Honoring the Legacy of Autonetics

Anaheim Commemorative Monument Dedication

Autonetics
Anaheim, California

Pioneering innovations in electronics and guidance, navigation and control that charted new frontiers on Earth and beyond

This monument is dedicated to every Autonetics employee and retiree whose legacy of excellence continues today as part of The Boeing Company.

Vision ... Innovation ... Progress ... Community. For more than 50 years, these words were brought to life at this site by the men and women of Autonetics, who contributed substantially to our nation's security and the economic growth of Anaheim and Orange County, California.

Autonetics developed and advanced electronics and electromechanics for precision navigation, guidance and control for missiles, ships, submarines, planes, and spacecraft. The work performed here was instrumental in the defense of the United States and its allies during the Cold War and sparked commercial applications found in everyday life.

The knowledge, skill, and dedication of Autonetics individuals resulted in major technological advances that have contributed to the charting of new frontiers ... on missiles, ships, submarines, planes, spacecraft, and beyond ... effectively navigating our world.

Jim McNerney
Chairman, President and
Chief Executive Officer
The Boeing Company

John McLuckey
President, Boeing Space Systems (1996 - 1998)
President and Chief Operating Officer, Aerospace and
Defense, Rockwell International Corporation (1995 - 1996)

Curt Pringle
Mayor, City of Anaheim, Orange County,
California (2002 - 2010)

A home in Anaheim

In 1959, Los Angeles-based North American Aviation began moving its expanding Autonetics division to the site in Anaheim, Orange County, California.

Autonetics history and growth coincided with that of the missile and space age in the mid-20th century. At its peak in the 1960s, the Autonetics workforce numbered nearly 36,000 men and women, and the Anaheim site encompassed more than three million square feet of offices and laboratories on approximately 260 acres.

"The North American Aviation teams, which became Autonetics ... were always on the cutting edge of technology. Autonetics gave the nation a number of 'firsts' ...," wrote John R. Moore, who served as the first president of Autonetics from 1955 to 1966. Under his leadership, Autonetics became a force in the navigation marketplace.

In 1967, North American Aviation merged with Rockwell Standard to become the North American Rockwell Corporation; it subsequently became known as Rockwell. In 1996, Rockwell and Boeing announced that Boeing was acquiring Rockwell's aerospace and defense businesses, including Autonetics.

Boeing began combining its Southern California resources in 2006 by moving many Anaheim programs to the Huntington Beach facility. This streamlining of Boeing's presence was accomplished while preserving the core capabilities of the former Autonetics division.

Autonetics grew to be a sprawling 260-acre facility as shown in this 1965 aerial image (left). The name, Autonetics, comes from the terms Automation and Cybernetics. A plaque (center) marked the dedication of the Autonetics Headquarters building in 1964 (right), originally located on Miraloma Avenue.

Images: Boeing

Electronics for precision navigation, guidance and control

At a time in the mid-20th century when there were no satellite-based or complex computing aids available, Autonetics tackled the problem of how to precisely, autonomously, and reliably guide a missile, ship, submarine, or aircraft from its starting point to its destination, a path that could extend thousands of miles. Autonetics developed the expertise required in electronics and instruments, such as gyroscopes and accelerometers, to solve these problems.

This skill and experience became crucial during the Cold War, when the United States adopted the nuclear triad as its strategic deterrent against the Soviet Union. The triad consisted of Intercontinental Ballistic Missiles (ICBM) (land), nuclear-powered submarines (sea), and strategic aircraft bombers (air). Autonetics contributed greatly to all three types of large platforms by providing guidance and control subsystems, enabling the missiles to travel farther and more precisely, the submarines to navigate with greater accuracy across longer distances, and the bombers to travel on target more safely, quickly, and accurately.

The effectiveness of the US nuclear deterrent eventually led to the end of the Cold War and the dissolution of the Soviet Union in 1991.

The US nuclear triad encompassed land-based, sea, and air deterrents. Shown from left are a dual Minuteman missile test launch from Vandenberg Air Force Base in 1979, a US Trident nuclear submarine and a US Air Force FB-111 military aircraft.

Images: US Air Force, US Navy, Department of Defense

Shown is a Minuteman test launch from Vandenberg Air Force Base, California. The inset depicts the evolution of missile guidance and control systems provided by Autonetics, and the close-up shows the advanced guidance replacement unit deployed on all operational Minuteman IIIs.

