= Rockwell B @-@ 1 Lancer =

The Rockwell B @-@ 1 Lancer is a four @-@ engine supersonic variable @-@ sweep wing , jet @-@ powered heavy strategic bomber used by the United States Air Force (USAF) . It was first envisioned in the 1960s as a supersonic bomber with Mach 2 speed , and sufficient range and payload to replace the Boeing B @-@ 52 Stratofortress . It was developed into the B @-@ 1B , primarily a low @-@ level penetrator with long range and Mach 1 @.@ 25 speed capability at high altitude . It is commonly called the " Bone " (originally from " B @-@ One ") .

Designed by Rockwell International (now part of Boeing) , development was delayed multiple times over its history due to changes in the perceived need for manned bombers . The initial B @-@ 1A version was developed in the early 1970s , but its production was canceled , and only four prototypes were built . The need for a new platform once again surfaced in the early 1980s , and the aircraft resurfaced as the B @-@ 1B version with the focus on low @-@ level penetration bombing . However , by this point , development of stealth technology was promising an aircraft of dramatically improved capability . Production went ahead as the B version would be operational before the " Advanced Technology Bomber " (which became the B @-@ 2 Spirit) , during a period when the B @-@ 52 would be increasingly vulnerable . The B @-@ 1B entered service in 1986 with the USAF Strategic Air Command (SAC) as a nuclear bomber .

In the early 1990s , following the Gulf War and concurrent with the disestablishment of SAC and its reassignment to the newly formed Air Combat Command (ACC) , the B @-@ 1B was converted to conventional bombing use . It first served in combat during Operation Desert Fox in 1998 and again during the NATO action in Kosovo the following year . The B @-@ 1B has supported U.S. and NATO military forces in Afghanistan and Iraq . The B @-@ 1B is expected to continue to serve into the 2030s , with the Long Range Strike Bomber to start supplementing the B @-@ 1B in 2030 .

= = Development = =

= = = Background = = =

In 1955 the U.S. Air Force issued requirements for a new bomber combining the payload and range of the Boeing B @-@ 52 Stratofortress with the Mach 2 maximum speed of the Convair B @-@ 58 Hustler . In December 1957 , the U.S. Air Force selected North American Aviation 's proposal to replace the B @-@ 52 with the B @-@ 70 Valkyrie . The Valkyrie was a six @-@ engine bomber that could reach Mach 3 speeds at high altitude (70 @,@ 000 ft or 21 @,@ 000 m) to avoid interceptor aircraft , the only effective anti @-@ bomber weapon in the 1950s . Soviet aircraft were already unable to intercept the high @-@ flying Lockheed U @-@ 2 ; the Valkyrie would fly at similar altitudes but much higher speeds . In combat , the B @-@ 70 was expected to simply fly right by the defenders .

By the late 1950s , however , anti @-@ aircraft surface @-@ to @-@ air missiles (SAMs) could threaten high @-@ altitude aircraft , as demonstrated by the 1960 downing of Gary Powers 's U @-@ 2 . The USAF Strategic Air Command (SAC) were aware of these developments and had begun moving its bombers to low @-@ level penetration even before the U @-@ 2 downing . This tactic greatly reduces radar detection distances by use of terrain masking ; using features of the terrain like hills and valleys , the line @-@ of @-@ sight from the radar to the bomber can be broken , rendering the radar (and human observers) incapable of seeing the target . Even at somewhat higher altitudes , radar systems of the era were subject to " clutter " from stray returns from the ground and other objects , requiring a minimum angle above the ground to be effective . Bombers flying at low altitudes could remain under these angles simply by keeping their distance from the radar sites . This combination of effects made SAMs of the era ineffective against low @-@ flying aircraft . The same effects also meant that low flying aircraft were difficult to detect by higher flying interceptor aircraft , since their radar systems could not readily pick out opposing aircraft against the clutter from ground reflections (lack of look @-@ down / shoot @-@ down capability) .

The switch from high @-@ altitude to low @-@ altitude flight profiles severely affected the B @-@ 70 , whose design was highly tuned to provide the desired high @-@ altitude performance . Planners outlined a series of low @-@ level profiles for the B @-@ 70 , but higher aerodynamic drag at low level limited the B @-@ 70 to subsonic speed while dramatically decreasing its range . The result would be an aircraft with somewhat higher subsonic speed , but less range than the B @-@ 52 it was meant to replace . Unsuited for the new low @-@ altitude role , and because of a growing shift to the intercontinental ballistic missile (ICBM) force , the B @-@ 70 bomber program was canceled in 1961 by President John F. Kennedy , and the two XB @-@ 70 prototypes were used in a supersonic research program .

Although never intended for the low @-@ level role , the B @-@ 52 's flexibility allowed it to outlast its intended successor as the nature of the air war environment changed . The B @-@ 52 's huge fuel load allowed it to operate at lower altitudes for longer times , and the large airframe allowed the addition of improved radar jamming and deception suites to deal with radars . During the Vietnam War the concept that all future wars would be nuclear was turned on its head , and the " big belly " modifications increased the B @-@ 52 's total bomb load to 60 @,@ 000 pounds (27 @,@ 000 kg) , turning it into a powerful tactical aircraft which could be used against ground troops along with strategic targets from high altitudes . The much smaller bomb bay of the B @-@ 70 would have made it much less useful in this role .

= = = Design studies and delays = = =

Although effective , the B @-@ 52 was not ideal for the low @-@ level role . This led to a number of aircraft designs known as penetrators , which were tuned specifically for long @-@ range low @-@ altitude flight . The first of these designs to see operation was the supersonic F @-@ 111 fighter @-@ bomber , which used variable @-@ sweep wings for tactical missions . Similar aircraft also emerged for other users as well , notably the BAC TSR @-@ 2 , and later , Panavia Tornado and Sukhoi Su @-@ 24 . A number of studies on a strategic @-@ range counterpart followed .

The first post @-@ B @-@ 70 strategic penetrator study was known as the Subsonic Low Altitude Bomber (SLAB) , which was completed in 1961 . This produced a design that looked more like an airliner than a bomber , with a large swept wing , T @-@ tail and large high @-@ bypass engines . This was followed by the similar Extended Range Strike Aircraft (ERSA) , which added a variable @-@ sweep wing , then in vogue in the aviation industry . ERSA envisioned a relatively small aircraft with a 10 @,@ 000 pounds (4 @,@ 500 kg) payload and a range of 8 @,@ 750 nautical miles (16 @,@ 200 kilometres) , with 2 @,@ 500 nmi (4 @,@ 600 km) being flown at low altitudes . In August 1963 the similar Low @-@ Altitude Manned Penetrator (LAMP) design was completed , which called for an aircraft with a 20 @,@ 000 pounds (9 @,@ 100 kg) bomb load and somewhat shorter range of 7 @,@ 150 nmi (13 @,@ 240 km) .

