NASA
National Aeronautics and
Space Administration
Goddard Space Flight Center

Goddard News

Greenbelt, Maryland and Wallops Island, Virginia

Special issue May 1, 1984

Goddard celebrates its 25th anniversary — May 1, 1984

Director's Message

25 proud years

Anniversary celebrations are a time for reflecting on past achievements and the "good old days" as well as for understanding where we are today and for anticipating what the future holds.

As Goddard celebrates its 25th Anniversary this month, we can look back on our accomplishments with pride. Clearly, there have been many significant milestones. No doubt many of you are aware of them because you made them possible. It is you who are paving the way for tomorrow's technological breakthroughs and space achievements.

I believe, in celebrating Goddard's 25 years, we can find a certain amount of satisfaction in our contributions to NASA and to the country. We have established a tradition that greatly contributes to the Space Program and to the extension of mankind's knowledge. In looking to the future, we can anticipate expanding our horizons and drawing upon our talents, skills, and dedication even more.

The past 25 years have been very busy for Goddard. We have established ourselves as NASA's largest and most diversified field Center, involved in space and Earth science, project management, technology development, spacecraft tracking, and data systems, to name just a few disciplines. The future will be at least as bright and as exciting.

Let's enjoy our celebration of the past quarter century, and, at the same time, welcome the challenges that the next 25 years will bring.

Noel W. Hinners

GSFC FIRSTS

GSFC is first and ONLY national laboratory with competence of developing, designing, fabricating, testing, launching and analyzing space science missions.

GSFC has been responsible for more than 170 Delta-launched space flights.

GSFC has provided the research and development for the Nation's weather satellite programs.

GSFC launched and tested the Nation's first passive (ECHO) communications satellite.

Schedule of Events

To mark the anniversary, a week-long series of events has been planned. They include:

Tuesday, May 1

2:00 p.m., Building 8 Auditorium—Award ceremony with VIP guests, including all former Goddard Center Directors and Dr. Hinners.

4:30-7:30 p.m., Rec Center—Free reception for all employees, sponsored by GEWA.

Wednesday, May 2

11:00 a.m., Visitors' Center—Balloon launch by students from Catherine T. Reed Elementary School.

Noon, Front of Building 8—U.S. Naval Academy Band Concert

Thursday, May 3

3:00 p.m., Building 8 Auditorium—Special Colloquium on Center Goals by Dr. Hinners

Friday, May 4

Noon, Front of Building 8—First Street Name to be placed.

Center's anniversary brings Week-long list of activities

Goddard Space Flight Center celebrates its 25th anniversary this month.

The official birthdate is May 1, 1959, which means that Center activities have spanned four decades.

An award ceremony Tuesday, May 1, honors 61 Greenbelt and 23 Wallops employees who were on board of May 1, 1959 and have served the full 25 years. Special citations were to be given the employees.

Former Center Directors were to be recognized during the ceremony, also. All four former Directors, as well as Dr. Robert L. Krieger, who was Director when Wallops was a Center, were to attend. Dr. Krieger was Wallops Director from 1948 until his retirement in August, 1981. Former Goddard Center Directors and their tenures are Dr. Harry J. Goett, 1959-1964; Dr. John F. Clark, 1964-1976; Dr. Robert F. Cooper, 1976-1979; and A. Thomas Young, 1979-1982. Dr. Noel W. Hinners has been Director since June 14, 1982.

The evening reception at the Recreation Center was to feature free refreshments and be hosted by the Goddard Employees Welfare Association (GEWA). Two door prizes, a 19-inch color television set and a $50 deposit in a Credit Union account, were to be donated by the Goddard NASA Federal Credit Union.

The Catherine T. Reed Elementary School children will place stamped return addressed postal cards in the small balloons they are to set free. The children hope that people who recover the balloons will return them, and the

Center's anniversary

Continued from page two

students plan to make a contest of who receives the card from the farthest point.

The world-renowned Naval Academy Band is composed of 40 members. It is scheduled for an hour-long concert on the steps of building 8.

Dr. Hinners will outline the goals and some hopes for the future of the Center in his colloquium address.

Five Goddard thoroughfares are to be renamed. A survey conducted recently indicated by an overwhelming majority that Goddard employees desired the name changes and wanted them to be named for Goddard missions and projects. The main road from the Main Gate to its dead-end will be Goddard Road, in honor of the Center's namesake. Other streets to appear will be TIROS Road, buildings 5/7 to back gate; Explorer Road, Parkway exit/employee gate; Delta Road, building 2 to the pond; Minitrack Road, building 12 to building 28; and Aerobee Road, which parallels Route 193 from building 11 to building 13.

* * *

Employees with 25 Years honored

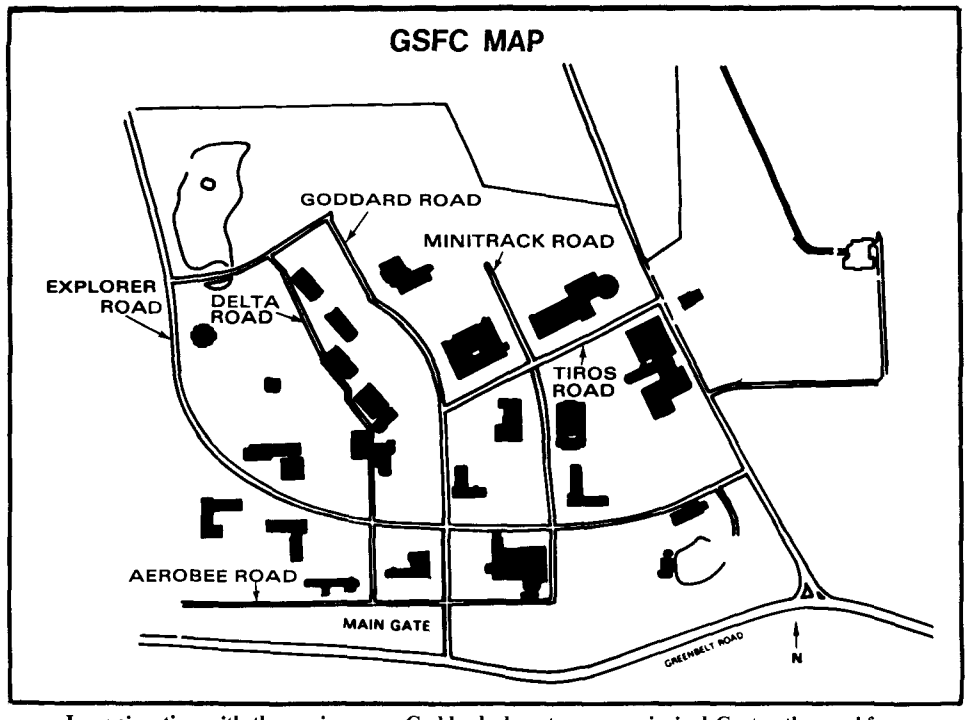
Goddard Honors Center Pioneers

Eighty-four employees of the Goddard Space Flight Center, including Wallops Flight Facility, were to be honored here this week for having been employees for the full 25 years since the Center was established on May 1, 1959.

