The National Space Club

honors

The National Oceanic and Atmospheric Administration

April 1, 1985

NATIONAL AIR AND SPACE MUSEUM
SMITHSONIAN INSTITUTION
Washington, District of Columbia

APRIL 1, 1985, is a proud day for the Department of Commerce and our Nation. It marks the 25th anniversary of the launch of the world's first weather satellite. We in Commerce feel a special satisfaction because our weather scientists led the way, with colleagues from the military, the National Aeronautics and Space Administration and the private sector.

Now, 25 years later, the Department's National Oceanic and Atmospheric Administration continues this proud heritage by its leadership extending the benefits of environmental satellites to people around the globe.

We salute all whose efforts have brought us to this day.

Malcolm Baldrige

Malcolm Baldrige
Secretary of Commerce

THE NATIONAL SPACE CLUB, founded as the National Rocket Club on October 4, 1957, is a nontechnical organization, composed of representatives of industry, government, educational institutions, and the press, which seeks to promote United States leadership in the field of astronautics.

The objectives of the club are to foster policies and programs necessary to establish and maintain United States space leadership and to stimulate the advancement and application of space flight and related technologies for the benefit of all mankind.

25th ANNIVERSARY OF WEATHER SATELLITES

Awards Ceremony

SAMUEL P. LANGLEY THEATER
NATIONAL AIR AND SPACE MUSEUM

Presentation of the Colors

UNITED STATES AIR FORCE HONOR GUARD COLOR TEAM

Master of Ceremonies

Jules Bergman
ABC SCIENCE EDITOR

Welcome

Walter J. Boyne
DIRECTOR, NATIONAL AIR AND SPACE MUSEUM

Charles J. Tringali
PRESIDENT, NATIONAL SPACE CLUB

Remarks

Honorable Anthony J. Calio
DEPUTY ADMINISTRATOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Honorable James M. Beggs
ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Honorable Malcolm Baldrige
SECRETARY, DEPARTMENT OF COMMERCE

Presentation of Awards

Reception

Reception Committee

- Sheila Frye, *NOAA Program Committee*
- Dave Wilkinson, *National Space Club*
- Wendy Walker, *Courtesy Associates*

We gratefully acknowledge the support of the U.S. Air Force

The following companies salute NOAA achievements:

Their names are recorded here with gratitude and appreciation.

RCA/ASTRO-ELECTRONICS
HUGHES AIRCRAFT
FORD AEROSPACE & COMMUNICATIONS
ITT AEROSPACE/OPTICAL
MORTON THIOKOL
SYSTEMS AND APPLIED SCIENCES

25th ANNIVERSARY OF WEATHER SATELLITES

Citations for Award Recipients

Mr. T. Theodore Fujita
UNIVERSITY OF CHICAGO (1961-Present)

For creative scientific leadership as an enthusiastic pioneer in the use of satellite imagery to analyze and predict mesoscale weather phenomena and to understand severe thunderstorms, tornadoes, and hurricanes.

Drs. Stanley M. Greenfield and William W. Kellogg
THE RAND CORPORATION (ca. 1950)

For critical scientific leadership as visionary researchers whose studies laid the groundwork for the initial TIROS and subsequent weather satellites. Their research established the ground resolution required to identify major cloud types and a methodology to interpret useful spatial and temporal changes, and thus provide useful meteorological information from satellite altitudes.

Col. Thomas O. Haig (Retired)
U.S. AIR FORCE SATELLITE EXPERIMENTAL PROGRAM
(1960-1965)

For pioneering achievements in engineering design and development while directing the Air Force program. These achievements proved the "wheel mode" attitude control system that enabled direct photography of clouds over the entire earth from a single satellite.

Dr. Rudolf A. Hanel
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GODDARD SPACE FLIGHT CENTER (1959-Present)

For pioneering achievements in engineering design and development critical to the evolutionary advancement in instrumentation on civil environmental satellites. These advances added the capability for mapping cloud cover at night, for determining vertical atmospheric profiles of temperature, water vapor and ozone, and for measuring global sea and land surface temperatures.

Mr. David S. Johnson (Retired)
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE (1965-1981)

For exceptional accomplishments in program development while directing the United States civil operational environmental satellite program. During his tenure, the United States established its preeminent position in the monitoring of the global environment and never suffered a break in operational weather satellite service.

Mr. Dominick J. Juarez
ITT AEROSPACE/OPTICAL DIVISION, FT. WAYNE, INDIANA
(1968-Present)

For major contributions in engineering design and development that led to the evolution of cryogenically-cooled detector technology into the highly successful imaging and sounding instruments flown on the operational polar-orbiting environmental satellites.These instruments include the High Resolution Infrared Radiation Sounder (HIRS) and the Advanced Very High Resolution Radiometer (AVHRR).

