



Geostationary Operational Environmental Satellite-R (GOES-R) Series Program User Readiness Plan

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**GOES-R Series Program User Readiness Plan
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1 Introduction

The National Oceanic and Atmospheric Administration (NOAA) operates a system of environmental satellites to provide continuous weather imagery and monitoring of meteorological data for the United States and surrounding areas. The Geostationary Operational Environmental Satellites (GOES) provide critical information that supports Earth and space weather forecasting and warnings, climatologic analysis and prediction, ecosystems management, and safe and efficient public and private transportation. The GOES system also provides a platform for auxiliary communications services for GOES data rebroadcast, data collection platform relay, low resolution imagery, emergency weather communications, and satellite aided search and rescue.

The Geostationary Operational Environmental Satellite-R Series (GOES-R) is the next generation of geostationary weather satellites,. The advanced spacecraft and instrument technology used on the GOES-R series will result in more timely and accurate weather forecasts. The deployment of the GOES-R series spacecraft has impacted the current users of GOES data products and the volume of data they receive. The Advanced Baseline Imager (ABI) and the Geostationary Lightning Mapper (GLM) produce a significant increase in sampling rate and the number of data channels. For instance, the data rate for the Earth imaging Level 1b data products increases from 2 megabits per second (Mbps) to 66.6 Mbps. The data channels increase from one visible and 5 infrared (IR) to two visible and 14 IR channels.

1.1 Purpose

The GOES-R Program User Readiness Plan (UsrRP) describes the organization and processes to be implemented by the GOES-R Program Office (GPO) to prepare the users of GOES data and products for operations with the enhanced GOES-R offerings. This process supports the readiness of the current GOES users as the mission transitions to GOES-R starting in 2015.

1.2 Roles and Responsibilities

The GOES-R program is a collaborative development and acquisition effort between NOAA and the National Aeronautics and Space Administration (NASA). Under the NOAA/NASA Interagency Memorandum of Understanding, dated June 2007, the National Environmental Satellite, Data, and Information Service (NESDIS) and NASA Goddard Space Flight Center (GSFC) have agreed on the acquisition and program management structure for the GOES-R program and the overall responsibilities of both organizations aligned to leverage each agency's strengths.

1.2.1 GOES-R Program Office

The GOES-R Program is managed by NOAA with an integrated NOAA-NASA program office organization, staffed with personnel from NOAA and NASA and co-located at [NASA's Goddard Space Flight Center](#). GOES-R is composed of the [GOES-R Program Office](#) and two integrated NOAA-NASA project offices: the Flight Project and the Ground Segment Project. The Flight Project oversees the development of the [Space Segment](#), which consists of the [spacecraft](#), the [instruments](#), launch vehicle, and the [auxiliary communication payloads](#). The [Ground Segment Project](#) consists of the entire ground system, including the facilities, antenna sites, software and hardware for satellite command and control and to process, create, and distribute end user products.

The organization of the GPO to support the GOES-R Mission is shown in Figure 1-1.

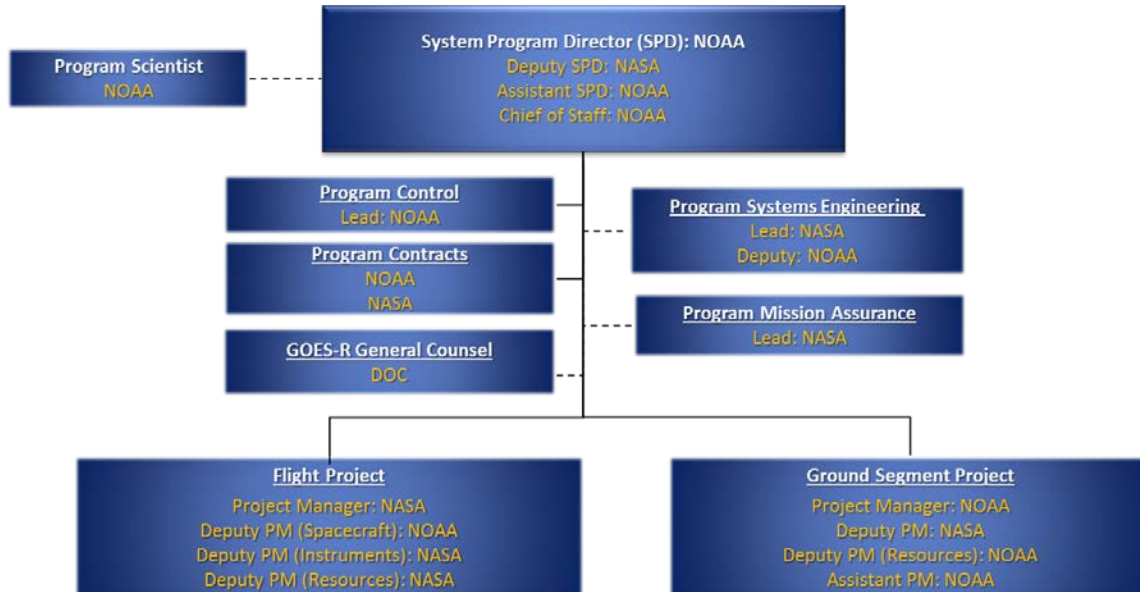


Figure 1-1 The GPO Coordinates the Interaction of the Flight and Ground Segment Projects

One of the responsibilities of the GPO is to monitor, assess, and establish methods to support user readiness. In addition to providing information and resources to aid the readiness activities of data users, the GPO is also responsible for developing and providing input to include in Educational and Public Outreach (E/PO) activities to the academic community and the general public.

1.2.2 Users

The users that are the focus of this plan are individuals, companies, and institutions that use the GOES-R Level 1b (L1b), Level 2, and higher-level (L2+) products to perform their functions.

A high level overview of the data flow from the GOES system to the users is shown in Figure 1-2. In this figure, the GOES-R system includes the spacecraft in orbit, the Consolidated Backup Unit (CBU), NOAA Satellite Operations Facility (NSOF), and Wallops Command and Data Acquisition Station (WCDAS) which are the facilities containing the ground segment with internal and external communications networks connecting them.

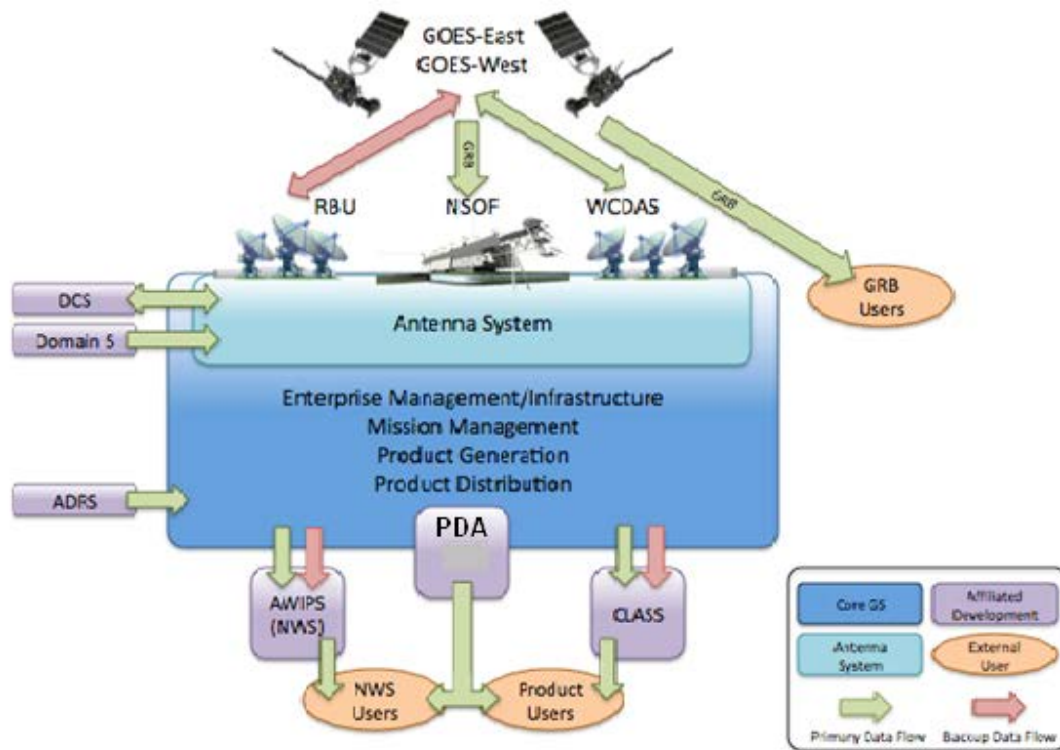


Figure 1-2 GOES-R Data Processing, Flow, and Storage

Examples of GOES-R data users are:

- NOAA meteorologists in Weather Forecast Offices (WFOs) and Centers who provide regional weather and river forecasts and warnings to the public using the Advanced Weather Interactive Processing System (AWIPS). Non-NOAA users such as NASA, United States Geological Survey (USGS), Department of Defense (DoD), and the international weather community are also included.
- Users of the Consolidated Large Array-Data Stewardship System (CLASS) which is being updated to accommodate the significant increase in archive capacity from GOES-R, the Suomi National Polar-orbiting Partnership (NPP) satellite, and the Joint Polar Satellite System (JPSS). These users include US government and academic research institutions that do not require low data latency.
- Direct Readout (DRO) users with transmitting sensors (such as buoys and river flood gauges) and those that receive the data relayed through GOES-R. The following are four DRO relay services:
 - GOES Rebroadcast (GRB)
 - High Rate Information Transmission (HRIT)/ Emergency Managers Weather Information Network (EMWIN)
 - Data Collection System (DCS)
 - Search And Rescue Satellite Aided Tracking (SARSAT)
- The Product Distribution Access (PDA) Users represented by the NOAA National Weather Service (NWS) National Centers for Environmental Prediction (NCEP), other US government agencies and international users who receive data from PDA in a push/pull mode and can tolerate moderate data latency.

