPS-2096	GS Ktr	Base	The GS **shall** have the capability to retrieve 5-day revolving temporary storage data by selected time periods.	Ensures that subsets of the Transfer Frame data may be accessed by time to more efficiently access the data.	
GSFPS-2769	GS Ktr	Base	The GS **shall** be capable of replaying transfer frames from the 5-day revolving temporary storage back as a separate virtual satellite flow.	The operational environment must interface with the 5-day raw data store, receive data, and emulate operational data flows, distinct from other live and simulated data sources.	
GSFPS-2098	GS Ktr	Base	The GS **shall** allow copying selected data from the 5-day revolving temporary storage to removable media.	Ensures that the Transfer Frame data may be exported for transfer or analysis.	
GSFPS-2103	GS Ktr	Base	The GS **shall** capture and store Transfer Frames in the 5-day revolving temporary storage.	Fundamental requirement for the preprocessed raw data Transfer Frames to be stored in 5-day storage. Supports anomaly resolution and replay for the Dev and I&T Environments.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2826			***6.28.1 Raw Data Recorder***		
GSFPS-2873	GS Ktr	Base	The GS **shall** provide a standalone recorder for site specific data capture of instrument and spacecraft data streams.	Raw data recording is needed to capture data from a raw data source at any location where such data is generated for purposes of playback through the GS, testing, etc.	The RDR can interface to the Dev, I&T, and operational environment for the purposes of playback.
GSFPS-2874	GS Ktr	Base	The recorder **shall** accept the baseband data signal from the spacecraft and instruments.	Needed to support raw data recording.	
GSFPS-2875	GS Ktr	Base	The recorder **shall** be able to simultaneously record individual satellite telemetry and instrument data streams.	Needed to support raw data recording.	
GSFPS-2876	GS Ktr	Base	The GS **shall** provide a standalone recorder for site specific data playback of instrument and spacecraft data streams.	Needed to support raw data playback.	
GSFPS-2877	GS Ktr	Base	The input of the recorder **shall** be compliant with the applicable data stream ICD.	Needed to support raw data recording.	
GSFPS-2878	GS Ktr	Base	The output of the recorder **shall** be compliant with the applicable data stream ICD.	Needed to support raw data playback.	
GSFPS-2879	GS Ktr	Base	The recorder **shall** be portable/transportable.	Data recorded (e.g., at the spacecraft factory) needs to be played back (e.g., at a GS site).	
GSFPS-2880	GS Ktr	Base	The recorder **shall** have removable commercial off-the-shelf media and drive units.	Avoids proprietary hardware or media types.	
GSFPS-2881	GS Ktr	Base	The recorder media **shall** be compatible, interchangeable, and easily movable between multiple instances of the recorder.	Ensures that data can be transferred between recorders.	
GSFPS-2882	GS Ktr	Base	The recorder **shall**, at operator direction, export/replicate designated data sets on compatible media.	Needed to support raw data recording and playback.	
GSFPS-2883	GS Ktr	Base	The recorder **shall** capture all bits received, including data containing bit errors.	Needed to support raw data recording and playback.	
GSFPS-2884	GS Ktr	Base	The recorder **shall** playback all the bits received, replicating the stream and including reproducing data which includes bit errors.	The bit errors are kept to enable system testing against flawed data.	
GSFPS-2885	GS Ktr	Base	The recorder **shall** output at baseband.	Needed to support raw data playback.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2886	GS Ktr	Base	The recorder **shall** be configurable to record for an operator specified interval(s) totaling at least 72 hours over the period of a week.	Defines sizing needed for recorder.	
GSFPS-2887	GS Ktr	Base	The recorder **shall** be configurable to playback for an operator specified interval(s) totaling at least 72 hours over the period of a week.	Defines sizing needed for recorder.	
GSFPS-2888	GS Ktr	Base	The recorder **shall** record data for 72 continuous hours when so configured by the operator with no breaks in the captured data stream.	Needed to support raw data recording.	
GSFPS-2889	GS Ktr	Base	The recorder **shall** playback data for 72 continuous hours when so configured by the operator with no breaks in the playback output.	Needed to support raw data playback.	
GSFPS-2890	GS Ktr	Base	The recorder **shall** time-stamp the data as it is recorded to a one second resolution.	Needed to support raw data recording and playback.	
GSFPS-2891	GS Ktr	Base	During replay the recorder **shall** make available the timestamps of the data to a one second resolution.	Needed to support raw data recording and playback.	
GSFPS-2892	GS Ktr	Base	The recorder **shall**, at operator direction, synchronize its time clock to the GS reference source.	Needed to support raw data recording and playback.	
GSFPS-2893	GS Ktr	Base	The recorder **shall** have operator selectable "off-line" mode (e.g., for operator interactive activities of set-up and configuration, or for selection of a pre-defined set-up/configuration).	Needed to support raw data recording and playback.	
GSFPS-2894	GS Ktr	Base	The recorder **shall** accept operator configurable starting point (e.g., time of day, time of year) and data stream(s) for both recording and playback.	Needed to support raw data recording and playback.	
GSFPS-2895	GS Ktr	Base	The recorder **shall** save operator defined set-ups and configurations, as designated by the operator, for future use by the operator.	Needed to support raw data recording and playback.	
GSFPS-2896	GS Ktr	Base	The recorder **shall** include a user interface, which can be used to fully control all record and playback operations from computers networked to the recorder.	Needed to support raw data recording and playback.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2898	GS Ktr	Base	The recorder **shall** display its status to the operator, including real-time, record-time/playback-time, and configuration.	Needed to support raw data recording and playback.	
GSFPS-2899	GS Ktr	Base	The recorder **shall** uniquely identify each volume of media on which it records data.	Needed to support raw data recording and playback.	
GSFPS-2900	GS Ktr	Base	The recorder **shall** maintain a directory of the media identifier and the contents of each recorded volume of data.	Needed to support raw data recording and playback.	
GSFPS-2901	GS Ktr	Base	The recorder **shall** append the medium identifier and the directory of contents of each recorded volume of data, as part of the information on each item of media.	Needed to support raw data recording and playback.	
GSFPS-2902	GS Ktr	Base	The recorder **shall** read the medium identifier and the content directory of all media loaded on it.	Needed to support raw data recording and playback.	
GSFPS-2903	GS Ktr	Base	The recorder **shall** display the medium identifier and the directory of contents of media known to it.	Needed to support raw data recording and playback.	
GSFPS-2904	GS Ktr	Base	The recorder **shall** be configurable by the operator to accept external electronic triggers to start/stop recording.	Needed to support raw data recording and playback.	
GSFPS-2527			***6.29 Calibration Scheduling***		
GSFPS-2528	GS Ktr	Base	The GS **shall** permit automated planning and scheduling of routine radiometric calibration activities for ABI, using defined ABI modes.	Permits automation of GS scheduling of routine instrument calibration activities. Automated planning and scheduling is necessary to reduce operator workload for routine activities.	
GSFPS-2529	GS Ktr	Base	The GS **shall** permit automated planning and scheduling of special radiometric calibration activities for ABI, using defined ABI modes.	Permits automation of GS scheduling of special instrument calibration activities. Automated planning and scheduling is necessary to reduce operator workload for these activities.	
GSFPS-2530	GS Ktr	Base	The GS **shall** permit automated planning and scheduling of ABI lunar and stellar observations to allow long-term calibration drift measurement and correction.	Permits automation of GS scheduling of special instrument calibration activities such as lunar and start looks for the long-term visible calibration drift monitoring. Automated planning and scheduling is necessary to reduce operator workload for these activities.	
GSFPS-2531	GS Ktr	Base	The GS **shall** permit automated planning and scheduling of routine instrument calibration activities for GLM, using defined GLM modes.	Permits GS scheduling of routine instrument calibration activities. Automated planning and scheduling is necessary to reduce operator workload for routine activities.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2532	GS Ktr	Base	The GS **shall** permit automated planning and scheduling of routine radiometric calibration activities for Solar Ultraviolet Imager (SUVI), using defined SUVI modes.	Permits GS scheduling of routine instrument calibration activities. Automated planning and scheduling is necessary to reduce operator workload for routine activities.	
GSFPS-2533	GS Ktr	Base	The GS **shall** permit automated planning and scheduling of long-term radiometric performance monitoring activities for SUVI, employing routine electronic calibration measurements, internal sources, and the sun, and using defined SUVI modes.	Permits GS scheduling of routine instrument calibration activities. Automated planning and scheduling is necessary to reduce operator workload for routine activities.	
GSFPS-2534	GS Ktr	Base	The GS **shall** permit automated planning and scheduling of routine radiometric calibration activities for Extreme ultraviolet and X-ray Irradiance Sensor (EXIS), using defined EXIS modes.	Permits GS scheduling of routine instrument calibration activities. Automated planning and scheduling is necessary to reduce operator workload for routine activities.	
GSFPS-2535	GS Ktr	Base	The GS **shall** permit automated planning and scheduling of long-term radiometric performance monitoring activities for EXIS, employing routine electronic calibration measurements, internal sources, and the sun, and using defined EXIS modes.	Permits GS scheduling of routine instrument calibration activities. Automated planning and scheduling is necessary to reduce operator workload for routine activities.	
GSFPS-2536	GS Ktr	Base	The GS **shall** permit automated planning and scheduling of long-term performance trending for Space Environment In Situ Suite (SEISS), from routine electronic calibration using defined SEISS modes.	Permits GS scheduling of routine instrument calibration activities. Automated planning and scheduling is necessary to reduce operator workload for routine activities.	
GSFPS-2537	GS Ktr	Base	The GS **shall** permit automated planning and scheduling of long-term performance trending for SEISS using defined SEISS modes.	Permits GS scheduling of routine instrument calibration activities. Automated planning and scheduling is necessary to reduce operator workload for these activities.	
GSFPS-2106			**7 PRODUCT GENERATION REQUIREMENTS**		
GSFPS-2538			***7.1 Overview***		
GSFPS-2539			Section 7 specifies the Product Generation (PG) function of the GOES-R Series GS.		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2108			***7.2 Operational View***		
GSFPS-2110			The PG function includes the generation of L1b and L2+ products from each GOES-R Series operational satellite on a continuous basis, meeting the applicable product latency requirements. Using the L1b and some L2+ output, the PG function also will create the GRB data set for rebroadcast by the GOES-R satellites and the eGVAR data set for rebroadcast by the GOES-N/O/P Ground System.		
GSFPS-2132			***7.3 Product Generation***		
GSFPS-2136	GS Ktr	Base	The GS **shall** produce all End-Products identified in GS Product Sets 1 and 2 in accordance with Appendix A, Table 1 using the Government-supplied algorithms.	Ensures that all identified end products are produced in product sets 1 and 2 in the base contract for the GS contractor development based on Government-provided algorithms. Appendix A, Table 1 includes performance parameters for each product such as latency and refresh and provides performance boundaries for each product.	Any limitations and assumptions associated with the Government-supplied algorithms will be documented in the Algorithm Theoretical Basis Documents.
GSFPS-2953	GS Ktr	0001	The GS **shall** produce all End-Products identified in GS Product Sets 1 and 2 in accordance with Appendix D using the Government-supplied algorithms.	Ensures that all identified end products are produced based on Government-provided algorithms in product sets 1 and 2 if Option 1 is exercised for the GS contractor development. Appendix D includes performance parameters for each product, as in Appendix A, but with improved latency and increased refresh rate and provides performance boundaries for each product.	Assumed that Option 1 is exercised before Option 2, but the Options can be exercised in any order.Any limitations and assumptions associated with the Government-supplied algorithms will be documented in the Algorithm Theoretical Basis Documents.
GSFPS-2540	GS Ktr	0002	The GS **shall** process all End-Product sets identified in GS Product Set 3 as listed in Appendix A, Table 3 using the Government-supplied algorithms.	Ensures that all identified end products are produced in product set 3 if Option 2 is exercised for the GS contractor development based on Government-provided algorithms. Appendix A, Table 3 includes performance parameters for each product in Product Sets 3 and 4 such as latency and refresh and provides performance boundaries for each product.	Any limitations and assumptions associated with the Government-supplied algorithms will be documented in the Algorithm Theoretical Basis Documents.
GSFPS-2541	GS Ktr	0002	The GS **shall** produce all End-Product sets identified in GS Product Set 4 in accordance with Appendix A, Table 3 using the Government-supplied algorithms.	Ensures that all identified end products are produced in product set 4 if Option 2 is exercised for the GS contractor development based on Government-provided algorithms. Appendix A, Table 3 includes performance parameters for each product in Product Sets 3 and 4 such as latency and refresh and provides performance boundaries for each product.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3149			The GS will produce products in NetCDF (currently version 4) and McIDAS for Atmosphere, Land, and Ocean Products, and NetCDF (currently version 4) and FITS for Space Products.		
GSFPS-3156	AWG		The L2+ algorithms **shall** yield Atmospheric, Ocean, and Land End-Products listed in the associated product table, preserving the Geographic Coverage Areas of the data provided by the instruments, subject to the Product Qualifiers Table in Appendix A.	Ensures that the L2+ algorithms provided by the AWG for Atmospheric, Ocean, and Land end-products (as described in Appendix A) are developed to properly produce those products according to the Geographic Coverage Areas specified for each product, subject to the Product Qualifiers Table included in Appendix A in order to be operationalized by the GS contractor. This also ensures that the AWG-developed algorithms will not degrade any of the Geographic Coverage Areas output from previous processing.	
GSFPS-2152	AWG		The L2+ algorithms **shall** yield Atmospheric, Ocean, and Land End-Products meeting the following End-Product Performance Parameters as listed in the associated product table and subject to the Product Qualifiers Table in Appendix A: a) Product Vertical Resolution b) Product Horizontal Resolution at nadir c) Product Mapping Accuracy at nadir d) Product Measurement Range e) Product Measurement Accuracy f) Product Measurement Precision	Ensures that the L2+ algorithms provided by the AWG for Atmospheric, Ocean, and Land end-products (as described in Appendix A) are developed to properly produce those products, subject to the Product Qualifiers Table included in Appendix A, in order to be operationalized by the GS contractor. This also ensures that the algorithms produced by the AWG will meet applicable product performance parameters as listed in Appendix A, Table 1, Appendix A, Table 3, and Appendix D.	
GSFPS-3100			The Government will provide L1b algorithms that define the method of processing instrument sensor data used to generate Atmospheric, Ocean, and Land End-Products meeting the following End-Product Performance Parameters as listed in the associated product table and subject to the Product Qualifiers Table in Appendix A: a) Geographic Coverage Area b) Product Vertical Resolution c) Product Horizontal Resolution at nadir d) Product Mapping Accuracy at nadir e) Product Measurement Range f) Product Measurement Accuracy g) Product Measurement Precision		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3194			The Government will provide algorithms that define the method of processing L1b data to generate L2+ Atmospheric, Ocean, and Land End-Products that meet the following End-Product Performance Parameters as listed in the associated product table, subject to the Product Qualifiers Table in Appendix A: a) Geographic Coverage Area b) Product Vertical Resolution c) Product Horizontal Resolution at nadir d) Product Mapping Accuracy at nadir e) Product Measurement Range f) Product Measurement Accuracy g) Product Measurement Precision		
GSFPS-3182			The Government will provide L2+ algorithms that define the method of processing instrument sensor data used to generate Atmospheric, Ocean, and Land End-Products for Lightning Detection that meet the following End-Product Performance Parameters as listed in the associated product table and subject to the Product Qualifiers Table in Appendix A: a) Geographic Coverage Area b) Product Vertical Resolution c) Product Horizontal Resolution at nadir d) Product Mapping Accuracy at nadir e) Product Measurement Range f) Product Measurement Accuracy g) Product Measurement Precision		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2164			The Government will provide L1b algorithms that define the method of processing instrument sensor data used to generate Space Weather End-Products meeting the following End-Product Performance Parameters as listed in the associated product table and subject to the Product Qualifiers Table in Appendix A: a) Product Orthogonality / Coverage Areas b) Product Horizontal/Angular Resolution c) Product Pointing/Mapping Uncertainty d) Product Measurement Range e) Product Measurement Accuracy f) Product Measurement Precision		
GSFPS-2150	GS Ktr	Base	The GS **shall** generate the L1b Atmospheric, Ocean, and Land End-Products listed in the associated product table, using the government supplied algorithms, preserving the Geographic Coverage Areas of the data provided by the instrument, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L1b algorithms provided by the Government) for Atmospheric, Ocean, and Land end-products (as described in Appendix A) is developed to properly produce those products within the constraints required in the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will not degrade any of the Geographic Coverage Areas of the data provided by the instruments.	
GSFPS-3171	GS Ktr	Base	The GS **shall** generate L1b Atmospheric, Ocean, and Land End-Products preserving the following End-Product Performance Parameters produced by the government-provided algorithm as listed in the associated product table and subject to the Product Qualifiers Table in Appendix A: a) Product Vertical Resolution b) Product Horizontal Resolution at nadir c) Product Mapping Accuracy at nadir d) Product Measurement Range e) Product Measurement Accuracy f) Product Measurement Precision	Ensures that the GS contractor-developed operationalized code (derived from the L1b algorithms provided by the Government) for Atmospheric, Ocean, and Land end-products (as described in Appendix A) is developed to properly produce L1b products within the constraints required in the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code produced will meet applicable product performance parameters as listed in Appendix A, Table 1.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2776	GS Ktr	Base	The GS **shall** generate L1b Atmospheric, Ocean, and Land End-Products meeting the Product Refresh / Coverage Time for each non-diagnostic instrument mode using the government-supplied algorithms listed in Table 1 Appendix A, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L1b algorithms provided by the Government) for Atmospheric, Ocean, and Land end-products (as described in Appendix A, Table 1) is developed to properly produce L1b end-products (subject to the constraints of the Product Qualifiers Table included in Appendix A). This also ensures that the operationalized code will meet the product refresh/coverage time (also described in Appendix A, Table 1) for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.
GSFPS-2777	GS Ktr	0001	The GS **shall** generate L1b Atmospheric, Ocean, and Land End-Products meeting the Product Refresh / Coverage Time for each non-diagnostic instrument mode using the government-supplied algorithms listed in Appendix D, subject to the Product Qualifiers Table in Appendix A. *(CCR01288)*	Ensures that the GS contractor-developed operationalized code derived from the L1b algorithms provided by the Government for Atmospheric, Ocean, and Land end-products (as described in Appendix D) are developed to properly produce product sets 1 and 2 within the constraints required in the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will meet the improved product refresh/coverage time described in Appendix D for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.
GSFPS-3183	GS Ktr	Base	The GS **shall** generate L1b Atmospheric, Ocean, and Land End-Products meeting the Vendor Allocated Ground Latency (VAGL) for each non-diagnostic instrument mode using the government-supplied algorithms listed in Table 1 Appendix A, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L1b algorithms provided by the Government) for Atmospheric, Ocean, and Land end-products (as described in Appendix A, Table 1) is developed to properly produce product sets 1 and 2 subject to the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will meet the product vendor allocated ground latency (also described in Appendix A, Table 1) for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.
GSFPS-3184	GS Ktr	0001	The GS **shall** generate L1b Atmospheric, Ocean, and Land End-Products meeting the VAGL for each non-diagnostic instrument mode using the government-supplied algorithms listed in Table 1 Appendix D, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L1b algorithms provided by the Government) for Atmospheric, Ocean, and Land end-products (as described in Appendix D) is developed to properly produce product sets 1 and 2 subject to the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will meet the product vendor allocated ground latency (also described in Appendix D) for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3169	GS Ktr	Base	The GS **shall** generate L1b Space Weather End-Products listed in the associated product table, preserving the Product Orthogonality/ Coverage of the data provided by the instrument, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L1b algorithms provided by the Government) for Space Weather end-products (as described in Appendix A) is developed to properly produce those products. This also ensures that the operationalized code will not degrade any of the Product Orthogonality/Coverage Areas of the data provided by the instruments.	
GSFPS-3174	GS Ktr	Base	The GS **shall** generate L1b Space Weather End-Products preserving the following End-Product Performance Parameters produced by the government-provided algorithm as listed in the associated product table and subject to the Product Qualifiers Table in Appendix A: a) Product Horizontal/Angular Resolution b) Product Pointing/ Mapping Accuracy c) Product Pointing Knowledge / Mapping Uncertainty d) Product Measurement Range e) Product Measurement Accuracy f) Product Measurement Precision	Ensures that the GS contractor-developed operationalized code (derived from the L1b algorithms provided by the Government) for Space Weather end-products (as described in Appendix A) is developed to properly produce product sets 1 and 2. This also ensures that the operationalized code produced will meet applicable product performance parameters as listed in Appendix A, Table 1.	
GSFPS-3186	GS Ktr	Base	The GS **shall** generate L1b Space Weather End-Products meeting the Product Refresh / Coverage Time for each non-diagnostic instrument mode using the government-supplied algorithms listed in Table 1 Appendix A, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L1b algorithms provided by the Government) for Space Weather end-products (as described in Appendix A, Table 1) is developed to properly produce product sets 1 and 2 subject to the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will meet the product refresh/coverage time (also described in Appendix A, Table 1) for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.
GSFPS-3187	GS Ktr	Base	The GS **shall** generate L1b Space Weather End-Products meeting the VAGL for each non-diagnostic instrument mode using the government-supplied algorithms listed in Table 1 Appendix A, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L1b algorithms provided by the Government) for Space Weather end-products (as described in Appendix A, Table 1) is developed to properly produce product sets 1 and 2 subject to the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will meet the product vendor allocated ground latency (also described in Appendix A, Table 1) for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2721	GS Ktr	Base	The GS **shall** generate L2+ Atmospheric, Ocean, and Land End-Products preserving the following End-Product Performance Parameters produced by the government-provided algorithm as listed in the associated product table and subject to the Product Qualifiers Table in Appendix A: a) Geographic Coverage Areas b) Product Vertical Resolution c) Product Horizontal Resolution at nadir d) Product Mapping Accuracy at nadir e) Product Measurement Range f) Product Measurement Accuracy g) Product Measurement Precision	Ensures that the GS contractor-developed operationalized code (derived from the L2+ algorithms provided by the Government) for Atmospheric, Ocean, and Land end-products (as described in Appendix A) is developed to properly produce those products subject to the Product Qualifiers Table included in Appendix A. This also ensures that the operational code produced will meet applicable product performance parameters as listed in Appendix A, Table 1.	
GSFPS-3188	GS Ktr	Base	The GS **shall** generate L2+ Atmospheric, Ocean, and Land End-Products meeting the Product Refresh / Coverage Time for each non-diagnostic instrument mode using the government-supplied algorithms listed in Table 1 Appendix A, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L2+ algorithms provided by the Government) for Atmospheric, Ocean, and Land end-products (as described in Appendix A, Table 1) is developed to properly produce product sets 1 and 2 subject to the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will meet the product refresh/coverage time (also described in Appendix A, Table 1) for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.
GSFPS-3189	GS Ktr	0001	The GS **shall** generate L2+ Atmospheric, Ocean, and Land End-Products meeting the Product Refresh / Coverage Time for each non-diagnostic instrument mode using the government-supplied algorithms listed in Table 1 Appendix D, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L2+ algorithms provided by the Government) for Atmospheric, Ocean, and Land end-products (as described in Appendix D, Table 1) is developed to properly produce product sets 1 and 2 subject to the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will meet the product refresh/coverage time (also described in Appendix D, Table 1) for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.
GSFPS-3190	GS Ktr	0002	The GS **shall** generate L2+ Atmospheric, Ocean, and Land End-Products meeting the Product Refresh / Coverage Time for each non-diagnostic instrument mode using the government-supplied algorithms listed in Table 3 Appendix A, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L2+ algorithms provided by the Government) for Atmospheric, Ocean, and Land end-products (as described in Appendix A, Table 3) is developed to properly produce all product sets subject to the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will meet the product refresh/coverage time (also described in Appendix A, Table 3) for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3191	GS Ktr	Base	The GS **shall** generate L2+ Atmospheric, Ocean, and Land End-Products meeting the VAGL for each non-diagnostic instrument mode using the government-supplied algorithms listed in Table 1 Appendix A, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L2+ algorithms provided by the Government) for Atmospheric, Ocean, and Land end-products (as described in Appendix A, Table 1) is developed to properly produce product sets 1 and 2 subject to the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will meet the product vendor allocated ground latency (also described in Appendix A, Table 1) for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.
GSFPS-3192	GS Ktr	0001	The GS **shall** generate L2+ Atmospheric, Ocean, and Land End-Products meeting the VAGL for each non-diagnostic instrument mode using the government-supplied algorithms listed in Table 1 Appendix D, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L2+ algorithms provided by the Government) for Atmospheric, Ocean, and Land end-products (as described in Appendix D, Table 1) is developed to properly produce product sets 1 and 2 subject to the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will meet the product vendor allocated ground latency (also described in Appendix D, Table 1) for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.
GSFPS-3193	GS Ktr	0002	The GS **shall** generate L2+ Atmospheric, Ocean, and Land End-Products meeting the VAGL for each non-diagnostic instrument mode using the government-supplied algorithms listed in Table 3 Appendix A, subject to the Product Qualifiers Table in Appendix A.	Ensures that the GS contractor-developed operationalized code (derived from the L2+ algorithms provided by the AWG) for Atmospheric, Ocean, and Land end-products (as described in Appendix A, Table 3) is developed to properly produce all product sets subject to the Product Qualifiers Table included in Appendix A. This also ensures that the operationalized code will meet the product vendor allocated ground latency (also described in Appendix A, Table 3) for each non-diagnostic instrument mode.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A-D parameters.
GSFPS-2758	GS Ktr	Base	The GS **shall** generate End-Products based on the Government-provided Algorithm Packages such that the comparison of GS test data outputs and AWG test data outputs yields reproducibility based on squared correlation coefficient (r-squared) between these two of at least 0.9995 with no more than 1% of the compared values having error greater than 0.15% from the AWG-provided value for the given data point.	Ensures that the output of the GS implementation of the end-product algorithms yield the same result as the AWG implementation of the algorithms. Any r^2 value simply describes the correlation of the data and allows for very large individual sample errors -- particularly in large datasets. The 1% qualifier helps to set an upper bound on the number of outliers in the generated data.	The requirement will be verified when the GS algorithm output matches the output of the AWG-developed code within the parameters defined in this requirement.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3129	GS Ktr	Base	The GS **shall** refresh sectorized products in accordance with Appendix E.	Section E defines a stressing case of sectorized products. This ensures that the Appendix E requirements under that stressing case can be met (i.e., that the system is sized appropriately). The system will be configured to meet operational requirements for sectorized products after GS acceptance.	The stressing case covers today's GINI output plus a representative set of NWS products.
GSFPS-2148	GS Ktr	Base	The GS **shall** monitor and report all end-product performance parameter compliance.	Allows the capability to supervise PG end-product performance parameter conformance/compliance against Appendix A-E parameters locally and provide a reporting function for all identified status/error data. Monitoring of PG functions is needed to ensure system performance.	This also allows generation of status messages that can be forwarded on to EM.
GSFPS-2542	GS Ktr	Base	The GS **shall** store end-product performance parameters for the life of the mission.	Enables historical analysis/trending of PG performance.	
GSFPS-2543	GS Ktr	Base	The GS **shall** forward the end-product performance parameters report to EM.	Sends PG end-product performance parameter conformance/compliance events for use and analysis by the Enterprise Management element. Enables centralized EM supervision.	
GSFPS-1434	GS Ktr	Base	The GS **shall** collect and report to EM performance measures at a level of detail sufficient to assess the margin on a per-process and per-product basis for product latency and refresh.	Ensures that the performance measures will be collected at a level granular enough to allow each product and process to be analyzed against required latency and refresh requirements to identify and isolate potential anomalies. Margin is the difference between actual performance and requirements.	
GSFPS-2180	GS Ktr	Base	The GS **shall** monitor and report all end-product performance parameters listed in the Appendix A end-product Table.	Allows the capability to supervise PG end-product performance parameters and to provide a reporting function for all identified status/error data. Monitoring of PG functions is needed to ensure system performance within the bounds of Appendix A.	
GSFPS-2205			The KPPs consist of: cloud and moisture imagery: CONUS, Full Disk, and Mesoscale, and sectorized products. The performance and quality constraints for CONUS, Full Disk, and Mesoscale KPP end-products are defined in Appendices A through D. The GS performance requirements with respect to sectorized products are defined in Appendix E.		
GSFPS-2215			***7.4 Metadata Generation***		
GSFPS-3168			The GS Data Management Plan [G417-R-PLN-0131] provides guidelines for GOES-R metadata.		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2217	GS Ktr	Base	The GS **shall** generate metadata describing completeness of input, identifying content outliers, and documenting the UTC time of completion of production for each L1b and L2+ data product.	Ensures that product processing history is captured in the metadata record for user processing, downstream processing, data categorization and access, etc. to be able to identify, evaluate, extract, employ and manage the data and data products from GOES-R.	
GSFPS-2928	GS Ktr	Base	The GS **shall** generate metadata that provides sufficient information at all levels of data granularity to be able to identify, evaluate, extract, employ and manage the data and data products from GOES-R.	High-level requirement to generate metadata at various steps in the data flow.	
GSFPS-2219	GS Ktr	Base	The GS **shall** generate metadata that contains all mandatory attributes and relevant optional attributes of the ISO 19115 - Metadata standard.	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	
GSFPS-2929	GS Ktr	Base	The GS **shall** generate metadata that is compliant with ISO 19115-2 - Geographic Information - Metadata - Part 2: Extensions for imagery and gridded data.	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	
GSFPS-3073	GS Ktr	Base	The GS **shall** generate metadata that is compliant with ISO/TR 19121 - Geographic Information - Imagery and Gridded Data.	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	
GSFPS-2793	GS Ktr	Base	The GS **shall** generate metadata compliant with FGDC standards.	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	
GSFPS-2794	GS Ktr	Base	The GS **shall** generate metadata that is compliant with ISO 19130 - Sensor and data model for imagery and gridded data (includesSensorML).	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	
GSFPS-2930	GS Ktr	Base	The GS **shall** generate metadata that is compliant with ISO 19136 - Geography Markup Language (GML).	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	
GSFPS-2931	GS Ktr	Base	The GS **shall** generate metadata that is compliant with ISO 19138 - Data quality measures.	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2932	GS Ktr	Base	The GS **shall** generate metadata that is compliant with ISO 19139 - Metadata - XML Schema Implementation.	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	
GSFPS-3074	GS Ktr	Base	The GS **shall** generate metadata that is compliant with ISO 6709 Standard representation of latitude, longitude and altitude for geographic point locations.	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	
GSFPS-3196	GS Ktr	Base	The GS **shall** generate metadata that is compliant with ISO 19109 - Geographic information -- Rules for Application Schema. *(CCR01285)*	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	
GSFPS-3195	GS Ktr	Base	The GS **shall** generate metadata that is compliant with ISO 19113 - Geographic information -- Quality principles. *(CCR01285)*	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	
GSFPS-3197	GS Ktr	Base	The GS **shall** generate metadata that is compliant with ISO 19114 - Geographic information -- Quality evaluation procedures. *(CCR01285)*	Ensures that sufficient guidelines are provided to the GS Contractor for metadata generation. The metadata model is a CDRL item for the contractor and this standard needs to be adhered to.	
GSFPS-2933	GS Ktr	Base	The GS **shall** generate metadata that includes metadata attributes that are generated by current legacy GOES products.	Ensures that the metadata model generated by the GS Contractor includes all metadata elements currently collected on GOES I-M and N-P products to support legacy processing capabilities and systems.	
GSFPS-2934	GS Ktr	Base	The GS **shall** generate metadata that supports anomaly recognition.	Ensures that metadata relating to anomalies or errors generated either during the process of data acquisition or during processing are captured in the GS Contractor generated metadata model.	
GSFPS-2935	GS Ktr	Base	The GS **shall** generate metadata that supports operational quality assessment.	Downstream quality assessment relies on information captured in the metadata.	
GSFPS-2936	GS Ktr	Base	The GS **shall** generate metadata that supports operational applications and decision support systems.	Enables operational use of metadata. Applications and decision support systems rely on information captured in the metadata.	
GSFPS-2937	GS Ktr	Base	The GS **shall** generate metadata that supports scientific use including information that is necessary for discipline area and interdisciplinary studies.	Information captured in the metadata is needed for scientific use of GOES-R data.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2938	GS Ktr	Base	The GS **shall** generate metadata that supports long term preservation, including information necessary to identify the data in the long-term future and to sufficiently characterize that data so that it can be used in climatological science to construct a climate record.	Ensures that metadata model produced by the GS Contractor includes elements required for describing support for long term preservation, such as product data formats and associated applications that can read and/or process these data formats.	
GSFPS-2939	GS Ktr	Base	The GS **shall** generate metadata using a model that is extensible.	Ensures that the metadata model generated by the GS Contractor allows for the inclusion and deletion of metadata elements.	
GSFPS-2795	GS Ktr	Base	The GS **shall** generate metadata files that include data provenance.	Ensures that metadata related to the process of tracing the origin of data and its movement between processing levels is collected.	
GSFPS-2940	GS Ktr	Base	The GS **shall** generate metadata needed for archival and stewardship.	Archive and data stewardship rely on information captured in the metadata rather than having to look within the data file itself.	Metadata needs will be captured in the Data Submission Agreements.
GSFPS-2941	GS Ktr	Base	The GS **shall** generate metadata required for data reprocessing.	Data reprocessing rely on information captured in the metadata rather than having to look within the data file itself.	
GSFPS-2942	GS Ktr	Base	The GS **shall** generate metadata required for real-time processing and use by NWS.	Ensures that the NWS metadata requirements are taken into account by the GS Contractor when the metadata model is formulated.	
GSFPS-2943	GS Ktr	Base	The GS **shall** generate metadata required for processing and use by OSDPD.	Ensures that the OSDPD metadata requirements are taken into account by the GS Contractor when the metadata model is formulated.	
GSFPS-3094	GS Ktr	Base	The GS **shall** create end-product attribute reports.	End-product attributes are metadata that describe the end-products. Reports on these products are needed for data management.	
GSFPS-2221			***7.5 Product Generation Supervision***		
GSFPS-2223	GS Ktr	Base	The GS **shall** monitor and report PG status.	Allows the capability to supervise PG operations and status locally and provide a reporting function for all identified status data. This also allows generation of status messages that can be forwarded on to EM.	
GSFPS-2225	GS Ktr	Base	The GS **shall** notify operators of data and product anomalies.	Ensures that the PG element will have the capability to automatically report anomalies directly to the operator on console so the operators have the ability to respond.	
GSFPS-3205	GS Ktr	Base	The GS **shall** have the capability to visually display any GOES-R product or intermediate product. *(CCR01506)*		
GSFPS-2229	GS Ktr	Base	The GS **shall** enable operations analyses of anomalous conditions.	Provides a general capability to detect, isolate, and analyze PG anomalies to support system operations and monitor product quality.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2231	GS Ktr	Base	The GS **shall** manage anomaly investigation reports in a database for the life of the mission.	Assists in disseminating anomaly information (cause, mitigation, etc.), so stakeholders and other space asset managers can make informed decisions regarding anomalies, other potential anomalies, and potentially reduce the impact of future anomalies.	Will be managed in CMART.
GSFPS-2544	GS Ktr	Base	The GS **shall** capture event messages of PG events.	Allows operators to evaluate/review all product generation and workflow management events for testing, fault isolation, and anomaly resolution. Event messages are needed for supervision.	
GSFPS-2546	GS Ktr	Base	The GS **shall** selectively filter PG event messages based on operator designation for forwarding to EM.	Allows the system to implement policies that identify specific status and event information based on selected criteria for forwarding to EM in order to reduce communications and to highlight data sub-sets from a large amount of data.	
GSFPS-2547	GS Ktr	Base	The GS **shall** forward filtered event messages of PG events to EM.	Allows the system to implement policies that identify specific status and event information based on selected criteria for forwarding to EM in order to reduce communications and to highlight data sub-sets from a large amount of data.	
GSFPS-2233			***7.6 Generate Level 1 Products***		
GSFPS-2789	GS Ktr	Base	The GS **shall** produce L1b products for all non-diagnostic data-producing instrument modes of the satellite in accordance with Appendix A, Table 1.	Ensures baseline Level 1b products used directly by data customers are available and input required to produce Level 2+ products is available to meet minimum performance parameter requirements.	For data-producing diagnostic instrument modes, data may be processed, but does not necessarily meet the Appendix A parameters.
GSFPS-3101	GS Ktr	0001	The GS **shall** produce L1b products for all non-diagnostic data-producing instrument modes of the satellite in accordance with Appendix D.	Ensures Level 1b products used directly by data customers are available and input required to produce Level 2+ products is available at the improved latency and refresh rates of Option 1 to meet minimum performance parameter requirements.	
GSFPS-3097	GS Ktr	Base	The GS **shall** produce GRB products for uplink at the rate at which the instruments produce data on a swath-by-swath basis.	Ensures GRB products are generated as soon as the GRB content data is available, so uplink rate does not fall behind instrument data rate and cause data loss.	Level 1b generation will never lag beyond the receipt completion of data from next scan or sampling period
GSFPS-2235	GS Ktr	Base	The GS **shall** collect L1b product quality metrics to include loss of source data input and number of outlier detections.	Aids in the detection of data loss, instrument anomalies, and anomalous observations to support product quality assurance. This minimizes unnecessary Level 2+ processing of suspect Level 1b data.	
GSFPS-2554	GS Ktr	Base	The GS **shall** append instrument derived calibration and navigation information for those L1b products not resampled to the fixed grid.	Calibration and navigation information is necessary for downstream processing and needs to be coupled with the associated product.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2237	GS Ktr	Base	The GS **shall** assemble GOES-R products and associated metadata nominally produced at WCDAS for GRB uplink in accordance with the following allocation: a) LHCP: L1b products from ABI 0.64 um band and 6 IR bands (3.9, 6.185, 7.34, 11.2, 12.3, and 13.3 um) b) RHCP: L1b products from ABI bands 0.47, 0.865, 1.378, 1.61, 2.25, 6.95, 8.5, 9.6 and 10.35 um, L2+ GLM, L1b SUVI, L1b EXIS, and L1b SEISS products as specified in Appendices A-D, and Magnetometer data	Ensures load balanced utilization of the two circular polarizations, allowing users to receive all GRB products with a dual-polarized system (both LHCP and RHCP), and allowing users flexibility to receive GOES Imager legacy channels with a single-polarized system (LHCP only).	The content of the GRB with respect to GRB Information packets, metadata, text messages, etc. will be derived by the GS contractor, with Government input. If L1b products are generated, they will be included in GRB (including products generated from diagnostic mode data).
GSFPS-2555	GS Ktr	Base	The GS **shall** apply lossless compression for GRB.	Ensures bandwidth requirements are minimized to conserve bandwidth and fit within the 31 Mbps GRB bandwidth constraint. Lossless compression is necessary to maintain data integrity.	The 31Mbps is a worst case estimate operations rate estimated on assumption that lossless yields would be nominally 2:1 or less.
GSFPS-2556	GS Ktr	Base	The GS **shall** format all data for transfer over the GRB link using CCSDS 133.0-B-1 Section 4.1 Protocol Data Unit.	CCSDS 133.0-B-1 is the standard selected by the GOES-R program for data transfer.	
GSFPS-2557	GS Ktr	Base	The GS **shall** constrain the GRB CCSDS Space Packet data zone to not exceed 16,384 octets.	Ensures data losses are minimized in the event of link losses. The 16384 number is twice the size of what comes down from the satellite. The intent is to reduce the trillions of files that must be managed.	
GSFPS-2559	GS Ktr	Base	The GS **shall** append a CRC integrity measure to each GRB Space Packet.	Ensures data corruption can be detected by data recipients to maintain data integrity.	
GSFPS-2680	GS Ktr	Base	The GS **shall** provide GRB Information Packets that address the following information types (TBR): a) Operations schedules b) Periodic data status informing users of process performance c) Periodic state vectors for orbit knowledge d) Static data unit conversion tables e) Static calibration tables as changed *(CCR01662)*	Ensures GRB users can validate data use and coverage and be informed of GOES-R operations and plans.	
GSFPS-2681	GS Ktr	Base	The GS **shall** generate emulated GVAR (eGVAR) data in accordance with the Ground Segment (GS) to GOES N/O/P Ground System Interface Requirements Document (IRD) (P 417-R-IRD-0158).	Ensures heritage systems can continue to function using GOES-R data until they are able to complete the transition from GOES-NOP to GOES-R receiving systems. The IRD defines the interface between GOES-R and the GOES N/O/P SSGS.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3150	GS Ktr	Base	The GS **shall** generate eGVAR using the following ABI bands: 0.64, 3.9, 6.19, 11.2, and 13.3 um.	These bands align as closely as possible with existing GVAR bands.	
GSFPS-3151	GS Ktr	Base	The GS **shall** generate eGVAR from Full Disk ABI scans every 30 minutes.	Ensures the eGVAR product is produced with a cadence similar to the heritage data.	
GSFPS-2548	GS Ktr	Base	The GS **shall** generate the L1b products in accordance with Government-supplied algorithms.	Ensures data is processed according to the algorithms developed by the instrument vendors and provided by the Government.	Algorithm Package from Flight will be the source of the L1b algorithms that the GS Ktr will implement and derive any additional data requirements from these APs (e.g., quality flags, ancillary data, metadata).
GSFPS-2549	GS Ktr	Base	The GS **shall** report outliers detected such as saturated samples during the ABI resampling process.	Ensures product quality is reported to users and to product quality monitors for downstream processing.	
GSFPS-2550	GS Ktr	Base	The GS **shall** store in a separate file in the 7-day revolving temporary storage a record of the sample array used in the ABI resampling to a fixed grid pixel, when outlier(s) are detected.	Sample array is stored separately for ease of retrieval in downstream processing and analysis.	
GSFPS-2354	GS Ktr	Base	The GS **shall** provide eGVAR data in accordance with the Ground Segment (GS) to GOES N/O/P Ground System Interface Requirements Document (IRD) (P 417-R-IRD-0158).	Ensures heritage systems can continue to function using GOES-R data until they are able to complete the transition from GOES-NOP to GOES-R receiving systems. The IRD defines the interface between GOES-R and the GOES N/O/P SSGS.	
GSFPS-2926	GS Ktr	Base	The GS **shall** create L1b product metadata that includes an accounting of uncorrectable errors detected in the raw data link that propagate to L1b, algorithm software version, and instrument serial number.	Ensures information about uncorrectable errors and the context in which they occurred remains with the data files in which the errors are found to facilitate analysis and to identify corrupt data prior to downstream processing.	
GSFPS-3075	GS Ktr	Base	The GS **shall** include L1b product quality metrics in the L1b metadata.	Ensures quality metrics remain with the associated data files.	
GSFPS-3076	GS Ktr	Base	The GS **shall** append the L1b metadata to the L1b product.	Ensures metadata remains with the associated Level 1b data.	
GSFPS-3077	GS Ktr	Base	The GS **shall** use a separate APID in the CCSDS Header unique for each data type.	Ensures an efficient method of discriminating data types in the Level 1b data stream to support users and downstream Level 2 + processing.	Data types and APIDs are defined by the Spacecraft and Instrument Vendors and will be provided by the Government.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3079	GS Ktr	Base	The GS **shall** produce L1b products for diagnostic data-producing instrument modes of the satellite in which the data produced by the instruments supports L1b product generation.	Ensures diagnostic data products are available for analysis by the instrument teams. L1b products are produced whenever data is available to produce them.	These are included in GRB per GSFPS-2237 and are treated like any other L1b data.
GSFPS-3080	GS Ktr	Base	The GS **shall** identify L1b products generated from diagnostic data-producing instrument modes.	Ensures diagnostic data products can be distinguished from data taken during routine operations.	
GSFPS-2243			***7.7 Instrument Radiometric (including Photometric) and Energetic Particle Calibration***		
GSFPS-2249	GS Ktr	Base	The GS **shall** perform instrument radiometric (including photometric) or energetic particle calibration for each instrument using calibration algorithms supplied by the Government and calibration database constants developed by each instrument vendor and provided by the Government.	Ensures instrument data is calibrated according to the algorithms developed by the instrument vendors.	Algorithm Package and calibration database from Flight will be the source of the L1b algorithms that the GS Ktr will implement and derive any additional data requirements from these APs (e.g., quality flags, ancillary data, metadata).
GSFPS-2251	GS Ktr	Base	The GS **shall** receive instrument calibration database parameters and database parameter updates from the Government. *(CCR01429)*	Ensures instrument data calibration can be updated as needed.	Cal databases will be developed by the GS contractor and updates to calibration database parameters will be provided to the Government from the instrument vendors and/or Calibration WG.
GSFPS-2956	GS Ktr	Base	The GS **shall** apply the instrument radiometric and energetic particle calibration to the data to produce L1b products.	Ensures calibration corrections are applied to L0 data as part of the L1b processing.	
GSFPS-2563	GS Ktr	Base	The GS **shall** ingest calibration database parameters. *(CCR01429)*	Ensures calibration coefficients can be accepted by the Level 1b software.	
GSFPS-2564	GS Ktr	Base	The GS **shall** implement instrument calibration parameters into GS instrument calibration databases. *(CCR01429)*	Ensures calibration coefficients will be applied to Level 0 data to produce Level 1b data.	
GSFPS-2257	GS Ktr	Base	The GS **shall** receive pre-launch vendor detector selection tables to be used to baseline the condition of the detector array.	Ensures detector array condition information is available for incorporation in the Level 1B software.	
GSFPS-2259	GS Ktr	Base	The GS **shall** maintain ABI detector selection tables.	Ensures ABI detector selection tables are current. Necessary to meet flight requirements for maintaining knowledge of satellite operational state.	
GSFPS-3081	GS Ktr	Base	The GS **shall** provide for variable ABI bit depth quantities by band as long as radiance precision is maintained in order to conserve GRB bandwidth.	Enables efficient utilization of GRB bandwidth.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3201	AWG		The GS **shall** apply radiance drift corrections to compensate for at least 1% radiance drift due to expected ABI instrument degradation (from 1.5% to 0.5% over the lifetime of the instrument). *(CCR01396)*	The ABI will not be able to meet the MRD requirement for long-term drift correction over the instrument lifetime. The Calibration WG will develop the correction parameters and provide them to the Government for implementation by the GS.	
GSFPS-3202	GS Ktr	Base	The GS **shall** have the capability to apply drift corrections, by instrument channel, to compensate for instrument degradation. *(CCR01396)*	The GS will apply correction parameters/coefficients to correct ABI long-term drift.	Parameters will be developed by Calibration WG and provided to the GS for implementation on the system.
GSFPS-2267			***7.8 Generate Level 2+ Products***		
GSFPS-2565	GS Ktr	Base	The GS **shall** ingest L1b data as input to L2+ product processing.	High level requirement to maintain continuity of data processing. During nominal operations, GRB is the source of the L1b data.	
GSFPS-2289	GS Ktr	Base	The GS **shall** capture L2+ product quality measurements of derived content measure that include average, maximum and minimum content values.	Necessary to capture these measurements to support L2+ algorithms.	
GSFPS-2287	GS Ktr	Base	The GS **shall** create the L2+ products.	The GS must create a set of L2+ products to meet mission requirements.	ATBDs from AWG will be the source of the L2+ algorithms that the GS Ktr will implement and derive any additional data requirements from these ATBDs (e.g., quality flags, ancillary data, metadata).
GSFPS-2271	GS Ktr	Base	The GS **shall** receive ancillary data from the ADRS in accordance with the Ground Segment (GS) To Ancillary Data Relay System (ADRS) Interface Requirements Document (IRD) (P 417-R-IRD-0157).	Ensures ancillary data required by Level 2+ code is available from agreed upon sources in agreed upon formats and frequencies in accordance with the IRD.	ADRS will broker ancillary data for the GS. List of ancillary data is contained within the GS-to-ADRS IRD.
GSFPS-2283	GS Ktr	Base	The GS **shall** manage product algorithm software, documentation and metadata.	Necessary for configuration management of the operational GS software baseline and associated documentation. Associates versions of operational algorithm code with their documentation and metadata.	
GSFPS-2927	GS Ktr	Base	The GS **shall** create L2+ product metadata that includes an accounting of uncorrectable errors propagated to L2+ products, L2+ quality metrics, L2+ end-product performance parameter compliance metrics, algorithm software version, ancillary data version(s), and instrument serial number.	High level requirement to generate L2+ metadata. Ensures capture of product quality information needed for tracking and trending and the context in which uncorrectable errors occurred.	
GSFPS-3181	GS Ktr	Base	The GS **shall** append the L2+ metadata to the L2+ product.	Ensures metadata remains with the associated Level 2+ data.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2293			***7.9 Product Generation Storage***		
GSFPS-2295	GS Ktr	Base	The GS **shall** assign a unique file identifier to each product.	Ensures that each product will be uniquely identifiable to allow easy product query capability and preserve proper GSP configuration management processes.	
GSFPS-2297	GS Ktr	Base	The GS **shall** create and append an integrity measurement to all products processed through the GS.	Ensures data integrity information is created and appended for all products.	
GSFPS-2301	GS Ktr	Base	The GS **shall** store L1b product quality measurements of derived content measure that include average, maximum and minimum content values for the life of the mission.	Ensure Level 1b product quality information is available for tracking and trending.	
GSFPS-2818			***7.10 GOES Rebroadcast Simulator***		
GSFPS-2682	GS Ktr	Base	The GS **shall** provide a standalone simulation of the GRB rebroadcast data stream for local, on-site testing of user ingest and data handling systems.	Needed to test GRB receive terminals prior to launch.	
GSFPS-2796	GS Ktr	Base	The GRB Simulator **shall** be portable/transportable.	Ensures that the GRB simulator will be modular and small enough to be transported by an individual from one site to another for multiple users' utilization.	
GSFPS-2797	GS Ktr	Base	The output of the GRB Simulator **shall** be consistent with the GRB output, including physical layer link characteristics specified in the Space Segment to GOES Rebroadcast IRD, 417-R-IRD-0002, and subsequent Space Segment ICDs. *(CCR01328)*	Describes the GRB content and format that will be simulated and requires the output to be consistent with actual GRB data.	
GSFPS-2798	GS Ktr	Base	The GRB Simulator **shall** have user selectable "off-line" mode (e.g., for operator interactive activities of scenario and test pattern creation or modification, configuration definition).	Allows the operator to use the GRB simulator for configuration or test data creation/modification without impacting GRB simulator operations.	
GSFPS-2799	GS Ktr	Base	The GRB Simulator **shall** have a user selectable "on-line" mode (for output of GRB).	Necessary for normal simulator operations.	
GSFPS-2800	GS Ktr	Base	The GRB Simulator **shall** output data, without user intervention, over a period of at least 5-days, incrementing all time and header fields in a realistic manner and in accordance with the expectation of the GRB section of the Product Definition and Users' Guide (CDRL SE-16). *(CCR01328)*	Necessary to fully simulate the GRB output under a variety of test conditions.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2801	GS Ktr	Base	The GRB Simulator **shall** output data utilizing user defined scenarios and configurations.	Allows the creation of different scenarios for GRB output.	GS personnel can configure the GRB Simulator to match operational requirements. Users can modify the simulator configuration to meet their needs.
GSFPS-2802	GS Ktr	Base	The GRB Simulator **shall** provide for user (manual) creation of scenarios, configurations, and test patterns for use by the operator.	Allows the simulator to create test data.	
GSFPS-2803	GS Ktr	Base	The GRB Simulator **shall** provide for the input of scenarios, configurations, test patterns, and proxy data from externally created files.	Allows the simulator to import data from external sources either through media or an electronic connection.	
GSFPS-2804	GS Ktr	Base	The GRB Simulator **shall** store scenarios, configurations, test patterns, and proxy data files for use as directed by the user.	Allows the simulator to store user-selectable data.	
GSFPS-2805	GS Ktr	Base	The GRB Simulator **shall** accept a user configurable starting point for simulations, e.g. time of day, day of year, and data content.	Allows the operator to define a simulation basis point either as a function of time or data content.	
GSFPS-2806	GS Ktr	Base	The GRB Simulator **shall** output user modifiable/configurable content based on GRB Scenarios currently being output.	Ensures that the output of the Simulator matches changes made by the user or driven by the scenario.	
GSFPS-2807	GS Ktr	Base	The GRB Simulator **shall** create user designated errors (type and frequency) in the output stream when so directed.	Allows simulation of realistic errors for testing of error handling within the GRB receive system.	
GSFPS-2808	GS Ktr	Base	The GRB Simulator **shall** output GRB at IF.	Allows simulation of GRB to match GS IF switch output to provide a more realistic GRB stream. IF simulation allows the introduction of link and propagation errors.	
GSFPS-2809	GS Ktr	Base	The GRB Simulator **shall** output GRB at baseband.	Allows simulation of GRB to match GS baseband output to test higher order data processing.	
GSFPS-2810	GS Ktr	Base	The GRB Simulator **shall** display its status to the user, including real-time, simulation-time, and configuration and test/proxy data in use.	Allows the operator to monitor the state of the simulation.	
GSFPS-2811	GS Ktr	Base	The GRB Simulator **shall** require only generally available hand tools for take-down and packing for shipment from a site, and un-packing and set-up on receipt at a site.	Ensures that proprietary and costly tools and/or specially trained personnel will not be required to break down, ship, and set-up the GRB simulator at other locations.	
GSFPS-2813	GS Ktr	Base	The GRB Simulator **shall** provide user definition of header and documentation fields at the word level.	Allows the GRB simulator to be modified to match the operational configuration or to test alternate scenarios.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2814	GS Ktr	Base	The GRB Simulator **shall** provide user selectable pattern generation for data fields.	Allows the operator to define pattern generation for data fields in the absence of simulated science content data.	
GSFPS-2815	GS Ktr	Base	The GRB Simulator **shall** provide user selection of stored and imported (externally prepared) files for header, documentation, and data fields.	Provides for user access to stored and imported GRB data files as selected or filtered by the user to allow for multiple test scenarios.	
GSFPS-2816	GS Ktr	Base	The GRB Simulator **shall** maintain an event log.	Ensures that all usage of the GRB simulator's functions will be recorded.	
GSFPS-2817	GS Ktr	Base	The GRB Simulator **shall** generate time field values based on "on-line" mode user selection of either a fixed reference time or actual wall-clock time.	Allows the GRB simulator operator to specify an actual timing reference or easily change the time reference to a user-defined value.	
GSFPS-2958			***7.11 Operational Instrument Calibration Data Metrics Monitoring***		
GSFPS-2959	GS Ktr	Base	The GS **shall** be capable of operational monitoring and display of the operational (current and trended) values for the following Instrument Calibration Data parameters: a) ABI Component temperatures 1) Blackbody 2) Mirrors 3) Detector (patch) 4) Baseplate 5) Electronics 6) Cooler (or cooler housing) b) Radiometric Data (Note: 6 and 7 are for ABI calibration drift correction) 1) Noise (NEDN/NEDT) 2) Calibration coefficients (such as intercept and slope) 3) Blackbody counts 4) Space view counts 5) Radiometric PRT counts 6) Lunar scans 7) Star catalog scans c) GLM electronic and scene data collected for calibration on command (slew spacecraft to collect non-earth scene) d) SUVI electronic calibration collected on command.	Ensures that instrument calibration data are available for monitoring and trending. Instrument Calibration Data are required by the calibration/validation teams (Instrument teams/long-term calibration). This defines Instrument Calibration Data.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2960	GS Ktr	Base	The GS **shall** provide the capability to remotely view the current and trended Instrument Calibration Data metrics displays from external algorithm maintenance or calibration / validation facilities.	Allows calibration and validation personnel at facilities other than that of the GS to remotely access and view the instrument calibration data metrics from their local facilities electronically to support calibration activities.	
GSFPS-2326			**8 PRODUCT DISTRIBUTION REQUIREMENTS**		
GSFPS-2328			***8.1 Overview***		
GSFPS-2567			Section 8 specifies the PD element functionality of the GOES-R GS. The PD element provides real-time continuous network distribution of GS products and data. The GOES-R Access Subsystem portion of PD includes revolving temporary 7-day storage of products and data. It also includes the GOES-R Access Point that provides product availability for, and distribution to users. The GOES-R Access Subsystem will be designed, developed, and transitioned by the OSD organization with support from the GSP for GS integration.		
GSFPS-2330			Data and information will be provided by the PD functionality in support of authorized GOES-R users.		
GSFPS-3152			PD is responsible for any reformatting, reprojection, subsetting (sectorizing), and routing for distribution to the AWIPS interface. AWIPS data is routed to NWS per the GOES-R Series Ground Segment (GS) to Advanced Weather Interactive Processing System (AWIPS) Interface Requirements Document (IRD) (P417-R-IRD-0160).		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2332			The major PD functions are: a) Delivery of products and associated supporting data for long-term archive to CLASS b) Delivery of products and mission data to satisfy product subscriptions and one-time delivery of products and mission data to meet latency delivery requirements c) Delivery of sectorized cloud and moisture imagery to AWIPS		
GSFPS-2338			***8.2 Product and Data Dissemination***		
GSFPS-2340	GS Ktr, GAS *(CCR-01430)*	Base	The GS **shall** send all L1b and L2+ products as specified in Appendix A to the GOES-R Access Subsystem in accordance with the GOES-R Ground Segment (GS) To GOES-R Access Subsystem (GAS) Interface Requirements Document (IRD) (G417-R-IRD-0196). *(CCR01513)*	Provides user interface for obtaining L1b and L2+ GOES-R products for ad-hoc data queries and for establishing or modifying data subscriptions or standing orders for machine to machine delivery of data via "push" or "pull" distribution. Appendix A includes the full set of Product Sets 1-4.	
GSFPS-2949	All *(CCR-01414)*	0001	The GS **shall** send all L1b and L2+ products as specified in Appendix D to the GOES-R Access Subsystem in accordance with the GOES-R Ground Segment (GS) To GOES-R Access Subsystem (GAS) Interface Requirements Document (IRD) (G417-R-IRD-0196). *(CCR01513)*	If option 1 is exercised, this requirement points to Appendix D to ensure that core GS data is made available to the GAS for delivery to users.	
GSFPS-3750	GAS		The GAS **shall** receive products and data for distribution in accordance with the GOES-R Ground Segment (GS) To GOES-R Access Subsystem (GAS) Interface Requirements Document (IRD) (G417-R-IRD-0196). *(CCR01513)*	Ensures the GAS receives GOES-R products and data for temporary storage and distribution to users. The details of the specific products and data items are identified in both the GS F&PS appendices and the interface IRS and ICD documents.	
GSFPS-3754	GAS		The GAS **shall** send data to the GOES-R GS in accordance with the GOES-R Ground Segment (GS) To GOES-R Access Subsystem (GAS) Interface Requirements Document (IRD) (G417-R-IRD-0196). *(CCR01513)*	Ensures the GAS can provide data to the GOES-R GS regarding health, performance, and status information. The details of the specific data items are listed in the IRD and will be further defined in the IRS and ICD for the interface. This information is provided to PD and sent to EM for monitoring of the GAS to ensure a quick response to performance degradations and failures.	
GSFPS-2342	GS Ktr, OSO *(CCR-01430)*	Base	The GS **shall** send products and data to CLASS for archive in accordance with the Ground Segment (GS) To Comprehensive Large Array-Data Stewardship System (CLASS) Interface Requirements Document (IRD) (417-R-IRD-0090).	CLASS provides the long-term archive and stewardship for GOES-R data and products allowing users to retrieve, analyze, and process GOES-R data for the life of the program (and beyond). The IRD defines the interface between CLASS and the GS.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3755	GS Ktr	Base	The GS **shall** receive event messages from GAS in accordance with the GOES-R Ground Segment (GS) To GOES-R Access Subsystem (GAS) Interface Requirements Document (IRD) (G417-R-IRD-0196). *(CCR01513)*	Ensures the GOES-R GS can receive event messages from the GAS regarding health, performance, and status information. The details of the specific data items are listed in the IRD and will be further defined in the IRS and ICD for the interface. The GS receives the messages, which are eventually delivered to the EM element for monitoring of the GAS to ensure a quick response to performance degradations and failures.	
GSFPS-3747	GS Ktr	Base	The GS **shall** send products and data to GAS in accordance with the GOES-R Ground Segment (GS) To GOES-R Access Subsystem (GAS) Interface Requirements Document (IRD) (G417-R-IRD-0196). *(CCR01513)*	Ensures the GOES-R GS sends products and data to the GAS for temporary storage and distribution to users. The details of the specific products and data items are indentified in both the GS F&PS appendices and the interface IRS and ICD documents.	
GSFPS-2344	GAS *(CCR-01430)*		The GAS **shall** acknowledge receipt of data requests within ten seconds (10 seconds) (TBR) *(CCR01513)*.	Ensures that users submitting requests receive timely feedback that their request have been received.	
GSFPS-3744	GS Ktr	Base	The GS **shall** handle (process, track, notify, report, store, and forward to EM) event messages received from GAS in the same manner as event messages generated within the PD Element. *(CCR01513)*	Ensures GAS event messages are handled properly by the GS including all requirements for notification, warnings, and reports required for health, performance, and status events, including performance degradation and failures.	
GSFPS-2569	GS Ktr	Base	The GS **shall** provide Instrument Calibration Data to the GOES-R Access Subsystem. *(CCR01472)*	Ensures that instrument calibration data is available to evaluate, troubleshoot, and trend data and products, as necessary.	
GSFPS-3082	GAS *(CCR-01430)*		The GAS **shall** limit data subscriptions based on operator configurable parameters (e.g., total duration, and single request data volume) *(CCR01513)*.	Allows operators to limit the access to data, as necessary based on selectable criteria. Data limits can be used to reduce system loading.	
GSFPS-3748	GAS		The GAS **shall** have the capability to limit data requests based on operator configurable parameters, to include duplicate data requests. *(CCR01513)*	Allows the operators to limit the access to data as necessary based on selectable criteria, including redundant duplicate requests. This allows the operators to manage downloads and distribution throughput loading. For example, duplicate requests will be denied reducing distribution loading and in the case of large block product requests, which can be delayed until low throughput usage periods.	
GSFPS-3164			The operator will have the capability to configure which products are to be sent to CLASS, and adjust the archive status of any output product (based on policy decisions). Whenever the GS produces a product, data item, or file identified as "for archive," the GS will make it available for transmission to CLASS in accordance with the GS to CLASS IRD.		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3165	GS Ktr	Base	The GS **shall** have the capability for the operator to change the long-term archival storage status of any GS products, data item or file (i.e., identify as "for archive" or "not for archive.")	The GS needs to be flexible to accommodate changing archive needs.	This change could be scheduled or immediate
GSFPS-2356			***8.3 Authorized User Services***		
GSFPS-2995			The GS will have the capability to build a set of sectorized products per satellite for forwarding to the NWS AWIPS. Each product in the set will be defined by the operator. Products will be defined based on six parameters--corner points, map projection, spatial resolution, bit depth, ABI channel, and periodicity. The full set of sectorized products established by these parameters will be forwarded to AWIPS as they are produced. GS performance requirements with respect to sectorized products are defined in Appendix E.		
GSFPS-2358	GS Ktr, OSO *(CCR-01430)*	Base	The GS **shall** provide all sectorized cloud and moisture imagery products to the NWS using the transfer mechanism specified in the Ground Segment (GS) To Advanced Weather Interactive Processing System (AWIPS) Interface Requirements Document (IRD) (417-R-IRD-0160).	Defines the interface between the GS and AWIPS, which is necessary to distribute KPPs to NWS through AWIPS.	
GSFPS-3128	GS Ktr	Base	The GS **shall** be capable of producing and distributing sectorized products in accordance with Appendix E. *(CCR01414)*	Appendix E defines a stressing case of sectorized products, which are distributed as KPPs through AWIPS. This ensures that the Appendix E requirements under that stressing case can be met (i.e., that the system is sized appropriately). The system will be configured to meet operational requirements for sectorized products after GS acceptance.	The stressing case covers today's GINI output plus a representative set of NWS products.
GSFPS-2996	GS Ktr	Base	The GS **shall** provide the capability to modify the set of operator-defined sectorized cloud and moisture imagery products.	Ensures operators are able to make changes to the set of sectorized products as necessary to accommodate changes in operational requirements.	Sectorized product sets can be defined individually for each satellite. Changes to the set of sectorized product sets are accomplished without software baseline updates.
GSFPS-2998	GS Ktr	Base	The GS **shall** provide the capability for operator modification of sectorized cloud and moisture imagery product parameters.	Ensures operators are able to make changes to the parameters used to create sectorized products to accommodate changes in operational requirements.	Changes to the set of sectorized product sets are accomplished without software baseline updates.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3083	GS Ktr	Base	The GS **shall** be capable of producing sectorized cloud and moisture imagery products based on any single operator-selected ABI channel.	Ensures operators are able to generate sectorized products based on specific wavelength bands to accommodate changes in NWS requirements.	Changes to the set of sectorized product sets are accomplished without software baseline updates.
GSFPS-2957	GS Ktr	Base	The GS **shall** be capable of producing an operator-defined set of sectorized cloud and moisture imagery products.	Allows operators the ability to select the types of sectorized products to be generated. Needs to be operator definable to accommodate changes in NWS requirements that are established in agreements between NESDIS and NWS.	Sectorized product sets can be defined individually for each satellite. Changes to the set of sectorized product sets are accomplished without software baseline updates.
GSFPS-3084	GS Ktr	Base	The GS **shall** have the capability to define sectorized cloud and moisture imagery products from CONUS imagery based on the following operator-configured parameters a) Geographic coordinate corner points b) Map projection c) Spatial resolution d) Bit depth scaling e) ABI channel f) Periodicity	Defines the specific parameters based on NWS requirements that an operator can use to define and generate sectorized products based on CONUS data.	Changes to the set of sectorized product sets are accomplished without software baseline updates.
GSFPS-3085	GS Ktr	Base	The GS **shall** have the capability to define sectorized cloud and moisture imagery products from Mesoscale imagery based on the following operator-configured parameters: a) Map projection b) Spatial resolution c) Bit depth scaling d) ABI channel e) Periodicity	Defines the specific parameters based on NWS requirements that an operator can use to define and generate sectorized products based on Mesoscale data.	Changes to the set of sectorized product sets are accomplished without software baseline updates.
GSFPS-3086	GS Ktr	Base	The GS **shall** have the capability to define sectorized cloud and moisture imagery products from Full Disk imagery based on the following operator-configured parameters: a) Geographic coordinate corner points b) Map projection c) Spatial resolution d) Bit depth scaling e) ABI channel f) Periodicity	Defines the specific parameters based on NWS requirements that an operator can use to define and generate sectorized products based on Full Disk data.	Changes to the set of sectorized product sets are accomplished without software baseline updates.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2684	GS Ktr	Base	The GS **shall** have the capability to remap sectorized cloud and moisture imagery products to the following projections: a) Mercator b) Lambert Conformal c) Polar Stereographic	Allows operators to generate sectorized products in a projection format that meets NWS requirements.	Changes to the set of sectorized product sets are accomplished without software baseline updates.
GSFPS-2687	GS Ktr	Base	The GS **shall** have the capability to scale sectorized cloud and moisture imagery products across a range from full resolution to 8 bits based on operator configuration.	Allows operators to select the resolution of sectorized products to reduce the information word size for efficient data handling (smaller file sizes) to accommodate changes in NWS requirements.	Changes to the set of sectorized product sets are accomplished without software baseline updates.
GSFPS-2688	GS Ktr	Base	The GS **shall** be capable of producing operator-defined reduced-resolution sectorized cloud and moisture imagery products with spatial resolution size range between 0.5 km and 28 km.	Defines the range of spatial resolutions that an operator is able to select to accommodate changes in NWS requirements.	Changes to the set of sectorized product sets are accomplished without software baseline updates. The range is defined based on new (ABI) and legacy capabilities.
GSFPS-3000	GS Ktr	Base	The GS **shall** be capable of producing sectorized products with an operator-defined periodicity equal to or less frequently than the parent cloud and moisture imagery products are produced by the GS.	Allows an operator to select the temporal resolution of sectorized products from the parent product frequency to less frequent to reduce information overload and file size (etc.) to accommodate changes in NWS requirements.	Changes to the set of sectorized product sets are accomplished without software baseline updates.
GSFPS-2576	GAS *(CCR-01430)*		The GAS **shall** make any item placed in the 7-day revolving temporary storage by the GOES-R GS available through the GOES-R Access Point. *(CCR01513)*	Allows operational users to obtain GOES-R data and products on an ad hoc basis for data recovery.	7 days allows for a minimum amount of storage plus margin.
GSFPS-3753	GAS		The GAS **shall** provide application programming interfaces (API) to support subscription and ad hoc user access. *(CCR01513)*	Allows for users to access GAS products and data through a machine-to-machine interface with minimal user interaction after initial implementation. For example, a site or organization (with a large number of GOES-R data and product users) can create a system to pull GOES-R data and products to a local server for user access, reducing GOES-R-to-site bandwidth requirements and allowing local users, quick access to GOES-R data and products.	
GSFPS-2366	GAS *(CCR-01430)*		The GAS **shall** collect performance measurements on GOES-R Access Point new and retiring users, user requests, request acknowledgements, data and product transmissions and transaction information / latency. *(CCR01513)*	Allows operators to evaluate the performance of the GOES-R Access Point, usage patterns, and bandwidth performance to better manage the access point and troubleshoot problems for trending and analysis.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-1487	GAS *(CCR-01430)*		The GAS **shall** manage user account information, including: user contact information, the level of service a user is authorized to request, links to related log entries, and user organization information. *(CCR01513)*	Allows the Ground Segment to manage user account information for oversight of system operations, historical trending, and to maintain system security.	Users only access the GS via the GOES-R Access Point.
GSFPS-2368	GAS *(CCR-01430)*		The GAS **shall** report on GOES-R Access Point performance measurements. *(CCR01513)*	Provides a record of Access Point performance for analysis and trending.	
GSFPS-3749	GAS		The GAS **shall** collect and report metrics on product usage to include product access count and frequency and user account activity. *(CCR01513)*	Allows GAS to monitor account activity to best allocate resources for data and product distribution and to cull unused user access accounts as required. As an example product user information allows for operators to determine, which products are most accessed and may require addition distribution resources or to identify unused products, which may be depreciated in the future.	
GSFPS-2370	GAS *(CCR-01430)*		The GAS **shall** administer GOES-R Access Point User accounts. *(CCR01513)*	Allows the Ground Segment to administer user accounts, allow user access to GOES-R products and data, and maintain system security.	
GSFPS-2372	GAS *(CCR-01430)*		The GAS **shall** provide access to mission operations data sent from mission management to the GOES-R Access Subsystem. *(CCR01330, CCR01513)*	NESDIS requires the publication of mission operations data. OSO will access this data via the GAS to publish (outside of the GS).	
GSFPS-2578	GS Ktr	Base	The GS **shall** provide mission operations data, satellite configuration, instrument imaging schedules, maneuver schedules, special operations schedules, calibration plans and activities, unique payload configuration and status, spacecraft ephemerides, and acquisition data; to the GOES-R Access Subsystem. *(CCR01330)*	NESDIS requires the publication of mission operations data. OSO will access this data via the GAS to publish (outside of the GS).	
GSFPS-2374	GAS *(CCR-01430)*		The GAS **shall** provide an Identification and Authentication mechanism, separate from that for operations personnel, for external Users (NIST SP 800-82) that meets the electronic authentication (eAuthentication) requirements of OMB M-04-04, E-Authentication Guidance for Federal Agencies, and NIST SP 800-63, Electronic Authentication Guideline. *(CCR01513)*	Ensures the GAS system is secure and complies with applicable security directives.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2376	GAS *(CCR-01430)*		The GAS shall provide a subscription service to GOES-R Access Point Users that allows subscriptions to be configured by a minimum of the following parameters: a) Geographic Coverage Area b) Date c) Time d) Time period e) Product ID / name f) Quality flags g) Data format h) Spacecraft ID i) Channel number j) Instrument name k) Instrument mode l) Data type *(CCR01392, CCR01513)*	Allows users to subscribe for receiving data or a products on a continuing basis using query criteria to select the information of interest.	
GSFPS-2689	GAS *(CCR-01430)*		The GAS shall provide a data and information query service to GOES-R Access Point Users including at a minimum the following searchable parameters: a) Geographic Coverage Area b) Date c) Time d) Time period e) Product ID / name f) Quality flags g) Data format h) Spacecraft ID i) Channel number j) Instrument name k) Instrument mode l) Data type *(CCR01392, CCR01513)*	Allows users to subscribe for receiving data or a products on a request basis using query criteria to select the information of interest.	
GSFPS-2690	GAS *(CCR-01430)*		The GAS **shall** provide an ad hoc request service to GOES-R Access Point Users. *(CCR01513)*	Allows non-subscribed users to request data from the prior 7 days from GAS. Needed for data recovery or for "one-time" requests.	
GSFPS-2380	GAS *(CCR-01430)*		The GAS **shall** support a minimum of 1,000 users connected simultaneously to the GOES-R Access Point. *(CCR01513)*	Provides simultaneous connectivity to the GOES-R access point to a reasonable lower bound.	This is a connection/access requirement, not a throughput/bandwidth sizing requirement.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2382	GAS *(CCR-01430)*		The GAS **shall** accommodate concurrent transfers of product files to 100 (TBR) ad hoc users through the GOES-R Access Point. *(CCR01513)*	Provides ad hoc requested data and product to as many users as realistic at the same time, and is a system and throughput/bandwidth sizing constraint. This requires that the entire transaction be satisfied (from the user request, through access to the product in storage, to the transmission of the product to the user) for 100 users simultaneously.	This requirement must be fulfilled simultaneously with the subscribed user transfer described in GSFPS-2428.
GSFPS-2916	GAS *(CCR-01430)*		The GAS **shall** begin transfer of any requested and available product from the GOES-R Access Point to the requester within five (5) seconds (TBR) of ad hoc request validation. *(CCR01513)*	Enables a responsive Access Point interface, so the requestor knows the system has received their request and is performing the task.	
GSFPS-2917	GAS *(CCR-01430)*		The GAS **shall** begin the transfer of a subscribed product consistent with the latency in Appendix B, for those subscriptions fulfilled via the GOES-R Access Point. *(CCR01291, CCR01513)*	Ties the latency requirements in Appendix B to the beginning of the transfer of a subscription transfer.	Only applies to "push" subscription deliveries.
GSFPS-2384	GAS *(CCR-01430)*		The GAS **shall** receive data requests from Users of the GOES-R Access Point. *(CCR01513)*	Provides a capability for the users to request products and data and set up ad hoc requests or subscription services.	
GSFPS-2386	GAS *(CCR-01430)*		The GAS **shall** validate data requests from Users of the GOES-R Access Point. *(CCR01513)*	Ensures the Access Point confirms the legitimacy of a request and that it conforms to system and operator-defined limits prior to formal acceptance and execution	
GSFPS-2388	GAS *(CCR-01430)*		The GAS **shall** store data requests from Users of the GOES-R Access Point for 90 days in a product distribution log. *(CCR01513)*	Allows the Ground Segment to manage data request information for oversight of system operations, historical trending, and to maintain system security. The reason for 90 days of storage is based on NIST 800-53 directives.	
GSFPS-2390	GAS *(CCR-01430)*		The GAS **shall** check for duplicate data and product requests from the same GOES-R Access Point User as part of the request validation process. *(CCR01513)*	Ensures efficient use of GOES-R Access Point resources to avoid sending the same data to the same user twice.	
GSFPS-2392	GAS *(CCR-01430)*		The GAS **shall** provide help information to GOES-R Access Point Users when setting up their requests. *(CCR01513)*	Provides users with information on how the Access Point works and how to make requests, so they can obtain the data and products they need.	
GSFPS-2406	GAS *(CCR-01430)*		The GAS **shall** disseminate reports of status of queries and requests upon request from GOES-R Access Point Users. *(CCR01513)*	Enables users to obtain the status of their request and where it is in the process.	
GSFPS-2408	GAS *(CCR-01430)*		The GAS **shall** fulfill requests from Users for product retransmission via the GOES-R Access Point for up to 7-days after product generation. *(CCR01513)*	Allows users to re-request data and products, which may not have been successfully transmitted or captured by users. Data retention policy limits availability of a product to 7 days.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2412	GS Ktr, GAS *(CCR-01430)*	Base	The GS **shall** collect product availability and status information.	Ensures the PD element collects data, product, and element status to be used to monitor the health and performance of the element.	
GSFPS-2577	GS Ktr, GAS *(CCR-01430)*	Base	The GS **shall** report product availability and status information.	Allows operators to review the collected data, product, and element status, so they can monitor the health and performance of the element.	
GSFPS-2414	GAS *(CCR-01430)*		The GAS **shall** provide product status to GOES-R Access Subsystem Users on request. *(CCR01513)*	Provides users information on whether a particular product is available or not.	
GSFPS-2420			***8.4 Data Product Delivery***		
GSFPS-2582	GS Ktr	Base	The GS **shall** forward filtered event messages of product distribution events to EM.	Allows the system to implement policies that identify specific status and event information based on selected criteria for forwarding to EM in order to reduce communications and to highlight data sub-sets from a large amount of data.	
GSFPS-2581	GS Ktr	Base	The GS **shall** selectively filter PD event messages based on operator designation for forwarding to EM.	Allows the system to implement policies that identify specific status and event information based on selected criteria for forwarding to EM in order to reduce communications and to highlight data sub-sets from a large amount of data.	
GSFPS-2691	GS Ktr, GAS *(CCR-01430)*	Base	The GS **shall** collect and report to EM performance measures at a level of detail sufficient to assess the margin on a per-process and per-product basis for product latency and refresh.	Ensures that the performance measures will be collected at a level granular enough to allow each product and process to be analyzed against required latency and refresh requirements to identify and isolate potential anomalies. Margin is the difference between actual performance and requirements.	
GSFPS-2579	GS Ktr, GAS, OSO *(CCR-01430)*	Base	The GS **shall** capture event messages of product distribution events.	Allows operators to evaluate/review all product distribution events for testing, fault isolation, and anomaly resolution. Event messages are needed for supervision.	
GSFPS-3752	GAS		The GAS **shall** have the capability to filter event messages based on operator-selectable criteria for forwarding to the GS. *(CCR01513)*	Allows GAS to implement policies that identify specific status and event information based on selected criteria for forwarding to GOES-R core GS in order to reduce communications and to highlight data sub-sets from a large amount of data.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-2428	GAS *(CCR-01430)*		The GAS **shall** process a minimum of 200 (TBR) simultaneous subscription service data transfers. *(CCR01513)*	Provides subscribed data and product to as many users as realistic at the same time, and is a system and throughput/bandwidth sizing constraint. This requires that the entire transaction be satisfied (from the user request, through access to the product in storage, to the transmission of the product to the user) for 200 users simultaneously.	This requirement must be fulfilled simultaneously with the ad hoc user transfer described in GSFPS-2382.
GSFPS-2422	GAS *(CCR-01430)*		The GAS **shall** notify subscription users when subscribed products are available at the GOES-R Access Point. *(CCR01394, 01513)*	Keeps users informed with notifications when products become available.	This requirement applies to "pull" subscription capabilities, which does not exclude the need for push subscriptions as well.
GSFPS-2424	GAS *(CCR-01430)*		The GAS **shall** post the product manifest within 1 second after a product is posted to the GOES-R Access Point. *(CCR01513)*	Ensures all users are informed, as quickly as possible, what products are available, including new products, and is a system performance constraint.	
GSFPS-3137	GAS *(CCR-01430)*		The GAS **shall** be capable of transferring data from the GOES-R Access Point to users at a minimum combined rate of 500 Mbps (TBR). *(CCR01513)*	Ensures a minimal amount of throughput to support the transfer of data and products to users, and is a system performance constraint.	
GSFPS-3153	OSO		The GS **shall** transfer data from the GOES-R Access Point to users at a minimum combined rate of 500 Mbps (TBR).	Ensures a minimum bandwidth is maintained for GOES-R data transfer and product distribution to the next network node and is a network infrastructure/communications bandwidth constraint.	
GSFPS-2583			***8.5 Product Distribution Storage***		
GSFPS-2303	GAS *(CCR-01430)*		The GAS **shall** store all GOES-R data items received in accordance with the GOES-R Ground Segment (GS) To GOES-R Access Subsystem (GAS) Interface Requirements Document (IRD) (G417-R-IRD-0196) in a 7-day revolving temporary store. *(CCR01399, 01513)*	Ensures that data and products are available for requests, re-transmissions, troubleshooting, and other needs for short-term user and operator access.	
GSFPS-3113	GAS *(CCR-01430)*		The GAS **shall** have the capability to retrieve, display, export, and store for the life of the mission operator-selected data from the 7-day revolving temporary storage. *(CCR01513)*	Provides the ability to select a particular set of data for storage for the life of the mission (within the GS rather than in CLASS). Also provides the capability to access data in the 7-day store (for operator and user access).	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3216			**9 GS ANTENNA SYSTEM REQUIREMENTS**		
GSFPS-3217			***9.1 OVERVIEW***		
GSFPS-3218			***9.1.1 Background***		
GSFPS-3219			***9.1.2 Scope***		
GSFPS-3220			This section specifies the functional and performance requirements for a GS Antenna System in support of the GOES-R and GOES-N missions. The term GS Antenna System is defined as the following capabilities across all three GOES-R GS sites: a) the set of antenna stations; b) GOES-R Antenna Monitor, Control, and Test subsystem (GAMCATS); c) Intermediate Frequency Distribution Switching (IFDS) matrices; upgrade at WCDAS and new at NSOF and RBU d) intra-site network, cables, and infrastructure; e) a timing and frequency reference system at the RBU; f) interfaces to existing WCDAS and NSOF timing and frequency reference systems are provided as GFP; g) access roadways; h) Data Collection System (DCS) antenna(s) and equipment at RBU to generate and uplink Data Collection Platform Report pilot tone; i) Perimeter CCTV security at the RBU. *(CCR01530)*		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3221			The GS Antenna System includes a set of antenna stations. The term GS antenna station is defined as: a) the antenna structure, including reflector, axis gears and drives, pedestal, and equipment shelter and enclosure(s); b) feeds and sub-reflector(s); c) the receive path to the IFDS; d) the transmit path from the IFDS to the antenna reflector; e) a frequency translator; f) monitoring and control; g) cableway(s) and cables, including cabling between the shelter and site operations building; h) power to pads from operations building interface; i) grounding and lightning protection; j) pad and service area, and road extension to pad; k) security fence and locks; l) antenna station lighting and security lighting; m) operational safety video surveillance capability. It is intended that the GS Antenna System will be used to reliably transmit command and data signals to, and receive telemetry and rebroadcast data from, GOES-R and GOES-N satellites, while integrating with the Ground Segment at all three sites. *(CCR01530)*		