These all culminated in the October 1963 Advanced Manned Precision Strike System (AMPSS) , which led to industry studies at Boeing , General Dynamics , and North American . In mid @-@ 1964 , the USAF had revised its requirements and retitled the project as Advanced Manned Strategic Aircraft (AMSA) , which differed from AMPSS primarily in that it also demanded a high @-@ speed high @-@ altitude capability , similar to that of the existing Mach 2 class Convair B @-@ 58 Hustler . Given the lengthy series of design studies , Rockwell engineers joked that the new name actually stood for " America 's Most Studied Aircraft " .

The arguments that led to the cancellation of the B @-@ 70 program had led some to question the need for a new strategic bomber of any sort . The U.S. Air Force was adamant about retaining bombers as part of the nuclear triad concept that included bombers , ICBMs , and submarine @-@ launched ballistic missiles (SLBMs) in a combined package that complicated any potential defense . They argued that the bomber was needed to attack hardened military targets and to provide a safe counterforce option because the bombers could be quickly launched into safe loitering areas where they could not be attacked . However , the introduction of the SLBM mooted the mobility and survivability argument , and a newer generation of ICBMs , such as the Minuteman III , had the accuracy and speed needed to attack point targets . During this time , ICBMs were seen as a less

costly option based on their lower unit cost , but development costs were much higher . Secretary of Defense Robert McNamara preferred ICBMs over bombers for the Air Force portion of the deterrent force and felt a new expensive bomber was not needed . McNamara limited the AMSA program to studies and component development beginning in 1964 .

Program studies continued ; IBM and Autonetics were awarded AMSA advanced avionics study contracts in 1968 . McNamara remained opposed to the program in favor of upgrading the existing B @-@ 52 fleet and adding nearly 300 FB @-@ 111s for shorter range roles then being filled by the B @-@ 58 . He again vetoed funding for AMSA aircraft development in 1968 .

= = = B @-@ 1A program = = =

President Richard Nixon reestablished the AMSA program after taking office , keeping with his administration 's flexible response strategy that required a broad range of options short of general nuclear war . Nixon 's Secretary of Defense , Melvin Laird , reviewed the programs and decided to lower the numbers of FB @-@ 111s , since they lacked the desired range , and recommended that the AMSA design studies be accelerated . In April 1969 , the program officially became the B @-@ 1A . This was the first entry in the new bomber designation series , first created in 1962 . The Air Force issued a request for proposals in November 1969 .

Proposals were submitted by Boeing , General Dynamics and North American Rockwell in January 1970 . In June 1970 , North American Rockwell 's design was selected and was awarded a development contract . The original program called for two test airframes , five flyable aircraft , and 40 engines . This was cut in 1971 to one ground and three flight test aircraft . The company changed its name to Rockwell International and named its aircraft division North American Aircraft Operations in 1973 . A fourth prototype , built to production standards , was ordered in the fiscal year 1976 budget . Plans called for 240 B @-@ 1As to be built , with initial operational capability set for 1979 .

Rockwell 's design featured a number of features common to 1960s U.S. designs . Among these was the use of a " crew capsule " that ejected as a unit during emergencies , which was introduced to improve survivability in the case of an ejection at high speed . Additionally , the design featured large variable @-@ sweep wings in order to provide both high lift during takeoff and landing , and low drag during a high @-@ speed dash phase . With the wings set to their widest position the aircraft had considerably better lift and power than the B @-@ 52 , allowing it to operate from a much wider variety of bases . Penetration of the Soviet Union 's defenses would take place at supersonic speed , crossing them as quickly as possible before entering into the less defended " heartland " where speeds could be reduced again . The large size and fuel capacity of the design would allow the " dash " portion of the flight to be relatively long .

In order to achieve the required Mach 2 performance at high altitudes , the exhaust nozzles and air intake ramps were variable . Initially , it had been expected that a Mach 1 @.@ 2 performance could be achieved at low altitude , which required that titanium be used in critical areas in the fuselage and wing structure . The low altitude performance requirement was later lowered to Mach 0 @.@ 85 , reducing the amount of titanium and therefore cost . A pair of small vanes mounted near the nose are part of an active vibration damping system that smooths out the otherwise bumpy low @-@ altitude ride . The first three B @-@ 1As featured an escape capsule that ejected the cockpit with all four crew members inside . The fourth B @-@ 1A was equipped with a conventional ejection seat for each crew member .

The B @-@ 1A mockup review occurred in late October 1971 . The first B @-@ 1A prototype (Air Force serial no . 74 @-@ 0158) flew on 23 December 1974 . Three more B @-@ 1A prototypes followed . As the program continued the per @-@ unit cost continued to rise in part because of high inflation during that period . In 1970 , the estimated unit cost was $ 40 million , and by 1975 , this figure had climbed to $ 70 million .

= = = New problems and cancellation = = =

In 1976 , Soviet pilot Viktor Belenko defected to Japan with his MiG @-@ 25 " Foxbat " . During debriefing he described a new " super @-@ Foxbat " (almost certainly referring to the MiG @-@ 31) that had look @-@ down / shoot @-@ down radar in order to attack cruise missiles . This would also make any low @-@ level penetration aircraft " visible " and easy to attack . Given that the B @-@ 1 's armament suite was similar to the B @-@ 52 , and it now appeared no more likely to survive Soviet airspace than the B @-@ 52 , the program was increasingly questioned . In particular , Senator William Proxmire continually derided it in public , arguing it was an outlandishly expensive dinosaur . During the 1976 federal election campaign , Jimmy Carter made it one of the Democratic Party 's platforms , saying " The B @-@ 1 bomber is an example of a proposed system which should not be funded and would be wasteful of taxpayers ' dollars . "

When Carter took office in 1977 he ordered a review of the entire program . By this point the projected cost of the program had risen to over $ 100 million per aircraft , although this was lifetime cost over 20 years . He was informed of the relatively new work on stealth aircraft that had started in 1975 , and he decided that this was a better avenue of approach than the B @-@ 1 . Pentagon officials also stated that the AGM @-@ 86 Air Launched Cruise Missile (ALCM) launched from the existing B @-@ 52 fleet would give the USAF equal capability of penetrating Soviet airspace . With a range of 1 @,@ 500 miles (2 @,@ 400 km) , the ALCM could be launched well outside the range of any Soviet defenses and penetrate at low altitude just like a bomber (and much lower radar cross @-@ section due to size) , but in much greater numbers at a lower cost . A small number of B @-@ 52s could launch hundreds of ALCMs , saturating the defense . A program to improve the B @-@ 52 and develop and deploy the ALCM would cost perhaps 20 % of the price to deploy the planned 244 B @-@ 1As .

On 30 June 1977 , Carter announced that the B @-@ 1A would be canceled in favor of ICBMs , SLBMs , and a fleet of modernized B @-@ 52s armed with ALCMs . Carter called it " one of the most difficult decisions that I 've made since I 've been in office . " No mention of the stealth work was made public with the program being top secret , but today it is known that in early 1978 he authorized the Advanced Technology Bomber (ATB) project , which eventually led to the B @-@ 2 Spirit .

