Bombers

B-1 Lancer

Brief: A long-range, air refuelable multirole bomber capable of flying missions over intercontinental range, then penetrating enemy defenses with a heavy load of ordnance.

Function: Long-range conventional bomber.

Operator: ACC, ANG.

First Flight: Dec. 23, 1974 (B-1A); Oct. 18, 1984 (B-1B).


Production: 104.

Inventory: 93 (B-1B).


Contractor: Boeing; AIL Systems; General Electric.

Power Plant: four General Electric F101-GE-102 turbofans, each 30,780 lb thrust.

Dimensions: span 172 ft, length 69 ft, height 17 ft.

Accommodation: four, pilot, copilot, and two systems officers (offensive and defensive), on zero/zero ejection seats.

Weights: empty equipped 192,000 lb, max operating weight 477,000 lb.

Ceiling: over 30,000 ft.

Performance: max speed at low level high subsonic; 900+ mph (Mach 1.2 at S/L); range intercontinental.

Armament: three internal weapons bays capable of accommodating in a conventional role up to 84 Mk 82 (500-lb) bombs or Mk 62 naval mines and up to 30 CBU-87/89 cluster munitions and CBU-97 Sensor Fuzed Weapons (SFWs), to be fitted with the Wind-Corrected Munitions Dispenser (WCMD) kits, and up to 24 2,000-lb GBU-31 Joint Direct Attack Munitions (JDAMs).

COMMENTS

By Susan H.H. Young

Aperture Radar (SAR), Ground Moving Target Indicator (GMTI), and Terrain-Following Radar, an extremely accurate Global Positioning System/Inertial Navigation System (GPS/INS), computer-driven avionics, and a strategic Doppler radar, enabling aircrews to navigate, update target coordinates in flight, and precision bomb.

The current defensive avionics package, built around the ALQ-161 Electronic Countermeasures (ECM) system, is supplemented by the ALE-50 towed decoy and chaff and flares to protect against radar-homing and heat-seeking missiles. Aircraft structure and radar-absorption materials reduce the aircraft’s radar signature to approximately one percent that of a B-52. The ALE-50 provides greater protection against RF threats.

B-1A. USAF acquired four prototype flight test models of this new strategic bomber in the 1970s, but the program was canceled in 1977. Flight test of the four B-1A models continued through 1981.

B-1B is the improved variant initiated by the Reagan Administration in 1981. First production model flew October 1984 and USAF produced a total of 100. The B-1 was first used in combat in support of operations against Iraq during Desert Fox in December 1998. B-1B’s speed, superior handling qualities, and large payload make it a key element of any joint/composite strike force, with the flexibility to deliver a wide range of weapons or to carry additional fuel, as required. B-1Bs are currently acquiring the capability to carry up to 24 2,000-lb GPS–guided GBU-31 JDAMs, with fleet completion in FY02.

The B-1B’s capability is being significantly enhanced by the ongoing Conventional Mission Upgrade Program (CMUP). This gives the B-1B greater lethality and survivability through the integration of precision and standoff weapons and a robust ECM suite. CMUP includes GPS receivers, a MIL-STD-1760 weapon interface, secure interoperable radios, and improved computers to support precision weapons, initially the GBU-31 JDAM, with follow-on computer and software upgrades permitting simultaneous carriage of mixed guided and unguided weapons, including WCMOs, AGM-154 Joint Standoff Weapons (JSOWs), and the AGM-158 Joint Air-to-Surface Standoff Missiles (JASSMs). The Defensive System Upgrade Program, accompanying the ALE-55 fiber-optic towed decoy, ALR-56M radar, and ALQ-210 receiver/processor, will improve aircrew situational awareness and jamming capability.

ACCOMMODATION: two, mission commander and pilot.

Weights: empty 125,000 lb, typical T-O weight 336,500 lb.

Ceiling: 50,000 ft.

B-2 Spirit

Brief: Stealthy, long-range multirole bomber that can deliver conventional and nuclear munitions anywhere on the globe by flying through previously impenetrable defenses.

Function: Long-range heavy bomber.

Operator: ACC.

First Flight: July 17, 1989.

Delivered: Dec. 11, 1993-present.


Production: 21.

Inventory: 21.

Unit Location: Whiteman AFB, Mo.

Contractor: Northrop Grumman, with Boeing, LTV, and General Electric as principal subcontractors.

Power Plant: four General Electric F118-GE-100 turbofans, each 17,300 lb thrust.

Dimensions: span 172 ft, length 69 ft, height 17 ft.

Weights: empty 132,000 lb, typical T-O weight 336,500 lb.

Ceiling: 50,000 ft.
Performance: minimum approach speed 149 mph, typical estimated unrefueled range for a hi-lo-hi mission with 16 B61 nuclear free-fall bombs 5,000 miles, with one aerial refueling more than 10,000 miles. Armament: in a nuclear role: up to 16 nuclear weapons (B61, B62 Mod II, B83). In a conventional role: up to 200 2,000-lb JDAMs or a penetration version of a BLU-109, or 16 Mk 84 2,000-lb bombs; or up to 16,200-lb GBU-36/B (GPS–Aided Munition); or up to eight 700-lb GBU-37/38/39/B laser-guided bombs; or up to 16,200-lb GBU-36/B (GPS–Aided Munition); or up to eight 700-lb GBU-37/38/39/B laser-guided bombs. Various other conventional weapons, incl the Mk 82 500-lb bomb, M117 750-lb bomb, Mk 62 500-lb Naval Mine, and up to 32 GBU-87/89/97 cluster bombs. JASSMs and JSOW are presently being added to B-2 Block 30 aircraft through FY03.

CONTRIBUTION

The B-2 bomber is a unique, highly advanced system, combining sophisticated technologies, notably Low Observable (LO) stealth design, with high aerodynamic efficiency, enabling it to attack heavily defended targets and neutralize enemy defenses and, thereby, making way for less stealthy systems to operate. Based on the flying wing concept, the B-2 has no vertical tail surfaces. The smoothly blended ‘fuselage’ section controls lift and allows two flight crew and two large weapon bays side by side in the lower centerbody. These bays contain rotary launchers or bomb racks capable of carrying a total weapons load of 40,000 lb.

Four nonafterburning turbofan engines are mounted in pairs within the lower centerbody, with scalloped under-wing intake ducts and shielded over-wing trailing-edge nozzles. The aircraft has a quadruplet-redundant fly-by-wire flight control system, actuating moving surfaces at the wing trailing edges that combine aileron, elevator, and rudder functions. A landing gear track of 40 ft enables the B-2 to use any runway that can handle a Boeing 727 airplane.

The B-2 production represents three successive blocks of capability. Block 10 aircraft carried B83 nuclear bombs or 16 Mk 84 2,000-lb conventional munitions. Block 20 aircraft additionally carried the B61/7 and B61/11 nuclear gravity bombs, as well as two GPS–Aided Munitions (GAMs), the GBU-37 and GBU-36, on two rotary launcher assemblies, providing an inter- mission, near-precision strike capability. All Block 10 and 20 aircraft have now been upgraded to Block 30.

The Block 30 configuration retains weapon capability introduced in Block 10 and 20 and adds significant new capability. Using the rotary launcher assembly, all B-2s and Block 30 B-52s can carry up to 16 B61/7 B62 Mod II, B62 Mod III, or 8 GAM-113s (to be replaced by EGBU-8 in the future). All of these weapons are individually targeted, giving the B-2 multiple kill prospects capability. All B-2s are also capable of substituting bomb rack assemblies in place of the rotary launchers, providing the capability to employ 80 500-lb MA-82s, 36 750-lb MA-117s, 34 tactical munitions dispensers, or 80 Mk 62 sea mines. Future modifications to the bomb racks will allow the B-2 to carry a wide variety of conventional weapons, such as JDAM, JSOW, JASSM, and WCMDs, GBU-31 JDAMs, JSOWs from 2001, JASSMs in 2002–03, and on some aircraft, three to four AGM-142A Have Nap missiles or eight AGM-84 Harpoons in under-wing clusters.

COMMENTARY

Retaining a key role within USAF’s manned strategic bomber force, the B-2’s still-expanding weapons capability reflects its continuing ability to perform a wide range of missions despite the more than 40 years of service, including show of force, maritime operations, long-range precision strikes, offensive counterair, air interdiction, and defense suppression. The B-2 is equipped with an Electro-Optical (EO) viewing system that uses Forward-Looking Infrared (FLIR) and high-resolution Low-Light-Level Television (LLLT) sensors to augment the targeting, battle assessment, flight safety, and terrain avoidance systems, thus improving combat ability and low-level flight capability. Pilots have Night Vision Goggles (NVGs) to further enhance night operation. The B-2’s ECM suite uses a combination of electronic detection, jamming, and infrared countermeasures to protect against hostile air defense systems. The aircraft can also detect and counter missile attack from the rear.

Several versions of the Stratofortress were produced, including:

B-52A. Initial production version, with J57-P-1W engines and provision for in-flight refueling. First flown August 5, 1954, the three aircraft built were used by Boeing for technical development and flight testing. Delivered to SAC November 1957. Finally retired 1969.

B-52B. First operational version, 23 of which were built. Also, 27 RB-52B dual-role bomber/reconnaissance aircraft. Delivered to SAC November 1957. Finally retired 1969.


B-52G. Introduced important design changes, including a redesigned wing containing integral fuel tanks for increased range, fixed under-wing external tanks, a shorter tail fin of greater chord, and a remotely controlled tail gun turret that allowed the gunner to be repositioned with the rest of the crew. Initial flight August 1958, with the first of 193 aircraft entering service in February 1959. Withdrawn 1994.

B-52H. The only version still in service. The H introduced TF33 turbfans, providing increased unrefueled range, and improved defensive armament. First flown July 1960, 102 were built, with deliveries between May 1961–October 1962.

Deployment of the B-1 and B-2 led to a changed role in the primary role of the B-52 to cruise missile carrier with, typically, multiple cruise missile launches at high altitude, often followed by B-52 low-level descent to attack additional targets using gravity weapons.

Ongoing modernization of its conventional capabilities is extending the B-52’s service life well into this century, with the ability to provide massive firepower in low-threat environments supplemented by a standoff attack capability. Upgrades include the installation of GPS, ARC-210 radars, Have Quick II anti-jam radio, KY-100 secure radio, and MIL-STD-1760 interfaces; and infrared countermeasures to protect against hostile air defense systems. The aircraft can also detect and counter missile attack from the rear.

A-10A Thunderbolt II (SSgt. George F. Thompson)
Avionics improvements include the Avionics Midlife Improvement program, which replaces the current system processors and data transfer cartridges. Electronic attack improvements include the Situational Awareness Defensive Improvement Panoramic threat receiver and the electronic combat modernization improvement upgrade to the ALO-172 electronic countermeasures set.

Current plans encompass a force of around 76 aircraft.

**Fighter and Attack Aircraft**

**A-10 Thunderbolt II**

**Brief:** A simple, effective, and survivable twin-engine aircraft specifically designed for Close Air Support of ground forces and which can be used against all ground targets, including tanks and other armored vehicles.

**Function:** Attack aircraft.

**Operator:** ACC, PACAF, USAFE, ANG, AFRIC.

**First Flight:** Feb. 15, 1975 (preproduction).

**Delivered:** November 1975–March 1984.

**IOC:** October 1977

**Production:** 713.

**Inventory:** 367.


**Contractor:** Fairchild Republic.

**Power Plant:** Two General Electric TF34-GE-100 turbofans, each 9,065 lb thrust.

**Accommodation:** Pilot only, on-zero-height/518 mph–zero-speed ejection seat.

**Dimensions:** Span 57 ft 6 in, length 53 ft 4 in, height 14 ft 8 in.

**Weight:** Empty 28,000 lb, max gross 51,000 lb.

**Ceiling:** 45,000 ft.

**Performance:** Speed 420 mph, range with 9,500 lb of empty 28,000 lb, max gross 51,000 lb.

**Armament:** One 30 mm GAU-8/A gun is retained, but under-wing stores are normally restricted to canisters of white phosphorous rockets for target marking. The first OA-10 unit reached Initial Operational Capability (IOC) in October 1987.

**OA-10A:** Redesignated A-10s, used for forward air control of fighter aircraft, combat escort, search and rescue, and visual reconnaissance. The 30 mm GAU-8/A gun is retained, but under-wing stores are normally restricted to canisters of white phosphorous rockets for target marking. The first OA-10 unit reached Initial Operational Capability (IOC) in October 1987.

**AC-130 Gunship**

**Brief:** Heavily armed aircraft using side-firing weapons integrated with sophisticated sensor, navigation, and fire-control systems to provide precise firepower or area saturation for long periods, at night and in adverse weather.

