



Geostationary Operational Environmental Satellites - R Series (GOES-R)

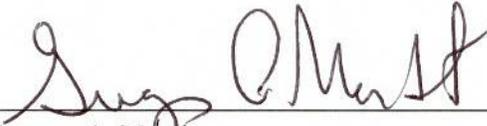
SYSTEM REVIEW PLAN (SRP)

January 31, 2013



**U.S. Department of Commerce (DOC)
National Oceanic and Atmospheric Administration (NOAA)
National Environmental Satellite, Data, and Information Services (NESDIS)
National Aeronautics and Space Administration (NASA)**

GOES-R Series System Review Plan (SRP)



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12/3/2012

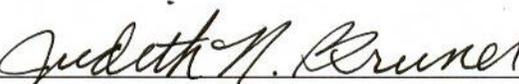
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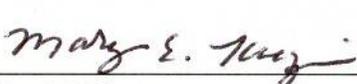
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TABLE OF CONTENTS

1	PURPOSE.....	1
2	DOCUMENTS.....	2
2.1	APPLICABLE DOCUMENTS.....	2
2.2	REFERENCE DOCUMENTS.....	2
3	MISSION OVERVIEW AND DESCRIPTION.....	3
3.1	GOES-R Program Description.....	3
3.1.1	GOES-R Space Segment.....	3
3.1.2	GOES-R Series Ground Segment.....	3
3.2	GOES-R Organization.....	4
4	SCOPE OF GOES-R SERIES INDEPENDENT REVIEWS.....	5
4.1	Key Decision Points (KDP).....	7
4.2	Program Readiness Reviews.....	7
4.3	Product Maturity for Readiness Reviews.....	7
4.4	Milestone Reviews.....	7
5	GOES-R REVIEW BOARDS.....	10
5.1	INTEGRATED INDEPENDENT REVIEW TEAM (IIRT).....	10
5.2	STANDING REVIEW BOARD (SRB).....	10
6	REVIEW RESPONSIBILITIES.....	12
6.1	IIRT RESPONSIBILITY.....	12
6.2	SRB RESPONSIBILITY.....	12
6.3	PROGRAM RESPONSIBILITY.....	13
7	REPORTING AND REQUEST FOR ACTION (RFA) CLOSURE.....	15
	ATTACHMENT 1: SUMMARY OBJECTIVES OF CRITICAL MILESTONE REVIEWS.....	18

List of Figures

Figure 1	GOES-R Program Organization.....	4
Figure 2	GOES-R Series Program and Project Milestones for Systems Reviews.....	6

List of Tables

Table 1	Critical GOES-R Series Program Milestones.....	9
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1 PURPOSE

This document establishes the plan for conducting a comprehensive set of System Reviews of the next generation Geostationary Operational Environmental Satellites – R (GOES-R) Series Program. The GOES-R Series Program and Project review process consists of a phased sequence of reviews including; (a) Standing Review Board (SRB) assessments of program readiness at key development lifecycle milestones, (b) Integrated Independent Review Team (IIRT) assessments of the projects, and Engineering Peer Review (EPR) technical evaluations of various systems, subsystems, assemblies, and components, as necessary. The purpose of the GOES-R Series reviews is to reduce risk by evaluating the program's/project's progress relative to fixed expectation and success criteria at each evaluation point within the mission life cycle. This plan meets the intent of the GOES-R Series Management Control Plan (MCP) and the Goddard Procedural Requirements (GPR) 8700.4, Goddard Systems Reviews, as tailored to respond to the unique needs of the National Oceanic and Atmospheric Administration (NOAA) / National Aeronautics and Space Administration (NASA) partnership that is responsible for this program.

2 DOCUMENTS

2.1 APPLICABLE DOCUMENTS

The processes in each of the following documents or latest revisions thereof are applicable to the Integrated Independent Reviews for GOES-R Series:

- Department Administrative Order (DAO) 208-3 “Major System Acquisitions for the Department of Commerce”, December 1997
- Memorandum of Understanding between NASA and NOAA for the GOES-R Series Program, June 15, 2007
- GOES-R Series Management Control Plan, 410-R-PLN-0067
- GPR 1060.3, The Goddard Governance System
- NASA Procedural Directive (NPD) 8610.24, Launch Services Program Pre-launch Readiness Reviews
- Mission Requirements Document for the GOES-R Series, 410-R-MRD-0070
- GOES-R Concept of Operations (CONOPS), P417-R-CONOPS-0008
- GOES-R Series Program Systems Engineering Management Plan (SEMP), 410-R-PLN-0069
- GSFC-STD-1000, GSFC Rules for the Design, Development, Verification, and Operation of Flight Systems (GOLD Rules)
- GOES-R Level 1 Requirements Document (LIRD), P417-R-LIRD-0137
- NASA Procedural Requirements (NPR) 7120.5E NASA Space Flight Program and Project Management Requirements w/Changes 1-9

2.2 REFERENCE DOCUMENTS

The processes in the following documents or latest revisions thereof are reference for the Integrated Independent Reviews for GOES-R Series:

- GSFC-STD-1001, Criteria for Flight and Flight Support Systems Lifecycle Reviews
- NPR 7123.1, NASA Systems Engineering Processes and Requirements
- 410-R-PLN-0081, GOES-R Series Risk Management Plan
- GPR 8700.4, Goddard Systems Reviews
- GPR 8700.6, Engineering Peer Reviews

3 MISSION OVERVIEW AND DESCRIPTION

The National Oceanic and Atmospheric Administration (NOAA) operates a system of environmental satellites in geostationary orbits to provide continuous weather imagery and monitoring of meteorological data for the United States, Latin America, much of Canada and most of the Atlantic and Pacific ocean basins. GOES satellites provide critical atmospheric, oceanic, climatic, and solar products supporting weather forecasting and warnings, climatologic analysis and prediction, ecosystems management, and safe and efficient public and private transportation. The GOES satellites also provide a platform for space environmental observations, and auxiliary communications services that provide for GOES data rebroadcast, data collection platform relay, low resolution imagery, emergency weather communications, and satellite aided search and rescue.

