The B-47 *Stratojet* Association

XB-47

The XB-47 46-065

The Boeing B-47 Stratojet was the first swept-winged jet bomber built in quantity for any air force, and was the mainstay of the medium-bombing strength of the Strategic Air Command throughout the 1950s. A total of 2042 Stratojets were built, making the B-47 program the largest American bomber project since the end of the Second World War.

The size of the crew (three men) was unusually small for an aircraft of the size and complexity of the B-47, with the three-member crew having to confront more than three hundred gauges, dials, switches, and levers. The B-47 went through a long gestation period during which many problems had to be fixed, and it took a long time before the Stratojet could be considered as being combat-ready. The early service of the B-47 was marked by frequent crashes and accidents, and the plane got a reputation as a crew-killer. Although there was nothing intrinsically wrong with the Stratojet, the B-47 was relatively difficult to land and terribly unforgiving of crew mistakes or inattention. Fifty-five percent of B-47 accidents were traced to human error, either by aircrews or maintenance personnel. It took a long time before more effective crew training was able to reduce the accident rate to a more acceptable level. By 1954, training had become sufficiently effective that the B-47 now had the lowest accident rate of any jet aircraft. Nevertheless, the B-47 never outlived its early reputation as a crew-killer. As veteran Stratojet pilot Brig. General Earl C. Peck observed in 1975, the B-47 was often admired, respected, cursed or even feared, but almost never loved.

The origin of the B-47 Stratojet can be traced back to the Second World War. In June of 1943, an informal USAAF request led several aircraft manufacturers to begin studies of multi-jet aircraft for fast photographic reconnaissance or medium bombing missions. On November 17, 1944, the USAAF issued formal requirements for a jet-powered medium bomber with a range of 3500 miles (3041 nautical miles), a service ceiling of 45,000 feet, and a maximum speed of 550 mph (478 knots).

Even before the USAAF began its study, Boeing had been working on the adaptation of large aircraft to jet propulsion. The initial Boeing study was the Model 424, which was essentially a scaled-down B-29 with four jet engines paired in two nacelles mounted underneath the wing.

However, wind tunnel testing proved that this engine arrangement was unsatisfactory. In December of 1944, Boeing engineers went back to the drawing board and came up with the Model 432, in which all four engines were moved inside the main fuselage to improve the efficiency of the wing. The engines were located right over the main fuel tank area of the fuselage and were fed by bulbous air intakes located beside the cockpit section. The engines exhausted

via tailpipes located on top of the rear fuselage. The aircraft still resembled the B-29 design, but with a much thinner wing.

The USAAF was sufficiently impressed with this design that they awarded Boeing a Phase I study contract for the Model 432 proposal. The project was assigned the designation XB-47. At the same time, contracts were awarded to North American for the XB-45, Convair for the XB-46, and Martin for the XB-48.

The configuration of the XB-47 was soon to undergo a drastic change. Just after VE-Day in May of 1945, the US Army's Scientific Advisory Group headed by the famous aerodynamicist Theodor von Karman was allowed to visit German aircraft factories and aeronautical research facilities to see if any of the innovations developed there could be incorporated into American designs. Boeing's chief aerodynamicist, George Schairer, accompanied the group. One of the items that was discovered was the results of some German research dating back to the mid-1930s on the use of swept-wings to improve the performance of high-speed aircraft. These studies confirmed independent studies carried out by NACA in the USA. The use of sweep angles as high as 45 degrees enhanced high-speed performance by delaying the formation of shock waves as the aircraft neared the speed of sound.

Word about the German research on swept wings was flashed back to Seattle, and Boeing engineers immediately stopped work on the straight-winged XB-47. Wind tunnel tests confirmed the essential validity of the German findings, and work began on a swept-winged version of the XB-47.

