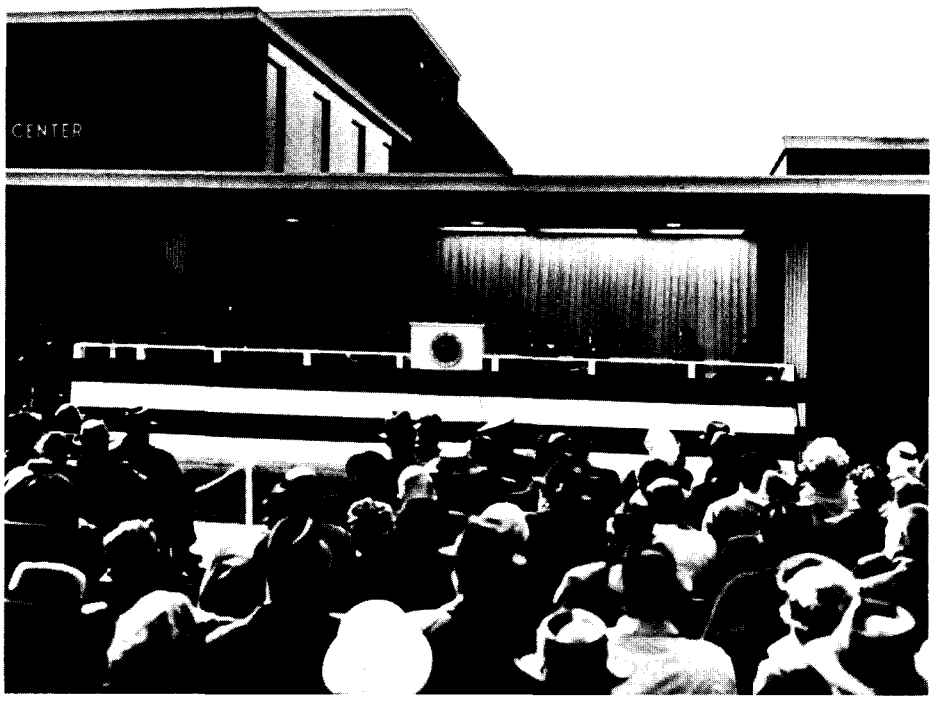
Special Edition

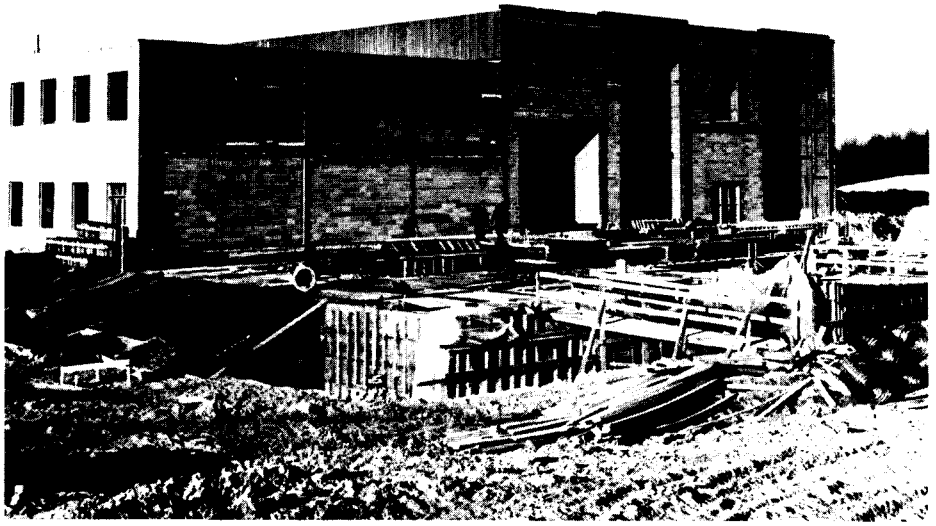
NASA
National Aeronautics and Space Administration
Goddard Space Flight Center

Goddard News

Greenbelt, Maryland and Wallops Island, Virginia
Spring 1989

Goddard Space Flight Center Turns 30: A Glorious Past, A Promising Future





***A SPACE CENTER IS BORN*—After the naming of the Goddard Space Flight Center on May 1, 1959, and before the official March 16, 1961 dedication ceremonies in front of Building 1 (pictured upper left), the front gate sign was erected (pictured right). Soon to follow was the construction of facilities such as this new laboratory for space research (Building 7, pictured lower left).**

by Randee Exler

Goddard has a lot to celebrate on its 30th birthday next month. During the past three decades, we have built and tested more than 40 satellites at our Greenbelt facility; have managed approximately 160 different satellite projects for NASA, have launched 171 payload-carrying Delta rockets, and have flown more than 2,500 sounding rockets and 550 scientific balloons from all corners of the Earth.