Domestically , the reaction to the cancellation was split along partisan lines . The Department of Defense was surprised by the announcement ; internal expectations were that the number of B @-@ 1s ordered would be reduced to around 150 . Congressman Robert Dornan (R @-@ CA) claimed , " They 're breaking out the vodka and caviar in Moscow . " In contrast , it appears the Soviets were more concerned by large numbers of ALCMs representing a much greater threat than a smaller number of B @-@ 1s . Soviet news agency TASS commented that " the implementation of these militaristic plans has seriously complicated efforts for the limitation of the strategic arms race . " Western military leaders were generally happy with the decision . NATO commander Alexander Haig described the ALCM as an " attractive alternative " to the B @-@ 1 . French General Georges Buis stated " The B @-@ 1 is a formidable weapon , but not terribly useful . For the price of one bomber , you can have 200 cruise missiles . "

Flight tests of the four B @-@ 1A prototypes for the B @-@ 1A program continued through April 1981 . The program included 70 flights totaling 378 hours . A top speed of Mach 2 @.@ 22 was reached by the second B @-@ 1A . Engine testing also continued during this time with the YF101 engines totaling almost 7 @,@ 600 hours .

= = = Shifting priorities = = =

It was during this period that the Soviets started to assert themselves in several new theaters of action , in particular through Cuba during the Angolan Civil War starting in 1975 and the Soviet invasion of Afghanistan in 1979 . U.S. strategy to this point had been focused on containing Communism and preparation for war in Europe . The new Soviet actions revealed that the military lacked capability outside these narrow confines .

The U.S. Department of Defense responded by accelerating its Rapid Deployment Forces concept but suffered from major problems with airlift and sealift capability . In order to slow an enemy

invasion of other countries , air power was critical ; however the key Iran @-@ Afghanistan border was outside the range of the U.S. Navy 's carrier @-@ based attack aircraft , leaving this role to the U.S. Air Force . Although the B @-@ 52 had the range to support on @-@ demand global missions , its long runway requirements limited the forward basing possibilities .

During the 1980 presidential campaign , Ronald Reagan campaigned heavily on the platform that Carter was weak on defense , citing the cancellation of the B @-@ 1 program as an example , a theme he continued using into the 1980s . During this time Carter 's defense secretary , Harold Brown , announced the stealth bomber project , apparently implying that this was the reason for the B @-@ 1 cancellation .

= = = B @-@ 1B program = = =

On taking office , Reagan was faced with the same decision as Carter before : whether to continue with the B @-@ 1 for the short term , or to wait for the development of the ATB , a much more advanced aircraft . Studies suggested that the existing B @-@ 52 fleet with ALCM would remain a credible threat until 1985 , as it was predicted that 75 % of the B @-@ 52 force would survive to attack its targets . After this , the introduction of the SA @-@ 10 missile , the MiG @-@ 31 interceptor and the first Soviet Airborne Early Warning and Control (AWACS) systems would make the B @-@ 52 increasingly vulnerable . During 1981 , funds were allocated to a new study for a bomber for the 1990s time @-@ frame . This led to the Long @-@ Range Combat Aircraft (LRCA) project . The LRCA evaluated the B @-@ 1 , F @-@ 111 and ATB as possible solutions ; an emphasis was placed on multi @-@ role capabilities , as opposed to purely strategic operations .

In 1981 , it was believed the B @-@ 1 could be in operation before the ATB , covering the transitional period between the B @-@ 52 's increasing vulnerability and the ATB 's introduction . Reagan decided the best solution was to procure both the B @-@ 1 and ATB , and on 2 October 1981 Reagan announced that 100 B @-@ 1s were to be ordered to fill the LRCA role .

In January 1982 the U.S. Air Force awarded two contracts to Rockwell worth a combined $ 2 @.@ 2 billion for the development and production of 100 new B @-@ 1 bombers . Numerous changes were made to the design to make it better suited to the now expected missions , resulting in the new B @-@ 1B . These changes included a reduction in maximum speed , which allowed the variable @-@ aspect intake ramps to be replaced by simpler fixed geometry intake ramps in the newer design . This reduced the B version 's radar signature ; the reduction in radar cross @-@ section was seen as a good trade off for the speed decrease . High subsonic speeds at low altitude became a focus area for the revised design , and low @-@ level speeds were increased from about Mach 0 @.@ 85 to 0 @.@ 92 . The B @-@ 1B has a maximum speed of Mach 1 @.@ 25 at higher altitudes .

The B @-@ 1B 's maximum takeoff weight was increased to 477 @,@ 000 pounds (216 @,@ 000 kg) from the B @-@ 1A 's 395 @,@ 000 pounds (179 @,@ 000 kg) . The weight increase was to allow for takeoff with a full internal fuel load and for external weapons to be carried . Rockwell engineers were able to reinforce critical areas and lighten non @-@ critical areas of the airframe , so the increase in empty weight was minimal . In order to deal with the introduction of the MiG @-@ 31 equipped with the new Zaslon radar system , and other aircraft with look @-@ down capability (which reduced the B @-@ 1s low @-@ flying advantage) , the B @-@ 1B 's electronic warfare suite was significantly upgraded .

Opposition to the plan was widespread within Congress . Critics pointed out that many of the original problems remained in both areas of performance and expense . In particular it seemed the B @-@ 52 fitted with electronics similar to the B @-@ 1B would be equally able to avoid interception , as the speed advantage of the B @-@ 1 was now minimal . It also appeared that the " interim " time frame served by the B @-@ 1B would be less than a decade , being rendered obsolete shortly after the introduction of a much more capable ATB design . The primary argument in favor of the B @-@ 1 was its large conventional weapon payload , and that its takeoff performance allowed it to operate with a credible bombload from a much wider variety of airfields . The USAF spread production subcontracts across many congressional districts , making the aircraft more popular on Capitol Hill .

B @-@ 1A # 1 was disassembled and used for radar testing at the Rome Air Development Center at the former Griffiss Air Force Base , New York . B @-@ 1As # 2 and # 4 were modified to include B @-@ 1B systems . The first B @-@ 1B was completed and began flight testing in March 1983 . The first production B @-@ 1B was rolled out on 4 September 1984 and first flew on 18 October 1984 . The 100th and final B @-@ 1B was delivered on 2 May 1988 ; before the last B @-@ 1B was delivered , the USAF had determined that the aircraft was vulnerable to Soviet air defenses .

= = Design = =

= = = Overview = = =

The B @-@ 1 has a blended wing body configuration , with variable @-@ sweep wing , four turbofan engines , triangular fin control surfaces and cruciform tail . The wings can sweep from 15 degrees to 67 @.@ 5 degrees (full forward to full sweep) . Forward @-@ swept wing settings are used for takeoff , landings and high @-@ altitude maximum cruise . Aft @-@ swept wing settings are used in high subsonic and supersonic flight . The B @-@ 1 's variable @-@ sweep wings and thrust @-@ to @-@ weight ratio provide it with better takeoff performance , allowing it to use more runways than previous bombers . The length of the aircraft presented a flexing problem due to air turbulence at low altitude . To alleviate this , Rockwell included small triangular fin control surfaces or vanes near the nose on the B @-@ 1 . The B @-@ 1 's Structural Mode Control System rotates the vanes automatically to counteract turbulence and smooth out the ride .

