Reach for the sky

How the Bomarc missile set the stage for Boeing to demonstrate its talent in systems integration

An IM-99B Bomarc is ready for launch from one of the later-model shelters at the Eglin Air Force Base, Fla., test range in 1962.

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Tale of the tape: Bomarc versions

Model	IM-99A	IM-99B
Speed	Mach 2.5	Mach 2.5 (tested to speeds of Mach 4)
Range	250 miles (400 kilometers)	440 miles (710 kilometers)
Length	46 feet 9 inches (14.2 meters)	45 feet (13.7 meters)
Wingspan	18 feet 2 inches (5.54 meters)	18 feet 2 inches (5.54 meters)
Number of production models built	269	301

By Michael Lombardi

It was one of the most ambitious military programs of its day, and it established Boeing as a leader in large-scale systems integration. The program was Bomarc, a supersonic surface-to-air missile that was the world's first long-range antiaircraft missile and the first missile Boeing mass-produced.

Today, the need to defend the United States and allied nations against ballistic missile attacks has made the Ground-based Midcourse Defense Program (GMD) a U.S. priority. In the mid 20th century, the concern was the Soviet Union's nuclear weapons program and the capability of Soviet long-range bombers to reach the continental United States. Those grave concerns made a layered area defense against bombers a priority for the U.S. military.

As a result, the U.S. Air Force in 1949 authorized Boeing to proceed with research into a new supersonic antiaircraft missile. Two months after the go-ahead, the Michigan Aeronautical Research Center (MARC) was added to the research project—which was then labeled "Bomarc," a combination of the names Boeing and MARC.

In January 1951, Boeing was awarded a contract to develop the missile, which was given the designation XF-99. At that time, these missiles were considered pilotless aircraft, since their mission was to intercept enemy bombers, and were given an "F" for fighter designation. Later the Air Force refined its designation system, and the Bomarc became the IM-99 (Interception Missile). The first of the XF-99 research missiles flew on Sept. 10, 1952.

Leading up to Bomarc, Boeing had gained experience in surface-to-air missiles with a pioneering program called GAPA (Ground to Air Pilotless Aircraft). As World War II was coming to a close, Boeing's leadership, foreseeing the sharp decline in airplane orders, decided the company needed to diversify its postwar products. One new area of products was missiles.

In June 1945 Boeing began work on GAPA, designed to intercept aircraft flying at speeds up to 700 mph at altitudes between 8,000 and 60,000 feet (or 1,130 kilometers per hour, between 2,440 and 18,300 meters in altitude). The missile combined a rocket-powered first stage and a ramjet-powered upper stage. GAPA didn't go into production but did provide experience that became the foundation for Bomarc.

The first production model of the Bomarc was the IM-99A, which first flew on Feb. 24, 1955. The IM-99A was powered by an Aerojet–General liquid-fueled rocket motor that boosted the missile to near supersonic speed. At that speed, twin Marquardt ramjet engines, attached by pylons to the underside of the missile, propelled the missile to its target at Mach 2.5 to a range of 250 miles (400 kilometers). Boeing built 269 production IM-99As.

One major issue with the early Bomarc was the main booster's highly corrosive liquid rocket fuel. This fuel could not be stored on board the missile and had to be loaded before launch, a process that added nearly two minutes to the missile's launch time. Fortunately, Thiokol developed a large solid-fuel booster that Boeing used to replace the liquid-fueled motor. The result was the much safer and better-performing IM-99B Super Bomarc, which had a response time of less than 30 seconds.

The B model had increased range of 440 miles (710 kilometers). While its stated cruise speed was Mach 2.5, the B model had been tested to speeds of Mach 4 and was effective from sea level to 100,000 feet (30,480 meters).

Bomarc was integrated into the centralized command-and-control air-defense system for Canada and the United States, known as SAGE (semi-automatic ground environment). The system would guide the Bomarc to incoming targets until the missile's own seeker could lock on to a target and detonate the missile's warhead at the closet point of pass or upon impact.

Boeing built 301 production IM-99B missiles. In all, between 1957 and 1964, Boeing built 570 production missiles and another 130 for various tests.

Bomarc was a successful program that met all of its original objectives. But the nature of the nuclear threat had changed from primarily bombers to ballistic missiles. In 1970, Congress declared that a continental U.S. air defense missile system was no longer necessary and that the primary defense would be an irresistible offense supplied by the Strategic Air Command. On Oct. 1, 1972, the last Bomarc was retired from service.

The valuable engineering and production experience gained from Bomarc, as well as from the design and development of the base facilities and ground equipment, gave Boeing all it needed to be the prime contractor for one of history's biggest military programs: the Minuteman intercontinental ballistic missile. Bomarc, and to a greater extent Minuteman, helped build Boeing's reputation as a world leader in large-scale systems integration. This core competency continues to this day on a number of programs, in particular the 787 and Future Combat Systems. ■

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Boeing employees perform Bomarc manufacturing at the Boeing Missile Production Center in Seattle. Boeing ended up building 570 production Bomarc missiles.