**Function:** Attack aircraft.

**Operator:** AFSOC.

**First Flight:** 1967.

**Delivered:** 1968–95.

**IOC:** 1972 (AC-130H); 1995 (AC-130U).

**Production:** 39.

**Inventory:** 21.

**Unit Location:** Hurlburt Field, Fla.

**Contractor:** Lockheed Martin, Rockwell (AC-130U).

**Power Plant:** Four Allison T56-A-15 turboprops, each 4,910 shp.

**Accommodation:** AC-130H crew of 14; AC-130U crew of 13.

**Dimensions:** Span 132 ft 7 in, length 97 ft 9 in, height 38 ft 6 in.

**Commentary**

The AC-130 is a C-130 modified with gun systems, electronic and Electro-Optical (EO) sensors, fire-control systems, enhanced navigation systems, sophisticated communications, defensive systems, and inflight refueling capability. These systems give the gunship crew the capability to acquire and identify targets day or night, coordinate with ground forces and Command-and-Control (C2) agencies, and deliver surgical firepower in support of both conventional and special operations missions.

**AC-130A** was the initial version, deployed in Vietnam in 1968–69. Eighteen produced.

**AC-130E, an improved version, of which eight were built. Converted to H standard after service in Vietnam.**

**AC-130H Spectres serve with the 16th SOW. The unit has eight, each equipped with a digital fire-control computer. They employ EO sensors and target-acquisition systems, including FLIR and LLLTV, and are capable of in-flight refueling. Fire-control computers, navigation, communications, and sensor suites have been upgraded; an Infrared Suppression System (IRSS) overhaul is underway.

**AC-130U Spookys are the most recent gunship conversions, converted by Rockwell, of which 13 were delivered to the 16th SOW’s 4th SOS in 1994–95. These aircraft have greater altitude capability and combined increased firepower and more superior accuracy with the latest methods of target location. The two 20 mm cannon of the H model are replaced with one trainable 25 mm Gatling gun. All weapons can be subordinated to the APQ-180 digital fire-control radar, FLIR, or All-Light-Level Television (ALLTV) for adverse weather attack operations.**

Although the AC-130H Spectre and AC-130U Spooky gunships use dissimilar avionics and other systems, fire support to ground parties is generally comparable. The AC-130U will not be required for most fire support missions but provides benefits under certain circumstances (weather, dual target attack, and defensive avionics).

**F-15 Eagle**

**Brief:** A supersonic, all-weather, highly maneuverable tactical fighter designed to permit USAF to swiftly gain and maintain air superiority in aerial combat.

**Function:** Fighter.

**Operator:** ACC, AETC, AFMC, PACAF, USAFE, ANG.

**First Flight:** July 27, 1972.

**Delivered:** from November 1974.

**IOC:** September 1975.

**Production:** 874.

**Inventory:** 522.


**Contractor:** Boeing.

**F-15C Eagle** (A/C James L. Harper Jr.)

**Weight:** H model: gross 155,000 lb.

**Ceiling:** 25,000 ft.

**Performance:** H model: speed 300 mph, range 1,500 miles, with air refueling unlimited.

**Armament:** two 20 mm Vulcan cannons with 3,000 rd (AC-130H); one 25 mm Gatling gun (AC-130U); one 40 mm Bofors cannon with 256 rd, and one H howitzer with 100 rd.

**Commentary**

The AC-130 is a C-130 modified with gun systems, electronic and Electro-Optical (EO) sensors, fire-control systems, enhanced navigation systems, sophisticated communications, defensive systems, and inflight refueling capability. These systems give the gunship crew the capability to acquire and identify targets day or night, coordinate with ground forces and Command-and-Control (C2) agencies, and deliver surgical firepower in support of both conventional and special operations missions.

**AC-130A** was the initial version, deployed in Vietnam in 1968–69. Eighteen produced.

**AC-130E, an improved version, of which eight were built. Converted to H standard after service in Vietnam.**

**AC-130H Spectres serve with the 16th SOW. The unit has eight, each equipped with a digital fire-control computer. They employ EO sensors and target-acquisition systems, including FLIR and LLLTV, and are capable of in-flight refueling. Fire-control computers, navigation, communications, and sensor suites have been upgraded; an Infrared Suppression System (IRSS) overhaul is underway.

**AC-130U Spookys are the most recent gunship conversions, converted by Rockwell, of which 13 were delivered to the 16th SOW’s 4th SOS in 1994–95. These aircraft have greater altitude capability and combined increased firepower and more superior accuracy with the latest methods of target location. The two 20 mm cannon of the H model are replaced with one trainable 25 mm Gatling gun. All weapons can be subordinated to the APQ-180 digital fire-control radar, FLIR, or All-Light-Level Television (ALLTV) for adverse weather attack operations.**

Although the AC-130H Spectre and AC-130U Spooky gunships use dissimilar avionics and other systems, fire support to ground parties is generally comparable. The AC-130U will not be required for most fire support missions but provides benefits under certain circumstances (weather, dual target attack, and defensive avionics).
Accommodation: pilot only in F-15A/C; two seats in F-15B/D.
Dimensions: span 42 ft 10 in, length 63 ft 9 in, height 18 ft 5 in.
Weight: empty 28,600 lb, gross 68,000 lb.
Ceiling: 65,000 ft.
Power Plant: F100-PW-220 (36,500 lb thrust); F100-PW-229 (29,000 lb thrust).
Armament: one internally mounted M61A1 20 mm six-barrel cannon; to four AIM-9 Sidewinder and up to four AIM-7 Sparrow air-to-air missiles, or up to eight AIM-120 AMRAAMS; up to six AGM-65 Maverick air-to-surface missiles; AGM-130; GBU-15; EO, IR, and standard bombs; CBU-87/99/127 cluster munitions; and nuclear weapons. JSOW, JDAM, and WCDM capability from FY03.

**COMMENTARY**

F-15E has a strengthened airframe for increased gross weight at takeoff and maneuver at 9 Gs throughout the flight envelope. Cockpit controls and displays are improved, and a wide-field-of-view HUD is included.

For low-altitude, high-speed penetration and precision attack on tactical targets at night and in adverse weather, the F-15E carries a high-resolution APG-70 SAR and LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) pods, with wide-field FLIR. The APG-70 gives the F-15E, with its AMRAAM, AIM-7, and AIM-9 load, a true multirrole capability with the inherent air-to-air capability of the F-15C. The digital, triple-redundant flight-control system permits automatic terrain following. Other improvements include a ring-laser gyro INS, with GPS capability from 1997, and, in FY03, the capability to carry smart weapons (JSOW, JDAM, and WCDM). CFTs, adapted to carry ordnance tangentally, can be fitted to reduce drag while increasing combat range.

During Desert Storm 48 USAF F-15Es were deployed to the Persian Gulf where they operated mainly at night, hunting Scud missile launchers and artillery sites using the LANTIRN system. They also operated successfully with Joint STARS aircraft.

**F-16 Fighting Falcon**

**Armament:** one internally mounted M61A1 20 mm six-barrel cannon; to four AIM-9 Sidewinder and up to four AIM-7 Sparrow air-to-air missiles, or up to eight AIM-120 AMRAAMS; up to six AGM-65 Maverick air-to-surface missiles; AGM-130; GBU-15; EO, IR, and standard bombs; CBU-87/99/127 cluster munitions; and nuclear weapons. JSOW, JDAM, and WCDM capability from FY03.

**COMMENTARY**

The inherent air-to-air capability of the F-15C, the digital, triple-redundant flight-control system permits automatic terrain following. Other improvements include a ring-laser gyro INS, with GPS capability from 1997, and, in FY03, the capability to carry smart weapons (JSOW, JDAM, and WCDM). CFTs, adapted to carry ordnance tangentally, can be fitted to reduce drag while increasing combat range.

During Desert Storm 48 USAF F-15Es were deployed to the Persian Gulf where they operated mainly at night, hunting Scud missile launchers and artillery sites using the LANTIRN system. They also operated successfully with Joint STARS aircraft.

**F-16 Fighting Falcon**

**Function:** Multirole fighter.

**Operator:** ACC, AETC, AFMC, PACAF, USAFE, ANG, AFRICOM.

**First Flight:** Dec. 8, 1976 (full-scale development).

**Delivered:** August 1980–present.

**ICG:** October 1980, Hill AFB, Utah.

**Production:** 2,206.

**Block 40 F-16CG Fighting Falcon (SSgt. Vince Parker)**

**Inventory:** 1,412.

**Unit Location:** 14 active wings, 28 ANG, and five AFRIC units (one Associate aircraft).

**Contractor:** Lockheed Martin.

**Power Plant:** one augmented turbofan. General Electric F110-GE-100 (27,600 lb thrust) and Pratt & Whitney F100-PW-229 (23,450 lb thrust); are alternative standard engines. Increased Performance Engines (IPEs) in aircraft delivered from late 1991: Block 50: F110-GE-129 (29,000 lb thrust); Block 52: F100-229W-229 (29,100 lb thrust).

**Accommodation:** pilot only, on zero/zero ejection seat.

**Dimensions:** wingspan with missiles 32 ft 8 in, length overall 49 ft 5 in, height 16 ft 9 in. Weight: F-16C (single-seat) 11,000 lb; F-16D (two-seat) 14,000 lb; F-16E 20,000 lb.

**Performance:** max speed Mach 2, radius of action: Block 40 with two 2,000-lb bombs, two AIM-9 missiles, and external fuel, hi-lo-hi 852 miles.

**Armament:** one M61A1 20 mm multimuzzle cannon, with 511 rd, mounted in fuselage; wingtip-mounted missiles; seven other external stores stations for fuel tanks and a range of air-to-air and air-to-surface munitions.

**COMMENTARY**

The F-16 is the workhorse of the USAF fighter fleet. The 200+ USAF F-16 multimission fighters deployed to the Persian Gulf theater flew more sorties than any other type during Desert Storm, with 13,500 missions, and were again used extensively during Allied Force. F-16s are deployed to patrol the no-fly zones in northern and southern Iraq. F-16A (single-seat) and F-16B (two-seat) versions, which entered service with the 388th TFW, Hill AFB, Utah, incorporated advanced technologies from the start, making these aircraft two of the most maneuverable fighters built. Equipment includes a multimode radar with a clutter-free look-down capability, advanced Radar Warning Receiver (RWR), HUD, internal chaff/flare dispensers, and a 500-rd 20 mm internal gun.

Production of the F-16A and B for USAF ended in 1985. Most now belong to ANG, USAF and NATO operators have cooperated in an operational capabilities upgrade. Under this midlife upgrade program the radar, fire-control computer, stores-management computer, and avionics software are improved, giving F-16/BA the ability to use next-generation air-to-air and air-to-surface weapons.

Reliability and maintainability improvements include a ring-laser gyro INS and installation of the upgraded F100-229W turbofan.

The Multinational Staged Improvement Program (MSIP) ensured, the aircraft could accept systems under development, thereby minimizing retrofit costs. All F-16s delivered since November 1981 have had built-in structural and wiring provisions and systems architecture that expand the single-seat’s multirole flexibility to perform precision strike, night attack, and beyond-visual-range intercept missions.

**F-16C (single-seat) and F-16D (two-seat) aircraft** were introduced at production Block 25 with MSIP II improvements in the cockpit, airframe, and core avionics and an increased-range APG-68 radar. Deliveries began in 1984. With the exception of AFMC, all of the active and many of the Guard and Reserve units have since converted to F-16Cs/Ds.

**F-16D (two-seat) will utilize in night attack operations with precision guided weapons.** Follow-on improvements include ALE-47 improved defensive coun-
targeting pods, joint helmet mounted cueing system, AIM-9X, Link 16 data link, and improved weapons capabilities.

Block 60 F-16Cs include a new Integrated Electronic Warfare System and the Agile Beam Radar from Northrop Grumman. Either the General Electric or Pratt & Whitney IPE powerplants are being offered. Currently Lockheed Martin will deliver 80 Block 60 fighters from 2004–07 to the United Arab Emirates.

The Block 60 is considered the chief alternative for USAF if the Joint Strike Fighter is canceled.

**F-16CG**

Designated aircraft are equipped with LANTIRN for precision day or night attack.

**F-16C/DJ**

Designated Block 50 aircraft are equipped with the HARM Targeting System for Suppression of Enemy Air Defenses (SEAD), the role previously undertaken by F-16C/Ds with interim High-speed Anti-Radiation Missile (HARM) capability in conjunction with the now-retired F-4G Wild Weasel aircraft. These aircraft will be delivered to 60 Air National Guard units beginning in FY04–07.