During award ceremonies in the building 8 auditorium on Tuesday, May 1, the 61 Greenbelt employees and the 23 Wallops employees were to be given special certificates of recognition. The honor was called the "Pioneers Award."

The awards recognize the "contributions of the individuals who were employees of the Center (or Wallops) on the first day of May 1959 and who served during the entire 25 years.

"These employees have truly been pioneers in mankind's efforts to explore space and have contributed substantially to the outstanding record of success compiled by the Goddard Space Flight Center (Wallops Flight Facility)."



In conjunction with the anniversary, Goddard plans to name principal Center thoroughfares.

Goddard honors Center pioneers

Present at the start, and still on the job

The Wallops employees honored were: Mr. Marvin W. McGoogan, Ms. Jean F. Hall, Mr. Roy L. Colonna, Mr. Douglas R. Estes, Jr., Mr. Robert E. Carr, Mr. William F. Landon, Mr. Robert T. Duffy, Mr. Cary F. Milliner, Jr., Mr. William L. Lord, Mr. Julian A. White, Mr. Orland E. Howard, Jr., Mr. Richard R. Johnson, William D. Stevenson, Mr. Edward R. Matthews, Mr. George A. Matzner, III, Ms. Joyce B. Milliner, Ms. Mae M. Pettit, Mr. Abel T. Ashby, Mr. Everette J. Snead, Mr. Ralph H. Mills, Mr. John T. Dukes, Jr., Mr. Charles G. Ward, and Mr. Edward L. McFord.

The Greenbelt employees were: Mr. William G. Stroud, Mr. Richard W. Batchelder, Mr. William F. Wright, Dr. James E. Kupperian, Jr., Mr. Charles A. Lee, Mr. Robert C. Baumann, Mr. Joseph Purcell, Mr. David H. Suddeth, Mr. Jeremiah J. Madden, Mr. Allen K. Berndt, Mr. James M. Williamson, Mr. Francis J. Logan, Mr. Robert L. Tanner, Mr. John L. Donley, Mr. Eugene C. Humphrey, Mr. Warner H. Hord, Jr., Mr. Gerald W. Longanecker, Mr. Henry L. Anderson, Mr. George B. Robinson, Mr. George H. Harris, Mr. Albert Boggess, III, Mr. Donald L. Righter, Dr. Jaylee M. Mead, Dr. John A. O'Keefe, Mr. Gerald R. Baker, Mr. John D. Stolarik, Mr. Clarence Wade, Jr., Dr. Thomas Kelsall, Mr. Clell S. Scearce, Dr. James P. Heppner, Mr. John K. Steckel, Mr. Charles E. Campbell, Mr. David S. Hepler, Mr. Lib C. Rogers, Mr. John H. Lane, Ms. Elise R. Fisher, Mr. Frank T. Martin, Mr. Frank G. Rawlinson, Mr. Henry J. Franks, Jr., Mr. William F. Jennings, Mr. Wesley J. Bodin, Jr., Mr. Raymond L. Granata, Mr. Richard W. Reuschlein, Mr. Robert J. Fisher, Mr. Paul J. Kushmeider, Mr. William C. Brown, Mr. Howard I. Kingman, Jr., Mr. George O. Stewart, Mr. Clarence E. Doll, Jr., Dr. Leslie H. Meredith, Dr. Joseph W. Siry, Mr. John H. Berbert, Dr. Nino L. Bonavito, Ms. Barbara E. Lowrey, Mr. Harry A. Taylor, Jr., Dr. Isadore Harris, Ms. Edith I. Reed, Mr. John E. Ainsworth, Jr., Mr. Harry B. Benton, Mr. Richard G. Holt, and Mr. William W. Conant.

* * *

GSFC was the first NASA center to develop international, cooperative space programs: US/UK Ariel I, April 26, 1962.

GSFC developed first satellite program to study Earth-Sun interplanetary space relationships: OGO III, June 7, 1966.

Goddard space achievements give reasons for pride

On July 19, 1955, President Eisenhower announced that America planned to put a satellite into orbit for the International Geophysical Year of 1957-1958. The satellite would be small but ambitious: it would provide scientists their first opportunity to study the Earth as a planet.

By the beginning of the International Geophysical Year, two Russian Sputniks (launched in 1957) already had attained orbit and transmitted radio messages to Earth. Two American satellites followed early in 1958. The first, Explorer 1 (launched January 31) revealed a radiation belt around the Earth. The second, Vanguard 1 (launched March 17) surprised everyone with the news that the Earth was not round but slightly pear shaped.

Creation of NASA

By October 1958, President Eisenhower authorized the creation of the National Aeronautics and Space Administration and the construction of major new facilities for an American space program began.

The Vanguard team, working at the Naval Research Laboratory in Washington, D.C., became the core of NASA's first new major scientific laboratory for space exploration. Named the Goddard Space Flight Center on May 1, 1959, this new facility was located 15 miles northeast of Washington, in Greenbelt, MD. It opened for business with its first building in September 1960.

At the time, Goddard's mission was to use unmanned satellites to study near-Earth space, the Sun and the Sun-Earth environment, and to apply satellite technology for Earth, for example, communications and weather monitoring.

To accomplish these goals, Goddard officials planned and built a network for tracking and communicating with all NASA near-Earth orbiting satellites. Before long, the Center also took on responsibility for developing the Delta rocket for launching medium-sized satellites. The diversity of all these activities made Goddard the only NASA center with significant responsibilities in every area of space exploration, from conceiving satellites to using the data they return.

Foremost laboratory

Today, Goddard remains NASA's foremost laboratory for space science and services. It is one of the four largest NASA facilities, with an operating budget of $1.018 billion in FY 1983. The staff includes 3,600 civil engineers, scientists, technicians, administrators, and staff, supported by an additional 6,000 private contractors.

Ground breaking for Building 1 at Greenbelt, June 3, 1959.