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3222			***9.2 SYSTEM-LEVEL REQUIREMENTS***		
GSFPS-3223			The GS Antenna System is allocated a portion of the end-to-end IF/RF signal communications path from the spacecraft to ground and from ground to spacecraft. The GS Antenna System allocation is from the antenna through the IF Distribution Switch (IFDS) for receive, and from the IFDS to the antenna for transmit. The modulators and demodulators (and the IF-to-digital and digital-to-IF conversion functions) are allocated to the GOES-R GS contractor. The functional and performance requirements allocated to the Antenna System of the GOES-R GS represent the Antenna System allocation of the end-to-end receive and transmit path, with demarcation points of the Antenna and the IFDS.		
GSFPS-3224			***9.2.1 General***		
GSFPS-3225	ANT		The GS Antenna System **shall** meet all requirements simultaneously under all environmental conditions except where specified.		
GSFPS-3226	ANT		The GS Antenna System **shall** comply with all parameters listed in Appendix F (GOES-N/O/P Link Parameters).		
GSFPS-3227	ANT		The GS Antenna System **shall** have no single point of failure for functionality at any site.	Redundancy is necessary in mission critical functionality such as Mission Management. Designing a system to avoid single point failures helps minimize the likelihood of a catastrophic failure that jeopardizes the system's health and safety.	
GSFPS-3228	ANT		The GS Antenna System **shall** communicate with the GOES-R Space Segment consistent with the Space Segment (SS) to Ground Located - Command, Control, and Communications Segment (GL-C3S) (P 417-R-IRD-0001) IRD.	Points to the document that specifies the RF interface between the GOES-R spacecraft and RF receive equipment.	
GSFPS-3229	ANT		The GS Antenna System **shall** communicate with the GOES-NOP Space Segment consistent with Appendix F.	Points to the location that specifies the RF interface between the GOES-NOP spacecraft and RF receive equipment.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3230	ANT		The GS Antenna System **shall** comply with the requirements of NESDIS Standard No. S24.802, 'General Requirements for Ground Electronic Equipment', paragraphs 3.2 through 3.2.5.7, paragraph 3.5, and paragraph 3.9.	Provides basic guidance regarding performance requirements for electric equipment. Includes racks and cable routing.	Commercial Off the Shelf (COTS) equipment will be exempt from paragraphs 3.2 through 3.2.5.7. *(CCR01530)*
GSFPS-3231	ANT		The GS Antenna System **shall** be designed to provide adequate space around all equipment and structures to perform maintenance, replace equipment, and attach test equipment.	Need space for maintenance.	
GSFPS-3232			***9.2.2 Primary and Backup Site Functions***		
GSFPS-3233	ANT		The GS Antenna System at WCDAS **shall** include the primary space-to-ground communications services for the GOES-R GS.	This aligns with current GOES operations and future NESDIS concepts of operations.	
GSFPS-3234	ANT		The GS Antenna System functionality resident at WCDAS **shall** be operable from WCDAS.	All functions at WCDAS can be operated locally without dependence on other sites. This ensures that the operators at a given site have the capability to operate independently of each other.	
GSFPS-3235	ANT		The GS Antenna System **shall** provide the capability to operate all WCDAS-deployed functionalities remotely from the NSOF.	Since the primary control operations occur at NSOF, NSOF must also be capable of operating WCDAS functions remotely. This capability could be used for contingency situations or for other non-emergency operations.	
GSFPS-3236	ANT		The GS Antenna System RBU functionality **shall** be deployed at Fairmont, WV.	The GS RBU location was determined based on proximity to NSOF, geographic coverage, and non-interference with other RF carriers as documented in multiple trade studies.	
GSFPS-3237	ANT		The GS Antenna System RBU functionality **shall** be remotely operable from the NSOF.	The RBU will not be staffed with operations personnel, so remote operations from the primary facilities will be required. This capability will be used for contingency situations or for other non-emergency operations.	
GSFPS-3238	ANT		The GS Antenna System RBU functionality **shall** be remotely operable from the WCDAS.	The RBU will not be staffed with operations personnel, so remote operations from the primary facilities will be required. This capability may be used for contingency situations where certain elements of the RBU need to be operated by WCDAS personnel or for other non-emergency operations.	
GSFPS-3239	ANT		The GS Antenna System RBU functionality **shall** be operable from the GS Antenna System RBU.	The RBU must have operator interfaces at the facility in the event that local RBU operations are required.	
GSFPS-3240	ANT		The GS Antenna System RBU **shall** operate without on-site staff, except in the case of continuity of operations deployments.	During routine operations, the RBU will not be staffed with operations personnel. Some maintenance personnel may be available either on-site or on-call, depending on the implementation and RMA approach for the RBU.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3241	ANT		The GS Antenna System **shall** be capable of supporting the following single functions or combination of functions at the RBU: a) Space - Ground Communications (T&C, Mission data) b) Signal Monitoring c) GRB Rebroadcast d) HRIT/EMWIN uplink e) Enterprise Management / GAMCATS f) DCS pilot uplink	This list of functions is a subset of GS capabilities to be provided by the RBU. Since the RBU will not provide a complete MM, PG, PD, or EM backup, this list breaks down the element functionality into a more granular functional level. The intent is that each of these functions will be independently usable at the RBU, such that one function could fail-over to the RBU without the need to fail over the entire set of NSOF or WCDAS operations. Failover by function is in response to contingency planning and failover strategies being employed by current operations. These include failover of KPP production and distribution if NSOF KPP processing goes down, however, remote SOCC operations may still be accomplished from the NSOF. Failover by function allows more flexibility in the use of the RBU to meet availability requirements in the event of maintenance downtime without full failover.	
GSFPS-3757	ANT		The GS Antenna System at NSOF **shall** be capable of receiving GVAR and GRB data from GOES N-P and GOES-R Series satellites. *(CCR01530)*	The NSOF antennas must be backwards compatible to support legacy GVAR operations.	Either GVAR or GRB feeds are received from any one spacecraft at a time.
GSFPS-3242			***9.2.3 System Capabilities***		
GSFPS-3243	ANT		This GS Antenna System **shall** be capable of supporting the GOES-R series spacecraft.		
GSFPS-3244	ANT		This GS Antenna System **shall** be capable of supporting the GOES N-P series spacecraft.	Required to mitigate the impact to the GOES NOP mission. Current antenna placement requires removal of existing FMS NOP antenna. Provides OSO with flexibility in mission planning at the WCDAS & RBU.	
GSFPS-3245	ANT		The GS Antenna System **shall** be designed such that GOES-R functions/components do not impact GOES-NOP functions/components.	Required to mitigate the impact to the GOES NOP mission. Current antenna placement requires removal of existing FMS NOP antenna. Provides OSO with flexibility in mission planning at the WCDAS & RBU.	
GSFPS-3246	ANT		The GS Antenna System **shall** have a maximum latency of one second when the system is operationally available. *(CCR01530)*	Establishes the latency allocation for all GS antenna subsystems, the calculated latency allowance for the receive RF/IF paths for GOES-R at the WCDAS and RBU antennas/IF switch is defined as 3 to 10 milliseconds which is well under the 1 second allocation.	
GSFPS-3247	ANT		The GS Antenna System **shall** be capable of tracking spacecraft in nominally geosynchronous orbits, with inclinations up to at least 15 degrees.	15 degrees needed to support end of life, high inclination	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3248	ANT		The GS Antenna System **shall** be designed such that modifications to the operational system can be accomplished, integrated and tested without impact to operational systems.	General system requirement for development, integration and test outside of operations.	
GSFPS-3249	ANT		The GS Antenna System **shall** be designed such that maintenance can be accomplished without impact to operational systems.	General system requirement for development, integration and test outside of operations.	
GSFPS-3250	ANT		The GS Antenna System **shall** uplink HRIT/EMWIN signal as specified in the SS to HRIT/EMWIN IRD (P 417-R-IRD-0168).	Describes the RF interface between the GS and the GOES-R spacecraft for uplink of HRIT signal.	
GSFPS-3251	ANT		The GS Antenna System at WCDAS **shall** uplink the DCS signal to the Space Segment in accordance with the SS to DCS IRD (417-R-IRD-0005).	Describes the RF interface between the GS and the GOES-R spacecraft for uplink of DCS signal.	
GSFPS-3252	ANT		The GS Antenna System at the WCDAS **shall** downlink the DCS signal from the Space Segment in accordance with the SS to DCS IRD (417-R-IRD-0005).	Describes the RF interface between the GS and the GOES-R spacecraft for uplink of DCS signal.	
GSFPS-3253	ANT		The GS Antenna System **shall** send and receive the GRB signal as specified in the Space Segment (SS) to GOES Rebroadcast (GRB) Service IRD (P 417-R-IRD-0002). *(CCR01530)*	Describes the RF interface between the GOES-R spacecraft and RF equipment for GRB *(CCR01530)*	
GSFPS-3254	ANT		The GS Antenna System **shall** permit an operator to manually override any automated control process or operational constraint, e.g. soft limits. *(CCR01530)*	When dealing with hardware of this magnitude, a technical/operator should have ultimate control of the system due to safety.	
GSFPS-3255			**9.2.3.1 Ranging Support**		
GSFPS-3256	ANT		The GS Antenna System **shall** provide all capabilities necessary to support the GRB and GVAR ranging functions (e.g., measuring ground-loop delays).	Antenna System supports part of the ranging function.	
GSFPS-3257	ANT		The GS Antenna System **shall** perform ranging ground loop calibration while performing nominal operations.	Allows testing and calibration of the antenna RF/IF equipment performance. NOTE: Occurs during housekeeping.	
GSFPS-3258	ANT		The GS Antenna System **shall** transmit a ranging signal.	Allows the GS to conduct ranging activities.	
GSFPS-3259	ANT		The GS Antenna System **shall** receive a ranging signal.	Allows the GS to conduct ranging activities.	
GSFPS-3260	ANT		The GS Antenna System **shall** perform ground loop ranging calibration for each antenna station using the GRB signal.	Ensures that range bias can be measured within the GS.	
GSFPS-3261	ANT		The GS Antenna System **shall** perform ground loop ranging calibration for each antenna station using the Orbit Raising, Tracking, Telemetry and Command signal.	Ensures that range bias can be measured within the GS.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3262			**9.2.3.2 Link Monitoring**		
GSFPS-3263	ANT		The GS Antenna System **shall** monitor the RF characteristics of signals necessary to validate and verify signal performance characteristics.	Ensures that communication link information (e.g., link up) is provided to the MM for its supervisory functions. Standard commercial test equipment of sufficient quality and capability needs to be used to show that all performance specs are met. *(CCR01530)*	MM may provide portions of this data to EM based on system configuration. Monitoring occurs in real time. *(CCR01530)*
GSFPS-3264	ANT		The GS Antenna System **shall** monitor the command RF uplink for the GOES-R series.	Ensure that command uplink is performing within parameters	
GSFPS-3265	ANT		The GS Antenna System **shall** monitor the DCS RF uplink for the GOES-R series.	Ensure that uplink is performing within parameters	
GSFPS-3266	ANT		The GS Antenna System **shall** monitor the GRB RF uplink for the GOES-R series.	Ensure that uplink is performing within parameters	
GSFPS-3267	ANT		The GS Antenna System **shall** monitor the RF uplink for HRIT/EMWIN for the GOES-R series.	Ensure that uplink is performing within parameters	
GSFPS-3268	ANT		The GS Antenna System **shall** monitor the real-time telemetry RF downlink for the GOES-R series.	Provide knowledge of current state of telemetry link. This is intended to be monitoring of the signal quality of the S-band telemetry downlink.	
GSFPS-3269	ANT		The GS Antenna System **shall** monitor the DCS RF downlink for the GOES-R series.	Ensure downlink is performing within parameters.	
GSFPS-3270	ANT		The GS Antenna System **shall** monitor the instrument raw data RF downlink for the GOES-R series.	Ensure downlink is performing within parameters.	
GSFPS-3271	ANT		The GS Antenna System **shall** remotely monitor and display the individual RF/IF satellite uplink carriers immediately before the combining process.	Ensures that GS operators have ability to remotely verify that the GOES-R spacecraft signal at any IF switch is being received within established signal performance parameters.	
GSFPS-3272	ANT		The GS Antenna System **shall** remotely monitor and display the composite RF/IF satellite uplink signal after the final stage of amplification.	Ensures that GS operators have ability to remotely verify that the GOES-R spacecraft signal for any antenna is being received within established signal performance parameters.	
GSFPS-3273	ANT		The GS Antenna System **shall** monitor all RF uplink paths simultaneously.	Defining what link monitoring entails.	
GSFPS-3274	ANT		The GS Antenna System **shall** remotely monitor and display all RF/IF satellite downlinks.	Ensures that all GS Antenna Systems responsible for uplinking commands to the spacecraft are operating within performance parameters.	
GSFPS-3275	ANT		The GS Antenna System **shall** remotely monitor downlinks from an output port of the IF switch.	Ensures that GS operators have ability to remotely verify that the GOES-R spacecraft signal at any IF switch is being received within established signal performance parameters.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3276			***9.2.4 System Life / Availability***		
GSFPS-3277	ANT		The GS Antenna System **shall** have a total operating life of at least 50 calendar years.	Consistent with the expected fuel-life of the GOES-R series mission, including T and U. "Operating Life" is defined in the Glossary.	
GSFPS-3278	ANT		The GS Antenna System **shall** meet all performance requirements throughout the life of the GS Antenna System.		
GSFPS-3279	ANT		The GS Antenna System **shall** have a design life equal to, or greater than the following: a) RF and power electronics: 10 years b) Controllers (Local, remote, remote interface): 7 years c) Corrosion Protection: 9 years d) Other: 50 years *(CCR01530)*	Based on NESDIS experience.	
GSFPS-3280	ANT		The GS Antenna System **shall** have a minimum Operational Availability of 0.99988 for the set of Antenna System functions, averaged over a 30-day period.	All of the antenna subsystem's functionality must be available 0.99988 of the time. If one antenna subsystem function is unavailable, then the period of unavailability counts against the antenna subsystem availability. In other words, the availability of all of the functions within the antenna subsystem comprise the availability of the overall set, and so the availability of each function must exceed the availability of the subsystem. This helps minimize the downtime of the antenna subsystem. Availability value supports 5 minutes of outage time per month (43195 minutes of uptime/43200 total minutes)=.99988.	
GSFPS-3281	ANT		The GS Antenna System **shall** have a minimum Operational Availability of 0.995 for each antenna station, averaged over a 30-day period.	This equates to 3.6 hours of downtime per month per antenna station, which is consistent wtih existing systems. Specifying an availability number of 0.995 per antenna station is consistent with meeting the GS Antenna System availability of 0.99988.	
GSFPS-3282	ANT		The GS Antenna System **shall** have a MaxTTRS of 5 minutes for antenna functionality.	If a function is lost that supports antenna functionality, it must be restored within a time period such that full antenna functionality is restored within 5 minutes in response to operational requirements.	
GSFPS-3283	ANT		The GS Antenna System **shall** be capable of transitioning each antenna station to operational status (excluding repointing) from any other non-failed state within 60 seconds.	Ensures all antennas are available to meet the 5-min MaxTTRS requirement (4 minute repoint, 1 minute boot-up)	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3284	ANT		The GS Antenna System **shall** be designed such that upon failure of any operational component/path, the GS Antenna System **shall** automatically switch to a backup component/path.	Needed to eliminate the need for manual intervention in the event of a failure.	
GSFPS-3285	ANT		The GS Antenna System RBU **shall** be capable of transitioning to operational status within 5 minutes.	The RBU must be capable of becoming operational within 5 minutes in order to meet the MaxTTRS requirements above.	
GSFPS-3286	ANT		The GS Antenna System facilities (primary and backup) **shall** maintain synchronization with each other such that historical data is not required to transition to operational status.	GS facilities that shift between primary and backup status (for most functions WCDAS/NSOF - RBU, but also WCDAS - NSOF in some instances) must maintain data synchronization such that transition from one site to another can occur without the need for updates prior to becoming operational. Continual synchronization of data is the primary intent of this requirement.	
GSFPS-3287	ANT		The GS Antenna System RBU **shall** transition to backup status for a given function once the primary responsibility for that function has returned to the primary facility or upon intentional termination of a failover sequence.	Ensures that only one instance of a function has primary responsibility for the function at any given time.	
GSFPS-3288	ANT		The GS Antenna System RBU **shall** retain primary responsibility for a function during handover back to the primary facility until successful handover has been completed.	Ensures that exactly one instance of a function always has primary responsibility for the function at any given time. Terminating the primary responsibility too early could result in an unsuccessful handover of responsibility for that function.	
GSFPS-3289	ANT		The GS Antenna System RBU **shall** be capable of operating independently of functionalities deployed at WCDAS and NSOF during failover events, while still meeting all applicable functional and performance requirements.	During a failover, the RBU's functionality must be self-contained and not rely on any associated functions at one of the primary sites. Additionally, the RBU must continue to meet any functional and performance requirements.	
GSFPS-3290	ANT		The GS Antenna System **shall** be able to failover functionality between sites on a function-by-function basis, while maintaining continuity of operations.	The approach for failover is on a per-function (rather than a per-site) basis, so that part of an element's functionality could be operating at the primary site and another part could be operating at the backup for a particular function. This also requires that operations continue as described in the handover requirements.	
GSFPS-3291			***9.2.5 Infrastructure***		
GSFPS-3292			**9.2.5.1 Power and HVAC**		
GSFPS-3293	ANT		The GS Antenna System **shall** provide air conditioning and heating temperature controls for all enclosed areas in which equipment not rated for the environmental conditions is located. *(CCR01530)*	Environment needs to be able to be manually controlled.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3758	ANT		The GS Antenna System **shall** enable the ABCS to monitor and control the antenna shelter HVAC at WCDAS. *(CCR01530)*	Environmental and power sensors, controllers, etc. installed by the Antenna Contractor will be integrated into the existing ABCS at WCDAS.	This does not imply a connection to either GAMCATS or the GS.
GSFPS-3295	ANT		The GS Antenna System **shall** have two power system interfaces: a) Utility power: powers infrastructure equipment (e.g., motors, lights, HVAC, etc.) b) UPS/Technical power: Powers electronic equipment (e.g., fiber optic, Low Noise Amplifiers (LNA), transmit systems)	Require that critical antenna equipment be on a separate power system (connected to UPS).	
GSFPS-3296	ANT		The GS Antenna System **shall** include a technical power system that is capable of handling the loads required by all the equipment requiring technical power.		
GSFPS-3297	ANT		The GS Antenna System **shall** include a utility power system that is capable of handling the worst case practical combination of the loads required by all the equipment requiring utility power.		
GSFPS-3298	ANT		The GS Antenna System **shall** be designed with separate power distribution panels for technical and utility power.	The facility will have two power distribution panels so that critical components can be handled separately from non-critical components.	
GSFPS-3299	ANT		The GS Antenna System **shall** use copper for all electrical conductors.	Don't want aluminum because it will cold flow, producing high resistance connections over the long term. This is dangerous when high current flows occur.	
GSFPS-3300	ANT		The GS Antenna System **shall** comply with NOAA Standard No. S24.802, paragraphs 3.10 through 3.10.7.	Guidance for power and power supplies.	
GSFPS-3301	ANT		The GS Antenna System **shall** include power cable protection units that connect to the grounding system and are located to maximize protection to the equipment in the shelter from transients on the power lines.	Prevents transients from feeding back into the antenna equipment. Includes protection for wires between drive motors and their control circuits.	
GSFPS-3302	ANT		The GS Antenna System **shall** include power cable protection units that are connected to separate circuit breakers on both Technical and Utility busses.	Prevents transients from feeding back into the antenna equipment.	
GSFPS-3303	ANT		The GS Antenna System **shall** include power cable protection units that are installed so that they can be replaced without interrupting power to the operating equipment.	Prevents transients from feeding back into the antenna equipment.	
GSFPS-3304	ANT		The GS Antenna System power supplies **shall** be "hot-swappable."	Needed for maintenance.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3305	ANT		The GS Antenna System **shall** be designed such that external electrical service outlets are Ground fault interrupt (GFI) protected NEMA 5-20 service outlets.	20 AMP is key for expected usage.	
GSFPS-3306	ANT		The GS Antenna System **shall** include power distribution panels mounted on, not in, the wall over the floor entry point of the conduits.	Lessons learned/standard practice	
GSFPS-3307	ANT		The GS Antenna System **shall** be designed with power distribution panels that are Square D type QO Load Centers, providing at least 32 branch poles and protected by an appropriate main breaker.	Lessons learned/commonality of spares	
GSFPS-3308	ANT		The GS Antenna System **shall** be designed to maintain a power factor of 0.8 or greater (lagging) at each site.	Violation can negatively impact site power.	
GSFPS-3309			**9.2.5.2 Cables and Connections**		
GSFPS-3310	ANT		The GS Antenna System **shall** use fiberoptic cables for all connections to the antenna stations, except primary power and ground.	Isolation from lightning.	
GSFPS-3311	ANT		The GS Antenna System **shall** comply with Standard No. S24.803 and paragraphs 3.6 through 3.7.4 of Standard No. S24.802 for all cables and connectors.	System will comply with NOAA guidelines for connectors.	
GSFPS-3312	ANT		The GS Antenna System **shall** be designed such that all cableways or conduits between the antennas and facility are protected from the environment.	Necessary for sustainability.	
GSFPS-3313	ANT		The GS Antenna System **shall** be designed such that all cableways or conduits between the antennas and facility are secure from tampering.	Necessary for security.	
GSFPS-3314	ANT		The GS Antenna System **shall** be designed such that all cableways or conduits between the antennas and facility are equipped with access points.	Necessary for maintenance.	
GSFPS-3315			**9.2.5.3 Timing System**		
GSFPS-3316	ANT		The GS Antenna System at WCDAS and NSOF **shall** interface to the station's IRIG-B timing system.		Timing signal is GFP.
GSFPS-3317			The WCDAS and NSOF station timing system will provide a 13 dBm +/-2 dB signal via a 50 ohm coax cable connection.		
GSFPS-3318	ANT		The GS Antenna System at WCDAS and NSOF **shall** interface to the station's 10 MHz reference signal.		Timing signal is GFP.