Unlike the B @-@ 1A , the B @-@ 1B cannot reach Mach 2 + speeds ; its maximum speed is Mach 1 @.@ 25 (about 950 mph or 1 @,@ 530 km / h at altitude) , but its low @-@ level speed increased to Mach 0 @.@ 92 (700 mph , 1 @,@ 130 km / h) . The speed of the current version of the aircraft is limited by the need to avoid damage to its structure and air intakes . To help lower its radar cross section (RCS) , the B @-@ 1B uses serpentine air intake ducts (see S @-@ duct) and fixed intake ramps , which limit its speed compared to the B @-@ 1A . Vanes in the intake ducts serve to deflect and shield radar emissions from the highly reflective engine compressor blades .

The B @-@ 1A 's engine was modified slightly to produce the GE F101 @-@ 102 for the B @-@ 1B , with an emphasis on durability , and increased efficiency . The core of this engine has since been re @-@ used in several other engine designs , including the GE F110 which has seen use in the F @-@ 14 Tomcat , F @-@ 15K / SG variants and most recent versions of the General Dynamics F @-@ 16 Fighting Falcon . It is also the basis for the non @-@ afterburning GE F118 used in the B @-@ 2 Spirit and the U @-@ 2S . The F101 engine was the basis for the core of the extremely popular CFM56 civil engine , which can be found on some versions of practically every small @-@ to @-@ medium @-@ sized airliner . The nose gear cover door has controls for the auxiliary power units (APUs) , which allow for quick starts of the APUs upon order to scramble .

= = = Avionics = = =

The B @-@ 1 's main computer is the IBM AP @-@ 101 , which is also used on the Space Shuttle orbiter and the B @-@ 52 bomber . The computer is programmed with the JOVIAL programming language . The Lancer 's offensive avionics include the Westinghouse (now Northrop Grumman) AN / APQ @-@ 164 forward @-@ looking offensive passive electronically scanned array radar set with electronic beam steering (and a fixed antenna pointed downward for reduced radar observability) , synthetic aperture radar , ground moving target indication (GMTI) , and terrain @-@ following radar modes , Doppler navigation , radar altimeter , and an inertial navigation suite . The B @-@ 1B Block D upgrade added a Global Positioning System (GPS) receiver beginning in 1995 .

The B @-@ 1 's defensive electronics include the Eaton AN / ALQ @-@ 161A radar warning and defensive jamming equipment , which has three sets of antennas ; one at the front base of each wing and the third rear @-@ facing in the tail radome . Also in the tail radome is the AN / ALQ @-@

153 Missile Approach Warning (Pulse @-@ Doppler radar) . The ALQ @-@ 161 is linked to a total of eight AN / ALE @-@ 49 flare dispensers located on top behind the canopy , which are handled by the AN / ASQ @-@ 184 avionics management system . Each AN / ALE @-@ 49 dispenser has a capacity of 12 MJU @-@ 23A / B flares . The MJU @-@ 23A / B flare is one of the world 's largest infrared countermeasure flares at a weight of over 3 @.@ 3 pounds (1 @.@ 5 kg) . The B @-@ 1 has also been equipped to carry the ALE @-@ 50 Towed Decoy System .

Also aiding the B @-@ 1 's survivability is its relatively low radar cross @-@ section (RCS) . Although not technically a stealth aircraft in a comprehensive sense , thanks to the aircraft 's structure , serpentine intake paths and use of radar @-@ absorbent material its RCS is about 1 / 50th of the similar sized B @-@ 52 's RCS ; this is about 26 ft ² or 2 @.@ 4 m ² , roughly equivalent to the RCS of a small fighter aircraft .

= = = Upgrades = = =

The B @-@ 1 has been upgraded since production , beginning with the " Conventional Mission Upgrade Program " (CMUP) , which added a new MIL @-@ STD @-@ 1760 smart @-@ weapons interface to enable the use of precision @-@ guided conventional weapons . CMUP began with Block A , which was the standard B @-@ 1B with the capability to deliver non @-@ precision gravity bombs . Block B brought an improved Synthetic Aperture Radar , and upgrades to the Defensive Countermeasures System and was fielded in 1995 . Block C provided an " enhanced capability " for delivery of up to 30 cluster bomb units (CBUs) per sortie with modifications made to 50 bomb racks .

Block D added a " Near Precision Capability " via improved weapons and targeting systems , and added advanced secure communications capabilities . The first part of the electronic countermeasures upgrade added Joint Direct Attack Munition (JDAM) , ALE @-@ 50 Towed Decoy System , and anti @-@ jam radios . Block E upgraded the avionics computers and incorporated the Wind Corrected Munitions Dispenser (WCMD) , the AGM @-@ 154 Joint Standoff Weapon (JSOW) and the AGM @-@ 158 JASSM (Joint Air to Surface Standoff Munition) , substantially improving the bomber 's capability . Upgrades were completed in September 2006 . Block F was the Defensive Systems Upgrade Program (DSUP) to improve the aircraft 's electronic countermeasures and jamming capabilities , but it was canceled in December 2002 due to cost overruns and schedule slips .

In 2005 , a program began to upgrade crew stations and integrate data linking . A B @-@ 1 equipped with the Fully Integrated Data Link (FIDL) first flew on 29 July 2009 ; the FIDL enables electronic data sharing , eliminating the need to enter information between systems by hand . In January 2013 , Boeing delivered the first Integrated Battle Station (IBS) equipped B @-@ 1 . This replaced several displays with new multi @-@ function color display units , an upgraded Central Integrated Test System , and a newer Aircraft Performance Monitoring Computer . In June 2012 , the B @-@ 1Bs are receiving Sustainment @-@ Block 16 upgrades to add Link 16 networking and digital flight instrumentation .

In 2007 , the Sniper XR targeting pod was integrated on the B @-@ 1 fleet . The pod is mounted on an external hardpoint at the aircraft 's chin near the forward bomb bay . Following accelerated testing , the Sniper pod was fielded in summer 2008 . Future precision munitions include the Small Diameter Bomb . In 2011 , the Air Force was considering upgrading the B @-@ 1s with multiple ejector racks so that they can carry three times as many smaller JDAMs than they currently can .

In February 2014 , work began on a multi @-@ year upgrade of 62 B @-@ 1Bs , scheduled to be completed by 2019 . The vertical situation display upgrade (VDSU) shall replace existing flight instruments with multifunction color displays , a second display shall aid threat evasion and targeting , and act as a back @-@ up display . Additional memory capacity is to be installed for the diagnostics database . Procurement and installation of the IBS upgrades is expected to cost $ 918 million , research and engineering costs are estimated at $ 391 million . Other additions are to replace the two spinning mass gyroscopic inertial navigation system with ring laser gyroscopic systems and a GPS antenna , replacement of the APQ @-@ 164 radar with the Scalable Agile

Beam Radar - Global Strike (SABR @-@ GS) active electronically scanned array , and a new attitude indicator .