Our Center has also proven itself a leader in space and Earth sciences and can boast many NASA "firsts" such as the first weather pictures from space (Tiros 1, launched 3/1/60) and the first and only spacecraft to pass through the tail of a comet (International Cometary Explorer, September 1985).

NASA gave birth to its first major scientific laboratory on May 1, 1959. On that date, T. Keith Glennan, NASA Administrator, announced that the new space center would be named the Goddard Space Flight Center "in commemoration of Dr. Robert H. Goddard, American pioneer in rocket research."

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This new facility was dedicated to basic space research and the development of satellites, space probes and vehicles, tracking, communications, and data reduction systems.

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.

Goddard Today

Today, Goddard remains NASA's foremost laboratory for space science and services. Its Greenbelt facility is a modern campus-like complex of 29 buildings on 1,100 acres of rolling Maryland countryside.

The first Goddard employees were the 157 people of the Vanguard group who were transferred from the Naval Research Laboratory (NRL), Washington, DC, to the newly-created National Aeronautics and Space Administration. By June 30, 1960, the Goddard personnel had grown to 707 people.

Thirty years later, Goddard has one of the world's leading groups of scientists, engineers and administrative managers devoted to research in space, Earth sciences, and applications.

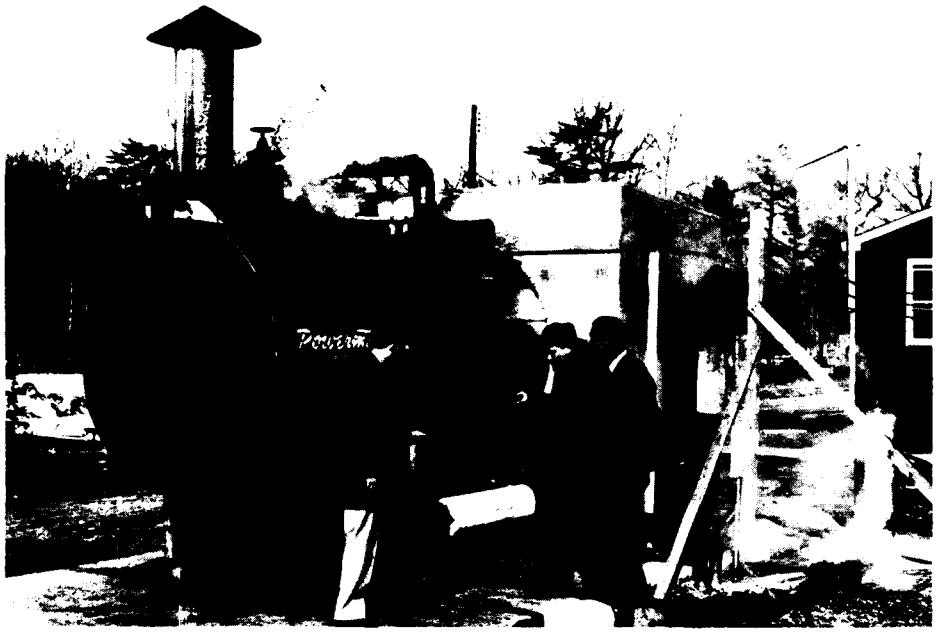
Goddard has grown in numbers and size. More than 3,700 Civil Service employees and 8,100 contract personnel work for Goddard today–a total of nearly 12,000 employees. The budget is more than $1 billion annually.

Goddard has planted roots around the globe. In addition to the Greenbelt facility, Center officials manage the Wallops Flight Facility, Wallops Island, VA; the Goddard Institute for Space Studies, New York, NY; a ground terminal at White Sands, NM; and ground stations in Ascension Island; Santiago, Chile; Dakar, Senegal; Guam; Hawaii; Yarragadee, Australia; Merritt Island, FL; Ponce de Leon, FL; and Bermuda.