- The CLASS data users pull data from the CLASS as it becomes available in that archive. The CLASS is the long term archive where the GOES-R data from the PDA is stored indefinitely for users who do not require data latency less than 5 minutes. Examples of these users are researchers at educational institutions involved in the atmospheric, oceanic, climate, and astrophysical sciences. The CLASS receives GRB, Key Performance Parameter (KPP), Level 0 and Level 2+ data
- Low latency data is provided to DRO users in the NOAA NWS organizations and other non-NOAA users through the four bent-pipe radio frequency (RF) data relays.
- The GRB contains the ABI, GLM, space environment, and solar data which drive data flow in the NOAA space and Earth environment research and operational framework. In addition to this there are approximately 30 non-NOAA users of GVAR (the legacy counterpart of GRB) that will be significantly affected by the transition to GRB. The users of the other 3 DRO relays are minimally affected by GOES-R.
- Users of the PDA system push or pull data through the GOES Access Subsystem (GAS). The GAS is the interface for obtaining data from the PDA and ancillary data such as the Global Forecast System (GFS) model output from the National Centers for Environmental Prediction (NCEP) initialized with recent data from the PDA.
- Other non-NOAA users depend upon data and products from or derived from GOES sensors. In Figure 1-2, these users are labeled as the Product Users.

1.2.3 Stakeholders

The primary stakeholders are the NOAA and NASA organizations including the GPO which is the facilitator of this plan. Other stakeholders are the organizations that have plans to deliver improvements to their operations which are enabled by the inclusion of GOES-R data or those stakeholder groups identified in Section 5.

1.2.4 Document Organization

This document will show how the GPO accommodates a staged approach to introducing and communicating GOES-R data and products to the user community. This approach is described in the following sections:

- Section 1 explains the purpose and organization of this document and background of the GOES-R mission and existing GOES mission framework.
- Section 2 describes a top-level view of the interaction of the GPO with the existing NESDIS and NWS operations and research framework. This top-level description introduces the more detailed information provided by sections 3 through 6.
- Section 3 describes the user system readiness approach. The GPO monitors the development and integration schedule for the GOES-R Ground Segment and other components of the NOAA data system that provide access to GOES-R data and products.
- Section 4 describes the Proving Ground (PG) plan created to ensure the user community is ready after the launch of GOES-R.
- Section 5 describes the Communication and Outreach Plan. This is a description of how the GPO communicates with stakeholders, the user community, and the public. The key objective is to ensure that the user community and the stakeholders are informed with the development progress of GOES-R's new data products and systems.
- Section 6 describes the Training Plan. This description explains the components of existing training structure for the meteorological and space environment user community and how the GOES-R data and products will be integrated into the existing operational framework

2 Top-Level User Readiness Plan

The GPO will perform several activities to monitor and report user readiness for GOES-R. The GPO must:

- a. Work within the management plans of the existing project development organizations. These organizations are responsible for upgrades to the:
 - 1) GOES-R Ground Segment
 - 2) Environmental Satellite Processing and Distribution System (ESPDS)/PDA
 - 3) CLASS
 - 4) AWIPS

In this document, this group of systems is a source of data to the users and is referred to as the User System.
- b. Identify events in the User System schedules that provide opportunities to verify User Readiness. These events are used as criteria to monitor, measure, and report User Systems readiness and User readiness verification progress. The plan for this is discussed in Section 3.
- c. Address mission requirements that affect users' schedules for preparedness.
- d. Report the status of User Readiness (including User System Readiness) to GOES-R's stakeholders.
- e. Collaborate with users to monitor their schedules, communicate development status, and support users' needs for data and information to support testing and training related to GOES-R preparedness.
- f. Collaborate as needed with other efforts regarding various aspects of user readiness, including but not limited to the GOES-R Readiness effort and HRIT/EMWIN, DCS, SARSAT readiness activities.

Figure 2-1 illustrates a user readiness view of the GOES-R mission and the interaction with the users.

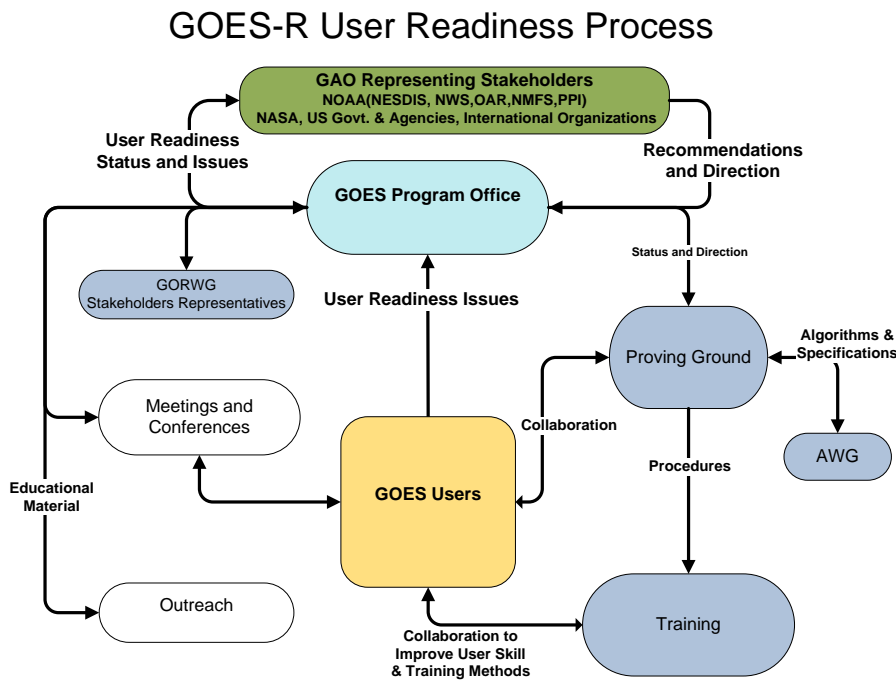


Figure 2-1 GOES-R User Readiness Process

The left side of Figure 2-1 shows collaboration through professional meetings such as the American Meteorological Society, the National Weather Association, and at the GOES Users’ Conference. These are forums for presenting GPO status to the users and other members of the national and international community in Earth and space environmental remote sensing, modeling and prediction technology.

The right side of Figure 2-1 shows the relationship of the GOES-R Proving Ground which engages the NWS forecast, watch and warning communities and other agency users in pre-operational demonstrations and training for select products with GOES-R attributes (enhanced spectral, spatial, and temporal resolution). This process for evolving from research to operations is presented in Section 4.

2.1 The Plan

The User Readiness Plan leverages the activities that the GOES-R Program currently uses in the development of the Flight and Ground Segment. The plan’s implementation activities are also coordinated with activities in the NWS and NESDIS. The following is a list of actions that have already been taken by the GPO to include a User Readiness process within the framework of existing activities:

1. Identify User Readiness as a significant risk to be mitigated in the GOES-R mission implementation and to be addressed in the Mission Readiness Review.
2. Establish a method of assessing User Readiness, identifying readiness criteria and methods of measuring the achievement of those criteria at staged intervals in the schedule of mission implementation.
3. Initiate and support the Proving Ground activity.
4. Establish a direct collaboration between the Proving Ground and the NOAA training functions.

5. Establish and maintain a Communications and Outreach Plan.
6. Monitor the development, integration, and validation status of the user systems.
7. Present user readiness activities and training functions at various meetings and conferences to ensure current data is being disseminated.

2.2 User Readiness Criteria

User Readiness will continue to improve with the guidance of the various planned activities that the GPO oversees. The PG is a vital component to assess the readiness of users during development of products and decision aids because of the direct collaboration between users and developers. Demonstrations and experiments that happen year round at various Cooperative Institutions allow for effective training to users. The statuses of these activities are given to the GPO for assessment of their readiness. These statuses are given as formal reports, presentations, and survey responses.

The following criteria will be used to assess user readiness:

1. Users are aware of the changes and updates being made to the GOES-R mission
2. Training is readily available for the products being developed
3. Participation and feedback for the various user readiness activities are well documented
4. All questions from users are addressed by the GPO
5. GRB users are aware of the needed changes for their ground station
6. All user readiness information is easily attainable

3 User System Readiness

This section describes the User Systems Readiness process; which is to track and report to GOES-R’s stakeholders the progress made to ensure users are prepared for these new systems and their data rates. The four User Systems affected by GOES-R are described in Table 3-1. Their relationship to each other and the overall GOES ground system architecture is shown in Figure 3-1.

The User Systems Readiness activity is the responsibility of the GOES-R Ground Segment Project (GSP) Office and it is managed by the GSP Science Office (GSPSO).

