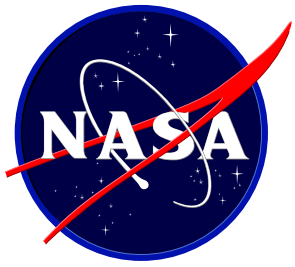
National Aeronautics And Space Administration

GOES-N Mission

Press Kit
May 2006



GOES-N Mission Contacts

Erica Hupp NASA Headquarters, Washington, D.C.	NASA Headquarters PAO	202-358-1237
Cynthia M. O'Carroll Goddard Space Flight Center, Greenbelt, MD	NASA GSFC PAO	301-286-4647
George Diller Kennedy Space Center, FL	KSC PAO	321-867-2468
John Leslie NOAA Suitland, MD	NOAA PAO	301-457-5005
KSC PAO Office KSC	3 days before the launch	321-867-2468

Contents

(Rev. 10, 5/18/06)

Media Services Information

NASA Media Services

News Center/Status Reports

NASA Public Affairs will staff the KSC News Center beginning on L-3 days, continuing until approximately two hours after a successful launch. The NASA News Center at KSC may be reached at 321/867-2468. Recorded status reports also will be available beginning two days before launch by dialing **321-867-2525** or **301-286-NEWS**.

Briefings

The L-1 Pre-launch Press Conference is scheduled for May 23 at 1 p.m. at the NASA News Center at KSC. Information presented will include the details about the Delta IV countdown, launch readiness of GOES-N, background on the satellite and its mission, and the launch weather forecast. The briefing will be carried live on NASA TV. Audio of the conference will be carried on the NASA "V" circuits, which may be accessed by dialing 321/867-1220...1240...1260...7135.

Media Credentialing for the Pre-Launch Press Conference

Media seeking launch accreditation for the Prelaunch Press Conference should apply via the web no later than 48 hours prior to the event. Go to:

https://media.ksc.nasa.gov

For further accreditation information, contact Mandi Falconer at 321/867-2497.

NOTE: Media credentialing for all launch day activities must be done separately through Boeing Launch Systems (BLS). See information on launch activities below.

NASA Television Transmission

NASA Television will broadcast Boeing's launch coverage of GOES-N that begins at 5:45 p.m. EDT, concluding 30 minutes after liftoff. See Boeing Media Services below for additional launch coverage information.

NASA Television is on AMC-6, Transponder 17C, located at 72 degrees West longitude, frequency 4040.0 MHz video, 6.8 MHz audio (MPEG-2 digital signal). For NASA TV information and schedules on the Internet, visit:

http://www.nasa.gov/ntv

Internet Information
Detailed information about the GOES-N mission and science objectives can be found at the following NASA and NOAA websites:

http://www.nasa.gov/goes-n
http://goespoes.gsfc.nasa.gov
http://www.noaa.gov
http://nws.noaa.gov

NASA Hurricane Resource website:

http://www.nasa.gov/hurricane

Boeing Media Services

Boeing Launch Activities
This is a Boeing commercial launch; therefore, all launch day activities will be handled by Boeing Launch Systems (BLS). These activities include all media credentialing for the launch, launch commentary and broadcasting the launch on a commercial satellite feed. Boeing will provide updated launch information at (714) 896-4770.

Launch Day Media Credentialing
Accredited media wishing to attend the launch should meet at the Pass & I.D. parking lot of Cape Canaveral Air Force Station (CCAFS). All media equipment and vehicles will be subject to a security inspection prior to entering the base. The press site will be located at NASA Causeway, Station B, NASA KSC.

Boeing Launch Coverage and Live Web Cast
Live commentary and launch coverage by Boeing of the GOES-N launch will be available on a commercial satellite transponder beginning at 5:45 p.m. EDT on May 20 and will conclude approximately 30 minutes after launch. Satellite coordinate information is:

Satellite: TBD, Transponder TBD; Orbital Location: TBD; Downlink Frequency: TBD; Audio Channels: TBD

Additional Boeing press information may be obtained from the following:

http://www.boeing.com
http://www.boeing.com/delta

GOES-N Quick Facts

The GOES-N satellite was built Boeing Space & Intelligence Systems (BS&IS) and will be launched by Boeing Launch Systems (BLS). Each satellite in the satellite series carries two major instruments: an Imager and a Sounder. In addition, GOES-N will carry the Space Environment Monitor suite on instruments the Solar X-ray Imager (SXI) and a Search and Rescue Transponder.

