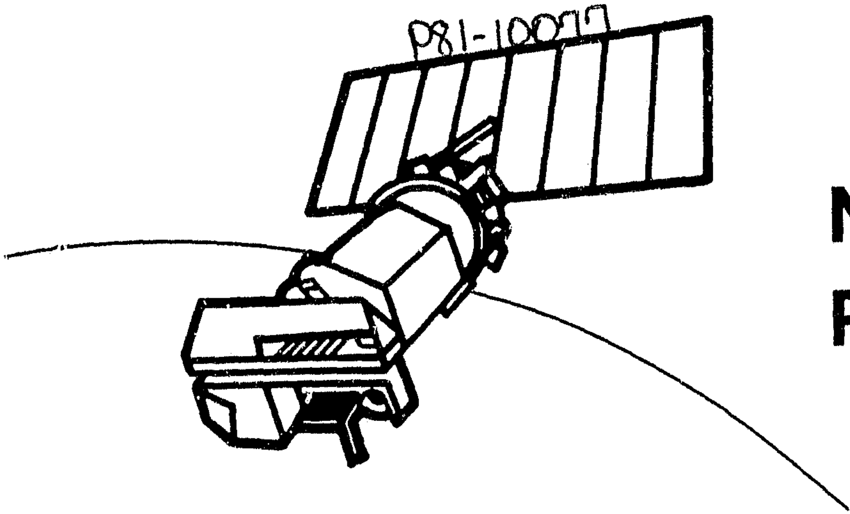

NOAA-C Press Kit

Mr. French

FOR RELEASE *Immediate*

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IMMEDIATE

RELEASE NO: 81-76

IMPROVED NOAA SATELLITE SCHEDULED FOR LAUNCH

A new environmental monitoring satellite, from which improved sea surface temperature information of growing significance to the fishing and marine transportation industries, weather forecasters, and others can be determined, will be launched no earlier than June 22, the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA) have announced.

The satellite, now designated NOAA-C but to become NOAA-7 once in orbit, will carry the most versatile scanning radiometer ever sent aloft in an environmental spacecraft, gathering visual and infrared imagery and measurements in five spectral channels.

June 12, 1981

-more-

This should permit more accurate evaluation of sea surface temperatures, as well as the temperatures of land, ice, surface water and clouds under the satellite's orbital path.

Two earlier satellites in the TIROS-N series carried four-channel radiometers. One of them, NOAA-6, is still operational, while the other, TIROS-N, failed after operating twice its design life of 14 months, and was turned off on Feb. 21, 1981.

NOAA-C will be launched atop an Atlas-F by an Air Force launch team from the Western Space and Missile Center at Vandenberg Air Force Base, Lompoc, Calif. Its design life is about two years.

The improved sea surface temperature, computed from sensor readings returned to Earth, will be of special value to fishermen off the West Coast and in the Gulf of Alaska, and to marine shipping companies in the Gulf of Mexico and along the East Coast.

Commercial fishermen in California, Oregon, Washington and Alaska use sea surface temperature charts compiled from satellite infrared imagery and data to locate the most productive fishing grounds for those species which are water temperature sensitive. Catches of salmon, albacore and herring have been improved, and fuel costs reduced many fishermen report.

On the other side of the continent, along the East Coast and in the Gulf of Mexico, shipping interests use charts showing the Gulf Stream and Gulf Loop Current, also derived from satellite observations.

-more-

Oil tankers, tugs towing barges and other vessels take advantage of, or avoid, the swifter currents, reducing transit time and saving fuel. One towing and transportation company operating 60 vessels in the Caribbean estimates fuel savings of 20 to 40 percent by incorporating the stream and loop current information into its fuel conservation program.

The new satellite, NOAA-C, also will carry a joint Air Force-NASA experimental instrument aloft to monitor possible contamination of the environment in the immediate vicinity of the spacecraft resulting from its propulsion systems. Such contamination, if it exists, could degrade the performance of future instruments planned for launch aboard satellites similar to NOAA-C.