Table 3-1 User Systems

Acronym	System Name	Description
AWIPS	Advanced Weather Interactive Processing System	Interactive computer system that integrates meteorological and hydrological data, enabling forecasters to prepare forecasts and issue warnings. GOES-R will provide selected products to AWIPS.
CLASS	Comprehensive Large Array-data Stewardship System	Web-based data archive and distribution system for NOAA’s environmental data. CLASS will provide retrospective data access and distribution services of GOES-R data to all users.
PDA	Product Distribution and Access	The Environmental Satellite Processing and Distribution System (ESPDS) system responsible for receiving and storing real-time environmental satellite data and products and making them available to authorized users. The PDA will provide real-time distribution and access services for GOES-R users.
GRB	GOES Rebroadcast	One channel of the space data relay service of GOES-R for Level 1b data products. These data are available to all users with GRB receivers in view of a GOES-R series satellite at the East or West operational longitudes

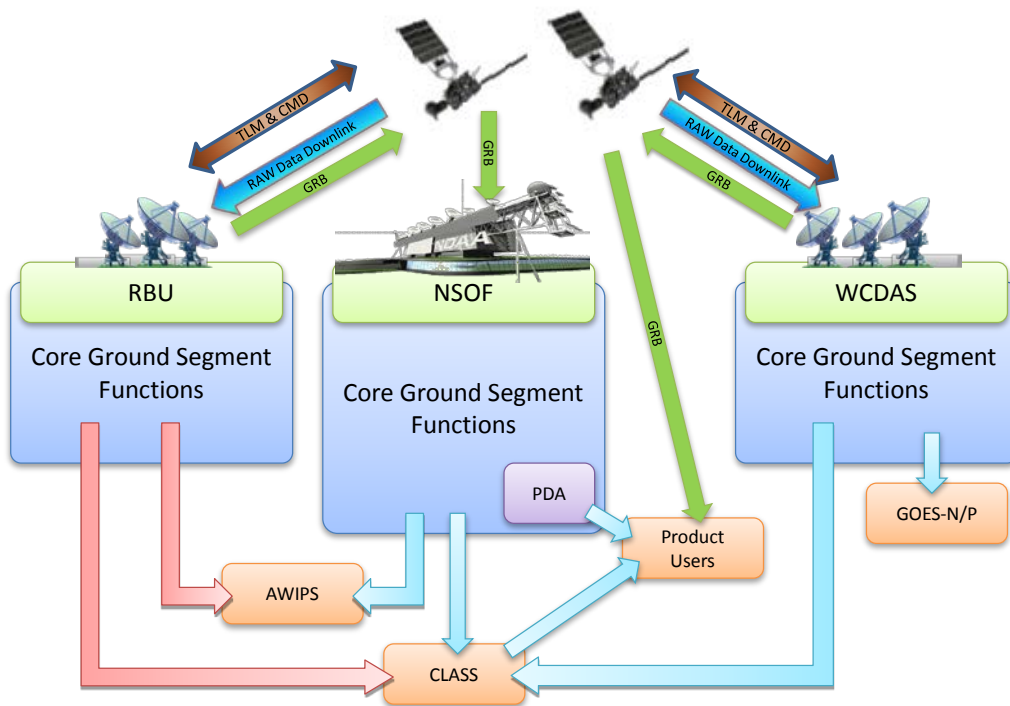


Figure 3-1 GOES Ground Segment Architecture Overview

3.1 User System Readiness Process/Criteria

This activity feeds into the overall User Readiness Plan in that it captures issues unique to the systems themselves, and allows those issues to be addressed via the appropriate methodologies described within this plan (i.e., the Proving Ground, Training, and Communication). To assess user system readiness for each system, the GSP Science Office asked stakeholders and representatives of the four user systems a series of questions, including:

- Who are the stakeholders and how are they currently engaged?
- What tools, data, and training are needed to ensure user system readiness?
- What are the relevant test and verification plans to user systems readiness?
- What is the schedule, cost, and staffing required ensuring user system readiness?

From the responses, a high-level checklist was developed that provides a framework for development of the system-specific method of evaluating readiness. Further work on quantifying readiness will be done within the GSP in consultation with the Program Office.

The concept behind the checklist is that all systems have seven items in common that must be resolved in order for the system to be ready for the user. These elements are as follows:

- Schedules must be baselined and resolved
- Any additional or supporting systems or infrastructure must be successfully implemented
- The system architecture must be described (as-is and to-be)
- Data management questions such as format and metadata must be resolved
- Users must be identified and training or awareness initiatives established
- End-to-end test of data products themselves must be successful
- Risks must be identified and mitigated.

Each system, however, has different concerns that are unique to that system. Some systems, for instance, require infrastructure modifications in order to be ready for the users to receive data, while others do not. Each system representative will comment on each applicable segment on a periodic basis. When all segments have been completed, the system is deemed ready for the user.

It is important to note that this checklist does not replace or duplicate any Project or Program work required to deliver the systems as per contractual agreement; this checklist simply gathers a wide range of information in one place for easy analysis. As time progresses, this checklist will be modified to reflect any items that are not needed.

3.1.1 GOES-R Direct Readout User Readiness

Most users for Direct Readout, which include High Rate Information Transmission/Emergency Managers Weather Information Network (HRIT/EMWIN, formerly known as EMWIN/LRIT) and Search and Rescue Satellite Aided Tracking (SARSAT), will have small changes with the transition to GOES-R. The Data Collection System (DCS) will have a frequency change for GOES-R and GOES-R users will need to tune their direct readout equipment to the new frequency. The DCS program is managing the expansion from 266 to 433 channels in the GOES-R era and is responsible for the user transition. The GVAR users within Direct Readout will be affected by the transition to GOES-R. GVAR users will need to transition to GRB in order to attain the new data.

For GRB user readiness, an Execution Plan is being developed that will address those specifics. Drawing from the abovementioned checklist, the following activities form the core of work that will be performed in order to ensure user readiness:

- Release Product Users Guide (PUG)
 - Describes format and content of GRB data
- Release GRB downlink specification document for users
 - Provides GRB rebroadcast radio frequency downlink characteristics to enable the user community to develop GRB receivers
- Build the GRB simulator and develop a framework for distributing the simulators to interested parties
 - Contractor to build and deliver the simulators
- Develop informational materials for users and post on the web site
- Develop presentations and/or workshops for users containing updates on schedule and availability

The above represents a preliminary list from which schedules can be developed and modified over time.

GOES-R provides direct readout services in the Radio Frequency (RF) L-band spectrum from 1680-1695 MHz for GRB, HRIT/EMWIN, and DCS. The DCS service can be configured for Data Collection Platform Radios (DCPR) using either U.S. domestic or International standards. Table 3-2 shows the frequency, bandwidth and modulation for each service planned. The final determination for GRB has not been established; however, two candidates are under consideration: Quadrature Phase Shift Keying (QPSK) with 9/10 coding and 8PSK with 2/3 coding. Although the final decision will not be made until after spacecraft testing has been conducted, either option selected for GRB will be compatible with Digital Video Broadcasting - Satellite – 2nd Generation (DVB-S2), the digital television broadcast standard.

Table 3-2 GOES-R Direct Readout Services

Service	Center Frequency	Bandwidth	Modulation
GRB	1686.6 MHz	10.9 or 9.8 MHz	DVB-S2; Dual circular polarization
DCPR Domestic	1679.9 MHz	400 kHz	8PSK Trellis coding
DCPR International	1680.2 MHz	400 kHz	8PSK Trellis coding
HRIT/EMWIN	1694.1 MHz	1205 kHz	BPSK Linear Polarization

4 Proving Ground

This section documents the plan for organizing and conducting “Proving Ground” activities to demonstrate early operational integration of future GOES-R capabilities. Because of the length of time required for planning, acquisition, and development of the GOES-R instruments and spacecraft, and the importance of these new capabilities, NOAA has undertaken early planning and demonstration activities to ensure timely and cost-effective integration of the future GOES capabilities. The GOES-R PG program will ease the transition from research to operations. This program consists of a broad set of field demonstration activities structured to gain early NWS (and others) field experience utilizing the NOAA Testbeds. The principal focus is on the forecaster/AWIPS-II environment:

- To prepare for the GOES-R information,
- To get real-world experience and product feedback by using existing resources
- To evaluate product tailoring and decision aids.

In addition, by leveraging current research and other satellite assets, NWS and others can produce improved guidance. The PG activities close the loop from Algorithm Working Group (AWG) development of legacy and new product algorithms and decision aids, through real-world forecaster experience with those products, to feedback to the developers.

4.1 Proving Ground Mission

The intended outcomes of the PG Program are to enable “Day 1” readiness (operational use at the time the satellite is declared operational) and maximum utilization, for both the developers and users, of GOES-R products. The GOES-R PG engages current operational environments in pre-operational demonstrations of selected capabilities of GOES-R to bridge the gap between research and operations by:

- Utilizing current systems (satellite, terrestrial, or model/synthetic) to emulate future GOES-R capabilities
- Infusing GOES-R-like products and techniques into NWS operations with emphasis on AWIPS and transitioning to AWIPS-II
- Engaging in a dialogue to provide feedback between developers and users

The PG accomplishes its mission through:

- Sustained interaction between developers and end users for training, product evaluation, and solicitation of user feedback.
- Close coordination with GOES-R AWG and Risk Reduction activities as sources of demonstration products, promoting a smooth transition to operations.

