The B-47 first flew 50 years ago this month. Its influence went far beyond its military role. A whole host of airliners followed its basic design characteristics.

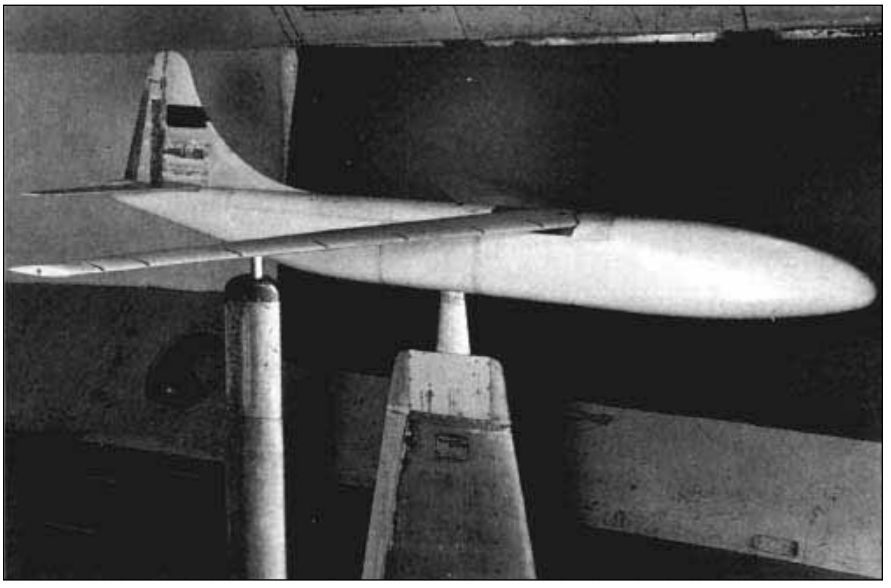
The Long Reach

By Walter J. Boyne

of the Stratojet

Displaying the characteristics that defined a half-century of aircraft, a Lockheed-built Boeing B-47E Stratojet banks its swept wings as its pod mounted jet engines pour out the power. The aircraft markings are typical for the later period of B-47 service.

Boeing photo



The future for both civilian and military jet aircraft takes shape in the form of swept wings tested in December 1945 on this wind tunnel model. The smooth body and tail, typical of a B-29, were incidental to the tests.

THE Air Force's B-47 bomber was radically new in design, a sleek, swept-wing beauty built with all the expertise that Boeing had acquired in World War II and inspired by the latest and best in American and German technology. Unlike previous aircraft, the new bomber was powered by six jet engines. The Stratojet, whose first flight was made 50 years ago this month, was the most influential multijet aircraft in aviation history.

Gen. Curtis E. LeMay, commander of Strategic Air Command, seized on the B-47 to endow SAC with awesome power, equipping no fewer than 28 bombardment and five strategic reconnaissance wings with the new long-range aircraft. No one who has witnessed the takeoff of a wing of 45 B-47s will ever forget the sight of the powerful aircraft rolling down the runway, one after the other, separated only by seconds, seeming to take forever to lift off and then vanishing swiftly in the distance.

At the time of their debut, and for years afterward, the B-47s formed the most powerful bomber fleet in the world, each bomb bay packed with explosive force equivalent to scores of thousands of tons of TNT. Faster than most fighters at operational altitude and with global range provided by in-flight refueling, the bomber confronted the Soviet Union with a virtually insoluble defensive problem.

Boeing photo

The future unveiled. In this early press release photo, Boeing's "radical" XB-47 Stratojet faces a partially completed B-50, the last propeller-driven bomber delivered to the Air Force.

The Progenitor

Had it done nothing more than serve in its military deterrent role, the B-47's place in history would be secure, but the aircraft's basic design characteristics were so fundamentally sound that they dominated the aviation industry for decades. Its combination of cylindrical fuselage, swept wings, and podded engines would be adopted not only by tankers and the next generation of bombers but also by most of the world's commercial jet transports.