With the successful launch of NOAA-C, two polar-orbiting satellites will be circling the globe, returning weather and environmental information to NOAA's National Earth Satellite Service. Each spacecraft -- NOAA-6 and the new, improved version -- will view virtually all of the Earth's surface from about 805 kilometers (500 miles) in space at least twice every 24 hours. Data and imagery from the polar orbiters, as well as from two geostationary orbiting spacecraft operated by NOAA, routinely are used by the agency's National Weather Service.

Instruments aboard the polar-orbiters take atmospheric soundings, measurements in vertical "slices" of the atmosphere showing temperature profiles, water vapor amounts and the total ozone content from the Earth's surface to the top of the atmosphere.

-more-

The sounding data are especially important in producing global weather analyses and forecasts at the Weather Service's National Meteorological Center. And these advisories are vital to accurate continental, regional and local weather forecasts.

In addition to imaging the Earth and obtaining atmospheric soundings, the TIROS-N series satellites also collect environmental observations from remote data platforms -- such readings as wave heights on the oceans, water levels in mountainous streams, tidal activity and the like. These versatile spacecraft also monitor solar particle radiation in space, used, in part, to warn manned space missions and high altitude commercial aircraft flights of potentially hazardous solar radiation activity.

Finally, NOAA-6 and its new space twin have a communications function, distributing unprocessed sensor data to Earth stations in more than 120 nations in real time as the spacecraft pass overhead.

NOAA-C, as with its predecessors in the TIROS-N series, was designed and built by RCA Astro Electronics, Princeton, N.J., under contract to NASA's Goddard Space Flight Center, Greenbelt, Md., which acts as industry interface for NOAA. Following successful launch and checkout in orbit by NASA, NOAA-7 will be operated by NOAA's National Earth Satellite Service.

Four more satellites in the series are scheduled through 1985, to be launched on a "call up" basis to insure uninterrupted data flow.

NOAA-C cost approximately $15 million to build, and launch costs will be about $7.5 million.

(END OF GENERAL RELEASE; BACKGROUND INFORMATION FOLLOWS.)

NOAA-C MISSION

NOAA-C is the fourth of eight TIROS-N series operational meteorological polar orbiting spacecraft. The purpose of these satellites is to make measurements of temperature and humidity in the Earth's atmosphere, surface temperature, surface and cloud cover, water-ice-moisture boundaries, and proton and electron flux near the Earth. They have a capability of receiving, processing and retransmitting data from free-floating balloons, buoys and remote automatic stations distributed around the globe and can also track stations which are in motion. In addition, the NOAA-E, -F and -G spacecraft will carry a Search and Rescue instrument. All launches are planned for the 1980-85 time period.