4.2 Background

The GOES-R PG joins NESDIS, NOAA’s cooperative institutes and its affiliated partners (including NWS forecast offices) to participate in pre-operational demonstrations of select capabilities with GOES-R attributes. Other government entities (EPA, DOD) are also included in the demonstrations. The PG activities facilitate the examination and validation of new ideas, technologies, and products primarily through the Advanced Weather Information Processing System (AWIPS). Emphasis is placed on the transition from AWIPS-I (AWIPS Legacy) to AWIPS-II (AWIPS Migration). AWIPS-II is the next-generation decision support system for forecasters. Pre-operational analysis will prepare users for the new types of satellite imagery and tools that will become available with GOES-R.

The PG provides simulated/proxy GOES-R products for operational assessment. Testing methodology includes:

- The combination of current GOES instruments with other satellite channels
- Utilization of other proxy imagers such as the Moderate Resolution Imaging Spectroradiometer (MODIS) and the Spinning Enhanced Visible Infrared Imager (SEVIRI) channels
- The use of synthetic, model generated imagery to replicate GOES-R products.

Field proving of early satellite products has been progressing for many years. Developmental and demonstration prototyping of current satellite products and test activities is currently being conducted at many locations. For example, as of 2009, over 70 offices were served with up to 40 various products. Although most were not AWG-demonstrated GOES-R products, they did provide early experience for the forecaster in using both legacy and new products at higher spatial resolution.

4.3 Program Purpose and Scope

The purpose of the GOES-R PG Program is to connect the NWS and other agencies at an early stage so that the GOES-R Program can be a success from Day 1. To achieve this, NOAA must ensure baseline products are ready for use by the operational community when the satellite is declared operational and that we create realistic expectations of product availability and any known limitations.

The GOES-R AWG is responsible for the development and validation of Level 2 product algorithms for the future GOES-R earth viewing Advanced Baseline Imager (ABI) and Geostationary Lightning Mapper (GLM) instruments. The scope of the PG (PG) Program is to demonstrate the products developed from the AWG algorithms in an operational environment so the forecasters can become familiar with and provide valuable feedback about the planned products. During the pre-launch phase of GOES-R the AWG-developed algorithms cannot be fully demonstrated due to the use of simulated and proxy data for the ABI and GLM. It is expected, however, that the PG program demonstrate the products developed from the AWG as closely as possible, and note deviations from the official products. After AWG-demonstrated algorithms have been demonstrated, risk reduction products, integrated products, and decision aids may be demonstrated.

The Satellite PG will be a recipient of and a resource for User Education and Training. PG participants (developers, managers and users) will need to be educated on the characteristics of and applications of the satellite products to be demonstrated and integrated into operations of the

NWS forecast offices and national centers and other NOAA offices (NESDIS, NOS, NMFS, etc.) The proxy and simulated GOES-R products used in the PG will be integrated along with other remote sensing data into training modules by the Cooperative Program for Operational Meteorology, Education and Training (COMET) program and the Virtual Institute for Satellite Integration Training (VISIT) program. The products are also included in SHyMet courses and Weather Event Simulator (WES) cases. Decision aids, new display systems and modifications to NOAA's operations provided by PG participants, will be addressed in user education, training and WES cases.

4.4 Proving Ground Program and the NWS Strategic Goal

The GOES-R PG supports the NWS Strategic Goal to “Develop a fully integrated observation system (e.g., satellite, radar, upper air, etc), along with analysis tools to fully exploit data and enable strategic warn-on-forecast stretch goals.” The PG also supports several of the high impact weather NOAA mission goals. As the next generation of observing systems (e.g.,

GOES-R, NPP, and JPSS) come on line, the forecasters will have less and less time to analyze this growing amount of observational and model data. The system will need to assimilate observations from multiple

platforms into products that directly address forecast and warning requirements, such as convective initiation giving specific convective threat, icing threat, and flood potential. An end-state objective is to automatically analyze the data and determine when the forecaster needs to react. The proving ground will support this objective through demonstration of decision aids during the risk-reduction phase of the program.

4.5 Proving Ground Description

4.5.1 Critical Timeline

During the pre-launch period it is anticipated that selected forecast offices and national centers will be asked to participate in evaluation of selected GOES-R data and products. In order to do so, these forecasters will need to be trained and that in turn requires development of specific training modules. The proving ground is expected to be a major aid to producing those training modules. The first phase of the proving ground is to demonstrate baseline products so that training modules can be developed in time to train those forecasters who will be asked to participate in post-launch checkout of GOES-R.

Some GOES-R training has already begun. For example, a VISIT view lesson on the ABI was developed in 2005, MODIS data started to flow to several forecast offices in 2006, and more recently, a COMET module on GOES-R was released. In addition, a WES for the ABI is under-development. More information on training can be found in Section 6 of this document.

4.5.2 Field Operational Projects

The GOES-R PG is organized in two ways: by test bed and by GOES-R algorithm product demonstrated. An algorithm team lead may provide specific products for selected Weather Forecast Offices (WFOs) to address, while NOAA test beds will demonstrate products of particular interest to that test bed.

One or more cooperative institutes may support products demonstrated in one of these NWS specialized test beds. For example, at an early Hazardous Weather Test Bed demonstration, two NOAA cooperative institutes and one NASA center participated:

- Cooperative Institute for Meteorological Satellite Studies (CIMSS) - supporting Convective Initiation,
- Cooperative Institute for Research in the Atmosphere (CIRA) - supporting Statistical Hail Prediction, and
- Short-term Prediction Research and Transition Center (SPoRT) - supporting Lightning Data

The Storm Prediction Center (SPC) provided the independent evaluation in the operational setting. In all cases, the proving ground operations plans for a specific year will provide detail on the products to be demonstrated and the roles and responsibilities of supporting organizations and those providing an independent assessment of the products demonstrated. The emphasis is placed on conducting an independent evaluation in an operational environment.

The intent is that PG activities be conducted at many and varied field sites including NOAA Test Beds and numerous WFOs in all NWS Regions. The NOAA Test Beds include:

- Hazardous Weather Test bed
- Hydrometeorological Test bed
- Satellite Algorithm Test Bed
- Aviation Weather Test bed
- Joint Hurricane Test bed

- Joint Center for Satellite Data Assimilation

The Proving Ground Executive Board (now the Science and Demonstration Executive Board (SDEB)¹ and the NWS have jointly identified a set of GOES-R Products as “Warning Related” products. These products directly contribute to NWS Warning Mission (Save Lives & Property) and can be evaluated operationally in near real time. The GOES-R PG activities focus on the AWG version of these algorithms/products for demonstration due to their critical importance in day-to-day high impact weather. These products are identified below:

Baseline Products:

- Volcanic Ash: detection & Height
- Cloud and Moisture Imagery
- Hurricane Intensity
- Lightning Detection: Events, Groups & Flashes
- Rainfall Rate / Quantitative Precipitation Estimation (QPE)
- Total Precipitable Water
- Fire/Hot Spot Characterization

Option 2 Products:

- Aircraft Icing Threat
- Convective Initiation
- Enhanced “V” / Overshooting Top Detection
- Low Cloud and Fog
- SO2 Detection

4.6 Implementation Approach

4.6.1 General Project Readiness Process

To conduct a successful product demonstration and evaluation, the following steps must be accomplished:

- 1) First a specific cooperative institute (CI) or center, under the direction of an AWG Applications Team codes the product algorithm for either AWIPS or McIDAS implementation. The code may be intended for on-site implementation (at the CI), or at a central facility such as one of the test beds and/or a WFO.
- 2) Documentation and training packages are prepared in accordance by the CI or AWG.
- 3) Code is then installed and checked out at either the central facility and displayed onsite or installed and displayed at the site and staff at the demonstration site is trained.
- 4) The AWG team lead takes on an active support role while the site conducts the demonstration.
- 5) The primary testbed prepares an evaluation report with support from the AWG team lead involved and input from participating WFOs and provides it to the GPO.

4.6.2 Guidelines for Project Planning, Approval, Execution and Evaluation

Since the PG purpose is to *demonstrate*, to the extent possible, future products rather than to serve as a testbed for product *development*, in all cases it is important that projects demonstrate, as closely as possible, the “official” GOES-R algorithms. If product development is part of the activity it will, once approved, be

¹ The SDEB replaced the PGEB in January 2012

handled as a Risk Reduction activity. This policy is to avoid misleading forecasters about the expected future GOES-R products.

There are two ways that a specific proving ground project can be initiated. A producing organization (or provider), e.g. a member of the AWG may develop a Proving Ground Demonstration Proposal describing what products will be evaluated, the time frame for development/documentation, the proposed location(s), and the proposed time frame for evaluation. Alternatively, a consumer organization, or consumer, e.g., one or more WFOs, one or more NOAA Testbeds, and/or a Regional Headquarters, may provide a Proving Ground Demonstration Proposal in concert with one or more producing organizations. In either case, the proposal is reviewed by the SDEB, and, if acceptable, is then approved by the GOES-R Program Scientist. Any budget for the demonstration is allocated on a fiscal year basis at the same time.