Goddard's First Year

The first satellite under the project control of Goddard, Explorer VI, provided the world with the first image of Earth from space and a complete map of the Van Allen radiation belts. Launched on August 7, 1959, Explorer VI successfully transmitted a crude picture of a sunlit, crescent-shaped portion of the North Central Pacific Ocean as the spacecraft passed over Mexico.

By the following March, Tiros 1, another Goddard satellite, was launched. Tiros 1 returned the first pictures of global cloud coverage. From Explorer VI and Tiros 1, two new sciences were born–the study of Earth resources and the study of the weather by satellite.



***IT WON'T RUN WITHOUT WHEELS... BUT IT DID*—Looking much like an old time railroad engine out of Disneyland, temporary Boiler 1 was readied for removal in 1961. Shown talking over the plans are (left to right) Stu Snyder, Chief of the Plant Engineering Branch; Ira Beckner, Operating Engineer; and Donald Forgan, Foreman of the Central Power Plant.**

Leader in Earth Science

Over the years, Goddard has remained a leader in Earth science. Those early Explorer images evolved into the best-known of the Earth observers, Landsat, which provides land planners worldwide with

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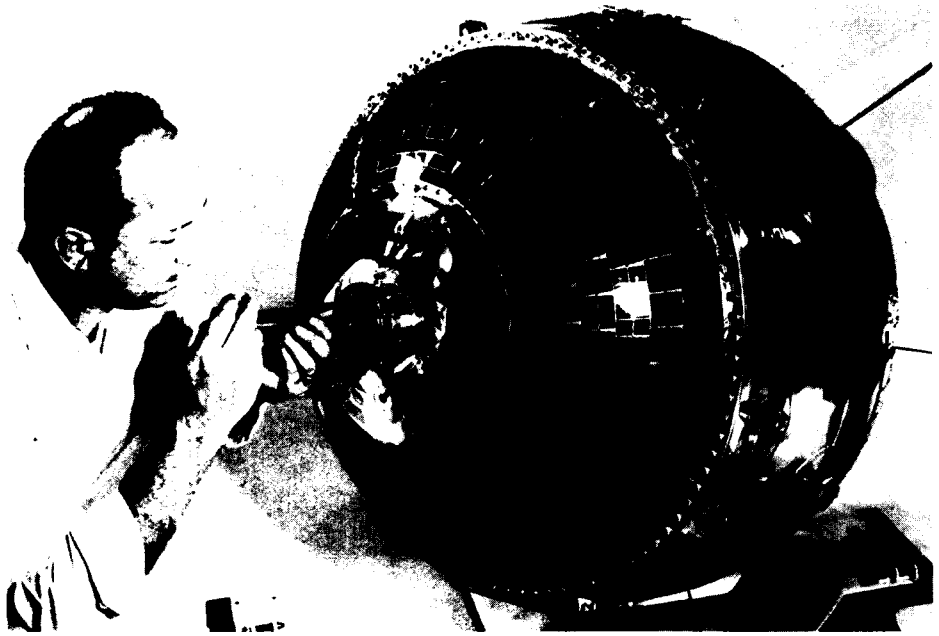


***EARLY IN-HOUSE PROJECT*—Goddard technician adjusts a scientific instrument on the Atmospheric Explorer-B spacecraft. This 1966 spacecraft made direct measurements of the Earth's atmosphere on a global basis.**

***ROBERT H. GODDARD BUST*—Mrs. Ester C. Goddard (right) and Sculptor Joseph Anthony Atchison with the bust of Robert H. Goddard which was unveiled at the March 1962 Goddard Space Flight Center Dedication and is on display in the Building 8 lobby today.**

A Legacy

The efforts of the father of modern rocketry, Dr. Robert H. Goddard, went greatly unrecognized in the United States until the dawn of what is now called the "space age." High honors and wide acclaim, belated but richly deserved, now come to the name of Robert H. Goddard.

On September 16, 1959, the 86th Congress authorized the issuance of a gold medal in honor of Professor Goddard.

In memory of the brilliant scientist, a major space science laboratory, the Goddard Space Flight Center was established on May 1, 1959.

Mrs. Esther C. Goddard, wife of the brilliant rocketeer, wrote this legacy about her husband in 1969 in honor of the Goddard Space Flight Center's first decade. Her words are as appropriate now as when they were written 20 years ago.