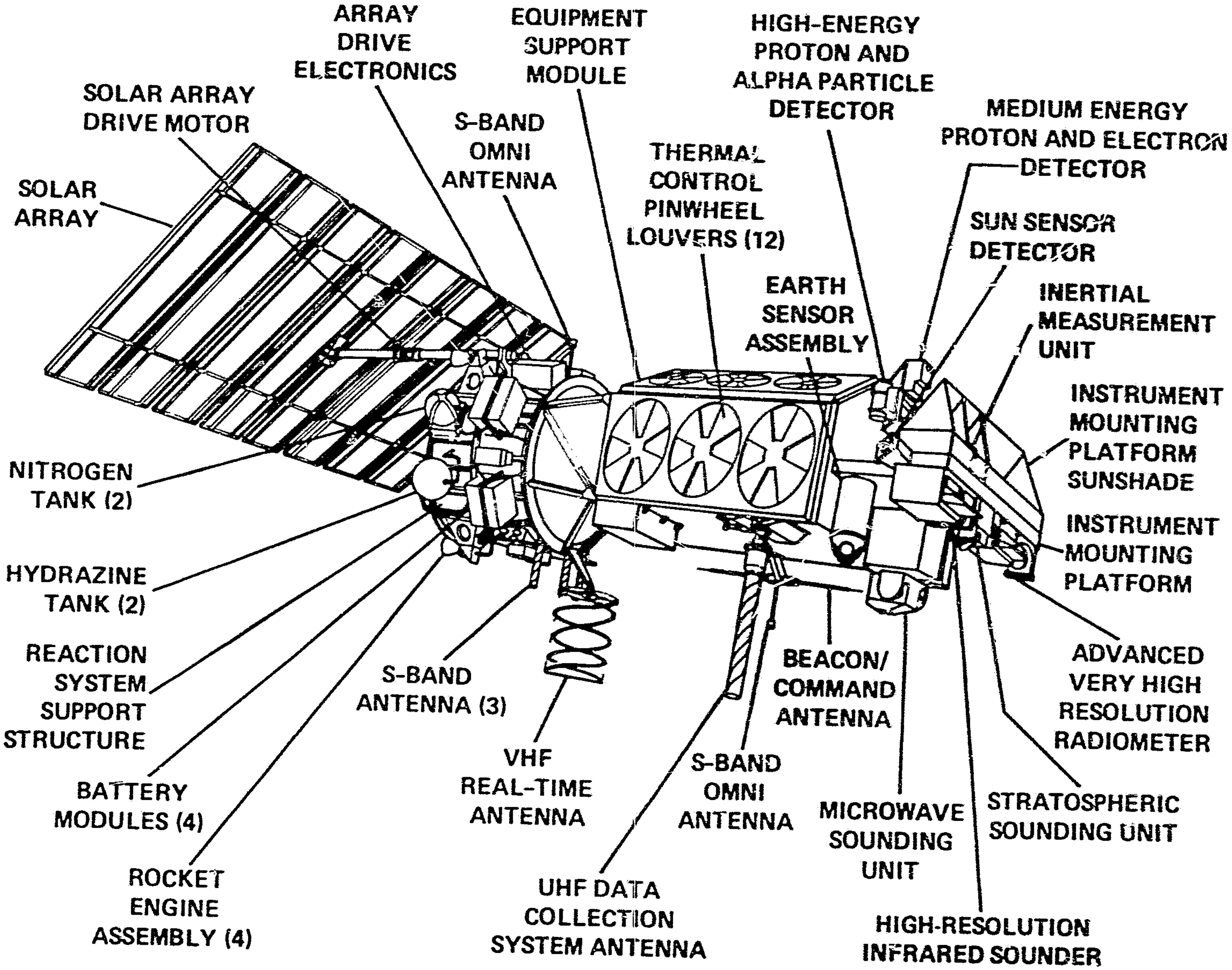
Project Objectives

NOAA-C objectives include collection of environmental data for use in the National Operational Environmental Satellite System. Specific objectives include providing improved methods of obtaining quantitative environmental data and improved data handling capabilities through:

- High resolution, day and night cloud cover observations on a local and global scale;
- High resolution observations of sea surface temperatures;
- Improved observations of vertical temperatures and water vapor profiles in the troposphere and lower stratosphere on a global basis;
- Observations of vertical temperature profiles in the middle and upper stratosphere on a global basis;
- Operational flight of a high-capacity data collection/relay and platform location system;
- Observations of electron and proton flux densities and total particle energy densities in the near-Earth space environment.

The TIROS-N series is based on the Block 5D spacecraft bus developed by RCA Astro Electronics for the Air Force. Differences between the Block 5D and NOAA-C are constrained to those necessary to meet mission requirements or found to be cost effective.

The launch vehicle for NOAA-C is a modified Atlas-F. Following successful launch, two fully operational satellites will be in orbit at one time. A backup satellite will be available for launch five months after NOAA-C is placed in orbit.


SOLAR ARRAY
SOLAR ARRAY DRIVE MOTOR
ARRAY DRIVE ELECTRONICS
S-BAND OMNI ANTENNA
EQUIPMENT SUPPORT MODULE
THERMAL CONTROL PINWHEEL LOUVERS (12)
HIGH-ENERGY PROTON AND ALPHA PARTICLE DETECTOR
EARTH SENSOR ASSEMBLY
MEDIUM ENERGY PROTON AND ELECTRON DETECTOR
SUN SENSOR DETECTOR
INERTIAL MEASUREMENT UNIT
INSTRUMENT MOUNTING PLATFORM SUNSHADE
INSTRUMENT MOUNTING PLATFORM
ADVANCED VERY HIGH RESOLUTION RADIOMETER
STRATOSPHERIC SOUNDING UNIT
HIGH-RESOLUTION INFRARED SOUNDER
MICROWAVE SOUNDING UNIT
BEACON/ COMMAND ANTENNA
S-BAND OMNI ANTENNA
UHF DATA COLLECTION SYSTEM ANTENNA
VHF REAL-TIME ANTENNA
S-BAND ANTENNA (3)
NITROGEN TANK (2)
HYDRAZINE TANK (2)
REACTION SYSTEM SUPPORT STRUCTURE
BATTERY MODULES (4)
ROCKET ENGINE ASSEMBLY (4)