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3319	ANT		The GS Antenna System at the RBU **shall** have a 10 MHz timing signal, referenced to the GPS disciplined Rubidium standard, with the following phase noise characteristics: 1 Hz carrier offset: -85 dBc 10 Hz carrier offset: -115 dBc 100 Hz carrier offset: -140 dBc 1 kHz carrier offset: -155 dBc 100 kHz carrier offset or more: -160 dBc *(CCR01530)*	Consistent with the timing signal in the other operational sites. *(CCR01530)*	RBU timing system will be installed in the RBU computer room.
GSFPS-3759	ANT		The GS Antenna System at the RBU **shall** have an IRIG-B time code system. *(CCR01530)*	Consistent with the timing signal in the other operational sites.	
GSFPS-3760	ANT		The GS Timing and Frequency System at RBU **shall** provide the following frequency stability when locked to GPS (expressed as Allan Variance): < 1.0 E-12 (24 hour average) < 3.0 E-11 (averaged over 1.0 seconds) *(CCR01530)*	The frequency stability at RBU needs to comply with the NTIA filing, and be equal to the WCDAS stability.	
GSFPS-3320	ANT		The GS Antenna System at RBU **shall** have a station timing system level of 13 dBm +/-2 dB.	Consistent with the timing signal in the other operational sites.	
GSFPS-3761	ANT		The GS Antenna System at the RBU **shall** provide access to the IRIG-B time code and 10 MHz timing signal for use by other GS components at the RBU. *(CCR01530)*	The Antenna System timing and frequency system will be used by the core GS components at the RBU as well.	
GSFPS-3762	ANT		The GS Antenna System at the RBU **shall** include a NTP server as part of the timing system for time distribution. *(CCR01530)*	Consistent with the timing signal in the other operational sites.	
GSFPS-3321	ANT		The GS Antenna System at the RBU **shall** provide a timing system with IRIG-B and 10 MHz signals fan-out that is installed with 100% reserve capacity.	For future expansion.	100% reserve capacity accounts for GS components beyond Antenna System. *(CCR01530)*
GSFPS-3763	ANT		The GS Antenna System at the RBU **shall** be expandable such that a fan-out of the timing system IRIG-B and 10 MHz signals can support up to 100 TNC ports. *(CCR01530)*	For future expansion.	
GSFPS-3322	ANT		The GS Antenna System **shall** synchronize all nodes at the RBU utilizing the timing signal from the timing system resident at the RBU.	The GS Antenna System contractor will provide a time reference source at the RBU to synchronize all nodes at RBU.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3323			***9.2.6 Environmental Requirements***		
GSFPS-3324	ANT		The GS Antenna System **shall** operate in accordance with specified requirements when subjected to any one or combination of the following conditions at WCDAS: a) The environmental conditions specified in Paragraphs 3.14 through 3.14.7 of NOAA/NESDIS Standard No. S24.802, except at WCDAS the operating lower temperature limit shall be -10 degrees C. b) Precipitation, from rain, fog, or mist up to 100 mm per hour (3.94 inches/hour). c) Ice accumulation (0.1 inches/hour). d) If the antenna is positioned such that it will collect snow, it can withstand a 30 centimeter (11.8 in) accumulation. e) Low wind: steady velocity of up to 45 km per hour (28.0 mph). f) Medium wind: a one minute mean wind speed between 45 km per hour (28.0 mph) and 70 km per hour (43.5 mph), with gusts of up to 95 km per hour (59 mph). g) High wind: maximum one minute mean wind speed of 177 km per hour (110 mph). *(CCR01530)*	These environmental requirements are based on previous NESDIS procurements for outdoor equipment, but modified to match the maximum wind rating of the main operations building. For comparison, the operating temperature range in S24.802 is -20F to +120F (-29C to +59C)	
GSFPS-3325	ANT		The GS Antenna System at WCDAS **shall** survive sustained winds up to 242 km per hour (150 mph).	Upper limit where an antenna can survive in high winds in a stowed or non-tracking position. This rating is below the current HR antennas and protects up to a Cat 4 hurricane.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3326	ANT		The GS Antenna System **shall** operate in accordance with specified requirements when subjected to any one or combination of the following conditions at the RBU: a) The environmental conditions specified in Paragraphs 3.14 through 3.14.7 of NOAA/NESDIS Standard No. S24.802, b) Precipitation, from rain, fog, or mist up to 100 mm per hour (3.94 inches/hour). c) Ice accumulation (0.5 inches/hour). d) If the antenna is positioned such that it will collect snow, it can withstand a 30 centimeter (11.8 in) accumulation. e) Low wind: steady velocity of up to 45 km per hour (28.0 mph) . f) Medium wind: a one minute mean wind speed between 45 km per hour (28.0 mph) and 70 km per hour (43.5 mph), with gusts of up to 95 km per hour (59 mph). g) High wind: maximum one minute mean wind speed of 121 km per hour (75 mph). (CCR01530)	These environmental requirements are based on previous NESDIS procurements for outdoor equipment, but modified to exceed the maximum wind recorded in the state of WV, 1930 - 1996: peak gust of 69 mph. (ref: www.ncdc.noaa.gov/oa/mpp/freedata.html) The operating temperature range required by S24.802 is -20F to +120F (-29C to +59C)	
GSFPS-3327	ANT		The GS Antenna System at NSOF **shall** maintain legacy system performance with respect to environmental conditions as described in the Geostationary Operational Environmental Satellite (GOES) Receive Antenna System (GRAS) for the National Oceanic and Atmospheric Administration (NOAA) Satellite Operations Facility (NSOF) Suitland, MD, Specification: GSD2002.001. *(CCR01530)*	NSOF antennas will be upgraded--need to be able to continue to operate the same with respect to environmental conditions at NSOF.	
GSFPS-3328			**9.2.6.1 Lightning Protection**		
GSFPS-3329	ANT		The GS Antenna System **shall** have a lightning protection system in accordance with NOAA/NESDIS Standard, S24.809.	NESDIS requirement for all outdoor systems.	
GSFPS-3331	ANT		The GS Antenna System **shall** use waterproofed and metallic power conduits for all exposed conduits.	For lightning protection	
GSFPS-3332	ANT		The GS Antenna System **shall** enclose all internal power wiring in grounded metallic conduit or pipe.	For lightning protection	
GSFPS-3333			**9.2.6.2 Waterproofing / Corrosion**		
GSFPS-3334	ANT		The GS Antenna System **shall** provide waterproof access doors and openings for all antennas.	Ensures system integrity, since water will cause harm to all electronics.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3335	ANT		The GS Antenna System **shall** protect doors / openings from the prevailing winds.	Don't want debris carried in from the wind, etc.	
GSFPS-3336	ANT		The GS Antenna System **shall** have suitable waterproofing, support and protection at all points where cables or waveguides enter the equipment shelter.	Ensures system integrity, since water will cause harm to all electronics.	
GSFPS-3337	ANT		The GS Antenna System **shall** be corrosion protected.	Needed to reduce long-term maintenance costs.	
GSFPS-3338	ANT		The GS Antenna System **shall** comply with Society for Protective Coatings' SSPC-SP2/3 with respect to surfaces to be coated.	The standard applies to surface preparation for coating. Legacy requirement.	
GSFPS-3339	ANT		The GS Antenna System **shall** comply with MIL-P-15328 with respect to aluminum surfaces.	The standard is for a wash primer coating. Legacy requirement.	
GSFPS-3340	ANT		The GS Antenna System **shall** comply with MIL-P-8585A with respect to aluminum surfaces.	The standard is for a zinc chromate primer coating. Legacy requirement.	
GSFPS-3341			***9.2.7 Security***		
GSFPS-3342			**9.2.7.1 IT Security**		
GSFPS-3343	ANT		The GS Antenna System **shall** have multi-layered security (Defense in Depth) and comply with the security recommendations for a Supervisory Control and Data Acquisition (SCADA) system found in NIST SP 800-82, Draft Guide to Industrial Control Systems (ICS) Security.	As the MM function will be using telecommunications equipment rated at a High Impact-Sensitive but Unclassified level (e.g., NSA approved encryption devices), a defense in depth approach must be applied to ensure the proper safety and security of the GOES-R satellite. NIST SP 800-82 is referenced as it provides the requisite guidance that should be followed to ensure the proper isolation and controls will be implemented.	
GSFPS-3344	ANT		The GS Antenna System **shall** employ multi-factor identification and authentication that is separate from the administrative network, per NISTSP 800-82, Draft Guide to Industrial Control Systems (ICS) Security.	As the MM function will be using telecommunications equipment rated at the National Security level a defense in depth approach must be applied to ensure the property safety and security of the GOES-R satellite. Multi-factor authentication will help ensure that data integrity is maintained and will greatly reduce the risk of system compromise due to unauthorized access.	
GSFPS-3345	ANT		The GS Antenna System **shall** comply with the NOAA Enterprise Architecture Technical Reference Model (TRM).	The GS will be a part of the larger NOAA/NESDIS enterprise architecture and security architecture. Compliance with these architecture's reference models will help ensure integration.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3346	ANT		The GS Antenna System **shall** operate correctly as intended on systems using National Checklist Program Common Configurations such as the Federal Desktop Core Configuration.	The Cyber Security Research and Development Act of 2002 tasked NIST to "develop, and revise as necessary, a checklist setting forth settings and option selections that minimize the security risks associated with each computer hardware or software system that is, or is likely to become widely used within the Federal Government." As a result, NIST has developed the National Checklist Program which includes lists of common security configurations such as the FDCC. These checklists may include security configuration files, security documentation, and security policy directives applicable to a given system. The FDCC, an OMB (U.S. Office of Management and Budget) mandate, requires that all Federal Agencies standardize the configuration of approximately 300 settings on each of their Windows XP and Vista Computer.	
GSFPS-3347	ANT		The GS Antenna System **shall** implement common security configurations using the following order of precedence: a) NOAA b) DOC c) NIST d) Defense Information Systems Agency (DISA) e) Center for Internet Security (CIS)	As the GOES-R GS is considered a federally owned and operated system it must comply with federal guidance. Since the system is operated by NOAA as a part of the Department of Commerce, those regulations take precedence. NIST guidance must be complied with in accordance with the Federal Information Security Management Act of 2002. DISA is a leading authority in IT security for the DoD and has developed several guides (i.e., STIGS) that serve as an authoritative resource for implementing sound IT security configurations and settings. The Center for Internet Security (CIS) is a non-profit enterprise whose mission is to help organizations reduce the risk of business and e-commerce disruptions resulting from inadequate technical security controls. The CIS also provides a resource for best practices that should be considered when configuring IT security controls and mechanisms into critical systems such as the GOES-R GS.	
GSFPS-3348	ANT		The GS Antenna System **shall** be designed to enforce the principle of “least privilege” so that authenticated users are limited to accessing only those system objects required for the normal performance of their duties.	NIST 800-53 Security Control AC-6, Least Privilege requires that the GS enforce the most restrictive set of rights/privileges or accesses needed by users (or processes acting on behalf of users) for the performance of specified tasks. Therefore, the GS should be designed to ensure the concept of least privilege and thus ensure that normal user access prevents them from having administrative privileges.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3349	ANT		The GS Antenna System **shall** include anti-malware and Host-based Intrusion Prevention System (HIPS) functions within the development, integration and test, and operations environments.	Required in the Operations and I&T environments per NIST, DOC and NOAA. Required for the Development environment to determine any impacts on latency and sizing, as the security software does use CPU cycles, memory, and hard drive space. Also mitigates risk of an un-detected virus in Dev being introduced into the I&T environment as the software is promoted into that environment.	
GSFPS-3350			**9.2.7.2 Physical Security**		
GSFPS-3351	ANT		The GS Antenna System **shall** employ smart card login in accordance with Homeland Security Presidential Directive 12 (HSPD-12).	HSPD-12 establishes a mandatory, Government-wide standard for secure and reliable forms of identification issued by the Federal Government to its employees and contractors (including contractor employees). This includes two factor authentication and the use of smart card technology (for facility access as well as system access to include logins). Therefore to ensure that when the GS goes into an operational state it must support DOC/NOAA compliance with HSPD-12.	
GSFPS-3352	ANT		The GS Antenna System **shall** have an HSPD-12 keycard access lock that can be integrated into the building access control system for each antenna shelter.	One of the lower level HSPD-12 requirements is all new physical access systems use the PIV/CAC card to control access.	
GSFPS-3353	ANT		The GS Antenna System **shall** comply with the Interagency Security Committee's Security Standard for Leased Spaces for physical security.		
GSFPS-3354			**9.2.7.2.1 Perimeter Protection**		
GSFPS-3355	ANT		The GS Antenna System at the RBU **shall** have security bollards installed a around any Antenna System structures and equipment deemed mission critical. *(CCR01530)*	NOAA requirement for physical security.	
GSFPS-3764	ANT		The GS Antenna System fence at the RBU and WCDAS **shall** be constructed of 10 gauge galvanized chain link fence, 8 ft tall, topped with arm standards, and laced with barbed wire. *(CCR01530)*	NOAA requirement for physical security.	
GSFPS-3356	ANT		The GS Antenna System fence at the RBU and WCDAS **shall** be laid out in straight line segments. *(CCR01530)*	Permits unhampered observation.	
GSFPS-3357	ANT		The GS Antenna System fence at the RBU and WCDAS **shall** have a three-foot "clear" zone or buffer on both sides and clear of anything that could interfere with a clear line-of-sight down the fence line or provide access over the fence. *(CCR01530)*	NOAA requirement for physical security.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3358	ANT		The GS Antenna System gates at the RBU and WCDAS **shall** include but not limited to Intercom, CCTV and HSPD-12 compliant card readers. *(CCR01530)*	NOAA requirement for physical security.	
GSFPS-3765	ANT		The GS Antenna System **shall** have door access monitoring and notification for all antenna stations via GAMCATS. *(CCR01530)*	Need to be operationally aware of personnel presence in the antenna shelters.	
GSFPS-3360	ANT		The GS Antenna System **shall** be setback of 30 feet or more from the perimeter fence.	NOAA requirement for physical security.	
GSFPS-3361			**9.2.7.2.2 Building / Shelter Access Points and Exterior Doors**		
GSFPS-3362	ANT		The GS Antenna System **shall** provide doors which meet ASTM F 842 Grade 30 or higher for forced entry resistance.	NOAA requirement for physical security.	
GSFPS-3363	ANT		The GS Antenna System **shall** provide doors that have non-removable hinges and high security mechanical or electronic locks.	NOAA requirement for physical security.	
GSFPS-3364	ANT		The GS Antenna System **shall** provide exterior doors that are integrated into the building Electronic Access Control System (EACS) and have at minimum a magnetic or strike locks, HSPD-12 card readers, exit switch and contact sensors. *(CCR01530)*	NOAA requirement for physical security.	
GSFPS-3365	ANT		The GS Antenna System at the RBU **shall** have CCTV security monitoring at all external access points (gates, doors) and be integrated into the building EACS. *(CCR01530)*	NOAA requirement for physical security.	
GSFPS-3366			**9.2.7.2.3 Lighting**		
GSFPS-3367	ANT		The GS Antenna System **shall** have exterior lighting at entrances and exits.	NOAA requirement for physical security.	
GSFPS-3368	ANT		The GS Antenna System exterior lighting **shall** be adequate for night time surveillance and image recording.	NOAA requirement for physical security.	
GSFPS-3766	ANT		The GS Antenna System **shall** control antenna station exterior lights at WCDAS and RBU via GAMCATS. *(CCR01530)*	Lighting is controlled operationally by GAMCATS as a part of the Antenna System rather than through the facility's control system.	
GSFPS-3369			**9.2.7.2.4 Cameras and Video Surveillance**		
GSFPS-3370	ANT		The GS Antenna System **shall** have a video surveillance capability for all antenna stations independent from any existing facility capabilities. *(CCR01530)*	Video surveillance required for safety during operations. *(CCR01530)*	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3371	ANT		The GS Antenna System **shall** provide the ability to monitor and control the video surveillance system for each site from within that site's operations facility via GAMCATS. *(CCR01530)*	Safety is not site specific, the capability should exist for all controlling sites.	
GSFPS-3372	ANT		The GS Antenna System **shall** have the capability to monitor and control the video surveillance system for any site from within the site operations facility of any other site via GAMCATS. *(CCR01530)*	Safety is not site specific, the capability should exist for all controlling sites.	
GSFPS-3373	ANT		The GS Antenna System **shall** have the capability to record and archive video surveillance for 30 days, at 15 frames per second video for each camera.	Required to investigate physical intrusions after-the-fact.	
GSFPS-3376	ANT		The GS Antenna System **shall** have signage advising of video surveillance.	NOAA requirement for physical security.	
GSFPS-3377			***9.2.8 Software Maintenance***		
GSFPS-3378	ANT		The GS Antenna System **shall** permit an operator to install or upgrade software from any site within the GS Antenna System.	Software modifications within the GS can occur from any GS authorized site to any other site. This requirement provides for software at NSOF or RBU to be installed/upgraded from WCDAS, software at WCDAS and RBU to be installed/upgraded from NSOF, and software at NSOF/WCDAS to be installed/upgraded from RBU. This may also include access from the GS Factory, Satellite Factory, and/or other locations as defined by the GSP. This enables the consolidation of software maintenance and/or development activities if desired by the operations personnel. It also enables rapid patch deployment or software distribution via a unified mechanism, improving configuration management capabilities and potentially reducing costs.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3379	ANT		The GS Antenna System **shall** enable access and inspection of software at any site, from any other site.	Software access and inspection within the GS can occur from any GS authorized site to any other site. This requirement provides for software at NSOF or RBU to be accessed and inspected from WCDAS, software at WCDAS and RBU to be accessed and inspected from NSOF, and software at NSOF/WCDAS to be accessed and inspected from RBU. This may also include access from the GS Factory, Satellite Factory, and/or other locations as defined by the GSP. This enables the consolidation of software maintenance and/or development activities if desired by the operations personnel. It also enables rapid inspection of software via a unified mechanism, improving configuration management capabilities and potentially reducing costs.	
GSFPS-3380	ANT		The GS Antenna System **shall** enable modification of software at any site from any other site.	Software modifications within the GS can occur from any GS authorized site to any other site. This requirement provides for software at NSOF or RBU to be modified from WCDAS, software at WCDAS and RBU to be modified from NSOF, and software at NSOF/WCDAS to be modified from RBU. This enables the consolidation of software maintenance and/or development activities if desired by the operations personnel. It also enables rapid patch deployment or software distribution via a unified mechanism, improving configuration management capabilities and potentially reducing costs.	
GSFPS-3381	ANT		The GS Antenna System **shall** enable testing of software at any site from any other site.	Software testing within the GS can occur from any GS authorized site to any other site. This requirement provides for software at NSOF or RBU to be tested from WCDAS, software at WCDAS and RBU to be tested from NSOF, and software at NSOF/WCDAS to be tested from RBU. This may also include access from the GS Factory, Satellite Factory, and/or other locations as defined by the GSP. This enables the consolidation of software maintenance and/or development activities if desired by the operations personnel. It also enables testing and troubleshooting of software via a unified mechanism, improving configuration management capabilities and potentially reducing costs.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3382	ANT		The GS Antenna System **shall** enable distribution of software at any site, from any other site.	Software distribution can occur between any GS authorized combination of sites. The GS will have interfaces and connectivity that enable this distribution. Because of this, software development and maintenance activities may be consolidated, which could reduce costs and improve configuration management capabilities.	
GSFPS-3383			**9.2.8.1 Development Environment**		
GSFPS-3384	ANT		The GS Antenna System **shall** provide a development environment at WCDAS for software development and checkout, including firmware. *(CCR01530)*	The development environment is an offline environment that will be used by the GS Antenna System as described below.	
GSFPS-3385	ANT		The GS Antenna System development environment **shall** be capable of hosting the GS Antenna System operational baseline software.	The development environment needs to be able to host an complete version (current, historical, or future/development) of the GS Antenna System software baseline for use/checkout prior to promotion, performance analysis, etc.	
GSFPS-3386	ANT		The GS Antenna System development environment **shall** be sized such that the execution of the GS Antenna System software baseline will meet operational performance requirements.	Sizing and performance of the development environment will support the same functional and performance requirements of the operational Antenna System.	
GSFPS-3387	ANT		The GS Antenna System development environment **shall** provide access to all operational input data (status and events) necessary for the offline execution of GS Antenna System software.	This ensures that development activities for WCDAS-based functions and processes can occur at WCDAS.	
GSFPS-3388	ANT		The GS Antenna System development environment **shall** provide the selectable capability to capture, store, and retrieve logs, configurations, performance data, and other artifacts associated with development activities.	This provides the development environment with sufficient capabilities to conduct development activities. The term "selectable" indicates that these functions may be turned on or off as needed for a particular activity.	
GSFPS-3389	ANT		The GS Antenna System development environment **shall** provide tools and compilers necessary to enable the change, recompilation, and execution of any segment/module of the software source code.	The development environment will be used to modify Antenna System source code. This supports the checkout of those modifications through the environment.	
GSFPS-3390	ANT		The GS Antenna System development environment **shall** utilize the same configuration management and version control tools as the operational environment.	The development environment, as part of the whole GS Antenna System, uses the CMART.	
GSFPS-3391	ANT		The GS Antenna System development environment **shall** have the capability to export compiled code segments and associated configuration and other support files to the integration and test (I&T) environments following established configuration management (CM) processes.	This provides a transfer mechanism from the development environment to the I&T environments for promotion of code and associated items developed on the development environment.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3392	ANT		The GS Antenna System development environment **shall** be physically or logically segregated from other GS Antenna System environments such that data and developed/compiled code transfers can only be initiated from the I&T environment.	Helps to prevent accidental migration of code from the development environment to the I&T environments. The higher-security environment will always control the transfer.	
GSFPS-3393	ANT		The GS Antenna System development environment **shall** provide tools to monitor and display GS Antenna System software execution performance and compare relative to performance requirements.	Monitoring development code performance is necessary for operators/developers to know that the system meets operational requirements.	
GSFPS-3394	ANT		The GS Antenna System development environment **shall** provide local workstation operator/developer access and control.	Provides access and control of the development environment at WCDAS so that activity can occur locally.	
GSFPS-3395	ANT		The GS Antenna System development environment **shall** be physically or logically segregated from other GS Antenna System environments such that instances of any portion of the GS software baseline executing on the development environment cannot interfere with nor degrade the performance of software executing on any other environment.	Ensures physical and logical non-interference between the development environment and the I&T and operational environments.	
GSFPS-3396	ANT		The GS Antenna System development environment **shall** provide remote access to the development environment and tools from NSOF and RBU.	Enables remote software maintenance.	
GSFPS-3397	ANT		The GS Antenna System development environment **shall** be capable of controlling off-line antenna stations and associated hardware that are configured to be associated with the development environment.	For the purposes of software checkout.	
GSFPS-3398			**9.2.8.2 Integration and Test Environment**		
GSFPS-3399	ANT		The GS Antenna System **shall** provide an I&T environment at WCDAS to support I&T for the GS Antenna System software, including firmware. *(CCR01530)*	This environment is necessary to conduct software I&T in a separate environment from the development and operational systems.	
GSFPS-3400	ANT		The GS Antenna System I&T environment **shall** be sized such that the execution of the GS Antenna System software baseline will meet operational performance requirements.	This allows the I&T environment to conduct realistic performance test activities and to mimic the operational environment under nominal operating conditions and scenarios.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3401	ANT		The GS Antenna System I&T environment **shall** be physically or logically segregated from other GS Antenna System environments such that instances of any portion of the GS Antenna System software baseline executing on the I&T environment cannot interfere with nor degrade the performance of software executing on any other environment.	Helps to prevent accidental migration of code from the I&T environment to the operational or development environments.	
GSFPS-3402	ANT		The GS Antenna System I&T environment **shall** utilize the same software configuration management and version control tools as the operational environment.	Using common software CM and version control tools helps manage code between the environments.	
GSFPS-3403	ANT		The GS Antenna System I&T environment **shall** provide tools to monitor and display software execution performance and compare relative to GS Antenna System F&PS requirements.	Diagnostic tools are needed to support software performance during I&T activities. These provide the capability to measure system performance against GS Antenna System requirements.	
GSFPS-3404	ANT		The GS Antenna System I&T environment **shall** have access to real-time operational status and event information.	Enables a "live" status and event data stream for test.	
GSFPS-3405	ANT		The GS Antenna System I&T environment **shall** be capable of exporting output data to the development environment.	Enables a "live" status and event data stream for development.	
GSFPS-3406	ANT		The GS Antenna System I&T environment **shall** have the capability to export compiled code segments and associated configuration and other support files to the operational environment, following established configuration management processes, and without disruption of mission operations. *(CCR01530)*	The I&T environment must promote successfully I&T'd software to the OE. The I&T environment exists only at WCDAS, but must support promotion of software at all three sites. It must follow software CM processes. It also must not impact ongoing operations. It must be capable of promoting software to operations. *(CCR01530)*	
GSFPS-3407	ANT		The GS Antenna System I&T environment **shall** have the capability to capture and store 36 hours of data generated from software execution.	36 hours of I&T storage (one day plus margin).	
GSFPS-3408	ANT		The GS Antenna System I&T environment **shall** provide the selectable capability to capture, store and retrieve logs, configurations, performance data, and other artifacts associated with test activities.	The I&T environment needs to log test activities through these capabilities. It is selectable so that not all test activities need to be logged. The logged activities are operator-definable.	
GSFPS-3409	ANT		The GS Antenna System I&T environment **shall** accommodate test and verification of planned modifications under operational-equivalent conditions.	The I&T environment must be capable of checkout and requirements verification of modifications that will be run on the operational system while subjected to operational conditions and prior to promotion to the operational environment.	
GSFPS-3410	ANT		The GS Antenna System I&T environment **shall** interface with the GS MM I&T environment to support GS Element and Segment-level testing.	Enables end-to-end testing across the MM-internal interface to the Antenna subsystem.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3411	ANT		The GS Antenna System I&T environment **shall** be capable of controlling off-line antenna stations and associated hardware that are configured to be associated with the I&T environment.	For the purposes of I&T.	
GSFPS-3412			***9.3 SAFETY***		
GSFPS-3413			***9.3.1 Personnel Safety Units (PSUs)***		
GSFPS-3414	ANT		The GS Antenna System **shall** include Personnel Safety Units (PSUs) that are installed at all work areas on the antenna and at the top and bottom of all stairs and ladders.	PSUs are required at each antenna station for safety. They enable maintenance personnel to quickly and safely stop antenna motion at any time to avoid damage to equipment or injury to personnel.	
GSFPS-3415	ANT		The GS Antenna System **shall** include PSUs that include a safe/operate switch and a visual indicator to show when the antenna drive system is disabled. *(CCR01530)*	Safety	
GSFPS-3416	ANT		The GS Antenna System **shall**, when the PSU safe/operate switch is in the safe position: a) remove all servo drive power b) apply both sets of brakes c) disable control units for the antenna d) place the control unit in STOP mode	Safety	
GSFPS-3417	ANT		The GS Antenna System **shall** display a red light on or near each PSU, visible from the ground, whenever the associated PSU is activated.	Safety	
GSFPS-3418	ANT		The GS Antenna System **shall** require a manual reset for each activated PSU prior to permitting any control unit to regain control of the antenna.	Safety	
GSFPS-3419	ANT		The GS Antenna System **shall** be in the STOP mode, with no control point selected, when the PSU is reset (deactivated).	Safety	
GSFPS-3420	ANT		The GS Antenna System **shall** require an operator to first make a positive selection of the control point, and then change the antenna to a mode other than the STOP mode, before any other changes can be made when a PSU is reset (deactivated).	Safety	
GSFPS-3421	ANT		The GS Antenna System **shall** provide status of PSUs.	Safety	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3422			***9.3.2 Emergency Provisions***		
GSFPS-3423	ANT		The GS Antenna System **shall** have a local (shelter) emergency power-off capability to cut off power to all equipment at each antenna station. *(CCR01530)*	Safety to enable maintenance personnel to quickly and safely power off all equipment in the event of an emergency to avoid damage to equipment and/or injury to personnel.	Intent is for fire protection. *(CCR01530)*
GSFPS-3424	ANT		The GS Antenna System **shall** have a remote (operations facility) emergency capability to power off all equipment at each antenna station.	Safety to enable maintenance personnel to quickly and safely power off all equipment in the event of an emergency to avoid damage to equipment and/or injury to personnel.	Intent is for fire protection. *(CCR01530)*
GSFPS-3425	ANT		The GS Antenna System **shall** be designed such that emergency power-off mechanisms are protected from accidental activation.	These mechanisms prevent service personnel from accidentally bumping into an emergency power off switch and shutting down the antenna.	
GSFPS-3426	ANT		The GS Antenna System **shall** have internal emergency lighting in all enclosed areas that activates automatically in the event of a power outage.	Electrical Code compliance requirement.	
GSFPS-3427	ANT		The GS Antenna System **shall** automatically illuminate interior emergency exits and evacuation routes in the event of an emergency.	Electrical Code compliance requirement.	
GSFPS-3428	ANT		The GS Antenna System **shall** be compliant with National Fire Protection Agency (NFPA) 72: National Fire Alarm Code.	Fire Code compliance requirement.	
GSFPS-3429	ANT		The GS Antenna System **shall** be compliant with NFPA 10.	Fire Code compliance requirement.	
GSFPS-3430	ANT		The GS Antenna System **shall** provide automatic notification of fire via GAMCATS. *(CCR01530)*	The feature provides the building service personnel and/or GOES R system operators notification that a fire has occurred in the antenna equipment shelter which will be typically unoccupied.	
GSFPS-3431	ANT		The GS Antenna System **shall** employ automatic fire suppression using FM-200 for all antenna stations.	Electrical Code compliance requirement.	
GSFPS-3432	ANT		The GS Antenna System **shall** provide battery backup electrical power for all security systems.	NOAA requirement for physical security.	
GSFPS-3433	ANT		The GS Antenna System **shall** provide a connection point at each antenna station for emergency generator power.		The technical and utility power are provided from the same transportable emergency generator through a single connection. *(CCR01530)*
GSFPS-3434			***9.3.3 Physical Safety***		
GSFPS-3435	ANT		The GS Antenna System **shall** comply with OSHA safety requirements	Safety standards compliance.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3436	ANT		The GS Antenna System **shall** have toe plates at maintenance and access platforms and stairs.	Safety	
GSFPS-3437	ANT		The GS Antenna System **shall** have guard rails at maintenance and access platforms and stairs.	Safety	
GSFPS-3438			***9.3.4 Safety Lighting***		
GSFPS-3439	ANT		The GS Antenna System **shall** include red dual-lamp obstruction light fixtures mounted on the antenna reflector structure at the maximum height under all antenna configurations.	FAA requirement.	
GSFPS-3440	ANT		The GS Antenna System **shall** provide flashing red lights (Antenna Motion Warning Lights) and audible horn to signal antenna motion.	Safety	
GSFPS-3441	ANT		The GS Antenna System **shall** automatically engage the Antenna Motion Warning Light whenever the antenna is in a control mode that will allow antenna movement.	Safety (antenna can move at any time)	
GSFPS-3442	ANT		The GS Antenna System **shall** provide Antenna Motion Warning Lights that are readily visible, in full sunlight, from any position within 30m of the antenna.	Safety	
GSFPS-3443	ANT		The GS Antenna System **shall** provide an audible horn that is audible within 30m of the antenna structure.	Safety	
GSFPS-3444	ANT		The GS Antenna System **shall** sound an audible horn for a selectable period between 5 and 30 seconds when the antenna is placed into a control mode that allows antenna movement.	Safety	
GSFPS-3445	ANT		The GS Antenna System **shall** provide lights to signal active RF transmission (RF Transmission Warning Lights).	Safety: RF power could be a hazard between the feed and the dish surface.	
GSFPS-3446	ANT		The GS Antenna System **shall** flash blue RF Transmission Warning Lights whenever the antenna is transmitting RF energy.	Safety: Blue is the NESDIS standard color that maintenance personnel have associated with high power RF warning for several decades.	
GSFPS-3447	ANT		The GS Antenna System **shall** provide RF Transmission Warning Lights that are readily visible, in full sunlight, from any position within 30m of the antenna.	Safety: To ensure maintenance personnel can see from a reasonable distance whether the antenna is transmitting.	
GSFPS-3448	ANT		The GS Antenna System **shall** be designed to include a light fixture at each location in or on the antenna pedestal or structure where maintenance is required.	Ability to perform maintenance.	
GSFPS-3449	ANT		The GS Antenna System **shall** be designed such that interior lighting complies with the recommendations of the IES Lighting Handbook and GSA standards.	Guidelines for lighting.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3450	ANT		The GS Antenna System **shall** be designed with EXIT signs with battery backup at the exits of the antenna shelters.	Emergency lighting.	
GSFPS-3451			***9.4 ANTENNA STATION REQUIREMENTS***		
GSFPS-3452			***9.4.1 Physical Structure***		
GSFPS-3453	ANT		The GS Antenna System **shall** be designed such that full antenna movement can be accomplished with 0.5 meters ground clearance.	Necessary for maintenance access and personnel safety.	
GSFPS-3454	ANT		The GS Antenna System **shall** provide equipment enclosures that are compliant with National Electrical Manufacturers Association (NEMA) 4X.	Industry Recognized Standard used on all previous NESDIS Antenna procurements.	
GSFPS-3455	ANT		The GS Antenna System **shall** conform to the document "Specifications for Structural Joints Using ASTM A-325 or A-490 Bolts" (American Institute of Steel Construction, AISC), unless specified otherwise.	Industry Recognized Standard used on all previous NESDIS Antenna procurements.	
GSFPS-3456	ANT		The GS Antenna System **shall** be designed such that reflector panels are field replaceable and adjustable.	Necessary for long term maintenance, as the chance of damage to the dish surface increases with time.	
GSFPS-3457	ANT		The GS Antenna System **shall** comply with FAA Regulations 14 CFR, Part 77.13.	This translates to a height requirement at WCDAS. Exact height restriction will depend on distance from centerline of runway.	
GSFPS-3458			***9.4.2 Drive System***		
GSFPS-3459			**9.4.2.1 General**		
GSFPS-3460	ANT		The GS Antenna System **shall** utilize brushless motor drives.	Only practical solution based on legacy lessons learned. Brushes are maintenance-intensive.	
GSFPS-3461	ANT		The GS Antenna System **shall** be capable of independently limiting velocity and acceleration to lower-than-maximum values through software-adjustable limits.	Safety.	
GSFPS-3462	ANT		The GS Antenna System **shall** include a capability to manually position, e.g. "hand-crank", the antenna during contingency operations.	Emergency operations. This equates to a hand-crank, or equivalent.	
GSFPS-3463	ANT		The GS Antenna System **shall** include a capability to position the antenna using a portable drill.	The ability to use a power drill to turn the antenna is required, and consistent with current operations.	
GSFPS-3464			**9.4.2.2 Axis Travel Range**		
GSFPS-3465	ANT		The GS Antenna System **shall** have the capability to point to stellar radio sources for the purposes of calibration.	Needed to perform antenna G/T for the certified operational readiness review, acceptance testing, and operational trending of the life of the antenna.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3466	ANT		The GS Antenna System **shall** have the capability to point to any position along the geostationary arc, plus the additional variation due to a +/-15 degree inclination, to a minimum elevation of 5 degrees. *(CCR01530)*	Necessary for operations.	
GSFPS-3467	ANT		The GS Antenna System **shall** have the capability to point to any position over the defined ranged of the geostationary arc without mechanical reconfiguration.	Mechanical reconfiguration requires manual operation at the antenna station which will not meet RBU lights out operation and would impact to operations concept at other two sites.	
GSFPS-3468			**9.4.2.3 Motion Limits (CCR01530)**		
GSFPS-3469	ANT		The GS Antenna System **shall** provide software-adjustable limits to antenna motion for each axis. *(CCR01530)*	Need to protect the antenna against structural damage due to a race condition. This would be in addition to the ACU soft limits.	
GSFPS-3470	ANT		The GS Antenna System **shall** provide hard mechanical stops able to withstand the maximum kinetic energy plus drive torque without damage to the dish structure to limit antenna motion for the elevation axis. *(CCR01530)*	Required for physical safety of the antenna in any operational mode.	
GSFPS-3471			**9.4.2.4 Axis Brakes**		
GSFPS-3472	ANT		The GS Antenna System **shall** employ brakes capable of holding each WCDAS and RBU antenna under all specified operational environmental conditions. *(CCR01530)*	Safety in the event of a power failure, and so that the motor isn't used for emergency stops.	This does not include the DCS pilot antennas.
GSFPS-3473	ANT		The GS Antenna System **shall** provide a fail-safe brake system in which the brakes are mechanically applied and electrically released.	Safety in the event of a power failure.	
GSFPS-3474	ANT		The GS Antenna System **shall** be capable of stopping the antenna within one degree of travel using the brake system.	Legacy safety feature.	
GSFPS-3475	ANT		The GS Antenna System **shall** include brakes with the thermal capacity to withstand two full load stops within 30 seconds.	Legacy safety feature. Worst case scenario for operator stop/start/stop error.	
GSFPS-3476	ANT		The GS Antenna System **shall** provide independently-operable brake systems for each axis.	Legacy safety feature. Can stop one axis without having to stop the other axis.	
GSFPS-3477	ANT		The GS Antenna System **shall** be capable of manual brake release and manual brake re-application, e.g. "hand" release and apply.	Legacy safety feature. Required for manual backup in case of electrical failure.	
GSFPS-3478	ANT		The GS Antenna System **shall** automatically reapply brakes when electrical power is restored, if the brakes are manually released.	Legacy safety feature.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3479			**9.4.2.5 Pointing and Tracking**		
GSFPS-3481	ANT		The GS antenna system **shall** be capable of being operationally repointed, including polarization optimization, from any position on the geostationary arc to any other position on the arc within four minutes.	Includes Az/El and Polarization. Needed to meet GS availability requirements.	
GSFPS-3482	ANT		The GS Antenna System **shall** be capable of tracking with a time bias of up to a total deviation of 600 seconds from the reference track, in ± 1 second increments.	Necessary to accommodate the potential for time errors from a correct spatial reference.	Time bias also applies to star-tracking. *(CCR01530)*
GSFPS-3483	ANT		The GS Antenna System **shall** be capable of tracking to an azimuth angle bias of ± 20º from the reference track, in increments that are adjustable from ± 0.001 degrees to 1.00 degrees, by 0.001 degrees.	The ACU bias step size is the ability to command the antenna to point away from a calculated or stored position by a specified number of degrees, which must be defined in finite increments or "steps". Consistent with current capability.	
GSFPS-3484	ANT		The GS Antenna System **shall** be capable of tracking to an elevation angle bias of ± 20º from the reference track, in increments that are adjustable from ± 0.001 degrees to 1.00 degrees, by 0.001 degrees.	The step size is the ability to command the antenna to point away from a calculated or stored position by a specified number of degrees, which must be defined in finite increments or "steps".	
GSFPS-3485	ANT		The GS Antenna System **shall** be capable of tracking to a polarization angle bias of ± 20º from the reference track, in increments that are adjustable from ± 0.001 degrees to 1.00 degrees, by 0.001 degrees.	The step size is the ability to command the antenna to point away from a calculated or stored position by a specified number of degrees, which must be defined in finite increments or "steps".	
GSFPS-3486	ANT		The GS Antenna System **shall** track based on IF signals received from the IFDS.	Specifies interface for IF signals	
GSFPS-3487	ANT		The GS Antenna System **shall** have L-, S- and X-band tracking receivers.	Specifies need to track at all bands.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3488			**9.4.2.6 Antenna Position**		
GSFPS-3489	ANT		The GS Antenna System **shall** be implemented such that the relative misalignment between the peak of each RF beam and the mechanical reference axes of the antenna can be corrected to within 0.005 degrees. *(CCR01530)*	This requirement allows the relative misalignment between the RF beam and mechanical axes to be measured, and a bias applied to compensate for the misalignment. If the effective RF electrical beam for each frequency band is not aligned to the antenna mechanical/optical boresight, an error will exist in the RF monitoring equipment feedback that controls the drive motors, and pointing will not be accurate (e.g., in Program Track mode). This is important when transitioning between modes (Program to Signal Track): If the RF beam(s) and reference axis are not aligned, outages in transition between modes will occur. This is especially important with respect to GOES-N/P, which has significant variation in spacecraft position. *(CCR01530)*	
GSFPS-3490	ANT		The GS Antenna System **shall** use true north and true horizontal as the reference for antenna axes.	Legacy capability. Should be retained to minimize possible confusion for operations and maintenance personnel.	
GSFPS-3491	ANT		The GS Antenna System **shall** provide resolution of the antenna angle position to within 0.001 degree.	Legacy capability. Should be retained to minimize possible confusion for operations and maintenance personnel.	
GSFPS-3492	ANT		The GS Antenna System **shall** be designed such that initial alignment of each axis is within 0.01 degrees of arc from its true reference position.	Legacy capability. Minimizes the necessity for software offsets. With a larger error in alignment, software corrections to pointing would have to be applied in every instance.	
GSFPS-3493			***9.4.3 Equipment Shelter***		
GSFPS-3494	ANT		The GS Antenna System **shall** include an equipment shelter per antenna station to contain all equipment associated with the antenna station.	Shelter is required to house/protect and enable access to equipment located at the antenna station.	
GSFPS-3495	ANT		The GS Antenna System **shall** include sufficient number of electrical service outlets to accommodate maintenance and test equipment at all locations on the antenna.	Eliminates the need for drop cords from different levels/locations.	
GSFPS-3496	ANT		The GS Antenna System **shall** be designed such that any openings in both the inner and outer walls for air inlets and outlets are covered with a mesh that is insect, rodent, and bird proof.	Lessons learned.	
GSFPS-3497	ANT		The GS Antenna System **shall** be designed with door thresholds to prevent entrance of water.	Lessons learned.	
GSFPS-3498	ANT		The GS Antenna System **shall** be designed to include redundant HVAC systems for each antenna shelter.	This is standard for legacy antennas.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3500	ANT		The GS Antenna System **shall** be designed such that the air handling units in each equipment shelter includes an economizer.	Uses cold outside air to cool (rather than refrigeration).	
GSFPS-3501	ANT		The GS Antenna System **shall** be capable of maintaining an ambient shelter temperature of 70 degrees Fahrenheit (+/- 5 degrees).	Ensures that the HVAC systems can handle the load to accommodate temperatures for maintenance personnel.	
GSFPS-3502	ANT		The GS Antenna System **shall** be capable of maintaining an ambient shelter humidity of 50 percent (+/- 10 percent).	Ensures that the HVAC systems can handle the load to accommodate temperatures for maintenance personnel.	
GSFPS-3503			***9.5 RADIO FREQUENCY (RF) REQUIREMENTS***		
GSFPS-3504			***9.5.1 General***		
GSFPS-3505	ANT		The GS Antenna System **shall** operate in the transmit frequency bands as follows: a) 2025-2050 MHz (transmit S-band) b) 7212-7228 MHz (transmit X-band)	Ensures that the WCDAS and RBU TT&C antenna systems will have an uplink capability that will meet all applicable availability requirements allocated to the antennas.	
GSFPS-3506	ANT		The GS Antenna System **shall** use Threaded Neill-Concelman (TNC) connectors for timing and IF connections.	Consistent with legacy; needed for safety of the connections and performance. Other connectors have had reliability & maintenance issues.	
GSFPS-3507	ANT		The GS Antenna System **shall** be designed such that all waveguide flanges use RFI (Chomerics or equivalent) gaskets.	Required for safety. Lessons learned after incidents involving injury due to radiation leaks. Station standard for maintenance.	
GSFPS-3508	ANT		The GS Antenna System **shall** provide simultaneous L-, S-, and X-band receive and S- and X-band transmit capabilities.	Nominal frequency ranges for the mission.	
GSFPS-3509	ANT		The GS Antenna System **shall** operate in the receive frequency bands as follows: a) 1670-1700 MHz (receive L-Band) b) 2200-2290 MHz (receive S-Band) c) 8100-8350 MHz (receive X-band)	Ensures that the antenna TT&C systems (at WCDAS and RBU) will have a tri-band downlink capability that will meet all applicable availability requirements allocated to the antennas.	
GSFPS-3510	ANT		The GS Antenna System **shall** have a sidelobe gain (G) in the spillover region that rises to no more than 0.0 dBi in the receive X-band.	Necessary from coordination with the military (to protect our signals from theirs). Can't reference the ITU standard for this because we can't meet standards with the presence of the military interference.	
GSFPS-3511	ANT		The GS Antenna System **shall** have a sidelobe gain (G) in the spillover region that rises to no more than 0.0 dBi in the transmit` X-band.	Necessary to avoid interference with FAA frequencies.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3512	ANT		The GS Antenna System **shall** be designed such that all local oscillators (LO) are phase locked to the 10 MHz station frequency standard.	In the event of a 10 MHz station frequency-reference failure, allows data-link to be maintained without interruption of service; phase lock required to maintain data-link without frequent manual intervention.	
GSFPS-3513	ANT		The GS Antenna System **shall** use an L-band downconverter LO frequency of 1620.0 Mhz.	Required to be compatible with GS interface. Complies with legacy interface.	
GSFPS-3514	ANT		The GS Antenna System **shall** use an S-band downconverter LO frequency of 2140.0 MHz.	Required to be compatible with GS interface. Complies with legacy interface.	
GSFPS-3515	ANT		The GS Antenna System **shall** use an S-band upconverter LO frequency of 1960 MHz.	Required to be compatible with GS interface.	
GSFPS-3516	ANT		The GS Antenna System **shall** use an X-band downconverter LO centered on the pass-band of the X-band IF switch.	Needed to maximize the performance of the X-band downlink.	
GSFPS-3517	ANT		The GS Antenna System **shall** use an X-band upconverter LO centered on the pass-band of the X-band IF switch.	Needed to maximize the performance of the X-band downlink.	
GSFPS-3518			***9.5.2 Performance***		
GSFPS-3519			As defined in the SS to C3S IRD (417-R-IRD-001), SS to GRB (417-R-IRD-002), SS to DCS (417-R-IRD-005) the overall end-to-end ground requirement for signal degradation (excluding environmental losses) from the output of the spacecraft through the digital output of the IF demodulators (GS Contractor provided) is < 2.3 dB. Likewise, the overall requirement for signal degradation from the IF modulator (GS Contractor provided) through the input of the spacecraft is < 2.3 dB.		
GSFPS-3480	ANT		The GS Antenna System **shall** allow a loss of 1.0 dB or less (3-sigma) for worst-case environmental conditions. *(CCR01530)*	This degrades the actual required G/T due to high wind conditions.	"Worst-case" environmental conditions are as defined in GSFPS-3324 and GSFPS-3326. *(CCR01530)*
GSFPS-3520	ANT		The GS Antenna System **shall** be designed such that end-to-end uncoded bit-error-rate implementation loss for the transmit chain (output of IF switch through output of antenna) is no more than 0.15 dB for each uplink.	The overall ground implementation loss as required by the SS to GS IRD is 2.3 dB. The majority of the allocation is to the modulator (allocated to GS contractor). This requirement allocates implementation loss to the Antenna System for the transmit chain. Clarification: Per this requirement, the transmit chain will not increase noise and distortion by more than 0.15 dB, end-to-end.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3521	ANT		The GS Antenna System **shall** be designed such that end-to-end uncoded bit-error-rate implementation loss for the receive chain (input of antenna through output of IF switch) is no more than 0.15 dB for each downlink.	The overall ground implementation loss as required by the SS to GS IRD is 2.3 dB. The majority of the allocation is to the demodulator (allocated to GS contractor). This requirement allocates implementation loss to the Antenna System for the receive chain. Clarification: Per this requirement, the receive chain will not increase noise and distortion by more than 0.15 dB, end-to-end.	