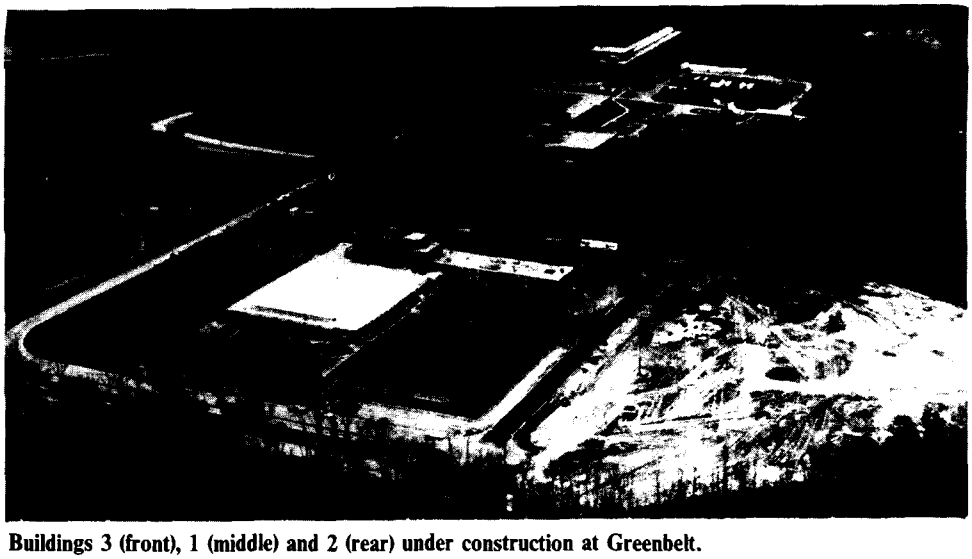
Goddard manages facilities in Greenbelt, MD; Wallops, VA; Palestine, TX; and in New York City; as well as a network of tracking stations around the world.

A small group of senior Goddard scientists staff the Goddard Institute for Space Sciences, Goddard's Office in New York. The Institute, founded in 1961, links Goddard and the national space program with talented students and scholars in Northeastern universities and laboratories. This partnership promotes a valuable means of sharing expertise between government and academia.

The balance of the Goddard team operates Wallops Flight Facility, a test site on the Virginia coast which joined Goddard in October 1981. The only flight test facility wholly-owned and operated by NASA, Wallops was established in 1945 by NASA's predecessor agency (the National Advisory Committee for Aeronautics). The facility today holds an experimental research airport and is the headquarters of the national sounding rocket program, supporting launches both on-site and around the world. It comprises 1,833 acres of main base, 3,085 acres of launching site, a 107 acres of tracking site, and 1,140 acres of protective marshland. Wallops also manages high-altitude balloon launches for NASA and other users at its Palestine, TX, launch facility.

Earth Services

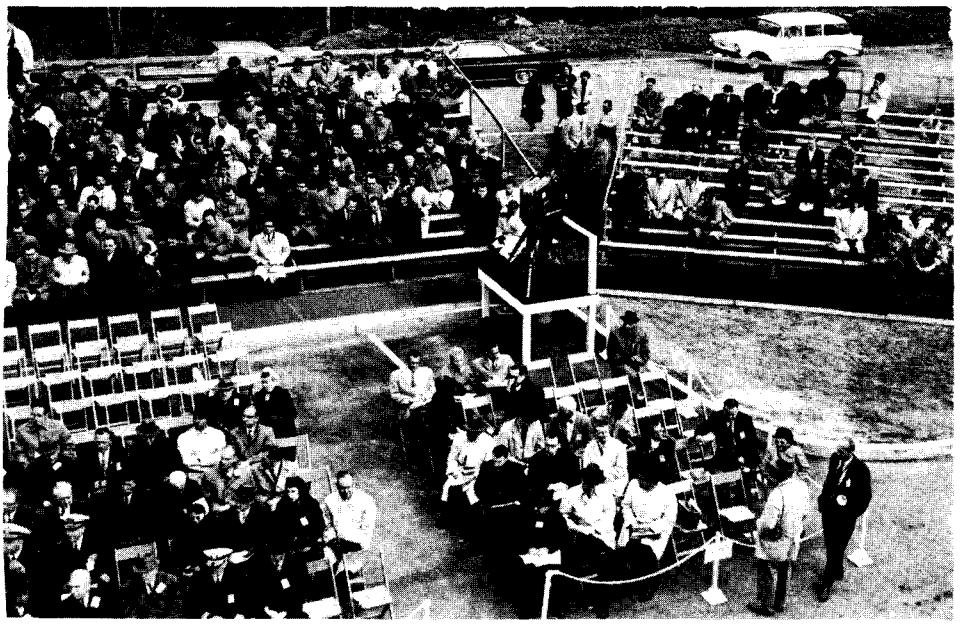
On August 7, 1959, Goddard personnel watched the launch of their first satellite. It was Explorer VI, and it re-



Buildings 3 (front), 1 (middle) and 2 (rear) under construction at Greenbelt.

turned the first image of the Earth from orbit. The picture, centering on Mexico City, resembled a grainy photograph, but it clearly foretold what new benefits to mankind would come from space. By March of the next year, another Goddard satellite—Tiros 1—returned the first global cloud cover photographs of the planet. Two new sciences began: the study of Earth resources and the study of the weather by satellite.

The first Earth image from Explorer VI led to the well-known series of Landsat satellites, which today provides land planners worldwide with large area land surveys. Goddard launched the first such satellite, the Earth Resources Technology Satellite (Landsat 1) in July 1972. Goddard continues today to update Landsat capabilities for discriminating ground cover features such as types of vegetation, mineral deposits, and water features. At the same time, Goddard has used a variety of other satellites to explore the Earth's structure and resources through variations in its magnetic fields, gravity, and day/night temperatures.



Dignitaries and guests attend the Goddard Dedication Ceremony, March 16, 1961.

First weather picture

The first weather pictures of Goddard's Tiros program evolved into the present weather satellite system of the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). Goddard still works closely with NOAA to continue improving satellite capabilities to forecast weather further and further in advance.

As a result of its work with weather satellites, Goddard increasingly became involved in exploring and modelling of the Earth's atmosphere. In November 1960, the Center launched an Ionospheric Explorer (Explorer 8) that confirmed the existence of the helium layer in the upper atmosphere. More recently, in 1979, the SAGE satellite (Stratospheric Aerosol and Gas Experiment) explored pollutants thought to threaten the Earth's protective ozone layer.

Goddard's future plans call for continued exploration of the atmosphere to clarify climate and weather, most notably with launch of the Upper Atmosphere Research Satellite in 1989.

Satellite Communications

The earliest Goddard satellites not only demonstrated the uses of space for ground and weather observation, they also explored the uses of orbit for communications. By August of 1960, people around the world were standing watch at night in hopes of seeing Goddard's Echo 1 orbiting overhead. Echo 1, visible as a sole pinpoint of light moving among the stars, brought the reality of satellites in orbit home to millions.