Once the GOES-R Program Senior Scientist accepts the proposal, a Proving Ground Operations Plan is jointly developed by the provider and consumer based on the proposal they submitted. The Operations Plan describes in more detail the goals of PG Project, the GOES-R product(s) to be demonstrated, identifies the PG Participants and their responsibilities, outlines the project schedule, and identifies milestones and deliverables. The Proving Grounds Operations Plan is reviewed by the stakeholders (PG Partners involved, NWS POC(s), and the SDEB) and revised accordingly. After the GOES-R Program Senior Scientist approves it, the project commences.

As part of the approved Operations Plan, specific monitoring and quarterly reporting will be required. A key element is project progress alignment with the overall GOES-R launch readiness schedule to ensure low risk readiness for, ultimately, transition to the future GOES capabilities.

Periodic progress reviews will be established by the SDEB to ensure timely progress and to meet changing conditions that may occur. As projects are established and executed, status will be maintained on the PG web site.

At the conclusion of the demonstration, a Proving Ground Final Report will be required. This report will include a description of the demonstration, describe the participants involved along with the activities that took place, and most importantly it will include an evaluation for each product demonstrated during the PG activity. Input for the Final Report is expected from all of the Providers and Consumers involved in the activity. Product recommendations for both current and future operations will be captured in the Final Report and any recommendations related to current operations will be delivered to responsible parties for consideration. The appropriate GOES-R/ AWG group will also be notified. Additionally, NWS Headquarters will coordinate with WFOs to provide an annual report describing the PG activities in which they were involved including any recommendations to the GPO.

4.6.3 Project Implementation

4.6.3.1 AWIPS-II Compatibility

Primarily, the PG program will be demonstrating GOES-R products within an operational environment using AWIPS-II. Therefore, it is important that the products be compatible with AWIPS-II data standards.

4.6.3.2 Configuration Control Guidelines

Once a Proving Ground Operations Plan is approved, it should not be modified without the consent of the SDEB and all stakeholders involved in that project.

4.7 Management Approach

The overall program management responsibility is by the GPO, working in concert with NWS management. The GPO will provide policy level direction and coordination while NWS management insures that an

appropriate evaluation is conducted and its results are promulgated throughout NWS. The individual demonstration projects will have their own management and coordination approach specified in the individual operations plan.

4.7.1 Executive Board

As of January 2012, a policy-level GOES-R SDEB has been established to oversee both PG and Risk Reduction activities. The SDEB combines the responsibilities of the Proving Ground Executive Board and the Risk Reduction board. The goal of the change in governance is to better address operational requirements by provides a mechanism for the NWS Corporate priorities to guide both PG and Risk Reduction activities. The SDEB Governance Charter describes the details of the scope of the board's activities.

The SDEB is chaired by the GOES-R Program Senior Scientist and includes 6 members representing NWS, NESDIS, and OAR. Two members from NWS represent OCWWS and OST. Two members represent NESDIS/STAR: the Satellite Meteorology and Climatology Division Chief and the Cooperative Research Program Manager. The remaining members include a representative from OAR and an additional member from the GOES-R Program. The Board will review progress on a regular basis and determine readiness of the various projects and their checkpoints and major decision points.

The SDEB Chair will approve operations plan proposals, operations plans, final decisions and policies as required and lead budget planning and evaluation of various initiatives. Additional guidance, technical assistance and subject matter expertise about the proposed activities will be provided to the SDEB by three advisory groups: NWS Operational Advisory Team, the Technical Advisory Group, and the Independent Advisory Committee.

The SDEB will receive guidance from the NWS Operational Advisory Team (NOAT) to ensure that the science development and demonstration activities are aligned with operational priorities.

4.7.2 Proving Ground Database and Library

A relational database will be created and maintained by the SDEB chair's support staff, to serve as a management tool providing visibility into all aspects of the project. It will provide cross-referencing of all GOES-R products to:

- All users/test beds
- All cognizant supporting cooperative institutes,
- Timelines for preparation, conduct and evaluation report of a proving ground demonstration

Proving ground members will be able to query the database for selected matrix reports. In addition, all approved yearly operations plans will also be available online. All active (and past) proving ground activities are described and status maintained on the proving ground web site: http://cimss.ssec.wisc.edu/goes_r/proving-ground.html.

5 Communications and Outreach Plan

The Communications and Outreach Plan encapsulates the overall communications strategy for the GOES-R Program, to include those activities targeted to a broader audience beyond the User Community. This plan also establishes strategic goals and objectives for communicating our message, and explains the tactics that will be employed to inform key audiences of the status, progress, benefits, and achievements of the GOES-R Program. The value the mission brings to the nation and how to prepare users for the vast amount of data that will be available with the GOES-R series satellites are both important messages that the GPO wants to convey to this audience.

The message is intended convey not only of *what* the GOES-R Program is accomplishing, but also *why* we are doing so and *how* it is relevant to them. This section lays out a top-level Communications and Outreach Plan for the GOES-R Program. The GPO provides overall leadership and guidance for the strategy and implementation of the plan through a coordinated network of program staff, GOES-R-affiliated field centers, partner institutions, and other NOAA and NASA organizations that contribute to implementing this plan.

5.1 Key Issues/Challenges

The key issues and challenges that the Communications and Outreach Plan hope to address are the following:

- Most stakeholders and the general public do not understand the value of the critical services that the GOES-R series will provide.
- The magnitude of new data and information that will be available from the GOES-R series is a benefit, but the challenge is effectively communicating all of these new benefits to the user community and preparing users properly for receiving this data.

5.2 Communications and Outreach Objectives

- To communicate the progress of the program such as data stream availability, training, hardware specifications, and other important information that the end users will need to be Day 1 ready;
- To increase public awareness of the new capabilities and improvements for the upcoming GOES-R Mission and how it will positively affect their daily lives; and
- Make decision-makers cognizant of the value, types, and sources of GOES-R data.

5.3 Key Communications Message

The advanced spacecraft, instrument, and ground system technology of the GOES-R series will result in more timely and accurate weather forecasts. It will improve support for the detection and observation of meteorological phenomena that directly affect public safety, protection of property, and ultimately, economic health and development.

5.4 Approach

The Communications and Outreach Plan is intended to ensure a strategically targeted communications approach.

The Plan:

- Maps easily and intuitively to Program, Line Office, Agency, and Federal strategies;
- Clearly identifies target audiences with specific messages tailored to each group;
- Opens and maintains pathways of communication with key decision-makers and opinion-shapers as well as end users;
- Guides the development of information products that accurately and clearly communicate GOES-R results;
- Engages our science and applications community;
- Utilizes the internet, social media, publications and printed material, multimedia, and events;
- Identifies coordination processes with NOAA/NASA Public Affairs Offices, NOAA/NASA Legislative Affairs Offices, NOAA/ NASA Communications Offices, etc.;
- Leverages resources by creating partnerships with appropriate outside groups and organizations; and
- Provides satellite observation information to the general public by building a communications network where sustained and engaging activities are provided.

5.5 Target Audiences

The Communications and Outreach audience can be grouped into three broad categories: Stakeholders, the User Community, and the general public. Target groups are defined as follows:

- **Stakeholders:** To communicate to this audience, GOES-R needs to establish resources that enable efficient and effective assessment of the value of the GOES-R Program and to set the direction for future geostationary environmental satellite programs.
- **User Community:** It is important that the GPO maximizes dissemination of GOES-R information to these users to help them prepare for the launch of GOES-R and the vast amount of data that will be available. The User Community is broadly defined as the groups that utilize GOES-R data and products. GOES-R Users are identified as, but not limited to, the following:
 - National Environmental Satellite Data and Information Service (NESDIS)
 - NWS [to include Weather Forecast Offices (WFO), River Forecast Centers (RFC), National Centers for Environmental Prediction (NCEP), etc.]
 - Broadcast Meteorologists (to include Accuweather, Weather Channel, etc.)
 - Academic Partners/Cooperative Institutes
 - Department of Defense (DoD)
 - Other NOAA Line Offices
 - National Marine and Fisheries Service (NFMS)
 - National Ocean Service (NOS)
 - Office of Atmospheric Research (OAR)
 - Other USG Agencies [Environmental Protection Agency (EPA), Federal Aviation Administration (FAA), Federal Emergency Management Agency (FEMA), Bureau of Land Management (BLM), National Transportation Safety Board (NTSB), etc.]
 - Aviation Industry
 - First Responders
 - Local Governments
 - Climatologists

- International Users [European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), Instituto Nacional de Pesquisas Espaciais (INPE), World Meteorological Organization (WMO), Environment Canada (EC), Korea Meteorological Administration (KMA), etc.]
- General Public: GOES-R must also communicate to the general public to increase awareness of the GOES-R Program, the critical services it will provide, and the value that it will bring to the nation. Public communication also includes providing information for the media to disseminate to the broader public.

Another important sector of the public audience is students. Students are the future forecasters, broadcast meteorologists, and policy makers and identifying and developing specific educational content is an important facet of this plan.

5.6 Communications and Outreach Implementation

The GOES-R Communications and Outreach Plan will utilize a variety of methods to communicate GOES-R status, benefits, accomplishments, and other pertinent information. Communications will be tailored to specific audiences and will vary depending on the intended target. The GPO communicates information to these groups through various methods. In turn, the GPO receives feedback, readiness status, and recommendations that are taken into account for future decision making.