The GOES-R Series is a collaborative development and acquisition effort between NOAA and the National Aeronautics and Space Administration (NASA). Program activities occur at the co-located Program and Project Offices at Goddard Space Flight Center, Greenbelt, MD.

3.1 GOES-R Program Description

The GOES-R Series system includes spacecraft, instruments, launch services, and all associated ground system elements and operations for four satellites (GOES-R/S/T/U). The GOES-R Series program, in accordance with the NASA Procedural Requirements (NPR) 7120.5, is defined as a single-project program due to the interrelated nature of the ground and flight projects. Additionally, due to its national importance and program life cycle costs, the GOES-R Series program is assigned as a Category 1 program and has a risk classification of B per NPR 8705.4, Risk Classification for NASA Payloads. The GOES-R Series is also defined as a High Impact system in accordance with the Federal Information Processing Standards (FIPS) 199.

3.1.1 GOES-R Space Segment

The baseline GOES-R Series space segment consists of four spacecraft containing the following payloads: a) Advanced Baseline Imager (ABI); b) Space Environment In-Situ Suite (SEISS); c) Solar Ultraviolet Imager (SUVI); d) Extreme Ultraviolet and X-Ray Irradiance Sensors (EXIS); e) Geostationary Lightning Mapper (GLM); and f) Magnetometer (MAG).

The GOES-R Series system will provide the following set of auxiliary communications services: 1) GOES Rebroadcast (GRB), and 2) Unique Payload Services (UPS). UPS is further broken down into four services: 1) High Rate Information Transmission (HRIT); 2) Emergency Managers Weather Information Network (EMWIN); 3) Search and Rescue (SAR); and 4) Data Collection System (DCS).

3.1.2 GOES-R Series Ground Segment

The Ground Segment encompasses the following four major functions: 1) Mission Management (MM), 2) Enterprise Management (EM), 3) Product Generation (PG), and 4) Product Distribution (PD). Mission Management (MM) includes mission scheduling, satellite (including instrument) operations, satellite state-of-health trending, orbital analysis, and ground operations. Enterprise Management (EM) supports all operational functions by monitoring, assessing, and controlling the configuration of the operational systems, networks, and communications for the GOES-R Series ground segment. Product Generation (PG) includes algorithm support, processed raw data, processing to Level 1b (including calibration, navigation and registration), generation of the data for rebroadcast, and for higher level data creation including operational derived products. Product Distribution (PD) includes distribution of Level 1b,

Level 2+, and derived products to user portals while addressing interfaces with the user for accessing GOES data.

3.2 GOES-R Organization

A graphic illustration of the GOES-R Series Organization is shown in Figure 1. The GOES-R Series Program is NOAA led, with an integrated NOAA-NASA program office organization.

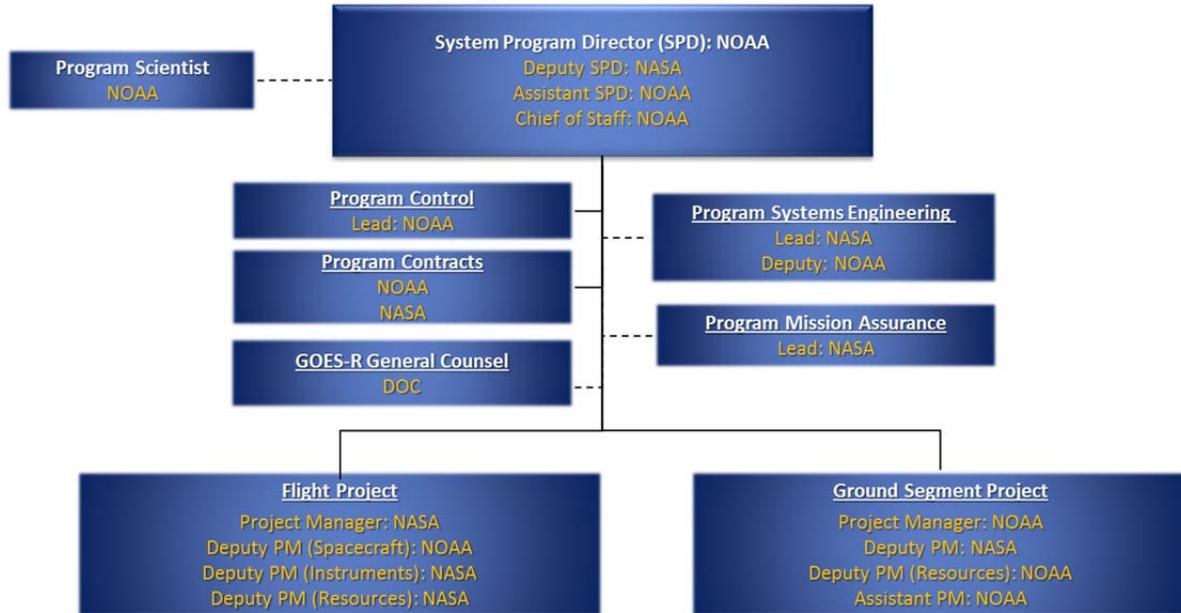


Figure 1 GOES-R Program Organization

4 SCOPE OF GOES-R SERIES INDEPENDENT REVIEWS

Reviews will be held at the milestones identified in Figure 2 and are described below.