Contributions to US security on land

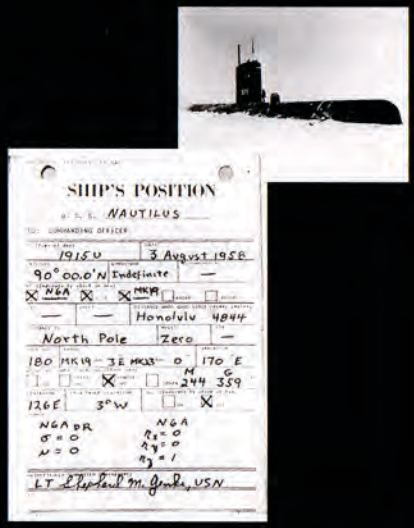
When the Soviet Union launched a man-made satellite, *Sputnik*, in October 1957, the United States became aware that its adversary now had the ability to launch a weapon toward its shores. To counter, the United States accelerated development of a protective fleet of land-based missiles.

In 1958, Autonetics joined a contractor team selected by the US Air Force to produce the Minuteman missile. Named in honor of the advance scouts of the American Revolution, the Minuteman was conceived as a rapidly deployable, highly reliable ballistic missile with intercontinental range. It was a weapon system marvel, capable of being launched in less than one minute and reaching its target in less than 30 minutes. On February 1, 1961, Minuteman made a successful first flight from Cape Canaveral Air Force Station, Florida, with Autonetics navigation and flight control hardware and software directing the system.

Autonetics ultimately supplied more than 3,000 inertial guidance and control systems for the Minuteman I and its successors, the II and III, and the follow-on Peacekeeper, the most accurate ICBM ever developed. Contributions to US missile defense continue at Boeing, such as providing seeker hardware for the Patriot missile and as the integrator for the Ground-based Midcourse Defense (GMD) missile system.

Autonetics provided the guidance and control for the Peacekeeper missile (left), whose mission came to an end in September 2005. Inset shows the missile guidance system. Autonetics developed and Boeing has continued to provide more than 1,000-millimeter wave radar seekers (inset) for the Patriot Advanced Capability (PAC-3) missile (center). Boeing is the prime contractor for the Ground-based Midcourse Defense missile system (right).

Images: Boeing, US Army, Missile Defense Agency



The USS *Nautilus*, guided by an Autonetics inertial navigator, became the first vessel to cross under the North Pole. The *Nautilus* ship's log captured the historic moment on August 3, 1958.

Navigation aids for traveling Earth's waters

Autonetics pioneered innovations in inertial navigation and control systems for vessels traveling Earth's oceans. On August 3, 1958, the USS *Nautilus*, guided by an Autonetics inertial navigator, became the first vessel to traverse the North Pole, an environment where conventional navigation techniques would not operate properly. This epic journey covered 1,200 miles under the ice and constituted a major breakthrough in underwater navigation.

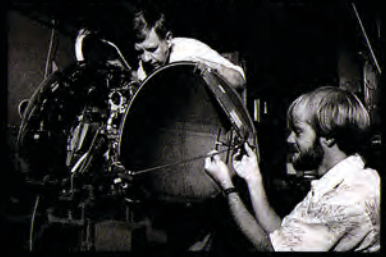
Autonetics continued to advance the design of inertial navigation systems for submarines and ships. As the 21st century began, every US and United Kingdom nuclear submarine relied upon an Electrostatically Supported Gyro Navigator (ESGN) developed by Autonetics.

This success in navigation paved the way to numerous accomplishments in other marine systems. These included control systems, communications networks and signal processing, with one example being the Fast Time Analyzer System that provided real-time and postflight acoustic data analysis for enemy submarine identification. Autonetics navigation and control systems also contributed to leading-edge technology for approximately 100 different types of underwater vehicles such as the Long-term Mine Reconnaissance System (LMRS) for surveying potential underwater mine fields. These pioneering submersibles explored the hidden world beneath the ocean's surface, spurring advances in ocean systems, proprietary programs, and commercial applications.

Autonetics provided the Electrostatically Supported Gyro Navigator used on US submarines (left), the Fiber Optic Data Multiplex System (FODMS) information transfer system (inset) found on U.S. and foreign Navy destroyers (center), and the Long-term Mine Reconnaissance System.

Images: Boeing, US Navy

The F-111D was one of many military aircraft types that benefitted from Autonetics-designed capabilities.



Technicians ready a modified all-weather radar for installation in the F-111D, a tactical strike aircraft developed in the 1960s for the US Air Force.

Improvements to the safety and precision of flight

Autonetics produced critical subsystems that enabled the air-based weapons systems in the US nuclear triad to complete their mission.

From 1958 to 1970, Autonetics designed and produced more than 3,000 radar and fire control sensors to give fighter-bomber aircraft a precision all-weather weapons delivery capability. These sensors gave aircraft, including the Lockheed F-104, Republic F-105, General Dynamics F-111D, and Boeing B-52, the capability to enter enemy territory undetected, release their payload, and return to base.