Echo was the simplest satellite of all—a 100-foot diameter, aluminum

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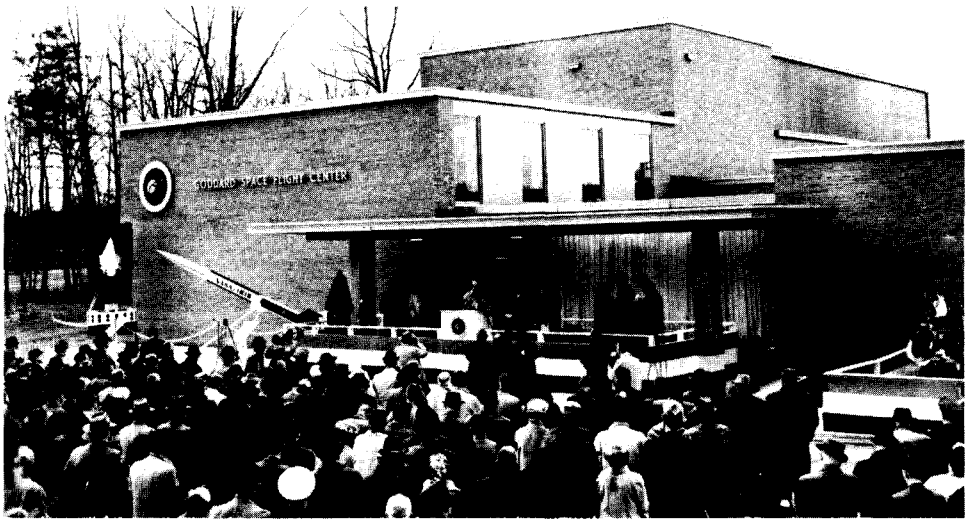


Dedicating Goddard (left). Mrs. Robert H. Goddard (right) participates on behalf of her late husband, Dr. Robert H. Goddard, for whom the Center is named.

Wallops: 14 years old when Goddard began

The year that the NASA Goddard Space Flight Center had its beginning was a time of great change for the then Wallops Station. Although Wallops was fourteen years old, it just had become independent from the Langley Aeronautical Laboratory the year before when the NACA (National Advisory Committee for Aeronautics) was incorporated into the newly-formed space agency. The Eastern Shore of Virginia site was made a separate NASA installation named Wallops Station.

A major growth was being planned at Wallops at the same time the Department of the Navy decided to close its Chincoteague Naval Air Station in 1959. Because the Chincoteague Naval Air Station contained all of the necessary facilities and utilities required for the expansion, assuming responsibility for the surplus Naval facility seemed more desirable-purchasing it and developing on the mainland adjacent to the island.

A new causeway and bridge which would permit "land traffic" to Wallops Island was almost complete. Nearly two miles long with a bridge clearance of 40 feet above mean high tide, the causeway cost about $1.5 million. Prior to this time, all personnel and equipment were transported to Wallops Island by a small ferry and several small power boats.

Naval personnel turning over the Chincoteague Naval Air Station to NASA July 1, 1959.

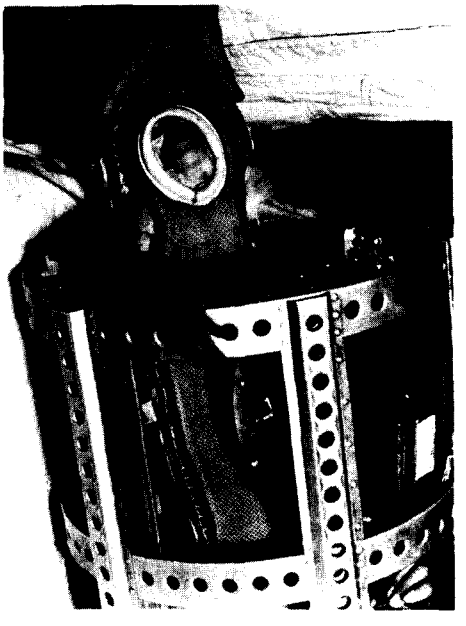
The 160-foot Aerobee launch tower was under construction on Pad 1. From here, the liquid-fueled rockets would be launched from Wallops.

Another lauch pad also was being prepared on the island. It was Launch Pad 3, from which the Scout vehicle could loft reentry missions, special probes, and Earth-orbital satellites. (First Scout was launched July 1960.) Blockhouse 3, with walls eight-feet thick, was under construction.

One of the most publicized projects in the history of Wallops also was taking place in 1959—the Mercury capsule tests. A famous rhesus monkey named "Sam" was launched on a Little Joe rocket in December of that year. Sam, fitted in his special contoured couch and restraining harness, came through the flight with flying colors. Without a hitch, he performed his duty assignment of pulling a lever when a light came on. Before Alan Shepard took the first manned suborbital flight, Wallops completed the tests of the escape tower, the life support system and the flotation system on the Mercury capsule.

Other projects that year included drop tests, noise studies, gun tests for the Navy as well as sounding rocket launchings.

Spandar, a huge 60-foot antenna mounted on a 90-foot pedestal, was under construction. This long-range radar with a peak transmitting power of five megawatts (5,000,000 watts) would prove to be a highly accurate and reliable S-band radar still in use 25 years later. Today, Wallops has gone full cycle—from a facility managed by the Langley Research Center, to an independent center, and now a part of the Goddard Space Flight Center. Wallops' mission has expanded to encompass total management for NASA's sounding rocket and balloon programs as well as supporting the nation's aeronautical programs.



Sam, a rhesus monkey, is prepared for launch aboard a Mercury capsule at Wallops, December, 1959.

A 1959 Little Joe vehicle with Mercury capsule attached is readied for launch at Wallops.

Center Directors: (left, top to bottom) Dr. Robert L. Krieger, Wallops Director from 1948 to 1981; Dr. Harry J. Goett, Goddard Director from 1959 to 1964; Dr. John F. Clark, Goddard Director from 1964 to 1976; (right, top to bottom) Dr. Robert F. Cooper, Goddard Director from 1976 to 1979; A. Thomas Young, Goddard Director from 1979 to 1982; and Dr. Noel W. Hinners, current Goddard Director.

Space achievements

Continued from page five

coated balloon. But it proved immensely useful. For years, overseas communications had been restricted to shortwave signals, which only could be relayed at night using the tenuous reflection of the ionosphere. The ionosphere's reflectivity dissipated by day; however, with Echo, broadcasters could transmit anytime the satellite was in view as it circled the Earth.