Main Spacecraft Design Elements

• Space dimensions:	Length 13.75 ft. (4.2m); Width 6.2 ft. (1.88m)
• Weight at Launch:	6908 lbs. (3133 kg.)
• Weight in orbit (beginning of life	3969 lbs. (1800 kg.)
• Propulsion:	Liquid Apogee Motor 110 lbf (490N) Stationkeeping Thrusters 75 W and 135 W
• Power – Solar	Beginning of life, 2.3 kw; End of life, 2 kw
• Solar panels	1 wing, w/1panel of dual-junction gallium arsenide solar cells
• Payload	S-Band, 1 downlink, 5 uplinks (include telemetry and command data) L-band, 8 downlinks UHF, 1 downlink, 2 uplinks
• Antennas	3 S/L Band, cup-shaped with dipole 2 T&C antennas and 1 Omni antenna (aft) 1 UHF, cup-shaped with dipole
• Attitude Control	three-axis body stabilized built on the Boeing 601 heritage design
• Control System	stellar inertial based control system that employs a set of three star tracers and a Hemispherical I Inertial Reference Units (HIRU) to monitor and compute the spacecraft's attitude
• Spacecraft control	four reaction wheels are used to control the spacecraft In the normal mode
• Momentum control	twelve 2-lb. thrusters are used to manage momentum and to maintain the orbital location
• Launch vehicle:	Boeing Delta IV Medium + (4,2)

Science Instruments: Imager, Sounder, and the Space Environment Monitor System (SEM). The SEM consists of a three-axis vector magnetometer, an Energetic Particle Sensor (EPS) and associated High-Energy proton and Alpha Detector (HEPAD), the X-Ray Sensor (XRS) and the Solar X-ray Imager (SXI).
Mission Lifetime: 10 years (after 2 years of on-orbit storage and 8 years operational)
Launch Site: Eastern Range SLC 37B, Cape Canaveral Air Force Station
Launch Date/Window: May 24, 2006 at 6:11 p.m. – 7:11 p.m. EDT (60 minute window).
Spacecraft separation: 4 hours and 20 minutes after launch
First Signal Acquisition: 6 hours and 30 minutes after launch at the Air Force Tracking Station, Diego Garcia located in the Indian Ocean.
Engineering Handover from Boeing to NASA: Launch + 24 days**,**
NASA completes on-orbit checkout: Launch + approximately 200 days – spacecraft acceptance by NASA and handover to NOAA for operations
Spacecraft Provider: Boeing Satellite Systems
Launch Operations: Boeing Launch Systems
Spacecraft Operations: Satellite Operations Control Center, Suitland, Md.
Mission Management: NASA Goddard Space Flight Center, Greenbelt, Md. and The National Oceanic and Atmospheric Administration.

GOES-N Mission Cost: Total mission costs are approximately $481.4M for the spacecraft, the instrument payload and launch services.

Earth System Science and the Geostationary Operational Environmental Satellite Program Objectives

Beginning in the 1960s, NASA pioneered the study of the atmosphere from the unique perspective of space with the launch of its Television Infrared Observation Satellite. Thanks to new satellite and computer technologies, it is now possible to study the Earth as a global system.

Earth System Science integrates many disciplines of scientific research that focus on understanding the planet as a whole, its integral parts and how its parts interact. Through research, scientists are getting better at understanding and improving their forecasting of climate and weather phenomena.

The GOES N-P series of spacecraft continuously observe and measure meteorological phenomena in real time, providing the meteorological community and the atmospheric scientist greatly improved observational and measurement data of the Western Hemisphere. In addition to short-term weather forecasting and space environmental monitoring, these enhanced operational services also improve support for atmospheric science research, numerical weather prediction models, and environmental sensor design and development. Forecasting the approach of severe storms, the GOES system of weather satellites provides timely environmental information to meteorologists and their audiences alike—graphically displaying the intensity, path and size of storms. Early warning of impending storms enhances the public’s ability to retreat to safety and protect their property.

The NOAA satellites help to carry forth the U.S. commitment to systematic, global weather observation and provide total global coverage four times a day. The mission supports growing international cooperation in space; the spacecraft instrument suite provides data supporting requirements of 140 nations. All nations can access NOAA spacecraft data and for many, NOAA data is their sole weather forecasting reference. In addition to weather observations, the Search and Rescue component of the program makes major contributions toward international search and rescue operations.

The GOES program objectives support NASA's objectives by providing for distribution of meteorological data to various organizations, improving the capability for forecasting, providing real-time warnings of solar disturbances and by extending our knowledge of the atmosphere and its processes to improve short- and long-term weather forecasts. Data from the NOAA spacecraft are helping NASA scientists design instruments for follow-on Earth science missions. Also, with the data from the GOES satellites, NASA scientists are

continuing to develop applications that will directly enhance the quality of human life and help to protect the environment.

The GOES program disseminates information about the Earth system, expands scientific knowledge by characterizing the Earth system and enables productive use of Earth science products in the public and private sectors.

NASA AND NOAA TO LAUNCH
LATEST ENVIRONMENTAL SATELLITE
GOES-N FACT SHEET

GOES-N is the first spacecraft to be launched in the new GOES N-P series of geostationary environmental weather satellites. Developed by NASA for the National Oceanic and Atmospheric Administration (NOAA), the GOES satellites continuously provide observations of the Earth including the continental U.S., providing weather monitoring and forecast operations, as well as a continuous and reliable stream of environmental information and severe weather warnings.