My late husband, Robert Goddard, has been widely honored, because he was the first American scientist who dared, in 1919, to publish the mathematical theory and experimental beginnings which indicated that it was possible for man to reach the moon, with materials already in existence. He was also the first scientist to actually construct, and on March 16, 1926 at Auburn, Massachusetts to fly a rocket using liquid propellants. His major contributions lie in the fields of propulsion, guidance and recovery. He also suggested the so-called "step" or multi-stage rocket, and worked out a probable sequence of air and space exploration. Rocket development has followed closely the pattern he envisaged for it. First came the exploration of the Earth's air envelope, then the space between the Earth and the moon; and now the vicinity of the moon, and then moon itself. According to his reasoning, man would land on the moon, establish observatories there to learn more about our own planetary system, and our own galaxy, the Milky Way. He foresaw thorough exploration of all our sun's planets, and of the stars, or other suns, near us, through advanced means of propulsion, possibly ion or nuclear propulsion. He even mentioned the possiblity of inter-galactic exploration, using a "radioactive clock" which is already within man's capabilities.

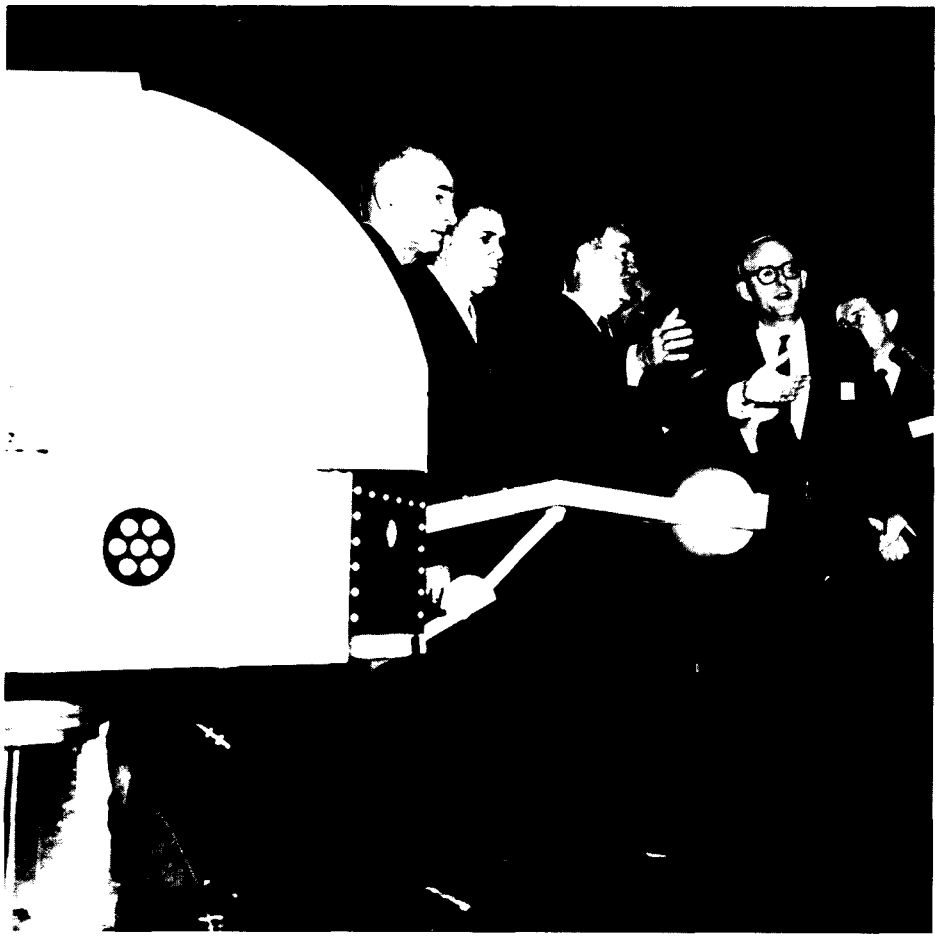
It has been a profound joy to me to have been able to live to see his predictions, which were sometimes met with skepticism, proven to be correct. Perhaps it is not premature to call attention to the fact that man must advance rapidly, both intellectually and spiritually, to meet the avalanche of new knowledge about our universe and man's place in it that will surely follow as we move from the cradle of the Earth into travel among the stars.

My Bob made considerable progress during his life and many others have taken over the work since his passing. Particularly in the last ten years the Goddard Space Flight Center has made tremendous strides in making the Goddard dream a very real reality.