Dr. Lewis D. Kaplan
MASSACHUSETTS INSTITUTE OF TECHNOLOGY (ca. 1960)

For pioneering contributions to scientific leadership as the creator of the original scientific concept for detecting the structure of the atmosphere using spectral and thermal radiation while at MIT and for subsequent experiments and improvements that made possible atmospheric soundings from environmental satellites.

Mr. Roy Leep
WTVT TELEVISION WEATHER SERVICE, TAMPA, FLORIDA
(1966-Present)

For pioneering contributions to public safety and service, by being the first television meteorologist to use weather pictures received directly from satellites to enhance the education and warning of the public about the progress of hurricanes and other severe storms. He led the television industry in the progressive addition of new satellite direct readout capabilities as they became available and motivated other television broadcasters to follow his example.

Mr. Vincent J. Oliver (Retired)
SATELLITE DATA APPLICATIONS GROUP
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
(1963-1981)

For innovative, outstanding scientific leadership while directing research activities that developed many of the techniques used in daily weather forecasting operations in the United States and the world. He developed techniques to determine the jet streams, frontal systems, rainfall estimates, land fog, and other weather-related phenomena from satellite images.

Mr. Abraham Schnapf (Retired)
RCA ASTRO-ELECTRONICS, PRINCETON, NEW JERSEY
(1958-1975)

For outstanding contributions to engineering design and development and to program development at RCA Astro-Electronics, that led to four successful generations of weather satellites . . . the TIROS, ESSA, ITOS, and TIROS-N/NOAA series, all of which met or exceeded design life expectancy.

Mr. Leonard W. Snellman (Retired)
WESTERN REGION, NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
(1965-1982)

For enthusiastic scientific leadership in pioneering the use of satellite imagery in operational weather forecasting by developing applications uniquely suited to the western states, conducting training programs for forecasters, and installing facsimile reception capabilities in even the smallest weather service office in his region.

Dr. Verner E. Suomi
UNIVERSITY OF WISCONSIN-MADISON (1960-Present)

For unparalleled scientific leadership and innovative engineering design and development in conceiving new sensors and applications from the first TIROS satellite through the GOES series. His inventions include the "spin-scan" camera, that made geostationary weather satellites possible, and "McIDAS," the software philosophy that permits interactive access to vast quantities of environmental satellite data.

Twenty-Five years later

Today we honor the meteorological satellite pioneers—the groundbreakers who conceived and converted to daily reality the satellites that have brought so many scientific and practical benefits.

The skills and spirit of these pioneers overcame the challenges of bringing meteorological satellites into being. They turned theories into space systems, concepts into national programs, and observations from space into useful information about the atmosphere.

Although they are well known to their colleagues, these pioneers are unsung in the wider world. This day provides the appropriate opportunity to give them the recognition they deserve.

Triumph of convictions

On April 1, 1960, the world's first meteorological satellite was orbited from Cape Canaveral. Named TIROS, for Television Infrared Observation Satellite, it established immediately the accuracy of the vision of its champions. Within hours, its observations were being distributed for use in weather forecasts. The advantage of mapping the earth's cloud cover from satellite altitudes had been demonstrated. It offered revelations, too! TIROS I showed clouds banded and clustered in unexpected ways. Sightings from the surface had not prepared meteorologists for the interpretation of the cloud patterns that the panoramic view from an orbiting satellite would show.

Many of the pioneers had staked their professional reputation on TIROS I; their reward was its undeniable success. Yet the triumph of TIROS I was but a single milepost in a longer journey. TIROS II was being readied, and cloud interpretation techniques were being refined. New technology was being applied to make improvements possible.

Partnership for achievement

Sponsorship of the TIROS project began within the Advanced Research Projects Agency of the Department of Defense. In early 1959, responsibility for the project was transferred to the new National Aeronautics and Space Administration. NASA's Goddard Space Flight Center took over from the U.S. Army Signal Corps the job of building and flying the satellite. NASA would work closely with the Meteorological Satellite Section of the U.S. Weather Bureau in applying satellite data to meet the Bureau's forecasting responsibilities.

The satellite, payload, and special ground equipment were provided by RCA's Astro-Electronics Division under contract with the Army's Signal Corps Research and Development Laboratory. Douglas Aircraft built the Thor-Able rocket and worked with the Air Force's Ballistic Missile Division and Space Technology Laboratories to mate the satellite to the rocket and launch it.