= = Operational history = =

= = = Strategic Air Command = = =

The second B @-@ 1B , " The Star of Abilene " , was the first B @-@ 1B delivered to the USAF Strategic Air Command (SAC) in June 1985 . Initial operational capability was reached on 1 October 1986 and the B @-@ 1B was placed on nuclear alert status . The B @-@ 1 received the official name " Lancer " on 15 March 1990 . However , the bomber has been commonly called the " Bone " ; a nickname that appears to stem from an early newspaper article on the aircraft wherein its name was phonetically spelled out as " B @-@ ONE " with the hyphen inadvertently omitted .

In late 1990 , engine fires in two Lancers led to a grounding of the fleet . The cause was traced back to problems in the first @-@ stage fan , the aircraft were placed on " limited alert " ; in other words , they were grounded unless a nuclear war broke out . Following inspections and repairs they were returned to duty beginning on 6 February 1991 . By 1991 , the B @-@ 1 had a fledgling conventional capability , forty of them able to drop the 500 pounds (230 kg) Mk @-@ 82 General Purpose (GP) bomb , although mostly from low altitude . Despite being cleared for this role , the problems with the engines prevented their use in Operation Desert Storm during the Gulf War . B @-@ 1s were primarily reserved for strategic nuclear strike missions at this time , providing the role of airborne nuclear deterrent against the Soviet Union . The B @-@ 52 was more suited to the role of conventional warfare and it was used by coalition forces instead .

Originally designed strictly for nuclear war , the B @-@ 1 's development as an effective conventional bomber was delayed . The collapse of the Soviet Union had brought the B @-@ 1 's nuclear role into question , leading to President George H. W. Bush ordering a $ 3 billion conventional refit . After the inactivation of Strategic Air Command (SAC) and the establishment of the Air Combat Command (ACC) in 1992 , the B @-@ 1 developed a greater conventional weapons capability . Part of this development was the start @-@ up of the U.S. Air Force Weapons School B @-@ 1 Division . In 1994 , two additional B @-@ 1 bomb wings were also created in the Air National Guard , with former fighter wings in the Kansas Air National Guard and the Georgia Air National Guard converting to the aircraft . By the mid @-@ 1990s , the B @-@ 1 could employ GP weapons as well as various CBUs . By the end of the 1990s , with the advent of the " Block D " upgrade , the B @-@ 1 boasted a full array of guided and unguided munitions . The B @-@ 1B no longer carries nuclear weapons ; its nuclear capability was disabled by 1995 with the removal of nuclear arming and fuzing hardware .

= = = Conventional role = = =

The B @-@ 1 was first used in combat in support of operations against Iraq , during Operation Desert Fox in December 1998 , employing unguided GP weapons . B @-@ 1s have been subsequently used in Operation Allied Force (Kosovo) and , most notably , in Operation Enduring Freedom in Afghanistan and the 2003 invasion of Iraq . The B @-@ 1 's role in Operation Allied Force has been criticized as the aircraft was not used until after enemy defenses had been suppressed by aircraft like the older B @-@ 52 it was intended to replace . The B @-@ 1 has deployed an array of conventional weapons in war zones , most notably the GBU @-@ 31 , 2 @,@ 000 pounds (910 kg) Joint Direct Attack Munition (JDAM) . In the first six months of Operation Enduring Freedom , eight B @-@ 1s dropped almost 40 percent of aerial ordnance , including some 3 @,@ 900 JDAMs . JDAM munitions were heavily used by the B @-@ 1 over Iraq , notably on 7 April 2003 in an unsuccessful attempt to kill Saddam Hussein and his two sons . At the height of the Iraq War , a B @-@ 1 was permanently airborne to provide rapid precision bombardment upon important targets as intelligence identified them . During Operation Enduring Freedom , the B @-@

1 was able to raise its mission capable rate to 79 % .

The B @-@ 1 has higher survivability and speed when compared to the older B @-@ 52 , which it was intended to replace . It also holds 61 FAI world records for speed , payload , distance , and time @-@ to @-@ climb in different aircraft weight classes . In November 1983 , three B @-@ 1Bs set a long distance record for the aircraft , which demonstrated its ability to conduct extended mission lengths to strike anywhere in the world and return to base without any stops . The National Aeronautic Association recognized the B @-@ 1B for completing one of the 10 most memorable record flights for 1994 .

Of the 100 B @-@ 1Bs built , 93 remained in 2000 after losses in accidents . In June 2001 , the Pentagon sought to place one @-@ third of its then fleet into storage ; this proposal resulted in several U.S. Air National Guard officers and members of Congress lobbying against the proposal , including the drafting of an amendment to prevent such cuts . The 2001 proposal was intended to allow money to be diverted to further upgrades to the remaining B @-@ 1Bs , such as computer modernization . In 2003 , accompanied by the removal of B @-@ 1Bs from the two bomb wings in the Air National Guard , the USAF decided to retire 33 aircraft to concentrate its budget on maintaining availability of remaining B @-@ 1Bs . In 2004 , a new appropriation bill called for some of the retired aircraft to return to service , and the USAF returned seven mothballed bombers to service to increase the fleet to 67 aircraft .

On 14 July 2007 , the Associated Press reported on the growing USAF presence in Iraq , including reintroduction of B @-@ 1Bs as a close @-@ at @-@ hand platform to support Coalition ground forces . Since 2008 , B @-@ 1s have been used in Iraq and Afghanistan in an " armed overwatch " role , loitering for surveillance purposes while ready to deliver guided bombs in support of ground troops if contacted .

The B @-@ 1B underwent a series of flight tests using a 50 / 50 mix of synthetic and petroleum fuel ; on 19 March 2008 , a B @-@ 1B from Dyess Air Force Base , Texas , became the first USAF aircraft to fly at supersonic speed using a synthetic fuel during a flight over Texas and New Mexico . This was conducted as part of an ongoing Air Force testing and certification program to reduce reliance on traditional oil sources . On 4 August 2008 , a B @-@ 1B flew the first Sniper Advanced Targeting Pod equipped combat sortie where the crew successfully targeted enemy ground forces and dropped a GBU @-@ 38 guided bomb in Afghanistan .

In March 2011 , B @-@ 1Bs from Ellsworth Air Force Base attacked undisclosed targets in Libya as part of Operation Odyssey Dawn . The USAF had 66 B @-@ 1Bs in service in September 2012 , split among four squadrons organized into two Bomb Wings : the 7th Bomb Wing at Dyess AFB , Texas , and the 28th Bomb Wing at Ellsworth AFB , South Dakota .

