

Special Feature: The B-52 Stratofortress



Seventy-five years ago in June 1946, the US Army Air Forces awarded Boeing a contract to build the XB-52, the world's first intercontinental bomber.¹ After several modifications, the Air Force, satisfied with the design, ordered 13 B-52As in 1952.² On the occasion of this particular anniversary of the Stratofortress, *Air & Space Power Journal (ASPJ)* is pleased to highlight some aircraft milestones followed by a few first-hand accounts of crew members.

Acquisition and activation. Production moved quickly; the first flights of the B-52Ds, B-52Es, and B-52Fs occurred annually from 1956 to 1958. In the middle of these “firsts” in 1957, the Air Force approved the contract for the next-generation B-52, the B-52G. The greater fuel capacity meant an increased range of 30 percent; the tail gunner seat was moved adjacent to the electronic counter measures operator; and a welcome climate control feature was introduced—essentially dual-zone.³ In 1960, the B-52H, still in operation today, made its first flight. In total, from the XB-52 to the B-52H, 774 aircraft were approved, produced, and fielded in just over 10 years. The Air Force retired the B-52Ds in the early 1980s and retired the B-52Gs following the Gulf War in 1991.

Strategic power projection. Under General Curtis E. LeMay, the B-52 flew nonstop flights as far north as the North Pole (1956), and in 1957 in Operation

Power Flite, three B-52Bs became the first jet aircraft to circumnavigate the globe nonstop, completing the flight in just over 45 hours. In early 1962, the Stratofortress conducted a nonstop flight between Japan and Spain that broke 11 speed and distance records.⁴ The Strategic Air Command's B-52s were a global alert force—on the ground and in the air—ready to conduct nuclear counterstrikes in the event of a Russian attack.

Weapons capability. The 1950s also saw the successful fielding of air-launched cruise missiles (ALCMs), one of which—the Hound Dog—remained in service until 1977. During the 1980s, the B-52 began to carry nuclear-armed ALCMs; an early GPS system and the advent of terrain contour mapping allowed these missiles to navigate autonomously.

The Air Force also deployed Harpoon antiship missiles from the B-52Gs and B-52Hs in the early 1980s. That same decade, the Air Force converted a number of ALCMs to carry a conventional payload. These conventional ALCMs—CALCMs—were first employed during Operation Desert Storm. The Stratofortress has had an aerial mining capacity for decades as well, and in 2019, the Air Force revealed work on arming B-52Hs, the most recent model, with Quickstrike air-dropped sea mines.⁵

The B-52 was first used to carry conventional ordnance in the Vietnam War in missions executed under an operation code-named Arc Light. While most missions during the war were blanket bombardments, the B-52 also provided direct tactical support to the Army and the Marine Corps. During the Vietnam War, the B-52 also gained its well-known moniker, the BUFF—short for Big Ugly Fat “Fellow.”⁶ During Operation Niagara in 1968, B-52s dropped 75,631 tons of bombs around Khe Sanh in over 2,700 sorties. In support of Operations Linebacker I and II in 1972, Strategic Air Command increased its deployment of B-52s to 210; the entire fleet at the time numbered 402.

During the execution of Linebacker II, Sergeant Samuel Turner made history as the first tail gunner to shoot down an enemy aircraft—in this case, a MiG-21. Airman 1st Class Albert Moore later duplicated Turner's feat, and Moore's aircraft, “Diamond Lil,” still graces the north entrance of the US Air Force Academy in Colorado Springs.⁷ Linebacker II, also known as the “Christmas Bombings,” from December 18–29, 1972, saw more than 15,000 tons of bombs dropped, 15 B-52s shot down, 8 crewmembers killed, 24 crewmembers deemed missing in action, and 33 crewmembers captured and later returned. Linebacker II led directly to the negotiated peace settlement the following year that enabled President Richard Nixon's “Peace with Honor.” The aircraft had proven itself once and for all as a key operational asset during wartime.⁸