NOAA-C nominal orbit parameters are:

Orbit altitude: 870 kilometers (540 miles)
Sun-synchronous inclination: 98.8 degrees
Orbit period: 102.37 minutes

International Participation

International participants are the United Kingdom, Ministry of Defense Meteorological Office (British Met Office); the Republic of France, Centre National d'Etudes Spatiales (CNES); and the Canadian Department of Communications, Communications Research Center (CRC), in the later phases of the series.

INSTRUMENTATION

High Resolution Radiometry

One of the NOAA objectives for the TIROS-N series is to provide timely day and night sea surface temperature, ice, snow and cloud information to diverse classes of users. The instrument used to obtain this data is the Advanced Very High Resolution Radiometer/2.

Requirements include:

- Direct readout to ground stations of the Automatic Picture Transmission class, worldwide, at low resolution of 4 km (2.4 mi.) with reduction of panoramic distortion;
- Direct readout to ground stations of the High Resolution Picture Transmission class, worldwide. Resolution will be 1 km (.6 mi.);
- Global Area Coverage of on-board recorded data at relatively low resolutions of 4 km (2.4 mi.) for central processing;
- Local Area Coverage of on-board storage of data from selected portions of each orbit at high resolution of 1 km (.6 mi.) for central processing.

It is NOAA's objective to provide sea surface temperatures to an accuracy of 1.5 degrees Celsius, absolute and relative (2.7 degrees Fahrenheit) on a 10-km (6.2-mi.) grid, at least once per day, but hopefully twice, and to an accuracy of 1 degree C absolute on a 100-km (62-mi.) grid at least once per day. Visible and near infrared spectral coverage is necessary to meet NOAA requirements for observation of land coverage, delineation of water, of snow and ice, and of melting snow and ice.

NOAA-C's radiometer is sensitive in five general regions. The radiometer on earlier TIROS-N series satellites were sensitive in only four. The fifth channel, in the 12 micrometer region, is expected to permit improved sea surface temperature readings.

Data Collection System

A data collection and platform location subsystem is required to meet NOAA goals. This subsystem provides for the receipt, processing and storage of data (temperature, pressure, altitude, etc.) from fixed and moving platforms (e.g., free-floating balloons and buoys) and for the location of the moving platforms for later transmission to a central processing facility.

Platform location is used to determine the velocity of the fluid medium in which the platform is immersed (i.e., wind velocity in the case of balloons and ocean current at a depth of the drogue in the case of buoys). The accuracy achieved is primarily a function of the position accuracy for each fix, the time interval between fixes and the representativeness or responsiveness of the "tracer" (e.g., balloon, drogue motion).

Components of the Data Collection System are:

- Free-floating balloon platforms;
- Free-floating buoy platforms;
- Fixed platforms located predominately in polar regions;
- The satellite data collection subsystem;
- The ground station data retrieval subsystem;
- Centralized data reduction and processing.

As an operational spacecraft the NOAA-C satellite will receive low-duty cycle transmissions, uncoordinated in time or frequency, from the platforms in a random access manner using a one-way radio frequency link. The received transmission will be processed onboard the satellite in order to recover the platform data message and for the free-floating platforms, to measure the transmission received frequency so that additional ground processing can determine the locations from the Doppler induced frequency shift. The recovered data message and frequency measurements (along with time code) are stored onboard the satellite for ground station data retrieval at periodic intervals.