GSFPS-3522	ANT		The GS Antenna System **shall** have the capability to point to multiple stellar radio sources for G/T calibration as identified in Recommendation ITU-R S.733 Annex 1.	Needed to provide for alternate calibration sources.	
GSFPS-3523	ANT		The GS Antenna System **shall** be designed such that the G/T calibration used at initial acceptance shall be repeatable over the operational life of the Antenna System.	This is a performance requirement because it drives a design that does not require modifications to support the same calibration methods after system acceptance (declared operational) as were used during system acceptance (as is sometimes the case). Necessary to establish and maintain a consistent calibration baseline for comparison over the lifetime of the mission.	
GSFPS-3524	ANT		The GS Antenna System **shall** be designed such that G/T calibration can be performed with no configuration change to the operational system (except for re-pointing).	Calibration is part of standard antenna operations and should not require special reconfiguration.	
GSFPS-3525	ANT		The GS Antenna System **shall** be designed such that the G/T calibration is sufficiently accurate to establish specified G/T performance requirements of the Antenna System.	Antenna contractor derives accuracy from calibration requirements.	
GSFPS-3526	ANT		The GS Antenna System **shall** have a gain-to-system noise temperature ratio of at least 26.5 dB/K for the L-band receive chain (RBU/WCDAS), referenced to the LNA inputs, with clear sky, an elevation of 5 degrees, an ambient temperature of 23° C, and with both transmit systems radiating at full power, when measured in accordance with Recommendation ITU-R S.733 Annex 1.	G/T specification is required to close the link with the spacecraft.	
GSFPS-3527	ANT		The GS Antenna System **shall** have a gain-to-system noise temperature ratio of at least 27.0 dB/K for the S-Band receive chain (RBU/WCDAS), referenced to the LNA inputs, with clear sky, an elevation of 5 degrees, an ambient temperature of 23° C, and with both transmit systems radiating at full power, when measured in accordance with Recommendation ITU-R S.733 Annex 1.	G/T specification is required to close the link with the spacecraft.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3528	ANT		The GS Antenna System **shall** have a gain-to-system noise temperature ratio of at least 36.5 dB/K for the X-band receive chain (RBU/WCDAS), referenced to the LNA inputs, with clear sky, an elevation of 5 degrees, an ambient temperature of 23° C, and with both transmit systems radiating at full power, when measured in accordance with Recommendation ITU-R S.733 Annex 1.	G/T specification is required to close the link with the spacecraft.	
GSFPS-3529	ANT		The GS antennas system **shall** have a gain-to-system noise temperature ratio of at least 18.1 dB/K for the L-band receive chain (NSOF), referenced to the LNA inputs, with clear sky, an elevation of 5 degrees, and an ambient temperature of 23° C, when measured in accordance with Recommendation ITU-R S.733 Annex 1.	Needed to close the link with the spacecraft.	
GSFPS-3530	ANT		The GS Antenna System **shall** have a phase noise that will be less than or equal to 1.0 degree RMS, integrated from 1 Hz to 10 MHz.	Needed to reduce data corruption/bit error rate on the output of the demodulators (provided by the GS contractor). Note current performance is approximately 0.5 - 2 dB better than this spec Applies to transmit chain AND receive chain.	
GSFPS-3531	ANT		The GS Antenna System **shall** have a rated output power for the S-Band transmit system with less than 1 dB gain compression that provides an EIRP of at least 106 dBmi.	High Powered Amplifier (HPA) power required to close the link with the spacecraft.	
GSFPS-3532	ANT		The GS Antenna System **shall** have level controls for independent adjustment of each transmit system signal in 1 dB steps (+0.2db accuracy) over an attenuation range of at least 40 dB.	Operators need to ability to adjust output power during operations to meet operational requirements.	
GSFPS-3767	ANT		The GS Antenna System **shall** attenuate the output level of any selected signal in the combiner by at least 80 dB when the attenuator is set to 0 dB and its input is deselected. *(CCR01530)*	Needed to avoid self-interference.	
GSFPS-3533	ANT		The GS Antenna System **shall** have a rated output power for the X-Band transmit system with less than 1 dB gain compression that provides EIRP of at least 112 dBmi.	HPA power required to close the link with the spacecraft. The spacecraft receive requires this C/3IM requirement to limit the amount of interference between signals received in composite uplink (S/C Command, DCS, HRIT/EMWIN).	
GSFPS-3534	ANT		The GS Antenna System third order intermodualtion distortion products **shall** be a minimum of 30 dB below each tone when utilizing two tones at a power level per tone equal to 7 dB below that needed to produce the rated ERIP. *(CCR01530)*	The spacecraft receive requires this C/3IM requirement to limit the amount of interference between signals received in composite uplink (S/C Command, DCS, HRIT/EMWIN).	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3535	ANT		The GS Antenna System **shall** have a minimum X-Band third order intermodulation distortion below two individual intersymbol carriers shall be -15 dBC.	The spacecraft receive requires this C/3IM requirement to limit the amount of interference between signals received in the X-band uplink (two poles of GRB uplink).	
GSFPS-3768	ANT		The GS Antenna System **shall** have less than -60 dBC transmit band discrete spurious within 1 dB bandwidth and at 6 dB below rated output. *(CCR01530)*	If spurious is greater than -60 dBC, it will impact spacecraft testing.	
GSFPS-3769	ANT		The GS Antenna System **shall** include two fully independent combiners per S-band transmit system. *(CCR01530)*	To support testing independent of operations.	
GSFPS-3770	ANT		The GS Antenna System **shall** provide eight independent signal inputs separately applied to each combiner. *(CCR01530)*	To support the required uplink signaling.	
GSFPS-3771	ANT		The GS Antenna System **shall** provide isolation between any two combiner inputs of at least 30 dB over the operating frequency range. *(CCR01530)*	Necessary to prevent self-interference. 30 dB is minimum level of isolation sufficient for operations.	
GSFPS-3772	ANT		The GS Antenna System **shall** provide selectable combiner inputs to be applied to the line driver output. *(CCR01530)*	Enables the system to control signal sources for each transmitter and to enable/disable signaling.	
GSFPS-3773	ANT		The GS Antenna System **shall** produce full rated output of the transmit system with a signal level of -5 dBm at any combiner input. *(CCR01530)*	This is the WCDAS station standard.	
GSFPS-3774	ANT		The GS Antenna System **shall** include Bayonet Neill-Concelman (BNC) test points for each combiner channel input and at the combined output signal. *(CCR01530)*	To allow monitoring of each input signal after attenuation and the combined output signal. Used to determine if the spurious performance is within spec.	
GSFPS-3775	ANT		The GS Antenna System **shall** provide test points that meet the performance requirements of the operational interfaces and connections. *(CCR01530)*	Testing needs to be to the same level of performance as the operational interface.	
GSFPS-3536			***9.5.3 Polarization, Axial Ratio, and Isolation***		
GSFPS-3537	ANT		The GS Antenna System **shall** apply polarization requirements within the 3 dB beamwidth of the antenna in the specified band.	Typically on axis, there is more polarization isolation (line up with the beam). This specifies the region beyond the main beam that we require the polarization isolations to apply. L and S have different beamwidths.	
GSFPS-3538	ANT		The GS Antenna System **shall** have a maximum axial ratio for L-band receive circular polarization of 0.50 dB	This defines the polarization isolation requirements for proper performance given the polarization of the spacecraft receive and transmit signals. Necessary to meet the 0.9999 availability of the space to ground link. Polarization of the spacecraft transmit/receive signals is included in GFI.	
GSFPS-3541	ANT		The GS Antenna System **shall** provide rotatable linear polarization of at least 220 degrees with an accuracy of 0.2 degree. *(CCR01530)*	Need 220 degrees and 0.2 degrees of accuracy to fine tune polarization orientation. 1/5th of a degree provides adequate polarization isolation. *(CCR01530)*	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3542	ANT		The GS Antenna System **shall** provide the capability to adjust the polarization at a slow speed of 0.01 degrees/second.	Supports fine adjustment of polarization.	
GSFPS-3543	ANT		The GS Antenna System **shall** have a cross polarization isolation for linear polarization of greater or equal to 30 dB for X-band receive.	This defines the polarization isolation requirements for proper performance given the polarization of the spacecraft receive and transmit signals. Necessary to meet the availability of the space to ground link. Polarization of the spacecraft transmit/receive signals is included in Appendix F.	
GSFPS-3544	ANT		The GS Antenna System **shall** have a cross polarization isolation for linear polarization of greater or equal to 30 dB for X-band transmit	This defines the polarization isolation requirements for proper performance given the polarization of the spacecraft receive and transmit signals. Necessary to meet the availability of the space to ground link. Polarization of the spacecraft transmit/receive signals is included in Appendix F.	
GSFPS-3545			***9.5.4 Radio Frequency Interference (RFI) / Electromagnetic Interference (EMI)***		
GSFPS-3546	ANT		The GS Antenna System **shall** generate less than -140 dBm of radio interference noise from the drive system at the antenna port of the RF filtering system, in a 10 kHz bandwidth over the receive frequency ranges.	Operational necessity to prevent interference with other site equipment.	
GSFPS-3547	ANT		The GS Antenna System **shall** comply with the ElectroMagnetic Interference (EMI) requirements of FCC rules CFR 47, Part 15, Subpart B, Sections 15.107 and 15.109 for Class A or B conducted and radiated emissions.	Standard for EMI required for operation.	
GSFPS-3548	ANT		The GS Antenna System **shall** be designed such that all electronic equipment mounted on the antenna is enclosed in a conductive, grounded Radio Frequency Interference (RFI) shielded waterproof box.	Necessary to limit RFI interference and to protect equipment from water.	
GSFPS-3549	ANT		The GS Antenna System **shall** meet specifications under the conditions of an externally transmitted signal of at least 500 watts into the feed at any frequency outside of 2x (two times) the width of the operational receive frequency band.	This is required to prevent external transmissions from interfering with receive signals. It is expected that internal interference will be accounted for by the contractor (derived from performance requirements). Given these conditions, we don't need to specify lower-level requirements (e.g., LNA 1 dB compression point).	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3550	ANT		The GS Antenna System **shall** continue to operate in the presence of external signals at the following frequency bands and levels, that are received at angles at least 10 degrees from the antenna boresight: a) 1670 to 1675 MHz: 0 dBm (NSOF only) b) 1600 to 1660 MHz: +30 dBm c) 1710 to 2100 MHz: +10 dBm *(CCR01530)*	Need to define given strong signal environment at all sites--want to make sure that the system is hardened so that, for example, the LNAs are not damaged due to external interference. This requirement is derived from the specification for the existing receive RF filter that is in these antennas, given known signals. This is separate from GSFPS-3549 which generalizes for out-of-band signals.	
GSFPS-3551	ANT		The GS Antenna System **shall** generate less than -160 dBm/Hz noise and spurious within the 400 to 500 MHz frequency band.	To prevent interference with the existing ground-systems. Station requirements at WCDAS; assumed application to RBU.	
GSFPS-3552	ANT		The GS Antenna System **shall** generate less than -70 dBC in the 1 kHz bandwidth for all frequency bands outside of 400 to 500 MHz.	To ensure a clean link with the spacecraft; applies to all transmissions at all sites.	
GSFPS-3553	ANT		The GS Antenna System equipment located at the Antenna stations **shall** comply with MIL-STD-461F, requirements CE102, CS101, CS114, RE102, RS103. *(CCR01530)*	Guidelines for EMI. The applicable limits are for Army/Ground. *(CCR01530)*	
GSFPS-3554	ANT		The GS Antenna System **shall** comply with MIL-463A, with respect to definitions relative to EMI test and measurement.	Guidelines for EMI.	
GSFPS-3555	ANT		The GS Antenna System **shall** be designed such that all AC Power line connections shall be filtered to prevent conducted interference.	Minimize interference to any RF equipment.	
GSFPS-3556	ANT		The GS Antenna System **shall** be designed such that the radiation interference associated with power lines/connections is less than -80 dBm/M^2 at a distance of 3 feet.	Minimize interference to any RF equipment.	
GSFPS-3557			***9.5.5 Receive Chain***		
GSFPS-3558	ANT		The GS Antenna System **shall** be designed such that RF L-, S-, and X- bands have redundant paths with transfer switches to automatically change a receive chain.	Supports recovery from events such as LNA failure. GAMCATS has requirement to manually override automatic functions.	
GSFPS-3559	ANT		The GS Antenna System **shall** be designed such that each offline receive chain can be tested in parallel to the operational receive chain.	Needed for testing purposes.	
GSFPS-3560	ANT		The GS Antenna System **shall** have switchable, redundant low noise amplifier paths.	Legacy requirement. Enables off-line path checks and other maintenance and testing concepts.	
GSFPS-3561	ANT		The GS Antenna System **shall** be designed such that the LNA input and output switches can be ganged switchable with downconverters.	Enables immediate switch to an alternate path prior to dull diagnosis of a failure. Without this capability, it would require individual component testing and switching, and a more cumbersome maintenance approach.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3562	ANT		The GS Antenna System **shall** be designed such that the LNA input and output switches can be individually switched between downconverters.	Enables the testing of alternate receive chains.	
GSFPS-3563	ANT		The GS Antenna System **shall** be designed such that each LNA is unconditionally stable under short circuit, open circuit, and operational conditions.	Operational mode should not impact stability of the LNAs.	
GSFPS-3564	ANT		The GS Antenna System **shall** be designed such that, at any station, If the standard frequency is not present, the downconverters will continue to use the internal LO as its frequency standard.	Provision for a backup in the event that the standard frequency is not present.	
GSFPS-3565	ANT		The GS Antenna System **shall** be designed such that, with a loss of station frequency reference, the downconverter LO is a minimum of 0.001 parts per million.	This prevents a phase step which will cause a loss of data at the receiver end.	
GSFPS-3566	ANT		The GS Antenna System **shall** be designed such that the polarization between the dual circular configuration and rotatable linear configuration can be remotely changed in less than 10 seconds.	All existing L-band feeds are linear. Provides capability to switch between legacy and new.	
GSFPS-3567			***9.5.6 Transmit Chain***		
GSFPS-3568	ANT		The GS Antenna System **shall** be designed such that RF S-, and X- bands have redundant chains with transfer switches to automatically change a transmit chain.	Redundancy for off-line maintenance and test, and to meet legacy requirements.	
GSFPS-3569	ANT		The GS Antenna System **shall** be designed such that each offline transmitter chain can be tested in parallel to the operational transmitter chain.	Needed for testing purposes.	
GSFPS-3570	ANT		The GS Antenna System **shall** have, at a minimum, the following local controls and indicators for the transmit chain: a) Circuit Breakers b) Local/Remote c) RF Mute d) Summary Fault/Alarm Indication e) Fault Rest f) Forward and Reverse Power Indicator g) Gain Adjustment h) Power Supply Status i) Audible Alarm Mute j) Arc Test (if available) k) Self Test (if available)	These controls are the minimum number required the safety of maintenance personnel for the transmit function.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3571	ANT		The GS Antenna System **shall** be designed such that each combiner input is configurable such that each channel input can be 'applied' or 'not applied' to the output of the combiner.	Need independent control of each input to facilitate redundant testing of the uplink. Fundamental capability of the transmit chain.	
GSFPS-3572	ANT		The GS Antenna System **shall** be designed such that if the standard frequency is not present, the transmit chain's upconverters continue to use the internal LO as its frequency standard.	Needed to continue operations in the event of a loss of the frequency standard.	
GSFPS-3573	ANT		The GS Antenna System **shall** be designed such that, with a loss of station frequency reference, the upconverter LO is a minimum of 0.001 parts per million.	This prevents a phase step which will cause a loss of data at the receiver end (satellite).	
GSFPS-3574	ANT		The GS Antenna System **shall** utilize audible alarms to indicate that a preset limit has been exceeded or a protection device has been activated on the transmitter.	Provides warning to safeguard transmitter in the event of an anomaly. Intended to be in the shelter, from the transmit chain. Safety.	
GSFPS-3575	ANT		The GS Antenna System **shall** be designed such that, after a fault has been detected and failover occurs, the faulty transmitter requires a manual reset.	Need to ensure that the fault won't automatically clear so that the maintainer can identify the fault. This is standard practice to determine if this was a transient or continuous fault. Not generalized for receive chain, because a transient fault is most unlikely.	
GSFPS-3576	ANT		The GS Antenna System **shall** be designed such that, after transmitter reset, the transmit system will return to a power level equal to its previous level of operation.	Not intended to imply that the faulty transmitter will switch back to operational mode. Will return to previous level with dummy load such that maintenance and diagnosis can occur.	
GSFPS-3577	ANT		The GS Antenna System **shall** be able to uplink the following IF carrier frequencies: 74.2 MHz (GOES-N Commands), 67.7 MHz (PDR), 73.0 MHz (LRIT), 74.7 MHz (EMWIN), and 74.9 MHz (DCPC).	Uplink signals required for GOES-N series satellites.	
GSFPS-3578	ANT		The GS Antenna System **shall** use the following uplink bandwidths: 40 kHz (GOES-N Commands), 4.2 MHz (PDR), 586 kHz (LRIT), 27 kHz (EMWIN), and 45 kHz (DCPC).	Uplink signals required for GOES-N series satellites.	
GSFPS-3579			***9.5.7 DCS Pilot***		
GSFPS-3580	ANT		The GS Antenna System at the RBU **shall** generate up to two DCS pilot tones. *(CCR01530)*	NOAA is changing from one to two Pilot frequencies to minimize the chance of there ever being zero Pilot signals. If there is ever zero Pilot signals all DCPR receivers will lose lock and will be unable to receive any DCPR transmissions until Pilot lock is regained. *(CCR01530)*	The RBU DCS pilot antennas are controllable via GAMCATS.
GSFPS-3581	ANT		The GS Antenna System at the RBU **shall** transmit none, either, or both of the DCS pilot tones to either or both GOES spacecraft. *(CCR01530)*	This provides the maximum flexibility during a controlled Pilot changeover and therefore minimizes the chance of a Pilot outage. *(CCR01530)*	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3582	ANT		The GS Antenna System at the RBU **shall** have the capability to select the uplink signal frequency from 401.5-403.0 MHz in increments of not more than 100 Hz.	Consistent with the current signal generator at Wallops Back-Up (WBU).	
GSFPS-3583	ANT		The GS Antenna System at the RBU **shall** have an EIRP adjustable over a range of 30-50 dBmi in steps of 0.5 dB or less for the pilot signal.		
GSFPS-3584	ANT		The GS Antenna System at the RBU **shall** have a DCS pilot signal with a RHCP transmission.		
GSFPS-3585	ANT		The GS Antenna System at the RBU **shall** have a DCS pilot signal phase-locked to the 10 MHz station standard.		
GSFPS-3586	ANT		The GS Antenna System at the RBU **shall** have a phase noise that will be <= 1.0 degree RMS, integrated from 1 Hz to 10 MHz with respect to the DCS pilot signal.		
GSFPS-3587			***9.6 ANTENNA MONITOR, CONTROL, AND TEST***		
GSFPS-3588			***9.6.1 General***		
GSFPS-3589	ANT		The GS Antenna System **shall** limit control of each antenna station to only a single entity at a time.	This should be implemented due to safety concerns. Multiple entities controlling an antenna station will increase the risk operational safety.	
GSFPS-3590	ANT		The GS Antenna System **shall** provide all available monitor information to all monitor and control locations at all times.	To make informed decisions about RF communications at the WCDAS, RBU and NSOF the status of the Antenna System must be afforded to all locations.	
GSFPS-3591	ANT		The GS Antenna System **shall** be designed such that all equipment required to monitor and control the antenna can be controlled from either: (a) its front panel or (b) a local monitor and control panel mounted as close to the equipment as possible.	Want to avoid having to plug in a laptop to control, or to walk up and down stairs to access.	
GSFPS-3592	ANT		The GS Antenna System **shall** be designed such that all necessary controls and indicators are easily accessible.	Need for effective operations.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3593	ANT		The GS Antenna System **shall** be designed such that "override" control can be assumed in the following order of precedence (from lowest to highest): a) Personal Safety Units (PSUs) b) Personnel Maintenance Unit (PMU) and Discrete units (e.g., downconverter, upconverter) c) Remote panels (ACU, remote LNA switch interface, Combiner control, etc,) d) Local antenna station GAMCATS access e) Site GAMCATS Remote access (system-wide visibility)	For safety reasons, need to ensure that control can be assumed at the appropriate level and "locked out" and levels above the level of assumed control.	
GSFPS-3594			**9.6.1.1 Tracking Control**		
GSFPS-3595	ANT		The GS Antenna System **shall** be capable of tracking stars (in addition to satellites).	In order to conduct an accurate G/T measurement the antenna must be able to track the RF source (a constellation).	
GSFPS-3596	ANT		The GS Antenna System **shall** be capable of importing acquisition data.	GS has a requirement to ingest acquisition data, so it will be available to the GFP Antenna System.	
GSFPS-3597	ANT		The GS Antenna System **shall** be capable of importing acquisition data from removable media (e.g., CD-ROM)	GS has a requirement to ingest acquisition data, so it will be available to the GFP Antenna System.	
GSFPS-3598	ANT		The GS Antenna System **shall** provide the ability to preview the ephemeris data with respect to time, azimuth and elevation angles in any mode.	Needed to evaluate the propagated track. Allows the user to determine if the entity to be tracked is within an acceptable view of the antenna station. Example would be G/T testing with TARUS. Is the elevation angle sufficient to make the measurement @ a specific time.	
GSFPS-3599	ANT		The GS Antenna System **shall** provide the ability for the operator to establish start, stop, and step times for the ephemeris data preview.	Needed to evaluate the propagated track. Allows the user to determine if the entity to be tracked is within an acceptable view of the antenna station. Example would be G/T testing with TARUS. Is the elevation angle sufficient to make the measurement @ a specific time.	
GSFPS-3600	ANT		The GS Antenna System **shall** store acquisition data in formats that include right-ascension - declination formats.	GS has a requirement to ingest acquisition data, so it will be available to the GFP Antenna System.	
GSFPS-3601	ANT		The GS Antenna System **shall** be capable of using at a minimum, North American Air Defense Command (NORAD) 2 line orbital element data referenced by Spacecraft Identification (ID) and epoch time. (Ref. NASA Standard STDN No. 724, paragraph 3.2.1.5.)	GS has a requirement to ingest acquisition data, so it will be available to the GFP Antenna System.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3602			***9.6.2 Antenna Operating Modes***		
GSFPS-3603	ANT		The GS Antenna System **shall** provide for the following modes of operation as a minimum: a) Stop b) Stow c) Manual Position d) Program Track e) Signal Track f) History Track g) Local Control h) Antenna Movement Test	Standard tracking modes/tools needed to maximize uplink and downlink signal quality.	
GSFPS-3604			**9.6.2.1 STOP Mode**		
GSFPS-3605	ANT		The GS Antenna System **shall** be designed such that the antenna can be placed in STOP when in any position or mode.	Safety. Can Stop the antenna from any mode.	
GSFPS-3606	ANT		The GS Antenna System **shall** engage the brakes when in STOP mode.	Safety. Ensures that brakes, rather than drive motors are used to stop the antenna.	
GSFPS-3607	ANT		The GS Antenna System **shall** inhibit the drive control signal when in STOP mode.	Safety	
GSFPS-3608	ANT		The GS Antenna System **shall** remove power from as much of the Antenna System as possible when in STOP mode.	Safety. Ensures that power is applied to only necessary equipment to redundantly mitigate the risk of unexpected antenna movement.	
GSFPS-3609			**9.6.2.2 STOW Mode**		
GSFPS-3610	ANT		The GS Antenna System **shall** be capable of a storage mode (STOW) that can meet sustained wind survivability requirements.	See GSFPS-3325 for survivability.	
GSFPS-3611	ANT		The GS Antenna System **shall** be designed such that once antenna is stowed, power is not required to maintain antenna survivability.	See GSFPS-3325. Once stowed, power is not required to maintain survivability.	
GSFPS-3612	ANT		The GS Antenna System **shall** be designed such that the antenna can be placed in STOW from any position or mode.	Safety. Can stow the antenna from any mode.	
GSFPS-3613	ANT		The GS Antenna System **shall** be capable of remote application and release of stow lock mechanisms.	Necessary for nominal operations.	
GSFPS-3614	ANT		The GS Antenna System **shall** be capable of the manual application and release of stow lock mechanisms, in the event of a power failure.	Necessary for contingency (power failure).	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3615	ANT		The GS Antenna System **shall** be designed to include an interlock system to prevent the application of drive power when the stow locks are applied.	Safety. Ensures that drives can't be engaged when the stow locks are applied.	
GSFPS-3616			**9.6.2.3 MANUAL POSITION Mode**		
GSFPS-3617	ANT		The GS Antenna System **shall** be able to change antenna orientation via ACU front panel "controls" when in MANUAL POSITION mode.	Operator needs access to ACU manual controls (e.g., keyboard, touch screen, GUI, scroll bars, etc.)	
GSFPS-3618	ANT		The GS Antenna System **shall** support at least 40 operator-selectable, pre-defined sets of pointing angles.	Legacy requirement for pre-defined positions so that positions don't need to be manually entered repeatedly.	
GSFPS-3619	ANT		The GS Antenna System **shall** include azimuth, elevation, and polarization angles for each band for each MANUAL POSITION mode pointing angle set.	Antenna position status information for operator.	
GSFPS-3620			**9.6.2.4 PROGRAM TRACK Mode**		
GSFPS-3621	ANT		The GS Antenna System **shall** include a PROGRAM TRACK mode in which the Antenna System is driven to follow a sequence of angles in a specific time order, calculated from stored acquisition data.	Legacy, needed to support the GOES NOP spacecraft.	
GSFPS-3622			**9.6.2.5 SIGNAL TRACK Mode**		
GSFPS-3623	ANT		The GS Antenna System **shall** be designed to optimize the position of the antenna and/or pointing with respect to the desired satellite by monitoring the satellite signal strength via a signal track receiver when in SIGNAL TRACK Mode.	Automated tracking based on strength of signal is a nominal legacy capability.	
GSFPS-3624	ANT		The GS Antenna System **shall** signal track via 60 to 90 MHz (L- and S-band) and 1.2 GHz (X-band) signals received through the IFDS.	Signal track interfaces with the IFDS for automated tracking.	
GSFPS-3625	ANT		The GS Antenna System **shall** be able to accept any of the available signals in the L-, S- and X-bands at any level between +10 dBm and -40 dBm via the signal track receiver.	Breadth of signals that can be tracked.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3626	ANT		The GS Antenna System **shall** have the capability to adjust, at a minimum, the following operator-configurable parameters in SIGNAL TRACK Mode: a) Step size: Sets the size of each step for each axis during the signal track process. b) Integration time: Sets the time interval over which the signal strength reading is integrated. c) Scan cycle time range: Sets the time the antenna will remain in the parked state after peaking on the received signal. d) Degraded signal range: Sets the reduction in signal strength, relative to the peak value. If the received signal drops below this value, the signal track process will be re-started, regardless of the scan cycle time. e) Acquire threshold: Sets the absolute signal level required before the signal track process can be enabled. f) Data Duration: Number of days to average the data over (integer) sets the size of the database.	Breadth of signals that can be tracked.	
GSFPS-3627	ANT		The GS Antenna System **shall** be capable of storing, in SIGNAL TRACK Mode, the historical tracking records of selected pointing angles for at least 10 satellites, excluding tracking excursions.	Determines satellite position over a period of time, and enables satellite position determination without other references. Also can compare records between antennas. Don't want a historical record of tracking excursions--only pointing angles of the satellite(s).	
GSFPS-3628			**9.6.2.6 HISTORY TRACK Mode**		
GSFPS-3629	ANT		The GS Antenna System **shall** be capable of repeating prior tracking patterns input from stored historical tracking records.	Determines satellite position over a period of time, and enables satellite position determination without other references. Also can compare records between antennas. Don't want a historical record of tracking excursions--only pointing angles of the satellite(s).	
GSFPS-3630	ANT		The GS Antenna System **shall** be capable of transferring stored historical tracking records between similar antennas for tracking.	The history-file captures the tracking pattern required to point at a given satellite. We want each new antenna to be able to track a satellite using the history-file generated by another antenna.	
GSFPS-3631	ANT		The GS Antenna System **shall** be capable of tracking based on manually-entered tracking patterns.	In case other references don't exist/anomalous conditions.	
GSFPS-3632			***9.6.3 Antenna Control Unit (ACU)***		
GSFPS-3633	ANT		The GS Antenna System **shall** provide an Antenna Control Unit (ACU) to monitor and control each antenna station.	ACU is a general term. Fundamental capability to control the antenna, including the drive system.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3634	ANT		The GS Antenna System **shall** provide monitoring and control of the antenna in all operating modes via the ACU.	The ACU is the monitoring and controlling entity of the antenna drive system. It extends drive capability and the associated functions to antenna user.	
GSFPS-3635	ANT		The GS Antenna System **shall** provide monitoring and controlling capability via the ACU from a (remote) control panel in the operations room.	Important to have direct ACU control (not via GAMCATS or other interface) from the operations room. Specific to antenna/drive.	
GSFPS-3636			***9.6.4 Personnel Maintenance Unit (PMU)***		
GSFPS-3637	ANT		The GS Antenna System **shall** be designed to include a Personnel Maintenance Unit (PMU) for maintenance personnel control of antenna.	PMU used by maintenance personnel to assume control of the antenna during maintenance actions.	
GSFPS-3638	ANT		The GS Antenna System **shall** be placed in STOP mode when the PMU is de-activated.	Safety. When the PMU is disengaged, the ACU re-assumes control (whether via GAMCATS or locally). Needs to be in STOP mode so that the antenna does not begin operating unexpectedly as soon as control transfers.	
GSFPS-3639	ANT		The GS Antenna System **shall** be designed such that the PMU is hand-held.	Needs to be compact to carry in one hand.	
GSFPS-3640	ANT		The GS Antenna System **shall** be capable of displaying azimuth / elevation and polarization angles using the PMU.	Necessary control capabilities.	
GSFPS-3641	ANT		The GS Antenna System **shall** be capable of independently and directly controlling azimuth / elevation and polarization axes using the PMU.	Necessary control capabilities.	
GSFPS-3642	ANT		The GS Antenna System **shall** be designed to provide sufficient control response to protect from inadvertent antenna movement when using the PMU.	Safety.	
GSFPS-3643	ANT		The GS Antenna System **shall** support control to at least 30m from the antenna base when using the PMU.	Operating range to support maintenance	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3644			***9.6.5 GOES-R Antenna Monitor, Control, and Test (GAMCATS)***		
GSFPS-3645			**9.6.5.1 General**		
GSFPS-3646			The GOES-R Antenna Monitoring, Control and Test Subsystem (GAMCATS) represents a set of consolidated monitor, control, and testing capabilities specifically for the GOES-R GS Antenna System. These capabilities will provide monitoring and control for the antenna control unit, receive elements, transmit elements, control ports of the IFDS switching system, Built-In Test Equipment (BITE), environmental systems (monitor only), fire suppression system (monitor only), waveguide, dehydrator, switching, and any other related contractor provided equipment at all relevant sites. GAMCATS will manage the GS Antenna Systems's networks. GAMCATS will not provide monitor, control, or test capabilities for legacy GOES-N/O/P. *(CCR01530)*		
GSFPS-3647	ANT		The GS Antenna System **shall** include a consolidated monitoring and control and testing capability (GAMCATS).	Fundamental requirement to include GAMCATS capability.	
GSFPS-3648	ANT		The GS Antenna System **shall** monitor, display, control, and provide status for all designated GOES-R series Antenna System functions/components via GAMCATS. *(CCR01530)*	High level requirement for monitor and control via GAMCATS. GAMCATS will only be used to control GOES-R series equipment/function. Legacy (GOES N/O/P) functions will not be controlled via GAMCATS. This will also drive a requirement to segment the IFDS's and ADS's to enable GOES-R series control of only GOES-R series designated ports (without impact to GOES N/O/P).	GAMCATS will not control anything controlled by ABCS and EACS. *(CCR01530)*
GSFPS-3779	ANT		The GS Antenna System **shall** manage the GS Antenna System's networks via GAMCATS. *(CCR01530)*		
GSFPS-3649	ANT		The GS Antenna System **shall** be able to control any Antenna System function that is locally or remotely controllable via GAMCATS. *(CCR01530)*	Any controllable function needs to be controllable via GAMCATS consolidated control.	Excludes anything controlled by ABCS and EACS. *(CCR01530)*
GSFPS-3650	ANT		The GS Antenna System **shall** have the capability to receive and accept commands from GAMCATS.	Provides mechanism for antenna control and monitoring.	
GSFPS-3652	ANT		The GS Antenna System **shall** have GAMCATS capabilities at all three sites.	GAMCATS is distributed over the entire system to enable cross-site control.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3653	ANT		The GS Antenna System **shall** provide the capability for remote monitoring and control of all antenna stations (at all sites) from any other site (NSOF, WCDAS, RBU), via GAMCATS.	Ensures ability to control any site's antenna from any other site.	
GSFPS-3654	ANT		The GS Antenna System **shall** have GAMCATS capabilities at each antenna station for monitor and control of only the associated antenna.	Need GAMCATS at each antenna station for control. Nominal operations and control (local and remote) is through GAMCATS. ACU provides backup in the event of network/GAMCATS failure. For safety GAMCATS at any particular antenna station must be limited to monitor and control only the associated antenna and its functionality.	
GSFPS-3655	ANT		The GS Antenna System **shall** include a GAMCATS that is rack-mounted.	Need to rack mount GAMCATS for control room space/operations considerations.	
GSFPS-3656	ANT		The GS Antenna System **shall** monitor and control the ACU via the GAMCATS.	High level requirement for ACU control via GAMCATS.	
GSFPS-3657	ANT		The GS Antenna System **shall** be designed such that GAMCATS control of each ACU can only be accomplished from a single location at a time.	Ensures different control locations cannot control the same ACU simultaneously.	
GSFPS-3658	ANT		The GS Antenna System **shall** monitor the following environmental parameters via GAMCATS: a) Humidity in antenna shelter room b) Temperature in shelter room c) Temperature in shelter room's racks d) Temperature of the LNAs e) Water on the antenna shelter floor f) Power status (RBU only) *(CCR01530)*	Environmental conditions are monitored by GAMCATS. LNA temperatures are required for G/T measurements.	
GSFPS-3780	ANT		The GS Antenna System at RBU **shall** monitor and control antenna shelter HVAC via GAMCATS. *(CCR01530)*	The shelters are not connected to the facility ABCS.	
GSFPS-3659	ANT		The GS Antenna System **shall** monitor waveguide pressure(s) in the Antenna System via GAMCATS.	Required to ensure dry air system in the waveguide is operating within limits.	
GSFPS-3781	ANT		The GS Antenna System **shall** be configurable by the GS Mission Management element via ground directives sent to GAMCATS. *(CCR01530)*	Provides for GS control of antenna system.	Directives can be either manually or autonomously initiated
GSFPS-3660	ANT		The GS Antenna System **shall** provide Antenna System status and event information, including Antenna System network status, to the Mission Management (MM) Element of the GOES-R GS via GAMCATS. *(CCR01530)*	Ensures that communication link information (e.g., link up) is provided to the MM for its supervisory functions.	For the purposes of enterprise supervision, the antenna subsystem interfaces with MM rather than EM.
GSFPS-3661	ANT		The GS Antenna System **shall** make all monitored communication link information available to MM via GAMCATS.	GAMCATS is expected to be the interface with MM.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3662	ANT		The GS Antenna System **shall**, via GAMCATS, be able to monitor and control GOES-R signals and switching within the IFDS.	GAMCATS controls GOES-R signals through the IFDS, but not GOES-N/O/P.	
GSFPS-3663	ANT		The GS Antenna System **shall** be able to monitor and control all switching to support GOES-R operations and testing via GAMCATS.	Fundamental capability of GAMCATS.	
GSFPS-3664	ANT		The GS Antenna System **shall** be able to monitor and control test signal injection and signal measurements via GAMCATS.	Fundamental capability of GAMCATS; supports testing of system.	
GSFPS-3665	ANT		The GS Antenna System **shall** be able to monitor a test signal at the test inject input point and output at the IFDS via GAMCATS.	Fundamental capability of GAMCATS; supports testing of system.	
GSFPS-3666	ANT		The GS Antenna System **shall** monitor RF links via GAMCATS.	Link monitoring needs to be part of the consolidated monitoring function (GAMCATS).	
GSFPS-3667	ANT		The GS Antenna System **shall** be capable of local display and notification of Antenna System status and detected anomalies/events via GAMCATS.	Fundamental requirement of GAMCATS capability.	
GSFPS-3668	ANT		The GS Antenna System **shall** interface to the legacy WCDAS IFDS for L- & S-Band through the IFDS Switching Software (GFP) via GAMCATS.	GAMCATS needs to interface with existing, legacy software for L&S.	
GSFPS-3669			The interface to the IFDS Switching Software at WCDAS is RS-232, using TCP/IP.		
GSFPS-3670	ANT		The GS Antenna System **shall** detect and display faults and status in any monitored Configuration Item (CI) within 1 second of occurrence.	IFDSSS is the existing software controller of the existing IFDS at WCDAS. The GS antenna system needs to interface with the existing software.	
GSFPS-3671	ANT		The GS Antenna System **shall** respond to automated or manual commands in less than 1 second.	Need real-time feedback for operational configuration control. Lessons learned from GBMCS (GOES B/U Monitor and Control System).	
GSFPS-3672	ANT		The GS Antenna System **shall** be designed such that GAMCATS workstations are dedicated solely to GAMCATS functionality.	Prevents hosting other software on the GAMCATS system that might interfere with operations.	
GSFPS-3673	ANT		The GS Antenna System antenna station(s) operational chain(s) **shall** be remotely selectable via GAMCATS.	Ensures that the RF/IF paths are switchable by operators and other MM element controls to meet MaxTTRS requirements.	
GSFPS-3674	ANT		The GS Antenna System **shall** make all locally detected hardware and software anomaly and status reports available to GAMCATS.	GAMCATS is the gateway to the GOES R GS, therefore; without this requirement the GS does not get updated.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3675	ANT		The GS Antenna System **shall** isolate anomalies by function and by site via GAMCATS.	Intended to limit the potential for cascading failures due to an anomaly at a given site in a given function. The intent is that a failure is limited to the function in which it occurred and at the site in which it occurred. This will help to increase overall system operational availability.	
GSFPS-3676	ANT		The GS Antenna System **shall** capture logs of all operator inputs.	Ensures the GS will retain all information about operator actions for future analysis (e.g., reconstruct sequence of events).	
GSFPS-3677	ANT		The GS Antenna System **shall** make video surveillance output available to operators via GAMCATS.	Remote movement of an Antenna System should require the observation/inspection of the antenna and surrounding area before the drive is activated. This is a safety practice. The video surveillance system is required for security as well.	
GSFPS-3678			**9.6.5.2 Operator Interface**		
GSFPS-3679	ANT		The GS Antenna System **shall** provide the largest GAMCATS display possible for a rack-mountable system.	Small screens impractical for real-time operations (largest that can fit in a rack-mount)	
GSFPS-3680	ANT		The GS Antenna System **shall** provide rack-mounted keyboard and mouse/trackball access and control via GAMCATS.	Safety and integrity; a different user-interface is more likely to be inadvertently operated.	
GSFPS-3681	ANT		The GS Antenna System **shall** present a graphical representation of the entire Antenna System and status via GAMCATS.	Fundamental capability of GAMCATS.	
GSFPS-3682	ANT		The GS Antenna System **shall** provide for interrogation of status into lower levels of the Antenna System to the station CI level via GAMCATS.	Fundamental capability of GAMCATS.	
GSFPS-3683	ANT		The GS Antenna System **shall** provide mirrored display of all ACU functions from each ACU via GAMCATS.	Need to be able to expose all functionality of the ACU via GAMCATS.	
GSFPS-3684	ANT		The GS Antenna System **shall** provide mirrored display of all IFDS LCU functions from each LCU via GAMCATS.	Need to be able to expose all functionality of the LCU for the IFDS via GAMCATS.	
GSFPS-3685	ANT		The GS Antenna System **shall** be able to display the status of all equipment in any receive chain or transmit chain via GAMCATS.	Fundamental capability of GAMCATS.	
GSFPS-3686	ANT		The GS Antenna System **shall** be able to display the equipment status of test equipment connected to the Antenna System via GAMCATS.	Fundamental capability of GAMCATS.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3687			**9.6.5.3 Antenna System Interface Simulator (ASIS)**		
GSFPS-3688	ANT		The GS Antenna System **shall** provide a standalone simulator of all monitor, control, and test functionality via the ASIS.	Needed to test the interface between the antenna system and the Core GS portion of the MM element prior to GS antenna system delivery. Intent is to simulate non-IF messaging that goes between the antenna system and the core GS. Enables GS contractor to test the core GS-Antenna non-IF interface. *(CCR01530)*	
GSFPS-3689	ANT		The GS Antenna System **shall** output simulation data utilizing user defined scenarios and configurations via the ASIS.	Allows the creation of different antenna M, C, &T scenarios.	
GSFPS-3690	ANT		The GS Antenna System's ASIS **shall** interface with the GS in the same manner (formats, protocols, etc.) as the Antenna System interfaces with the GS.	Needed so no changes on the GS side of the interface are necessary to accommodate the simulator.	
GSFPS-3691			***9.6.6 Antenna System Test***		
GSFPS-3692	ANT		The GS Antenna System **shall** be designed such that each NSOF antenna station has an upconverter to translate an IF test signal to the RF band so it can be injected into the off-line receive chain.	Needed for testing/maintenance.	
GSFPS-3693	ANT		The GS Antenna System **shall** be able to capture and store at least 500 GB per site of the signal spectrum trace, including signal level (C/N), occupied bandwidth, and phase noise.	Needed for testing and for historical purposes.	
GSFPS-3694	ANT		The GS Antenna System **shall** graphically display measurement data.	Provides ability for spectral plots.	
GSFPS-3695	ANT		The GS Antenna System **shall** be capable of signal/spectrum playback.	Playback required so operators can search for and zero-in on interfering signals. Ability to play back from archive.	
GSFPS-3696	ANT		The GS Antenna System **shall** provide the capability for the offline execution of any single process or set of processes nominally resident at WCDAS and NSOF.	This ensures that development activities for WCDAS-based functions and processes can occur at WCDAS.	
GSFPS-3697	ANT		The GS Antenna System **shall** include "Built-in Test Equipment" (BITE) to effect station and system level testing on each antenna, to include, at a minimum, spectrum analyzer, scope, power meter, signal generator, arbitrary waveform generator, modulator with analog/digital schemes, PN code generator, Bit Error Rate (BER) unit.	Describes minimum set of BITE capabilities.	
GSFPS-3698	ANT		The GS Antenna System **shall** have two (2) sets of BITE for each site.	Need ability to test at least two antenna stations simultaneously.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3699	ANT		The GS Antenna System **shall** have the capability to selectively test inject signals by band (L-, S-, or X-) and by primary or redundant side.	Fundamental requirement for routine maintenance and test capabilities.	
GSFPS-3700	ANT		The GS Antenna System **shall** have the capability to inject test signals for the transmit and receive chains.	Fundamental requirement for routine maintenance and test capabilities.	
GSFPS-3701	ANT		The GS Antenna System **shall** provide automated "Built In Tests" (BITs) to effect station or system level tests on each antenna, to include, at a minimum: a) automatic transmit combiner attenuator calibration b) test signal measurement c) G/T measurements d) Received EIRP measurements e) Generate test signals (modulated and unmodulated) f) BER implementation loss	Fundamental requirement for routine maintenance and test capabilities.	
GSFPS-3702	ANT		The GS Antenna System **shall** have the capability to distribute any signals to at least four outputs simultaneously via the BIT/BITE.	Need to have the ability to send signal to multiple pieces of test equipment simultaneously to aid in testing. Minimizes the number of IFDS ports used during testing.	
GSFPS-3703	ANT		The GS Antenna System **shall** be designed such that test inject signals are upconverted and downconverted using operational LO frequencies.	Needed to reproduce operational signals.	
GSFPS-3704	ANT		The GS Antenna System **shall** be designed such that the test inject signals match operational performance.	Needed to reproduce operational signals.	
GSFPS-3705	ANT		The GS Antenna System injected test signals **shall** be calibrated to an accuracy of ±1 dB at each test input.	Needed to validate system performance.	
GSFPS-3706	ANT		The GS Antenna System **shall** be capable of injecting test signals over the dynamic range of the system, in increments of 0.1 dB or less.	Needed to produce test signals at desired level; required for test purposes.	
GSFPS-3707	ANT		The GS Antenna System **shall** provide the ability to perform antenna station and system-level testing on any antenna station(s) and/or equipment not configured for the operational path.	Needed to support maintenance and test.	
GSFPS-3708	ANT		The GS Antenna System **shall** provide the ability to perform antenna station and system-level testing on the redundant receive chains of any operational antenna station(s).	Needed to support maintenance and test.	
GSFPS-3709	ANT		The GS Antenna System **shall** provide the ability to inject test signals into each antenna receive and transmit chains.	Needed to support maintenance and test.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3710			***9.7 INTERMEDIATE FREQUENCY DISTRIBUTION***		
GSFPS-3711			***9.7.1 General***		
GSFPS-3712	ANT		The GS Antenna System **shall** be designed such that IFDS upgrades at WCDAS are fully compatible with the current Wallops IFDS hardware, firmware, and software monitor and control system.	Needed to ensure compatibility with legacy switch.	
GSFPS-3713	ANT		The GS Antenna System **shall** be designed such that the IFDS at NSOF and RBU is compatible and interchangeable with the IFDS upgrades at WCDAS. *(CCR01530)*	Needed to ensure commonality of the Antenna System across all sites.	
GSFPS-3714	ANT		The GS Antenna System **shall** be independently adjustable from 0 to +10 dB with a step size no greater than 0.5 dB, for each output of the receive IFDS.	Keeps system within the dynamic range of the receive demodulators (supplied by the GOES-R GS).	
GSFPS-3715	ANT		The GS Antenna System **shall** be designed such that, following an interruption in primary power, the IFDS's shall return within one second to the configuration which existed prior to the interruption.	Legacy requirement, existing capability.	
GSFPS-3716	ANT		The GS antenna system **shall** have patch panels for all input and output channels to the IFDS at each site.	Provides for easier/safer maintenance.	
GSFPS-3717	ANT		The GS Antenna System **shall** have non-blocking, "Full Fan-out", enabling any input to be distributed to any or all output(s) without loss, for the IFDS.	Necessary to ensure that none of the signal paths are blocked, and that one signal can be distributed to all outputs with a minimum of unity gain. Meets legacy requirement.	
GSFPS-3718			The legacy IF switch at WDAS provides IF switching services for L- and S-band receive and transmit capabilities of GOES-N/O/P. The portion of the IFDS allocated to the receive chain is termed "Receive IFDS" (RIFDS), and the portion allocated to the transmit chain is termed "Transmit IFDS" (TIFDS).		
GSFPS-3719	ANT		The GS Antenna System **shall** be designed such that the IFDS has an interface panel that accommodates all input and output connections and provides measurement access points.	Supports routine maintenance with access points for the ground equipment without having to go into the cabinets themselves.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3720	ANT		The GS Antenna System IFDS's and Auxiliary Distribution Systems (ADS's) at all sites **shall** be sized to accommodate: a) All inputs and outputs for GOES-R and GOES-N/O/P legacy operations and test b) Operational receive and transmit chains for two additional antenna stations at WCDAS, one additional at NSOF, and one additional at RBU c) 10% additional for input spares d) 10% additional for output spares	Additional WCDAS sizing to support upgrades after N/O/P end-of-life. Minimal cost impacts now to accommodate growth. Need to ensure extra capacity in the event of failed inputs or outputs.	
GSFPS-3721	ANT		The GS Antenna System **shall** interface with the HRIT/EMWIN service in accordance with the Ground Segment (GS) to High Rate Information Transmission (HRIT) / Emergency Managers Weather Information Network (EMWIN) Interface Requirements Document (IRD) (G417-R-IRD-0095).	Points to the IRD for requirements on the interface at the IF switch between HRIT data stream and the GS.	
GSFPS-3722	ANT		The GS Antenna System **shall** interface with DCS in accordance with the Ground Segment (GS) to Data Collection System (DCS) Interface Requirements Document (IRD) (G417-R-IRD-0094).	Points to the IRD for requirements on the interface at the IF switch between DCS data stream and the GS.	
GSFPS-3723			***9.7.2 Auxiliary Distribution System (ADS)***		
GSFPS-3724	ANT		The GS Antenna System **shall** provide Auxiliary Distribution System(s) to maintain continuity of operations in the event of IFDS failure.	L&S ADS at WCDAS is GFP. X-Band WCDAS, NSOF and RBU need to be supplied by the Antenna contractor.	
GSFPS-3725	ANT		The GS Antenna System **shall** have the same level of performance using the Auxiliary Distribution System(s) as with using the IFDS (with the exception of switching).	ADS at WCDAS is GFP. NSOF and RBU need to be supplied by the Antenna contractor.	
GSFPS-3726	ANT		The GS Antenna System **shall** be designed such that Auxiliary Distribution System(s) have separate patch panels from the IFDSs.	Need to separate IFDS interfaces from ADS interfaces.	
GSFPS-3727			***9.7.3 Local Control Unit (LCU)***		
GSFPS-3728	ANT		The GS Antenna System **shall** provide local monitoring and control of each IFDS via Local Control Units (LCUs).	LCU provides local control of the IFDS and monitoring of the hardware. Redundant for each system.	
GSFPS-3729	ANT		The GS Antenna System **shall** have the capability to assume local control of the IFDSs via each LCU.	Enables override locally for maintenance or test action.	
GSFPS-3730	ANT		The GS Antenna System **shall** have the capability to block remote control of the IFDSs when local control is assumed.	Enables override locally for maintenance or test action.	