Esther Goddard

William P. O'Leary Remembers Goddard's Famous Faces

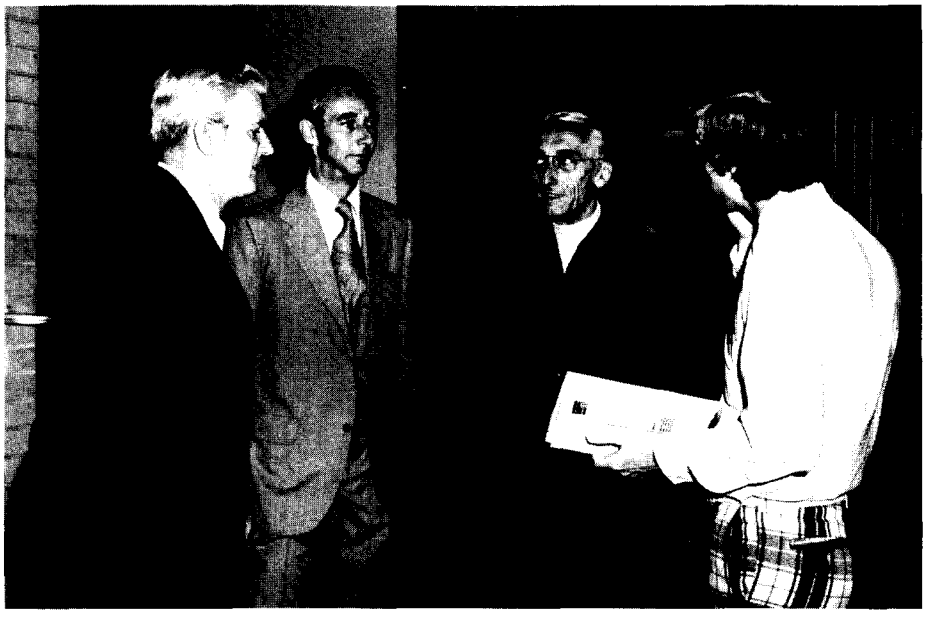
William P. O'Leary has been leading tours for the Office of Public Affairs since he joined Goddard in 1962. Although officially retired in 1985, O'Leary continues to play host to our very special guests. Over the years, O'Leary has conducted approximately 5,000 tours for more than 250,000 people. Other famous faces he has shown around Goddard include heads of state from Mexico, Thailand, Belgium, Madagascar Republic and the United Kingdom; authors James Michener and Isaac Asimov; actors Leonard Nimoy and Darth Vadar (Dave Prowse), and actress Myrna Loy.



***1966*—NASA Administrator James Webb (second from left), Vice President Hubert Humphrey (third from left) and Deputy Director John W. Townsend, Jr. (third from right) with the Orbiting Solar Observatory in the Building 8 Auditorium in 1966.**

***1970*—O'Leary (right) holds an umbrella for President Richard M. Nixon (center) when he visited Goddard in 1970 following the Apollo 13 accident.**

1972—O'Leary (left) gave singer Ethel Merman (center) and her secretary a tour in 1972.



1975—Underseas explorer Jacques Cousteau (second from right), his TV producer (second from left), and Astronaut Russell "Rusty" Schweichart.

1984—President Ronald Reagan (left) was presented a photo of the Solar Maximum Mission Satellite by Director Dr. Noel Hinners (center) and NASA Administrator James Beggs in 1984 following the successful repair mission.

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large-area land surveys. Goddard launched the Earth Resources Technology Satellite (Landsat 1) in July 1972.

Out of the Tiros program grew the weather satellite system of the Department of National Oceanic and Atmospheric Administration (NOAA). The weather maps available for television newscasts today evolved out of Goddard's meteorological efforts.

Goddard still develops, tests and launches satellites for NOAA through its Meteorological Satellites Project. Over the years Goddard has managed more than 20 of these satellites for NOAA.

Several NOAA satellites carry search and rescue equipment developed by Goddard for COSPAS/SARSAT, a U.S./Soviet/Canadian/French effort that uses satellites to locate persons in distress. More than 1,200 persons have been saved to date.

Goddard's contributions to Earth science will extend far into the future. The Upper Atmosphere Research Satellite, which will study atmospheric changes that affect weather and climate, will launch in 1991. The Goddard-managed NASA Polar Orbiting Platform-1 of the Earth Observing System will be launched in 1996 and will carry up to 20 instruments that will study global changes.