With upgrades to keep the B @-@ 1 viable , the air force may keep it in service until approximately 2038 . Despite upgrades , the B @-@ 1 has repair and cost issues ; every flight hour needs 48 @.@ 4 hours of repair . The fuel , repairs and other needs for a 12 @-@ hour mission costs $ 720 @,@ 000 as of 2010 . The $ 63 @,@ 000 cost per flight hour is , however , less than the $ 72 @,@ 000 for the B @-@ 52 and the $ 135 @,@ 000 of the B @-@ 2 . In June 2010 , senior USAF officials met to consider retiring the entire fleet to meet budget cuts . The Pentagon plans to supplement the aircraft with the Long Range Strike Bomber beginning in 2030 . In the meantime , its " capabilities are particularly well @-@ suited to the vast distances and unique challenges of the Pacific region , and we 'll continue to invest in , and rely on , the B @-@ 1 in support of the focus on the Pacific " as part of President Obama 's " Pivot to East Asia " .

In August 2012 , the 9th Expeditionary Bomb Squadron returned from a six @-@ month tour in Afghanistan . Their nine B @-@ 1Bs flew 770 sorties , the most of any B @-@ 1B squadron on a single deployment . The squadron spent 9 @,@ 500 hours airborne , having one of its bombers in the air at all times . They accounted for a quarter of all combat aircraft sorties over the country while there and averaged 2 ? 3 requests for air support per day . On 4 September 2013 , a B @-@ 1B participated in a maritime evaluation exercise , deploying munitions such as laser @-@ guided 500 lb GBU @-@ 54 bombs , 500 lb and 2 @,@ 000 lb Joint Direct Attack Munitions (JDAM) , and Long Range Anti @-@ Ship Missiles (LRASM) . The aim was to detect and engage several small craft using existing weapons and tactics developed from conventional warfare against ground

targets ; the B @-@ 1 is seen as a useful asset for maritime duties such as patrolling shipping lanes .

Beginning in 2014 , the B @-@ 1 was used by the U.S. against the Islamic State (IS) in the Syrian Civil War . From August 2014 to January 2015 , the B @-@ 1 accounted for eight percent of USAF sorties during Operation Inherent Resolve . The 9th Bomb Squadron was deployed to Qatar in July 2014 for support of missions for Afghanistan , but when the air campaign against IS began on 8 August , the unit 's B @-@ 1 's were redirected to Iraq . During the Battle of Kobane in Syria , the squadron 's B @-@ 1s dropped 660 bombs over five months in support of Kurdish forces defending the city , one @-@ third of all bombs used during OIR during the period , killing some 1 @,@ 000 ISIL fighters . The 9th Bomb Squadron ? s B @-@ 1s went " Winchester " , dropping all weapons on board , 31 times during its deployment . Over 2 @,@ 000 JDAMs were dropped in its sixth @-@ month rotation . B @-@ 1s from the 28th Bomb Wing flew 490 sorties where they dropped 3 @,@ 800 munitions on 3 @,@ 700 targets during a six @-@ month deployment . In February 2016 , the B @-@ 1s were sent back to the U.S. for cockpit upgrades .

As part of a USAF organizational realignment announced in April 2015 , all B @-@ 1B aircraft are to be reassigned from Air Combat Command to Global Strike Command (GSC) effective 1 October 2015 .

= = Variants = =

B @-@ 1A

The B @-@ 1A was the original B @-@ 1 design with variable engine intakes and Mach 2 @.@ 2 top speed . Four prototypes were built ; no production units were manufactured .

B @-@ 1B

The B @-@ 1B is a revised B @-@ 1 design with reduced radar signature and a top speed of Mach 1 @.@ 25 . It was otherwise optimized for low @-@ level penetration . A total of 100 B @-@ 1Bs were produced .

B @-@ 1R

The B @-@ 1R is a proposed upgrade of existing B @-@ 1B aircraft . The B @-@ 1R (R for " regional ") would be fitted with advanced radars , air @-@ to @-@ air missiles , and new Pratt & Whitney F119 engines . This variant would have a top speed of Mach 2 @.@ 2 , but with 20 % shorter range .

Existing external hardpoints would be modified to allow multiple conventional weapons to be carried , increasing overall loadout . For air @-@ to @-@ air defense , an Active electronically scanned array (AESA) radar would be added and some existing hardpoints modified to carry air @-@ to @-@ air missiles . If needed the B @-@ 1R could escape from unfavorable air @-@ to @-@ air encounters with its Mach 2 + speed . Few aircraft are currently capable of sustained speeds over Mach 2 .

= = Operators = =

United States
United States Air Force
Strategic Air Command 1985 ? 92
Air Combat Command 1992 ? 2015
Air Force Global Strike Command 2015 ? present
7th Bomb Wing ? Dyess AFB , Texas
9th Bomb Squadron 1993 ? present
13th Bomb Squadron 2000 ? 05
28th Bomb Squadron 1994 ? present
337th Bomb Squadron 1993 ? 94
28th Bomb Wing ? Ellsworth AFB , South Dakota
34th Bomb Squadron 1994 ? 97 , 2002 ? present

37th Bomb Squadron 1986 ? present
77th Bomb Squadron 1985 ? 95 , 1997 ? 2002
53d Test and Evaluation Group ? Nellis AFB , Nevada
337th Test and Evaluation Squadron (Dyess AFB , Texas) 2004 ? present
57th Wing ? Nellis AFB , Nevada
77th Weapons Squadron (Dyess) 2003 ? present
96th Bomb Wing ? Dyess AFB , Texas
337th Bomb Squadron 1985 ? 93
338th Combat Crew Training Squadron 1986 ? 93
4018th Combat Crew Training Squadron 1985 ? 86
319th Bomb Wing ? Grand Forks AFB , North Dakota 1987 ? 94
46th Bomb Squadron
366th Wing ? Mountain Home AFB , Idaho 1997 ? 2002
34th Bomb Squadron
384th Bomb Wing ? McConnell AFB , Kansas 1987 ? 94
28th Bomb Squadron
Air National Guard
116th Bomb Wing (Georgia Air National Guard) ? Robins AFB , Georgia 1996 ? 2002
128th Bomb Squadron
184th Bomb Wing (Kansas Air National Guard) ? McConnell AFB , Kansas 1994 ? 2002
127th Bomb Squadron
Air Force Flight Test Center ? Edwards AFB , California
412th Operations Group 1989 ? 92
410th Flight Test Squadron
412th Test Wing 1992 ? present
419th Flight Test Squadron
6510th Test Wing 1974 ? 89
6519th Flight Test Squadron