5.6.1 Stakeholder Communication

A key component of this plan is to reach strategic stakeholders – those who make decisions or inform decision-makers on funding for the GOES-R Program and other environmental satellite programs. Key stakeholders also represents the interest of the broader public and are active consumers of scientific information. Effectively communicating to Stakeholders is essential to ensuring that the life-saving capabilities of GOES-R are recognized and understood, and that the program continues to receive adequate funding and support. Key sources of information for this audience are online content, briefings, and scientific publications.

Online Communication:

The GOES-R website (www.goes-r.gov) is a primary outlet of communications and key source of current information on the status of GOES-R. High level information on the mission, space segment, ground segment, systems engineering, data products, and the latest news is detailed here as well as the benefits GOES-R will provide. The GPO will ensure that this website is fully functional and current. Stakeholders can utilize this resource for the latest GOES-R news and top-level program information.

Briefings:

The GOES-R Program will keep key offices of NASA and NOAA informed about GOES-R and will communicate the latest news and developments through targeted briefings. This includes providing monthly updates to the NOAA Program Management Council (PMC) and at NESDIS and GSFC Monthly Status Reviews (MSR). GOES-R will also provide quarterly briefings to Department of Commerce (DoC), and annual briefings to users such as the Office of the Federal Coordinator for Meteorology (OFCM), which are then distributed to its agencies that will be users of GOES-R data and products. To reach GOES-R's Congressional stakeholders, the Program coordinates with NOAA and NASA Legislative Affairs units as appropriate to provide status updates, quarterly briefings to Congress, and testimonies as needed.

The GPO also coordinates with NOAA/NESDIS and NASA/GSFC Communications Offices to not only ensure that GOES-R messaging is part of overall NOAA/NESDIS and NASA/GSFC communications but to collectively leverage resources and technology as needed particularly when engaging with key stakeholders. GOES-R also serves as a member of the NESDIS Education Council, NESDIS Communicators Team, and other GSFC communication groups.

Scientific Publications:

In addition to online content and briefings, GOES-R will provide targeted articles and meeting summaries to science publications such as the Bulletin of the American Meteorological Society and NASA Earth Observer to educate and provide status updates stakeholders on the GOES-R mission. Respected publications are influential resources for this audience.

5.6.2 User Community Communication

The GOES-R User Community is one of the key variables to the success of GOES-R. The GOES-R User Community is large, diverse, and global and requires significant lead time to plan, budget, execute, and test the systems to be ready for the GOES-R data streams and products. The program must effectively reach and communicate to all users. Much of the User Community communication can be targeted to the audience as a whole, but in some cases, the program will use specific communications methods to target users by the way they will receive GOES-R data (Advanced Weather Interactive Processing System (AWIPS), GOES Rebroadcast (GRB), or the Comprehensive Large Array-data Stewardship System (CLASS).

The GOES-R Proving Ground:

PG activities and communications are crucial to Day 1 GOES-R readiness. The PG effort has been successful in bridging the gap between research and operations and providing a rich source of information contributing to user education and training on GOES-R applications.

The status of PG activities is posted on the GOES-R website, Cooperative Institute and partner websites, and PG blogs for interested parties to track the progress. Detailed information about PG activities and functions can be found in Section 4: Proving Ground of this document.

Online Communication:

An important source of information for the User Community is the GOES-R website. In addition to the top level information targeted to a broad audience, there is also a User Community section of the site, with information related to training, Cooperative Institutes, PG activities, and data transition. The site also includes information about upcoming and past conferences and meetings including presentations from those meetings. There is a robust documents section that includes both program directives and briefings. The GPO will continue to seek ways to expand User Readiness content on the site. The GPO participates in the NESDIS Web Team, where ideas and best practices for website communications are shared.

Other websites and blogs associated with GOES-R Cooperative Institutes and PG partners are important in providing information about the development of GOES-R products and examples of how GOES-R proxy products are being used now and how they will be used in the future. Blogs published by Cooperative Institutes, centers, and testbeds, provide up-to-date information on training and testing of GOES-R products.

Social Media:

The GPO recognizes the power of social media. The program has created a Facebook page for GOES-R (www.facebook.com/GOESRsatellite) to communicate news and information about the mission as well as PG activities. The page encourages the User Community to comment and ask questions, and has been successful in creating two-way communication between the program and user. The GPO is also an

administrator of the GOES-R PG Facebook page (www.facebook.com/goesrpg), which focuses specifically on PG news and activities.

The GPO participates in both the NESDIS and GSFC Social Media Teams, where ideas and best practices for social media communication are shared. Also, as part of the cooperation of the social media teams, NESDIS and GSFC Facebook pages share top GOES-R stories, broadening the audience for GOES-R messaging. The GPO plans to utilize additional social media as the GOES-R launch date approaches, such as Twitter, Google+, and Wikipedia. While there is currently a Geostationary Operational Environmental Satellite Wiki Page, the GPO will create and keep up-to-date GOES-R-specific content.

Training Modules:

Tutorials and training videos are essential in communicating information about the GOES-R Mission and the products that will be available to end users. The GPO works with the Cooperative Program for Operational Meteorology, Education and Training (COMET) which creates training modules and distance education courses about satellite meteorology, weather forecasting, and specific GOES-R capabilities. These videos can be found on the GOES-R website, through the COMET Meteorology Education and Training (MetEd) site, and on YouTube. Other online training modules are available through the Virtual Institute for Satellite Integration Training (VISIT) and NASA SPoRT (Short-term Prediction Research and Transition Center). All training material will be discussed in Section 6: Training.

Conferences and Meetings:

Conferences and meetings are important opportunities to reach the User Community and to give the program the chance to communicate with different types of users. The GPO participates in and conducts conferences with the User Community to keep current with new developments in the program and to assess user readiness. The program also uses these conferences to obtain user feedback; gaining insight from different communities to ensure that user readiness will be achieved.

The GOES-R Program participates in many conferences each year, providing briefings on the mission, instruments, ground segment, PG activities, products, and program updates. The annual American Meteorological Association (AMS) and National Weather Association (NWA) meetings are important opportunities to connect with the broader forecast and user communities. The AMS Broadcast Conference is an important user group that the program would like to serve as GOES-R “ambassadors” in their local markets.

The Data Collection Services (DCS) participates in the NOAA Satellite Conference, which gives the GPO the opportunity to reach direct readout users who will utilize GRB to receive their data once GOES-R becomes operational. This conference is also an opportunity to reach international GOES-R users, especially those in Central and South America. Spanish translators are available at this conference and many of the presentations, reading materials, and some training video modules are translated in Spanish as well.

DCS hosts other meetings focused on the Satellite Telemetry Interagency Working Group (STIWG), Technical Working Group (TWG), and High Rate Information Transmission (HRIT)/Emergency Managers Weather Information Network (EMWIN). The DCS meets annually to bring together the STIWG and TWG in a forum where status is reported and feedback is also welcomed. The STIWG is a user advisory group set up to represent user interests to NOAA’s satellite operators. They present user requirements and user concerns to NOAA, and assist in making decisions on direction of new development activities. This meeting is open to all users of the DCS (except vendors) but only specified members have voting privileges if a vote is required. The TWG meeting is open to all users of the GOES DCS. This meeting is an opportunity for

users to hear reports from NOAA's satellite operators, and discuss technical issues with NOAA and other users, and with equipment manufacturers.

The annual EUMETSAT Meteorological Satellite Conference allows GOES-R to reach the European User Community. Additional partnerships with EUMETSAT are developing as the GOES-R program evolves. Within the PG, NOAA and EUMETSAT cooperate through a Visiting Scientist program. This program allows representatives from both sides to discuss the GOES-R products and how to enhance them so they apply to a wider user audience. This cooperative endeavor allows for a diverse view on the development and improvement of products.

Scientific Publications:

Scientific publications are another resource for reaching the User Community. GOES-R has written and will continue to write articles in science magazines such as the *Bulletin of the American Meteorology Society (BAMS)*. *Space News* and the *Earth Observer* are other opportunities to publish information about GOES-R.

Print Communications:

Printed materials are another important source of information used to reach the User Community. One example of this is the two-page factsheets that are produced by the GPO to provide detailed information on each of the GOES-R products as well as the PG. These fact sheets are targeted toward operational forecasters to help them understand the new products and activities. These materials are distributed at conferences and meetings throughout the year and are also available on the GOES-R website.

5.6.3 Public Communication

It is important to connect with the broader public community to increase awareness of the GOES-R Mission and communicate the many benefits the system will provide to their daily lives. The public, in turn, is a major influencer of policy and decision-makers. Students and educators are a specific subset of the general public that is important to reach out to because they are the future users of GOES-R data and future decision-makers.

General Public

Broad, top-level communication is needed to reach the general public to increase awareness and communicate how GOES-R will benefit the public on a daily basis.

Online Communication:

The GOES-R website (www.goes-r.gov) is one of the primary tools that will be used to reach all audiences, including the public. Certain sections of the website are targeted to specific audiences, and the public will benefit from the homepage, mission overview, space and ground segment overviews, education and outreach, multimedia, and news content. The GPO is also a member the NESDIS Web Team, which is a forum for sharing ideas and best practices for online communications and these resources are utilized to continually improve online communications. The GPO will ensure resources are provided to keep the website up-to-date and to employ web technologies that are designed to enhance the users' web experience.