Two primary ground stations received the data radioed by TIROS I. One at Fort Monmouth, New Jersey, was operated by the Signal Corps. The Lockheed Missile and Space Division and its consultant, the Philco Corporation, operated the second ground station in Hawaii for the Ballistic Missile Division. Analysis and interpretation of TIROS I cloud pictures were provided by the Weather Bureau's Meteorological Satellite Section, NASA, the Air Force's Cambridge Research Center and Air Weather Service, Allied Research Associates, the Army Signal Corps, and the Naval Research Weather Facility. The photos were processed by the Naval Photographic Interpretation Center.

The years between

The years since TIROS I have been a period of remarkable progress in meteorological satellites. Although technological advances—notably the advent of the geostationary weather satellite—have played a role, people and organizations have accounted for the real breakthroughs. A new generation has been attracted to the work, pulled to it by the enthusiasm of the pioneers and the wave of benefits that each new improvement has generated.

The progress of the past 25 years can be measured by the extent to which meteorological satellite data are now used. There is probably no national or private weather service in the world that does not receive and use meteorological satellite information in some form. Many operate their own ground stations to receive the data directly; others use weather forecasting products derived from satellite data and transmitted to them by other means; some do both.

The United States has meteorological satellite programs for operational purposes, both civil and defense. The satellites also carry research instruments. Other nations and consortia of nations have their own programs. A globe-encircling ring of geostationary weather satellites is provided by Europe, India, Japan, and the United States.

To the advantage of all nations, operational data, research results, and even spacecraft instruments are exchanged in cooperative ventures. The current polar-orbiters, the Advanced TIROS-N series, carry instruments provided by Canada, France, and the United Kingdom, for example.

International cooperation has been and remains a paramount aspect of the United States' civil meteorological satellite effort. The United Nations' World Meteorological Organization (WMO) links operators and users of weather satellite programs through its coordination of information and training activities. The Global Telecommunications System, coordinated by WMO, is a principal mechanism for conducting the timely international dissemination of weather products derived from satellite data.

In the technology area, breakthroughs and advanced industrial practices have made many improvements possible. Infrared sensors opened the night-side of the earth to viewing, and microwave instruments permit looking through clouds at the atmosphere and surface below. Instruments capable of providing more details about the sizes, shapes, and radiation characteristics in the scene have been added as sensor technology made them possible and when communications and computer equipment permitted the larger data volumes to be accommodated.

There has been a steady move toward quantitative measurements (for example, the early television cameras have given way to calibrated scanning radiometers). The quantitative sensors allow numerical values to be assigned to the conditions being observed. The temperatures and humidities of atmospheric layers around the globe can be determined this way, as well as cloud-top temperatures, sea surface temperatures, and other environmental factors.

These numerical data have immediate use in applications such as numerical weather forecasting, wind field and ocean current analysis, agricultural frost warnings, severe weather forecasting, and research. The capabilities of some of these sensors extend to an ability to detect and track the greening wave of plant life as favorable growing conditions wax or wane around the world. Techniques have been developed and are being improved to make this fortunate offshoot of meteorological satellites into a powerful new tool for measuring the global vitality of our food and fiber crops.

TIROS I was the first of a continuing line of weather satellites. It led to the operational environmental satellite systems now maintained routinely by the United States and other nations. The mission of these operational satellites has grown to include information about the sea, ice and snow fields, the earth's surface, natural disasters, the earth's radiation environment, and the energy streaming from the sun to the earth.

The operational satellites gather and relay information from remote, automatic sensor platforms in the air, sea, or land that signal environmental data and warn of events such as rising rivers or the tsunamis generated by earthquakes. Some are equipped to relay to rescue agencies the distress signals of downed aircraft or foundering ships. Thus, meteorological satellites not only make it possible to know our environment better, but also help protect us from its caprices.

The Future

The need to continue and expand observations of the earth and its environment from space is unquestioned. A corps of colleagues and descendants of the pioneers we honor here today stands ready to match the growing requirements for these data with the sensors, communications systems, and space vehicles that make them possible. Even now, the merits

of systems designs for the next century are being investigated and debated. It may be that in the 1990's the United States may deploy astronaut-tended space platforms as the next step in the evolution of weather satellites.

There is an even stronger summons: to spread ever wider the benefits of these technical wonders. The task has just begun. The far-sighted vision of these pioneers created meteorological satellites that examine the earth's environment for the betterment of the world population. The work begun can only be finished when the betterment is available to all people everywhere. A true challenge of the next 25 years of weather satellites will be to fulfill the vision of universal benefits.

In Memoria

Don T. Hilleary

William Nordberg

Francis W. Reichelderfer

Harry Wexler

TIROS NIMBUS TOS ITOS TIROS-N ATN
TIROS 1, FIRST WEATHER SATELLITE, APRIL 1, 1960
FIRST GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE
GOES 1, OCTOBER 16, 1975
ATS SMS GOES