Echo carried the first two-way voice communication and the first picture transmission (both between Cedar Rapids, Iowa and Richardson, Texas), foreshadowing the growth of the giant communications satellite industry.

Private Sector

The success of the satellite communications industry was so phenomenal that the private sector was soon doing its own research and development. By July 1962, the first privately-built satellite—RCA's Telstar 1—had been launched, relaying telephone, black-and-white and color television, and high and low speed data signals across the Atlantic.

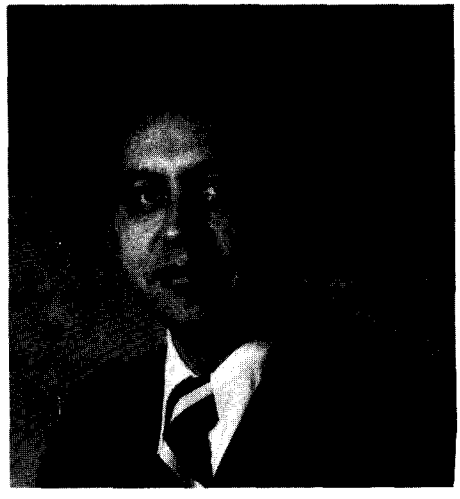
With the rise of the private satellite communications industry Goddard phased down its involvement in communications research and development. But first the Center prepared a final series of satellites to demonstrate the full range of uses to which space communications might one day be put. Beginning with Applications Technology Satellite 1 (ATS-1 in 1966) and ending with ATS-6 (launched in 1974), the Center showed the way services ranging from aeronautical and maritime communications to education broadcasts to remote areas could be used.

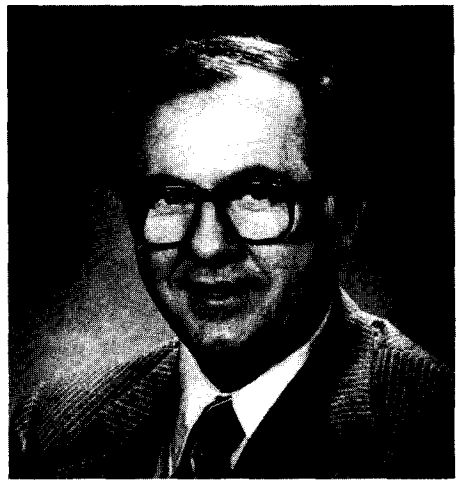
Space Sciences

At the same time, Goddard scientists began to explore the Earth from orbit, the Center also began to explore space—from space.

Explorer 7, Goddard's second satellite, was launched October 13, 1959, to continue the exploration of the Earth environment started by the first American satellite Explorer 1. The Goddard satellite measured X-rays, cosmic rays, Earth radiation and recorded the first micrometeorite impact.

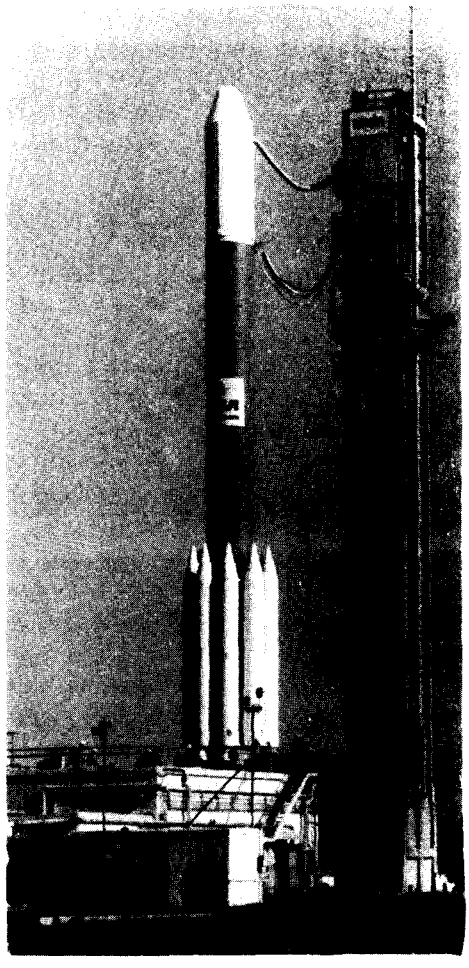
A string of Goddard science satellites followed and soon overturned the common perception that near-Earth space was only a vacuum. Instead, they revealed the Earth moved through a solar wind of charged particles and energy flowing outward from the Sun to the planets.





The satellites further surprised scientists with indications that disturbances on the Sun and in the solar wind resulted in magnetic storms over the Earth, and even might affect the climate and the weather. These satellites included Goddard's series of Interplanetary Monitoring Platforms (beginning in 1963), Atmosphere Explorers (beginning in 1966), Orbiting Solar Observatories (beginning in 1966), International Sun Earth Explorers (beginning in 1977), the Solar Maximum Mission (1980), and the Dynamics Explorers (1981). All have sought to clarify the Sun-Earth relationship.

In coming years, Goddard plans to continue this Sun-Earth exploration, most comprehensively with a new series of four satellites scheduled for launch next decade (the International Solar Terrestrial Physics Program). Also for the future, Goddard is developing a Solar Extreme Ultraviolet Telescope and Spectrograph as well as a Solar Optical Telescope to perform solar research from the Space Shuttle.



The Delta Launch Vehicle on its 158th mission.

Goddard's first satellite, Explorer VI launched August 7, 1959.

Stellar phenomena

While early Goddard space science satellites explored the Sun-Earth region, many also carried instruments to make observations of stellar phenomena beyond the Sun.

The new orbital vantage point opened up the whole range of energies emitted by stars to observation. Previously, Earthbound astronomers only had been able to study stars by their visible appearance, radio emissions and, to a limited extent, ultraviolet emissions. All other forms of energy—infrared, x-ray, gamma ray, cosmic ray, all of which are indicative of different astronomical processes—largely were imperceptible below the Earth's thick atmosphere.

Goddard's first Orbiting Astronomical Observatory, launched in 1968, allowed astronomers for the first time to view stars comprehensively by their emissions of ultraviolet light and x-rays. Observations in the ultraviolet were further advanced by the International Ultraviolet Explorer (IUE), launched in January 1978, which is a cooperative effort with the European Space Agency and the United Kingdom. The IUE since has become the world's most used astronomical observatory and has been pointed at some of the greatest mysteries in the universe, such as quasars and black holes.