**F-22 Raptor**

**brief**: High-technology follow-on for the F-15C. An all-weather fighter that combines an extremely maneuverable airframe at both sub- and supersonic speeds with stealth technologies and highly integrated avionics to achieve air superiority in aerial combat.

**Function**: Fighter.

**Operator**: ACC.

**First Flight**: Sept. 7, 1997.

**Delivery**: 2001 (first production representative aircraft delivered).

**IOC**: December 2005.

**Production**: 339 (planned).

**Contractor**: Northrop Grumman Corporation (preferred subcontractor).

**Power Plant**: Two Pratt & Whitney F119-PW-100 turbofans, each in 35,000-lb thrust class.

**Armament**: single-seat variant of the multirole fighter; a single-seat stealthy aircraft with advanced avionics for air-to-air and air-to-ground combat.

**Dimensions**: span 44 ft 6 in, length 62 ft 1 in, height 16 ft 7 in.

**Weight**: empty 40,000-lb class, gross approx 60,000 lb.

**Ceiling**: above 50,000 ft.

**Performance**: design target: max level speed at S/L 900 mph, range more than 2,000 miles.

**Armament**: two internal GAU-20 20 mm guns, two AIM-9 Sidewinders stored internally in the sides of the fuselage, six AIM-120 AMRAAMS in the main weapons bay; for ground attack, two 1,000-lb JDAMs will replace four AMRAAMS internally.

**Commentary**

This supersonic multirole fighter is designed to penetrate high-threat enemy airspace and achieve air superiority with a first-look, first-kill capability against multiple targets. It will cruise at supersonic speed without using its afterburners (supercruise), its fully integrated avionics and weapon systems will permit simultaneous engagement of multiple targets. Extreme maneuverability is achieved through the combination of the avionics system, structural strength, and thrust vectoring nozzles. A Raytheon Common Integrated Processor will tie together various avionics functions.

Two prototypes were built for competitive evaluation with Northrop/Donnell Douglas YF-23 prototypes. First flight was Sept. 29, 1990, YF-22 selected as winner in April 1991.

**F-22A**

Production-configured version entered Engineering and Manufacturing Development (EMD) phase in August 1991. USAF is receiving nine single-seat F-22As, three without avionics to explore flight characteristics, flutter, loads, propulsion, and envelope expansion, and six as avionics test beds. It is also testing one static test and one fatigue test airframe.

With a decision made toward the end of 1999 to continue development, the next six F-22s are production representative test aircraft used for follow-on testing of avionics, stealthiness, and weapons delivery systems. A critical series of avionics flight testing milestones had to be achieved prior to the decision on Low-Rate Initial Production (LRIP), including, crucially, the first flight of an F-22 equipped with combat-capable Block 3.0 avionics, achieved by Raptor 4005 on Jan. 5, 2001. However, DOD postponed an LRIP decision until after a defense program and strategy review in fall 2001.

**F-117 Pitchfork**

**Brief**: World’s first operational aircraft designed to exploit Low Observable (LO) stealth technology to expand the range of heavily defended strategic targets that can be attacked.

**Function**: Attack aircraft.

**Operator**: ACC. AFMC.

**First Flight**: June 18, 1981.


**IOC**: October 1983.

**Production**: 59.

**Inventory**: 55.

**Unit Location**: Eglin AFB, Fla., Holloman AFB, N.M. Contractor: Lockheed Martin.

**Power Plant**: two General Electric F404-GE-402 nonafterburning turbojets, each 8,000 lb thrust.

**Armament**: pilot only, on zero/zero ejection seat.

**Dimensions**: span 34 ft 4 in, length 56 ft 11 in, height 12 ft 6 in.

**Weight**: (estimated) 29,000 lb, max gross 52,500 lb.

**Ceiling**: 35,000 ft.

**Performance**: high subsonic, mission radius, un-refueled (5,000-lb weapon load) 656 miles.

**Armament**: full internal carriage of what is described as a wide variety of tactical weapons, incl laser-guided 2,000-lb munitions.

**Commentary**

Acknowledged publicly in November 1981, the F-117A’s first operational deployment was to Panama in 1989 for Just Cause. During the Persian Gulf War in 1991, a fleet of more than 40 F-117As undertook 1,270 missions. No aircraft were lost or damaged by hostile fire. An F-117 was lost March 27, 1999, while participating in Allied Force in Yugoslavia.

**F-117A**

**Development and manufacture began simultaneously in November 1978 within a highly classified environment, using many parts either transferred or modified from existing aircraft. The F-117A was deployed initially with the 4450th Tactical Group (designated 37th TFW in 1989) at Tonopah Test Range Airfield, Nev., where operations were restricted mainly to night flying to maintain secrecy, although three aircraft were lost in much-publicized accidents.**

To achieve the aircraft’s minimal radar signature, the skin panels of the arrowhead-shaped airframe are divided into many small, perfectly flat surfaces (facets), which deflect a variety of angles all signals from probing hostile ground or airborne radars. In addition, much of the aircraft’s external surface is made of composites and radar-absorbent materials. The F-117A’s dull black finish reflects little light, and the engine air intakes and exhaust nozzles are above the wings and rear fuselage, respectively, to shield them from IR seekers below. The two nonafterburning turbines give the aircraft low noise signature and high subsonic performance.

Key features include a state-of-the-art digital avionics suite integrating sophisticated navigation and attack systems, complemented by a specially developed automated mission-planning system. High-performance INS is installed, with upgraded FLIR and DLIR (Downward-Looking Infrared), each with a boresight laser designator and an autotracker, to ensure precision attack.

Improvements since 1989 have included upgraded cockpit display and instrumentation, GPS capability, and ring-laser gyro INS. Current modification aims at providing a single, optimal LO configuration, adverse
Joint Strike Fighter

**Brief:** An affordable, highly common family of next-generation strike aircraft.

**Function:** Multirole fighter.

**Operator:** ACC for USAF.


**Delivery:** 2008 (anticipated first production aircraft), IOC: 2011 (USAF).

**Power Plant:** Pratt & Whitney F119 derivative, in 35,000-lb thrust class.

**Accommodation:** pilot only, on zero/zero ejection seat.

**Dimensions:** TBD

**Weight:** TBD

**Ceiling:** TBD

**Speed:** S/L 630 knots calibrated airspeed for Navy and Short takeoff variant; maximum cruise Mach 0.83, max operating speed Mach 0.83, max weapon range hundreds of kms, unreplenished endurance at 40,000 ft with operational weapon load approx 6 hr.

**Armament:** (main weapons bay): USAF variant: one internal gun, two AMRAAMs, and two 2,000-lb JDAMs. USN variant: two AMRAAMs and two 2,000-lb JDAMs. STOVL variant: two AMRAAMs and two 1,000-lb JDAMs. External carriage will also be available. (Note: Numerical counts of weapons carried may be added as system development continues.)

**Contractor:** Lockheed Martin and Boeing are competing contractors; Pratt & Whitney is primary propulsion contractor; General Electric is alternate engine contractor.

**Performance:**
- **Weight:** empty 423,882 lb, gross 800,000 lb.
- **Ceiling:** 45,000 ft.
- **Performance:** max operating speed Mach 0.83, max weapon range hundreds of kms, unreplenished endurance at 40,000 ft with operational weapon load approx 6 hr.

**Armament:**
- **Weight:** TBD
- **Ceiling:** TBD
- **Speed:** TBD
- **Armament:** TBD
- **Contractor:** TBD
- **Inventory:** TBD
- **Unit Location:** TBD
- **Power Plant:** four GE CF6-80 turbfans, each 61,500 lb thrust.
- **Accommodation:** flight crew of two, plus four mission specialists.
- **Dimensions:** span 211 ft 5 in, length 228 ft 9 in, height 63 ft 8 in.
- **Weight:** TBD
- **Ceiling:** TBD
- **Speed:** TBD
- **Armament:** TBD
- **Contractor:** TBD
- **Inventory:** TBD
- **Unit Location:** TBD
- **Power Plant:** TBD
- **Accommodation:** TBD
- **Dimensions:** TBD
- **Weight:** TBD
- **Ceiling:** TBD
- **Speed:** TBD

**COMMENTARY:**
- USAF is developing the Joint Strike Fighter (JSF) to replace its current force of F-16 and A-10 aircraft with a stealthy multirole fighter that will comprise the bulk of USAF’s fighter fleet for up to 50 years. This advanced multiplatform fighter is designed to penetrate high-threat enemy airspace and engage all enemy targets in any conflict. In addition to its advanced LO design, the JSF incorporates stealth, maneuverability, longevity, and highly advanced avionics to accomplish the bulk of USAF missions. Its fully integrated avionics and weapon systems will permit simultaneous engagement of multiple targets in enemy airspace.

**X-32A**

**Lockheed Martin Joint Strike Fighter concept demonstrator (Ted Carlson)**

- **Dimensions:** TBD
- **Weight:** TBD
- **Ceiling:** TBD
- **Speed:** TBD
- **Armament:** TBD
- **Contractor:** TBD
- **Inventory:** TBD
- **Unit Location:** TBD
- **Power Plant:** TBD
- **Accommodation:** TBD
- **Dimensions:** TBD
- **Weight:** TBD
- **Ceiling:** TBD
- **Speed:** TBD

**X-35A**

**Lockheed Martin Joint Strike Fighter concept demonstrator (Ted Carlson)**

- **Dimensions:** TBD
- **Weight:** TBD
- **Ceiling:** TBD
- **Speed:** TBD
- **Armament:** TBD
- **Contractor:** TBD
- **Inventory:** TBD
- **Unit Location:** TBD
- **Power Plant:** TBD
- **Accommodation:** TBD
- **Dimensions:** TBD
- **Weight:** TBD
- **Ceiling:** TBD
- **Speed:** TBD

**E-3 Sentry**

**Brief:** Modified Boeing 707, fitted with a rotating radar dome 30 ft wide and 6 ft thick, which provides all-weather air surveillance and C3 for tactical and air defense forces. Capable of surveillance from Earth’s surface up to the stratosphere, over land or water, at more than 200 miles.

**Function:** Airborne early warning, Battle Management (BM), C3 aircraft.

**Operator:** ACC, PACAF, AFRIC (associate).

**First Flight:** Oct. 31, 1975 (full avionics).

**Delivered:** March 1977–84.

**IOC:** 1977

**Production:** 34

**Unit Location:** Elmdorf AFB, Alaska, Kadena AB, Japan, Tinker AFB, Okla.

**Contractor:** Boeing

**Power Plant:** four Pratt & Whitney TF33-PW-100/100A turbosfans, each 21,000 lb thrust.

**Accommodation:** basic operational crew of 17–23, incl 13–19 AWACS mission specialists and four flight crew members.

**Reconnaissance and Surveillance Aircraft**

**E-3 Sentry**

**Brief:** Modified Boeing 707, fitted with a rotating radar dome 30 ft wide and 6 ft thick, which provides all-weather air surveillance and C3 for tactical and air defense forces. Capable of surveillance from Earth’s surface up to the stratosphere, over land or water, at more than 200 miles.

**Function:** Airborne early warning, Battle Management (BM), C3 aircraft.

**Operator:** ACC, PACAF, AFRIC (associate).

**First Flight:** Oct. 31, 1975 (full avionics).

**Delivered:** March 1977–84.

**IOC:** 1977

**Production:** 34

**Unit Location:** Elmdorf AFB, Alaska, Kadena AB, Japan, Tinker AFB, Okla.

**Contractor:** Boeing

**Power Plant:** four Pratt & Whitney TF33-PW-100/100A turbosfans, each 21,000 lb thrust.

**Accommodation:** basic operational crew of 17–23, incl 13–19 AWACS mission specialists and four flight crew members.
E-3C Sentry (Sgt. Sean M. Worrell)

maritime detection capability. Nine were built new for USAF, and one of the original E-3As was upgraded.

E-3B is the upgraded earliest version E-3A. Twenty-two production models and two prototypes were produced. Improvements include much-enhanced computer capabilities, jam-resistant communications, austere maritime surveillance capability, additional radio communications, and five additional display consoles.

E-3C is an upgrade to the original 10 US/NATO Standard E-3A aircraft, with additional real-time, terminal, mission control, and radar capabilities. Redeivered 1984.

USAF E-3s are undergoing major sustainability, reliability, and crewman upgrades. Mission system improvements include new passive detection systems, known as Electronic Support Measures, that complement the active beam radar, enhancing the aircraft's ability to detect signals emitted by both hostile and friendly targets. Additional enhancements include upgrade of the Joint Tactical Information Distribution System (JTDIS), jam-resistant communications, increased computer capacity, and GPS capability. Full operational capability on these improvements is expected soon. Radar system improvements will permit AWACS aircraft operating in the pulse-Doppler mode to detect smaller, stealthier targets. IOC for these radar improvements is imminent.

