The Boeing B-47 Stratojet was the perfect strategic weapon for its time, so feared by its enemies that the bomber never had to perform its lethal nuclear mission.

The Soviet leadership knew the B-47—swiftly deployed in ever greater numbers—gave the United States an unstoppable nuclear strike force.

Sadly, the B-47 also suffered losses on a scale that would be utterly intolerable today. Over its lifetime, 203 aircraft (about 10 percent of the total procured) were lost in crashes, with 464 deaths. This article focuses on the two peak years, 1957 and 1958, when 49 B-47s crashed—incurring 122 fatalities.

There were a number of reasons for this doleful toll. The Stratojet, never called so by its crews, introduced a new flight performance regime requiring new skills and greater precision.

The B-47's Deadly Dominance

By Walter J. Boyne

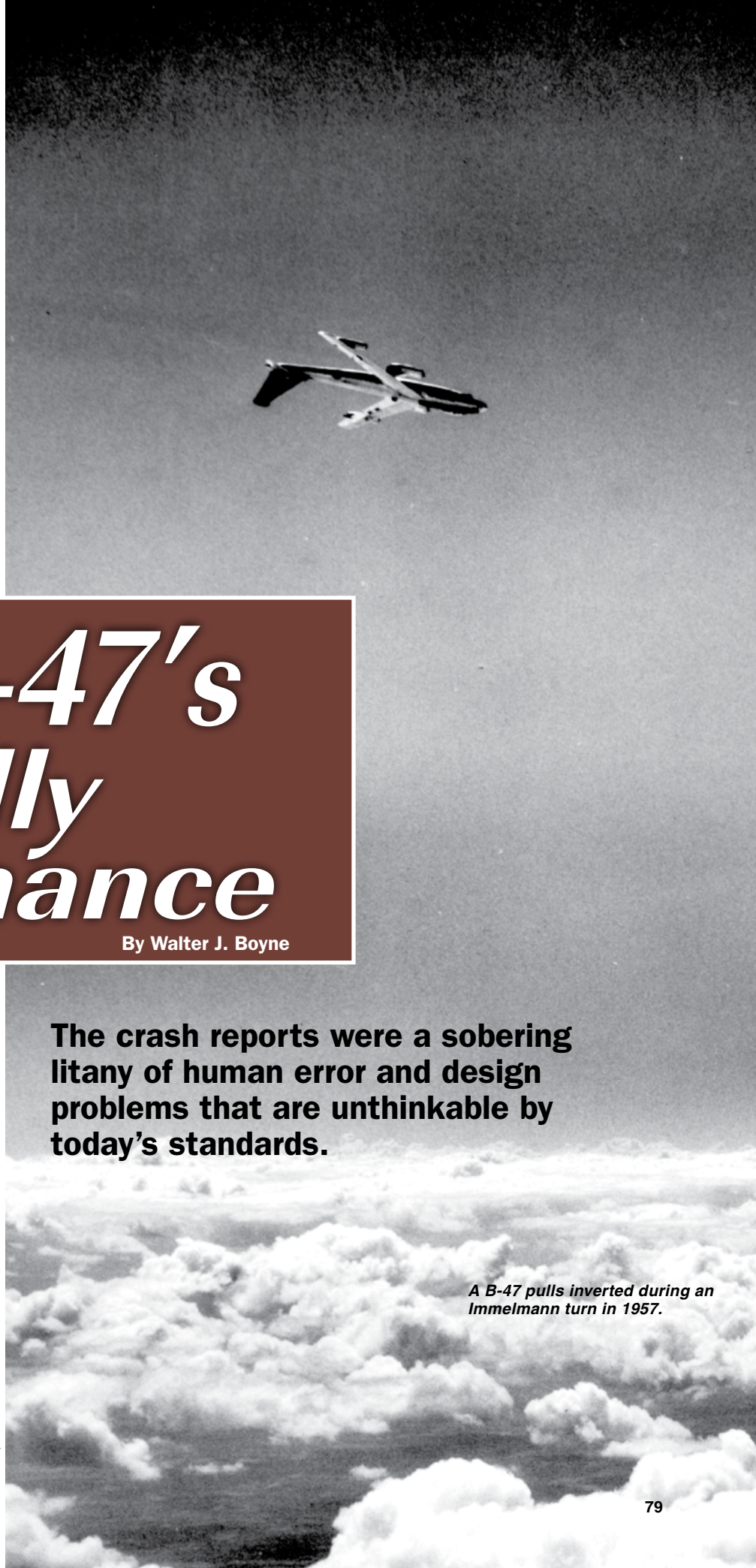
It was a hybrid of World War II metallurgy, construction techniques, and aerodynamic theory that was sometimes inadequate for the new era of jet engines.