Post–Cold War. In the early 1990s, the Stratofortress was again called to battle. In the opening days of the Gulf War in January 1991, seven B-52s conducted the longest strike mission in history to date: a 35-hour, nonstop flight totaling 14,000 miles. During the war, the B-52 was used to attack ground forces as it had in the Vietnam War. Accounts of Iraqi troops, much like North Vietnamese troops almost 20 years before, tell the tale of the terrifying impact of a B-52 bombing run.⁹ The Gulf War also saw the B-52 operate from bases in countries such as Saudi Arabia, the UK, Turkey, and Spain.¹⁰

In 1991, President George H. W. Bush cancelled the B-52 crews' 24/7 strategic alert, and two years later, the aircraft was adapted to carry the next generation of conventional weapons. The Stratofortress went to war again in 1999, with the Serbian armed forces the next adversary to experience the terror of a B-52.

Partner missions. One variant of the aircraft, the NB-52B or *Balls Eight*, carried the winged and manned, air-launched X-15 supersonic aircraft for its 199 flights from 1960 to 1968. While used for other programs in the interim, the Air Force's *Balls Eight* relationship with hypersonic aircraft came full circle—the aircraft's final mission was as the mothership for the X-43A, an unmanned hypersonic research vehicle. *Balls Eight* was formally retired from service in December 2004 after an illustrious 44-year career.¹¹

Twenty-first century adaptations. In 2014, the Air Force introduced the first B-52s equipped with the Combat Network Communications Technology system, providing operators with “communication data links, full-color LCD displays with real-time intelligence feeds overlaid on moving maps,” and in-flight capabilities to retarget weapons and mission parameters.¹²

Discussing the 2020 decision by the Air Force to keep 76 B-52Hs in service until 2050, Air Force Chief of Staff General Charles Q. Brown said of the challenges and opportunities of the almost 60-year-old Stratofortress, “it is like an old truck that was built when they actually build them tough. . . . The challenge you have with a platform like that now is how to bring in new technology and capability.”¹³

Originally purchased for \$6 million each, B-52Hs can fire long-range missiles—including hypersonics that can travel up to 1,000 miles—nuclear-tipped cruise missiles, satellite-guided bombs, and air-dropped mines. In 2020 and 2021 to date, B-52s have flown strategic power-projection missions to the Persian Gulf, Ukraine, and the western Pacific as well as support missions to Afghanistan. Colonel Anthony C. Cain, USAF, retired, and a former B-52 navigator, sums it up appropriately below: “The B-52 and its generations of crews, maintainers, and support personnel are symbols of the United States Air Force's global strike capa-

bility. The professionalism and dedication shown by anyone who has been connected to the mission makes the BUFF legendary.”

In this one of many anniversary years of the Stratofortress, *ASPJ* is honored to highlight a few observations and stories of current and former B-52 crew members.

Exalt 15. September 3, 1975, started out as a routine B-52G training flight day. Our crew arrived at the 51st Bomb Squadron building about 0900 to take our photo for the squadron crew line-up. Our crew of seven (with a new pilot along for training) went to base operations, filed our flight plan, and proceeded to the aircraft to ready it for take-off. The regular copilot was to fly in the instructor pilot’s seat.

Take-off from Seymour-Johnson AFB, North Carolina, was uneventful, but as we were climbing on departure, the instructor pilot, flying as the co-pilot, told us we had a fuel leak in the right wing. We declared an emergency to air traffic control, did all our fuel-leak emergency procedures, informed our command post of the problem, and canceled all training activity in order to burn off fuel to land safely.

The fuel leak was under control, and everything was normal as we did some routine checks of the flight and navigation systems. At 1221, everything changed. Somewhere near Aiken, South Carolina, the aircraft started shaking violently, worse than any turbulence, and pulled forcefully to the right, twice. It felt like a car driving from smooth pavement to very rough railroad tracks. We determined later that it was probably the right-wing tearing, the autopilot trying to correct the aircraft to counter the additional wind resistance, and the right wing continuing to fail. In a matter of seconds, the aircraft rolled right. The pilots realized inverted flight was imminent and ejected at approximately 120 degrees of roll, the electronic warfare officer and radar navigator after them. The electronic warfare officer's seat worked as advertised, but while the radar navigator's seat got him out of the aircraft, it did not automatically separate from him. Our gunner was out of his seat at the time and did not eject.

