

Vanguard I celebrates 50 years in space

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The Vanguard I satellite celebrates its 50th birthday this year. Its launch on March 17, 1958 from Cape Canaveral, Florida, culminated the efforts of America's first official space satellite program begun in September 1955. The first solar-powered satellite, Vanguard I has the distinction of being the oldest artificial satellite orbiting the earth. Its predecessors, Sputniks I and II and Explorer I, have since fallen out of orbit.

The Vanguard I was launched as part of the United States' participation in the International Geophysical Year (July 1957 to December 1958) in a tri-service project with the U.S. Army operating the tracking stations and the U.S. Air Force providing the launching site. As part of the scientific program for the International Geophysical Year, the Naval Research Laboratory (NRL) was officially delegated the responsibility of placing an artificial satellite with a scientific experiment into orbit around the earth. NRL developed the launch vehicles; developed and installed the satellite tracking system; and designed, constructed and tested the satellites in a program headed by Dr. John Hagen. NRL's proposal to conduct Project Vanguard was based on experience gained from extensive use of German V-2 and Viking rockets to probe the earth's upper atmosphere.

Vanguard I is 6 inches in diameter and weighs about 3 pounds. Its small size, compared to the Soviet's 200-pound Sputnik I, caused then-Soviet Premier Nikita Khrushchev to dub it "the grapefruit satellite."

In the 50 years following Vanguard's launch the 3-pound satellite made more than 196,990 revolutions of the earth and travelled 5.7 billion

nautical miles, the distance from earth to beyond the planet Pluto and halfway back. In that time it has provided a wealth of information on the size and shape of the earth, and set a number of space records as well.

The successes of Vanguard I set the pattern for a multitude of other space ventures in this country and abroad. Vanguard also served as a springboard for NRL scientists to launch several series of space probes to study various aspects of radiation phenomena.

Vanguard I introduced much of the technology that has been applied in other U.S. satellite programs. For example, it proved that solar cells could be used for several years to power radio transmitters. Vanguard's solar cells operated for about seven years, while conventional batteries used to power another onboard transmitter lasted only 20 days. Now the oldest man-made satellite in orbit, Vanguard I has been 100 percent successful in meeting its scientific objectives. It accomplished the following:

- First orbiting package to be powered by solar energy.
- Returned a wealth of information on air density, temperature ranges and micrometeorite impact.
- Maintained an orbit so stable that cartographers were able to more accurately redrawn maps of islands in the Pacific Ocean.
- Revealed that the earth is slightly pear-shaped rather than round.

Although Vanguard's solar-powered "voice" became silent in 1964, it continues to serve the scientific community. Ground-based tracking of the satellite provides data concerning the effects of the sun, moon, and atmosphere on satellite orbits. For example:

-- Fifteen years after its launch, Vanguard was in an orbit with an apogee height of 2,121 nautical miles above the earth's surface, and a perigee of about 353.6 nautical miles. The orbit period was approximately 133.8 minutes.

-- By 2000 Vanguard was in an orbit with an apogee height of 2,073 nautical miles above the earth's surface, a perigee of 352 nautical miles, and an orbit period of 132.8 minutes.

In conjunction with the Vanguard launch, NRL scientists laid out a worldwide tracking system called Minitrack. Laboratory scientists later used many of the principles embodied in this system to develop a Space Surveillance System that can detect unannounced, radio-silent satellites passing over the U.S.

Although Vanguard I's solar-powered radio transmitter stopped transmitting in 1964, U.S. space surveillance systems still track the spacecraft.

When it was launched 50 years ago, it was estimated that the satellite's life expectancy would be about 200 years. Since then, scientists have extended this estimate to 2000 years. Accordingly, Vanguard I should be celebrating many more birthdays in space.

Source: Naval Research Laboratory

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