



Glenn Research Center High Energy Rocket Engine Research Facility (B-1) and Nuclear Rocket Dynamics and Control Facility (B-3)

The National Aeronautics and Space Administration (NASA) constructed the High Energy Rocket Engine Research Facility (B-1) and the Nuclear Dynamics and Controls Facility (B-3) at Plum Brook Station in Sandusky, Ohio. Approximately 9000 acres of land at the site had been formerly used as the Plum Brook Ordnance Works for the War Department. Between 1955 and 1963, NASA and its predecessor, the National Advisory Committee for Aeronautics (NACA), had acquired the land to build a number of large test facilities. The Plum Brook Station site is part of the NASA John H. Glenn Research Center.

The B-1 and B-3 test stands were constructed in the early 1960s to test full-scale liquid-hydrogen fuel systems. Over the next decade, each stand was used for two major series of tests, one for the Nuclear Engine for Rocket Vehicle Application (NERVA) nuclear rocket program and one for the Centaur second-stage rocket. The B-1 test stand was in Building 3111, and the B-3 test stand in Building 3311. The complex included the Pump and Shop Building (Bldg. 3131), Substation D (Bldg. 3161), the Boiler Building (Bldg. 5231), the Valve House (Bldg. 5232), the B-3 Boiler House (Bldg. 3331), a 200,000-gal liquid-hydrogen storage dewar (Bldg. 5351), a liquid-hydrogen dewar control building (Bldg. 5335), and steam ejector apparatus. B-1 and B-3 were operated remotely from the B Control and Data Building (Bldg. 5411).

The site is a flat, barren area located near the center of Plum Brook Station off Factory Road near its intersection with Fox Road. There were two large water-retention basins built at the site, but they were never used for their intended purpose. The tests used large quantities of the potentially dangerous liquid hydrogen, so the B Control and Data Building was located approximately 2300 ft southwest of B-1, and 2600 ft west of B-3.

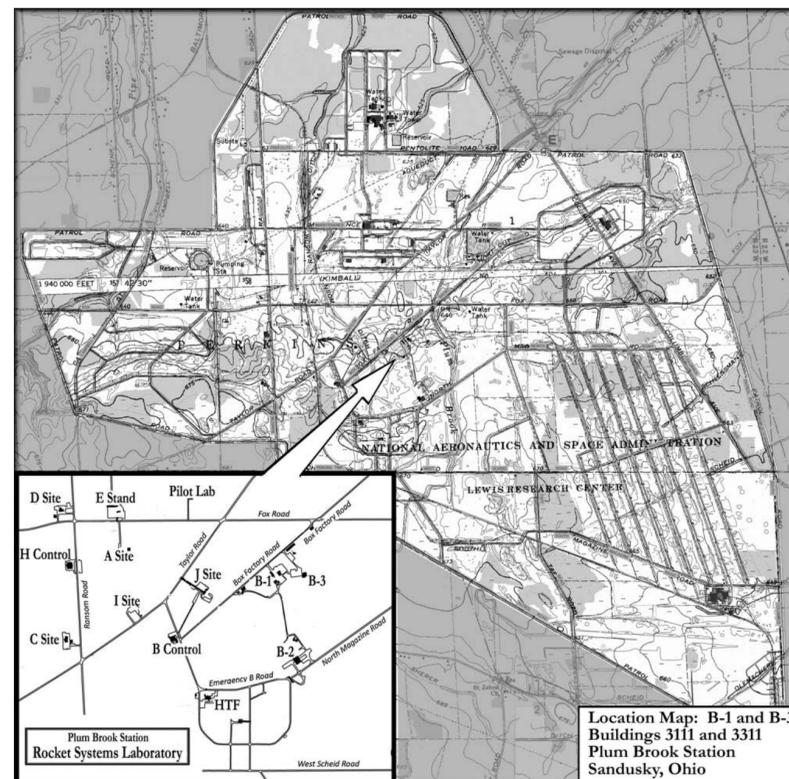
NERVA was an attempt to develop a nuclear-powered rocket for both long-range missions to Mars and as a possible upper stage for the Apollo Program. B-1 and B-3 extensively tested the turbopump system in vacuum conditions. The B-1 tests were designed to start an unfueled reactor and turbopump without prechilling the pumps or propellant lines. It was crucial for the NERVA rocket to be able to vary its speed and restart its engine without any external power. The B-3 tests established the proper startup procedure, which included liquid-hydrogen flow rates, power-cycle time delay, and the powering of the turbine. The use of a realistic feed system helped define the centrifugal turbopumps' overall system performance and mechanical characteristics.

Centaur was a 15,000-lb-thrust second-stage rocket designed in 1957 and 1958. It was the first major rocket to use liquid hydrogen. A second generation of Centaur was developed in the mid-1960s and would go on to have a long career. B-1 and B-3 were used to study Centaur's turbopump boost pumps and shroud jettison system, respectively. The tests were also an important early step in the eventual elimination of the boost pumps from the Centaur feed system. The shroud jettison tests were for the new Titan/Centaur rocket that successfully placed two Viking rovers on Mars in the mid-1970s.

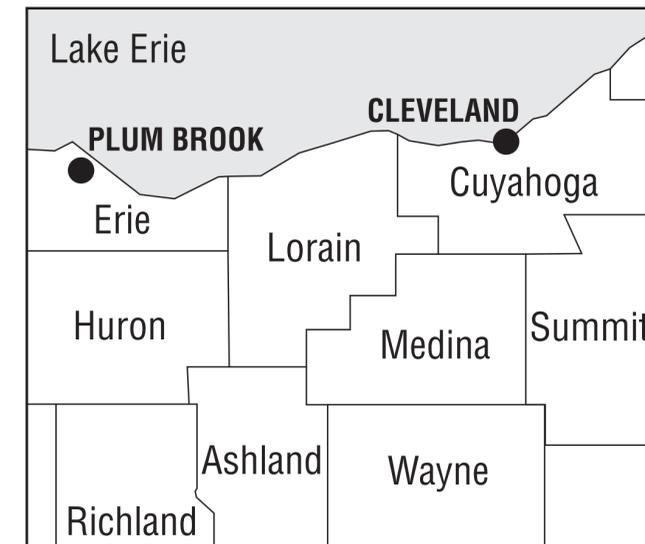
The B-1 and B-3 test stands were inactive after June 1969 and May 1974, respectively. When Plum Brook Station was closed down in 1973 and 1974, the facilities were put in standby condition. Plum Brook reopened in the 1990s but never reactivated the two test stands. B-1 and B-3 were demolished on September 8 and September 21, 2010, respectively. This report is part of a wider effort begun in June 2009 by the NASA Glenn History Office to document the test stands prior to their demolition in 2010. Other resources will include a website and an exhibit display.



STATE MAP



Location Map: B-1 and B-3 Buildings 3111 and 3311 Plum Brook Station Sandusky, Ohio



REGIONAL MAP