I was the navigator on that flight, and the accident board determined I was the last one out. I remember forcing my head to look for the radar navigator, but he was gone, and debris was streaming out of the hole where he was sitting moments before. I strained to get my legs in ankle restraints, which was necessary because we were in downward ejection seats, but the accident board theorized my ejection was up. The board theory was the aircraft had already exploded because my hatch was black from fire burns, while the others were white. I finally pulled my handle and remember thinking, “oh my God, I’m dead.” Then everything went dark. Because of that, I believe God does not let you see when you are going

to die. You are shielded from that experience. I did see my life flash before my eyes in snippets of memories.

The next thing I knew, I was in a parachute. The chute was tangled with the strap from my ejection seat, which failed to separate as expected. To land safely, I had to pull the seat to me and stand in it to control it. Ironically, the seat helped me penetrate through a pine forest. I managed to get out of the parachute harness and get my survival radio, even though I was beat up from the ejection and the seat banging into me. By then, aircraft were looking for downed crewmembers. Minutes later, I contacted one by twice radioing, "Downed crewmember, Exalt 15." He directed helicopter rescue who found me soon thereafter.

The pilot who was receiving training was in the helicopter. He told me the radar navigator had not survived. As it turned out, our downward seats were damaged by the torquing action. The radar navigator did everything right, but the aircraft exploded near enough to knock him unconscious. The copilot in the instructor pilot seat, and the gunner did not survive the aircraft explosion. I lost three friends and brothers that day.

**Hector Marquez, USAF, retired,
navigator, BUFF: 1975–81; 1989–92**

Proud gunner. I enlisted in the United States Air Force in 1975. I was trained as a nuclear weapons specialist (463X0), and my first assignment was to the largest nuclear weapons storage site on the planet, Manzano Mountain, Kirtland Air Force Base, New Mexico. My work as an Airman included a stint as a volunteer at the National Atomic Museum and Sandia Labs to maintain the displays of assorted inert nuclear devices.

There was a B-52 "B" model 52-0013 at the museum on display that was fully intact but "locked." I found the keys to the front hatch and helped myself to a tour of the inside all the way back to the gunner's station. I was so impressed with that war machine that I set a goal to retrain and fly as a gunner! I was accepted, and I loved every minute of it! I am proud to be one of the last B-52 gunners!

**Senior Master Sergeant James M. Ryles, USAF, retired,
T-1 gunner, WST gunner, instructor gunner, and evaluator gunner, BUFF: 1975–91**

B-52 gear fire and saga of Slip 57. May 2006. We had just landed 18 hours after the end of my last combat sortie at a certain island location. We landed with a full load of retained GBU-31s, and the drag chute failed, so the pilots had to get on the brakes a little more aggressively than normal. We taxied to the weapons' check area to have our bombs pinned, and the pilots set the brakes and cleared the weapons' troops in. My radar navigator and I were watching the marshaller in the forward-looking infrared when he suddenly began making an infinity symbol with his wands. Confused, we kept watching him. Next, he began making motions like "take off your shoulder straps." Not recognizing any of the motions, the crew debated what he was trying to tell us: bees? Miller time? We quickly realized it was bad when his third action was to throw down his wands, spin, and begin running away at full speed. (As we found out later, the hydraulic line going to the front right main landing gear had popped, pouring hydro fluid all over the hot brakes. Of course, it lit on fire, producing flames that went over the top of the wings).

The entire crew realized things were bad at exactly the same instant, and the radar navigator had already opened the entry hatch before the pilot was able to yell "Egress" twice. Unfortunately, he had forgotten to remove his headset, so I watched his head snap back as the comm cord reached the extent of its length. Realizing what had happened, the radar navigator grabbed the comm cord connector, unsuccessfully gave it two or three pulls before yelling "forget this," ripping off his headset, and jumping out through the open hatch. I, after watching all this while patiently sitting in my seat, jumped up and ran to the hatch, only to have this entire comm cord issue and resolution myself.