***COMMUNITY INVOLVEMENT*—Goddard participated in a solar energy research project with Greenbelt Homes, Inc. in 1966. Panels were installed on several townhomes on Crescent Drive in old Greenbelt.**

Leader in Space Science

Goddard has proven also to be a leader in space science. At the same time Goddard scientists began studying the Earth from orbit, the Center also began to study space—from space.

Explorer 7, Goddard's second satellite, launched October 13, 1959, continued the tradition of space exploration set by Explorer-1. This satellite studied the protons and electrons trapped in the Van Allen radiation belts; studied the particles coming from the Sun; studied cosmic radiation from outside the solar system; and correlated particle phenomena with the observed magnetic field in Earth.

Satellites such as Goddard's series of Interplanetary Monitoring Platform (beginning in 1963), Atmospheric Explorers (beginning in 1966), International Sun-Earth Explorers (beginning in 1977), the Solar Maximum Mission (1980), and the Dynamics Explorers (1981) have sought to clarify the Sun-Earth relationship.

Two of Goddard's solar-studying satellites achieved famous first for NASA. The Solar Maximum Mission, or Solar Max as the spacecraft is affectionately known, was the first satellite repaired in orbit (April 1984). Goddard's Satellite Servicing Project orchestrated this dramatic demonstration of space mechanics performed by the astronaut crew of Shuttle Mission 41-C.

The International Sun-Earth Explorer-3 was renamed the International Cometary Explorer (ICE) and given a new mission. In September 1985, ICE passed through the tail of Comet Giacobini-Zinner, making this celestial traveler the first spacecraft to intercept a comet.

In the near future, Goddard will continue new Sun-Earth exploration. Three satellites, GEOTAIL, WIND, and POLAR, part of Goddard's multi-mission International Solar Terrestrial Physics Project, are slated for launch beginning in 1992.

Stellar Phenomena

Satellites in space allow astronomers to look beyond the thick Earth atmosphere and see the heavens with a clarity unknown before. The new orbital vantage point provided by Goddard's early satellites opened up the whole range of energies emitted by stars for observation.

Goddard's first Orbiting Astronomical Observatory (OAO), launched in 1968, allowed astronomers for the first time to view stars comprehensively by their emissions of ultraviolet light and x-rays. OAO-3, also known as Copernicus, obtained the first precise astronomical observations of celestial objects from above the Earth's atmosphere in August 1972.

Observations in the ultraviolet were advanced further by the International Ultraviolet Explorer (IUE), launched in 1978.

The IUE, the world's most used astronomical observatory, is an international success. This joint NASA, European Space Agency and United Kingdom Science and Engineering Research Council project is credited with the discovery of galactic halos—hot gas which surrounds our galaxy; and with monitoring volcanic activities on Io, a moon of Jupiter. The first spectra of Comet Halley from space and of Supernova 1987A, the brightest supernova since the invention of the telescope, have been credited to this 11-year-old satellite.

Goddard will control telescope operations from NASA's Hubble Space Telescope (HST) manifested to be launched December 1989. The size of a railroad box car, this observatory hosts the most powerful telescope ever flown in space and will observe in both visible and ultraviolet wavelengths. HST is expected to be

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astronomy's primary tool for the next 10 to 15 years.

Goddard is planning several more major space science satellites in the near future: the Cosmic Background Explorer (COBE) and the Gamma Ray Observatory (GRO). COBE, built and tested at Goddard, is scheduled for launch in July 1989 aboard a Goddard-managed Delta expendable launch vehicle and will answer questions about the creation of the Universe. Goddard's GRO, one of NASA's four "Great Observatories," scheduled for an April 1990 Shuttle launch, is expected to provide great insights into the science of gamma ray astronomy.