The basic B-47 design was translated directly into the KC-135 tanker and the Boeing 367-80 prototype. The latter led to a series of epoch-making 707 airliners, which in turn spawned all of the follow-on aircraft from the 727 to the 777 that have made Boeing an industry giant. The B-47's basic formula was also seen in the designs of other US and foreign manufacturers, including the Convair 880/990, the Douglas DC-8, and the European Airbus Industrie series.

The B-47 was an enormously flexible aircraft. Over the first decade of the Cold War, as Soviet defenses improved, so did B-47 tactics. The B-47 was created to be a high altitude penetrator, but later its pilots embraced low-level "oil burner" tactics to slip in under radar. Low-level tactics included the "pop-up," which featured a low-level run-in followed by a quick pull up to 18,000 feet. After bomb release, the aircraft would turn sharply and dive for the ground.

Pilots reached an extreme with what was called the low altitude bombing system maneuver. Like the pop-up, the LABS also featured a low-level run-in, but this time it was followed by a pull up into a half loop, with the nuclear bomb released at the quarter-loop point. The aircraft would continue with the half loop, rolling out in an Immelmann turn, then dive away.

LeMay flaunted the B-47's power as

a matter of policy, sending it on record-setting missions, operating it from overseas bases, and taking every opportunity to make clear to the Soviets that the US possessed an unparalleled offensive nuclear force and would use it if necessary.

Spurred by the Suez Crisis of 1956, SAC demonstrated its ability to launch a large strike force on short notice. In a two-week period, more than 1,000 B-47s were flown on nonstop simulated combat missions, averaging 8,000 miles each, over North America and the Arctic.

In 1958, SAC's B-47 strength peaked with 1,367 bombers (in 28 wings) and 176 RB-47s in service. These two aircraft fleets were reinforced by 380 jet-powered B-52s, 22 aging Convair B-36s, and a mixed fleet of 780 KC-97 and 182 KC-135 tankers. The mix changed as newer aircraft and missiles entered service, but the basic premise remained the same: The US would use SAC's strength and proficiency to contain the Soviet Union and blunt its policy of expansion.

As the fleet grew, the Air Force's requirements expanded. Fortunately, the basic design was versatile, lending itself to no fewer than 38 variants, ranging from the XB-47A prototype through the "standard" B-47E bomber to tankers, electronic and photographic reconnaissance models, missile carriers, drones, and weather birds. It even served in Vietnam as a communications relay aircraft.

Steve Richards via Warren Thompson

A B-47 and F-94 fly into Ladd AFB, Alaska, in 1951. In 1958, SAC's arsenal of of the versatile B-47 peaked at 1,367 bombers in 28 wings and 176 reconnaissance models. In all, there were 38 variants.

Still, the B-47's creation was filled with uncertainty, and, in its early years, its promise was almost overshadowed by its problems.

Remarkable Requirements

In June 1943, alert to the strong possibilities of turbine power, US Army Air Forces asked several manufacturers to produce designs for a multijet aircraft. On Nov. 17, 1944, a formal requirement was issued for a jet-powered medium bomber with a maximum speed of 550 mph, a range of 4,100 miles, and a service ceiling of 45,000 feet. These were remarkable requirements; the respective figures for the B-29, which was just being proven in service, were 358 mph, 3,500 miles, and 31,850 feet.

Boeing went through a long series of design studies, but the critical breakthrough came when George Schairer, Boeing's chief aerodynamicist, analyzed German research on the swept wing and asked that it be applied to the XB-47. The resulting tests showed such promise that a nearly $10 million contract for two prototypes was issued.

