

Y-12 and the National Defense



Prototype propulsor for the U.S.S. Seawolf was delivered ahead of schedule and \$5 million under budget.

The Y-12 National Security Complex has supported national defense needs for more than 50 years. Founded to support the manufacture of nuclear weapons, Y-12's current stockpile stewardship role focuses on the refurbishment and remanufacture of weapons components; however, the skills and expertise at Y-12 serve the nation's defense needs in many other areas as well.

Navy Support

Y-12 prepared 1/4-scale test models of the U.S.S. Seawolf and delivered the submarine's prototype propulsor ahead of schedule and \$5 million under budget. This effort, which is typical of the support provided the U.S. Navy, involved integrating technologies for

- design and simulation,
- advanced numerically controlled programming,
- complex machining and fabrication,
- welding and special process development, and
- advanced inspection techniques.

The Navy/Y-12 prototyping team responded to over 1000 design changes in 3.5 years, after which Y-12 transferred the government-owned technology to both private industry and government manufacturing centers to provide manufacturability input for design of future units.

Army Support

Recognizing that rapid treatment of combat-wounded personnel greatly improves their survival and recovery rate, the U.S. Army and the U.S. Marine Corps jointly backed development of the Advanced Surgical Suite for Trauma Casualties (ASSTC). The result was the creation of a "plug-and-play" surgical suite that could be transported by helicopter or truck to a forward area where state-of-the-art medical technology would be made available to the wounded. ASSTC has been so well received that various disaster relief organizations have shown interest in obtaining variants for their use. Employing concurrent engineering techniques and lightweight composite materials, Y-12 and its military customers took only 9 months to move from the concept to a finished prototype. ASSTC was given a *Popular Science* "Best of What's New" Award in 1998. It can be deployed in 30 minutes or less from its 5 ft × 5 ft × 10 ft box and weighs less than 4000 lb.

Marine Corps Support

Y-12's expertise in technology and materials science helped General Dynamics Land Systems Division, prime contractor for the Marine Corps' Advanced Amphibious Assault Vehicle



ASSTC can be deployed and operational in 30 minutes.

(AAAV) to develop and deliver two planing hulls and turrets. These innovative hulls are propelled by two water jets. The project integrated the efforts of Y-12 precision manufacturing, welding, and metrology experts to respond to 61 design changes over a 62-day span.

Aerospace and Air Force Support

Y-12 support for aerospace initiatives included production of the “moon box” and material handling tools for the National Aeronautics and Space Administration (NASA) in the mid-1960s. The Apollo astronauts used the moon box to hold the samples of lunar soils and rocks that they brought back to Earth for study. Y-12 also prepared the National Aerospace Plane Model for use in wind tunnel tests.

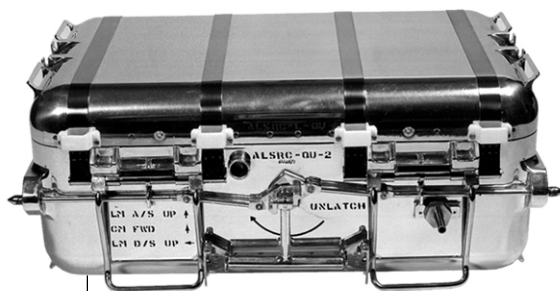
Y-12’s precision manufacturing and analysis capabilities are being used to support the F-22 project for the U.S. Air Force. These capabilities are also being put to use in manufacturing components

for the X-33 Single-Stage-To-Orbit project that will replace the current space shuttle.

The Tomahawk cruise missile is a major weapon system for the U.S. Air Force. A unique dimensional inspection problem appeared during manufacture of its wing components. The metrology experts at Y-12 analyzed this problem, leveraging extensive DOE investment in world-class metrology. Using computer simulation, Y-12 experts developed a special gauge to detect the problem and then designed, fabricated, and programmed the device to measure a ± 0.002 -in. contour on both sides of the wing at the same time. Y-12 then built two units for use by the wing manufacturers. The results of this effort improved the capabilities of the U.S. industrial base and missile performance.



Fabricating the prototype hull for the AAAV relied upon the integration of decades of shop-floor experience with state-of-the-art engineering and materials science that is a central feature of Y-12’s ability to meet its varied defense missions.



The “moon box” was designed to withstand acceleration pressures and maintain an almost absolute vacuum to ensure that lunar samples were not contaminated during the return voyage to Earth.

Other Projects

Y-12’s involvement in defense-related projects has been extensive and includes the following:

- Future command and control vehicle—developed two prototypes in a 7-month span and was used during U.S. deployment in the Balkans.
- Future armor rearm system—uses robotics and an armored transport vehicle to reload U.S. M1A1 Abrams tanks on the battlefield, eliminating the need for manual reloading and the attendant exposure of personnel to elements and battle.
- Long range fiber-optic guided (LONGFOG) missile—demonstrated that the part could be manufactured as one structure using electron-beam curing for composites, which showed significant improvements over conventional approaches.
 - cheaper tooling (\$40 vs \$1000),
 - faster throughput (50 parts per hour vs several parts per 1.5–2 hours),
 - lighter-weight tooling (10 lb vs 200 lb),
 - stronger structure, and
 - reduced part count.

Contacts: Media, Bill Wilburn (865) 241-4937

Manager, Oak Ridge Centers for Manufacturing Technology, Janice Christman (865) 574-8755

www.y12.doe.gov