Communications Satellites

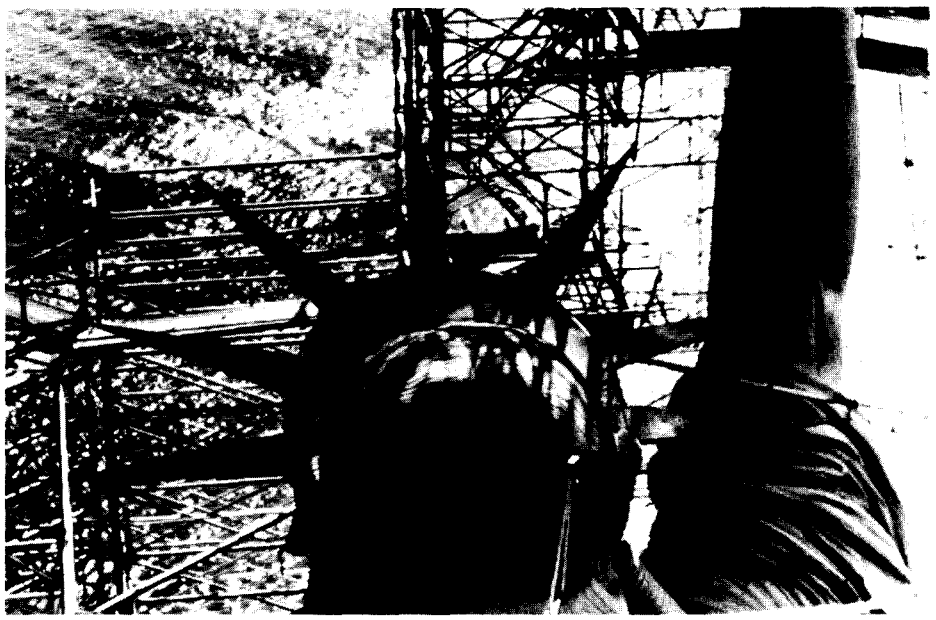
Goddard's overseas communications had been restricted to shortwave signals before the 1960 launch of Goddard's Echo 1 satellite. Echo reflected a radio message from President Eisenhower across the nation, which demonstrated the feasibility of global radio communications via satellites.

Echo was such a spectacular success that the private sector began doing its own research and development in this field. Before phasing down operations in this area, Goddard demonstrated through the Applications Technology Satellite (ATS) series (1966-1974) the way services ranging from aeronautical and maritime communications to education broadcasts to remote areas could be used.

Live color television from around the globe has its roots in ATS-6, launched December 6, 1966. ATS-6 relayed the first live color television broadcast from California to Goddard and simultaneously to a ground station in Australia.

Goddard's communication satellites of today allow NASA to communicate with the orbiting Space Shuttle as well as other low-Earth orbiting spacecraft. Out of Goddard's worldwide network of ground stations developed in the 1960s, evolved the Tracking and Data Relay Satellite System (TDRSS).

Goddard began in 1960 to construct NASA's first satellite tracking and communications network. The Center augmented the Navy's Minitrack network to include stations on every continent, except the poles. 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.



***RESTORING MISS LIBERTY*—The paint used to restore the Statue of Liberty in 1985, was developed at Goddard by Dr. John Schutt for space applications. Secondary applications of Goddard technology—spinoffs—have emerged over the years to the benefit of the Nation's lifestyle and economy.**

This decade, the Goddard network has been moving from the ground-based system to a system that uses satellites to track and communicate with other Earth-orbiting satellites. A constellation of three Tracking and Data Relay Satellites (TDRSs) now offers communications with the Space Shuttle and other orbiting satellites for up to 90 percent of its orbit, as opposed to the 15 to 20 percent coverage afforded by the tracking stations alone. With TDRS-D, launched from the orbiter Discovery in March 1989, the system is expected to be fully operational this month.

Launch Vehicles

NASA's "workhorse" carrier for medium-sized satellites was developed by Goddard. The Delta, NASA's busiest rocket, has been carrying agency and commercial satellites into space since the Echo communications balloon on August 12, 1960. Its history is one of continued upgrading of both performance and reliabil-

***LEADER IN METEOROLOGICAL RESEARCH*—What started with the launching of the first weather satellite Tiros-1 in March 1960, continues today at Goddard. Pictured is Dr. Fritz Hasler, of the Severe Storms Branch, examining a computer-generated, three-dimensional image of Hurricane Allen produced from Tiros-N data.**