From its very first flight, USAF tried to maximize the B-47's effectiveness with ever greater demands for performance, flexibility, and mobility.

Perhaps most important, the bomber debuted at a time when Strategic Air Command was undergoing an explosive expansion in size that diluted standardization efforts and the effectiveness of training and safety procedures.

After four years of intensive development the XB-47A made its first flight on Dec. 17, 1947, one of two prototypes built under a $10 million contract. It was the product of Boeing expertise and the information engineer George S. Schairer garnered from captured German data on swept wings and high-speed flight. The prototype was so radical that one of its

The crash reports were a sobering litany of human error and design problems that are unthinkable by today's standards.



A B-47 pulls inverted during an Immelmann turn in 1957.

USAF photo

USAF photos

primary engineers, Holden Withington, was still not certain it would fly as he watched it taxi out for its first takeoff.

The XB-47 featured slender, shoulder-mounted swept wings. A huge bubble canopy housed the fighter-like cockpit for the pilot and copilot-gunner. The navigator-bombardier-radar operator was tucked away in the nose and in later models had no outside visibility at all.

Six General Electric engines were mounted, four in inboard underwing pods and two near the wingtip. The engine placement provided aerodynamic benefits while strengthening the wing. The "bicycle landing gear" previously tested by Martin on a B-26 and the XB-48 was adopted because the thin wing provided no storage space.

Slow Acceleration

The selection of the ultrathin wing created both structural and aerodynamic problems. It had to be built with great strength to withstand huge deflections, as much as 17 feet in flight. But it was also flexible chord-wise, so that at speeds above 489 mph, the ailerons acted as a tab, twisting the wings rather than inducing a bank. At 525 mph, the ailerons were totally ineffective, and the control wheel could not budge from side to side. Ironically, in the course of B-47 development, the Boeing engineers discovered a thin wing was not absolutely necessary and designed the B-52 with huge thick wings and ample fuel storage.

Static structural tests proved the B-47 could survive 150 percent of its design limit load. Unfortunately, at the time there was no way to compute the cumulative effect of repeated cyclic loads imposed by operations.

Flying the aircraft at approach and landing speeds was demanding because the engines were so slow to accelerate. A drogue parachute was used to allow approach and landings to be made with the engines still carrying enough power to enable rapid throttle movement. After landing, a 32-foot brake parachute and an anti-skid brake stopped the aircraft.

Mass production was delayed by both postwar defense cuts and technical difficulties. The latter included a tendency to "Dutch Roll" and to pitch up. A specially designed "yaw damper"

Above left: A Stratojet makes a rocket-assisted takeoff in 1954. Left: A B-47 lands with both drag chutes deployed.

B-47 Crash

(Continued from page 1).

also hospitalized, overcome by smoke.

More than a dozen Upper Heyfordians were treated at the dispensary for smoke inhallation, exhaustion and minor cuts following the accident. All except four were released after first aid treatment.

A2C Lawrence Kapp, A2C Virgil Sykes, and A3C Robert Major were held overnight at the base dispensary.

British Help

During the emergency, while all available base fire fighting equipment was in use, a pumper truck from the Bicester branch Oxford District Fire Brigade stood by to handle any additional emergencey calls here. British policemen of the Oxfordshire Constabulary also res-

Photo via raf-upper-heyford.org

Debris from a May 1964 B-47 crash litters RAF Station Upper Heyford in England. At right, a clipping from a SAC newspaper describing the deadly crash.

fixed the first problem, while a host of small airfoil shaped vanes called "vortex generators" solved the latter.