Social Media:

Social media is also a powerful tool for reaching the public. The GOES-R Facebook page (www.facebook.com/GOESRSatellite) communicates top level news and information about the mission. The page encourages the public to comment and ask questions and has been successful in creating two-way communication between the program and the public. This page gives the public the opportunity to have specific questions about the mission answered.

The public also has access to NESDIS and GSFC Facebook pages that share top GOES-R stories. The use of Twitter, Google+, and Wikipedia will also give important information to the public.

Multimedia:

Multimedia is another important component in reaching the general public. High-quality videos and animations catch the eye of the public and illustrate the components of the GOES-R mission and the benefits it will provide. The GPO will work with NESDIS and GSFC visualization labs to create multimedia for the press and the general public which provide a high level look at GOES-R and its capabilities. The multimedia offerings will be showcased on the GOES-R website and Facebook page, NESDIS and GSFC website and Facebook pages, and the GPO plans to create a GOES-R YouTube channel for broader distribution of multimedia resources.

Print Communications:

Printed material is another important communication tool for interacting with the general public. The GPO coordinates with NASA's Jet Propulsion Laboratory (JPL) to produce high-quality, visually appealing, and informative printed material targeted to a broad general audience. These materials include bookmarks, calendars, posters, and other materials to educate the general public about GOES-R and its mission. The GPO also produces informative 2-page fact sheets that give overviews of GOES-R products, services, and mission elements. In addition, the GPO coordinates with NESDIS and GSFC Public Affairs Offices to create press releases to disseminate information about GOES-R milestones and latest news to the media and general public.

Students and Educators

Students and educators are a key component of the public audience. Youth are future forecasters, broadcast meteorologists, and policy-makers. It is essential to engage the youth audience to promote understanding of geostationary satellite technology and encourage scientific study and exploration. The GPO coordinates with NESDIS, GSFC, and JPL to create high-quality, engaging educational materials targeted to students and educators. GOES-R also serves as a member of the NESDIS Education Council.

Online Content:

A key method for reaching students is through the production of online content. Educational resources can be found on the GOES-R website in the Education and Outreach section which includes educational modules as well as fun and games. The GOES-R website also links to additional educational resources such as "Student Activities in Meteorology (SAM)," the Cooperative Institute for Meteorological Satellite Studies (CIMSS) "Satellite Meteorology for Grades 7-12," NOAA Science on a Sphere, NOAA and NASA Educational Resources, and JPL's Space Place and Scijinks. The Space Place (spaceplace.nasa.gov) is targeted to elementary school students and Scijinks (<http://scijinks.jpl.nasa.gov>) targets middle and high school students. Both websites provide fun and educational material, games, tutorials, and activities to help students learn about NASA missions, Earth and space science, weather, and technology. Each site contains GOES-R specific content.

Educational Activities and Games:

JPL has developed several educational modules, games, and activities for GOES-R. Examples include the GOES-R Fun Pad which allows kids to explore GOES-R through mazes, riddles, crosswords, word searches, and other fun activities. And the GOES-R Flight Controller is a game that allows kids to help plan hazard-avoiding flight paths for passenger planes flying between cities. Several other Space Place and Scijinks games and activities related to weather, the Earth, space, and satellites contain GOES-R content.

The GPO also recognizes the need to utilize new technology to reach the youth audience. JPL developed the iPhone/iPad app, "Satellite Insight," that demonstrates the large amount of data that GOES-R will

provide. This is the first iPhone/iPad app from NOAA, and the GPO will continue to utilize apps and other new technology to reach a younger audience.

Print Communications:

GOES-R also coordinates with JPL to develop and distributes printed educational materials such as bookmarks, posters, and calendars to educators and students through education fairs, conferences, and events such as the American Association of School Librarians (AASL) and National Science Teachers Association (NSTA) meetings.

All public education efforts are focused on creating high-level, informative, top-quality materials and content that will engage the public, including students and educators as well as the media, to encourage the broader public to learn about GOES-R and increase understanding of how important it is to their daily lives and their future. An informed, enthusiastic public can influence policy makers to maintain funding for GOES-R and similar programs.

5.7 Roles and Responsibilities

Given the diverse and multi-faceted nature of Communications and Outreach efforts, a team approach is necessary. The GPO is responsible for message development and the overarching coordination of strategy and plans. GOES-R will coordinate with NESDIS and GSFC Communication and Public Affairs Teams to fulfill this mandate. The GPO is also responsible for content development and maintenance of the GOES-R website, Facebook page, Wikipedia page, and any future social media efforts. The GPO develops fact sheets on GOES-R products and mission elements, program briefings for internal and external conferences and meetings, responses to Government Accounting Office (GAO) requests and audits, and regular briefings for various stakeholders (OMB, OFCM, DoC, NOAA, NASA, etc.). The GPO is responsible for funding all communications and outreach efforts.

The GPO also partners with and allocates funding for Communications and Outreach activities with the following:

- NASA JPL
 - Development, creation, and distribution of:
 - Print materials (calendar, posters, bookmarks, etc.)
 - Educational materials (GOES-R Fun Pad, Space Place and Scijinks tutorials, puzzles/games, etc.)
 - Mobile apps
 - Graphics work
- NOAA Environmental Visualization Lab
 - Development of multimedia resources
- NASA Goddard Scientific Visualization Studio
 - Development of multimedia resources
- COMET
 - Development and distribution of interactive training modules for the forecasting community
- Cooperative Institutes [Cooperative Institute for Meteorological Satellite Studies (CIMSS), Cooperative Institute for Research in the Atmosphere (CIRA), Short-term Prediction Research and Transition Center (SPoRT)]
 - Disseminate information about GOES-R PG activities through the use of blogs

The GPO utilizes a team of support contract staff to provide graphics and visualizations, briefing support, outreach content development, conference/meeting planning and support, and online maintenance and support.

5.8 Communications Summary

A comprehensive Communications and Outreach Plan is necessary for the GOES-R Program to identify key target audiences and inform them of *what* GOES-R is, *why* it is an important component of the NOAA and NASA missions, and *how* it is relevant to them. To accomplish this, a strategically targeted approach leveraging a coordinated network of partners and resources will be utilized. Communications methods will be multi-faceted to broaden reach and messaging will be targeted, engaging, and informative. Implementation of this plan will allow for two-way communication between the GOES-R Program and its audiences, opening a pathway for understanding and awareness. The plan will aid efforts to prepare the User Community for the magnitude of data and products that will be available from GOES-R. By communicating the critical benefits of GOES-R to key audiences, the GPO hopes to maintain stakeholder support for the program, engage the broader public and increase awareness, encourage wider use of GOES-R products and services, and ensure the future success of the mission.

6 Training

This section contains the GOES-R user training plan. It describes resources that will be used to train the GOES-R user communities on the use of data and products. The training plan describes how GOES-R affects the training mechanisms currently in place and where to receive information about upcoming or changing training mechanisms.

6.1 Training Development

NOAA has a well-established training program that includes the:

- Warning Decision Training Division (WDTD)
- Forecast Decision Training Division (FDTD)
- Analyze, Forecast and Support (AFS) Office formerly Office of Climate, Water, and Weather Services (OCWWS) Training Division
- COMET training program
- NWS Training Center (NWSTC)

Under the NWSTC, a new Operations PG in Kansas City, MO was established and has become the main focus of obtaining and creating new training on GOES-R products for NWS forecasters and other NOAA users. All users can obtain GOES-R training from various websites and tele-training, specifically COMET and VISIT. These programs are also developing training specifically geared toward the NWS user. A fair amount of preliminary training will come from the GOES-R PG.

A more recent addition to the GOES-R program is the position of “Satellite Liaison”. Satellite Liaisons are stationed at most of the National Centers and the NWS Training Center. Satellite Liaisons are tasked with running the various GOES-R demonstrations within these testbed locations. They are essentially a research-to-operations liaison, improving upon training from the product developers to present to testbed participants, and providing participant feedback to the developers for further improvement.

6.2 Training Sources

The following sections address the main sources of training information. While this applies to all users, these will be the primary sources of training for non-NOAA users.

6.2.1 COMET/MetEd

A primary source of information for users is COMET’s MetEd website. COMET’s mission is to “create environmental science education and training in support of a diverse community of users by offering media-rich, interactive, multi-lingual distance learning, internet-based synchronous and asynchronous courses, a user tracking and assessment system, and residence courses, workshops, and meetings.”² COMET takes training information from product developers and Satellite Champions to create internet-based training modules. In addition to the many GOES and GOES-R focused modules currently on the COMET website, additional modules will be developed over the next several years. Modules are continuously being created in Spanish as well to serve the Spanish speaking user community.

² http://www.comet.ucar.edu/who_about_us.php

6.2.2 ESRC

Within the MetEd website is the Environmental Satellite Resource Center (ESRC) that started in 2008. The ESRC is a searchable, database-driven website that provides easy access to a wide range of useful information and training materials on polar-orbiting and geostationary satellites. The ESRC is intended as a “one-stop-shop” for users seeking reliable sources of satellite information, training, and data.