PDRR	Acquisition and Operations					
	Phase B: Preliminary Design & Technology Completion	Phase C: Final Design & Fabrication	Phase D: System Assembly, Integration & Test, Launch & Checkout	Launch	Phase E: Operations & Sustainment	Phase F Close-out
Decision Milestones	KDP I KDP B ▲	KDP II KDP C ▲	KDP D ▲	KDP E ▲	Handover Readiness ▲	KDP F ▲
Decision- maker	NOAA US	NOAA US	NOAA DJS	NOAA DUS	NESDIS AA	NESDIS AA
Gateway Reviews	NOAA PMC ↑ GSFC CMC	NOAA-NASA PMC ↑ NESDIS-SMD PMC ↑ GSFC CMC	NOAA-NASA PMC ↑ NESDIS-SMD PMC ↑ GSFC CMC	NOAA-NASA PMC ↑ NESDIS-SMD PMC ↑ GSFC CMC	↑ NESDIS-SMD PMC ↑ GSFC CMC	↑ NESDIS-SMD PMC ↑ GSFC CMC
Program Reviews	△SRR △SDR	△PDR △CDR △SIR	△ORR △MRR	△PLAR	△DR	
Other Reviews		△MOR △FOR	△SMSR △FRF △LRR			
Supporting Reviews	Peer Reviews, System, Element, Subsystem, Software, etc. as specified in System Review Plan and Program and Project System Engineering Plans					

All reviews and milestones post-CDR apply to GOES-R, S, T, and U.

Figure 2 GOES-R Series Program and Project Milestones for Systems Reviews

4.1 Key Decision Points (KDP)

There are five Key Decision Points and two readiness milestone reviews identified for the GOES R Series program. The Secretary of Commerce is the designated KDP Milestone Decision Authority for Department of Commerce KDP Milestone Decisions. The Secretary delegated the KDP decision authority to the NOAA Administrator (Under Secretary of Commerce for Oceans and Atmosphere) on December 21, 2007.

- KDP B: The NOAA Administrator authorized the GOES-R Series program to proceed to implementation (acquisition and operations) phase on January 4, 2008. This allowed the program to begin the source selection processes for the spacecraft and ground systems.
- KDP C - Program Baseline Review: Budget and Schedule baselines are established for DOC and congressional oversight purposes. This is the baseline to which NOAA will hold the GOES-R Series program accountable. The NOAA US is the approval authority for KDP C
- KDP D - Mission Integration Readiness: The Program will certify that the projects are prepared to be integrated into an end-to-end GOES-R Series system. This transition is uniquely a "soft gate," in which the program may initiate integration work immediately, absent a notice of discontinuance by the NOAA Deputy Under Secretary for Operations (DUS/O) who is the decision authority for this milestone.
- KDP E - Mission Readiness Review: The program is prepared to solicit Kennedy Space Center led Flight Readiness and Launch Readiness Reviews in preparation for satellite launch and ground system operation. The decision authority for this milestone is the NOAA DUS/O.
- Launch Readiness Review: The program is ready to launch and perform early operations. The decision authority for this review is the NESDIS AA.
- Handover Readiness: Program certifies readiness to transition observatory to the flight operations team. The decision authority for this milestone is the NESDIS AA.
- KDP F - End of Mission: Signals the end of the operational use of the system and the beginning of the disposal phase. The decision authority is the NESDIS AA.

4.2 Program Readiness Reviews

Program readiness reviews will be held to determine readiness for KDP reviews. The NOAA-NASA Program Management Council (PMC) is the decision forum for the readiness reviews with the exception of the Handover Readiness Review and KDP F. For these exceptions, the NESDIS/SMD PMC is the readiness decision forum. The NOAA-NASA PMC reviews will be preceded by a GSFC Center Management Council (CMC) readiness review and a NESDIS/SMD PMC readiness review, the results of which will be presented as a recommendation for readiness to the NOAA-NASA PMC to support the readiness review decision. The Joint NESDIS/SMD PMC readiness reviews will be preceded by a GSFC CMC readiness review, the results of which will be presented as an advisory assessment to the Joint NESDIS/SMD PMC to support the readiness review decision.

4.3 Product Maturity for Readiness Reviews

The Project Milestone Product Maturity Matrix (Table 4-3) and the Project Control Plan Maturity Matrix (Table 4-4) from the NPR 7120.5 will be used for each program/project milestone review, as applicable.

4.4 Milestone Reviews

The GOES-R Series program will have Program and Project milestone reviews. Project milestone reviews will be conducted by Integrated Independent Review Teams (IIRT), as described in section 5, in

accordance with GPR 8700.4, Goddard Systems Reviews. These milestones are identified in Figure 2, GOES-R Series Program and Project Milestones for Systems Reviews and Table 1, Critical GOES-R Series Program Milestones. The definition and objectives of each critical milestone review can be found in Attachment 1 and are further detailed in GSFC-STD-1001.