Space Telescope

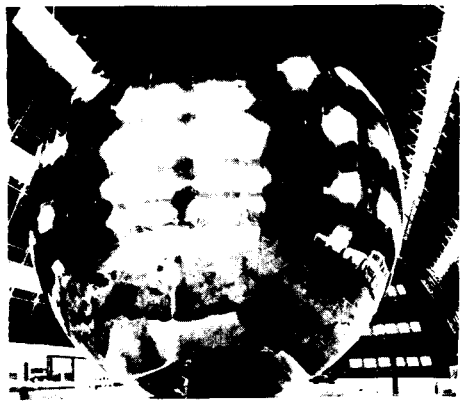
The IUE, as an operating observatory for astronomers, foreshadowed NASA's much larger Space Telescope, due for launch in 1986. The Space Telescope, which will observe in visible and ultraviolet wavelengths, is expected to be astronomy's primary tool for exploring the universe for the next 10 to 15 years. Goddard is responsible for the Telescope's science instruments and will operate the telescope in orbit.

At about the same time the Space Telescope is launched, Goddard plans to deploy two more major space science satellites. One, the Gamma Ray Observatory (GRO), will search the stars for gamma radiation, the highest known form of energy. The other, the Cosmic Background Explorer (COBE), will survey the infrared radiation in space which is believed to be the relic of the big bang origin of the universe.

Tracking and Communications

To return the vast amount of data about the Earth, the Sun, and the stars that is obtainable from orbit, Goddard began in 1960 to construct NASA's first satellite tracking and communications network.

The Center's first task was to expand the coverage of space offered by the Navy's Minitrack System, which had been built to support the earliest Vanguard missions. The Minitrack system was made up of ground stations spotted around the world beneath the Vanguards' orbital path and communicated with the satellites as they briefly passed overhead.



The Echo balloon undergoes testing at Greenbelt prior to launch.

To provide a larger and larger window for communicating with satellites, Goddard augmented the Minitrack network to include stations on every continent except the poles. The expanded

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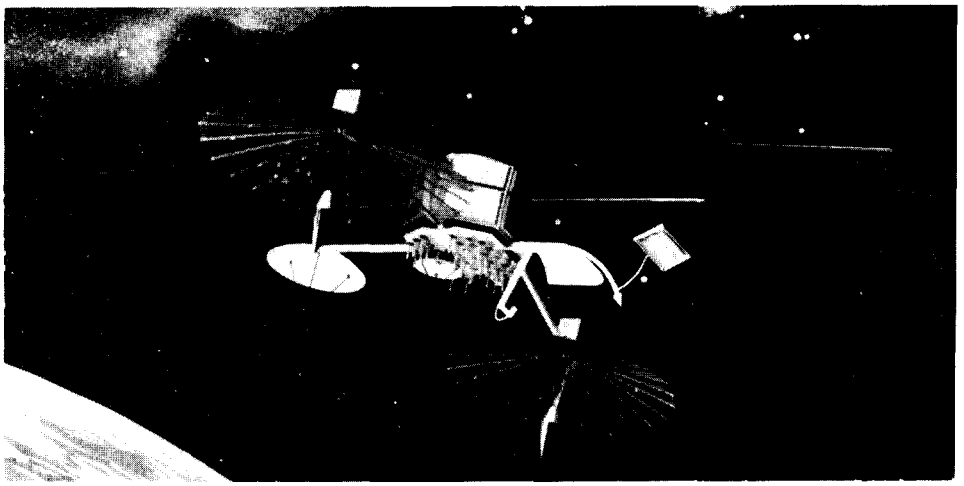
coverage kept pace with the increasingly varied orbital paths of new satellites as advantages were discovered to polar, elliptical, and even equatorial (geosynchronous) orbits. The stations communicated with Goddard by automated ground and satellite links, allowing controllers to uplink commands to their spacecraft and receive data at the same time.

Since 1960, Goddard has maintained communications for both unmanned satellites and manned spacecraft, covering all but NASA's interplanetary flights (which use NASA's Deep Space Network operated by the Jet Propulsion Laboratory in Pasadena, CA.).

Project Mercury Network

Forming the Project Mercury Network, the system relayed the first astronaut communications between space and Mission Control at Johnson Space Center in Houston, TX. Subsequently, the Goddard network has provided the sole communications link to every manned space flight, from Gemini to Skylab to the Space Shuttle.

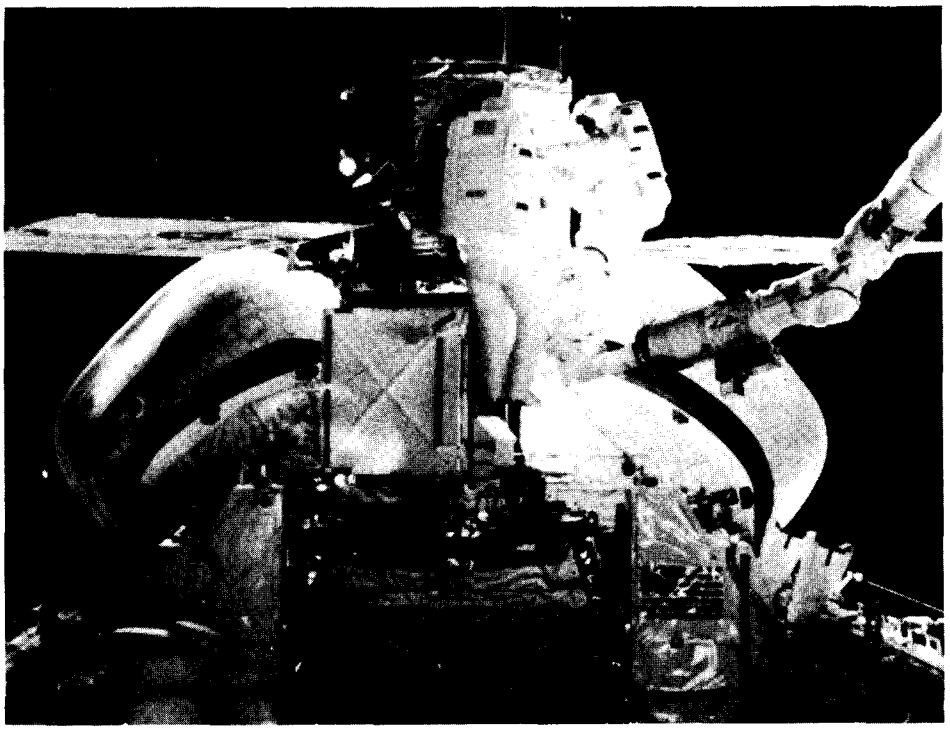
This decade, the Goddard network is moving from a ground station-based system to a spaceborne system that uses satellites to track and communicate with other Earth-orbiting satellites.



The first Tracking and Data Relay Satellite, launched April, 1983.