= = Aircraft on display = =

B @-@ 1A
74 @-@ 0160 - Wings Over the Rockies Museum at the former Lowry Air Force Base in Denver , Colorado .
76 @-@ 0174 - Strategic Air Command & Aerospace Museum near Offutt Air Force Base in Ashland , Nebraska . This aircraft has conventional ejection seats and other features used on the B @-@ 1B variant .
B @-@ 1B
83 @-@ 0065 Star of Abilene - Dyess Linear Air Park at Dyess Air Force Base , Texas . This was the first aircraft delivered to the U.S. Air Force . Dyess AFB is home to one of two active Air Force B @-@ 1B wings .
83 @-@ 0066 Ole Puss - Heritage Park at Mountain Home Air Force Base , Idaho with wheels in the wells .
83 @-@ 0067 Texas Raider - South Dakota Air and Space Museum at Ellsworth Air Force Base , South Dakota . Ellsworth AFB is home to one of two active Air Force B @-@ 1B wings .
83 @-@ 0068 Spuds - Reflections of Freedom Air Park at McConnell Air Force Base in Wichita , Kansas , a former Air Force and Air National Guard B @-@ 1B base .
83 @-@ 0069 Silent Penetrator - Museum of Aviation at Robins Air Force Base in Warner Robins , Georgia , a former Air National Guard B @-@ 1B base . This aircraft was the sixth B @-@ 1 produced , and was delivered to the 96th Bomb Wing at Dyess AFB , Texas on 13 March 1986 . This aircraft arrived at Robins AFB in September 2002 . Robins AFB was previously home to one of two Air National Guard B @-@ 1B wings . Renamed Midnight Train From Georgia by April 2015
83 @-@ 0070 7 Wishes - Hill Aerospace Museum at Hill Air Force Base in Ogden , Utah . The

Ogden Air Logistics Center at Hill AFB performs depot level maintenance on the entire B @-@ 1B fleet .

83 @-@ 0071 Spit Fire - near the main gate at Tinker Air Force Base , Oklahoma . This aircraft was one of two that suffered an in @-@ flight engine failure in 1990 that led to grounding of the fleet .

84 @-@ 0051 Boss Hawg - National Museum of the United States Air Force at Wright @-@ Patterson AFB near Dayton , Ohio . It is displayed in the Museum 's Cold War Gallery , and replaces the B @-@ 1A (74 @-@ 0174) formerly on display .

= = Accidents and incidents = =

Ten B @-@ 1s have been lost due to accidents . Between 1984 and 2001 , 17 crew members and people on board have been killed in B @-@ 1 accidents .

= = = Crashes = = =

On 29 August 1984 , B @-@ 1A (AF Ser . No. 74 @-@ 0159) stalled and crashed while performing minimum control speed tests at low altitude . The crew used the escape capsule to leave the bomber , but the parachutes deployed improperly , causing the capsule to hit nose down . The impact killed the B @-@ 1 's pilot , Rockwell test pilot Doug Benefield , and seriously injured two other crew members .

In September 1987 , B @-@ 1B (s / n 84 @-@ 0052) from the 96th Bomb Wing , 338th Combat Crew Training Squadron , Dyess AFB crashed near La Junta , Colorado while flying on a low @-@ level training route . This was the only B @-@ 1B crash to occur with six crew members aboard . The two crew members in jump seats , and one of the four crew members in ejection seats perished . The root cause of the accident was thought to be a bird strike on a wing 's leading edge during the low @-@ level flight . The impact was severe enough to sever fuel and hydraulic lines on one side of the aircraft , the other side 's engines functioned long enough to allow for ejection . The B @-@ 1B fleet was later modified to protect these supply lines .

In November 1988 , B @-@ 1B (s / n 85 @-@ 0063) from the 96th Bomb Wing , 337th Bomb Squadron , Dyess AFB crashed near Tye , Texas after a fire broke out above the left engines . All four crew members successfully ejected from the aircraft .

In November 1988 , B @-@ 1B (s / n 85 @-@ 0076) from the 28th Bomb Wing , 37th Bomb Squadron , Ellsworth AFB crashed short of the runway at Ellsworth AFB during adverse weather . All four crew members ejected successfully .

In November 1992 , B @-@ 1B (s / n 86 @-@ 0106) from the 7th Bomb Wing , 337th Bomb Squadron , Dyess AFB , Texas , flying on a low @-@ level training flight crashed into a mountain near Van Horn , Texas . All four members of the crew were killed , and the cause was attributed to pilot error .

In September 1997 , B @-@ 1B (s / n 85 @-@ 0078) from the 28th Bomb Wing , 37th Bomb Squadron , Ellsworth AFB , South Dakota , flying in the Powder River Military Operating Area crashed 25 miles (40 km) north of Alzada , Montana . All four members of the crew were killed . The review board found that the bomber struck the ground due to pilot error , while performing a defensive maneuver during training .

On 18 February 1998 , B @-@ 1B (s / n 84 @-@ 0057) from the 7th Bomb Wing , Dyess AFB , Texas crashed near Marion , Kentucky when a fire detected by a cockpit instrument panel shut down the aircraft 's power . All four crew members were able to eject and were rescued safely .

In December 2001 , B @-@ 1B (s / n 86 @-@ 0114) from the 28th Bomb Wing , 37th Bomb Squadron , Ellsworth AFB , South Dakota , was lost over the Indian Ocean . All four crew members successfully ejected and were rescued . The bomber was flying en route to a long @-@ range combat mission over Afghanistan when the crew declared an in @-@ flight emergency . The pilot , Captain William Steele , attributed the crash to " multiple malfunctions " causing the bomber to go " out of control " . Because of the water 's depth , the structural data collector (SDC) or " Black Box " was not recovered and the cause was not positively determined . The aircraft had recently returned

from a routine Phase Inspection , and was on its first combat mission after returning to the island of Diego Garcia in the British Indian Ocean Territory . This was the first B @-@ 1B to be lost during combat operations .

On 4 April 2008 , B @-@ 1B (s / n 86 @-@ 0116) lost hydraulic power while taxiing , then crashed into a concrete barrier and caught fire at Al Udeid AB , Qatar . The crew safely evacuated the aircraft . The B @-@ 1B was carrying two 2 @,@ 000 lb bombs at the time , which did not detonate . The aircraft was destroyed .

On 19 August 2013 , B @-@ 1B (AF Ser . No. 85 @-@ 0091) out of Ellsworth AFB , South Dakota crashed in a remote area near Broadus , Montana . All four crew members survived by ejecting before the aircraft crashed . A report found that the crash was due to a mechanical failure leading to a fuel leak and explosions .

= = = Other accidents and notable incidents = = =

On 4 October 1989 , B @-@ 1B (s / n 85 @-@ 0070) from the 96th Bomb Wing , 337th Bomb Squadron , Dyess AFB , Texas , was forced to make an emergency landing at Edwards Air Force Base after suffering an in @-@ flight failure of the No. 2 hydraulic system , which required use of the No 3 system to deploy the landing gear . After the nose gear failed to deploy , the crew attempted to lower the nose gear via the alternate emergency gear @-@ extension method . After several hours of attempting different means to lower the nose gear , the decision was made to perform a nose @-@ gear @-@ up landing on Rogers Dry Lake at Edwards . The lower portion of the forward bulkhead used to mount the radar antenna was the only part of the aircraft to suffer damage , and after repairs , the jet was returned to Dyess in January 1990 by the same crew which performed the emergency landing .