The Standing Review Boards (SRB) will conduct program milestone reviews shown in Table 1 in accordance with the procedures described in section 6. The definition and objectives of each milestone review can be found in Attachment 1. Program milestone reviews will include a summary of the key findings from previous project-level reviews with updates if appropriate. The intent of these program reviews is to ensure all program elements have met the criteria for a particular milestone.

Reviews for GOES-R Series follow-on spacecraft could be streamlined and tailored at a later date, as appropriate.

The review milestones will be captured, maintained and updated monthly on the GOES-R Series Integrated Program Master Schedule (IPMS).

Table 1 Critical GOES-R Series Program Milestones

Reviews	SRB GOES Program	IIRT Ground Segment					IIRT Flight Segment					
		Segment	Core	CLASS	PDA	AS	Spacecraft	ABI	EXIS	SUVI	SEISS	GLM
SRR	X	X	X	X ⁷	X ⁷	X	X	X	X	X	X	X
SDR	X	X	X	X ⁷	X ⁷	X	X	X	X	X	X	X
PDR	X	X	X	X ⁷	X ⁷	X	X	X	X	X	X	X
CDR	X	X	X	X ⁷	X ⁷	X	X	X	X	X	X	X
MOR		X ^{4,5}					X ^{4,5}					
SIR	X ⁵											
PER							X ⁵	X ⁵	X ⁵	X ⁵	X ⁵	X ⁵
ORR	X ⁵											
FOR		X ^{4,5}					X ^{4,5}					
PSR							X ⁵	X ⁵	X ⁵	X ⁵	X ⁵	X ⁵
MRR ¹	X ⁵											
SMSR ²	X ⁵											
FRR ¹	X ⁵											
LRR ¹	X ⁵											
PLAR ³	X ⁶											

¹SRB supports but does not chair these reviews.

²This review is not subject to an SRB review, but is compliant with the MCP and conducted by senior Center-based SMA and senior NASA and NOAA engineering officials.

³This review will be conducted by NOAA with selected SRB member participation

⁴Structure and review responsibilities between Flight and Ground Projects and IIRTs TBD

⁵Reviews also required for GOES S, T, and U

⁶As applicable reviews for GOES S, T, and U

⁷IIRT supports but does not chair these reviews.

5 GOES-R REVIEW BOARDS

The GOES-R Series program uses two types of Review Boards—Integrated Independent Review Teams at the Project and element levels, and the Standing Review Board for Mission (Program) level reviews.

5.1 INTEGRATED INDEPENDENT REVIEW TEAM (IIRT)

The NOAA-NASA PMC and GSFC CMC convene the GOES-R Series Integrated Independent Review Teams (IIRTs). The GSFC Deputy Center Director and the NESDIS AA select the GOES-R Series IIRT chairpersons. There are separate IIRTs for the Flight and Ground Segment Projects.

The GOES-R Series IIRTs will comprise experts in both NASA and NOAA systems who are fully independent of the GOES-R Series Program Office. The IIRTs are to provide expert technical review of the respective flight or ground segment elements. Through the planned series of milestone reviews, the IIRTs will evaluate the adequacy of the planning, design, and implementation and associated processes to safely and successfully accomplish the project requirements.

The co-chairs, accountable to the NOAA-NASA PMC, conduct the reviews and report completion of milestone review assessments to a NOAA-NASA PMC, in which GSFC CMC and NESDIS/SMD PMC members participate.

The IIRTs shall consist of technical and systems management experts with the composite ability to address the full scope required of the Projects for project-level reviews, with particular emphasis on assessing the areas of highest risk. A typical IIRT size is on the order of five (5) to twelve (12) team members. A portion of the members of the IIRTs shall be from outside of NASA and all other institutions and supplier organizations participating in the GOES-R Series procurement. This is to provide assurance that a broad range of best practices and lessons learned is applied from outside of the participating institutions. The IIRTs are not expected to mirror, on a strict one-to-one basis, the subsystems and engineering disciplines of the GOES-R Series Project being reviewed.

Members of review teams are chosen by the IIRT Co-chairs based on their combined expertise, objectivity and their ability to make a broad assessment of the implementation of the project being reviewed. Review team continuity throughout the program lifecycle is desirable, in order to limit retraining. For Flight Project and Ground Segment Project reviews, the full IIRT membership shall be documented in an Appointment Letter from the SRO Chief to the appropriate GOES-R Series Project Manager with distribution to the GSFC CMC Chair, the NOAA NESDIS Deputy Assistant Administrator for Systems (DAAS), and the GOES-R Series System Program Director, prior to each review.

5.2 STANDING REVIEW BOARD (SRB)

The GOES-R Series Standing Review Board (SRB) is convened by the NOAA DUS/O and the NASA Associate Administrator (AA). The NOAA DUS/O and NASA AA determine the scope and chairmanship of the SRB. The NESDIS AA and the GSFC Deputy Director approve team membership.

The SRB will comprise experts in both NASA and NOAA systems that are fully independent of the GOES-R Series Program Office. The SRB is to provide expert technical review of the full end-to-end mission system. Through the planned series of milestone reviews, the SRB will evaluate the adequacy of the planning, design, and implementation and associated processes to safely and successfully accomplish the mission requirements. The SRB will also assess GOES-R Series programmatic approach,

performance, risk posture and ability to deliver on commitments as baselined by the GOES-R Series Program Office.