This Tracking and Data Relay Satellite System (TDRSS) offers coverage of most NASA satellites from 85 to 100 percent of their Earth orbits, compared to the 15 to 20 percent coverage afforded by current ground stations.

The first Tracking and Data Relay Satellite (TDRS-A) was launched in April 1983 and is operating successfully after a faulty booster rocket complicated deployment. Once the booster problem is solved, TDRS-B will be launched to complete the full two-satellite, operational TDRS system, and switchover from the ground network will begin.



First repair of a satellite in orbit: the Solar Maximum Repair Mission of April, 1984.

Space Transportation

To speed the exploration and use of space through the years, NASA has devoted much of its activity to developing reliable launch vehicles. While other Centers such as Marshall Space Flight Center in Alabama, undertook development of the largest rockets that would culminate in the massive lifting capabilities of the Saturn V and the Space Shuttle, Goddard has had responsibility for managing the development and operation of a "workhorse" carrier for medium-sized satellites.

Goddard's launch vehicle, known as Delta, has been the busiest of all the NASA rockets, first carrying the scientific and communications payloads of the Space Agency, and later (on a reimbursable basis), the spinoff communications and weather satellites built by industry, other Federal agencies, and foreign governments.

Delta launched its first satellite on August 12, 1960—the Echo communications balloon, which weighed 82 kg. (180 lbs.). Since then, it has been upgraded constantly to handle heavier and heavier payloads as the standard size of "everyday" satellites increased along with their usefulness. The rocket launched its largest payload ever on February 14, 1980, the 2,296 kg. (5,062 lbs.) Solar Maximum Mission satellite used to study the Sun.

By the end of 1984, Delta will have launched approximately 177 satellites. The rocket not only has proved itself the workhorse NASA needed but also one of the most reliable launch vehicles ever built, compiling a remarkable 93.7 percent record of success.

Delta phase out

This decade, NASA will phase out its use of one-time (or expendable) launch vehicles such as Delta in favor of the more cost-effective, reuseable Space Shuttle. Meanwhile, Deltas continue to serve as a backup capability for NASA, and, in the future, may become yet another spinoff to industry, which increasingly has become interested in operating expendable launch vehicles commercially.

The spin-off of the Delta rocket will trim—but not end—Goddard's involvement in launch vehicles. The Center will continue to develop and launch sounding rockets, which fill the gap in aerospace exploration between the maximum altitude of balloons (about 48 km. or 30 miles) and the minimum stable orbit for satellites (about 482 km. or 300 miles).

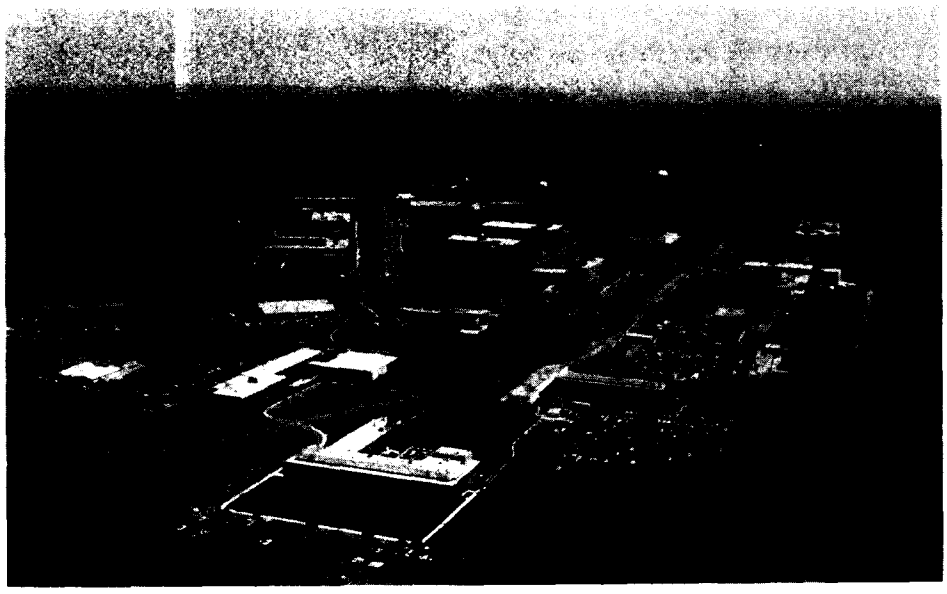
Sounding rockets are lightweight, low power and relatively inexpensive vehicles for studying the upper atmosphere or astronomy from high altitude. Typically, they carry payloads from 4.5 to 908 kg. (10 to 2,000 lbs.), reaching altitudes from 65 to 1,500 km., (40 to 931 miles) before they fall back to Earth.

Such rockets have been developed at Goddard's Wallops Facility since 1958, when NASA undertook management of the Nation's sounding rocket program.

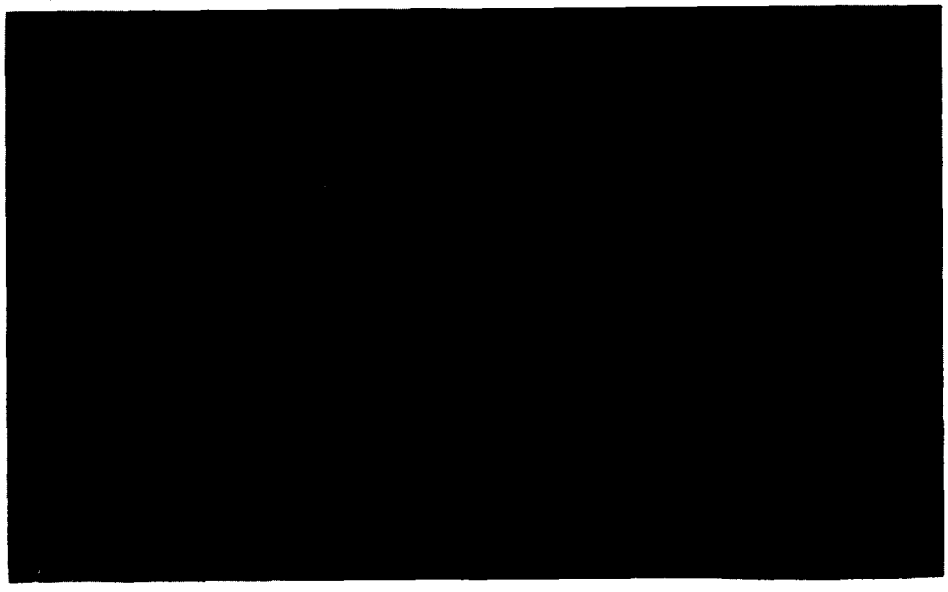
Wallops today

Today, the Wallops facility launches some 150 sounding rockets a year, both from its Virginia shore range and from sites world wide. The launches serve universities, Federal agencies, and foreign governments.

