B-2 at 30: Improving with Age

Primary Function
The Air Force’s B-2 Spirit is the only stealth bomber in the world, an unprecedented combination of long-range, heavy payload, and stealth on a single platform.

Aircraft Design
Its low observable flying wing design combines stealth with aerodynamic efficiency, and includes two spacious weapons bays capable of carrying 60,000 lbs.

First Flight
July 17, 1989. This star logo featuring the B-2 silhouettes was used at the plane’s rollout in 1989.

Radar Cross Section
The radar cross section (RCS) is a key measure of strength. A target’s RCS depends on its physical shape, materials, antennae, and other sensors. Onboard sensors can play as much of a role in determining RCS as materials and design.

Operator
APFSC, APMC, ANG (associate)

Prime Contractor
Northrop Grumman

Number Built
21

Inventory
20

Delivered

I/OC
April 1997 Whiteman AFB, Mo.

Active Variant
B-2A.

Aircraft Location
Edwards AFB, Calif; Whiteman AFB, Mo.

Performance

- Maximum speed Mach 0.8
  (550 knots, 630 mph, 1,000 kilometers per hour) at 40,000 feet altitude

- Cruise speed Mach 0.77
  (487 knots, 560 mph, 950 km/h) at 40,000 feet altitude

- Maneuvering
  Four pairs of control surfaces.
  One split drag rudder on each outer wing
  One elevator on each inner wing

- Ceiling
  50,000 ft.

- Range
  6,000 nautical miles (10,000 feet, 15,200 meters)

- Weight
  Max takeoff Weight 336,500 lb.
  Ceiling Weight 319,000 lb.
  Empty Weight 129,000 lb.

- Equipment
  • AN/APG-77 Radar
  • AN/ALQ-213 Electronic Warfare System
  • AN/AQY-8 AN/ASQ-237 Radar, LPI
  • AN/ASQ-175 Fire Control System
  • AN/ASQ-181 Quick-Response Weapon System

- Engines
  General Electric F118-GE-100 turbofans, each 13,300 lb. thrust

- Internal Armament
  • GBU-32 Joint Direct Attack Munition (JDAM)
  • GBU-31 Joint Direct Attack Munition (JDAM)
  • GBU-38 Joint Direct Attack Munition (JDAM)
  • GBU-57 Mass Production Ordnance (MPO)
  • AGM-158 Joint Air-to-Surface Standoff Missile (JASSM)

- Ongoing Upgrades Include:
  • Defensive Management System Modernization (DMSM) to improve survivability in contested environments, primarily by locating and identifying enemy radars.
  • Adaptable Communications Suite (ACS) providing beyond-line-of-sight communications to enable time-sensitive mission updates and in-flight re-tasking.
  • Low-Observeable Signature and Supportability Modifications (LOSSM) to improve the B-2’s stealth signature and reduce the amount of maintenance its stealth materials require.
  • Radar-Aided Targeting System (RATS) that uses the B-2’s radar to provide precision weapon targeting in GPS-denied environments.
  • JASSM-ER integration to enable B-2s to carry 16 of the extended-range variant of the AGM-158 Joint Air-to-Surface Standoff Missile (JASSM).

Upgrades
The original B-2s have benefited from significant enhancements since the planes were first introduced. All aircraft today meet the Block 30 standard, featuring AESA radars and Link 16.

- 1990: First Flight
- 1995: Adds GPS-Aided Targeting (GATS) and GPS-Aided Munitions (GAMS)
- 1998: Gains ability to use IDAM
- 1999: Adds Generic Weapons Interface System (GWIS) - can now carry four different weapon types on the rotary launcher (RLA)
- 2000: Adds External Phantom Saturator (EPS) to enable B-2s to fire Round of Cannon (ROC) ammunition
- 2001: ADDS Enhanced Global Positioning System (EGPS)
- 2004: Applies to use GPS
- 2006: Gains ability to use GBU-57 Massive Ordnance Penetrator (MOP)
- 2012: Adds fiber-optic, high-bandwidth data busses; improved threat identification; improved response times; improved geolocation accuracy
- 2018/2019 (Plana): Continue development of Low-Observeable Signature and Supportability Modifications; expand development efforts for advanced LO materials, structures, and procedures including Advanced Signature Reduction; Next-Generation Zonal Radar; upgrade to the Tier One Material Inspection System (TOMIS)

Potential future upgrades could include:
- Ability to carry both smart bomb rack and rotary launcher to maximize loadout flexibility
- Airspeed and altitude hold autopilot functionality to reduce crew fatigue
- Integration of hypersonic weapons on a more survivable launch platform
- Integration of anti-ship weapons such as the Long-Range Anti-Ship Missile, something the influential think tank CSBA has called for as a means of countering the Chinese Navy.
Operation Allied Force (1999)
- First sustained bombing campaign launched from continental United States.
- Two B-2s flew more than 31 hours from Whiteman AFB, Mo., to attack multiple targets in Kosovo.
- Though flying less than 1 percent of total missions, B-2s destroyed 33 percent of all targets in conflict’s first eight weeks.

Operation Enduring Freedom (2001)
- Longest flight —44 hours, October 7-8, 2001—longest air combat mission in history.
- Spirit of America and five other B-2s were first to enter Afghan airspace following the 9/11 attacks on New York and Washington, D.C.
- After dropping ordnance, the planes made a 45-minute pit stop with engines still running for crew and service change, then flew home 30+ hours to Missouri. Total flight time, including the pit stop, was about 75 consecutive hours.

- 6 B-2s struck critical regime infrastructure on night 1 (3 from Whiteman AFB, 3 from Diego Garcia).
- B-2s dropped 1.5 million pounds of ordnance on 600 targets in 49 sorties over 10 days.
- B-2s achieved 85 percent mission capable rate (higher than B-1 or B-52).

Operation Odyssey Dawn (2011)
- 3 B-2s launch from Whiteman AFB; one turns back, but two strike and destroy 45 hardened aircraft shelters near Sirte, Qaddafi’s hometown.
- Flew overwater route via Mediterranean, eliminating need for overflight/diplomatic permissions.
- Total mission is 25 hours, with two refuelings in each direction.

Operation Odyssey Lightning (2016)
- 2 B-2s launch from Whiteman AFB and drop 108 500-lb GBU-28 JDAMs on ISIS mobile targets in Libya.
- 34-hour mission is supported by 15 KC-135 and KC-10 tankers.

Armaments

**Nuclear**
- 16 B61-7, B61-12
- 16 B83
- 8 B61-11 bombs (on rotary launchers)

**Conventional**
- 80 Mk 62 500-lb sea mines
- 80 Mk 82 500-lb bombs
- 80 GBU-38 JDAMs
- 16 GBU-31 JDAMs
- 16 Mk 84 (2,000-lb) bombs
- 16 AGM-154 JSOWs
- 16 AGM-158 JASSMs
- 8 GBU-28 LGBs
- 2 GBU-57 Massive Ordnance Penetrators

Accidents

2008: Spirit of Kansas crashes shortly after takeoff at Andersen AFB, Guam. Both pilots eject safely, before the aircraft is destroyed. Investigators later blame moisture from heavy rains for maintenance crews improperly calibrating air-data sensors.

2010: Spirit of Washington suffers a catastrophic engine fire in Guam, severely damaging the aircraft and all four engines. With only 20 B-2 aircraft in the inventory, however, the Air Force returns the jet to service four years later.

B-2 is the only aircraft that can deliver these weapons.