The GOES environmental satellites are key in helping meteorologists observe and predict local weather events, including thunderstorms, tornadoes, fog, flash floods, and other severe weather. In addition, GOES observations have proven helpful in monitoring dust storms, volcanic eruptions and forest fires. Plus, the satellites support the search and rescue satellite aided system (SARSAT). The program directly enhances the quality of human life and furthers the protection of the Earth's environment.

Each GOES satellite carries two major instruments: an Imager and a Sounder. These instruments acquire high-resolution visible and infrared data, as well as temperature and moisture profiles of the atmosphere. They continuously transmit data to ground terminals where it is processed for rebroadcast to primary weather service offices in the U.S. and around the world, including the global research community.

These instruments provide two valuable features. The first, flexible scan, offers small-scale area imaging that allows meteorologists to take pictures of local weather trouble spots. This allows them to improve short-term forecasts over local areas. The second feature, simultaneous and independent imaging and sounding, is designed to allow weather forecasters to use multiple measurements of weather phenomena to increase the accuracy of their forecasts.

The GOES-N mission will be a vital contributor to weather, solar, and space operations and future science improvements with weather prediction and remote sensing. The satellite will aid severe storm warnings, resource management, search and rescue, emergency managers, and likely lead to additional advances in environmental sciences and multifaceted data applications of remotely sensed phenomena. GOES-N data will add to the global climate change databases of knowledge, embracing many civil and government environmental forecasting organizations that work to benefit people everywhere and help save lives.

GOES-N is scheduled to launch in the summer of 2006 on board a Boeing Delta IV (4,2) Expendable Launch Vehicle from the Space Launch Complex (SLC 37B) at Cape Canaveral Air Force Station.

The NASA-NOAA Partnership

In 1983, NASA signed an agreement with the NOAA to design and build a new generation of environmental satellites. These satellites would carry instruments designed to operate as never before, taking near continuous observations of Earth. NASA and NOAA have worked jointly to perfect, develop and complete the GOES program, begun in 1975 with the launch of the GOES-1 satellite. The two agencies have been actively engaged in a cooperative program ever since, and will continue the GOES series with the launch of the GOES-N satellite.

NOAA manages the overall GOES Program and establishes requirements, provides funding, distributes environmental data for the U.S., and determines the need for satellite replacement. NOAA also designs and develops the ground system needed to acquire, process and disseminate the satellite data.

NASA teams with NOAA to acquire and manage the study, design and development of each of the GOES spacecraft. NASA's Goddard Space Flight Center (GSFC) in Greenbelt, Md., is responsible for the construction, integration and verification testing of the spacecraft, instruments and unique ground equipment. Working as a team, NOAA and NASA design, develop, install and integrate the ground system needed to acquire, process, and disseminate the data from the sensors on the GOES satellites.

NASA's GSFC is responsible for the procurement of the GOES satellites for NOAA including final testing in Florida and the initial on-orbit checkout. NOAA is responsible for satellite operation, data distribution and management of the program. Boeing Launch Systems will conduct the commercial launch of GOES-N with a Federal Aviation Administration (FAA) launch license. Boeing is responsible for the Delta IV launch vehicle processing at SLC-37B, the integration of the GOES-N spacecraft with the Boeing Delta IV and the launch countdown activities.

Design and Operations

In the past, scientists from environmental service agencies have stated a need for continuous, dependable, timely and high-quality observations of the Earth and its environment. This new series of GOES satellites provide continuous observations to fill the need. The instruments on board the satellites measure the Earth's emitted and reflected radiation from which atmospheric temperature, winds, moisture and cloud cover can be derived.

GSFC engineers design the satellite to operate in geosynchronous orbit 22,000 miles

above the Earth. At this orbit, because the satellite's orbital velocity matches the rotation of the Earth, it appears to remain stationary in the sky. In addition, GSFC engineers develop the GOES satellites to have a three-axis body stabilized spacecraft design. This enables the satellite to "stare" at the Earth and provide images of clouds more frequently, relay an increased amount of data about the Earth's surface temperature and water vapor fields, and to sound continuously the atmosphere for vertical thermal and vapor profiles.

The system provides long-range weather forecasting, ensuring that non-visible data, for any region of the Earth, is no more than six hours old. It serves the central and eastern Pacific Ocean; North, Central, and South America; and the central and western Atlantic Ocean. Pacific coverage includes Hawaii and the Gulf of Alaska. Two satellites accomplish this, GOES west located at 135 degrees west longitude and GOES East at 75 degrees west longitude. NOAA's Command and Data acquisition station located in Wallops, Va., supports the interface to both satellites. The NOAA Satellite Operations Control Center in Suitland, Md. provides spacecraft scheduling, health and safety monitoring and engineering analyses. Processed data are received at the National Weather Service's National Centers for Environmental Prediction in Camp Springs, Md., and NWS forecast offices across the U.S.