By no coincidence, Goddard Space Flight Center takes its name from the man who invented sounding rockets early this century and so laid the foundations of the modern space age. The name commemorates Dr. Robert Goddard, a New England physics professor born in 1882 who developed the first liquid-fuel rockets for high altitude flight. Before is death in 1946, Dr. Goddard had launched a scientific instrument to an altitude of almost two miles, presaging the space exploration which his namesake Center conducts today.



Aerial views of the two Goddard facilities. Above, the Greenbelt facility near Washington, D.C. Below, the Wallops Flight Facility, VA.



Congratulations!
1959-1984
Goddard Space Flight Center
Twenty-fifth Anniversary
NASA

Some Goddard firsts...

Geodetic Survey . . . Vanguard-1 3/17/58
Determined earth is slightly pear shaped

Energetic Particles Radiation Experiment . . . Explorer-3 3/26/58
Provided additional Van Allen Belt data

Explorer VII 10/13/59
First micrometeorite penetration of a sensor occurred aboard energetic particles experiment which gathered data on radiation and magnetic storms

Meteorology Satellite . . . Tiros-1 3/1/60
Provided first global cloud cover picture transmissions

Passive Communications Earth Satellite . . . ECHO-1 8/12/60
100-foot sphere bounced radio signals back to earth

Ionospheric Explorer . . . Explorer-8 11/3/60
Confirmed existence of helium layer in upper atmosphere

Orbiting Solar Observatory . . . OSO-1 3/7/62
Provided first spacecraft acquired data on approximately 75 solar flares

First launch of a privately built satellite . . . TELESTAR-1 7/10/62
First successful TV transmission in space

Geosynchronous Orbiting Communications Spacecraft . . . SYNCOM-1 2/14/62

Aeronomy Explorer Satellite . . . Explorer-17 4/3/63
Discovered belt of neutral helium atoms around the earth

First Operational Geosynchronous Communications Satellite . . . SYNCOM II 7/26/63
Operated successfully until turned off by U.S. Navy in 1966

Interplanetary Monitoring Platform (IMP-A) . . . Explorer-18 11/27/63
Confirmed solar wind shock wave on atmosphere. Launched with first Delta X-258 third stage.

Three axis stabilized earth observation spacecraft . . . NIMBUS-1 8/28/64
First complete global cloud cover pictures each 24 hrs.

Truly synchronous (stationary) communications satellite . . . SYNCOM-3 8/19/64

Orbiting Geophysical Observatory . . . OGO-1 9/5/64

Environmental Survey Satellite . . . Tiros Operational Satellite (TOS) 2/3/66
Later called ESSA-1; had cloud cover TV sensor system

Fully successful Orbiting Geophysical Observatory . . . OGO-3 6/7/66
First three-axis stabilized spacecraft in highly elliptical orbit. Viewed earth, space, sun, and orbital plane. Interdisciplinary studies

Interplanetary Monitoring Platform around moon Explorer-33 . . . IMP-D 7/1/66
Planned lunar orbit not obtained. Spacecraft placed into highly elliptical orbit about the earth

Geosynchronous Applications Technology Satellite . . . ATS-1 12/7/66
Circular equatorial orbit near Hawaii. Returned first photo covering nearly entire disc of earth on 12/9/66 [see Explorer 35 below]

Radio Astronomy Explorer satellite . . . Explorer-38 . . . RAE-A 7/4/68
Had four, 750 foot-long [1500 ft. tip-to-tip] antennas which were deployed October 8, '68. Conducted radio astronomy studies in upper atmosphere

First non-midcourse corrected lunar orbiting spacecraft . . . Explorer-35 . . . IMP-E 7/19/67
Lunar orbit achieved 22 July, '67 permitting more detailed study of earth's magnetosphere

Animal Tracking Experiment: through NIMBUS-3 11/15/69
Obtained migration and habitat information on species of Elk

Launch of Delta rocket with strap-on solid thrust augmentation rockets . . . (ITOS-1) 1/23/70
OSCAR Ham Radio satellite launched from Delta rocket in orbit

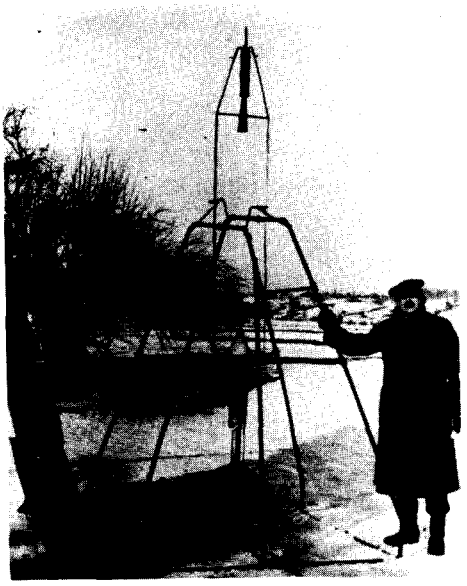
Orbiting X-Ray Satellite . . . Explorer-42 . . . (SAS-A) nicknamed "UHURU" 12/12/70
Catalogued celestial X-ray sources of the celestial sphere. "UHURU" means "Freedom" in Swahili; honoring Kenya's Independence Day. "UHURU" increased catalogue of known X-ray sources from 36 to about 200. Found first evidence that certain stars could collapse to an extremely dense state whose gravitational field was so powerful that light could not escape developing a so-called "black hole."

Successful Orbiting Astronomical Observatory . . . "Copernicus" . . . OAO-3 8/21/72
Obtained first precise astronomical observations of celestial objects from above the earth's atmosphere

Launch of a series of Canadian domestic communications satellites TELESAT-A 11/9/72
Spacecraft designed to transmit TV, voice, data, etc., throughout Canada

Tracking and communications control of one satellite by another 5/5/75
ATS-6 tracked and transmitted radio command signals from Rosman, N.C. ground station to the GEOS-3 spacecraft. GEOS responded to commands by returning data and spacecraft condition information to Rosman over the same communications loop

Use of a communications satellite (ATS-6) in a joint USA-USSR space mission 7/18/75
Communications from crews of docked Apollo and Soyuz spacecraft, including color TV relayed to earth.



Dr. Robert H. Goddard, for whom Goddard Space Flight Center is named, poses moments before the first successful flight of his liquid fueled rocket on March 16, 1926 near Auburn, MA.

NASA National Aeronautics and Space Administration
Goddard Space Flight Center

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Greenbelt, Maryland and Wallops Island, Virginia

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