NASA Facts

National Aeronautics and
Space Administration

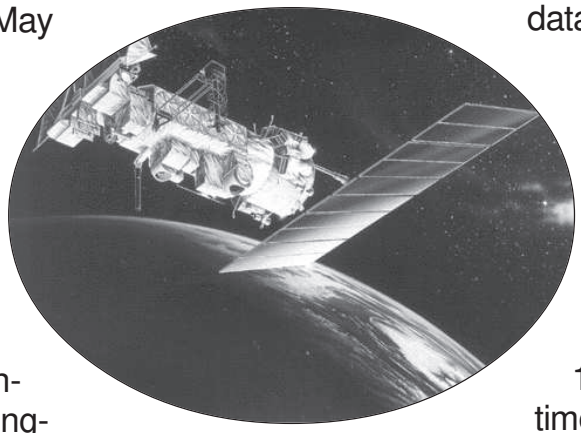
Goddard Space Flight Center
Greenbelt, Maryland 20771

AC 301 286-8955

FS-1998-03-008-GSFC

NASA's Role as Development Agent for the National Oceanic and Atmospheric Administration's Polar-Orbiting Operational Environmental (NOAA-K) Satellite

Since 1978, NASA has developed polar-orbiting environmental observation satellites for the National Oceanic and Atmospheric Administration (NOAA). NOAA-K, the latest NOAA spacecraft, will be launched in May 1998.



NOAA-K Spacecraft

The NOAA satellites carry instruments that observe our Earth and provide global data for NOAA's operational user requirements including short and long-range weather forecasts. The operational system consists of two polar-orbiting satellites. One crosses the equator at roughly 7:30 a.m. local time and 7:30 p.m. local time, and the other satellite crosses the equator at roughly 1:30 a.m./p.m. local time.

These spacecraft monitor the entire Earth, providing atmospheric measurements of temperature, humidity, ozone and cloud images as they track weather patterns that affect the global weather and climate. The satellites send millions of global measurements daily to NOAA's Command and Data Acquisition station and data processing center, adding valuable information to forecasting models, especially for ocean areas, where conventional ground based data are lacking.

Currently, NOAA has two operational polar orbiters: NOAA-12, launched in May 1991 in a 7:30 a.m. local time orbit; and NOAA-14, launched in December 1994 in a 1:30 p.m. local time orbit. NOAA-K will replace NOAA-12 in the 7:30 local time orbit.

NOAA-K will be renamed NOAA-15 after achieving orbit. The satellites are given a letter designation while under construction on the ground and are then renamed with a numerical designation after launch. This is done for two reasons: first, satellites are easier to track in orbit if they are designated with a number; second, the satellites are built in alphabetical order but are not necessarily launched in this same order. Therefore, to

avoid confusion, they are numbered upon reaching orbit.

The NASA-NOAA Partnership

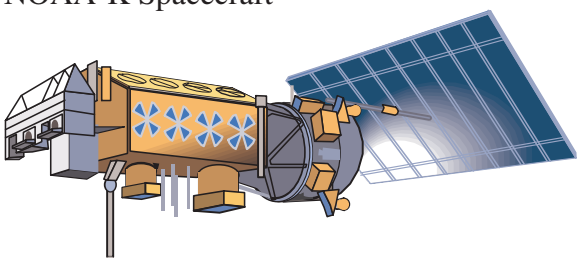
NASA and NOAA are actively engaged in a cooperative program to develop and launch the NOAA Polar-Orbiting Operational Environmental Satellites (POES). NASA's Goddard Space Flight Center in Greenbelt, Md. is responsible for the construction, integration and verification testing of the spacecraft, instruments and unique ground equipment. NASA coordinates the launch of the satellites with the U.S. Air Force. NASA turns operational control of the spacecraft over to NOAA after a comprehensive on-orbit verification period, which is expected to last approximately 60 days.

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 and develops the ground system needed to acquire, process and disseminate the satellite data.

NOAA-K

NOAA-K, the latest in the spacecraft series, will send data directly to thousands of users around the world. The spacecraft will continue the provision of a polar orbiting platform to support the environmental monitoring instruments for imaging and measuring the Earth's complex coupled systems - its atmosphere, its surface and cloud cover. Observations include information about Earth radiation; sea and land surface temperature; atmospheric vertical temperature; water vapor; and ozone profiles in the troposphere and stratosphere. Measurement of proton and electron flux at orbit altitude, remote platform data collection and the Search and Rescue Satellite-aided Tracking system (SARSAT) are also supported. NOAA-K will carry a new generation of microwave instruments to generate improved temperature and moisture profiles, and surface and hydrological products in cloudy regions where visible and infrared instruments have decreased capability.