More than two years of design and production effort followed, with the prototype aircraft emerging from the factory on Sept. 12, 1947. It was unlike anything ever seen before and represented a total departure from Boeing practice. Its slender, flexible, laminar-flow wing was swept back 35 degrees and drooped under the weight of its structure and six engines. The 3,750-pound–thrust General Electric J35 engines were installed three on a side, two inboard engines suspended in a streamlined pod, with the outer engine faired tight beneath the wing. The wing was too thin to contain either fuel or landing gear. The streamlined fuselage was marred by only a few bumps and was large enough to house a series of longitudinally placed tanks, which meant that fuel use had to be carefully managed to maintain the center of gravity within limits.

Fred Johnsen via Walter J. Boyne

Even with landing gear and flaps down, the B-47 was so clean that it required a parachute to provide additional drag on approach. The pilot maintained power on the slow-to-accelerate jet so that a go-around could be made quickly if needed.

Fred Johnsen via Walter J. Boyne

Any B-47 takeoff was interesting, but when ATO bottles were used, it was spectacular. Early B-47s had 18 bottles mounted internally. Later versions had an external 33-bottle unit.

The bicycle-style landing gear—two sets of two wheels in tandem, supplemented by a pair of small outrigger wheels that retracted into the inboard engine nacelles—derived from the Martin Aircraft Co. experiments. This arrangement dictated some of the aircraft's flying characteristics, for the gear placement meant that the aircraft could not be rotated for takeoff or flared for landing. For descents, the aft gear was extended to double the drag of the entire aircraft.

The three-man crew was grouped in a small pressurized compartment. The radar observer/navigator/bombardier sat in a dark cubbyhole forward, while the two pilots sat in tandem with an unrestricted view from the fighter-like canopy. Early planning called for all three crew members to be "triple rated," and thus able to do each other's job, but this proved to be impossible to sustain as the B-47 program expanded.

Boeing and the Air Force committed to the XB-47 program some of their top pilots, including Capt. Jack Ridley, Capt. Chuck Yeager (who flew a P-84 chase aircraft), Maj. Guy Townsend, Bob Robbins, and Scott Osler.

On Dec. 17, 1947, the anniversary date of the historic first flight at Kitty Hawk in 1903, Boeing test pilots Robbins and Osler made the short flight from Boeing Field in Seattle to company facilities at Moses Lake, Wash. (Later, Osler would become the first man to lose his life in a B-47, killed when a cockpit canopy came off in flight.)

From Skepticism to Belief

The two pilots were impressed by the performance of the new bomber, but, like everyone else, they had no idea of just how much it would shape the future of the company, the industry, the Air Force, and the country. The crucial test flight came when Col. Pete Warden persuaded Maj. Gen. K.B. Wolfe, the patron saint of the B-29 program, to take a short flight with Townsend. After a 20-minute ride, Wolfe had become a firm believer in the B-47, and promised large-scale production, with the first production order for 10 B-47As coming on Sept. 3, 1948.

Later, the B-47 became the first airplane to receive a weapon-system designation, the bomber becoming WS-100A and the reconnaissance version WS-100L.

The second prototype and all subsequent production B-47s were fitted with General Electric J47 engines, whose thrust was increased over time to a maximum of 7,200 pounds (with water injection) in the B-47E series. Additional thrust was provided by ATO—assisted takeoff—bottles. The early aircraft had 18 ATO bottles mounted internally, but this system was replaced on the E model by a jettisonable rack of 33 of the 1,000-pound thrust units.

While the dimensions and the external appearance remained remarkably stable over the life of the aircraft, maximum gross weight increased over time from the 125,000 pounds of the prototypes to 230,000 pounds for the E bomber model. At higher gross weights, the aircraft was sluggish and slow to accelerate, particularly at high temperatures and high density altitudes.

Despite teething problems, production orders increased, and both Douglas and Lockheed were tasked to build the aircraft. Ultimately, Boeing would build 1,373, Douglas 274, and Lockheed 385

Photo by Ray Shewfelt via Warren Thompson

In 1955, pilot Ray Shewfelt took this self portrait showing off the superb visibility afforded by the B-47's fighter-like canopy. Created as a high altitude penetrator, its pilots later embraced low-level "oil burner" tactics.

for a total of 2,032. No bomber since World War II has been produced in such quantity.