The chair(s), accountable to the NOAA-NASA PMC, conduct the reviews and report completion of milestone reviews to the GSFC CMC and the NOAA-NASA PMC.

The SRB shall consist of technical and systems management experts with the composite ability to address the full scope required for program level reviews, with particular emphasis on assessing the areas of highest risk. A typical SRB size is on the order of five (5) to twelve (12) team members. A portion of the members of the SRB shall be from outside of NASA and all other participating institutions and supplier organizations. This is to provide assurance that a broad range of best practices and lessons learned is applied from outside of the participating institutions. The SRB is not expected to mirror, on a strict one to one basis, the subsystems and engineering disciplines of the GOES-R Series Program.

Members of review teams are recommended by the SRB chair(s) based on their combined expertise, objectivity, and their ability to make a broad assessment of the implementation of the program. Review team continuity throughout the program lifecycle is desirable, in order to limit retraining.

6 REVIEW RESPONSIBILITIES

6.1 IIRT RESPONSIBILITY

The primary responsibility of the IIRTs is to provide expert technical review of all of the flight project and ground segment elements enumerated herein through the series of independent reviews identified in this plan.

The IIRT shall:

- evaluate the adequacy of the planning, design, implementation and use of associated processes by the Project to safely and successfully accomplish the Mission requirements in accordance with the processes in applicable standards to include the GOES-R Series Management Control Plan (MCP), GSFC Integrated Independent Reviews (GPR 8700.4), GSFC Rules for Design, Development Verification and Operation of Flight Systems (GOLD Rules) (GSFC-STD-1000) and Criteria for Flight and Flight Support Systems Lifecycle Reviews (GSFC-STD-1001)
- assess technical performance and ability of the Projects to deliver on commitments as documented in the following:
 - GOES-R Series Mission Requirements Document, 410-R-MRD-0070
 - GOES-R Series Management Control Plan, 410-R-PLN-0067
- confirm the documentation of and assess the compatibility of the success criteria, acceptable risk and allocated resources
- evaluate the technical content, schedule, and staffing of the Project over the entire life cycle
- assess system resource management and margins (e.g. mass, power, propellant)
- assess technical progress, risks remaining and mitigation plans
- assess the safety hazards, and hazard mitigation and control strategies
- assess progress/milestone achievement against approved baselines
- determine if any deficiencies exist that result in revised projections exceeding predetermined thresholds
- confirm that the Project team has queried the NASA Lessons Learned Information System (LLIS), other knowledge resources provided by the NASA Engineering Network (NEN <http://nen.nasa.gov/>), and NOAA lessons learned, as appropriate.
- assist the Project team in recognizing lessons learned, and encourage Project team members to apply past knowledge for current and future mission success by submitting their own significant lessons learned and related experiences to the web-based NEN providing an integrated set of resources that facilitates sharing, learning, and communication in the community.

6.2 SRB RESPONSIBILITY

The primary responsibility of the SRB is to provide expert technical review of all of the mission system elements enumerated herein through the series of Independent Reviews identified in this plan. The SRB shall:

- evaluate the adequacy of the planning, design, implementation and use of associated processes by the Program to safely and successfully accomplish the Mission requirements in accordance with the processes in applicable standards to include the GOES-R Management Control Plan (MCP), Goddard

Systems Reviews (GPR 8700.4), GSFC Rules for Design, Development Verification and Operation of Flight Systems (GOLD Rules) (GSFC-STD-1000) and Criteria for Flight and Flight Support Systems Lifecycle Reviews (GSFC-STD-1001)

- assess programmatic performance and ability of the Program to deliver on commitments as documented in the following:
 - GOES-R Series Level I Requirements Document (LIRD), P410-R-LIRD-0137
 - GOES-R Series Mission Requirements Document, 410-R-MRD-0070
 - GOES-R Series Management Control Plan, 410-R-PLN-0067
- confirm the documentation of and assess the compatibility of the success criteria, acceptable risk and allocated resources
- evaluate the technical content, schedule, staffing and cost of the Program over the entire life cycle
- assess system resource management and margins
- assess technical progress, risks remaining and mitigation plans
- assess the safety hazards, and hazard mitigation and control strategies
- assess progress/milestone achievement against approved baselines
- determine if any deficiencies exist that result in revised projections exceeding predetermined thresholds
- confirm that the Program team has queried the NASA Lessons Learned Information System (LLIS), other knowledge resources provided by the NASA Engineering Network (NEN, <http://nen.nasa.gov/>), and NOAA lessons learned, as appropriate.
- assist the Program team in recognizing lessons learned, and encourage Program team members to apply past knowledge for current and future mission success by submitting their own significant lessons learned and related experiences to the web-based NEN providing an integrated set of resources that facilitates sharing, learning, and communication in the community.