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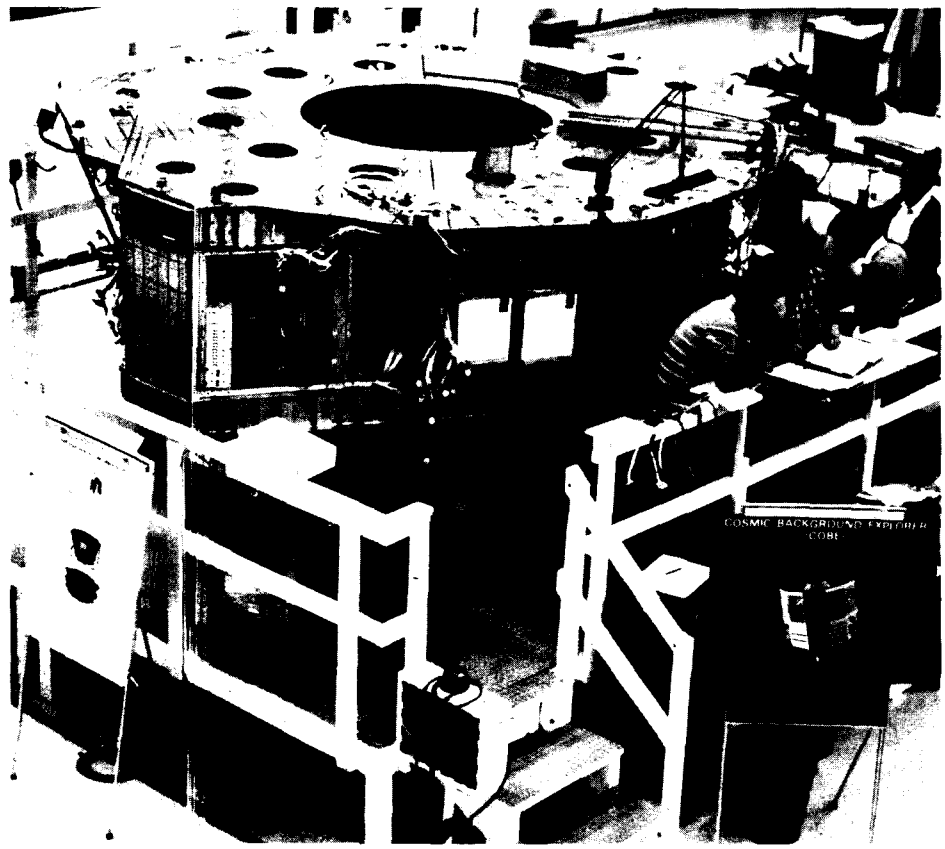
ity, and its versatility has made it the busiest and most reliable launch vehicle in the free world, with 171 launch successes in 183 attempts.

Effective July 1, 1988, NASA transferred Delta launch operations at the Eastern Test Range to the U.S. Air Force. Goddard retains limited management responsibilities for COBE/Delta, which is expected to be launched during summer 1989, and Delta II which will launch both the Roentgen Satellite (ROSAT) in February 1990 and the Extreme Ultraviolet Explorer (EUVE) in August 1991.

As Goddard phases down its Delta operations, the Center's involvement in smaller launch vehicles continues to prosper at the Wallops Flight Facility on the Eastern Shore of Virginia and the National Scientific Balloon Facility, in Palestine, Texas. Lightweight, low power, and relatively inexpensive sounding rockets have been developed at Wallops since 1958. Wallops has launched more than 2,500 sounding rockets to date with approximately 45 new launches taking place each year from locations around the globe. These small rockets fill the gap between the maximum altitude for balloons (approximately 30 miles/48 km) and the minimum altitude satellites (about 100 miles/ 160 km).

The Wallops facility also oversees NASA's balloon program. When fully inflated, the balloons expand to nearly 600 feet (182 m) in diameter with a volume of more than 50 million cubic feet (141.5 million cubic meters). Wallops personnel provide balloons and operations support at Wallops Island, the National Scientific Balloon Facility and at other launch sites around the world. To date, Wallops has launched more than 560 balloons with approximately 50 new balloons launched each year.

Balloons provide much longer flight periods than sounding rockets–hours and days instead of minutes–without the rigors of rocket liftoff, vibration or G-forces. For these reasons, they provide an environment that permits laboratory quality equipment.



***ENGINEERING INGENUITY*—During the past 30 years, Goddard has built more than 40 satellites in-house. Pictured is the Cosmic Background Explorer (COBE) wiring harness mock-up. Following the 1986 Challenger disaster, Goddard versatility enabled the project to change horses mid-stream and scale down the Shuttle-designed COBE (see artist concept in bottom right of photo) for a 1989 Delta launch.**

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Goddard Lives Up to Name

During the past 30 years, his namesake Center has emulated Dr. Robert H. Goddard's rare talent in both creative science and practical engineering as a model to be followed. The Goddard Space Flight Center has evolved into the only national laboratory that can develop, design, fabricate, test, launch and analyze space science missions using all of its own resources.

Just as Dr. Goddard's first rocket flight of 1926 paved the way for future space exploration, the scientists, engineers and technicians of the Goddard Space Flight Center are leading the world into the future today.