Atmospheric Sounding

The TIROS Operational Vertical Sounder system data is used to determine the vertical temperature profile of the atmosphere from the Earth's surface to near the top of the atmosphere (1 millibar) and moisture vapor content profile from the surface to the tropopause. It is a goal to compute these profiles globally to an accuracy of 1 degree C (temperature) and 20 percent moisture vapor content (10 percent desired) on a grid spacing at the Earth's surface of 400 km (248 mi.) or less, even in the presence of clouds.

An ozone measurement is necessary for correcting the determinations of the profiles.

The primary instrument providing tropospheric data is the High Resolution Infrared Radiation Sounder, which is sensitive to energy from the visible to the carbon dioxide region of the infrared spectrum. This instrument provides data permitting calculation of temperature profiles from the surface to 10 mb, water vapor content at three levels of the atmosphere and total ozone count. A Stratospheric Sounding Unit, provided by the Meteorological Office of the United Kingdom, is sensitive to energy in the carbon dioxide portion of the infrared spectrum and provides temperature information from the stratosphere. A third instrument, the Microwave Sounding Unit, is sensitive to energy in the oxygen region of the microwave spectrum and is used in conjunction with the two infrared instruments. The microwave data permits temperature computation to be made in the presence of clouds since measurements in this region are generally unaffected by non-precipitating water droplets.

Space Environment Monitor

The Space Environment Monitor provides continuous measurement of proton alpha and electron flux activity near the Earth. This instrument is an extension of the solar proton monitor previously flown on ITOS satellites. The instrument package additionally provides for measurement of alpha and electron flux, spectrum and total energy disposition into the Earth's upper atmosphere.

Contamination Monitor

This instrument to be flown only on NOAA-C, was built by NASA's Jet Propulsion Laboratory, Pasadena, Calif., for the U.S. Air Force. It will obtain contamination data (mass accretion) on the Earth-viewing panel of the equipment support module. In particular, the specific events during which mass accretion will be measured are solid-rocket motor burn, deployments and hydrazine firings.

It also is expected to measure the contamination-induced degradation effects on sensitive thermal-control coatings, as well as the magnitude of contamination that may be expected in the general area of a solar backscatter ultraviolet instrument to be flown on future spacecraft. Data provided by this instrument also will be used to verify analytical contamination models.

DATA TRANSMISSION

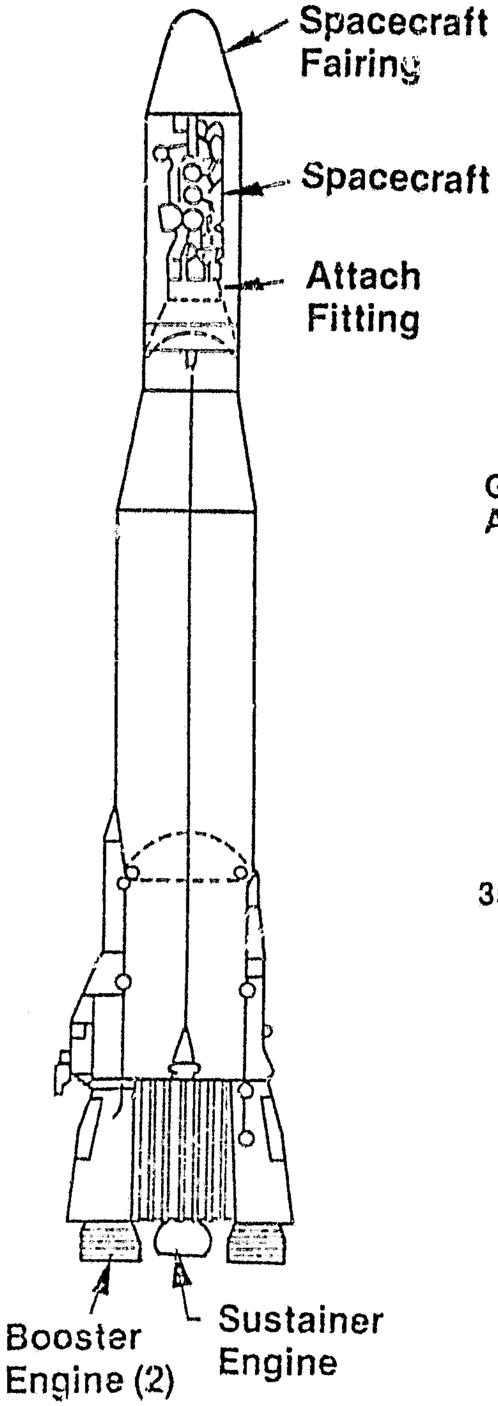
The data handling subsystem consists of four primary components; the TIROS Information Processor, the Manipulated Information Rate Processor, Digital Tape Recorders and the Cross Strap Unit. All data available for transmission to the ground are processed by some or all the components. The information processor formats all low bit rate instrument and housekeeping telemetry data and controls the data outputs. It processes data from the vertical sounder, space environment monitor and data collection system. The rate processor processes data from the advanced radiometer in order to provide separate outputs for Automatic Picture Transmission and High Resolution Picture Transmission in real time, recorded Global Area Coverage of reduced resolution data, and recorded Local Area Coverage of high resolution data for command readout at the command and data acquisition stations and processing in the NOAA central computer facility at Suitland, Md. In addition to formatting, the rate processor adds synchronization, identification, time code, telemetry and information processor output to the advanced radiometer.