The GOES N-P series has several new top-level capabilities. These capabilities include the Weather Facsimile service changing from an analog to a digital Low Rate Information Transmission format; expanded measurements for the space environment monitoring instruments; a new dedicated channel for the Emergency Managers Weather Information Network service; and most importantly, a more stable platform for supporting improved Imager, Sounder, and SXI instruments.

GOES-N will carry the government furnished ITT Space Systems Division built Imager and Sounder instruments to provide regular measurements of the Earth’s atmosphere, cloud cover, ocean temperatures and land surfaces. An advanced attitude control system using star trackers and an optical bench onto which the Imager and Sounder are mounted will provide enhanced instrument-pointing ability. These enhancements improve image navigation and registration to better locate severe storms and other events important to NOAA. NASA's GSFC and the NOAA's National Environmental Satellite, Data and Information Service (NESDIS) have set a higher standard of accuracy for the GOES-N series, including data pixel location to approximately two kilometers from geosynchronous orbit of 22,300 miles above the Earth’s surface.

GOES-N will also carry a government furnished Solar X-ray Imager (SXI) built by Lockheed Martin Advanced Technology Center in Palo Alto, Calif. Carried for the first time by GOES-M launched in 2001, the SXI will monitor solar weather conditions, including the dynamic environment of energetic particles, solar wind streams and coronal mass

ejections emanating from the sun. This data will allow forecasters to issue alerts of "space weather" conditions that may interfere with ground and space systems.

Another instrument package onboard GOES-N will be the Space Environment Monitor (SEM). SEM consists of three instrument groups including an Energetic Particle Sensor package, two magnetometer sensors, and a Solar X-Ray Sensor with an Extreme Ultraviolet Sensor. The units will perform *in situ* measurements of the magnetic and particle environments as well as remote measurement of the integrated X-ray emission and the extreme ultraviolet spectra of the sun.

The Energetic Particle Sensor and the Solar X-Ray Sensor with an Extreme Ultraviolet Sensor were built by Assurance Technology Corporation, Carlisle, Mass., and the two magnetometers were built by Science Applications International Corporation, Columbia, Md.

As of May 2006, the GOES system consists of GOES-12, operating as GOES-East in the eastern part of the constellation at 75 degrees west longitude, and GOES-10, operating as GOES-West at 135 degrees west longitude. GOES-11 is in an on-orbit storage mode nominally located at 105 West longitude and is scheduled to replace GOES-10 during the summer of 2006.

In addition to relaying information about the Earth’s climate and atmosphere, the GOES satellites also provide instantaneous relay of distress signals from people, aircraft, or marine vessels to the search and rescue ground stations of the Search and Rescue Satellite Aided Tracking (SARSAT) System. A dedicated search and rescue transponder on board GOES is designed to detect emergency distress signals originating from Earth-based sources. These unique identification signals are normally combined with signals received by NOAA's Polar Operational Environmental Satellite system and relayed to a search and rescue ground terminal. The combined data are used to perform effective search and rescue operations.

GOES System in Weather Forecasting

The GOES system is a basic element of U.S. weather monitoring and forecast operations and is a key component of NOAA's National Weather Service modernization program. Spacecraft and ground-based systems work together to accomplish the GOES mission of providing weather imagery and quantitative sounding data that form a continuous and reliable stream of environmental information for weather forecasting and related services.

The GOES satellites provide weather imagery and atmospheric sounding information for improved weather services, particularly for the timely forecasting of life-and property-threatening severe storms. The GOES N-P series will aid activities ranging from severe storm warnings to resource management and advances in science. GOES N-P data will

add to the global community of knowledge, embracing many civil and government environmental forecasting organizations that work to benefit people everywhere and help save lives.

Commercial weather groups, universities, the Department of Defense, NASA and the global research community also use GOES data products. Other users of these products can also be found in air and ground traffic control, ship navigation and agricultural sectors.

The GOES satellites are given a letter designation while under construction on the ground and are renamed with a numerical designation after successful launch and orbit-raising. The satellites are built in alphabetical order but are not necessarily launched in this same order.

GOES-N will be renamed GOES-13 upon reaching orbit where it will be stored until needed.

Data from the GOES spacecraft are helping NASA scientists design instruments for follow-on missions and for other NASA programs. NASA's Science Mission Directorate works to improve the lives of all humans through the exploration and study of Earth's system, the solar system and the Universe by using its unique observational capabilities from space. Earth science data, which NASA distributes to researchers worldwide, is essential to making informed decisions about the environment.