E-8 Joint Stars

Brief: A modified Boeing 707 equipped with a large, canopied radome mounted under the forward part of the fuselage, housing long-range, air-to-ground radar capable of locating, classifying, and tracking vehicles moving on Earth's surface out to distances in excess of 124 miles. Such data are then transmitted via data link to ground stations or other aircraft.

Function: Ground surveillance, BM, C2 aircraft.

Operator: ACC.


Production: 16 (planned).

Inventory: Eight.

Unit Location: Robins AFB, Ga. Contractor: Northrop Grumman.

Power Plant: four Pratt & Whitney TF33-102C turbojets, each 19,200 lb thrust.

Accommodation: Mission crew of 21 Air Force/Army operators (can be augmented to 34).

Dimensions: span 145 ft 9 in, length 152 ft 11 in, height 42 ft 6 in.

Weight: empty 171,000 lb, gross 336,000 lb.

Ceiling: 42,000 ft.

Performance: Mach 0.84, endurance with one in-flight refueling 20 hr.

COMMENTARY

Joint Stars is a Battle Management platform capable of providing theater commanders with excellent, simultaneous near-real-time wide area surveillance as well as downlink of targeting information to air and ground commanders. Joint Stars battle managers, in combination with a robust communications suite, conduct C2 of air operations to engage enemy forces in day, night, and adverse weather conditions. Joint Stars also conducts near-real-time surveillance and reporting for use by air and ground forces. The radar subsystem features multi-mode, side-looking phased-array radar that provides improved Moving Target Indicator (MTI), SAR, and Fixed Target Indicator (FTI) imagery. Joint Stars downlinks via a secure, jam-resistant digital data link. Multiple receivers are in use, predominantly the US Army's Common Ground Station and Joint Services Work Station.

As part of their operational test and evaluation, Joint Stars aircraft flew more than 150 operational missions during Desert Storm (with two E-8A development aircraft) and Joint Endeavor (with one E-8A and one test bed E-8C).

E-8A Prototype version, with specialized equipment installed aboard two specially modified 707-300 airframes. One was converted to an in-flight pilot trainer in 1997, and the second has been placed in long-term storage.

E-8C Production version, based on former commercial 707-300 airframes. Equipped with 18 operations-and-control consoles, two of which serve as communications stations. The first E-8C flew in March 1994 and served as the preproduction test bed. The last six production aircraft will have more advanced computer systems, which will be retrofitted on the 10 earlier aircraft.

OC-135 Open Skies

Brief: A modified C-135 aircraft that flies unarmed observation and verification flights over nations that are parties to the 1992 Open Skies Treaty.

Function: Reconnaissance aircraft.

Operator: ACC.

First Flight: June 1993.

Delivered: October 1993.

IOC: October 1993.

Production: Three.

Inventory: Two.

Unit Location: Offutt AFB, Neb.

Contractor: Boeing.

Power Plant: four Pratt & Whitney TF33-P-5 turbofans, each 16,050 lb thrust.

Accommodation: Seating for 38.

Dimensions: span 131 ft, length 135 ft, height 42 ft.

Weight: gross 297,000 lb.

Ceiling: 35,000 ft (basic C-135).

Performance: Speed: 500 mph, unrefueled range 3,900 miles.

COMMENTARY

A modified version of the WC-135, used for specialized reconnaissance with an infrared linescanner, Synthetic Aperture Radar, and forward- and vertical-looking video cameras, to monitor the 1992 Open Skies Treaty.

RC-135

Brief: A modified C-135 aircraft that flies unarmed observation and verification flights over nations that are parties to the 1992 Open Skies Treaty.

Function: Reconnaissance aircraft.

Operator: ACC.

First Flight: June 1993.

Delivered: October 1993.

IOC: October 1993.

Production: Three.

Inventory: Two.

Unit Location: Offutt AFB, Neb.

Contractor: Boeing.

Power Plant: four Pratt & Whitney TF33-P-5 turbofans, each 16,050 lb thrust.

Accommodation: Seating for 38.

Dimensions: span 131 ft, length 135 ft, height 42 ft.

Weight: gross 297,000 lb.

Ceiling: 35,000 ft (basic C-135).

Performance: Speed: 500 mph, unrefueled range 3,900 miles.

COMMENTARY

A modified version of the WC-135, used for specialized reconnaissance with an infrared linescanner, Synthetic Aperture Radar, and forward- and vertical-looking video cameras, to monitor the 1992 Open Skies Treaty.

RC-135B Cobra Ball


Function: Reconnaissance aircraft.

Operator: ACC.


Delivered: November 1996–present. IOC: TBD.

Production: 12 systems planned (system typically consists of four aircraft, one ground control station, and one Trojan Spirit II satellite communications suite). Sixty vehicles total ordered.

Inventory: Eight systems.

Unit Location: Indian Springs AFAF, Nev.

Contractor: General Atomics.

Power Plant: one Rotax 914 engine.

Accommodation: Unmanned system.

Dimensions: length 27 ft, height 6 ft 9 in, span 48 ft 8 in.

RQ-1A Predator


Function: Unmanned reconnaissance aircraft.

Operator: ACC.


Delivered: November 1996–present. IOC: TBD.

Production: 12 systems planned (system typically consists of four aircraft, one ground control station, and one Trojan Spirit II satellite communications suite). Sixty vehicles total ordered.

Inventory: Eight systems.

Unit Location: Indian Springs AFAF, Nev.

Contractor: General Atomics.

Power Plant: one Rotax 914 engine.

Accommodation: Unmanned system.

Dimensions: length 27 ft, height 6 ft 9 in, span 48 ft 8 in.

RC-135 (Predator) (USAF photo)
U-2 Dragon Lady (SSgt. Sean M. Worrell)  

430 mph; range more than 4,500 miles; max endurance 14 hr.

**COMMENTARY**

The U-2 is the Air Force’s premier high-altitude reconnaissance aircraft and the only unmanned system capable of carrying Imint and Sigint sensors simultaneously. The current generation of imaging (SAR, EO camera) and signals intelligence (Sigint) aircraft, four U-2ST trainers) in the inventory, having completed conversion to S model configuration with the new GE F118 engine, incorporating significant improvements in reliability and performance over the U-2R. The Air Force accepted the first U-2S in October 1994.

**WC-130 Hercules**  

A four-engine, swept-wing, long-range, high-altitude airplane providing a modern, highly survivable, C4I platform allowing the National Command Authority to direct US forces, execute emergency war orders, and coordinate actions by civil authorities.

**Operator:** ACC.  

**First Flight:** June 13, 1973 (E-4A); June 10, 1978 (E-4B).  

**Delivered:** December 1974–85.  

**IOC:** December 1974 (E-4A); January 1980 (E-4B).  

**Inventory:** four.  

**Unit Location:** Offutt AFB, Neb.  

**Function:** E-4 aircraft are used to execute the National Airborne Operations Center (NAOC), previously the National Emergency Airborne Command Post (NEACP), mission. The E-4B fleet provides a survivable C4I platform capable of supporting the National Command Authority throughout the full threat spectrum, including sustained operations in a nuclear environment.

**Dimensions:** span 195 ft 8 in, length 231 ft 4 in, height 63 ft 5 in.  

**Weight:** gross 800,000 lb.  

**Performance:** unrefueled endurance in excess of 12 hr; with aerial refueling up to 72 hr.

**COMMENTARY**

E-4 aircraft are used to execute the National Airborne Operations Center (NAOC), previously the National Emergency Airborne Command Post (NEACP), mission. The E-4B fleet provides a survivable C4I platform capable of supporting the National Command Authority throughout the full threat spectrum, including sustained operations in a nuclear environment.

**U-2 Dragon Lady**  

Brief: A high-altitude, long-range, long-endurance unmanned aerial vehicle.  

Function: Unmanned reconnaissance aircraft.

**Operator:** ACC.  

**First Flight:** Feb. 28, 1998.  

**Delivered:** five.  

**IOC:** 2003 (anticipated).  

**Production:** MSLR/HRP decision expected in FY91.  

**Inventory:** TBD.  

**Unit Location:** Beale AFB, Calif.  

**Contractor:** Northrop Grumman.  

**Power Plant:** four Allison T56-A-15 turboprops, each 52,500 lb thrust.

**Dimensions:** length 116 ft 2 in., height 33 ft 11 in, span 111 ft 6 in.  

**Weight:** empty 9,200 lb, gross 25,600 lb.  

**Ceiling:** 67,300 ft.  

**Performance:** design goals incl endurance of up to 40 hr at a cruise speed of 400 mph and at an altitude of 65,000 ft. This would allow loiter on station 3,450 miles from base for 24 hr.

**COMMENTARY**

A high-altitude endurance UAV carrying a 2,000 lb payload, incorporating EO/IR and SAR sensors that people watching among radar, IR, and visible wave-lengths as required. Objective system will add signals intelligence (Sigint) and improved Moving Target Indicator (MTI) capability. Navigation is GPS/INS. Global Hawk flies autonomously from takeoff to landing, providing near-real-time imagery products for tactical and theater commanders. Vehicle ground track and mission plan can be updated in real time to respond to changing air traffic control needs and/or mission collection needs. Global Hawk No. 2 crashed March 29, 1999. Vehicle No. 3 was damaged Dec. 6, 1999, after a test flight. Vehicle No. 1 resumed test flights March 11, 2000, after a precautionary standoff.

Global Hawk completed its advanced concept technology demonstration on June 30, 2000. It completed 58 flights, flew in excess of 66,000 ft altitude and 31 hours endurance, accumulating more than 700 hours total flight time. Global Hawk participated in several joint exercises, to include flying over Alaska and completing the first transoceanic crossing to Portugal and back.

A joint utility assessment completed in September 2000 found that the system demonstrated military utility and should be expeditiously fielded. The Air Force is currently evaluating options to field operational Global Hawks, with upgraded sensor capabilities, following a positive acquisition decision in FY01. Projected Primary Aircraft Inventory (PAI) is 16 imaging intelligence (Imint) and 12 Sigint aircraft. Total buy TBD.

**U-2 Dragon Lady**  

Brief: Single-seat, single-engine, high-altitude reconnaissance aircraft carrying a wide variety of sensors and cameras, providing continuous day or night, high-altitude, all-weather area surveillance in direct support of US forces.

**Function:** High-altitude reconnaissance.  

**Operator:** ACC.  

**First Flight:** August 1955 (U-2); 1967 (U-2R); October 1994 (U-2S).

**Delivered:** 1955–October 1989.  

**IOC:** circa 1956.  

**Production:** 35 (U-2S/ST).

**Inventory:** 35.

**Unit Location:** Beale AFB, Calif.  

**Contractor:** Lockheed.  

**Power Plant:** four Allison T56-A-15 turboprops, each 52,500 lb thrust.

**Accommodation:** one (two for trainer).

**Dimensions:** span 103 ft, length 63 ft, height 16 ft.  

**Weight:** gross 40,000 lb, empty 15,200 lb.  

**Ceiling:** above 70,000 ft.  

**Performance:** cruise speed up to 800 mph, continuous coverage on station with multiple air vehicles and relief on station, 460 miles from base at altitude of 25,000 ft, endurance 40 hr.

**COMMENTARY**

USAF has two Predator squadrons, the 11th and 13th RS. Both squadrons support operational deployment of MQ-1 and MQ-9 Predators, which conduct mission qualification training. The system demonstrated its operational capability during surveillance missions over Bosnia and Iraq by providing near-real-time video data to the ground control station. System upgrades are under way to expand capability. Armed Predator tests have been undertaken to assess its potential for the attack mission. USAF is also contemplating an air-to-air role.

**Special Duty Aircraft**

E-4B National Airborne Operations Center  

Brief: A four-engine, swept-wing, long-range, high-altitude airplane providing a modern, highly survivable, C4I platform allowing the National Command Authority to direct US forces, execute emergency war orders, and coordinate actions by civil authorities.

**Operator:** ACC.  

**First Flight:** June 13, 1973 (E-4A); June 10, 1978 (E-4B).  

**Delivered:** December 1974–85.  

**IOC:** December 1974 (E-4A); January 1980 (E-4B).  

**Inventory:** four.  

**Unit Location:** Offutt AFB, Neb.  

**Function:** E-4 aircraft are used to execute the National Airborne Operations Center (NAOC), previously the National Emergency Airborne Command Post (NEACP), mission. The E-4B fleet provides a survivable C4I platform capable of supporting the National Command Authority throughout the full threat spectrum, including sustained operations in a nuclear environment.