Tracking and Data Acquisition

Tracking and orbit determination support is provided by the Air Force. NASA's Goddard Space Flight Center is responsible for providing the orbital information to NOAA and to satisfy NOAA-C activation and evaluation requirements. All data acquisition is performed through NOAA Command and Data Acquisition stations and data links.

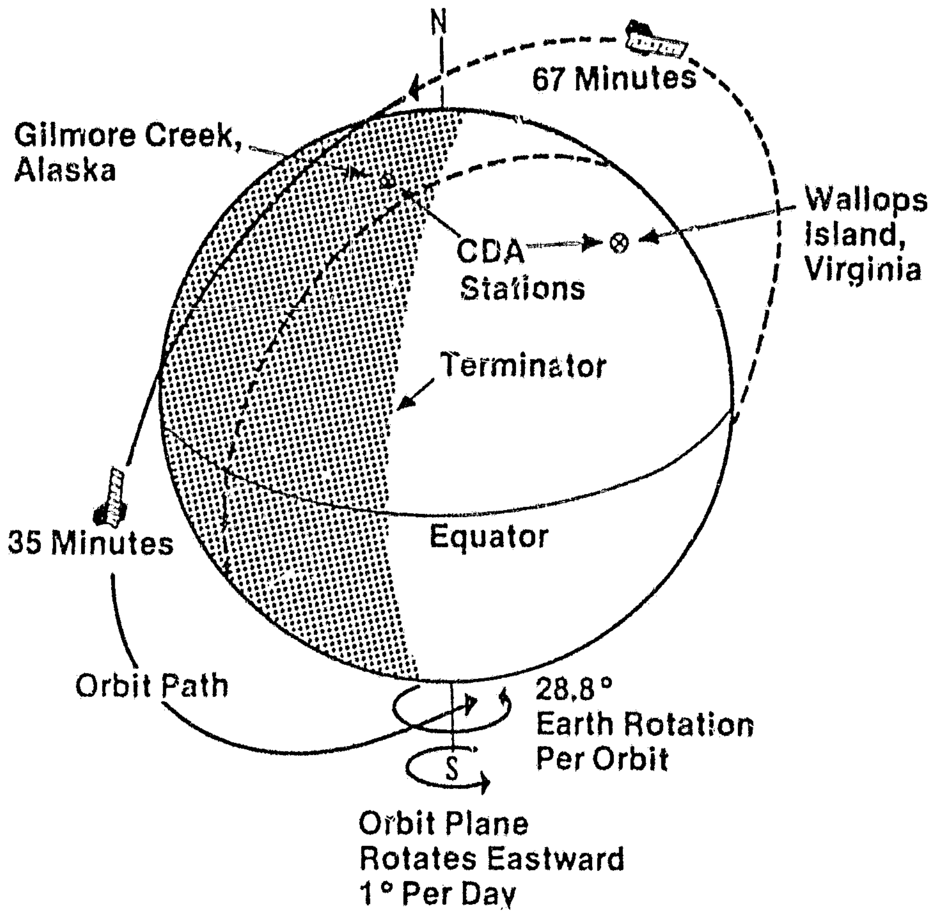
NOAA Command and Data Acquisition Stations -- The primary Command and Data Acquisition stations are located at Fairbanks, Alaska, and Wallops Station, Va. In addition, there is a reduced capability (limited command capability) station, located at Lannion, France, to receive limited volume transmissions of tape-recorded data from the satellite and to transmit commands in case of an emergency occurring during orbits when the satellite does not pass over a NESS Command and Data Acquisition Station.