Early in September of 1945, Boeing was ready with the first swept-wing design for the XB-47, which was designated Model 448 by the company. It retained the fuselage of the Model 432 but featured a thin wing swept back at an angle of 35 degrees at quarter chord, and incorporated two more engines added in the extreme tail for a total of six. The other four engines were still mounted inside the upper fuselage, but were now fed by intakes cut into the extreme nose and exhausted over the top of the wing. The USAAF felt that housing engines inside the fuselage constituted a fire hazard, and preferred designs that incorporated externally mounted engines that would be easier to maintain or replace. In October of 1945, Boeing engineers returned to the drawing board and came up with the Model 450-1-1, which carried six jet engines mounted in pods - 2 pairs in strut-mounted inboard nacelles suspended underneath the inner wing and single units in pods attached to the wingtips. The USAAF liked the change, and approved the Model 450-1-1 in October of 1945.

In November of 1945, the outboard engines were moved from the wingtips to pods underneath the outer wings 8 feet from the tip. The wingspan was increased to 116 feet. In December of 1945, the USAAF endorsed Boeing's proposal to build two flyable XB-47s. They would initially be built without any tactical equipment. In April of 1946, two XB-47 prototypes were ordered.

The XB-47 mockup was completed, inspected, and approved in April of 1946. Nevertheless, the Mockup Committee suggested some changes in the nose compartment, pilot and co-pilot seating, and landing gear arrangement.

Work on the actual prototype began in June of 1946. However, progress was hampered by problems with the design of the landing gear, control surfaces, as well as bottlenecks in the power plant installations. The thin "Middle River Stump Jumper" wing made it impossible to suspend a landing gear from the wing or retract a wheel into it. The problem was solved by the installation of a tandem two-wheel landing gear that retracted into the fuselage. With both main two-wheel landing gear trucks on the fuselage centerline, a pair of outrigger wheels that retracted into the inboard engine nacelles were added to achieve ground stability. This landing gear arrangement was previously tested on the Martin XB-26H "Middle River Stump Jumper," a B-26 Marauder that had been converted as a test aircraft.

The Stump Jumper

Since neither main gear was sufficiently close to the aircraft's center of gravity to permit the traditional rotation method of takeoff from a level attitude, the aircraft was built so that it rested on the ground at the proper takeoff attitude.

Since the early turbojet engines had poor acceleration as compared to piston engines, it was felt that additional thrust was needed for takeoff. This was provided by building in provisions for 18 solid-propellant JATO rockets inside the fuselage aft of the wing. Each JATO unit had a thrust of 1000 pounds.

The swept wing was fitted with a set of Fowler flaps on the inner trailing edges. These moved aft a considerable distance from their nested position in the underside of the wing as well as moving downwards.

The thin swept wing was extremely flexible, and the tips could flex 5 feet on either side of the normal position. Although the wing actually had no dihedral, it appeared to have a negative dihedral while on the ground because of the droop caused by its weight. Even in the air, the aircraft appeared to have negative dihedral because the tips of the wing, which was mounted as a positive angle to the centerline of the fuselage, were physically lower than the center section.

It was initially feared that the flexible wing would introduce controllability problems, because the deflection of conventional ailerons might tend to twist the wing in the opposite direction, nullifying or even reversing the aileron action. As a result, a set of spoilers was installed on the upper wing surfaces of the first prototypes to assist turn entry. However, it turned out that this precaution was unnecessary, and that the control was perfectly adequate with conventional ailerons, and the spoilers were deleted.

The crew of three consisted of a pilot, co-pilot/gunner, and a navigator/bombardier. The pilot and co-pilot sat in tandem beneath a fighter-style bubble canopy. The navigator/bombardier sat inside the nose behind a plexi-glass nose cone, and operated a radar bombing system using an antenna that was housed below the nose in a bulged plastic fairing. The thin wing had no space for fuel tanks, so all fuel had to be carried inside the fuselage. This meant that serious attention had to be paid to fuel consumption management, since the mass of fuel was distributed along a considerable length of the aircraft.

It was assumed that the high speed of the XB-47 would protect it against attacks from all quarters except from the extreme rear, so only tail defensive armament was provided. This consisted of a pair of 50-caliber machine guns in a turret in the extreme end of the tail cone. At first, an Emerson-built tail turret (referred to as the A-1 fire control system) with a cab for a tail gunner was to have been fitted. However, it proved to be too difficult to provide a cabin for a tail gunner, so a remotely controlled system was chosen which would be operated by one of the crew members. This eventually gave way to the A-2 fire control system, which eliminated the need for a separate tail gunner altogether. The A-2 system was to provide accurate defensive fire and was to be able to perform both search and track duties (although not simultaneously). The twin 50-caliber tail

guns could be controlled remotely from the cockpit or could be aimed and fired automatically by a radar directed system that locked onto an aircraft attacking from the rear.