As I hit the ground, I momentarily froze and looked up at the fire. Then I spun and began running. My electronic warfare officer later told me that he knew it was bad when he saw me freeze. The rest of the crew quickly followed, and we were all having our own foot race down the taxiway.

As we all stood together huffing and puffing, watching the fire being extinguished, we were in the perfect position to watch a B-1 land directly in front of us (we were headed home, and the B-1s were replacing us). It was after dark as I watched him on final approach. I remember seeing wing-tip lights, white lights where the wings sweep but definitely noticed no landing lights. (On the tower radio recording, it actually has them calling the tower "Slip 57, with the gear.")

My brain was running a little slow after the adrenaline of the emergency egress we had just completed, so I began to analyze what I was seeing—no lights mean no gear, which means. . . oh, crap. The B-1 flew a very stable approach, and a beautiful flare, right up until his burner cans started dragging the ground. The aircraft suddenly made a hard pitch over and slammed the rest of its body onto

the ground. All of us standing there on the parallel watching this happen directly in front of us said “shit” simultaneously.

I fully expected the aircraft to explode, so my first thought was to get down. Unfortunately, there was nothing to get behind, and I knew that being inside the fireball, it would do no good, so I decided that if this was going to be my last sight, I was going to enjoy it instead of cowering. Luckily, it did not explode and instead began to travel more than a mile down the runway on its belly. I watched a spiraling red-orange flame follow the jet as it slid. After a second, I realized that I'd probably live, but the B-1 guys were probably dead, so I just kept watching.

After it came to a stop, we all yelled, “get out guys!” Right then, a Maintenance bread truck roared up, threw open their door, and the driver yelled, “get in!” We all piled in on top of each other, and the driver peeled out as the seven or eight of us began to try to untangle ourselves. While we were driving away, the B-1 crew was trying to egress. They later claimed that they didn't realize they were gear up until they tried to drop the entry hatch, it fell about 6 inches and stopped—uh-oh. The weapons systems officers in the back then popped one of their top hatches to egress. There is a warning in most aircraft tech orders regarding the escape rope: “ensure that the rope is fully extended before use.” The weapons systems officer on this jet evidently forgot, so he just grabbed the end of the rope and jumped. Thankfully, he was the ONLY person hurt during either accident. He didn't slow down until he hit the pavement, hurting his back substantially but in doing so extended the rope for the rest of the crew.

**Major Kyle “HoBBS” Holt, USAFR,
navigator and instructor radar navigator, BUFF: 2003–present**

Longevity. In 1975, while talking with the crews on alert, a vice wing commander of the 28th Bomb Wing commented that the BUFFs would fly so long that he feared his grandson would fly them some day. Little did he know that he might have been talking about a GREAT grandson!

**Lieutenant Colonel Alan W. Debban, USAF, retired,
navigator and instructor radar navigator, BUFF: 1973–85**

Professionalism and dedication. In the last decade of the Cold War, B-52 crew duty tended to revolve around flying and alert duty. Depending on the unit mission and the size of the unit, crews would be assigned week-long alert tours one or two times each month. In between alert tours, flying training missions provided opportunities to practice the full strategic strike profile—takeoff, air refueling, low-level penetration and bombing (often with simulated short-range missile launch), high-altitude navigation (usually with a celestial navigation leg to simulate loss of navigation systems), simulated cruise missile launch, instrument approach, and pattern work to keep pilots proficient at landing the airplane. Training schedules alternated between alert tours to ensure crews were current and proficient at both day and night flying. Low-level routes included mountainous and nonmountainous terrain. The sorties could last more than 10 hours if the assigned low-level routes were far from the takeoff base.

Alert provided opportunities to keep current with tactical doctrine, emergency war order procedures, and simulated flight profiles for units with simulators. Alert facilities were self-contained with crew sleeping, dining, and recreational facilities. Crews could leave the facility to attend meetings, simulator training, or to visit the base exchange or other authorized facilities, provided they had a radio that could receive transmissions from the unit and Strategic Air Command command posts.