Problems stemming from the developmental nature of the jet engine and the very clean design of the B-47 combined to create difficulties in flying the aircraft. The jet engines required 12 to 20 seconds to spool up from idle to full power, which meant that approaches had to be planned very carefully. The problem was eased by the introduction of a 16-foot drogue parachute, which was deployed in the landing pattern. The parachute created enough drag to permit the pilot to maintain the engine rpm in a range permitting quick acceleration in case of a go-around, at which point the drogue chute would be jettisoned.

Braking was also a problem, leading to the incorporation of an antiskid device. On Townsend's suggestion, a 32-foot-diameter ribbon-style brake chute, developed by Theodore Kanake, was fitted to the airplane to reduce landing roll. Usually, the pilot did not apply the brakes after the brake chute had caused the bomber to decelerate below 100 knots. (The brake chute could also salvage a bad landing, if deployed at just the right moment at the top of the bounce.)

Despite the two parachutes, the B-47 was so clean that excess speed on the approach caused an exceedingly long landing run, so approach speeds were carefully calculated and maintained. It was not difficult to do so; the merest touch of the throttle served to adjust the speed in single knot increments.

Boeing photo

The slightly longer nose of the RB-47E, shown here (foreground) with the bomber version, added elegance to the sleek jet. A few reconnaissance Stratojets continued in service after all bombers had gone to the boneyard.

Ankle-Biters

For all of the B-47's technical marvels, a variety of mechanical problems cropped up during its early development, and there were frequent groundings. Fuel leaks plagued maintenance crews, and there were many difficulties with the early K-2 and K-4A bombing systems. The tail armament (originally two .50-inch machine guns and later two 20 mm cannons) was operated by the copilot, whose seat could be turned 180 degrees. However, the guns were often rendered useless by difficulties with the fire-control system.

The aircraft was pleasant to fly, although it exhibited Dutch roll, a name for the tendency of the airplane to make a series of S turns, each of slightly greater amplitude. This was corrected by the invention of the yaw damper, a device which automatically supplied just enough rudder motion to offset the Dutch roll. There were other aerodynamic problems. Early B-47s exhibited a tendency to pitch up. This problem was solved by the introduction of vortex generators—small lifting vanes which diffused the airflow and which can be seen today on almost every high speed aircraft.

A problem which was simply accepted rather than solved was the fact that, at speeds of 456 knots and higher, the ailerons became ineffective because the flexible wing twisted. The aircraft was placarded at 425 knots to provide an ample safety margin.

The greatest hazard to the B-47 was corrosion and metal fatigue. Between March 13 and April 16, 1958, no fewer than six B-47s crashed. The investigation revealed widespread problems ranging from fatigue in the lower wing skin to failure due to stress corrosion of the "milk bottle pin," the main fitting holding the wing to the fuselage. The solution was Project Milk Bottle, an expensive, time-consuming modification that nonetheless gave the B-47 fleet an additional six years of service.

As the Cold War deepened, the requirement for aircraft on alert increased from one-third of the fleet to 50 percent, and this put such a strain on manpower that it was decided to phase out some B-47 wings to make the personnel available to other units. The phaseout was accelerated as more B-52s and ICBMs came on line, but two world crises—Berlin in 1961 and Cuba in 1962—temporarily delayed the process.

By February 1966, all B-47 bombers had been retired to the boneyard at Davis–Monthan AFB, Ariz. A handful of reconnaissance versions continued to operate. The last Air Force Stratojet, an RB-47H, was retired in December 1969. The Navy had a specialized test version that it kept in use until 1976.

Now, though the B-47 has flown its last, at least 15 examples are preserved and on display in museums or at airfields, and the B-47 Stratojet Association is growing in numbers. These artifacts are all that remain of the beautiful aircraft that burst onto the scene a half-century ago. ■

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