6.3 PROGRAM RESPONSIBILITY

The primary responsibility of the GOES-R Series Program is to develop the GOES-R Series System in compliance with the planning, design, implementation, management, and operational standards prescribed in GPR 8700.4, Goddard Systems Reviews, GSFC-STD-1001, Criteria for Flight and Flight Support Systems Lifecycle Reviews and GSFC-STD-1000, Rules for the Design, Development, Verification, and Operation of Flight Systems demonstrated through the series of Independent Reviews identified in this SRP. The extent to which the individual elements shall be addressed by the reviews is the following:

- Payload – fully addressed
- Spacecraft – fully addressed
- Launch Vehicle Interface & Integration -- performed by KSC, with Project / Program / SRB participation
- Ground System – fully addressed
- Mission Operations, Data Capture, Analysis and Distribution – fully addressed

The GOES-R Series Program and Projects shall:

- support the system reviews through a comprehensive set of engineering peer reviews conducted in accordance with GPR 8700.6, Engineering Peer Reviews, and as described in the GOES-R Series Systems Engineering Management Plan, 410-R-PLN-0069. The GOES-R Series Program/Projects will conduct Engineering Peer Reviews on all mission subsystems, including hardware, software, and operations. The approach to engineering peer reviews accommodates extremely detailed reviews, and maximizes the effectiveness of each review while maintaining reporting and accountability to the system review teams, and ensures the infusion of expert knowledge appropriate for each peer review. Summary reports of the peer review results will be provided at the mission system level reviews.
- pay special attention to the plans and results for the GSFC Key Project Management Practices detailed in GPR 8700.4 - Attachment 3 during each Project-Level independent review, as appropriate. (These ten systems management practices provide key metrics to trend over the life cycle of the project and benchmark against other projects).
- design, develop, verify, and operate all products in accordance with the GSFC Rules (GSFC-STD-1000) or obtain the necessary waivers. (The “GOLD Rules” are a high-level subset of all the design rules required for safety and mission success for all space flight products. They spell out the technical or design requirements that every Goddard program shall meet, regardless of implementation approach.)
- present Request For Action (RFA) status monthly as part of program and project MSRs.
- make available to the Standing Review Board chair(s) all relevant review presentation. materials at least five (5) working days prior to the start of a review.
- alert the Standing Review Board chair(s) to any special concerns the program might have prior to the review.
- confer with the Standing Review Board chair(s) regarding scheduling changes and material content reviews.
- coordinate review/facility logistics to include security/badging, teleconference, internet access, local travel information, etc.
- query the NASA Lessons Learned Information System (LLIS, <http://llis.nasa.gov>), NOAA Lessons Learned and other knowledge resources, as appropriate, to access relevant past experiences and knowledge that can be leveraged to reduce risk, improve quality and efficiency.
- take into consideration the Standing Review Board’s advice and expert assessment of the technical and programmatic approach, risk posture, and progress against the program/project baseline.

7 REPORTING AND REQUEST FOR ACTION (RFA) CLOSURE

For Project and subsystem level reviews, the IIRT shall brief the GOES-R Series Project Teams on their initial impressions and the RFAs generated at the conclusion of each review. The IIRT Co-Chairs will coordinate the RFAs and issue the RFAs and final report to the appropriate GOES-R Series Project Manager, with a copy to the GOES-R Series System Program Director and Program System Engineer within 3 weeks of each review. The GOES-R Series Project Managers will submit project-level RFA responses to the Co-Chairs.

The GOES-R Series IIRTs will brief the results of milestone review assessments to a NOAA-NASA PMC, in which GSFC CMC and NESDIS/SMD PMC members participate.

For Program-level reviews, the SRB shall debrief the Program Team and the System Program Director, as well as the Project teams, at the conclusion of the review. The SRB shall also debrief the NESDIS DAAS and the GSFC Deputy Center Director. The GOES-R Series System Program Director shall report summary results of all SRB reviews to the GSFC Center Management Council during the Monthly Status Review following each review. For Program-level reviews, the System Program Director will submit RFA responses to the SRB chair(s) for formal closure of the RFA. The SRB team and GOES-R Series Program shall coordinate the submittal, review, and closure of the RFA responses through the GSFC Review Management System (GRMS). Each program-level review report shall show a roll-up of residual risks assessed by the team at the review.

The GOES-R Series SRB will brief the results of milestone review assessments to a NOAA-NASA PMC to which GSFC CMC and NESDIS/SMD PMC members have been invited.

8 ACRONYMS

AA	Associate Administrator (NASA)
AA	Assistant Administrator (NOAA)
ABI	Advanced Baseline Imager
CDR	Critical Design Review
CLASS	Comprehensive Large Array-data Stewardship System
CMC	Center Management Council
DCS	Data Collection System
DOC	Department of Commerce
EHIS	Energetic Heavy Ion Sensor
ELV	Expendable Launch Vehicle
EM	Enterprise Management
EMWIN	Emergency Manager's Weather Information Network
EUVS	Extreme Ultra Violet Sensor
EXIS	EUVS and XRS Irradiance Sensors
FOR	Flight Operations Review
FRR	Flight Readiness Review
GLM	GEO Lightning Mapper
GOES	Geostationary Operational Environmental Satellites
IIRT	Integrated Independent Review Team
LIRD	Level 1 Requirements Document
LLIS	Lessons Learned Information System
LRIT	Low Rate Information Transmission
LRR	Launch Readiness Review
MDR	Mission Definition Review
MM	Mission Management
MOR	Mission Operations Review
MOU	Memorandum of Understanding
MPS	Magnetospheric Particle Sensor
MRR	Mission Readiness Review
NASA	National Aeronautics and Space Administration
NEN	NASA Engineering Network
NOAA	National Oceanic and Atmospheric Administration
ORR	Operational Readiness Review
PD	Product Distribution
PDR	Preliminary Design Review
PER	Pre-Environmental Review
PG	Product Generation
PLAR	Post-Launch Assessment Review
PMC	Program Management Council
PSR	Pre-Shipment Review
RFA	Request for Action
SAR	Search and Rescue
SDR	System Definition Review