For a few years the difficulties were of such a magnitude that despite the B-47's terrific performance, with its 606 mph top speed and 3,000 mile combat radius, many at Boeing believed the B-50 series would continue to be their bread-and-butter warplane.

The 1953 National Security Council Document 162/2 called explicitly for maintenance of a strong military force, emphasizing the capability of inflicting massive retaliatory damage by offensive striking power. Strategic Air Command became that force, led by Gen. Curtis E. LeMay.

SAC embarked on an unprecedented peacetime growth in strength and proficiency. From 1951, the year the B-47 arrived in the force, to 1957, SAC expanded from 144,525 personnel to 224,014. It grew from 12 to 1,285 B-47s and from one B-47 medium bomb wing to 28—each with 45 aircraft. Boeing, Lockheed, and Douglas all built B-47s to meet the delivery schedule. The total number of aircraft in SAC went from 1,186 to 2,711.

This growth demanded an enormous logistics buildup. By far the most important supporting element to the B-47's effectiveness was the creation of a large fleet of aerial tankers. This began with less-capable Boeing KB-50s and KC-97s until the long-lived KC-135 arrived on scene. First introduced in 1957, the KC-135 fleet expanded rapidly. The tankers gave "legs" to the B-47 fleet and established it as a global threat.

Attention Critical

To support this aerial team, SAC swiftly set up a tremendous infrastructure of new Air Force bases, new schools for training air and ground crews, and huge depots for maintenance and repair. A corresponding industrial infrastructure of companies large and small grew up to meet the needs of this expansion. Overseas bases were organized to give the B-47s quick reaction time.

As the pell-mell re-equipment of SAC with B-47s went forward, there were errors in component supplies, training, and operational procedures.

SAC's flight program actually saw a decline in the rate of accidents per 100,000 flying hours, but it was still inadequate for the demands of the jet age. The cost was staggering by today's standards.

From 1953 to 1959, B-47s suffered 296 Class A and Class B mishaps, resulting in 242 fatalities. During this time annual flight hours for the B-47 rose from around 105,000 to a peak of 584,000.

In 1957 alone there were 35 Class A and Class B accidents; of these 24 were crashes that cost 63 lives. Almost as deadly was 1958—there were 33 Class A and B accidents, with 25 aircraft crashed and 58 fatalities. The vast majority of crashes came down to human error, with pilots assigned principal blame.

There were many reasons for this. The three-man crew flew a vastly more complicated aircraft than had the 10-man crews of the B-29 or B-50. It was easy for any crewman, particularly the aircraft commander, to have his attention diverted momentarily from the task of flying the aircraft. And missions sometimes ran 24 hours.

Crew coordination was essential, and could be easily disrupted when an emergency occurred. Yet attention to flight control was absolutely critical at all times.

The extremely clean lines of the B-47 enabled both its performance and its problems. A pilot concentrating on a new situation—course change, a sudden red light, radio instructions, anything—might let his attention wander for a few seconds and find himself banking in a dive that pushed his speed to a point where recovery was impossible. This proved to be a frequent scenario during instrument flight.

Where the B-50s of the time might let down in an instrument approach from a holding point in leisurely 1,000-foot increments, the B-47 descended at a hell-bent-for-leather 6,000 feet per minute rate that sometimes led to lethal miscalculations.

The B-47 required much closer attention than previous aircraft to preflight planning, fuel distribution, trim settings, and airspeed control. It was

deceptively easy to fly, but extremely precise operation was required during takeoff, in-flight refueling, instrument flight and landing. This became even more important with the introduction of new tactics that included higher takeoff weights, minimum interval takeoffs, three-ship cells for in-flight refueling, tankers with marginal performance, and operation from alternate airfields.

Using KC-97s as refueling aircraft caused many problems. The KC-97 could not fly fast enough with a full load of fuel to keep the B-47 from stalling. This forced the tanker into a descent to maintain enough speed. Operating with the KC-97 was particularly difficult for three-B-47 cells, especially at night or in weather.