XB-47 rollout

The first XB-47 (46-065) rolled out of the factory at Seattle, Washington, on September 12, 1947. It was powered by six 2750 General Electric J35-GE-7/9 turbojets. It was the first large American jet aircraft to feature a swept wing

The first flight of the XB-47 took place on December 17, 1947, with Bob Robbins and Scott Osler at the controls. On this first flight, the plane went from Seattle to nearby Moses Lake AFB, Washington, to begin a series of extensive flight tests.

The USAF flight tested the first XB-47 for approximately 83 hours, including 38 hours of Phase II flight tests that were carried out by Air Force test pilots between July 8 and August 15, 1948. The Boeing pilots that first flew the XB-47 were enthusiastic. Test flights at Muroc that summer had demonstrated that the XB-47 was 74 mph (64 knots) faster than the Martin XB-48. However, its performance was below that expected. The ceiling was 2500 feet below that promised by Boeing, and 7500 feet lower than that originally required by the USAAF. Its speed was slower than expected.

The second XB-47 (46-066) was fitted with larger 5200 lb. static thrust General Electric J47-GE-3 engines prior to its first flight. It flew for the first time on July 21, 1948. The new engines raised the top speed past the 600 mph (521 knots) level. The Air Force formally accepted the first XB-47 on November 29, 1948. The second XB-47 was accepted a month later.

The first XB-47 was later retrofitted with J47 engines, and flew with the J47s for the first time on October 7, 1949. On September 3, 1948, the first production was placed for the B-47. Ten B-47As were ordered on October 28, 1948, and the first 88 B-47Bs were added to the contract on November 14, 1948. On November 22, 1948, the Air Force issued a Letter Contract that covered an initial order for 10 B-47As and the future procurement of three more B-47As and 41 B-47Bs. The three additional B-47As were later canceled, and on February 28, 1949, the number of B-47Bs on order was raised from 41 to 55.

At the time of the production order, the weapon system concept had not yet been adopted by the USAF, but when it was, the B-47 became the first aircraft to receive a Weapon System designation, the bomber and photo-reconnaissance versions being WS-100A and WS-100L respectfully.

On February 8, 1949, the first XB-47 flew from Moses Lake AFB, Washington, to Andrews AFB near Washington, D.C., averaging 602.2 mph (523.3 knots) over a 2289 mile (1989 nautical mile) course, setting an unofficial transcontinental speed record. While in Washington, the aircraft was

shown to members of the House Armed Services Committee in the hope of obtaining sizable production orders.

Serial numbers of the Boeing XB-47 Stratojet:
46-065 and 46-066 (2)

Specifications of the Boeing XB-47 Stratojet:
Powerplant:
Six General Electric J35-GE-7 turbojets, each rated at 3750 lbs. static thrust.

Performance:
Maximum speed: 578 mph (502 knots) at 15,000 feet.
545 mph (474 knots) at 35,000 feet.
568 mph (494 knots) at sea level.
Service ceiling: 41,000 feet.
Cruise speed: 466 mph at 15,000 feet.
Stall speed: 129 mph at 15,000 feet.
Initial climb rate: 3100 feet per minute.
Range: 2650 miles (2303 nautical miles) with a 10,000 pound bombload.
Ferry range: 4000 miles (3476 nautical miles).

Dimensions:
Wingspan: 116 feet 0 inches.
Length: 107 feet 6 inches.
Height: 27 feet 8 inches.
Wing area: 1428 square feet.

Weights:
Empty: 74,623 pounds.
Normal: 125,000 pounds.
Gross: 121,080 pounds.
Maximum for takeoff: 162,500 pounds.

Armament:
Two 50-caliber machine guns in tail turret (not installed in the XB-47).

Bombload:
Normal: 10,000 pounds.
Maximum: 16 1000 pound bombs or one 22,000 pound bomb.

Additional material provided by Robert M. Robbins, Lt Col. Andy Labosky and Mark Natola