ID	Dev. Org.	Option	Requirement	Rationale	Assumptions
GSFPS-3731	ANT		The GS Antenna System **shall** include a rack-mountable front panel keypad/touch screen and display for each LCU.	Consistent with legacy. Enables easy maintenance access and consolidates with legacy hardware.	
GSFPS-3732	ANT		The GS Antenna System **shall** display all paths (inputs and outputs) via each LCU.	Basic functionality of the LCU.	
GSFPS-3733	ANT		The GS Antenna System **shall**, at a minimum, provide status of the following via each LCU: a) power supplies b) combiners c) amplifiers d) system gain e) channel gain f) CPUs g) I/O cards h) switching chassis	Basic functionality of the LCU.	
GSFPS-3734	ANT		The GS Antenna System **shall** refer to I/O channels by human-readable alpha-numeric names in the LCU (instead of the number of the input/output).	Needed such that no external lookup tables are needed to associate ports with ground system equipment or antennas.	
GSFPS-3735	ANT		The GS Antenna System **shall** provide a mechanism by which an operator may select and display a desired IFDS configuration via the LCU prior to the change being executed.	Need to establish path changes before they are implemented.	
GSFPS-3736	ANT		The GS Antenna System **shall** confirm operator acknowledgement prior to execution of configuration changes.	Need to establish path changes before they are implemented.	
GSFPS-3737	ANT		The GS Antenna System **shall** maintain established access privileges for different categories of LCU operators and users.	All functions of the matrix switching system's Local Control Unit (LCU) should not be exposed to operator, therefore; this requirement allows for limited access to sensitive system control. Example - System gain.	