Other factors intervened as well. After Oct. 1, 1957, SAC sought to keep one-third of its bombers and tankers on alert, with weapons loaded and the crews ready for takeoff within 15 minutes. Extra demands were imposed by "reflex" operations requiring 90-day overseas tours.

Each of these new requirements placed increased demands on the relatively new B-47 and its crews. An increase in gross weight from 125,000 pounds in the B-47A to 206,700 in the B-47E was offset by more powerful engines, water injection, and jet-assisted takeoff bottles. These combined to increase the strain on wings and fuselage.

One of the most important changes was SAC's establishment of the Hair Clipper training program for low-level flight and the use of the LABS (low altitude bombing system) maneuver. In this, the B-47 entered a half-loop at maximum speed, pulled up at 2.5 to 3.5Gs, automatically released its bomb at a predetermined point, then rolled out at the top in an Immelmann turn at a frighteningly low airspeed. The bomber dived away from the target to regain speed.

The concept was based on experience from operating SAC's F-84 fighter-bombers. It was believed a low-level approach at high speeds would reduce the efficiency of Soviet defenses and cut B-47 losses.

An almost predictable series of accidents forced cancellation of Hair Clipper on March 5, 1958, a little over a month after the first public demonstration.

Weather Hazards

There were also several "toss bombing techniques"—all dangerous. In the "pop-up" maneuver, the B-47 would fly in at 489 mph indicated airspeed until some 60 seconds prior to bombs away, then climb to 3,500 feet above the ground, level off, drop the parachute-retarded bomb, and make an immediate turn to escape. The general strain on the aircraft structures caused by the stress of atmospheric turbulence at low altitudes was exacerbated by a higher tempo of operations. This required more frequent refueling missions and increased numbers of takeoffs and landings.

The much-redacted crash reports of 1956-1957 are a sobering litany of human error and design difficulties impossible to understand by today's safety and training standards. Some of the accidents were inexplicable. In others, aircraft disappeared on a mission. There were two accidents where the aircraft commander was not physically fit to fly, and in another, a crew elected to attempt a takeoff even though they and ground control knew their right outrigger tire was blown.

The majority of accidents occurred with crews where the aircraft commander was a reserve officer with relatively high total flying hours, but only a small amount of time in the B-47. In addition, records show both mishap pilots usually had a limited amount of instrument and night flying time. The pilot was all too often a young first lieutenant, usually with less than 500 hours total time and perhaps 50 hours in the B-47. Time and again, the accident board concluded the primary cause was operator error: Faulty technique "allowed the aircraft to get into a position from which they were unable to recover."

Marginal flight conditions were particularly hazardous when conducting in-flight refueling with KC-97 aircraft. When the tanker aircraft was forced to change course because of weather or other reasons, the conditions were set for midair collisions. In one case a B-47 flying at near stall broke contact and wallowed into the tanker's prop wash. It was thrown into a 90-degree turn it could not recover from. In another instance the accident board attributed the accident's cause to operator error by the lead tanker aircraft commander and the No. 3 bomber aircraft commander. But it then added, "The main fault lies in the incompatibility of the tanker-bomber as witnessed by the extreme difficulty or impossibility to maintain proper formation."

The Lincoln AFB, Neb., fire crew smothered this B-47 in foam after an accident in the early 1960s.

Many of the accidents occurred on takeoff, all with a similar pattern. The high gross weight takeoffs appeared normal until a few seconds after liftoff. Then a wing dipped, struck the runway, and the aircraft crashed and burned. Analysis revealed a loss of power (engine failure, failure of water injection) that induced yaw. When this happened, the B-47 entered a stall, and a crash was unavoidable.

Takeoff crashes also resulted from incorrect preflight planning. In one instance, the aircraft commander failed to include the weight of 2,200 gallons of external fuel in his calculations, rotated too soon, stalled, and crashed. In another, the crew set the elevator trim incorrectly because it was using an outdated manual.