In October 1990 , while flying a training route in eastern Colorado , B @-@ 1B (s / n 86 @-@ 0128) from the 384th Bomb Wing , 28th Bomb Squadron , McConnell AFB , experienced an explosion as the engines reached full power without afterburners . Fire on the aircraft 's left was spotted . The # 1 engine was shut down and its fire extinguisher was activated . The accident investigation determined that the engine had suffered catastrophic failure , engine blades had cut through the engine mounts and the engine became detached from the aircraft .

In December 1990 , B @-@ 1B (s / n 83 @-@ 0071) from the 96th Bomb Wing , 337th Bomb Squadron , Dyess AFB , Texas , experienced a jolt that caused the # 3 engine to shut down with its fire extinguisher activating . This event , coupled with the October 1990 engine incident , led to a 50 + day grounding of the B @-@ 1Bs not on nuclear alert status . The problem was eventually traced back to problems in the first @-@ stage fan , and all B @-@ 1Bs were equipped with modified engines .

In June 1994 , B @-@ 1B (s / n 84 @-@ 0057) from the 7th Bomb Wing , 9th Bomb Squadron , made an emergency divert to Rhein @-@ Main Air Base , Germany due to a wing sweep malfunction . The crew made a high speed landing at Rhein @-@ Main and stopped 100 feet short of the end of the runway . Afterward the overheated brakes led to a fire in the right main landing gear , but it was quickly extinguished .

On 15 September 2005 , B @-@ 1B (s / n 85 @-@ 0066) was extensively damaged by fire while landing at Andersen Air Force Base , Guam . The investigation into the incident concluded that leaking hydraulic fluid and sparks from a wheel being gouged caused a fire to start in the aircraft 's right main landing gear as it touched down . The resulting fire damaged the B @-@ 1 's right wing , engine nacelle , airframe and landing gear , leading to an estimated repair cost of more than $ 32 million .

On 8 May 2006 , B @-@ 1B (s / n 86 @-@ 0132) from the 7th Bomb Wing , 9th Bomb Squadron , Dyess AFB , Texas , landed " gear @-@ up " during recovery from an 11 @-@ hour ferry flight to the island of Diego Garcia . A resulting fire was quickly extinguished and the crew escaped through the top hatch with only a minor back injury to the co @-@ pilot . The air force investigation concluded that the crew " forgot to lower the landing gear " based on the following reasons : 1) co @-@ pilot task oversaturation , 2) co @-@ pilot 's wanting to complete a long mission , 3) neither

pilot completed the landing checklist , 4) co @-@ pilot 's belief that the pilot had lowered the landing gear when he had not , 5) pilot had turned over control to the co @-@ pilot on the final approach and the pilot had reported to base that the landing gear was down when it was not - indicator lights showing the landing gear was still up were working and apparently ignored . As a result , the B @-@ 1B impacted and slid on the runway , which caused approximately $ 8 million of damage to the aircraft and runway .

= = Specifications (B @-@ 1B) = =

Data from USAF Fact Sheet , Jenkins , Pace , Lee except where noted
General characteristics
Crew : four (aircraft commander , copilot , offensive systems officer and defensive systems officer)

Payload : 125 @,@ 000 lb (56 @,@ 700 kg) ; internal and external ordnance combined
Length : 146 ft (44 @.@ 5 m)
Wingspan : Extended : 137 ft (42 m)
Swept : 79 ft (24 m)
Height : 34 ft (10 @.@ 4 m)
Wing area : 1 @,@ 950 ft ² (181 @.@ 2 m ²)
Airfoil : NACA69 @-@ 190 @-@ 2
Empty weight : 192 @,@ 000 lb (87 @,@ 100 kg)
Loaded weight : 326 @,@ 000 lb (148 @,@ 000 kg)
Max. takeoff weight : 477 @,@ 000 lb (216 @,@ 400 kg)
Powerplant : 4 × General Electric F101 @-@ GE @-@ 102 augmented turbofans
Dry thrust : 14 @,@ 600 lbf (64 @.@ 9 kN) each
Thrust with afterburner : 30 @,@ 780 lbf (136 @.@ 92 kN) each
Fuel capacity , optional : 10 @,@ 000 U.S. gal (37 @,@ 900 L) fuel tank each in 1 ? 3 internal weapons bays
Performance
Maximum speed : At altitude : Mach 1 @.@ 25 (721 kn or 830 mph or 1 @,@ 335 km / h) at 50 @,@ 000 ft or 15 @,@ 000 m altitude
At low level : Mach 0 @.@ 92 (700 mph or 1 @,@ 100 km / h) at 200 ? 500 ft or 61 ? 152 m altitude
Range : 5 @,@ 100 nmi (5 @,@ 900 mi ; 9 @,@ 400 km)
Combat radius : 2 @,@ 993 nmi (3 @,@ 444 mi ; 5 @,@ 543 km)
Service ceiling : 60 @,@ 000 ft (18 @,@ 000 m)
Wing loading : 167 lb / ft ² (816 kg / m ²)
Thrust / weight : 0 @.@ 38
Armament
Hardpoints : six external hardpoints for 50 @,@ 000 pounds (23 @,@ 000 kg) of ordnance (use for weapons restricted by arms treaties) and three internal bomb bays for 75 @,@ 000 pounds (34 @,@ 000 kg) of ordnance .
Bombs : 84 × Mk @-@ 82 Air inflatable retarder (AIR) general purpose (GP) bombs
81 × Mk @-@ 82 low drag general purpose (LDGP) bombs
84 × Mk @-@ 62 Quickstrike sea mines
24 × Mk @-@ 84 general purpose bombs
24 × Mk @-@ 65 naval mines
30 × CBU @-@ 87 / 89 / CBU @-@ 97 Cluster Bomb Units (CBU)
30 × CBU @-@ 103 / 104 / 105 Wind Corrected Munitions Dispenser (WCMD) CBUs
24 × GBU @-@ 31 JDAM GPS guided bombs (Mk @-@ 84 GP or BLU @-@ 109 warhead)
15 × GBU @-@ 38 JDAM GPS guided bombs (Mk @-@ 82 GP warhead)
48x GBU @-@ 38 JDAM (using rotary launcher mounted multiple ejector racks)
48x GBU @-@ 54 LaserJDAM (using rotary launcher mounted multiple ejector racks)

24 × AGM @-@ 154 Joint Standoff Weapon (JSOW)
96 × or 144 × GBU @-@ 39 Small Diameter Bomb GPS guided bombs (not fielded on B @-@ 1 yet)
24 × AGM @-@ 158 Joint Air to Surface Standoff Missile (JASSM)
24 × B61 or B83 nuclear bombs (no longer carried)
Avionics
1 × AN / APQ @-@ 164 forward @-@ looking offensive Passive electronically scanned array radar
1 × AN / ALQ @-@ 161 radar warning receiver and defensive jamming equipment
1 × AN / ASQ @-@ 184 defensive management system
1 × Sniper Advanced Targeting Pod (optional)

= = Notable appearances in media = =