Appendix A: End Product Performance Parameter Tables

Release Number - Subset of the total GOES-R products indicating which products are required for implementation at certain delivery milestones.

Product Geographic Coverage / Conditions - Product geographic coverage is defined as the size of the area that must be observed in the revisit time in order to complete the product; in the case of CONUS, it also specifies a particular area as well as location. The GOES-R products will be calculated for the coverage areas of the L1b data provided by the instrument subject to the Product Qualifiers.

Product Orthogonality / Coverage - Product Orthogonality / Coverage is defined for the Space and Solar Products only and is nominally the equivalent of the Product Geographic Coverage.

Product Vertical Resolution - Product vertical resolution is defined as layering averaging of the resultant samples corresponding to different heights in the atmosphere; where only one vertical sample is collected, no layer averaging is needed. The GOES-R System will produce the required vertical layering of the GOES-R products employing external data sources if needed. For typical imaging products, the vertical layering is typically over the total column.

Product Horizontal Resolution - Product horizontal resolution is defined as the finest horizontal spatial element of the product measured at nadir. The GOES-R System will not spatially degrade the product horizontal resolution beyond that of the L1b data of the earth-looking instruments when making Level 2 and higher products, except in the generation of GOES-R products with coarser horizontal resolution.

Product Horizontal/Angular Resolution - Product Horizontal/Angular Resolution is defined for the Space and Solar Products only and is nominally the equivalent of the Product Horizontal Resolution.

Product Mapping Accuracy (Product Navigation) - Product navigation or more generally product mapping accuracy is defined as the accuracy of the registration of the collected data to the appropriate earth or other reference frame. The GOES-R System will geolocate the GOES-R series L1b data (which meets instrument image navigation and registration requirement for earth-looking instruments) to comply with the product mapping accuracy requirements.

Product Pointing/Mapping Accuracy - Product Pointing/Mapping Accuracy is defined for the Space and Solar Products only and is the equivalent of the Product Mapping Accuracy.

Product Pointing Knowledge / Mapping Uncertainty - Product Pointing Knowledge / Mapping Uncertainty is defined for the Space and Solar Products only as the knowledge of the line of sight of the space and solar instruments.

Product Measurement Range - Product Measurement Range is defined as the range from the minimum to the maximum values over which the product will be measured.

Categorical Product -- A product whose output is limited to a set of discrete values. *(CCR01326)*

Product Measurement Accuracy (non-categorical products) - Product Measurement Accuracy is defined for non-categorical products as the systematic difference or bias between the derived parameter and ground truth. It is determined by computing the absolute value of the average of differences between the derived parameter and ground truth over a statistically significant population of data such that the magnitude of the random error is negligible relative to the magnitude of the systematic error. *(CCR01292, CCR01635)*

Product Measurement Accuracy (categorical products) - Product Measurement Accuracy for categorical products is defined in terms of the percentage of correct classification over a statistically significant population of data. *(CCR01292)*

Product Refresh Rate/Coverage Time - Product Refresh Rate/Coverage Time is defined as the time between the completion of the nth update of the product and the completion of the (n+1)th update of the same product for the user. The GOES-R baseline product tables list refresh times for products. However, ABI data may be produced more frequently than the listed times, particularly due to the different scan modes of ABI. Products that rely on surface observations with product refreshes that are long, compared to the instrument image refresh times, benefit from observations without obscurations caused by clouds. The product refresh is often longer than the coverage time associated with the data collection, as with the GLM in which case the longer of the two is listed for this composite parameter. *(CCR01282)*

Ground Data Latency - Product-dependent baseline maximum time allocated to the GS, defined as:

a) the time between the receipt of the last image data packet on the ground and delivery to the AWIPS demarcation point in the case of sectorized products, and

b) the time between the receipt of the last image data packet on the ground and the end-point of the GOES-R Access Subsystem in the case of all other products. *(CCR01333)*

Vendor Allocated Ground Latency - Product-dependent baseline maximum time allocated to the GS vendor, defined as the time between the arrival of the last data packet of an observation at the intermediate frequency conversion and the arrival of the last bit of a GOES-R product at either:

a) the AWIPS demarcation point in the case of sectorized products,

b) the input of the GRB uplink to the IF switch at WCDAS and RBU for space weather products, or

c) the ingest point of the GOES-R Access Subsystem in the case of all other products. *(CCR01333, CCR01649)*

Antenna Allocated Ground Latency - Sum of the 1) Baseline maximum time allocated between the receiving of the data in the last packet of the observation at the RF input to the antenna and the intermediate frequency conversion and 2) Baseline maximum time between the intermediate frequency on the transmit side of the GRB on the ground at CDAS and the intermediate frequency on the receive side of the GRB on the ground at NSOF. *(CCR01333, CCR01530)*

GOES-R Access Subsystem Allocated Ground Latency - Baseline maximum time between the arrival of the last bit of a GOES-R product at the ingest point of the GAS and:

a) the time when the file is ready to be pushed to the external recipient

b) the time when the file is staged and available to be pulled by the external recipient. *(CCR01333)*

Product Long-Term Stability - Product Long Term Stability is defined as the deviation in accuracy over a period of time, typically the lifetime of the mission, unless otherwise specified in the product long-term stability values.

Product Measurement Precision (non-categorical products) - Product measurement precision is the one-sigma standard deviation of the differences between the derived parameters and ground truth over the same population of data used to compute the product measurement accuracy. *(CCR01292, CCR01635)*

Product Measurement Precision (categorical products) - Product Measurement Precision for categorical products is:

a) For three or more categories: defined as the standard deviation of the misclassification error (number of bins away from the correct bin) over a statistically significant population of data.

b) For two categories: not applicable. *(CCR01292)*

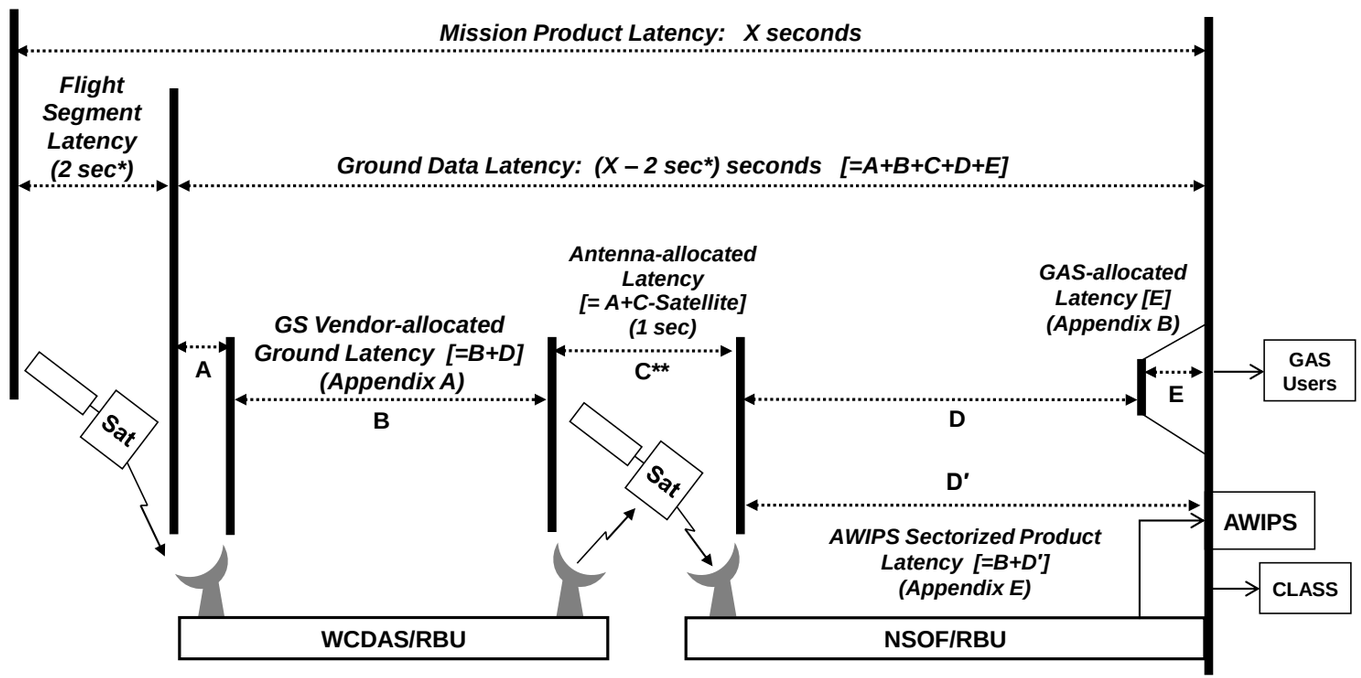
Temporal Coverage Qualifier - The Temporal Coverage Qualifier provides product-specific limitations to the solar zenith angle coverage of the products. When the term Day is used in the temporal qualifier, Day is defined as solar zenith angles less than or equal to 96 degrees. When the term Night is used in the temporal qualifier, Night is defined as solar zenith angles greater than 96 degrees and includes the period of twilight.

Product Extent Qualifier - The Product Extent Qualifier provides product specific limitations to the solar zenith angle coverage of the products over which a product can be computed. The use of the term quantitative in any of the product extent qualifiers defines the generation of the product while meeting the threshold product measurement accuracy performance in that region, whereas the use of qualitative in any of the product extent qualifiers defines the generation of the product without meeting the threshold product measurement accuracy performance requirements. For CONUS (3000 km x 5000 km) products and mesoscale (1000 km x 1000 km) products, the product will be computed within the CONUS-sized measurement area and the mesoscale-sized measurement area that falls within the product qualifier limitations.

Cloud Cover Conditions Qualifier - The Cloud Cover Conditions Qualifier provides product specific limitations to the cloud cover associated with the threshold accuracy.

Product Statistics Qualifier - The Product Statistics Qualifier provides product specific limitations, where applicable, to the product generation scene statistics under which the product measurement accuracies apply.