SEISS	Space Environment In-Situ Suite
SGPS	Solar and Galactic Proton Sensor
SIR	System Integration Review
SMA	Safety and Mission Assurance
SMD	Science Mission Directorate
SMS	Synchronous Meteorological Satellite
SMSR	Safety and Mission Success Review
SRB	Standing Review Board
SRP	System Review Plan
SRR	System Requirements Review
SUVI	Solar Ultraviolet Imager
US	Under Secretary for Oceans and Atmosphere
XRS	X-Ray Sensor

ATTACHMENT 1: SUMMARY OBJECTIVES OF CRITICAL MILESTONE REVIEWS

This attachment provides the summary objectives for design reviews conducted by the SRB. The success criteria identified in the guidelines shall be given consideration by the GOES-R Series Program for products involving the delivery of hardware and software for orbital flight.

The GOES-R Series System, Observatories, spacecraft, payloads (instruments), Ground Segment, and ground elements are subject to the design review process. The reviews to be conducted are as presented in Table 1 and are described below.

Systems Requirements Review (SRR)

The SRR examines the functional and performance requirements defined for the program (and its constituent projects) and ensures that the requirements and the selected concept will satisfy the program and higher-level requirements. For a system design that fully satisfies all requirements of a Systems Concept Review, the objectives of the SRR are to confirm that: (a) system requirements have been logically and fully allocated to each independent system element and in turn to their respective subsystem level or below, (b) all allocated requirements are verifiable, and, (c) all allocated requirements are traceable to their corresponding system level requirement.

The SRR should contain a complete and comprehensive description of the system design in order to establish the baseline for which the requirements are defined. It should present the design by means of block diagrams, depicting system interfaces with external supporting systems, internal interfaces between independent system elements, and interfaces within each independent system element to the subsystem level and below. Completed modeling and analysis results that demonstrate the ability of the design to fulfill system requirements should be presented.

Systems Definition Review (SDR)

The SDR examines the proposed system architecture/design and the flow down to all functional elements of the system. The objectives of the SDR are to; (a) demonstrate that the architecture/design is acceptable, (b) that requirements allocation is complete, (c) that a system the fulfills the mission objectives can be built within the constraints posed, (d) ensure that a verification concept and preliminary verification program are defined, (e) establish end item acceptance criteria, and (f) ensure that adequate detail information exists to support initiation of further development or acquisition efforts.

Preliminary Design Review (PDR)

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

The PDR should contain a complete and comprehensive presentation of the entire design. It should present the design and interfaces by means of block diagrams, power flow diagrams, signal flow diagrams, interface circuits, software logic flow and timing diagrams. Appropriate modeling results should be presented. Traceability for all items specified for previous SRB reviews, updated to the present stage of the development process, shall be presented.

Critical Design Review (CDR)

The objectives of the CDR are to demonstrate that: (a) all elements of the design are compliant with functional and performance requirements; (b) the verification approach is viable and will confirm compliance with all requirements; (c) risks have been appropriately identified and mitigated or are on track for timely mitigation; (d) the design is sufficiently mature to proceed with full scale fabrication; (e) the management processes used by the project team are sufficient to develop and operate the mission; and (f) the schedules and cost estimates indicate that the mission will be ready to launch and operate on time and within budget and that the control processes are adequate to ensure remaining within allocated resources.

The CDR should represent a complete and comprehensive presentation of the entire final design. It should present the final design and interfaces by means of completed drawings, block diagrams, power flow diagrams, signal flow diagrams, interface circuits, software logic flow and timing diagrams, modeling results, and breadboard and engineering model test results. Traceability for all items specified for previous SRB reviews, updated to the present stage of the development process, shall be presented.

Mission Operations Review (MOR)

The MOR establishes the adequacy of plans and schedules for ground systems and flight operations preparation, to justify readiness to proceed with implementation of the remaining required activities. The MOR is the first of two SRB reviews held to examine mission operations status. It is typically held subsequent to completion of detail design and fabrication activity, but prior to initiation of major integration activities of flight or ground-system elements.

The MOR review concentrates on the ground system and flight operations preparations. The objectives of the MOR are to demonstrate: (a) all mission-oriented operations including science, spacecraft and ground systems operations are identified, (b) the requirements for science and spacecraft operations support and for data processing and analysis support are understood, (c) the proposed approach will meet the requirements, (d) adequate systems engineering has been applied to the operational interfaces between the ground system and flight system including operational trades, signal link margins, constraints, and modes of operation including safe modes, (e) mission integration of pre-launch test planning including all planned tests between the flight segment and the ground system are sufficient, (f) the relationship between planned ground system software releases/capabilities and planned tests with the flight segment, (g) the plans and status for flight operations team and science operations preparations are sufficiently mature. The mission operations review should occur prior to significant integration and test of the flight system and ground system.

System Integration Review (SIR)

The SIR evaluates the readiness of the project to start flight system assembly, test, and launch operations. V&V plans, integration plans and test plans are reviewed. Test articles (hardware/software), test facilities, support personnel, and test procedures are ready for testing and data acquisition, reduction and control.

The objectives of the SIR are to demonstrate that: (a) all supportive flight system design analyses have been successfully completed and demonstrate adequate margin; (b) all lower level flight system verification activities have been satisfactorily completed and all discrepancies are sufficiently understood to warrant proceeding; (c) initial flight system comprehensive performance testing has established a valid performance baseline that complies with requirements; (d) planning is adequate for all remaining flight system activities; (e) development of all other flight system elements (e.g. launch vehicle, ground system, data processing and analysis system) is satisfactory; and (f) available cost and schedule resources support completion of all necessary remaining activities with adequate margin.

