

# Delta for



## Boeing's Delta rockets have been a mainstay of the space launch business for 50 years

by Robert Villanueva

**O**n May 13, 1960, the first Delta rocket lifted off from Cape Canaveral's launch pad 17A carrying the Echo 1 satellite. Although that mission failed, the program quickly followed up in August with the successful launch of Echo 1A. It marked the beginning of what would become one of the most successful space launch systems ever developed.

Fifty years and some 348 launches later, Delta rockets are still flying, carrying into space everything from earth-orbiting

satellites and scientific probes to planetary rover vehicles.

Delta's origins date back to Boeing predecessor company Douglas' design for the Thor intermediate-range ballistic missile, developed in the mid-1950s for the U.S. Air Force. Thor, a single-stage, liquid-fueled rocket, made its first successful launch on Sept. 20, 1957, and provided nuclear deterrence before intercontinental ballistic missiles. Thor later was modified to become the Delta launch vehicle.

Delta would launch satellites that revolutionized weather forecasting and the first Telstar and Intelsat satellites, which enabled the TV phrase, "live via satellite."

Design changes allowed Delta to carry increasingly larger and heavier payloads to space. These included larger first-stage tanks, the addition of strap-on solid rocket boosters, increased propellant capacity, an improved main engine, adoption of advanced electronics and guidance systems, and development of upper

# orce

stage and satellite payload systems.

Until the early 1980s, Delta was NASA's primary launch vehicle for communications, weather, science and planetary exploration satellites. But in 1981, after 24 years, Delta production stopped because NASA planned to use the space shuttles to deploy satellites. That policy changed in 1986, following the *Challenger* space shuttle tragedy. President Ronald Reagan announced the shuttle program would no longer launch commercial payloads, bringing the return of Delta, and the new Delta II. It was followed by Delta III.

After three launches, the Delta III was retired to make way for Delta IV. Developed in partnership with the U.S. Air Force Evolved Expendable Launch Vehicle program, the Delta IV became operational in 2002 as the most advanced family of rockets developed by Boeing. The family includes Delta IV Medium, three variants of Delta IV Medium+, and Delta IV Heavy versions.

Each Delta IV configuration is based on a Common Booster Core first stage that is as large as the fuselage of a Boeing 727 aircraft—16 feet 7 inches (5 meters) in diameter and 150 feet (46 meters) long. Each Common Booster Core has its own Pratt & Whitney Rocketdyne RS-68 main engine, which produces 650,000 pounds (2,891 kilonewtons) of thrust. The Delta IV second stage is derived from the Delta III second stage using the Pratt & Whitney RL-10B-2 engine, with two sizes of expanded fuel and oxidizer tanks, depending on configuration.

The Delta IV is manufactured at a 1.5-million-square-foot (140,000-square-meter) production facility in Decatur, Ala. Processing and launch facilities are at Cape Canaveral, Fla., and Vandenberg Air Force Base, Calif.

The massive boosters and other hardware are delivered to the launch sites on a 312-foot (95-meter), custom-built vessel named the *Delta Mariner*. The trip to Cape Canaveral is 1,400 miles (2,253 kilometers) and takes about 10 days. The trip to Vandenberg is 4,900 miles (7,890 kilometers) and takes about 25 days.

In 2006, Delta became part of the United Launch Alliance joint venture that combines Boeing's Delta and Lockheed Martin's Atlas launch services. The venture provides launch services to U.S. government customers.

Today, Delta continues to support critical national defense, scientific and commercial missions—and remains one of the world's premier launch systems. ■

*robert.s.villanueva@boeing.com*

**PHOTOS: (Right)** The first Delta launch on May 13, 1960. BOEING ARCHIVES

**(Insets, from left)** A Delta II rocket lifts off from Cape Canaveral, Fla., carrying a U.S. Air Force GPS satellite. CARLTON BAILIE

A Delta IV Medium rocket lifts off from Cape Canaveral in March 2003 on its first mission for the U.S. Air Force. CARLTON BAILIE

The Delta IV Heavy makes its first flight in December 2004 from Cape Canaveral. CARLTON BAILIE