NOAA-K Spacecraft



Spacecraft Design

NASA Goddard engineers designed the satellite for a two-year mission life. NOAA uses each spacecraft to its maximum capability, typically three to five years. In addition, engineers provided the satellite with a three-axis body stabilized design. This enables the satellite to scan the Earth and provide continuous global images of cloud cover, surface parameters such as snow, ice, and vegetation; and atmospheric temperatures, moisture, and aerosol distributions. The satellite is also able to collect and relay information from fixed and moving data platforms, such as buoys, free-floating balloons, and remote weather stations.

Each satellite consists of an imaging system, the Advanced Very High Resolution Radiometer (AVHRR-3), and a sounding suite of instruments consisting of the High Resolution Infrared Radiation Sounder (HIRS-3), and the Advanced Microwave Sounding Units (AMSU-A for temperature profiles and AMSU-B for moisture profiles).

Additionally, the NOAA-K satellite includes a Space Environment Monitor-2 which provides measurements to determine the intensity of the Earth's radiation belts and the flux of charged particles at the satellite altitude. The monitor provides warnings of solar wind occurrences that may impair long-range communication or high-altitude manned operations, damage satellite circuits and solar panels, or cause change in drag and magnetic torque on satellites.

A very important mission of these spacecraft is that of lifesaving. Each polar-orbiting NOAA satellite, except NOAA-12, is equipped with a Search and Rescue Satellite-aided Tracking system, which works internationally to locate ships and aircraft in distress. This system has been attributed to saving more than 7,000 lives since it became operational in November 1982.

Originally conceptualized and developed at Goddard in the early 1970s, this humanitarian effort is designed to reduce the time required to rescue air and maritime distress victims thereby significantly increasing their chances for survival.

SARSAT is part of an international satellite system for search and rescue which includes the NOAA spacecraft and the Russian provided satellite COSPAS. The system consists of the satellites in polar orbit and an international network of Earth stations, which provide global distress alert and location information to appropriate rescue authorities for maritime, aviation and land users in distress.

Orbit and Command

The satellite operates in a circular, near-polar orbit of 450 nautical miles (833 kilometers) above the Earth with an inclination angle of 98 degrees to the equator. The NOAA-K orbit period, which is the time it takes to complete one orbit of the Earth, will be approximately 101 minutes. The sunlight period will vary from 77 to 101 minutes with corresponding 0 to 24 minutes in the Earth's shadow. Since the Earth rotates approximately 26 degrees during each orbit, the satellite observes a different portion of the Earth's surface during each orbit.

The nominal orbit is Sun-synchronous and rotates eastward about the Earth's polar axis 0.986 degrees per day, approximately the same rate and direction as the Earth's average daily rotation about the Sun. The rotation keeps the satellite in a constant position with reference to the Sun for constant illumination through the year. NOAA-K will be launched so that it will cross the Equator at about 7:30 p.m. northbound and 7:30 a.m. southbound local time.

NOAA's Command and Data acquisition stations are located at NASA's Wallops Flight Facility, Wallops Island, Va., and Fairbanks, Alaska.

The NOAA Satellite Operations Control Center in Suitland, Md., provides spacecraft scheduling, health and safety monitoring and engineering analyses.

Data are processed in the NOAA Central Environmental Satellite Computer System and delivered to the National Weather Service's National Centers for Environmental Prediction in Camp Springs, Md., and National Weather Service forecast offices across the United States.

The NOAA POES System in Weather Forecasting

The POES spacecraft serve as complementary satellites to the geosynchronous Geostationary Operational Environmental Satellites (GOES) system. Where the GOES satellites provide near-term data from the continental U.S. and Hawaii to NOAA's forecasters, the polar-orbiting spacecraft provide full global data for short and long-range forecast models, climate modeling, and various other secondary missions.

Data Archiving and Dissemination

Data from the NOAA spacecraft are helping NASA scientists design instruments for follow-on missions for NASA's Earth Sciences program. NOAA has the responsibility to process, analyze, disseminate, and archive all operational data. These data are made available to NASA researchers and others for research and environmental applications.

More information on the POES program can be found on the Internet at:
http://poes2.gsfc.nasa.gov/ and at
http://www.2.ncdc.noaa.gov/doc/intro.htm