The acquisition stations transmit command programs to the satellite, acquire and record environmental and engineering data from the satellite. All data is transmitted between the stations and Suitland via commercial communications links. Commands are transmitted between NOAA's Satellite Operations Control Center and the stations via commercial communications links.



Atlas F Launch
Vehicle

NOAA-C Orbit



Ground Communications -- The ground communication links for NOAA-C are provided by RCA Americom and Goddard's NASA Communications (NASCOM) link. NASCOM provides any launch unique communications links for the NOAA-C launch. RCA, under contract to NOAA, provides all voice and data links between the Satellite Operations Control Center and the acquisition stations.

During launch and early orbit, Goddard will provide special Spacecraft Tracking and Data Network (STDN) support for telemetry reception. After launch, the NOAA acquisition stations will handle all telemetry reception. There is normally no requirement for the tracking network to command the spacecraft. The Air Force will provide "skin-track" tracking and orbit determination support during the mission.

SPACECRAFT DESCRIPTION

The NOAA-C satellite is an integrated spacecraft system designed to provide for, and control injection into, the required orbit after separation from the Atlas-F launch vehicle.

The spacecraft, including the apogee kick motor, in the launch configuration is 371 centimeters (146 inches) high and 188 cm (74 in.) in diameter and weighs nominally 1,405 kilograms (3,097 pounds). On orbit, with the kick motor and reaction-control equipment expendables consumed, the satellite has a nominal weight of 723 kg (1,594 lb.).

The solid rocket apogee kick motor, which performs the orbit injection maneuver, is an integral part of the NOAA-C spacecraft. It contains 664 kg (1,464 lb.) of propellant which burns to depletion in 45 seconds, leaving the empty motor assembly case, weighing 50.4 kg (111 lb.), in orbit with the spacecraft. During the motor burn the spacecraft is stabilized by nitrogen and hydrazine thrusters. The motor, model TE-M-364-15, is manufactured by the Thiokol Corp., Huntsville, Ala.

The spacecraft bus consists of the following subsystems: structure-thermal, power, attitude determination and control, and communications and data handling.

Structure-Thermal -- The structure is an integrated one consisting of a solar array, an injection motor structure and an equipment support module and instrument mounting platform. The satellite thermal control is achieved for all Sun angles between 0 and 68 degrees, internal maximum power dissipation and for end-of-mission-life conditions. Active and passive thermal control similar to that used on Block 5D will confine temperature of the Internal Satellite-Equipment Interface to a range of 5 to 30 degrees C (41 to 86 degrees F) and the instruments to a range of 10 to 30 degrees C (50 to 86 degrees F).

Power Subsystem -- The basic power subsystem is augmented with a second 26.5 ampere-hour battery, and a pulse load bus. The subsystem is a direct energy transfer type and will provide 420 watts average power.

Attitude Determination and Control Subsystem -- The attitude subsystem consists of an inertial measurement unit, a Sun sensor unit and Earth sensor assembly, reaction wheels and torque coils. Additional features include a three-axis magnetic moment compensation assembly, to trim out external and internal disturbances, and jet wheel unloading capability as a backup mode.

LAUNCH VEHICLE

The NOAA-C spacecraft will be launched from Space Launch Complex 3 (SLC-3) at the Air Force Western Space and Missile Center, Calif., by a mission-modified Atlas-F launch vehicle supplied by the Air Force. The launch vehicle's overall length, including the spacecraft fairing, is 28.1 meters (92.26 feet). The maximum diameter is 3 m (10 ft.). The launch vehicle is manufactured by the General Dynamics Corp., San Diego, Calif.