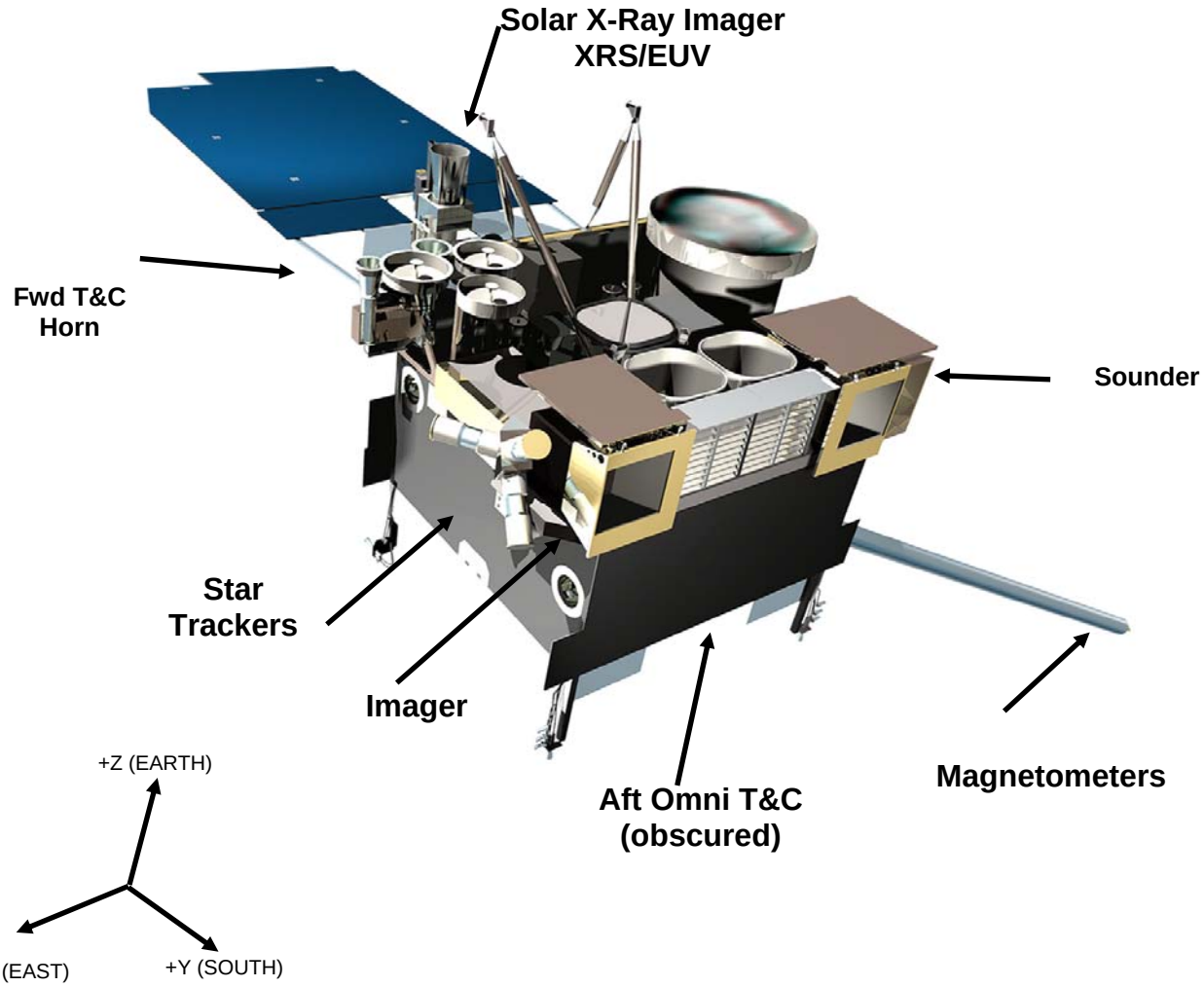
GOES-N Enhancements Over Previous GOES

- The Satellite design lifetime has been improved from 7 to 10 years, and the expected propellant lifetime has been increased to 14 years.
- The command data rate has been increased to 2,000 bps, as compared to a data rate of 250 bps for the previous generation of GOES satellites. The telemetry data rate has been improved to provide data at either 4,000 or 1,000 bps, as compared to the 2,000 bps data rate on the previous generation.
- The power subsystem has been improved so that operations during eclipse periods can be sustained. Outages due to solar intrusion Keep Out Zones (KOZ) will also be minimized because thermal shields have been added to the secondary mirror structure elements for the Imager and Sounder instruments. Over 600 more images and sounding sequences should be accomplished per year. Spacecraft design reduces solar loading on the radiant cooler and patch (no solar sail) so lower detector temperatures should reduce noise.
- An improved Image Navigation and Registration (INR) system will use star trackers to provide precision image navigation and registration information for use with the Imaging and Sounding data products. This will improve knowledge by at least 50 percent of exactly where severe weather events are located (3 km accuracy now becomes 1.5 km). A stable optical bench has been provided to isolate the thermal deformations of the spacecraft from the Imager and Sounder instruments.
- A data product improvement has been developed for digital Low Rate Information Transmission (LRIT) for distribution of data Products that were previously distributed in an analog WEFAX format. The LRIT system permits the transmission of data products consistent with the World Meteorological Organization (WMO) and allows the distribution of more National Weather Service (NWS) information at a higher data rate.
- The Data Collection System (DCS) has been enhanced with the addition of 300 and 1200 bps Data Collection Platforms (DCPs) and a higher power satellite transponder so that more DCPs can use the link at the same time.
- A dedicated transponder is being provided to support the Emergency Manager’s Weather Information Network (EMWIN) service.
- The communications services have been tailored to comply with modern national and international requirements.
- A new Solar X-Ray Imager (SXI) developed by the Lockheed Martin Advanced Technology Center. SXI improvements from GOES-12 include:

    - A back illuminated CCD (no high voltage)

- Increased dynamic range
- Improved charge collection efficiency (charge spreading/blurring)
- Image jitter correction using the High Accuracy sun Sensor
- Automatic flare event detection and more sequence capability
- Multiple image exposure and downlink capability each minute
- Flexibility of programmable memory for imaging

GOES-N On-Orbit Configuration



SPACECRAFT LOCAL COORDINATE REFERENCE FRAME

The Solar X-ray Imager

The Solar X-ray Imager (SXI) -- to be launched as part of the Space Environment Monitor suite of instruments on the GOES-N weather satellite -- will be used to aid National Oceanic and Atmospheric Administration (NOAA) and U.S. Air Force personnel in issuing forecasts and alerts of “space weather” conditions that may interfere with ground and space systems. Turbulent “space weather” can affect radio communication on Earth, induce currents in electric power grids and long distance pipelines, cause navigational errors in magnetic guidance systems, upset satellite circuitry and expose astronauts to increased radiation.

The first in a series of instruments, the Solar X-ray Imager will observe solar flares, coronal mass ejections, coronal holes, and active regions in the X-ray region of the electromagnetic spectrum from 6 to 60 A (Angstroms). These features are the dominant sources of disturbances in space weather that lead to, for example, geomagnetic storms. The Imager will also examine flare properties, newly emerging active regions, and X-ray bright points on the sun.

NOAA and the Air Force will use Solar X-ray Imager data for solar forecasting and monitoring solar storms, and to develop a better understanding of sun-related phenomena that affect the Earth’s environment.

The imager was developed, tested, and calibrated by Lockheed Martin Advanced Technology Center.

The imager instrument consists of a telescope assembly with a 6.3-inch (16-centimeter) diameter grazing incidence mirror and a detector system. Incoming X-rays graze the mirror's surface at very shallow angles and are brought to a focus on the detector system.

As long as the grazing angles are very shallow, about one degree, the X-rays do not penetrate the surface but are reflected, just like visible light. The detector system contains a micro-channel plate that converts the X-rays to visible light that is then recorded using a CCD camera. Resulting data is electronically packaged for transfer to NOAA ground stations in Suitland, Md., and Boulder, Colo. The images are processed and distributed to space weather forecast centers by the NOAA Space Environment Center in Boulder. The images are made immediately available to the public via the Internet by the NOAA National Geophysical Data Center, also in Boulder.

The imager will provide continuous, near real-time observation of the sun’s corona, acquiring a full-disk image every minute. The images cover a 42 arc-minute field of view with five arc-second pixels. The sun, as viewed from Earth, is approximately 32 arc-minutes in diameter.

By recording solar images every minute, NOAA observers will be able to detect and locate

the occurrence of solar flares. This is the name given to the explosive releases of vast amounts of magnetic energy in the solar atmosphere. Since scientists are not yet able to predict the occurrence, magnitude or location of solar flares, it is necessary to continually observe the sun to know when they are happening.

When a flare erupts, it throws out large clouds of ionized, or electrically charged, gas. A small fraction of the cloud is very energetic and can reach the Earth within a few minutes to hours of the flare being observed. These energetic particles pose a hazard to both astronauts and spacecraft.

Coronal mass ejections, which are often associated with flares, take several days to reach the Earth. Fast, powerful ejections give rise to geomagnetic storms, which can disrupt radio transmissions and induce large currents in power transmission lines and oil pipelines. They have resulted in large-scale failures of the North American power grid and greatly increased pipeline erosion. SXI also will monitor coronal holes -- persistent sources of high-speed solar wind. As the Sun rotates every 27 days, these sources spray across the Earth like a lawn sprinkler and cause recurring geomagnetic storms.

The first Solar X-ray Imager instrument was launched on NOAA’s GOES-12 weather satellite. GOES stands for Geostationary Operational Environmental Satellite. That name refers to the fact that the satellites are “parked” in a geostationary orbit, 22,300 miles above the Earth's equator. The orbital velocity of these satellites matches the Earth's rotation, so they remain in the same position in the sky.