6.2.3 VISIT

Another training source primarily for the NWS forecaster is the Virtual Institute for Satellite Integration Training (VISIT). VISIT is a collaborative effort combining NESDIS, NOAA-NESDIS Cooperative Institutes and the NWS to “accelerate the transfer of research results based on atmospheric remote sensing data into NWS operations using distance education techniques.”³ This is achieved by developing web-based audio/visual modules and live teletraining which are communicated to an expert at the local NWS forecast office (generally a Science Operations Officer).

6.2.4 SHyMet

The Satellite Hydrology and Meteorology (SHyMet) program is also geared toward NOAA and NWS users. It is designed to bring users the latest “satellite data and products in the warning and forecast programs with direct links to Government Performance Results Act goals” through online learning and teletraining.⁴

6.2.5 WES

Another important tool that the NWS Training Division has developed, is the Weather Event Simulator (WES) based on AWIPS. WES essentially plays back archived AWIPS data in a simulation mode as if in real time. WES cases (archived weather event) using satellite data and products have already been incorporated and will continue to be incorporated into COMET and VISIT training courses.⁵

6.2.6 CIMSS

The NOAA/NASA Cooperative Institute for Meteorological Satellite Studies at the University of Wisconsin-Madison is a developer of many GOES-R products. Preliminary training on the products they provide can be found on their website.

6.2.7 CIRA

The NOAA/NASA Cooperative Institute for Research in the Atmosphere at Colorado State University is another developer of GOES-R products. Information and preliminary training may also be found on their website.

³ http://rammb.cira.colostate.edu/training/visit/mission_statement.asp

⁴ <http://rammb.cira.colostate.edu/training/shymet/>

⁵ Training and Education in Support of NOAA’s Advanced Space-based Remote Sensing Programs and Global Earth Observing System of Systems (GEOSS) Proposed Activities FY11 to FY 15, March 2011.

6.2.8 SPoRT

NASA's Short-term Prediction Research and Transition Center at the Marshall Space Flight Center is another key developer of GOES-R products. Further information and training may be found on their website.

6.3 Implementation Timeline

All training described above will continue through 2016 (year of GOES-R launch), contingent upon funding. Recent and planned training applications include:

- COMET module on GOES-R ABI channels and their applications (2012)
- COMET module on the GOES-R PG (2013)
- COMET module on environmental satellite benefits for the transportation industry (2014)
- COMET module on applications of advanced GOES-R products
- A series of WES cases illustrating the integration of GOES-R products into NWS operations (joint with the NWS Warning Decision Training Branch, 2013)

6.4 Coordination with the NWS Operations Proving Ground in Kansas City

The new NWS Operations Proving Ground was created during FY2012 and began research to operations testbeds in FY 2013. The NWS Operations PG has continued to work with NOAA OSPO and the GOES-R PRO team to optimize the GOES-R/16 products. GOES-S efforts will build on this existing coordination to optimize products in a two-satellite constellation environment.

6.5 Website Links

More details about the various training resources mentioned in the previous subsections are available via the Internet by visiting the following web sites:

MetEd - <https://www.meted.ucar.edu/>

ESRC - <https://www.meted.ucar.edu/esrc/>

VISIT - <http://rammb.cira.colostate.edu/training/visit/>

SHyMet - <http://rammb.cira.colostate.edu/training/shymet/>

WES - <http://www.wdtb.noaa.gov/tools/wes/index.htm>

NWS Training Portal - <http://www.nws.noaa.gov/training/>

NWS Training Division - <http://www.nws.noaa.gov/os/training/index.shtml>

CIMSS - http://cimss.ssec.wisc.edu/goes_r/proving-ground/SPC/SPC.html

CIRA - http://rammb.cira.colostate.edu/research/goes-r/proving_ground/cira_product_list/

SPoRT - <http://weather.msfc.nasa.gov/sport/training/>

Appendix A. Acronyms

AASL	American Association of School Librarians
ABI	Advanced Baseline Imager
AFS	Analyze, Forecast and Support Office
AWG	Algorithm Working Group
AWIPS	Advanced Weather Interactive Processing System
BLM	Bureau of Land Management
CI	Cooperative Institutes
CIMSS	Cooperative Institute for Meteorological Satellite Studies
CIRA	Cooperative Institute for Research in the Atmosphere
CLASS	Consolidated Large Array Data Stewardship System
COMET	Cooperative Program for Operational Meteorology, Education and Training
DCS	Data Collection System
DCS	Data Collection Service
DoC	Department of Commerce
DoD	Department of Defense
DRO	Direct Readout
EC	Environment Canada
EMWIN	Emergency Managers Weather Information Network
EPA	Environmental Protection Agency
ESPDs	Environmental Satellite Processing and Distribution System
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FAA	Federal Aviation Administration
FDTB	Forecast Decision Training Branch
FEMA	Federal Emergency Management Agency
FSP	Flight Segment Plan
GAO	Government Accounting Office
GFS	Global Forecast System
GLM	Geostationary Lightning Mapper
GOES	Geostationary Operational Environmental Satellites
GPO	GOES-R Program Office
GRB	GOES Rebroadcast
GSP	Ground Segment Plan

GSP	Ground Segment Project
GSPSO	Ground Segment Project Science Office
GUC	GOES Users' Conference
GVAR	GOES Variable
HRIT	High Rate Information Transmission
INPE	Instituto Nacional de Pesquisas Espaciais
IR	Infrared
JPL	Jet Propulsion Laboratory
JPSS	Joint Polar Satellite System
KMA	Korea Meteorological Administration
KPP	Key Performance Parameter
L0	Level 0 (Mission Data)
L1b	Level 1b (Calibrated, Geolocated data products)
L2+	L2 and higher-level products
LRIT	Low Rate Information Transmission
Mbps	Megabits per second
McIDAS	Man computer Interactive Data Access System (data format)
MODIS	Moderate Resolution Imaging Spectroradiometer
MSR	Monthly Status Review
NASA	National Aeronautics and Space Administration
NCEP	National Centers for Environmental Prediction
NESDIS	National Environmental Satellite, Data, and Information Service
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAT	NWS Operational Advisory Team
NOS	National Ocean Service
NPP	(Suomi) National Polar-orbiting Partnership satellite
NSTA	National Science Teachers Association
NTSB	National Transportation Safety Board
NWS	National Weather Service
NWA	National Weather Association
NWSTC	NWS Training Center
OAR	Office of Atmospheric Research
OCWWS	Office of Climate, Water, and Weather Services, now Analyze, Forecast and Support Office

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OFCM	Office of the Federal Coordinator for Meteorology
PDA	Product Distribution Access
PG	Proving Ground
PGEB	Proving Ground Executive Board
PMC	Program Management Council
PUG	Product Users Guide
QPE	Quantitative Precipitation Estimation
RF	Radio Frequency
RFC	River Forecast Center
SAM	Student Activities in Meteorology
SARSAT	Search and Rescue Satellite Aided Tracking
SDEB	Science and Demonstration Executive Board
SEVIRI	Spinning Enhanced Visible Infrared Imager
SPC	Storm Prediction Center
SPoRT	Short-term Prediction Research and Transition Center
STIWG	Satellite Telemetry Interagency Working Group
TWG	Technical Working Group
USGS	United States Geological Survey
VISIT	Virtual Institute for Satellite Integration Training
WDTB	Warning Decision Training Branch
WES	Weather Event Simulator
WFO	Weather Forecast Office
WMO	World Meteorological Organization

Appendix B. Referenced and Related Documentation

The following is a representative list of documents, presentations, and web sites that relate to user readiness assurance. The list is organized by type; GPO documentation including plans and presentations by the GOES Flight and Ground Segment (FSP) and (GSP) respectively, Conference Presentations including presentations in meetings or the Meteorological Community and other organizations connected to the GOES Mission and its data. For material that is available on web sites, the URL and a short description are listed.

NASA, NOAA, and GOES Program Documentations:

- Geostationary Operational Environmental Satellite-R (GOES-R) Level-1 Requirements Document, (L1RD) March 1, 2011, **410-R-L1RD-0137, Version 3.5**
- Geostationary Operational Environmental Satellite-R (GOES-R) Series Ground Segment (GS) Project Plan, **410-R-PLN-0085, Version: 3.0**
- GOES-R Mission Requirements Document (MRD) **410-R-MRD-0070, Version 3.24**
- Geostationary Operational Environmental Satellite-R (GOES-R) PROVING GROUND PLAN, March 2010 GOES-R Access System (GAS) CONOPS
- GOES-R Product Users' Guide [in preparation]

Meetings of the AMS and GOES Users' Conference

- NWS Perspective for Lidar Wind Data, Jim Yoe – NWS/NCEP and the JCSDA, Mike Johnson – NWS/OST, February 8, 2011
- The SPoRT Center-Infusing NASA Technology Into NWS WFOs, Dr. Gary Jedlovec NASA/MSFC Earth Sciences Office, May 5, 2010
- Short-term Prediction Research and Transition Center (SPoRT) Project Overview, NWS and NASA/SPoRT Meeting, March 3, 2010

Websites

- Product Description Document: NCEP Model Analysis & Guidance, March 2011, <http://mag.ncep.noaa.gov>
- The GOES-R Website: <http://www.goes-r.gov>
- Proving Ground website: <http://www.goes-r.gov/users/proving-ground.html>