Autonetics also produced power control assemblies, test equipment, ejector racks, and the main caution panel for the Boeing B-1 bomber. For the B-52, Autonetics provided critical systems for its weaponry, including the navigation system for its Hound Dog missiles and the computer for its short-range attack missiles. These weapons enabled the bomber to perform its mission without exposing the aircraft or crew to enemy defenses.

The General Dynamics FB-111A and F-111D became the first aircraft to have a fully integrated radar, navigation, and weapon delivery system to allow the aircraft to fly under enemy radar at supersonic speed and deliver weapons accurately. This integration, pioneered by Autonetics, is standard today on all military aircraft.

The B-52 bomber (left) is the longest serving bomber in US military history. The B-1B Lancer (center), originally developed with a nuclear mission, was converted to support conventional munitions. Autonetics was a major supplier of electronic subsystems for the B-1B as well as ground test equipment (right) able to check out four aircraft simultaneously.

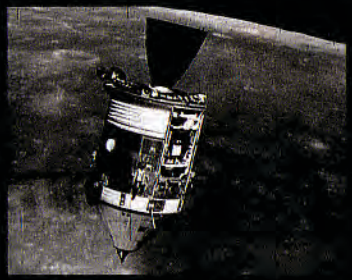
Images: Boeing

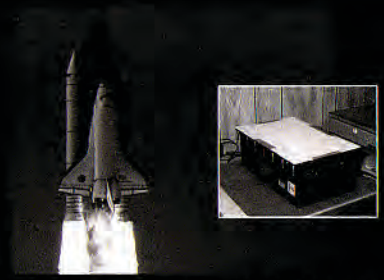
Innovations with applications beyond Earth's boundaries

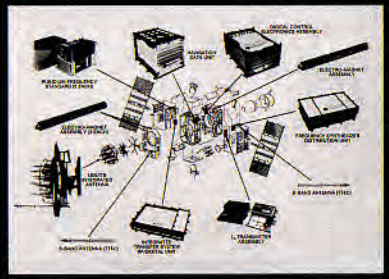
Autonetics inventions first conceived to meet a national security need found new applications in space with the design and development of critical subsystems for the US human spaceflight programs. These included the Apollo lunar landing program during the 1960s and the Space Shuttle program that followed, beginning in the 1980s.

These innovations provided the systems that the Apollo astronauts used to determine the exact position of the lunar module during rendezvous and docking. For the Shuttle, Autonetics supported early development of the space system with simulation hardware for critical testing, as well as the master events controller that monitored the Shuttle orbiter's on-board flight computers.

Autonetics also provided technical breakthroughs and major units of flight hardware for the Global Positioning System (GPS) navigational network, used worldwide. From the early 1970s until the 1990s, 55 percent of all major components used on the satellites were designed, built, and tested at the Anaheim site. Boeing continues to have a role in the GPS program, building and providing a new generation of GPS satellites, the first of which was launched in 2010.







Autonetics also contributed to space exploration, including rendezvous and docking systems for Apollo (left), sequencing controllers (inset) for the Space Shuttle (center), and major units of flight hardware for the GPS satellite network (right).

Images: NASA, Boeing

A legacy that continues

Autonetics core expertise in electronics and electromechanics continues through Boeing's support of heritage military programs, such as the Minuteman and ballistic missile defense systems, as well as in new 21st century applications that include military communications networks, such as an advanced radio used for rescuing downed military personnel.

Autonetics know-how and innovation also have found their way into commercial applications that have profoundly influenced the world in which we live. Autonetics stimulated improvements in the planar process used for manufacturing semiconductors. This work, originally having a military application for the Minuteman missile, contributed greatly to the growth of the modern computer industry and consumer electronics.

Examples of other commercial applications based in part on Autonetics technological developments include modems, handheld calculators, digital watches, and automated fingerprint identification systems. Thus, a heritage that began at the height of the Cold War continues today as a foundation of support for both our nation's security and commercial applications from which the world continues to benefit.

The Autonetics legacy continues in radio systems, such as this emergency rescue radio (left) that has saved dozens of war fighters' lives; through pioneering work in computers that have contributed to the commercial growth of the electronics industry (center); and the development of infrared focal planes (right inset) and sensor assemblies for diverse applications, including the Hubble Space Telescope (right).

Images: Boeing, NASA, DRS Corp., Jazz Semiconductor

Navigating Our World
Autonetics
Pioneering innovations in
electronics, guidance, navigation and
control that charted new frontiers
on Earth and beyond

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