Booster and Sustainer Stages

The Atlas-F is powered by liquid oxygen (LOX) and a liquid hydrocarbon fuel. The booster system consists of two fixed thrust engines which are gimbaled to provide pitch, yaw and roll control from liftoff through booster engine cutoff. The sustainer engine, also fixed thrust, is gimbaled and provides pitch and yaw control to the vehicle from just before booster engine cutoff until sustainer cutoff. Following booster staging, two vernier engines provide roll control. After sustainer cutoff the vernier engines provide fine trajectory corrections. During the boost phase of first stage flight the sustainer-vernier system is inoperative as far as chamber gimbaling is concerned. However, at staging, the system assumes attitude control of the vehicle.

Spacecraft Adapter

The spacecraft is attached to the launch vehicle by a 129-cm (50.8-in.) conical adapter mounted to the first stage.

Guidance and Control

The launch vehicle trajectory is a direct ascent ballistic-type one with a 192.8-degree launch azimuth from the launch complex. The launch vehicle provides a state vector at satellite separation to attain an apogee altitude of about 870 km (540 mi.). Guidance and control of the launch vehicle are accomplished by the Atlas autopilot which is preprogrammed. Guidance is augmented by the General Electric Radio Tracking System (GERTS) at the Western Space and Missile Center.

The expended booster, fairing and sustainer continue on ballistic trajectories and impact downrange in the Pacific Ocean.

Fairing

The aluminum 2.1-m (7-ft.) diameter, 6.9-m (22.6-ft.)-long fairing system protects the satellite from aerodynamic heating during the boost flight phase of the mission, and is jettisoned as soon as the vehicle leaves the atmosphere.

Procurement of Launching Service

Procurement of launching services is coordinated with the Air Force Space Division by NASA Headquarters. The launch vehicle activities are monitored and reviewed by the Goddard Space Flight Center, Greenbelt, Md., before and during launch operations. The launch is conducted at the Air Force Western Space and Missile Center, Vandenberg Air Force Base, Calif.

FLIGHT SEQUENCE OF EVENTS

(seconds)

Liftoff	0
Booster Engine Cutoff	121.0
Booster Package Jettison	124.1
Nose Fairing Jettison	144.0
Sustainer Engine Cutoff	324.5
Vernier Engine Cutoff	343.5
Spacecraft Separation	349.5
Pitch Rate-Start	532.0
Pitch Rate-Stop	557.0
Solid Motor-Ignition	627.0
Solid Motor-Burnout	670.4
Velocity Trim-Start	675.4
Velocity Trim-Stop	698.2
Hydrazine Isolation	698.7
Yaw Rate-Start	703.0
Yaw Rate-Stop	748.0
Roll Rate-Start	758.0
Roll Rate-To Orbit Rate	770.0
Hydrazine Blowdown-Start	850.0
Hydrazine Blowdown-Stop	990.0
Array Deployment	1,055.0
Boom Deployment	1,260.0
Array Cant	1,420.0
VRA Deployment	1,690.0
UDA Deployment	1,710.0
Handover	2,040.0

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Donald C. Winner	Chief, Satellite Services Division

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Dr. William N. Redisch	Deputy Project Manager
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John F. Corrigan	Launch Vehicle Manager
David K. Coolidge	Mission Operations Manager

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ITT-Aerospace/Optical Division Ft. Wayne, Ind.	High Resolution Infrared Radiometer Sounder/2
Jet Propulsion Laboratory Pasadena, Calif.	Microwave Sounding Unit
Ford Aerospace Communications Corp. Palo Alto, Calif.	Space Environment Monitor
Marconi Space and Defence Systems Frimley, United Kingdom	Stratospheric Sounding Unit
Electroniques Marcel Dassault Paris, France	ARGOS System (DCS)
Jet Propulsion Laboratory Pasadena, Calif.	Contamination Monitor
General Dynamics Corp. San Diego, Calif.	Atlas-F Launch Vehicle
Thiokol Corp. Huntsville, Ala.	Apogee Kick Motor

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