At northern bases, like the one where I spent my first tour, winter months provided the possibility of snow . . . feet of snow. During one alert tour, the snow turned into a three-day blizzard that closed the base. Not just slowed traffic . . . no traffic. Snow plows were useless—as soon as they made a pass, the snow filled in the gap as if the plow had never been there. Soon, road crews gave up and decided to wait out the storm. Nothing moved on the installation while everyone watched the snow fall.

The problem for those of us on alert that week was that we depended on the dining facility for our meals. By the third day, every drink and snack choice in the vending machines was gone—even the stuff that never sold! We had tried to open the refrigerators in the kitchen, but they were padlocked, and the facility manager did not have the key—only SSgt B, the cook, had the key to the food!

On the morning of the fourth day, several of us were gathered in the dining hall watching through the large picture window as the snow continued to fall. Someone shouted, “Hey, look at that!” Across the pristine field of snow that now made up the northern perimeter of the base was a solitary figure, arms at shoulder height, looking like a swimmer, plowing through an ocean of white. We realized it was SSgt B headed our way! Word spread quickly through the facility that we were not forgotten. As SSgt B made his way, half-frozen, into the facility, a crowd of bomber crews, tanker crews, maintainers, and security forces personnel lined down the hall to cheer him on.

Someone said, “SSgt B . . . what were you thinking? You could have frozen to death out there!” Looking through his thick, iced-over glasses, he replied, “I figured you guys were getting hungry, and I had the key to the fridge.” He had half-walked, half-swum from his home on the other side of the base—about five miles in freezing temperatures. When the Strategic Air Command inspection team came, to no one’s surprise, SSgt B was identified as a top performer—because, of course, that’s what he was.

B-52 duty in my experience was all about teamwork. The airplane was, and is, a crew airplane that requires coordination to produce mission success. Every individual on the installation was somehow tied to the mission. Our leaders made sure everyone knew how they contributed and that everyone was important to the success of the mission, right down to SSgt B, the alert chow-hall cook. We trained hard, worked hard, and celebrated unit, crew, and individual successes. We believed that deterring nuclear aggression was vital to our national security, just as it still is in today’s challenging world. The B-52 and its generations of crews, maintainers, and support personnel are symbols of the United States Air Force’s global strike capability. The professionalism and dedication shown by anyone who has been connected to the mission makes the BUFF legendary.

**Colonel Anthony C. Cain, USAF, retired,
navigator and radar navigator, BUFF 1982–93:**

Old dog, new tricks. The mighty B-52 Stratofortress soldiers on. The original Air Force leaders and Boeing engineers who designed and fielded this fine aircraft could never have envisioned this workhorse’s staying power. They probably would be equally impressed with the BUFF’s longevity and relevance as a valuable asset in America’s strategic arsenal. Time and again, the BUFF has answered the nation’s call. I am grateful I had the opportunity as a crew dog to contribute a small part to the BUFF’s already legendary history. From flying into combat after 9/11 to pushing the limits of hypersonic research and everything in between, this weapon system is not complete without her crew and maintainers. My best experiences in the BUFF will always be associated with great Airmen who demonstrated extraordinary teamwork.

During the first X-51 Waverider hypersonic launch in 2010, we took the jet to an altitude of 50,000 feet and performed a successful launch. It was the latest chapter demonstrating the BUFF’s versatile role supporting aerospace research at Edwards Air Force Base, California. It was an exciting day at the office, and it would not have happened without exceptional performances from everyone in-

volved. In retrospect, our trusty B-52 and crew once again met the challenge, provided a threshold for future BUFF modifications, and helped advance America's technological edge.

I characterize the BUFF just like Han Solo described the Millennium Falcon, "She may not look like much, but she's got it where it counts." There's no other aircraft like this built to last, and there may never be another that will even come close. The B-52 is a great enabler in more ways than one, and it brings out the best in many Airmen—past, present, and future.