A militarized version of the Boeing 747-200, the first B model was delivered to the Air Force in January 1980. Four were produced, of which three were converted E-4As. The first operational mission was flown in March 1980. They are hardened against the effects of nuclear explosions, including electromagnetic pulse, and have in-flight refueling capability. A 1,200-kVA electrical system supports advanced system electronics as well as state-of-the-art communications and data processing equipment such as Extremely High Frequency (EHF) Military satellite terminals and six-channel International Maritime Satellite (INMARSAT). A triband radome also houses the E-4B’s Super High Frequency (SHF) Frequency Demand Multiple Access (FDMA) communications antenna, the only such system on an aircraft allowing the National Command Authority to relay communications to and from its aircraft at any time during any type of mission.

The E-4B system is capable of linking with commercial telephone and radio networks and could be used for radio broadcasts to the general population. E-4Bs also support the Federal Emergency Management Agency (FEMA).

In early 2000, the E-4B entered the EMD phase of a modernization program aimed at updating the electronic infrastructure supporting the aircraft’s primary mission equipment and increasing the bandwidth of external communications and onboard data transfer. These updates, along with programmed changes to the aircraft’s interior configuration, internal noise reduction modifications, Battle Management improvements, and Global Air Transport Management (GATM) avionics modifications, will ensure the E-4B aircraft can effectively execute its NAOC and FEMA missions for the foreseeable future.
EC-18
Brief: A heavily modified Boeing 707 used as a flexible airborne telemetry and other data recording and retransmission station in tests of aircraft, spacecraft, and missiles.
Function: Electronic surveillance.
First Flight: January 1986.
Delivered: January 1986.
IOC: January 1986.
Production: six.
Inventory: three.
Unit Location: Edwards AFB, Calif.
Contractor: Boeing.
Power Plant: four Pratt & Whitney TF33 turbfans, each 18,000 lb thrust.
Accommodation: 16–24 in EC-18B.
Dimensions: span 145 ft 9 in, length 152 ft 11 in, height 42 ft 5 in.
Weight: gross 326,000 lb.
Ceiling: 42,000 ft.
Performance: max cruise speed 470 mph, range 7,610 miles.

**COMMENTARY**

EC-18

EC-130E Commando Solo

ANG uses this version as a broadcasting station for psychological warfare operations. Specialized modifications include enhanced navigation systems, self-protection equipment, and worldwide color television configuration. Commando Solo aircraft have been used in numerous military operations. They also have a role in civil emergencies. Secondary mission is electronic attack in the military frequency spectrum.

**EC-130 Commando Solo**

Four specialist versions of the latest C-130 aircraft ordered. First expected to enter operational service mid-2001 with the 193rd Special Operations Wing (ANG), Harrisburg.

**EC-130H Compass Call**

Brief: A heavily modified C-130 for electronic combat.
Function: Electronic warfare.
Operator: ACC.
First Flight: 1981.
IOC: 1983.
Production: (converted).
Inventory: 14.
Unit Location: Davis–Monthan AFB, Ariz.

**Dimensions:** span 132 ft 7 in, length 100 ft 6 in, height 38 ft 3 in.
**Weight:** 155,000 lb.
**Ceiling:** 20,000 ft.
**Performance:** max cruise speed 374 mph at 20,000 ft.

**COMMENTARY**

A variant used as an airborne communications jamming and information warfare platform. It played a vital role in disrupting Iraqi military communications at strategic and tactical levels during the Persian Gulf War and has since been deployed to the Balkans and Southwest Asia.

**EC-135J**

Brief: Modified KC-135 tanker aircraft extensively equipped with sophisticated communications equipment.
Function: In support of national command and control; other aircraft used for telemetry and voice relay.
Operator: AFMC.
First Flight: not available.
Delivered: not available.
Production: (converted).
Inventory: three.
Unit Location: Edwards AFB, Calif.
Contractor: Boeing.

**Power Plant:** (EC-135C) four Pratt & Whitney TF33-P-9 turbfans, each 18,000 lb thrust.

**Accommodation:** flight crew of four, plus various specialists.

**Dimensions:** span 130 ft 10 in, length 136 ft 3 in, height 38 ft 4 in.
**Weight:** 430,000 lb.
**Ceiling:** (ARIA) 33,000 ft.
**Performance:** (ARIA) max cruise speed 490 mph, operational radius 575 miles.

**COMMENTARY**

Several KC-135A tankers were modified for use as command control posts during the 1960s.

**EC-135A/GL** were operated by SAC; EC-135B were operated by STRATCOM.

**EC-135C**

A heavily modified Boeing 707 used as a flexible airborne telemetry and other data recording and retransmission station in tests of aircraft, spacecraft, and missiles.
Function: Electronic surveillance.
First Flight: January 1986.
Delivered: January 1986.
IOC: January 1986.
Production: six.
Inventory: three.
Unit Location: Edwards AFB, Calif.
Contractor: Boeing.
Power Plant: four Pratt & Whitney TF33 turbfans, each 18,000 lb thrust.
Accommodation: 16–24 in EC-18B.

**Dimensions:** span 145 ft 9 in, length 152 ft 11 in, height 42 ft 5 in.
**Weight:** gross 326,000 lb.
**Ceiling:** 42,000 ft.
**Performance:** max cruise speed 470 mph, range 7,610 miles.

**COMMENTARY**

EC-18

EC-130E ABCCC is an Airborne Battlefield Command and Control Center. Seven aircraft were updated by Unisys to ABCCC III standard. The advanced JTIDS receives data transmitted by AWACS aircraft and other systems, enabling the crew to see a real-time picture of air operations over a combat area. EC-130s have been deployed in support of NATO operations.

**EC-130E Commando Solo**

ANG uses this version as a broadcasting station for psychological warfare operations. Specialized modifications include enhanced navigation systems, self-protection equipment, and worldwide color television configuration. Commando Solo aircraft have been used in numerous military operations. Secondary mission is electronic attack in the military frequency spectrum.

**EC-130 Commando Solo**

Four specialist versions of the latest C-130 aircraft ordered. First expected to enter operational service mid-2001 with the 193rd Special Operations Wing (ANG), Harrisburg.

**EC-130H Compass Call**

Brief: A heavily modified C-130 for electronic combat.
Function: Electronic warfare.
Operator: ACC.
First Flight: 1981.
IOC: 1983.
Production: (converted).
Inventory: 14.
Unit Location: Davis–Monthan AFB, Ariz.

**Dimensions:** span 132 ft 7 in, length 100 ft 6 in, height 38 ft 3 in.
**Weight:** 155,000 lb.
**Ceiling:** 20,000 ft.
**Performance:** max cruise speed 374 mph at 20,000 ft.

**COMMENTARY**

A variant used as an airborne communications jamming and information warfare platform. It played a vital role in disrupting Iraqi military communications at strategic and tactical levels during the Persian Gulf War and has since been deployed to the Balkans and Southwest Asia.

**EC-135J**

Brief: Modified KC-135 tanker aircraft extensively equipped with sophisticated communications equipment.
Function: In support of national command and control; other aircraft used for telemetry and voice relay.
Operator: AFMC.
First Flight: not available.
Delivered: not available.
Production: (converted).
Inventory: three.
Unit Location: Edwards AFB, Calif.
Contractor: Boeing.

**Power Plant:** (EC-135C) four Pratt & Whitney TF33-P-9 turbfans, each 18,000 lb thrust.

**Accommodation:** flight crew of four, plus various specialists.

**Dimensions:** span 130 ft 10 in, length 136 ft 3 in, height 38 ft 4 in.
**Weight:** 430,000 lb.
**Ceiling:** (ARIA) 33,000 ft.
**Performance:** (ARIA) max cruise speed 490 mph, operational radius 575 miles.

**COMMENTARY**

Several KC-135A tankers were modified for use as command control posts during the 1960s.

**EC-135A/GL** were operated by SAC; EC-135B were operated by STRATCOM.

**EC-135C**

Aircraft, known as Looking Glass, supported STRATCOM’s airborne National Command Post mission, as well as other command-and-control missions. Delivered as KC-135B, they were redesignated in 1964 to reflect their role. Continuous airborne alert status ended July 24, 1990, and all retired by September 1998 as the USN’s E-6B aircraft took over the NCP mission.

**EC-135E ARIA**

The last E model, which functioned as a telemetry data recording and relay station to supplement land and marine telemetry stations that support DOD and NASA space and missile programs, was retired in November 2000. Specialized equipment included an airborne steerable antenna housed in a bulbous nose, a probe antenna on each wingtip, and a trailing wire antenna on the bottom of the fuselage. The cargo compartment was modified to include all of the instrumentation subsystems installed as a 30,000-lb modular package.
KC-135 Stratotanker

Brief: A short-to-medium-range tanker aircraft, meeting the air refueling needs of USAF bomber, fighter, cargo, and reconnaissance forces. It also supports US Navy, Marine Corps, and allied aircraft.

Function: Aerial refueling/airlift.


Dimensions: Span 132 ft 9 in, length 247 ft 10 in, height 65 ft 1 in.

Weight: Gross 382,500 lb, max fuel 110,015 lb.

Performance: Maximum speed at 33,000 ft 692 mph, at 41,000 ft 587 mph, max range 5,500 miles, max combat radius 2,300 miles.

Armament: Four 20 mm M61A1s, plus four 7.62 mm M61D machine guns.

KC-135R Stratotanker (Ted Carlson)

that will significantly improve systems reliability and maintainability. The entire fleet will be fitted with improved cockpit and navigation suites, including color weather radar, and integrated INS/GPS. Reduced vertical separation minima and GAMM upgrades are also planned for the entire fleet. Some KC-135Rs have been fitted with wing-mounted hose-and-drogue refueling pods to increase capability.

Because it has both types of tanker refueling equipment installed, the KC-10A can service USAF, USN, USMC, and other allied aircraft on the same mission. Special lighting permits night operations.

MC-130P Combat Shadow

Brief: Aircraft that flies clandestine or low-visibility, low-level missions into denied areas to provide air refueling for Special Operations Forces (SOF) helicopters or to air-drop small special operations teams, small bundles, and joystick and combat rubber raiding craft.

Function: Air refueling for SOF helicopters/airdrop.

Power Plant: Four Allison T56-A-15 turboprops, each 41,000 lb thrust.

Dimensions: Span 132 ft 7 in, length 98 ft 9 in, height 38 ft 4 in.

Weight: Empty 119,231 lb, gross 322,500 lb (KC-135R/T), 222,224 lb (KC-135E).

Performance: Maximum speed at 34,000 ft with a 605,000-lb load.

Armament: Four 20 mm M61A1s, plus four 7.62 mm M61D machine guns.

KC-135 Galaxy

Brief: A heavy-lift, air refuelable cargo transport for massive strategic airlift over long ranges, including outsize cargo. Supports special operations missions.

Function: Cargo and troop transport.

Power Plant: For the Boeing KC-135R/T, four TF33-PW-102 turbofans, each 18,000 lb thrust. For the KC-135E, four CFM56 turbofans. They embody modifications to 25 KC-135Is.

Dimensions: Span 222 ft 9 in, length 247 ft 10 in, height 65 ft 1 in.

Weight: Empty 374,000 lb, gross 769,000 (wartime 840,000) lb.

Performance: Max speed at 25,000 ft 571 mph, at 35,750 ft 475 mph, T-O weight at S/L 3,800 lb, max payload 2,070,000 lb, max range 6,649 miles.

Armament: None.

KC-46A

Brief: A heavy-lift, air refuelable cargo transport for massive strategic airlift over long ranges, including outsize cargo. Supports special operations missions.

Function: Cargo and troop transport.

Power Plant: For the Boeing KC-135R/T, four TF33-PW-102 turbofans, each 18,000 lb thrust. For the KC-135E, four CFM56 turbofans. They embody modifications to 25 KC-135Is.

Dimensions: Span 222 ft 9 in, length 247 ft 10 in, height 65 ft 1 in.

Weight: Empty 374,000 lb, gross 769,000 (wartime 840,000) lb.

Performance: Max speed at 25,000 ft 571 mph, at 35,750 ft 475 mph, T-O weight at S/L 3,800 lb, max payload 2,070,000 lb, max range 6,649 miles.

Armament: None.

C-5A

Brief: A heavy-lift, air refuelable cargo transport for massive strategic airlift over long ranges, including outsize cargo. Supports special operations missions.

Function: Cargo and troop transport.

Power Plant: Four TF33-PW-102 turbofans, each 18,000 lb thrust.

Dimensions: Span 222 ft 9 in, length 247 ft 10 in, height 65 ft 1 in.

Weight: Empty 374,000 lb, gross 769,000 (wartime 840,000) lb.