For more information about NOAA’s Space Environment Center and the SXI visit:

Space environment Center: http://sec.noaa.gov
SXI Home Page: http://sec.noaa.gov/sxi
Today’s Space Weather: http://sec.noaa.gov/today.html

GOES History

SMS-1 (SMS-A) was launched on May 17, 1974, from the Eastern Test Range (ETR) at Cape Canaveral, Florida. It was the first geostationary meteorological satellite. Launched from a Delta 2914 launch vehicle, its objectives were to evaluate a prototype operational meteorological satellite for NOAA's National Weather Service and provide regular daytime and nighttime meteorological observations in support of the national operational meteorological satellite system. The principal instrument on board was the Visible/Infrared Spin Scan Radiometer (VISSR), which provided day and night imagery of cloud conditions. Additionally, the satellite was equipped with a SEM and a DCS. The satellite also had the capability to perform facsimile transmissions of processed images and weather maps to WEFAX field stations. The satellite was positioned in a geostationary orbit directly over the equator at 45° W (over the central Atlantic), which provided continuous coverage of the central and eastern U.S. and the Atlantic Ocean. It was operational until January 1976 and was deactivated and boosted out of orbit on January 21, 1981.

SMS-2 (SMS-B) was launched February 6, 1975, from a Delta 2914 launch vehicle. It was equipped with a VISRR, SEM, and DCS and had WEFAX capability. It was placed in a geostationary orbit directly over the equator at 135° W (over the east-central Pacific Ocean). The satellite was deactivated August 5, 1982. SMS-1 and SMS-2 proved the viability of geosynchronous meteorological satellites.

GOES-1 (GOES-A) was the first in the series of Geostationary Operational Environmental Satellites. It was launched from a Delta 2914 launch vehicle on October 16, 1975. Its instrument complement was identical to SMS-1 and SMS-2. GOES-1 was placed over the Indian Ocean west of SMS-2 so that the combined coverage of the three satellites would include nearly 60 percent of the Earth's surface. It operated successfully in this orbit until June 1978 when it was relocated to replace SMS-2 and GOES-3 replaced GOES-1. It was deactivated on March 7, 1995.

GOES-2 (GOES-B) was launched on June 16, 1977, from a Delta 2914 launch vehicle. Its instrument complement was identical to the SMS and GOES-1 satellites. GOES-2 was placed in orbit directly over the equator at 60° W to replace SMS-1. It was operational until 1993. The satellite was reactivated in 1995 to broadcast National Science Foundation (NSF) transmissions from the South Pole to public broadcasting facilities in the U.S. The WEFAX system on GOES-2 continued to operate, although cloud images were no longer being received from the system. The satellite was deorbited at the beginning of May 2001.

GOES-3 (GOES-C) was launched June 16, 1978, from a Delta 2914 launch vehicle. The satellite was used to replace GOES-1 and to support the Global Atmospheric Research Program (GARP) over the Indian Ocean. It had the same instruments and capabilities as the earlier GOES spacecraft.

GOES-4 (GOES-D) was launched September 9, 1980, from a Delta 3914 launch vehicle. It was the first geostationary satellite to provide continuous vertical profiles of atmospheric temperature and moisture, which its primary instrument, the VISSR Atmospheric Sounder (VAS), provided. The VAS also provided both day and nighttime imagery of cloud conditions. Instrument limitations did not permit both types of operations simultaneously. The satellite also used new despun S-band and UHF antennas to relay meteorological data from more than 10,000 surface locations into a central processing center for incorporation into numerical weather prediction models and to transmit processed images and weather maps to WEFAX field stations. It was also equipped with a SEM and DCS similar to those on previous GOES. GOES-4 was placed in orbit at 135° W to replace the failing GOES-3. GOES-4's most serious anomaly occurred on November 25, 1982, when the VAS's scan mirror stopped during retrace after exhibiting excessively high torque. Efforts to restore either the visible or infrared capability were unsuccessful. It was deactivated November 22, 1988.

GOES-5 (GOES-E) was launched May 22, 1981, from a Delta 3914 launch vehicle. Its instrument complement was identical to GOES-4. It was placed in orbit at 75° W longitude. The satellite failed on July 29, 1984, when a VAS encoder lamp filament burned out that was needed to read the angle of the scan mirror used to obtain images. It was deactivated on July 18, 1990.

GOES-6 (GOES-F) was launched April 28, 1983, from a Delta 3914 launch vehicle. It was designed to replace GOES-4 and was originally placed in orbit at 136° W. After GOES-5 failed, it was moved to a central location at 98° W. When GOES-7 was placed in service, it was returned to its original location. The VAS imager on GOES-6 failed on January 21, 1989, so direct readout images and soundings were no longer available. WEFAX data continued to be transmitted to the data user community until the spacecraft was deactivated on May 24, 1992.