**Lieutenant Colonel Sean "GW" Celi, USAF, retired,
instructor radar navigator, BUFF: 1999–2011**

Thrilled with the job. I flew as a navigator and radar navigator for seven years at both Ellsworth (77th Bomb Squadron) and Griffiss (668th Bomb Squadron) in the later 1980s. Here's a part of a letter I wrote to my parents that I discovered while cleaning out the belongings of my late father. I was 28 and thrilled with my job.

First 1988 Strategic Air Command Bomb Comp mission—June 1988

"Flew all the way out to Red Flag—11.5 hours round trip! Talk about tired! It was a good mission—we got jumped by a couple of F-15s right after we entered the route, but we dove into the mountains, and all they got were a couple of IR passes. My gunner locked 'em up twice, so we'll see how it turns out.



Figure 1. B-52 descends to low level upon entry into its training route

The bomb run was pure chaos! They set up surface-to-air missiles all along the approach to the target, and the EW had us all over the sky “avoiding” the threat. All the while, I’m trying to aim on radar and zero out our timing. My Nav was sick as a dog, so I’m flailing away doing three things at once! Evidently, things worked because the pilots said we flew right over the target, and we released within a second of our assigned time.

The wing commander met our plane when we finally landed and wanted to know how we did. Who knows?—We’re flying 370 kts at 500 feet . . . it’s hard to judge if you put it on target or not. So, I lied and said it was a “Shack.” Made him feel good. Oh well, one more to go.”



Maintenance representatives, Sgt. Wayne T. Smith, 416th Munitions Maintenance Squadron, Sgt. William B. Pendergast, 416th Avionics Maintenance Squadron, SrA. Paul A. Towers, 416th Organizational Maintenance Squadron and TSgt. Joseph B. Kneece, 416th Field Maintenance Squadron. Second row, 668th Bomb Squadron members, Capt. Steve B. Thomas, Capt. John J. O'Brien, Capt. Bryan M. Branby, 1st Lt. David J. Re, SSgt. Earl E. Babcock. Third row, 1st Lt. David W. Brown, Capt. Kenneth L. Swab, Capt. Bernard T. O'Rourke, 1st Lt. Vincent C. Abel and TSgt. Ricky L. Hollins, not pictured—Maj. James A. Blackwood, 1st Lt. Shawn E. McManigell.

Figure 2. Photo of maintainers and flight crew during the late 1980s

Lieutenant Colonel Bryan Branby, USAF, retired,
navigator and radar navigator, BUFF: 1983-90

Notes

1. Tara Copp, "B-52 Engine Replacement Could Keep Bomber Flying through Its 100th Birthday," *Defense One*, June 30, 2021, <https://www.defenseone.com/>.
2. "B-52 Stratofortress, Historical Snapshot," Boeing (website) n.d., <https://www.boeing.com/>.
3. Bill Yenne, *B-52 Stratofortress: The Complete History of the World's Longest Serving and Best Known Bomber* (Minneapolis: Zenith, 2012), 45.
4. "Historical Snapshot," Boeing.
5. David Axe, "To Stop a Chinese Invasion, B-52s Could Drop Mines in the Taiwan Straits," *National Interest* (blog) July 4, 2021, <https://nationalinterest.org/>.
6. Yenne, *Stratofortress*, 86.
7. Don Branum, "Records Detail MiG Kill by 'Diamond Lil' Tail Gunner," US Air Force Academy Public Affairs, December 24, 2010, <https://www.usafa.af.mil/>.
8. Yenne, *Stratofortress*, 91–99.
9. Yenne, *Stratofortress*, 87, 130; and Robert A. Pape, *Bombing to Win: Air Power and Coercion in War* (Ithaca, NY: Cornell University Press, 1996), 201, 247.
10. Yenne, *Stratofortress*, 126–27.
11. Yenne, *Stratofortress*, 69–78.
12. "Historical Snapshot," Boeing.
13. Michael R. Gordon, "For Wars of the Future, Pentagon Looks to Distant Past: The B-52," *Wall Street Journal*, January 25, 2021, <https://www.wsj.com/>.

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