Vertigo caused several crashes, including one harrowing LABS maneuver in an overcast sky. In others even a few seconds of vertigo resulted in the aircraft assuming an attitude where recovery was impossible. In one low-altitude bombing disaster, the airplane was flown by a crew that the board deemed "especially well qualified in the LABS maneuver." Their aircraft disintegrated immediately upon entry into the maneuver, the left wing falling off first. The report states, "The aircraft had performed 508 Immelmanns and 253 rolls." If this is accurate, the sudden disintegration is understandable.

Photo via lincolnafb.org

Of all the 1957 accidents, one is the most difficult to fathom. Perhaps the most qualified B-47 pilot in the Air Force, Col. Michael N. W. McCoy, commanded the 321st Bomb Wing. He had 8,661 hours flying time and his copilot, Lt. Col. Charles Royce, had 3,855 hours. McCoy, an instructor pilot, had flown 1,093 hours in the B-47, while Royce had 813 hours in the aircraft. Both men had done well on recent proficiency checks.

On Oct. 9, 1957, McCoy took off from Pinecastle AFB, Fla., in a DB-47B, modified to carry the GAM-63 Rascal missile, with Maj. Vernon D. Stuff as navigator. The aircraft did not have ejection seats. The purpose of the flight was an instrument check for McCoy and an orientation ride for a visiting RAF officer, Group Capt. John Woodroffe.

Lessons Learned

The flight was conducted by visual flight rules, with little communication to or from the base after McCoy took off. A little after 11 a.m., the aircraft was reported seven miles west of Orlando, Fla., flying at an altitude of 1,500 to 2,000 feet, wings level in a descent. Shortly thereafter it was reported passing the Orlando Country Club in a left turn that became a vertical bank. The aircraft disintegrated about three miles from Orlando. All four men were killed.

While much of the report remains blacked out, it is difficult not to infer from the context that Woodroffe was in the rear seat for his orientation ride. Either he or McCoy was flying the aircraft at low altitude and at high speed. The bomber inadvertently entered a descent, accelerating to a speed that pushed it beyond the point of safe recovery. A violent effort to reverse the turn caused the aircraft to disintegrate.

It was a sad end to a great career for McCoy, and a reminder of just how dangerous the B-47 became with an inattentive pilot, however skilled.

The year 1958 had an almost equally dismal record, peaking in March and April, when six aircraft broke apart while flying low-altitude missions. Two of the aircraft were very low time B-47Es, one with only 1,265 hours. Of the six crashes four were directly attributable to structural fatigue failure. These crashes served notice that flaws might show up in any B-47, whatever its flying time.

The B-47 was supposed to serve as SAC's primary bomber until 1965; by 1958 there was already discussion that it might have to be phased out completely. SAC reacted in April by limiting the B-47 to 357 mph indicated airspeed and 1.5G maneuvers. Low-level flying was banned, gross weight could not exceed 185,000 pounds with external tanks, and banks were limited to 30 degrees. Restrictions were placed on flight through turbulent air, stalls, and touch-and-go landings. Specific limits were placed on refueling practices. Aircraft were carefully inspected for cracks indicating fatigue.

On May 29, 1958, the primary fix arrived, via kits necessary to reinforce the wing root of the fleet. All three contractors and Air Materiel Command worked on what became known as the Milk Bottle program. The name derived from the large milk bottle-shaped pins used to fasten the wings to the fuselage.

By January 1959, some 1,622 B-47s received this modification. Additional fatigue problems appeared later, especially in the upper fuselage longerons, but for the most part, B-47s were cleared for flight.

Although the response to the emergency was ultimately successful, the results were not immediate. Despite a dramatic dip in flying hours, there were 22 more B-47s destroyed in 1958.

Not until 1960 did the corrective efforts take full effect, and as the B-52 fleet grew, economics dictated the B-47 phaseout would follow. By 1966, only 16 RB-47s were left operating.

For a time, the B-47's high performance and diligent crews provided the United States with an overwhelming strategic advantage, but the experience was a sobering one.

SAC learned from it. It vastly improved training and flying safety procedures, and the B-52 quickly became the Air Force's principal nuclear bomber. ■

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