Allocation of Mission Product Latency



** Flight Segment Latency is 2 seconds for all products except Solar Imagery: X-Ray, which is 4 sec*
*** This latency period includes the satellite transponder time for GRB (<1 millisecond)*

Figure 2: Allocation of Mission Product Latency *(CCR-01365, CCR-01530)*

Appendix A Table 1: Baseline End-Product Sets and Performance Parameters

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Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Product Refresh Rate/ Coverage Time (B) (ABI Mode 3)	Refresh Rate / Coverage Time (B) Mode 4	VAGL (B) Mode 3	VAGL (B) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Aerosol Detection (including Smoke and Dust)	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Total Column	2 km	1 km	Binary yes/no detection above threshold 0.2 (for aerosol optical thickness)	Dust: 80% correct detection over land and ocean Smoke: 80% correct detection over land; 70% correct detection over ocean	CONUS: 15 min Full Disk: 15 min Mesoscale: 15 min	CONUS: 15 min Full Disk: 15 min	CONUS: 806 sec Full Disk: 806 sec Mesoscale: 806 sec	CONUS: 806 sec Full Disk: 806 sec	Not applicable	Atmosphere	Aerosols
Aerosol Optical Depth	1	B	NetCDF McIDAS	4	No	2+	CONUS, Full Disk	Total Column	2 km	1.0 km	-1 – 5 in optical depth	Based on Aerosol Optical Depth ranges: Over land: < 0.04: 0.06 0.04 – 0.80: 0.04 > 0.80: 0.12 Over water: < 0.40: 0.02 > 0.40: 0.10	CONUS: 5 min Full Disk: 15 min	CONUS: 5 min Full Disk: 15 min	CONUS: 266 sec Full Disk: 806 sec	CONUS: 266 sec Full Disk: 806 sec	Based on Aerosol Optical Depth ranges: Over land: < 0.04: 0.13 0.04 – 0.80: 0.25 > 0.80: 0.35 Over water: < 0.40: 0.15 > 0.40: 0.23	Atmosphere	Aerosols
Volcanic Ash: Detection and Height	2	B	NetCDF McIDAS	2	No	2+	Full Disk	3 km (top height)	2 km	1.0 km	0-50 tons/km^2	2 tons/km^2	Full Disk: 15 min	Full Disk: 15 min	Full Disk: 430 sec	Full Disk: 430 sec	2.5 tons/km^2	Atmosphere	Aerosols

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Cloud & Moisture Imagery	1	B	NetCDF McIDAS	54	Yes	2+	CONUS, Full Disk, Mesoscale	Not Applicable	2 km, with finer daytime obser-vations	1.0 km	Not Applicable	Not Applicable	CONUS: 5 min Full Disk: 15 min Mesoscale: 30 sec	CONUS: 5 min Full Disk: 5 min	CONUS: 50 sec Full Disk: 50 sec Mesoscale: 23 sec	CONUS: 50 sec Full Disk: 50 sec	Not applicable	Atmosphere	Clouds
Cloud Optical Depth	1	B	NetCDF McIDAS	4	No	2+	CONUS: for optical depth > 1 Full Disk: for optical depth > 1	Total column	CONUS: 2 km Full Disk: 4 km	CONUS: 1 km Full Disk: 2 km	1 – 50 (day) 1 – 8 (night)	Liquid phase: 20% (Day), 20% (Night); Ice phase: 20% (Day), 30% (Night)	CONUS: 15 min Full Disk: 15 min	CONUS: 15 min Full Disk: 15 min	CONUS: 806 sec Full Disk: 806 sec	CONUS: 806 sec Full Disk: 806 sec	Maximum of 0.5 or 20%	Atmosphere	Clouds
Cloud Particle Size Distribution	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Cloud Top	2 km	1.0 km	2 – 32 µm for liquid phase; 2 – 50 µm for ice phase	4 µm for liquid phase, 10 µm for ice phase	CONUS: 5 min Full Disk: 15 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 15 min	CONUS: 266 sec Full Disk: 806 sec Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 806 sec	2 µm for liquid phase; 4 µm for ice phase	Atmosphere	Clouds
Cloud Top Phase	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Cloud Top	2 km	1.0 km	Liquid /solid / supercooled / mixed	80% correct classification	CONUS: 5 min Full Disk: 15 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 15 min	CONUS: 266 sec Full Disk: 806 sec Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 806 sec	1.5 categories	Atmosphere	Clouds
Cloud Top Height	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Cloud top	CONUS: 10 km Full Disk: 10 km Mesoscale: 4 km	CONUS: 5 km Full Disk: 5 km Mesoscale: 2 km	CONUS: 100 – 300 m Full Disk: 0 - 15 km Mesoscale: 0 - 20 km	500 m for clouds with emissivity > 0.8	CONUS: 60 min Full Disk: 60 min Mesoscale: 5 min	CONUS: 60 min Full Disk: 60 min	CONUS: 266 sec Full Disk: 806 sec Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 806 sec	1500 m for clouds with emissivity > 0.8	Atmosphere	Clouds

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Cloud Top Pressure	1	B	NetCDF McIDAS	4	No	2+	CONUS, Full Disk	Cloud top	10 km	5 km	CONUS: 100-1000 mb Full Disk: 100 - 1000 mb	50 mb for clouds with emissivity > 0.8	CONUS: 60 min Full Disk: 60 min	CONUS: 60 min Full Disk: 60 min	CONUS: 536 sec Full Disk: 806 sec	CONUS: 536 sec Full Disk: 806 sec	150 mb for clouds with emissivity > 0.8	Atmosphere	Clouds
Cloud Top Temperature	1	B	NetCDF McIDAS	4	No	2+	Full Disk, Mesoscale	At Cloud Tops	2 km	1.0 km	180-300 K	3 K for clouds with emissivity > 0.8	Full Disk: 15 min Mesoscale: 5 min	Full Disk: 15 min	Full Disk: 806 sec Mesoscale: 266 sec	Full Disk: 806 sec	5 K for clouds with emissivity > 0.8	Atmosphere	Clouds
Hurricane Intensity	2	B	NetCDF McIDAS	2	No	2+	Full Disk	Not Applicable	2 km	1.0 km	Dvorak hurricane intensity scale values of 1.5 - 8 or leading to wind speeds of 12.8 m/s (25 knots) to 87.5 m/s (170 knots)	5 m/s over ocean	Full Disk: 30 min	Full Disk: 30 min	Full Disk: 806 sec	Full Disk: 806 sec	5 m/s over the ocean	Atmosphere	Clouds
Lightning Detection: 1) Events 2) Flashes 3) Groups	1	B	NetCDF McIDAS	6	Yes	2+	Full Disk	Surface to cloud top	10 km	5 km	Real time	70% total flash detection	Full Disk: 20 sec	Full Disk: 20 sec	Full Disk: 50 sec	Full Disk: 50 sec	5%	Atmosphere	Clouds
Rainfall Rate/QPE	2	B	NetCDF McIDAS	2	No	2+	Full Disk	Not Applicable	2 km	2 km	0-100 mm/hr	6 mm/hr at 10 mm/hr rate, with higher values at higher rates	Full Disk: 15 min	Full Disk: 15 min	Full Disk: 266 sec	Full Disk: 266 sec	9 mm/hr at 10 mm/hr rate, with higher values at higher rates	Atmosphere	Precipitation

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Legacy Vertical Moisture Profile	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Reflects layering of Numerical Weather Prediction Models; inherent vertical resolution is only 3 to 5 km	10 km	5 km	0 - 100%	Sfc-500 mb: 18% relative humidity; 500-300 mb: 18% relative humidity; 300-100 mb: 20% relative humidity	CONUS: 30 min Full Disk : 60 min Mesoscale: 5 min	CONUS: 30 min Full Disk : 60 min	CONUS: 266 sec Full Disk: 266 sec Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 266 sec	Sfc-500 mb: 18% relative humidity 500-300 mb: 18% relative humidity 300-100 mb: 20% relative humidity	Atmosphere	Profiles
Legacy Vertical Temperature Profile	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk Mesoscale	Reflects layering of Numerical Weather Prediction Models; inherent vertical resolution is only 3 to 5 km	10 km	5 km	180 - 320 K	1K below 400 hPa and above boundary layer	CONUS: 30 min Full Disk : 60 min Mesoscale: 5 min	CONUS: 30 min Full Disk : 60 min	CONUS: 266 sec Full Disk: 266 sec Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 266 sec	2 K below 400 hPa and above boundary layer	Atmosphere	Profiles
Derived Stability Indices (5 indices: CAPE, Lifted Index, K-index, Showalter Index, Total Totals)	2	B	NetCDF McIDAS	30	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	10 km	2 km	Lifted Index: -- 10 to 40 K CAPE: 0 to 5000 J/kg Showalter index: >4 to - 10 K Total totals Index: -43 to > 56 K index: 0 to 40	Lifted Index: 2.0 K CAPE: 1000 J/ kg Showalter index: 2 K Total totals Index: 1 K index: 2	CONUS: 30 min Full Disk: 60 min Mesoscale: 5 min	CONUS: 30 min Full Disk: 60 min	CONUS: 159 sec Full Disk: 159 sec Mesoscale: 266 sec	CONUS: 159 sec Full Disk: 159 sec	Lifted Index: 6.5 K CAPE: 2500 J/ kg Showalter index:6.5 K Total totals Index:4 K index: 5	Atmosphere	Profiles

Appendix A Table 1: Baseline End-Product Sets and Performance Parameters

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Product Refresh Rate/ Coverage Time (B) (ABI Mode 3)	Refresh Rate / Coverage Time (B) Mode 4	VAGL (B) Mode 3	VAGL (B) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Total Precipitable Water	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	10 km	2 km	0 - 100 mm	1 mm	CONUS: 30 min Full Disk: 60 min Mesoscale: 5 min	CONUS: 30 min Full Disk: 60 min	CONUS: 266 sec Full Disk: 806 sec Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 806 sec	3 mm	Atmosphere	Profiles
Clear Sky Masks	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	2 km	1 km	Binary yes/no detection	87% correct detection	CONUS: 15 min, Full Disk: 15 min, Mesoscale: 5 min	CONUS: 15 min, Full Disk: 15 min	CONUS: 266 sec, Full Disk: 806 sec, Mesoscale: 266 sec	CONUS: 266 sec, Full Disk: 806 sec	Not applicable	Atmosphere	Radiances
Radiances	1	B	NetCDF McIDAS	6	Yes	1b	CONUS: Clear and above Cloud Regions only, Full Disk: Clear and above Cloud Regions only, Mesoscale: Clear and above Cloud Regions only	Not Applicable	Individual channel resolutions (0.5 km, 1.0 km, and 2.0 km)	One half of individual channel resolutions (0.5 km, 1.0 km, and 2.0 km)	180K-320K when converted to brightness temperature units	1.0 K when converted to in brightness temperature units for known emissivity	CONUS: 15 min Full Disk: 15 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 5 min	CONUS: 266 sec Full Disk: 806 sec Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 806 sec	0.4 K when converted to in brightness temperature units for known emissivity	Atmosphere	Radiances

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Downward Shortwave Radiation: Surface	2	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	CONUS: 25 km, Full Disk: 50 km, Mesoscale: 5 km	CONUS: 2 km Full Disk: 4 km Mesoscale: 1 km	0-1500 W/m^2	85 W/m^2 at high end of range (1000 W/m^2); 65 W/m^2 at typical value/ midpoint (350 W/m^2); 110 W/m^2 at low end of range (100 W/m^2)	CONUS: 60 min Full Disk: 60 min Mesoscale: 60 min	CONUS: 60 min Full Disk: 60 min	CONUS: 3236 sec Full Disk: 3236 sec Mesoscale: 3236 sec	CONUS: 3236 sec Full Disk: 3236 sec	100 W/m^2 for low and high values (100 and 1000 W/m^2) and 130 for mid values (350 W/m^2)	Atmosphere	Radiation
Reflected Shortwave Radiation: TOA	2	B	NetCDF McIDAS	4	No	2+	CONUS, Full Disk	Not Applicable	25 km	CONUS: 2 km Full Disk: 4 km	0-1300 W/m^2	85 W/m^2 at high end of range (1000 W/m^2); 65 W/m^2 at typical value/ midpoint (350 W/m^2)	CONUS: 60 min Full Disk: 60 min	CONUS: 60 min Full Disk: 60 min	CONUS: 3236 sec Full Disk: 3236 sec	CONUS: 3236 sec Full Disk: 3236 sec	100 W/m^2 for low and high values (100 and 1000 W/m^2) and 130 W/m^2 for mid values (350 W/m^2)	Atmosphere	Radiation
Derived Motion Winds	2	B	NetCDF McIDAS	36	No	2+	CONUS, Full Disk, Mesoscale	Cloud Motion Vector winds: At cloud tops; Clear-Sky Water Vapor winds: 200 mb	10 km	5 km	Speed: 0-300 kts (0 to 155 m/s) Direction: 0 to 360 degrees	Mean Vector Difference: 7.5 m/s	CONUS: 15 min Full Disk: 60 min (based on a single set of 3 sequential images 5 or more minutes apart) Mesoscale: 5 min	CONUS: 15 min Full Disk: 15 min (based on a single set of 3 sequential images 5 pr more minutes apart)	CONUS: 806 sec Full Disk: 806 sec Mesoscale: 806 sec	CONUS: 806 sec Full Disk: 806 sec	Mean Vector Difference: 3.8 m/s	Atmosphere	Winds

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Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Product Refresh Rate/ Coverage Time (B) (ABI Mode 3)	Refresh Rate / Coverage Time (B) Mode 4	VAGL (B) Mode 3	VAGL (B) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Fire / Hot Spot Characterization	2	B	NetCDF McIDAS	8	No	2+	CONUS, Full Disk	Not Applicable	2 km	1.0 km	275 to 400 K for pixel brightness temperature for 3.9 µm channel	2.0 K within dynamic range	CONUS: 5 min Full Disk: 15 min	CONUS: 5 min Full Disk: 15 min	CONUS: 266 sec Full Disk: 806 sec	CONUS: 266 sec Full Disk: 806 sec	2.0 K	Land	Land
Land Surface (Skin) Temperature	2	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	CONUS: 2 km Full Disk: 10 km Mesoscale: 2 km	CONUS: 1 km Full Disk: 5 km Mesoscale: 1 km	CONUS: 213-330 K Full Disk: 213-333 K Mesoscale: 213-330 K	2.5 K with known emissivity, known atmospheric correction, and 80% channel correlation; 5 K otherwise	CONUS: 60 min Full Disk: 60 min Mesoscale: 60 min	CONUS: 60 min Full Disk: 60 min	CONUS: 3236 sec Full Disk: 806 sec Mesoscale: 159 sec	CONUS: 3236 sec Full Disk: 806 sec	2.3 K	Land	Land
Snow Cover	2	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	2 km	1.0 km	0 – 1.0 fractional cover	0.30	CONUS: 60 min Full Disk: 60 min Mesoscale: 60 min	CONUS: 60 min Full Disk: 60 min	CONUS: 3236 sec Full Disk: 3236 sec Mesoscale: 3236 sec	CONUS: 3236 sec Full Disk: 3236 sec	0.05	Land	Land
Sea Surface Temperature (skin)	2	B	NetCDF McIDAS	2	No	2+	Full Disk	Not Applicable	2 km	1.0 km	271-313 K	2.1 K with known emissivity, known atmospheric correction, and 80% channel correlation; 3.1 K otherwise	Full Disk: 60 min	Full Disk: 60 min	Full Disk: 806 sec	Full Disk: 806 sec	1.0 K	Ocean	Ocean

Appendix A Table 1: Baseline End-Product Sets and Performance Parameters

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Product Refresh Rate/ Coverage Time (B) (ABI Mode 3)	Refresh Rate / Coverage Time (B) Mode 4	VAGL (B) Mode 3	VAGL (B) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Energetic Heavy Ions	1	B	NetCDF	1	Yes	1b	1 direction	Not Applicable	Not Applicable	Not Applicable	10 to 200 MeV/n-4 mass groups: He, (C,N,O), Ne-S, & Fe	25%	5 min	5 min	267 sec	267 sec	Flux values associated with 10 counts above background in 5-min interval.	Space & Solar	Energetic Particles
Magnetospheric Electrons and Protons: Low Energy	1	B	NetCDF	1	Yes	1b	5 directions	Not Applicable	Not Applicable	Not Applicable	Electron and Protons: 30 eV to 30 keV	25%	30 sec	30 sec	51 sec	51 sec	Flux values associated with 10 counts above background in 5-min interval.	Space & Solar	Energetic Particles
Magnetospheric Electrons and Protons: Medium & High Energy	1	B	NetCDF	1	Yes	1b	5 directions	Not Applicable	Not Applicable	Not Applicable	Electrons: 30 keV to 4 MeV Protons: 30 keV to 1 MeV	25%	30 sec	30 sec	51 sec	51 sec	Flux values associated with 10 counts above background in 5-min interval.	Space & Solar	Energetic Particles
Solar and Galactic Protons	1	B	NetCDF	1	Yes	1b	2 directions	Not Applicable	Not Applicable	Not Applicable	1 MeV to 500 MeV & Differential Measurements	25%	1 min	1 min	51 sec	51 sec	Flux values associated with 10 counts above background in 5-min interval.	Space & Solar	Energetic Particles
Geomagnetic Field	1	B	NetCDF	1	Yes	1b	3-axis 0.5º	Not Applicable	+/- 0.25º	+/- 1º	> = +/- 512 nT/axis (3-axis vector)	1.0 nT (per axis)	2 samples per sec	2 samples per sec	1.8 sec	1.8 sec	0.016 nT	Space & Solar	Magnetic Field
Solar Flux: EUV	1	B	NetCDF	1	Yes	1b	Solar Disk (40 arcmin)	Not Applicable	Not Applicable	+/-2 arcmin	0.5x Sol Min 10x Sol Max	20%	30 sec	30 sec	24 sec	24 sec	2%	Space & Solar	Solar

Appendix A Table 1: Baseline End-Product Sets and Performance Parameters

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Product Refresh Rate/ Coverage Time (B) (ABI Mode 3)	Refresh Rate / Coverage Time (B) Mode 4	VAGL (B) Mode 3	VAGL (B) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Solar Flux: X-Ray	1	B	NetCDF	1	Yes	1b	Solar Disk (40 arcmin)	Not Applicable	Not Applicable	+/-2 arcmin	XRSA: 5x10-9 to 5x10-4 W/m2 XRSB: 2x10-8 to 2x10-3 W/m2	+/- 20%	3 sec	3 sec	1.8 sec	1.8 sec	2%	Space & Solar	Solar
Solar Imagery: X-Ray	1	B	NetCDF FITS	2	Yes	1b	0.0-1.3 Solar Radii	7.0 arcsec	Stability during 24 hours: 1.0 arcmin of sun center (N-S, E-W) (1 sigma)- 3.0 arcmin of sun center (N-S, E-W) (3 sigma) & Stability during 60 seconds: 2.0 arc seconds of sun center (E-W, N-S) (1 sigma)- 6.0 arcsec of sun center (E-W, N-S) (3 sigma)	+/-2.5 arcsec	Radiance: 0.3-10^6 ph/cm2/arcsec/sec & Temperature: 1 to 10 MK	+/-40% in radiance	Image: <2 min & Temp: < 6 min	Image: <2 min & Temp: < 6 min	<50 sec	<50 sec	+/-40% in radiance	Space & Solar	Solar

NOTE: There are 54 KPP Cloud and Moisture Imagery End-Products (48 single band End-Products in NETCDF format at the resolution native to each band and one multiband product at 2 km resolution in both NETCDF & McIDAS Area file formats). This number is arrived at as follows:

Single band products: 16 products * 1 format (NETCDF) * 3 coverage areas (Full Disk, CONUS, Mesoscale)
Multiband products: 1 product * 2 formats (NETCDF and McIDAS Area)* 3 coverage areas (Full Disk, CONUS, Mesoscale)
(CCR01313, CCR01368)

NOTE: The number of Derived Motion Winds End-Products is derived from 6 unique outputs multiplied by 3 coverage areas in two formats each.

Appendix A Table 2: Product Qualifiers

Appendix A Table 2: Product Qualifiers				
Observational Requirements	**Temporal Coverage Qualifiers (Threshold)**	**Product Extent Qualifier (Threshold)**	**Cloud Cover Conditions Qualifier (Threshold)**	**Product Statistics Qualifier (Threshold)**
Observational Requirements: ATMOSPHERE				
AEROSOLS				
Aerosol Detection (including Smoke and Dust)	Day	Quantitative out to at least 60 degrees LZA (Threshold) and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Aerosol Particle Size	Day	Quantitative out to at least 60 degrees LZA (Threshold) and qualitative at larger LZA	Clear conditions down to feature of interest associated with threshold accuracy	Over specified geographic area
Aerosol Optical Depth	Daytime at a minimum	Quantitative out to at least 60 degrees LZA (Threshold) and qualitative at larger LZA	Clear conditions down to feature of interest associated with threshold accuracy	Over specified geographic area
Volcanic Ash: Detection and Height	Day and night	Quantitative out to at least 60 degrees LZA (Threshold) and qualitative at larger LZA	Clear conditions down to feature of interest associated with threshold accuracy	Over volcanic ash cases
CLOUDS				
Aircraft Icing Threat	Day and night	Quantitative out to at least 60 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Cloud Ice Water Path	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	In presence of limited clouds with optical depths between 1.0 and 60 (day)	Over specified geographic area
Cloud Layers / Heights	Day and night	Quantitative out to at least 62 degrees LZA and qualitative at larger LZA	In presence of clouds with optical depth > 1. Clear conditions down to cloud top associated with threshold accuracy.	Over specified geographic area
Cloud Liquid Water	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	In presence of limited clouds with optical depths between 2.0 and 60 (day)	Over specified geographic area
Cloud & Moisture Imagery	Day and night	Not applicable	In presence of clear air and clouds	Over specified geographic area
Cloud Optical Depth	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	In presence of clouds with optical depth > 1	Over specified geographic area
Cloud Particle Size Distribution	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	In presence of clouds with optical depths >2 and <60	Over specified geographic area
Cloud Top Phase	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	In presence of clouds with optical depth > 1. Clear conditions down to cloud top associated with threshold accuracy.	Over specified geographic area
Cloud Top Height	Day and night	Quantitative out to at least 62 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy.	Over specified geographic area
Cloud Top Pressure	Day and night	Quantitative out to at least 62 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy.	Over specified geographic area
Cloud Top Temperature	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	In presence of clouds with optical depth > 1. Clear conditions down to cloud top associated with threshold accuracy.	Over specified geographic area
Cloud Type	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	In presence of clouds with optical depth > 1. Clear conditions down to cloud top associated with threshold accuracy.	Over specified geographic area
Convective Initiation	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	Clear conditions down to feature of interest associated with threshold accuracy	Over specified geographic area
Enhanced "V" / Overshooting Top Detection	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	Clear conditions down to feature of interest associated with threshold accuracy	Over enhanced V / overshooting top cases
Hurricane Intensity	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	Clear conditions down to feature of interest associated with threshold accuracy	Over oceanic tropical systems

Appendix A Table 2: Product Qualifiers

Observational Requirements	Temporal Coverage Qualifiers (Threshold)	Product Extent Qualifier (Threshold)	Cloud Cover Conditions Qualifier (Threshold)	Product Statistics Qualifier (Threshold)
Lightning Detection: 1) Events 2)Flashes 3) Groups	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	Cloud cover conditions permitting observation of lightning associated with threshold accuracy	Over lightning cases
Low Cloud and Fog	Day and night	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions down to feature of interest (no high clouds obscuring fog) associated with threshold accuracy	Over low cloud and fog cases with at least 42% occurrence in the region
Tropopause Folding Turbulence Prediction	Day and night	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions down to feature of interest associated with threshold accuracy	Over the lengths of separate flight transects through the regions of positive prediction
Visibility	Day	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions down to feature of interest associated with threshold accuracy	Over specified geographic area
PRECIPITATION				
Probability of Rainfall	Day and night	Quantitative out to at least 70 degrees LZA or 60 degrees latitude, whichever is less, and qualitative beyond	N/A	Over rain cases and mesoscale-sized surrounding regions
Rainfall Potential	Day and night	Quantitative out to at least 70 degrees LZA or 60 degrees latitude, whichever is less, and qualitative beyond	N/A	Over rainfall cases
Rainfall Rate/QPE	Day and night	Quantitative out to at least 70 degrees LZA or 60 degrees latitude, whichever is less, and qualitative beyond	N/A	Over rain cases and mesoscale-sized surrounding regions
PROFILES				
Legacy Vertical Moisture Profile	Day and night	Quantitative out to at least 62 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Legacy Vertical Temperature Profile	Day and night	Quantitative out to at least 62 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Derived Stability Indices (5 indices: CAPE, Lifted Index, K-index, Showalter Index, Total Totals)	Day and night	Quantitative out to at least 62 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Total Precipitable Water	Day and night	Quantitative out to at least 62 degrees LZA and qualitative at larger LZA	Clear conditions down to feature of interest associated with threshold accuracy	Over specified geographic area
RADIANCES				
Clear Sky Masks	Day and night	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Radiances	Day and night	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
RADIATION				
Absorbed Shortwave Radiation: Surface	Day	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Not applicable	Over specified geographic area
Downward Longwave Radiation: Surface	Day and night	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Downward Shortwave Radiation: Surface	Day for SZA values greater than 25 degrees	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Not applicable	Over specified geographic area
Reflected Shortwave Radiation: TOA	Day	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Not applicable	Over specified geographic area
Upward Longwave Radiation: Surface	Day and night	Quantitative out to at least 62 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area

Appendix A Table 2: Product Qualifiers				
Observational Requirements	**Temporal Coverage Qualifiers (Threshold)**	**Product Extent Qualifier (Threshold)**	**Cloud Cover Conditions Qualifier (Threshold)**	**Product Statistics Qualifier (Threshold)**
Upward Longwave Radiation: TOA	Day and night	Quantitative out to at least 62 degrees LZA and qualitative at larger LZA	Not applicable	Over specified geographic area
TRACE GASES				
Ozone Total	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
SO_2 Detection	Day and night	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
WINDS				
Derived Motion Winds	Day and night	Quantitative out to at least 62 degrees LZA and qualitative at larger LZA	Clear conditions down to feature of interest associated with threshold accuracy	Over specified geographic area
Observational Requirements: LAND				
Fire / Hot Spot Characterization	Day and night	Quantitative out to at least 65 degrees LZA and qualitative at larger LZA	If feature is obscured by thick clouds, product will not meet threshold measurement accuracy	Over specified geographic area
Flood/Standing Water	Day with Sun at less than 67 degree solar zenith angle	Quantitative out to at least 67 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Ice Cover	Day with Sun at less than 67 degree solar zenith angle	Quantitative out to at least 67 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Land Surface (Skin) Temperature	Day and night	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Snow Cover	Sun at less than 67 degree daytime solar zenith angle	Quantitative out to at least 55 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Snow Depth (over Plains)	Sun at less than 67 degree daytime solar zenith angle	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Surface Albedo	Sun at less than 67 degree daytime solar zenith angle	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Surface Emissivity	Sun at less than 67 degree daytime solar zenith angle	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Vegetation Fraction: Green	Sun at less than 67 degree daytime solar zenith angle	Quantitative out to at least 55 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Vegetation Index	Sun at less than 67 degree daytime solar zenith angle	Quantitative out to at least 70 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Observational Requirements: OCEAN				
Currents	Day and night	Quantitative out to at least 67 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Currents: Offshore	Day and night	Quantitative out to at least 67 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Sea & Lake Ice: Age	Sun at less than 67 degree daytime solar zenith angle	Quantitative out to at least 67 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Sea & Lake Ice: Concentration	Sun at less than 67 degree daytime solar zenith angle	Quantitative out to at least 67 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Sea & Lake Ice: Motion	Sun at less than 67 degree daytime solar zenith angle	Quantitative out to at least 67 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Sea Surface Temperature (skin)	Day and night	Quantitative out to at least 67 degrees LZA and qualitative at larger LZA	Clear conditions associated with threshold accuracy	Over specified geographic area
Observational Requirements: SPACE AND SOLAR				

Appendix A Table 2: Product Qualifiers				
Observational Requirements	**Temporal Coverage Qualifiers (Threshold)**	**Product Extent Qualifier (Threshold)**	**Cloud Cover Conditions Qualifier (Threshold)**	**Product Statistics Qualifier (Threshold)**
ENERGETIC PARTICLES				
Energetic Heavy Ions	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Magnetospheric Electrons and Protons: Low Energy	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Magnetospheric Electrons and Protons: Medium & High Energy	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Solar and Galactic Protons	Not Applicable	Not Applicable	Not Applicable	Not Applicable
MAGNETIC FIELD				
Geomagnetic Field	Not Applicable	Not Applicable	Not Applicable	Not Applicable
SOLAR				
Solar Flux: EUV	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Solar Flux: X-Ray	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Solar Imagery: X-Ray	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Appendix A Table 3: Option 2 End-Product Sets and Performance Parameters

Appendix A Table 3: Option 2 End-Product Sets and Performance Parameters																			
Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O2) Mode 3	Vendor Allocated Ground Latency (O2) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Aerosol Particle Size	3	O2	NetCDF McIDAS	2	No	2+	Full Disk	Total Column	2 km	1.0 km	Fine/Coarse Angstrom exponent range: -1 to +3	Fine/Coarse Angstrom exponent: 0.3 over ocean and land	Full Disk: 15 min	Full Disk: 5 min	Full Disk: 266 sec	Full Disk: 266 sec	0.15	Atmosphere	Aerosols
Aircraft Icing Threat	4	O2	NetCDF McIDAS	2	No	2+	Full Disk	Cloud top	2 km	5 km	Day: Unknown, None, Light, Moderate or Greater (MOG); Night: Unknown, None, Possible Icing	50% correct classification	Full Disk: 60 min	Full Disk: 5 min	Full Disk: 806 sec	Full Disk: 806 sec	1 category	Atmosphere	Clouds
Cloud Ice Water Path	3	O2	NetCDF McIDAS	6	No	2+	CONUS: for limited cloudiness, Full Disk: for limited cloudiness, Mesoscale: for limited cloudiness	SFC - 20 km	2 km	1.0 km	25 – 2000 g/m^2 (day); 25 – 300 g/m^2 (night)	Greater of 25g/m^2 or 30%	CONUS: 5 min Full Disk: 15 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 5 min	CONUS: 50 sec Full Disk: 159 sec Mesoscale: 50 sec	CONUS: 50 sec Full Disk: 159 sec	Greater of 25 g/m^2 or 30% (day) and 40% (night)	Atmosphere	Clouds
Cloud Layers / Heights	3	O2	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	1 cloud layer	CONUS: 10 km Full Disk: 10 km Mesoscale: 4 km	CONUS: 5 km Full Disk: 5 km Mesoscale: 2 km	Low, Mid, High	80% correct classification	CONUS: 60 min Full Disk: 60 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 5 min	CONUS: 806 sec Full Disk: 806 sec Mesoscale: 266 sec	CONUS: 806 sec Full Disk: 806 sec	1 category	Atmosphere	Clouds
Cloud Liquid Water	3	O2	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Total Column	2 km	1.0 km	25 – 1000 g/m^2 (day); 25 – 150 g/m^2 (night)	Greater of 25 g/m^2 or 15%	CONUS: 5 min, Full Disk: 30 min, Mesoscale: 5 min	CONUS: 5 min, Full Disk: 5 min	CONUS: 266 sec, Full Disk: 159 sec, Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 159 sec	Greater of 25 g/m^2 or 30% (day) and 40% (night)	Atmosphere	Clouds

Appendix A Table 3: Option 2 End-Product Sets and Performance Parameters

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O2) Mode 3	Vendor Allocated Ground Latency (O2) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Cloud Type	3	O2	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	CONUS: 10 km Full Disk: 2 km Mesoscale: 2 km	CONUS: 5 km Full Disk: 1 km Mesoscale: 1 km	7 types	60% correct classification	CONUS: 15 min Full Disk: 15 min Mesoscale: 15 min	CONUS: 5 min Full Disk: 5 min	CONUS: 536 sec Full Disk: 159 sec Mesoscale: 266 sec	CONUS: 536 sec Full Disk: 159 sec	2.5 categories	Atmosphere	Clouds
Convective Initiation	3	O2	NetCDF McIDAS	4	No	2+	CONUS, Mesoscale	Not Applicable	2 km	1.0 km	Binary yes/no detection	70% correct detection	CONUS: 5 min Mesoscale: 5 min	CONUS: 5 min	CONUS: 159 sec Mesoscale: 159 sec	CONUS: 159 sec	Not applicable	Atmosphere	Clouds
Enhanced "V" / Overshooting Top Detection	4	O2	NetCDF McIDAS	4	No	2+	CONUS, Mesoscale	Not Applicable	2 km	1.0 km	Binary yes/no detection(160 - 270 K)	75% correct detection (in terms of 1 – False Alarm Rate)	CONUS: 5 min Mesoscale: 5 min	CONUS: 5 min	CONUS: 159 sec Mesoscale: 159 sec	CONUS: 159 sec	Not applicable	Atmosphere	Clouds
Low Cloud and Fog	3	O2	NetCDF McIDAS	2	No	2+	Full Disk	0.5 km (depth)	2 km	1.0 km	Binary yes/no detection	70% correct detection	Full Disk: 15 min	Full Disk: 5 min	Full Disk: 159 sec	Full Disk: 159 sec	Not applicable	Atmosphere	Clouds
Tropopause Folding Turbulence Prediction	3	O2	NetCDF McIDAS	4	No	2+	Full Disk, Mesoscale	SFC - 100 mb	2 km	1.0 km	Binary yes/no detection above boundary layer for moderate or greater conditions	50% correct detection of Moderate or Greater turbulence	Full Disk: 15 min, Mesoscale: 5 min	Full Disk: 5 min	Full Disk: 159 sec, Mesoscale: 266 sec	Full Disk: 159 sec	Not applicable	Atmosphere	Clouds
Visibility	4	O2	NetCDF McIDAS	2	No	2+	Full Disk	Not Applicable	10 km	5 km	Clear (vis ≥ 30 km)Moderate (10 km ≤ Vis < 30 km) Low (2 km ≤ vis < 10 km); Poor (vis < 2 km) (under the conditions of clear up through clouds of only layer)	80% correct classification	Full Disk: 60 min	Full Disk: 5 min	Full Disk: 806 sec	Full Disk: 806 sec	1.5 categories	Atmosphere	Clouds
Probability of Rainfall	4	O2	NetCDF McIDAS	2	No	2+	Full Disk	Not Applicable	2 km	1.0 km	0 to 100%	25%	Full Disk: 15 min	Full Disk: 5 min	Full Disk: 266 sec	Full Disk: 266 sec	40%	Atmosphere	Precipitation

Appendix A Table 3: Option 2 End-Product Sets and Performance Parameters

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O2) Mode 3	Vendor Allocated Ground Latency (O2) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Rainfall Potential	4	O2	NetCDF McIDAS	2	No	2+	Full Disk	Not Applicable	2 km	1.0 km	0-100 mm	5 mm for pixels designated as raining	Full Disk: 15 min	Full Disk: 5 min	Full Disk: 266 sec	Full Disk: 266 sec	5 mm for pixels designated as raining	Atmosphere	Precipitation
Absorbed Shortwave Radiation: Surface	3	O2	NetCDF McIDAS	2	No	2+	Mesoscale	Not Applicable	5 km	1.0 km	0 - 1200 W/m^2	90 W/m^2 at low value (100 W/m^2); 45 W/m^2 at mid value (400 W/m^2); 55 W/m^2 at high value (800 W/m^2)	Mesoscale: 60 min	Not applicable	Mesoscale: 3236 sec	Not applicable	75 W/m^2 for low and high values (100 and 800 W/m^2) and 95 W/m^2 for mid values (400 W/m^2)	Atmosphere	Radiation
Downward Longwave Radiation: Surface	3	O2	NetCDF McIDAS	4	No	2+	CONUS, Full Disk	Not Applicable	CONUS: 25 km Full Disk: 100 km	CONUS: 5 km Full Disk: 4 km	50 - 750 W/m^2	25 W/m^2 for known cloud fraction	CONUS: 60 min Full Disk: 60 min	CONUS: 5 min Full Disk: 5 min	CONUS: 3238 sec Full Disk: 806 sec	CONUS: 3238 sec Full Disk: 806 sec	20 W/m^2 for known cloud fraction	Atmosphere	Radiation
Upward Longwave Radiation: Surface	3	O2	NetCDF McIDAS	4	No	2+	CONUS, Full Disk	Not Applicable	CONUS: 25 km Full Disk: 100 km	5 km	50-900 W/m^2	30 W/m^2	CONUS: 60 min Full Disk: 60 min	CONUS: 5 min Full Disk: 5 min	CONUS: 3236 sec Full Disk: 3236 sec	CONUS: 3236 sec Full Disk: 3236 sec	20 W/m^2	Atmosphere	Radiation
Upward Longwave Radiation: TOA	3	O2	NetCDF McIDAS	4	No	2+	CONUS, Full Disk	Not Applicable	25 km	5 km	50-450 W/m^2	20 W/m^2	CONUS: 60 min Full Disk: 60 min	CONUS: 5 min Full Disk: 5 min	CONUS: 3236 sec Full Disk: 3236 sec	CONUS: 3236 sec Full Disk: 3236 sec	5 W/m^2	Atmosphere	Radiation
Ozone Total	3	O2	NetCDF McIDAS	4	No	2+	CONUS, Full Disk	Total Column	10 km	5 km	100-650 DU (where 1 DU=-2.7 e16 mol/cm^2)	15 Dobson Units	CONUS: 60 min Full Disk: 60 min	CONUS: 5 min Full Disk: 5 min	CONUS: 266 sec Full Disk: 266 sec	CONUS: 266 sec Full Disk: 266 sec	25 Dobson Units	Atmosphere	Trace Gases
SO_2 Detection	3	O2	NetCDF McIDAS	2	No	2+	Full Disk	Total Column	2 km	1 km	Binary yes/no detection from 10 to 700 Dobson Units (DU)	70% correct detection	Full Disk: 60 min	Full Disk: 5 min	Full Disk : 806 sec	Full Disk: 806 sec	Not applicable	Atmosphere	Trace Gases

Appendix A Table 3: Option 2 End-Product Sets and Performance Parameters

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O2) Mode 3	Vendor Allocated Ground Latency (O2) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Flood/Standing Water	4	O2	NetCDF McIDAS	4	No	2+	Full Disk, Mesoscale	Not Applicable	10 km	5 km	Binary yes/no detection of water accumulation over 5 cm vertical depth	60% correct detection	Full Disk: 60 min Mesoscale: 60 min	Full Disk: 60 min	Full Disk 19,436 sec Mesoscale: 19,436 sec	Full Disk: 19,436 sec	Not applicable	Land	Land
Ice Cover	4	O2	NetCDF McIDAS	2	No	2+	Full Disk	Not Applicable	2 km	1 km	Binary yes/no detection	85% correct detection	Full Disk: 180 min	Full Disk: 180 min	Full Disk: 77,756 sec	Full Disk: 77,756 sec	Not applicable	Land	Land
Snow Depth (over Plains)	4	O2	NetCDF McIDAS	6	No	2+	CONUS: Tall Grassy Plains Only, Full Disk: Tall Grassy Plains Only, Mesoscale: Tall Grassy Plains Only	Not Applicable	2 km	1 km	0 to 27 cm	9 cm	CONUS: 60 min Full Disk: 60 min Mesoscale: 60 min	CONUS: 60 min Full Disk: 60 min	CONUS: 3236 sec Full Disk: 3236 sec Mesoscale: 3236 sec	CONUS: 3236 sec Full Disk: 3236 sec	15 cm	Land	Land
Surface Albedo	3	O2	NetCDF McIDAS	2	No	2+	Full Disk	Not Applicable	2 km	2 km	0 to 1 Albedo Units	0.08 (albedo units)	Full Disk: 60 min	Full Disk: 60 min	Full Disk: 3236 sec	Full Disk: 3236 sec	10%	Land	Land
Surface Emissivity	3	O2	NetCDF McIDAS	2	No	2+	CONUS	Not Applicable	10 km	5 km	0.85 to 1.0 (unitless)	0.05 (unitless)	CONUS: 60 min	CONUS: 60 min	CONUS: 3236 sec	CONUS: 3236 sec	0.005	Land	Land
Vegetation Fraction: Green	4	O2	NetCDF McIDAS	2	No	2+	CONUS	Not Applicable	2 km	1 km	0.0 to 1.0 (unitless)	0.05	CONUS: 60 min	CONUS: 60 min	CONUS: 3236 sec	CONUS: 3236 sec	0.05	Land	Land
Vegetation Index	4	O2	NetCDF McIDAS	2	No	2+	CONUS	Not Applicable	2 km	1 km	0 to 1 (NDVI units)	0.04 NDVI Units	CONUS: 60 min	CONUS: 60 min	CONUS: 3236 sec	CONUS: 3236 sec	0.04 NDVI units	Land	Land
Currents	4	O2	NetCDF McIDAS	4	No	2+	Full Disk, Mesoscale	SFC	2 km	1.0 km	0 to 2 m/s (0 to 7.2 km/hr), 0 to 360 degrees	Speed: 1 km/hr Direction: 45°	Full Disk: 6 hr Mesoscale: 6 hr	Full Disk: 6 hr	Full Disk: 3236 sec Mesoscale: 3236 sec	Full Disk: 3236 sec	1 km/hr	Ocean	Ocean
Currents: Offshore	4	O2	NetCDF McIDAS	4	No	2+	CONUS and US navigable waters thru EEZ, Full Disk	SFC	2 km	1 km	0 - 7.2 km/hr	1 km / hr	CONUS: 180 min Full Disk: 180 min	CONUS: 180 min Full Disk: 180 min	CONUS: 3236 sec Full Disk: 3236 sec	CONUS: 3236 sec Full Disk: 3236 sec	1 km/hr	Ocean	Ocean
Sea & Lake Ice: Age	4	O2	NetCDF McIDAS	2	No	2+	Full Disk	Ice Surface	1 km	3 km	Ice free areas, First year ice, Older ice	80% correct classification	Full Disk: 6 hr	Full Disk: 6 hr	Full Disk: 3236 sec	Full Disk: 3236 sec	1 category	Ocean	Ocean