Performance: Max speed at 25,000 ft 571 mph, at 35,750 ft 475 mph, T-O weight at S/L 3,800 lb, max payload 2,070,000 lb, max range 6,649 miles.

Armament: None.

C-5B

Brief: A heavy-lift, air refuelable cargo transport for massive strategic airlift over long ranges, including outsize cargo. Supports special operations missions.

Function: Cargo and troop transport.

Power Plant: Four TF33-PW-102 turbofans, each 18,000 lb thrust.

Dimensions: Span 222 ft 9 in, length 247 ft 10 in, height 65 ft 1 in.

Weight: Empty 374,000 lb, gross 769,000 (wartime 840,000) lb.

Performance: Max speed at 25,000 ft 571 mph, at 35,750 ft 475 mph, T-O weight at S/L 3,800 lb, max payload 2,070,000 lb, max range 6,649 miles.

Armament: None.
Outsize Cargo into Tuzla AB.

Pit, with two full-time, all-function HUDs and four multi-digital fly-by-wire control system and two-person cockpit. A number of C-5s have been equipped to a state-of-the-art cockpit and ensure global advanced medical facilities. Primary strategic special medical evacuation mission. A modified version of the DC-9, it is the only USAF aircraft specifically designed for the movement of litter and ambulatory patients. A modified version of the DC-9, it is the only USAF aircraft specifically designed for the movement of litter and ambulatory patients. A modified version of the DC-9, it is the only USAF aircraft specifically designed for the movement of litter and ambulatory patients. A modified version of the DC-9, it is the only USAF aircraft specifically designed for the movement of litter and ambulatory patients. A modified version of the DC-9, it is the only USAF aircraft specifically designed for the movement of litter and ambulatory patients. 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Function: C-707, C-141, and C-130J.

 Commentary: C-141B is a C-141 modified with computerized glass-cockpit instrumentation and digital flight management system, with integrated GPS data for navigation and modern navigation safety equipment. The first version, which rolled out at Warner Robins ALC, Ga, on Oct. 1, 1997, was assigned to AFRC’s 452nd Air Mobility Wing, March ARB, Calif. Sixty-three of these glass-cockpit transports are slated for ANG and AFRC.

C-17 Globemaster III (Tsigt. Cary Humphries)


Inventory: five. Unit Location: Edwards AFB, Calif., Hickam AFB, Hawaii. Contractor: Boeing. Power Plant: Four Pratt & Whitney TF33-P-7 turbofans, each 18,000 lb thrust. Accommodation: C-135B: 60 passengers. C-135C: 80 passengers, compact: 130 ft 10 in, length 134 ft 6 in, height 38 ft 7 in. Weights (C-135B): operating weight empty 102,300 lb, 99,275 lb, gross 275,500 lb. Ceiling: 50,000 ft. Performance (C-135B): max speed 600 mph, range with 452 nd Air Mobil-
C-12D. Similar to C model and also deployed to overseas embassies.

C-12F. With uprated PT6A-42 engines, can support medical airlift.

C-12J. A military version of the larger Beechcraft Model 1900, operated by PACAF.

C-20 Gulfstream
Brief: A twin-engine turbofan aircraft acquired to provide airlift for high-ranking government and DOD officials.

Function: Operational support airlift; special air missions.

Operator: AMC, USAFE.

First Flight: December 1979.


Production: not available

Inventory: 13.

Unit Location: Andrews AFB, Md., Ramstein AB, Germany.

Contractor: Gulfstream.

Power Plant: C-20A/B: two Rolls Royce–Spey MK511-8 turbofans, each 11,400 lb thrust; C-20H: two Rolls Royce–Tay MK661-8 turbofans, each 13,850 lb thrust.

Accommodation: crew of five; 12 passengers.

Dimensions: span 77 ft 11 in, length 83 ft 1 in, height 24 ft 4 in.

Weight: C-20A/B gross 68,200 lb; C-20H gross 74,600 lb.

Ceiling: 45,000 ft.

Performance: max cruising speed 561 mph, range 4,050 miles.

COMMENTARY C-20A. Three Gulfstream III transports were acquired to replace aging C-140B aircraft. They provide USAF’s Operational Support Airlift fleet with intercontinental range and ability to operate from short runways.

C-20B. Seven C-20B versions, with advanced mission communications equipment and revised interior, were acquired in the late 1980s. Two C-20B aircraft have been retired.

C-20C. Three special missions aircraft, with hardened strategic communications equipment.

C-20H. Two Gulfstream IV–SP aircraft, with advanced technology flight management systems and upgraded Rolls Royce engines, were acquired by USAF to meet expanding special air mission requirements.

C-21 Brief: Aircraft designed to provide cargo and passenger airlift and transport lifters during medical evacuations.

Function: Pilot seasoning, passenger and cargo airlift.

Operator: AETC, AMC, PACAF, USAFE, ANG.


Production: 84.

Inventory: 78.

Unit Location: Andrews AFB, Md., Keessler AFB, Miss., Langley AFB, Va., Maxwell AFB, Ala., Offutt AFB, Neb., Peterson AFB, Colo., Ramstein AB, Germany, Randolph AFB, Tex., Scott AFB, Ill., Stuttgart, Germany, Wright-Patterson AFB, Ohio, Yokota AB, Japan.

Contractor: Raytheon.

Power Plant: two AlliedSignal TFE731-2 turbofans, each 3,500 lb thrust.

Accommodation: crew of two and up to eight passengers or 3,153 lb cargo. Convertible to aeromedical evacuation configuration.

Dimensions: span 39 ft 6 in, length 48 ft 7 in, height 12 ft 5 in.

Weight: empty, equipped 10,119 lb, gross 18,300 lb.

Ceiling: 45,000 ft.

Performance: max level speed at 25,000 ft, 542 mph, range with max passenger load 2,420 miles, with max cargo load 1,653 miles.

COMMENTARY
C-21A aircraft provide operational support airlift for time-sensitive movement of people and cargo throughout the US and the Pacific and European theaters, including aeromedical missions if required.

C-22 Brief: A Boeing 727-100 used by the Air National Guard as its primary medium-range aircraft for airlift of personnel.

Function: Passenger transportation.

Operator: ANG.

First Flight: February 1963 (commercial).


Inventory: three.

Unit Location: Andrews AFB, Md.

Contractor: Boeing.

Power Plant: three JT9D-7 turbofans, each 14,000 lb thrust.

Accommodation: flight crew of four, plus three or four cabin crew; up to 89 passengers.

Dimensions: span 108 ft, length 133 ft 2 in, height 34 ft.

Weight: gross 170,000 lb.

Ceiling: 37,400 ft.

Performance: max speed 630 mph, range 2,000 miles, 5.5 hr endurance.

C-22B. Boeing 727 commercial transports purchased and modified as C-22Bs for use by ANG on operational support airlift missions. Two were further modified to accommodate an additional 1,100 gallons of fuel and landing gear rated for 170,000 lb gross landing weight.

C-26 Brief: A modified commuter transport aircraft.

Function: Transport, medevac, and counterdrug.

Operator: ANG.

First Flight: not available

Delivered: March 1989–present.


Production: not available

Inventory: 12 (C-26B, UC-26C).

Unit Location: various ANG units.

Contractor: Fairchild.

Power Plant: two AlliedSignal TPE331-11U-612 turboprops, each 1,100 shp (C-26A); TPE331-12AAR-701G, each 1,119 shp (C-26B); or TPE331-3U-303G, each 845 shp (UC-26C).

Accommodation: crew of two; 14–22 passengers.

Dimensions: (UC-26C) span 57 ft, length 59 ft 4 in, height 16 ft 8 in.

Weight: (UC-26C) gross 12,500 lb.

Ceiling: (UC-26C) 30,000 ft.

Performance: max cruising speed at midcruise weight of 12,500 lb 321 mph, range with 19 passengers 1,224 miles.

AIMC
C-26A. USAF acquired 13 Fairchild Metro III commuter transport aircraft, under the designation C-26A, to replace ANG C-131s. C-26As serving in the ANG Operational Support Transport Aircraft (ANGOSTA) role have a quick-change interior, enabling passenger seats to be replaced by a medevac or cargo-carrying configuration.

C-26B. Two C-26Bs, modified Fairchild Metro 23s, have FLIR, TCAS II, GPS, and microwave landing systems.

UC-26C. A modified Fairchild Merlin IVC, used for counterdrug operations.

C-32 Brief: A modified Boeing 757-200 used to provide transportation for the vice president, cabinet, Congress- nal members, and other high-ranking US and foreign officials.

Function: VIP air transport.

Operator: AMC.


Production: four.

Inventory: four.

Unit Location: Andrews AFB, Md.

Contractor: Boeing.

Power Plant: two Pratt & Whitney PW2040 turbofans, each 41,700 lb thrust.

Accommodation: 16 crew and 45 passengers.

Dimensions: span 124 ft 10 in, length 155 ft 3 in, height 46 ft 6 in.

Weight: empty, 127,800 lb, gross 255,000 lb.

Performance: cruise speed Mach 0.8–0.86; cruise altitude 41,000 ft.

C-37A Brief: A modified Gulfstream V utilized as part of the executive fleet, providing transportation for the vice president, cabinet, Congressional members, Secretary of Defense, service secretaries, and other prominent US and foreign officials.

Function: VIP air transport.

Operator: AMC.


Production: three.

Inventory: three.

Unit Location: Andrews AFB, Md.

Contractor: Gulfstream.


Accommodation: five crew and 12 passengers.

Dimensions: span 93 ft 6 in, length 96 ft 6 in, height 25 ft 10 in.

Weight: empty, 47,601 lb, gross 90,500 lb.

Performance: cruise speed Mach 0.8, cruise altitude up to 51,000 ft.

C-37A Brief: Along with the C-32s, are replacements for the VC-137B/C aircraft. They can conduct simultaneous diplomatic missions with secure communica tions. Capable of operations at any suitable civilian or military airfield in the world. The third C-37 is a VIP support airlift aircraft based in the European Theater as a pooled aircraft.

C-38A Brief: A twin-engine transcontinental aircraft used to provide transportation for DVS, such as Congressional or high-ranking military commanders. It can also be configured for medevac and cargo use.

Function: VIP air transport and operational support.

Operator: ANG.


Production: two.

Inventory: two.

Unit Location: Andrews AFB, Md.

Contractor: Tracor (Israel Aircraft Industries Ltd).

Power Plant: two AlliedSignal TFE731-40R-200G, each 2,250 lb thrust.

Accommodation: typically two crew and eight passengers. In medevac role: two Spectrum 500 Life Support Units and two medical attendants. All seats removable for cargo.

Dimensions: span 54 ft 7 in, length 55 ft 7 in, height 18 ft 2 in.

Weight: gross, 24,400 lb.

Performance: cruise speed Mach 0.87, cruise altitude 33,000 ft.

C-20 Gulfstream (Ted Carlson)
produced by IAI and supported worldwide by Galaxy Aerospace. Two aircraft are operated by ANG’s 201st AS replacing Learjet C-21As. The contract includes an option for two additional aircraft.

**C-130 Hercules**

**Brief:** A rugged aircraft capable of operating from rough dirt strips to provide theater airlift and paratrooping of troops and equipment into hostile areas.

**Function:** Inter- and intrairlift airlift.

**Operator:** AETC, AFMC, AMC, PACAF, USAFE, ANG, AFRC.

**First Flight:** circa 1954 (C-130A); 1955 (C-130B) four Rolls-Royce Dart 825 turboprops. The first four C-130s were ordered in 1955.

**Accommodation:** (C-130H) 132 passengers on palletized seating, or up to 100 troops, 64 paratroops, 74 litter patients plus attendants. (C-130J) 152 passengers or 124 troops, or 8,000 lb cargo.

**Performance:**
- **Range:** with 40,000-lb payload 2,240 miles.
- **T-O run:** 3,585 ft, landing run (at 130,000 lb) 1,700 ft, height 2,170 ft.
- **Climb:** 450 fpm to 25,000 ft.
- **Cruise:** 300,000 fpm.
- **Takeoff weight:** 300,000 lb.
- **Weight:** C-130H empty 81,000 lb, fuel/cargo mass gross 155,000 lb.
- **Ceiling:** 50,000 ft at 100,000 lb.
- **Performance:** (C-130H) max cruising speed 385 mph, T-O run 3,585 ft, landing run (at 130,000 lb) 1,700 ft, range 2,240 miles, payload 2,240 miles.

**COMMENTARY**

First flown 44 years ago, the C-130 Hercules transports continue in production and has been delivered to more than 60 countries. Basic and specialized versions operate throughout USAF, performing diverse roles in both peace and war situations, including airlift support, Arctic ice cap resupply, aeromedical missions, aerial spray missions, fire-fighting duties for the US Forest Service, and natural disaster and humanitarian relief missions.