The SIR should present a complete and comprehensive status of the final system with emphasis on changes to requirements and to the design since CDR. It should trace all fabrication and lower level verification activities with emphasis on discrepancies and their resolution. It should detail the composition and results of the comprehensive system test. It should detail all remaining project activities and detail status of all other mission system elements.

Pre-Environmental Review (PER)

The PER ensures that the test article hardware/software, test facility, ground support personnel and test procedures are ready for testing and data acquisition, reduction and control. The objective of the review are: (a) confirm that in-place test plans meet verification requirements and specifications, (b) confirm that sufficient resources are allocated to the test effort, (c) examine detailed test procedures for completeness and safety during the test operations, (d) determine that critical test personnel are test and safety-certified, (e) confirm that test support software is adequate, pertinent and verified (f) address lessons learned from other programs (including legacy GOES, POES and NPOESS), projects and instruments (especially prior instrument failures) as appropriate.

The PER should present a complete and comprehensive status of the final system with emphasis on changes to requirements and to the design since CDR. It should trace all fabrication and lower level verification activities with emphasis on discrepancies and their resolution. It should detail the composition and results of the comprehensive system test. It should detail all remaining project activities and detail status of all other mission system elements.

Operations Readiness Review (ORR)

The ORR examines the actual system characteristics and procedures used in the system or product's operation and ensures that all system and support (flight and ground) hardware, software, personnel, and procedures are ready for operations and that user documentation accurately reflects the deployed state of the system.

The ORR is held near the completion of pre-launch testing between the flight segment and the ground system. The ORR reviews the progress of ground system development and mission operations planning

activities. It establishes readiness to proceed with final preparations of ground system elements to support successful launch and mission operations. The ORR is held late in the test flow of the flight system, but prior to the last major interactive test between the flight and ground system elements. The review is conducted before shipment of flight system elements to the launch site. The objectives of the ORR are to demonstrate that: (a) the plans for final end-to-end testing and simulations are sufficient, (b) the results of previous testing (i.e. discrepancy summary, network compatibility assessment, training status, etc.) are recorded and discrepancies are fully understood and satisfactorily resolved, (c) the plans for final launch, orbital operations, and checkout are completed.

Flight Operations Review (FOR)

At the FOR, the project presents the results of its mission operations activities to demonstrate that compliance with all requirements have been verified and that the ability to execute all phases and modes of mission operations, data processing, and analysis have been demonstrated. Additionally, the project demonstrates that adequate planning and resources are in place for any remaining activities associated with interactive flight/and ground testing, network compatibility testing, and other remaining pre-launch testing. Finally, completion status of staffing, training and certification of the flight team are reviewed.

Pre-Ship Review (PSR)

The PSR verifies the completeness of the specific end item with respect to the expected maturity level and to access compliance to stakeholder expectations. The PSR examines the system, its end items and documentation, and test data and analyses that support verification. It also ensures that the system has sufficient technical maturity to authorize its shipment to the next level of integration, operational facility or launch site.

The objectives of the PSR are to demonstrate that: (a) all functional performance and environmental testing of the flight system has been successfully completed, including network and ground system compatibility testing as well as mission simulations; (b) all discrepancies are fully understood and satisfactorily resolved, including completion of corrective actions as well as planning and preparation of any required follow-on actions; (c) any changes since the SIR have been evaluated for mission implications, have been successfully incorporated into appropriate system elements, have been verified, and are compatible with any interfacing system element; and (d) planning and preparation for shipping and subsequent ground processing, launch, and mission operations is complete.

Mission Readiness Review (MRR)

The MRR examines and substantiates top-level requirements analysis products and assesses their readiness for external review. The objectives of the review are to: (a) confirm that the mission concept satisfies the customer's needs, (b) confirm that the mission requirements support identification of external and long-lead support requirements, (c) determine the adequacy of the analysis products to support development of the full system.

Safety and Mission Success Review (SMSR)

SMSRs are conducted prior to launch by the NASA Chief Safety and Mission Assurance (SMA) Officer and NASA Chief Engineer and NOAA Deputy AA Systems to prepare for SMA and engineering

participation in critical program/project reviews/decision forums. The SMA lead and lead PCE are the focal points for planning, coordinating and providing the program/project elements of these reviews.

Flight Readiness Review (FRR)

The FRR examines tests, demonstrations, analyses, and audits that determine the system's readiness for a safe and successful flight/launch and for subsequent flight operations. It also ensures that all flight and ground hardware, software, personnel, and procedures are operationally ready.

The FRR is held near the completion of pre-launch testing between the flight segment and the ground system. The objectives of the FRR are to demonstrate that: (a) the plans for final end-to-end testing and simulations are sufficient; (b) the results of previous testing (i.e. discrepancy summary, network compatibility assessment, training status, etc.) are recorded and discrepancies are fully understood and satisfactorily resolved; (c) the plans for final launch, orbital operations, and checkout are completed.

Launch Readiness Review (LRR)

This review is the final review prior to actual launch. The review is conducted in order to verify that Launch System and Spacecraft/Payloads are ready for launch.

Post-Launch Assessment Review (PLAR)

The review is an assessment of system in-flight performance.