GOES-G was launched May 3, 1986, from a Delta 3914 launch vehicle. The spacecraft did not reach operational orbit because of a failure in the launch vehicle.

GOES-7 (GOES-H) was launched February 26, 1987, from a Delta 3924 launch vehicle and placed in orbit at 75° W. The spacecraft was moved to 98° W in July 1989 following the January 1989 failure of GOES-6. In 1992, GOES-7 ran out of stationkeeping fuel, as expected. GOES-7 went to standby in January 1996 and was parked at 95° W in June 1996. Consequently, the VAS instrument and the associated data, along with WEFAX, DCS, and search and rescue services through GOES-7, were deactivated. In mid-November 1999, GOES-7 was moved to 175° W to take over the communications-relay duties of PEACESAT. The high orbital inclination made it possible to relay data from near the poles, particularly to support the National Science Foundation science group at

the South Pole. In addition to the same instrument complement as the earlier GOES, GOES-7 carried experimental search and rescue equipment that allowed near-instantaneous detection of emergency distress signals on the ground transmitting at 406 MHz.

GOES-8 (GOES-I) was launched April 13, 1994, from an Atlas-I/Centaur launch vehicle. It operated as GOES-East at 75° W for 8 years, from spring of 1995 to spring of 2003. It was the first in a new series of three-axis stabilized GOES that provided significant improvements over the previous GOES spin-stabilized spacecraft in weather imagery and atmospheric sounding information. The satellite was equipped with a separate Imager and Sounder, which allows simultaneous and independent imaging and sounding. Previously, a single instrument performed both functions alternately. GOES-8 features a flexible scan mechanism that offers small-scale area imaging, resulting in improved short-term forecasts over local area. It was also equipped with a SEM and DCS, had WEFAX capabilities, and performed near-instantaneous relay functions for the Sarsat system with its dedicated search and rescue transponder. The GOES-8 satellite reached the end of its useful life and was de-orbited on May 5, 2004.

GOES-9 (GOES-J) was launched May 23, 1995, from an Atlas-I/Centaur launch vehicle into a geostationary orbit at 135° W. The GOES-9 satellite is presently providing support to the Japanese Meteorological Agency (JMA), with ground station support from the NOAA facility at Fairbanks, Alaska.

GOES-10 (GOES-K) was launched April 25, 1997, from an Atlas I/Centaur launch vehicle and was placed in orbit at 105° W. It has the same instrument complement as GOES-8 and GOES-9. In the spring of 1998, GOES-10 was shut down and designated an “on-orbit spare” until the failure of GOES-8 or GOES-9. A month after launch, the GOES-10 solar array ceased rotating, but, due to the ingenuity of the GOES government-industry team, it was possible to invert the satellite, modify software, and operate the solar array in the reverse direction. Shortly thereafter, GOES-9 began experiencing problems with its momentum wheels, and GOES-10 was placed in active service as *GOES-West*, positioned at 135° W.

GOES-11 (GOES-L) was launched May 3, 2000, from an Atlas Centaur IIA launch vehicle and placed in storage mode at 105° W in August 2000. It has the same instrument complement as GOES-8, 9, and 10.

GOES-12 (GOES-M) was launched July 23, 2001, from an Atlas Centaur IIA launch vehicle. It is the first GOES to fly an SXI-type instrument. The GOES-12 satellite has been operating as GOES -East at 75° W longitude since the spring of 2003. It is expected to provide many more years of operational data products for the GOES user community.

GOES Spacecraft Contractors

Ford Aerospace and Communications Corporation (now Space Systems/Loral) built the Synchronous Meteorological Satellite and GOES 1-3. Hughes Space and Communications (now Boeing Satellite Systems) built the GOES 4-7 series of satellites. Space Systems/Loral built the GOES 8-12 series. Boeing Space & Intelligence Systems (BS&IS) is building GOES N-P series of satellites.

PROGRAM MANAGEMENT

NASA's GSFC is responsible for the construction, integration and verification testing of the spacecraft, instruments and unique ground equipment. NASA coordinates the launch of the spacecraft with the U.S. Air Force. NASA’s comprehensive on-orbit verification period is expected to last 200 days after launch when NASA will hand over formal operations to NOAA.

NOAA is responsible for program requirements funding and the on-orbit operation of the multi-satellite system. NOAA also determines the need for satellite replacement. NOAA designs, develops and operates the ground system needed to acquire, process and disseminate the satellite data.

NASA Program Management:

Headquarters
Dr. Mary Cleave, Associate Administrator, Science Mission Directorate
Dr. Colleen Hartman, Deputy Associate Administrator, Science Mission Directorate
Dr. Richard R. Fisher, Director, Heliophysics Division, Science Mission Directorate

Goddard Space Flight Center
Martin A. Davis, GOES Program Manager
Dennis Chesters, GOES Program Scientist

NOAA Management:
Gary K. Davis, Director, Office of Systems Development
Steve Kirkner, GOES Program Manager