**C-130A, B, and D.** Early versions, now retired. The initial production C-130A had four Allison T36-A-11 or -9 turboprop engines. USAF ordered a total of 219. The C-130B had improved range and higher weights and introduced Allison T56-A-7 turboprop engines. 134 were produced, with delivery beginning in November 1958. Twelve were modified beginning 1961 as JC-130Bs for air-refuel and satellite recovery stops together with three early H models. Twelve C-130Ds were modified as for Arctic operations.

**C-130E** is an extended-range development of the C-130B, with large under-wing fuel tanks; 389 were ordered, with deliveries beginning in April 1962. A wing modification to correct fatigue and corrosion has extended the life of the aircraft well into this century. Other modifications include a self-contained navigation system, with an integrated communications/navigation management suite, GPS capability, and a state-of-the-art autopilot that incorporates a ground collision avoidance system. ANG C-130Es are used in fire-fighting missions.

**C-130J** is generally similar to the E model but has updated turboprops, a redesigned outer wing, and improved pneumatic systems; delivery began in July 1994. Subsequent improvements include updated avionics, improved low-power color radar, and other minor modifications. Night vision instrument system was introduced from 1993. TCAS II in new aircraft from 1994. ANG’s AFRC C-130Es are used in fire-fighting missions. Specifically modified aircraft are used by AFRC’s 575th AS for aerial spraying, typically to suppress mosquito-spred epidemics. The ANG’s 109th AW, Schenectady County Airport, N.Y., operates 10 LC-130Hs, modified with wheel-skid gear in support of Arctic and Antarctic operations. Two DC-10-10s were modified for USAF control duties.

**Operational**
- **Accommodation:** four (two pilots, two flight engineers), up to 24 troops or 8,000 lb internal cargo.
- **Dimensions:** five 6,200 shp Allison T56-A-10 turboprops, each 6,200 shp.
- **Weight:** empty gross weight, VTO 52,870 lb; STO 58,000 lb.
- **Ceiling:** 50,000 ft.
- **Performance:** swamp weight, VTO 52,870 lb; STO 57,000 lb, self-deploy T-O 60,500 lb.

**MC-130E Combat Talon (Ted Carlson)**

**MC-130E Combat Talon**

**Brief:** A modified C-130 able to provide global, day, night, and adverse weather capability to air-drop personnel and equipment to support US and allied bases or air-carry capable ships. The CV-22’s mission is long-range clandestine penetration of denied areas in adverse weather and low visibility to infiltrate, exfiltrate, and resupply SOF. Capable of air-to-air refueling, its range is limited only by crew endurance.

**CV-22 avionics** include a full integrated precision navigation suite, with GPS and INS; a digital cockpit management system oriented around a 16-inch MFD; a terrain-following/terrain-avoidance (TF/TA) system; and a multifunctional, extensive defensive countermeasures suite. Components of this system include a Radar Warning Receiver (RWR), missile warning system, laser detection system, radar, missile jammer, IR missile jammer, and a countermeasures dispensing system. The communications suite will include secure UHF, VHF (AM and FM), and SATCOM radios.

**The first CV-22 is planned to begin initial operational test and evaluation at Kirtland AFB, N.M., in summer 2002. Initial training capability is scheduled for September 2003 at Kirtland AFB, N.M., and IOC for February 2005 at Hurlburt.**

**MC-130H Combat Talon**

**Brief:** A modified C-130 able to provide global, day, night, and adverse weather capability to air-drop personnel and equipment to support US and allied bases or air-carry capable ships.

**Function:** VIP air transport.

**Opers:** AETC, AFSC/AFRC, AMC.

**First flight:** circa 1965 (E); January 1990 (H).

**Delivered:** initially 1966.

**IOC:** 1966 (E); June 1991 (H).

**Production:** 24 (new-built Hs).

**Unit Location:** (active) and AFRC MC-130s at Duke Field, Fla., Kirtland AFB, N.M., RAF Mildenhall, UK.

**Contractor:** Lockheed Martin.

**Power Plant:** four Allison T56-A-15 turboprops, each 4,508 shp.

**Accommodation:** E: crew of nine; 53 troops or 26 paratroopers; H: crew of seven; 75 troops or 52 paratroopers.

**Dimensions:**
- **Span:** 132 ft 7 in, length 97 ft 9 in, height 38 ft 7 in.
- **Weight:** C-130H empty 81,000 lb, fuel/cargo mass gross 155,000 lb.
- **Ceiling:** 50,000 ft at 100,000 lb.

**Performance:**
- **Max speed:** 367 mph, range 6,000 miles (VC-137C).

**COMMENTARY**

One specially modified Boeing 707 transport is operated by AMC’s 89th Airlift Wing for VIP duties. Other aircraft were replaced by new Boeing 757-200s, designated C-32A, and designated C-37A.

**C-130T** is a specifically configured 707-200 aircraft, acquired by USAF for VIP duties. All modified to B standard.

**C-130T** has a modified C-130T aircraft modified with turbofan engines. All retired.

**C-137A** is a specially configured 707-200 aircraft, acquired by USAF for VIP duties. All modified to B standard.

**C-137T** is a specifically configured 707-200 aircraft, acquired by USAF for VIP duties. All modified to B standard.

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**C-137T** is a specifically configured 707-200 aircraft, acquired by USAF for VIP duties. All modified to B standard.
with NVGs and improved infrared and electronic defensive countermeasures. The 1st, 7th, and 15th SOWSs employ the Combat Talon II, supporting unconventional warfare units from their bases in Japan, Europe, and CONUS, respectively. The 58th SOW at Kirtland AFB, N.M., is responsible for MC-130H mission qualification training.

**VC-25 Air Force One**

Brief: A specially configured Boeing 747-200B used for air transport of the President and his entourage. When the President is aboard, it has the radio call sign "Air Force One."

Function: Air transport of the President.
Operator: AMC.
First Flight: First flown as Air Force One Sept. 6, 1990.
Delivered: August-December 1990.
IOC: circa 1990.
Production: two.
Inventory: two.
Unit Location: Andrews AFB, Md.
Contractor: Boeing.
Power Plant: Four General Electric CF6 turboloids, each 66,700 lb thrust.
Accommodation: crew of 26; up to 76 passengers.
Dimensions: span 195 ft 8 in, length 231 ft 10 in, height 63 ft 5 in.
Weight: empty 7,164 lb, gross 12,093 lb.
Ceiling: 45,000 ft.
Weight: empty (approx) 4,707 lb; gross 6,300 lb.
Performance: max speed at 36,000 ft more than 1,100 mph.

**T-6 Texan II**

Brief: A single-engine turboprop aircraft to be used for training student pilots, navigators, and naval flight officers in fundamentals of aircraft handling and instrument, formation, and night flying.

Function: Primary trainer.
Operator: AETC (USAF), USN.
Delivery: May 2000-present (operational aircraft).
IOC: FY01 (planned).
Production: USAF 454, USN 328 (planned).
Inventory: 18 (as of Nov. 3, 2000).
Unit Location: total planned: USAF: Columbus AFB, Miss.; Laughlin, Randolph, and Sheppard AFBs, Tex.; Moody AFB, Ga.; Vance AFB, Okla.; NAS Pensacola and Whiting, Fla.
Contractor: Raytheon Beech.
Power Plant: one Pratt & Whitney Canada PT6A-68 turboprop, 1,100 shp.
Accommodation: two, in tandem, on zero/zero ejection seats.
Dimensions: span 33 ft 6 in, length 33 ft 4 in, height 10 ft 6 in.
Weight: empty (approx) 4,707 lb; gross 6,300 lb.
Ceiling: 31,000 ft.
Performance: max speed 368 mph.

**COMMENTARY**

The Joint Primary Aircraft Training System (JPATS) T-6A Texan II is based on the Swiss Pilatus PC-9 aircraft, modified to include a strengthened fuselage, upgraded engine, increased fuel capacity, pressurized cockpit, larger, bird-resistant canopy, and new digital avionics. The JPATS will replace USAF’s T-37Bs and USN’s T-34Cs in primary pilot training, as well as supporting undergraduate naval flight officer and USAF navigator training.

**T-37 Tweet**

Brief: A twin-engine jet used for training undergraduate pilots and undergraduate navigator and tactical navigator students in fundamentals of aircraft handling and instrument, navigation, formation, and night flying.

Function: Primary trainer.
Operator: AETC, AFRC.
First Flight: September 1955.
Delivered: from December 1956.
IOC: 1957.
Production: 985.
Inventory: 417.
Unit Location: Columbus AFB, Miss., Laughlin, Randolph, and Sheppard AFBs, Tex., Vance AFB, Okla.
Contractor: Cessna.
Power Plant: two Continental J69-T-25 turbojets, each 1,025 lb thrust.
Accommodation: two, side by side, on ejection seats.
Dimensions: span 33 ft 6 in, length 29 ft 3 in, height 9 ft 2 in.
Weight: empty 3,870 lb, gross 6,625 lb.
Ceiling: 35,000 ft.
Performance: max speed at 25,000 ft 426 mph, range at 360 mph with standard tankage 870 miles.

**COMMENTARY**

USAF’s first purpose-built jet trainer, the T-37 is currently AETC’s standard two-seat primary trainer. A distinctive blue-and-white finish is intended to help formation training and ease maintenance.

**T-37A**, with J69-T-9 turbojets; all have been modified to T-37B standards.

**T-37B**, the original T-37A was superseded in November 1959 by the T-37B, with improved radio navigational equipment, UHF radio, and upgraded instruments. All A-models were later converted to B standard. Kits were subsequently produced to extend the capability of the T-37 by modifying or replacing critical structural components. AETC began replacing the T-37B with the new T-6A Texan II in 2000.

**T-38 Talon**

Brief: A twin-engine, high-altitude, supersonic jet trainer used in a variety of roles, primarily for undergraduate pilot and pilot instructor training.

Function: Trainer.
Operator: ACC, AETC, AFMC, AFRC.
First Flight: April 1959.
IOC: March 1961.
Production: more than 1,100.
Inventory: 509.
Unit Location: Beale and Edwards AFBs, Calif., Columbus AFB, Miss., Eglin AFB, Fla., Holloman AFB, N.M., Laughlin, Randolph, and Sheppard AFBs, Tex., Moody AFB, Ga., Vance AFB, Okla., Whitman AFB, Mo.
Contractor: Northrop.
Accommodation: two, in tandem, on ejection seats.
Dimensions: span 29 ft 3 in, length 46 ft 4 in, height 12 ft 10 in.
Weight: empty 7,164 lb, gross 12,093 lb.
Ceiling: above 55,000 ft.
Performance: max level speed at 36,000 ft more than Mach 1.23 (812 mph), range with reserves, 1,093 miles.

**T-25 Tweet (Ted Carlson)**

With its upgraded engine, pressurized cockpit, and new digital avionics, the T-25A Presidential transports replaced the former private jets. Each 56,700 lb thrust.

**Dimensions:**

- Weight: empty 7,140 miles.
- Span: 33 ft 5 in, length 33 ft 4 in, height 10 ft 6 in.
- Weight: empty (approx) 4,707 lb; gross 6,300 lb.
- Ceiling: 31,000 ft.
- Performance: max speed 368 mph.

**COMMENTARY**

The T-25A has been completed. It is used by the Air Force to train student pilots, navigators, and naval flight officers in fundamentals of aircraft handling and instrument, formation, and night flying.
T-38 Talon (Ted Carlson)

COMMENTARY
Most of the T-38s in service are used by AETC for advanced bomber–fighter training track in JSUPT. Capabilities are being enhanced through an ongoing program of modifications and structural renewal, including a full avionics upgrade and integrated GPS/INS. As a result of the reduction in the T-38’s workload through introduction of the T-1A and JSUPT, the service life of the T-38s should extend well beyond 2020.

T-38A. Close in structure to the F-5A export tactical fighter, the T-38A was the world’s first supersonic trainer aircraft. It is used to teach supersonic techniques, aerobatics, navigation, and instrument flying, and cross-country and low-level navigation. Also used to train test pilots and flight engineers at Edwards AFB, Calif., by AFMC to test experimental equipment, and by ACC to maintain pilot proficiency.

AT-38B. A slightly different version, with a gunseit and rear observer not dispensed, used by AETC for Introduction to Fighter Fundamentals.

T-38C. All T-38A and AT-38B airframes will be re-designated T-38C as a result of the reduction in the T-38A’s workload. The T-38C has a short takeoff and landing version.


COMMENTARY
T-43A. The T-43A was derived from the commercial Boeing Model 737-200 and was equipped with the same onboard avionics as most USAF operational aircraft, including mapping radar, VOR and TACAN radio systems, INS, radar altimeter, all required communications equipment, and celestial navigation capability.