Appendix A Table 3: Option 2 End-Product Sets and Performance Parameters

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O2) Mode 3	Vendor Allocated Ground Latency (O2) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Sea & Lake Ice: Concentration	4	O2	NetCDF McIDAS	4	No	2+	CONUS: Regional & Great Lakes and US coastal waters containing sea ice hazards to navigation, Full Disk: Sea ice covered waters in N. & S. Hemispheres	Ice Surface	CONUS: 3 km, Full Disk: 10 km	CONUS: < = 1.5 km Full Disk: < = 5.0 km	Ice concentration - 0/10 to 10/10	Ice concentration - 10%	CONUS: 180 min Full Disk: 6 hr	CONUS: 180 min Full Disk: 6 hr	CONUS: 3236 sec Full Disk: 9716 sec	CONUS: 3236 sec Full Disk: 9716 sec	30%	Ocean	Ocean
Sea & Lake Ice: Motion	4	O2	NetCDF McIDAS	4	No	2+	CONUS: Great Lakes and Chesapeake and Delaware Bays Full Disk: Sea ice covered waters in N. & S. Hemispheres	Not Applicable	CONUS: 5 km Full Disk: 15 km	CONUS: 2.5 km Full Disk: 7.5 km	Direction: 0 to 360º Displacement: 0 to 0.6 m/s	Direction:22.5° Speed: 3 km/day	CONUS: 3 hr Full Disk: 6 hr	CONUS: 3 hr Full Disk: 6 hr	CONUS: 3236 sec Full Disk: 9716 sec	CONUS: 3236 sec Full Disk: 9716 sec	Direction: 30° Speed: 3 km/day	Ocean	Ocean

Appendix B: OSD-Allocated Ground Latency for GOES-R Access Subsystem

Appendix B: OSD-Allocated Ground Latency for GOES-R Access Subsystem	
Name	**GAS Allocated Ground Latency**
Aerosol Detection (including Smoke and Dust)	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Aerosol Particle Size	Full Disk: 1 sec
Aerosol Optical Depth	CONUS: 1 sec Full Disk: 1 sec
Volcanic Ash: Detection and Height	Full Disk: 1 sec
Aircraft Icing Threat	Full Disk: 1 sec
Cloud Ice Water Path	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Cloud Layers / Heights	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Cloud Liquid Water	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Cloud & Moisture Imagery	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Cloud Optical Depth	CONUS: 1 sec Full Disk: 1 sec
Cloud Particle Size Distribution	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Cloud Top Phase	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Cloud Top Height	CONUS: 1 sec, Full Disk: 1 sec Mesoscale: 1 sec
Cloud Top Pressure	CONUS: 1 sec, Full Disk: 1 sec

Appendix B: OSD-Allocated Ground Latency for GOES-R Access Subsystem	
Name	**GAS Allocated Ground Latency**
Cloud Top Temperature	Full Disk: 1 sec Mesoscale: 1 sec
Cloud Type	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Convective Initiation	CONUS: 1 sec Mesoscale: 1 sec
Enhanced "V" / Overshooting Top Detection	CONUS: 1 sec Mesoscale: 1 sec
Hurricane Intensity	Full Disk: 1 sec
Lightning Detection: 1) Events 2)Flashes and 3) Groups	Full Disk: 1 sec
Low Cloud and Fog	Full Disk: 1 sec
Tropopause Folding Turbulence Prediction	Full Disk: 1 sec Mesoscale: 1 sec
Visibility	Full Disk: 1 sec
Probability of Rainfall	Full Disk: 1 sec
Rainfall Potential	Full Disk: 1 sec
Rainfall Rate/QPE	Full Disk: 1 sec
Legacy Vertical Moisture Profile	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Legacy Vertical Temperature Profile	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Derived Stability Indices (5 indices: CAPE, Lifted Index, K-index, Showalter Index, Total Totals)	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Total Precipitable Water	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Clear Sky Masks	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Radiances	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Absorbed Shortwave Radiation: Surface	Mesoscale: 1 sec

Appendix B: OSD-Allocated Ground Latency for GOES-R Access Subsystem	
Name	**GAS Allocated Ground Latency**
Downward Longwave Radiation: Surface	CONUS: 1 sec Full Disk: 1 sec
Downward Shortwave Radiation: Surface	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Reflected Shortwave Radiation: TOA	CONUS: 1 sec Full Disk: 1 sec
Upward Longwave Radiation: Surface	CONUS: 1 sec Full Disk: 1 sec
Upward Longwave Radiation: TOA	CONUS: 1 sec Full Disk: 1 sec
Ozone Total	CONUS: 1 sec Full Disk: 1 sec
SO_2 Detection	Full Disk: 1 sec
Derived Motion Winds	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Fire / Hot Spot Characterization	CONUS: 1 sec Full Disk: 1 sec
Flood/Standing Water	Full Disk: 1 sec Mesoscale: 1 sec
Ice Cover	Full Disk: 1 sec
Land Surface (Skin) Temperature	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Snow Cover	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Snow Depth (over Plains)	CONUS: 1 sec Full Disk: 1 sec Mesoscale: 1 sec
Surface Albedo	Full Disk: 1 sec
Surface Emissivity	CONUS: 1 sec
Vegetation Fraction: Green	CONUS: 1 sec
Vegetation Index	CONUS: 1 sec
Currents	Full Disk: 1 sec Mesoscale: 1 sec

Appendix B: OSD-Allocated Ground Latency for GOES-R Access Subsystem	
Name	**GAS Allocated Ground Latency**
Currents: Offshore	CONUS: 1 sec Full Disk: 1 sec
Sea & Lake Ice: Age	Full Disk: 1 sec
Sea & Lake Ice: Concentration	CONUS: 1 sec Full Disk: 1 sec
Sea & Lake Ice: Motion	CONUS: 1 sec Full Disk: 1 sec
Sea Surface Temperature (skin)	Full Disk: 1 sec
Energetic Heavy Ions	N/A
Magnetospheric Electrons and Protons: Low Energy	N/A
Magnetospheric Electrons and Protons: Medium & High Energy	N/A
Solar and Galactic Protons	N/A
Geomagnetic Field	N/A
Solar Flux: EUV	N/A
Solar Flux: X-Ray	N/A
Solar Imagery: X-Ray	N/A

Appendix C: Reserved *(CCR-01530)*

Appendix D: Improved Latencies and Refresh Rates for Product Sets 1 and 2 (Option 1)

Appendix D: Improved Latencies and Refresh Rates for Product Sets 1 and 2 (Option 1)

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O1) Mode 3	Vendor Allocated Ground Latency (O1) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Aerosol Detection (including Smoke and Dust)	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Total Column	2 km	1 km	Binary yes/no detection above threshold 0.2 (for aerosol optical thickness)	Dust: 80% correct detection over land and ocean Smoke: 80% correct detection over land; 70% correct detection over ocean	CONUS: 15 min Full Disk: 15 min Mesoscale: 15 min	CONUS: 5 min Full Disk: 5 min	CONUS: 806 sec Full Disk: 159 sec Mesoscale: 806 sec	CONUS: 806 sec Full Disk: 159 sec	Not applicable	Atmosphere	Aerosols
Aerosol Optical Depth	1	B	NetCDF McIDAS	4	No	2+	CONUS, Full Disk	Total Column	2 km	1.0 km	-1 – 5 in optical depth	Based on Aerosol Optical Depth ranges: Over land: < 0.04: 0.06 0.04 – 0.80: 0.04 > 0.80: 0.12 Over water: < 0.40: 0.02 > 0.40: 0.10	CONUS: 5 min Full Disk: 15 min	CONUS: 5 min Full Disk: 5 min	CONUS: 50 sec Full Disk: 159 sec	CONUS: 50 sec Full Disk: 159 sec	Based on Aerosol Optical Depth ranges: Over land: < 0.04: 0.13 0.04 – 0.80: 0.25 > 0.80: 0.35 Over water: < 0.40: 0.15 > 0.40: 0.23	Atmosphere	Aerosols
Volcanic Ash: Detection and Height	2	B	NetCDF McIDAS	2	No	2+	Full Disk	3 km (top height)	2 km	1.0 km	0-50 tons/km^2	2 tons/km^2	Full Disk: 15 min	Full Disk: 5 min	Full Disk: 50 sec	Full Disk: 50 sec	2.5 tons/km^2	Atmosphere	Aerosols

Appendix D: Improved Latencies and Refresh Rates for Product Sets 1 and 2 (Option 1)

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O1) Mode 3	Vendor Allocated Ground Latency (O1) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Cloud & Moisture Imagery	1	B	NetCDF McIDAS	54	Yes	2+	CONUS, Full Disk, Mesoscale	Not Applicable	2 km, with finer daytime obser-vations	1.0 km	Not Applicable	Not Applicable	CONUS: 5 min Full Disk: 15 min Mesoscale: 30 sec	CONUS: 5 min Full Disk: 5 min	CONUS: 50 sec Full Disk: 50 sec Mesoscale: 23 sec	CONUS: 50 sec Full Disk: 50 sec	Not applicable	Atmosphere	Clouds
Cloud Optical Depth	1	B	NetCDF McIDAS	4	No	2+	CONUS: for optical depth > 1, Full Disk: for optical depth > 1	Total column	CONUS: 2 km Full Disk: 4 km	CONUS: 1 km Full Disk: 2 km	1 – 50 (day) 1 – 8 (night)	Liquid phase: 20% (Day), 20% (Night); Ice phase: 20% (Day), 30% (Night)	CONUS: 15 min Full Disk: 15 min	CONUS: 5 min Full Disk: 5 min	CONUS: 806 sec Full Disk: 159 sec	CONUS: 806 sec Full Disk: 159 sec	Maximum of 0.5 or 20%	Atmosphere	Clouds
Cloud Particle Size Distribution	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Cloud Top	2 km	1.0 km	2 – 32 µm for liquid phase; 2 – 50 µm for ice phase	4 µm for liquid phase, 10 µm for ice phase	CONUS: 5 min Full Disk: 15 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 5 min	CONUS: 50 sec Full Disk: 806 sec Mesoscale: 266 sec	CONUS: 50 sec Full Disk: 266 sec	2 µm for liquid phase; 4 µm for ice phase	Atmosphere	Clouds
Cloud Top Phase	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Cloud Top	2 km	1.0 km	Liquid /solid / supercooled / mixed	80% correct classification	CONUS: 5 min Full Disk: 15 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 5 min	CONUS: 50 sec Full Disk: 159 sec Mesoscale: 50 sec	CONUS: 50 sec Full Disk: 159 sec	1.5 categories	Atmosphere	Clouds
Cloud Top Height	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Cloud top	CONUS: 10 km, Full Disk: 10 km, Mesoscale: 4 km	CONUS: 5 km Full Disk: 5 km Mesoscale: 2 km	CONUS: 100 – 300 m Full Disk: 0 - 15 km Mesoscale: 0 - 20 km	500 m for clouds with emissivity > 0.8	CONUS: 60 min Full Disk: 60 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 5 min	CONUS: 159 sec Full Disk: 159 sec Mesoscale: 266 sec	CONUS: 159 sec Full Disk: 159 sec	1500 m for clouds with emissivity > 0.8	Atmosphere	Clouds

Appendix D: Improved Latencies and Refresh Rates for Product Sets 1 and 2 (Option 1)

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O1) Mode 3	Vendor Allocated Ground Latency (O1) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Cloud Top Pressure	1	B	NetCDF McIDAS	4	No	2+	CONUS, Full Disk	Cloud top	10 km	5 km	CONUS: 100-1000 mb Full Disk: 100 - 1000 mb	50 mb for clouds with emissivity > 0.8	CONUS: 60 min Full Disk: 60 min	CONUS: 5 min Full Disk: 60 min	CONUS: 536 sec Full Disk: 159 sec	CONUS: 536 sec Full Disk: 159 sec	150 mb for clouds with emissivity > 0.8	Atmosphere	Clouds
Cloud Top Temperature	1	B	NetCDF McIDAS	4	No	2+	Full Disk, Mesoscale	At Cloud Tops	2 km	1.0 km	180-300 K	3 K for clouds with emissivity > 0.8	Full Disk: 15 min Mesoscale: 5 min	Full Disk: 5 min	Full Disk: 159 sec Mesoscale: 266 sec	Full Disk: 159 sec	5 K for clouds with emissivity > 0.8	Atmosphere	Clouds
Hurricane Intensity	2	B	NetCDF McIDAS	2	No	2+	Full Disk	Not Applicable	2 km	1.0 km	Dvorak hurricane intensity scale values of 1.5 - 8 or leading to wind speeds of 12.8 m/s (25 knots) to 87.5 m/s (170 knots)	5 m/s over ocean	Full Disk: 30 min	Full Disk: 5 min	Full Disk: 159 sec	Full Disk: 159 sec	5 m/s over the ocean	Atmosphere	Clouds
Lightning Detection: 1) Events 2) Flashes and 3) Groups	1	B	NetCDF McIDAS	6	Yes	2+	Full Disk	Surface to cloud top	10 km	5 km	Real time	70% total flash detection	Full Disk: 20 sec	Full Disk: 20 sec	Full Disk: 50 sec	Full Disk: 50 sec	5%	Atmosphere	Clouds
Rainfall Rate/QPE	2	B	NetCDF McIDAS	2	No	2+	Full Disk	Not Applicable	2 km	2 km	0-100 mm/hr	6 mm/hr at 10 mm/hr rate, with higher values at higher rates	Full Disk: 15 min	Full Disk: 5 min	Full Disk: 50 sec	Full Disk: 50 sec	9 mm/hr at 10mm/hr rate, with higher values at higher rates	Atmosphere	Precipitation

Appendix D: Improved Latencies and Refresh Rates for Product Sets 1 and 2 (Option 1)

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O1) Mode 3	Vendor Allocated Ground Latency (O1) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Legacy Vertical Moisture Profile	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Reflects layering of Numerical Weather Prediction Models; inherent vertical resolution is only 3 to 5 km	10 km	5 km	0 - 100%	Sfc-500 mb: 18 % relative humidity 500-300 mb: 18% relative humidity 300-100 mb: 20% relative humidity	CONUS: 30 min Full Disk: 60 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 5 min	CONUS: 266 sec Full Disk: 266 sec Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 266 sec	Sfc-500 mb: 18% relative humidity 500-300 mb: 18% relative humidity 300-100 mb: 20% relative humidity	Atmosphere	Profiles
Legacy Vertical Temperature Profile	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Reflects layering of Numerical Weather Prediction Models; inherent vertical resolution is only 3 to 5 km	10 km	5 km	180 - 320 K	1K below 400 hPa and above boundary layer	CONUS: 30 min Full Disk: 60 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 5 min	CONUS: 266 sec Full Disk: 266 sec Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 266 sec	2 K below 400 hPa and above boundary layer	Atmosphere	Profiles
Derived Stability Indices (5 indices: CAPE, Lifted Index, K-index, Showalter Index, Total Totals)	2	B	NetCDF McIDAS	30	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	10 km	2 km	Lifted Index: -- 10 to 40 K CAPE: 0 to 5000 J/kg Showalter index: >4 to - 10 K Total totals Index: -43 to > 56 K index: 0 to 40	Lifted Index: 2.0 K CAPE: 1000 J/ kg Showalter index: 2 K Total totals Index: 1 K index:2	CONUS: 30 min Full Disk: 60 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 15 min	CONUS: 159 sec Full Disk: 159 sec Mesoscale: 266 sec	CONUS: 159 sec Full Disk: 159 sec	Lifted Index: 6.5 K CAPE: 2500 J/ kg Showalter index: 6.5 K Total totals Index: 4 K index: 5	Atmosphere	Profiles

Appendix D: Improved Latencies and Refresh Rates for Product Sets 1 and 2 (Option 1)

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O1) Mode 3	Vendor Allocated Ground Latency (O1) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Total Precipitable Water	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	10 km	2 km	0 - 100 mm	1 mm	CONUS: 30 min, Full Disk: 60 min, Mesoscale: 5 min	CONUS: 5 min, Full Disk: 15 min	CONUS: 266 sec, Full Disk: 806 sec Mesoscale: 266 sec	CONUS: 266 sec, Full Disk: 806 sec	3 mm	Atmosphere	Profiles
Clear Sky Masks	1	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	2 km	1 km	Binary yes/no detection	87% correct detection	CONUS: 15 min, Full Disk: 15 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 5 min	CONUS: 266 sec Full Disk: 806 sec Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 806 sec	Not applicable	Atmosphere	Radiances
Radiances	1	B	NetCDF McIDAS	6	Yes	1b	CONUS: Clear and above Cloud Regions only, Full Disk: Clear and above Cloud Regions only, Mesoscale: Clear and above Cloud Regions only	Not Applicable	Individual channel resolutions (0.5 km, 1.0 km, and 2.0 km)	One half of individual channel resolutions (0.5 km, 1.0 km, and 2.0 km)	180K-320K when converted to brightness temperature units	1.0 K when converted to in brightness temperature units for known emissivity	CONUS: 15 min Full Disk: 15 min Mesoscale: 5 min	CONUS: 5 min Full Disk: 5 min	CONUS: 266 sec Full Disk: 806 sec Mesoscale: 266 sec	CONUS: 266 sec Full Disk: 806 sec	0.4 K when converted to in brightness temperature units for known emissivity	Atmosphere	Radiances

Appendix D: Improved Latencies and Refresh Rates for Product Sets 1 and 2 (Option 1)

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O1) Mode 3	Vendor Allocated Ground Latency (O1) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Downward Shortwave Radiation: Surface	2	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	CONUS: 25 km, Full Disk: 50 km, Mesoscale: 5 km	CONUS: 2 km Full Disk: 4 km Mesoscale: 1 km	0-1500 W/m^2	85 W/m^2 at high end of range (1000 W/m^2); 65 W/m^2 at typical value/ midpoint (350 W/m^2); 110 W/m^2 at low end of range (100 W/m^2)	CONUS: 60 min Full Disk: 60 min Mesoscale: 60 min	CONUS: 5 min Full Disk: 5 min	CONUS: 3236 sec Full Disk: 3236 sec Mesoscale: 3236 sec	CONUS: 3236 sec Full Disk: 3236 sec	100 W/m^2 for low and high values (100 and 1000 W/m^2) and 130 for mid values (350 W/m^2)	Atmosphere	Radiation
Reflected Shortwave Radiation: TOA	2	B	NetCDF McIDAS	4	No	2+	CONUS, Full Disk	Not Applicable	25 km	CONUS: 2 km Full Disk: 4 km	0-1300 W/m^2	85 W/m^2 at high end of range (1000 W/m^2); 65 W/m^2 at typical value/ midpoint (350 W/m^2)	CONUS: 60 min Full Disk: 60 min	CONUS: 5 min Full Disk: 5 min	CONUS: 3236 sec Full Disk: 3236 sec	CONUS: 3236 sec Full Disk: 3236 sec	100 W/m^2 for low and high values (100 and 1000 W/m^2) and 130 W/m^2 for mid values (350 W/m^2)	Atmosphere	Radiation
Derived Motion Winds	2	B	NetCDF McIDAS	36	No	2+	CONUS, Full Disk, Mesoscale	Cloud Motion Vector winds: At cloud tops; Clear-Sky Water Vapor winds: 200 mb	10 km	5 km	Speed: 0-300 kts (0 to 155 m/s) Direction: 0 to 360 degrees	Mean Vector Difference: 7.5 m/s	CONUS: 15 min Full Disk: 60 min (based on a single set of 3 sequential images 5 or more minutes apart) Mesoscale: 5 min	CONUS: 5 min Full Disk: 5 min	CONUS: 159 sec Full Disk: 159 sec Mesoscale: 159 sec	CONUS: 159 sec Full Disk: 159 sec	Mean Vector Difference: 3.8 m/s	Atmosphere	Winds

Appendix D: Improved Latencies and Refresh Rates for Product Sets 1 and 2 (Option 1)

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O1) Mode 3	Vendor Allocated Ground Latency (O1) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Fire / Hot Spot Characterization	2	B	NetCDF McIDAS	8	No	2+	CONUS, Full Disk	Not Applicable	2 km	1.0 km	275 to 400 K for pixel brightness temperature for 3.9 µm channel	2.0 K within dynamic range	CONUS: 5 min Full Disk: 15 min	CONUS: 5 min Full Disk: 5 min	CONUS: 266 sec Full Disk: 266 sec	CONUS: 266 sec Full Disk: 266 sec	2.0 K	Land	Land
Land Surface (Skin) Temperature	2	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	CONUS: 2 km Full Disk: 10 km Mesoscale: 2 km	CONUS: 1 km Full Disk: 5 km Mesoscale: 1 km	CONUS: 213-330 K Full Disk: 213-333 K Mesoscale: 213-330 K	2.5 K with known emissivity, known atmospheric correction, and 80% channel correlation; 5 K otherwise	CONUS: 60 min Full Disk: 60 min Mesoscale: 60 min	CONUS: 60 min Full Disk: 60 min	CONUS: 3236 sec Full Disk: 159 sec Mesoscale: 159 sec	CONUS: 266 sec Full Disk: 159 sec	2.3 K	Land	Land
Snow Cover	2	B	NetCDF McIDAS	6	No	2+	CONUS, Full Disk, Mesoscale	Not Applicable	2 km	1.0 km	0 – 1.0 fractional cover	0.30	CONUS: 60 min Full Disk: 60 min Mesoscale: 60 min	CONUS: 60 min Full Disk: 60 min	CONUS: 3236 sec Full Disk: 3236 sec Mesoscale: 3226 sec	CONUS: 3236 sec Full Disk: 3236 sec	0.05	Land	Land
Sea Surface Temperature (skin)	2	B	NetCDF McIDAS	2	No	2+	Full Disk	Not Applicable	2 km	1.0 km	271-313 K	2.1 K with known emissivity, known atmospheric correction, and 80% channel correlation; 3.1 K otherwise	Full Disk: 60 min	Full Disk: 5 min	Full Disk: 806 sec	Full Disk: 806 sec	1.0 K	Ocean	Ocean

Appendix D: Improved Latencies and Refresh Rates for Product Sets 1 and 2 (Option 1)

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O1) Mode 3	Vendor Allocated Ground Latency (O1) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Energetic Heavy Ions	1	B	NetCDF	1	Yes	1b	1 direction	Not Applicable	Not Applicable	Not Applicable	10 to 200 MeV/n-4 mass groups: He, (C,N,O), Ne-S, & Fe	25%	5 min	5 min	267 sec	267 sec	Flux values associated with 10 counts above background in 5-min interval.	Space & Solar	Energetic Particles
Magnetospheric Electrons and Protons: Low Energy	1	B	NetCDF	1	Yes	1b	5 directions	Not Applicable	Not Applicable	Not Applicable	Electron and Protons: 30 eV to 30 keV	25%	30 sec	30 sec	51 sec	51 sec	Flux values associated with 10 counts above background in 5-min interval.	Space & Solar	Energetic Particles
Magnetospheric Electrons and Protons: Medium & High Energy	1	B	NetCDF	1	Yes	1b	5 directions	Not Applicable	Not Applicable	Not Applicable	Electrons: 30 keV to 4 MeV Protons: 30 keV to 1 MeV	25%	30 sec	30 sec	51 sec	51 sec	Flux values associated with 10 counts above background in 5-min interval.	Space & Solar	Energetic Particles
Solar and Galactic Protons	1	B	NetCDF	1	Yes	1b	2 directions	Not Applicable	Not Applicable	Not Applicable	1 MeV to 500 MeV & Differential Measurements	25%	1 min	1 min	51 sec	51 sec	Flux values associated with 10 counts above background in 5-min interval.	Space & Solar	Energetic Particles
Geomagnetic Field	1	B	NetCDF	1	Yes	1b	3-axis 0.5º	Not Applicable	+/- 0.25º	+/- 1º	> = +/- 512 nT/axis (3-axis vector)	1.0 nT (per axis)	2 samples per sec	8 samples per sec	1.8 sec	1.8 sec	0.016 nT	Space & Solar	Magnetic Field
Solar Flux: EUV	1	B	NetCDF	1	Yes	1b	Solar Disk (40 arcmin)	Not Applicable	Not Applicable	+/-2 arcmin	0.5x Sol Min , 10x Sol Max	20%	30 sec	30 sec	24 sec	24 sec	2%	Space & Solar	Solar

Appendix D: Improved Latencies and Refresh Rates for Product Sets 1 and 2 (Option 1)

Name	Release Number	Product Baseline or Product Option (1 or 2)	Output Format for each Coverage	Number of End-Products	RBU Product	Product Level	Product Geographic Coverage (Product Orthogonality/Coverage for Space Weather)	Product Vertical Resolution (Product Horizontal / Angular Resolution for Space Weather)	Product Horizontal Resolution (Product Pointing/ Mapping Accuracy for Space Weather)	Product Mapping Accuracy (Product Pointing Knowledge / Mapping Uncertainty for Space Weather)	Product Measurement Range	Product Measurement Accuracy	Refresh Rate / Coverage Time Option (Mode 3)	Refresh Rate Option (Mode 4)	Vendor Allocated Ground Latency (O1) Mode 3	Vendor Allocated Ground Latency (O1) Mode 4	Product Measurement Precision	Product Type	Product Sub-type
Solar Flux: X-Ray	1	B	NetCDF	1	Yes	1b	Solar Disk (40 arcmin)	Not Applicable	Not Applicable	+/-2 arcmin	XRSA: 5x10-9 to 5x10-4 W/m2 XRSB: 2x10-8 to 2x10-3 W/m2	+/- 20%	3 sec	3 sec	1.8 sec	1.8 sec	2%	Space & Solar	Solar
Solar Imagery: X-Ray	1	B	NetCDF FITS	2	Yes	1b	0.0-1.3 Solar Radii	7.0 arcsec	Stability during 24 hours: 1.0 arcmin of sun center (N-S, E-W) (1 sigma)- 3.0 arcmin of sun center (N-S, E-W) (3 sigma) & Stability during 60 seconds: 2.0 arc seconds of sun center (E-W, N-S) (1 sigma)- 6.0 arcsec of sun center (E-W, N-S) (3 sigma)	+/-2.5 arcsec	Radiance: 0.3-10^6 ph/cm2/arcsec/sec & Temperature: 1 to 10 MK	+/-40% in radiance	Image: <2 min & Temp: < 6 min	Image: <2 min & Temp: < 6 min	<50 sec	<50 sec	+/-40% in radiance	Space & Solar	Solar

NOTE: There are 54 KPP Cloud and Moisture Imagery End-Products (48 single band End-Products in NETCDF format at the resolution native to each band and one multiband product at 2 km resolution in both NETCDF & McIDAS Area file formats). This number is arrived at as follows:

Single band products: 16 products * 1 format (NETCDF) * 3 coverage areas (Full Disk, CONUS, Mesoscale)
Multiband products: 1 product * 2 formats (NETCDF and McIDAS Area)* 3 coverage areas (Full Disk, CONUS, Mesoscale)
(CCR01313, CCR01368)

NOTE: The number of Derived Motion Winds End-Products is derived from 6 unique outputs multiplied by 3 coverage areas in two formats each.

Appendix E: AWIPS Sectorized Product Set Characteristics

Sectorized Product ID	Satellite Orbital Slot	Sector	Map Projection	Refresh (Full Disk: Mode 3: 15 Min Mode 4: 5 Min) (minutes)	Resolution (km)	ABI Bands Used (central wavelength, micrometer)	Corner Points For Full Disk- Based on +/- E/W 70 degrees from station longitude For Alaska Region - Current Reference longitude at 150W	Bit Depth	Latency (s)
1	GOES EAST	East CONUS	Lambert Conformal	5	0.5	0.64	See ABI Performance and Operational Requirements Document, 417-ABIPORD-0017	8 (TBR)	50.0
2	GOES EAST	East CONUS	Lambert Conformal	5	1	0.47, 0.865, 1.61	See ABI Performance and Operational Requirements Document, 417-ABIPORD-0017	8 (TBR)	50.0
3	GOES EAST	East CONUS	Lambert Conformal	5	2	1.378, 2.25, 3.90, 6.19, 6.95 7.34, 8.5, 9.61, 10.35, 11.2, 12.3, 13.3	See ABI Performance and Operational Requirements Document, 417-ABIPORD-0017	8 (TBR)	50.0
4	GOES EAST	Mesoscale (Flexible 1000 x 1000 km)	Lambert Conformal	0.5	0.5	0.64	N/A	8 (TBR)	23.0
5	GOES EAST	Mesoscale (Flexible 1000 x 1000 km)	Lambert Conformal	0.5	1	0.47, 0.865, 1.61	N/A	8 (TBR)	23.0
6	GOES EAST	Mesoscale (Flexible 1000 x 1000 km)	Lambert Conformal	0.5	2	1.378, 2.25, 3.90, 6.19, 6.95 7.34, 8.5, 9.61, 10.35, 11.2, 12.3, 13.3	N/A	8 (TBR)	23.0
7	GOES EAST	Full Disk	Mercator	15	0.5	0.64	Lower Left: 75S 145W Lower Right: 75S 5W Upper Right: 75N 5W Upper Left: 75N 145W	8 (TBR)	50.0
8	GOES EAST	Full Disk	Mercator	15	1	0.47, 0.865, 1.61	Lower Left: 75S 145W Lower Right: 75S 5W Upper Right: 75N 5W Upper Left: 75N 145W	8 (TBR)	50.0
9	GOES EAST	Full Disk	Mercator	15	2	1.378, 2.25, 3.90, 6.19, 6.95 7.34, 8.5, 9.61, 10.35, 11.2, 12.3, 13.3	Lower Left: 75S 145W Lower Right: 75S 5W Upper Right: 75N 5W Upper Left: 75N 145W	8 (TBR)	50.0
10	GOES WEST	West CONUS	Lambert Conformal	5	0.5	0.64	See ABI Performance and Operational Requirements Document, 417-ABIPORD-0017	8 (TBR)	50.0

Appendix E: AWIPS Sectorized Product Set Characteristics									
Sectorized Product ID	Satellite Orbital Slot	Sector	Map Projection	Refresh (Full Disk: Mode 3: 15 Min Mode 4: 5 Min) (minutes)	Resolution (km)	ABI Bands Used (central wavelength, micrometer)	Corner Points For Full Disk- Based on +/- E/W 70 degrees from station longitude For Alaska Region - Current Reference longitude at 150W	Bit Depth	Latency (s)
11	GOES WEST	West CONUS	Lambert Conformal	5	1	0.47, 0.865, 1.61	See ABI Performance and Operational Requirements Document, 417-ABIPORD-0017	8 (TBR)	50.0
12	GOES WEST	West CONUS	Lambert Conformal	5	2	1.378, 2.25, 3.90, 6.19, 6.95 7.34, 8.5, 9.61, 10.35, 11.2, 12.3, 13.3	See ABI Performance and Operational Requirements Document, 417-ABIPORD-0017	8 (TBR)	50.0
13	GOES WEST	Mesoscale (Flexible 1000 x 1000 km)	Lambert Conformal	0.5	0.5	0.64	N/A	8 (TBR)	23.0
14	GOES WEST	Mesoscale (Flexible 1000 x 1000 km)	Lambert Conformal	0.5	1	0.47, 0.865, 1.61	N/A	8 (TBR)	23.0
15	GOES WEST	Mesoscale (Flexible 1000 x 1000 km)	Lambert Conformal	0.5	2	1.378, 2.25, 3.90, 6.19, 6.95 7.34, 8.5, 9.61, 10.35, 11.2, 12.3, 13.3	N/A	8 (TBR)	23.0
16	GOES WEST	Alaska Region (N&W of CONUS)	Polar Stereographic	15	0.5	0.64	See ABI Performance and Operational Requirements Document, 417-ABIPORD-0017	8 (TBR)	50.0
17	GOES WEST	Alaska Region (N&W of CONUS)	Polar Stereographic	15	1	0.47, 0.865, 1.61	See ABI Performance and Operational Requirements Document, 417-ABIPORD-0017	8 (TBR)	50.0
18	GOES WEST	Alaska Region (N&W of CONUS)	Polar Stereographic	15	2	1.378, 2.25, 3.90, 6.19, 6.95 7.34, 8.5, 9.61, 10.35, 11.2, 12.3, 13.3	See ABI Performance and Operational Requirements Document, 417-ABIPORD-0017	8 (TBR)	50.0
19	GOES WEST	Full Disk	Mercator	15	0.5	0.64	Lower Left: 75S 153E Lower Right: 75S 57W Upper Right: 75N 57W Upper Left: 75N 153E	8 (TBR)	50.0
20	GOES WEST	Full Disk	Mercator	15	1	0.47, 0.865, 1.61	Lower Left: 75S 153E Lower Right: 75S 57W Upper Right: 75N 57W Upper Left: 75N 153E	8 (TBR)	50.0
21	GOES WEST	Full Disk	Mercator	15	2	1.378, 2.25, 3.90, 6.19, 6.95 7.34, 8.5, 9.61, 10.35, 11.2, 12.3, 13.3	Lower Left: 75S 153E Lower Right: 75S 57W Upper Right: 75N 57W Upper Left: 75N 153E	8 (TBR)	50.0

Note: Sectorized Product Latencies are contained within the same Vendor-Allocated Ground Latency as Appendix A and D Cloud and Moisture Imagery latency.

Appendix F: GOES-N/O/P Link Parameters

	DSN & CDA	CDA	Sensor Data	PDR / GVAR	LRIT	EMWIN	MDL	DCPI	DCPR	SAR
Satellite Tx										
EIRP (dBmi)	22.9	19	47.2	56.5	49.2	43.6	47.5	47	46	N/A
Freq (MHz)	2209.086	1694.00	1676.00	1685.70	1691.00	1692.70	1681.478	468.825	1694.500 Domestic 1694.800 Int'l	
Polarization	RHC	RHC	Linear N-S	Linear N-S	Linear N-S	Linear N-S	Linear N-S	RHC	Linear N-S	
Data Rate	1, 4 kbps	1, 4 kbps	2.62 Mbps Im 40 kbps	2.11 Mbps	293 kbps Coded	35.94 kbps coded	400 kbps	coded 350 bps	coded 450, 1800 bps	
Coding	none	none	none	none	Rate 1/2 Convol. +R-S 223/255	Rate 1/2 Convol. +R-S 223/255	none	R-S 223/255 chip 22.225 kHz	rate 2/3 trellis	
Data Format	Bi-phase-L	Bi-phase-L	NRZ-S	NRZ-S	NRZ-L	NRZ-M	NRZ-L	NRZ-M	NRZ-L	
Sub carrier (MHz)	1.024	None	None	None	None	None	None	None	None	
Carrier Modulation	BPSK	BPSK	QPSK 4:1	BPSK	BPSK	QPSK	QPSK	QPSK/CDMA NRZ-M	8-PSK (capacity=250 carriers@300 bps)	
Satellite Rx										
Polarization	RHC	RHC	N/A	Linear N-S	Linear N-S	Linear N-S	N/A	Linear N-S	N/A	N/A
Freq (MHz)	2034.2	2034.2		2027.7	2033	2034.7		2034.9		
Subcarrier (kHz)	16	16		none	none	none		none		
Modulation	BPSK/Phase Mod	BPSK/Phase Mod		BPSK	BPSK	QPSK		QPSK		
Alpha	N/A	N/A		N/A	1	0.5		N/A		
Ground Tx										
Polarization	Lin@CDA	Linear N-S	N/A	Linear N-S	Linear N-S	Linear N-S	N/A	Linear N-S	N/A	N/A
Storage (dBmi)	N/A	104.6		N/A	N/A	N/A		N/A		
Operation (dBmi)	101.2	88.7-91.7		94-98	83-87	76-80		76-80		
Ground Rx										
Polarization	RHC DSN, Lin	Linear N-S	Linear N-S	Linear N-S	Linear N-S	Linear N-S	Linear N-S	RHC	Linear N-S	N/A
G/T (dB/K)	26.5	26.5	26.5	15.2@users	-0.3@users	-0.3@users	15.5@users	-26@users	15@users	
Implementation (dB)	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.0	2.0	