Several T-43s are configured for passengers and provide operational support to assigned commands.


COMMENTARY
TG-11 self-launched, high-performance sailplane has a folding propeller that is stored behind a retractable propeller dome on the aircraft nose during soaring flight. It is used primarily for dual cross-country training, field selection, and advanced sailplane training.


COMMENTARY
T-41s, a military version of the Cessna 172, is an all-metal, strut-braced, high-wing monoplane. It is used also for Aero 456 flight testing, USAFA flying team support, and orientation flights.

Helicopters

**HH-60G Pav Hawk**
Specially modified helicopters used for SAR and support missions.

- **Function:** SOF heavy-lift helicopter.
- **Operator:** AETC, AFSC, PACAF, ANG, AFRC.
- **First Flight:** October 1974.
- **Delivered:** 1982-present.
- **IOC:** circa 1986.
- **Inventory:** 104.

**Unit Location:** Eielson AFB, Alaska, Kules ANGB, Alaska, Moffett Field, Calif.  
**Personnel Locating System (PLS)** that provides range/time data to compatible survivor radios.
- **Program:** HH-60G.
- **ICM:** SOF heavy-lift helicopter.
- **Contractor:** Sikorsky.

**Power Plant:** (1) Two General Electric 7E30-GE-700 turboshafts, each 1,620 shp.
- **Dimensions:** rotor diameter 72 ft 3 in, length of fuselage 64 ft 8 in, height 16 ft 8 in.
- **Weight:** gross 50,000 lb, ceiling: 16,000 ft.
- **Performance:** speed 164 mph, max range 630 miles, unlimited with air refueling.

- **Measurement:** mounts for any combination of three 7.62 mm miniguns and 50 caliber machine guns.

**HH-53J Pave Low III**
Enhanced version of the helicopter upgraded to Pave Low III “Enhanced” standard from 1986.

**Unit Location:** Francis S. Gabreski IAP, N.Y., Kulis ANGB, Alaska, Kadena AB, Japan, Kirtland AFB, N.M., Moody AFB, Ga., NAFS Keflavik, Iceland, Neils FOB, Nev. ANG.
**Commentary:**
A Service Life Extension Program (SLEP) upgraded the aircraft’s hydraulics, wiring, and basic airframe structure for increased gross weight, and an automated blade/pivot fold system optimized for shipboard compatibility. All aircraft modified to support aircrew respiratory protection system.
- ** IOC:** circa 1970.
- **Inventory:** 104.

**Brief:**
Specially outfitted heavy-lift helicopters used for SAR missions.

- **Function:** SOF heavy-lift helicopter.
- **Operator:** AETC, AFSC.
- **First Flight:** March 1967.
- **Delivered:** from July 1987 (MH-53J).
- **IOC:** 1988 (MH-53J).
- **Inventory:** 104.

**MH-53J Pave Low III (MSgt. Val Gempis)**

**Strategic Missiles**

**AGM-86 Air Launched Cruise Missile**

**Brief:**
A small, subsonic, unmanned, winged air vehicle, currently deployed on B-52H aircraft, which can be equipped with either a nuclear or conventional warhead and can be used to help dilute air defenses and complicate an enemy’s air defense task.

- **Function:** Strategic air-to-surface cruise missile.
- **Operator:** ACC.
- **First Flight:** June 1979 (FSD).
- **Delivered:** from 1981.
- **IOC:** December 1982, Griffiss AFB, N.Y.
- **Production:** 1,700+.
- **Inventory:** 1,600.

**Unit Location:** Barksdale AFB, La., Minot AFB, N.D.
**Contractor:** Boeing.
**Power Plant:** Williams/Teledyne CAE F107-WR-10 turbofan, 600 lb thrust.
**Guidance:** AGM-86B: inertial plus Terrain Contour Matching (TERCOM); AGM-86C: inertial plus GPS.
Commentary

AGM-86A. A prototype cruise missile, developed in the mid-1970s. Slightly smaller than the later versions, it introduced a new type of weapon. The AGM-86A, designed to be carried on the B-52H Stratofortress, is a stand-alone, clandestine/punitive strike weapon. It is equipped with a nuclear warhead and designed to evade theater defenses capability against a wide range of electronic countermeasures. The AGM-86A, equipped with a nuclear warhead and designed to evade theater defenses capability against electronic jamming and low-level flight capability enhance the missile’s effectiveness. The last of 1,715 production models was delivered in October 1986.

AGM-86C. A non-nuclear version, developed from 1984, the Conventional Air Launched Cruise Missile (CALCM) was first used operationally during the Persian Gulf War and has since been widely used in combat operations. CALCM provides the warfighter with an adverse weather, day/night, air-to-surface, accuracy, standoff outside theater defenses strike capability, with a range greater than 575 miles and a 3,000-lb class warhead. CALCM is equally effective for stand-alone, clandestine/punitive strikes, and fully integrated theater warfare. Boeing is currently under contract to convert 322 B-52s to conventional configuration, the first of which was delivered November 1999. One hundred thirty-two will feature new Block 1A enhancements with improved accuracy and increased immunity to electronic jamming.

AGM-6D. CALCM penetrator version with a Lockheed Martin AUP-3(M) warhead. The last 50 of the 322 CALCM conversions will be to AGM-6D configuration. The CALCM penetrator will provide the warfighter with a cost-effective, standoff outside theater defenses capability against a wide range of hardened, deeply buried targets. Final delivery is expected late 2001.

AGM-129 Advanced Cruise Missile


Guidance: inertial, with TERCOM update. Warhead: W80-1 nuclear. Dimensions: length 20 ft 10 in, body width 2 ft 3 in, wingspan 10 ft 2 in. Weight: 3,709 lb. Performance: range 1,865 miles. Comment: AGM-129A. Embodied stealth technology, the AGM-129A has improved range, accuracy, survivability, and targeting flexibility, compared with the AGM-66B. Developed by General Dynamics, McDonnell Douglas was certified as second source for this advanced system, which is deployed on B-52H aircraft.

LGM-30 Minuteman


LGM-30A/B. Minuteman I version deployed in the early 1960s. The last Minuteman I missile was removed from its silo at Malmstrom AFB, Mont., in February 1993. USAF had deployed 150 A and 650 B models in 16 launch facilities.

LGM-30F. Minuteman II version incorporated a larger second stage, an improved guidance package, greater range and payload capability, and hardening against the effects of nuclear blast. IOC was reached in October 1965 at Grand Forks AFB, N.D. USAF deployed 450 in nine sites.

LGM-30G. The Minuteman III became operational in June 1970, providing improved range, rapid retargeting, and the capability to place three Multiple Independently Targetable Re-entry Vehicles (MIRVs) on three targets with a high degree of accuracy. USAF initially deployed 550 in 11 squadrons. A single re-entry vehicle configuration has been demonstrated, and several were being worked on in accordance with strategic arms control negotiations. Currently a total of 500 Minuteman IIs are based at Minot AFB, N.D.; F.E. Warren AFB, Wyo.; and Malmstrom AFB.

An extensive life extension program is ensuring Minuteman’s continuing viability. Major upgrades include refurbishment of liquid propulsion post-boost rocket engine, replacement of the solid-propellant rocket motors, refurbishment of the environmental control system, repair of launch facilities, and installation of updated, survivable communications equipment and a O3 sustainment program.

LG-118 Peacekeeper

Brief: A solid-fuel, intercontinental-range ballistic missile capable of delivering a thermnuclear payload of 10 warheads with high accuracy over great distances. Function: Strategic surface-to-surface ballistic missile. Operator: AFSPC. First Flight: June 17, 1983. Delivered: June 1986–December 1988. IOC: December 1986, F.E. Warren AFB, Wyo. Production: 150. Inventory: 50. Unit Location: F.E. Warren AFB, Wyo. Contractor: Lockheed Martin. Power Plants: first three stages: solid-propellant; fourth stage: storable liquid; by Thiokol, Aerojet, Hercules, and Rocketdyne, respectively. Guidance: inertial guidance system. Warheads: 10 Avco Mk 21 MIRVs. Dimensions: length 71 ft 11 in diameter 6 ft 8 in. Weight: approx 195,000 lb. Commentary: LG-118A. Developed initially in response to an increased Soviet strategic threat, the ending of the Cold War caused the US to cap deployment at only 50 Peacekeeper missiles in the FY90 budget and to cease development of a rail-garrison mode of deployment. The Peacekeeper family of cruise missiles is a joint Navy–USAF program that carries up to 10 independently targetable re-entry vehicles. It is a more accurate and has a greater payload and range than the Minuteman III. Its greater resistance to nuclear effects and its more capable guidance system provide a greatly improved ability to destroy very hard targets. These attributes, combined with its prompt response, provide a decisive deterrent. Peacekeeper will be scheduled for retirement under the provisions of the START II treaty; however no retirement action will occur until its terms come into force.

Tactical Missiles and Weapons

AIM-7 Sparrow


AIM-9 Sidewinder

AIM-9 Sidewinder (top) EGBU-15 (center) AIM-120 AMRAAM (bottom) (Guy Aceto)

Warhead: high-explosive, weighing 20.8 lb.
Dimensions: length 9 ft 5 in, body diameter 5 in, finspan 2 ft 1 in.
Weight: launch weight 190 lb.
Performance: max speed above Mach 2, range 10+ miles.

**COMMENTARY**
Early versions. AIM-9A was the prototype version. The AIM-9B, initial production version, entered the inventory in 1957 and was effective only at close range during day. These shortcomings were eliminated on subsequent AIM-9E/H/J/P versions. The third-generation Sidewinder, AIM-9L, added a more powerful solid-propellant rocket motor as well as tracking maneuvering ability. Production and delivery began in 1976; production ended in 1981.

AIM-9M, a joint Navy–USAF project aimed at producing an improved version of AIM-9L with all-altitude, all-aspect, launch-and-leave intercept capability. Carriage options include: A-10, F-14, F-15, F-16, F-18. This version has increased Infrared Counter-Measurements (IRCCM) capability, improved background discrimination, and a reduced-smoke rocket motor. First flight of prototype was in February 1978. Full production began in FY81.


AIM-9X is the result of a Navy–Air Force program, derived from a jointly funded demonstration and validation contract. Raytheon is the EMD contractor. The AIM-9X program recently completed a successful operational assessment and gained Defense Acquisition Board approval to enter into LRIP. The flight test program has completed 11 live guided-missile firings with nine kills of QF-4 target drones. USAF plans to buy 5,080 missiles.

The AIM-9X incorporates advanced technologies such as a focal plane array imaging seeker, high off-boresight sensor, and a highly maneuverable all-terrain control system. The missile utilizes the existing AIM-9M rock motor, warhead, and fuse. It will be integrated with the joint helmet mounted cueing system to maximize its high off-boresight capability. It will be employed on F-15, F-16, F/A-18, F-22, and potentially JSF aircraft.

**AIM-120 AMRAAM**

Brief: A new-generation supersonic, medium-range, active radar-guided air-to-air missile with high-explosive warhead.

Function: Air-to-air guided missile.

Production: more than 12,000 planned for USAF/USN.
Inventory: classified.
Contractor: Raytheon.
Power Plant: Allied boost-sustain solid-propellant rocket motor.
Guidance: inertial and command inertial with active radar terminal homing.
Warhead: high-explosive directed fragmentation weighing 48 lb.
Dimensions: (A/B models) length 12 ft, body diameter 7 in, span of tail control fins 2 ft 1 in.
Weight: 335 lb.
Performance: cruising speed approx Mach 4, range more than 20 miles.

**COMMENTARY**
A joint project between Navy and USAF, the AIM-120 is a replacement for the AIM-7 Sparrow. The AIM-120 equips F-15, F-16, F/A-18, and F-22 fighters. (The F-22 will only carry the C model.) Inertial and command inertial guidance and active radar terminal homing provide launch-and-maneuver capability. Significant improvements in operational effectiveness over the AIM-7 include increased average velocity, reduced miss distance, improved fusing, increased warhead lethality, multiple target engagement capability, improved clutter rejection in low-altitude environments, enhanced electronic protection capability, increased maximum launch range, a reduced-smoke motor, and improved maintenance and handling.

AIM-120A was the first production version, delivered by Hughes in 1988 to the 33rd TFW at Eglin AFB, Fla.

AIM-120B/C are upgraded, reprogrammable variants of the AIM-120. The AIM-120C currently in production has smaller, clipped control surfaces to provide for internal carriage capability in the F-22.

**AGM-65 Maverick**

Brief: A tactical, TV–or Imaging-Infrared–guided air-to-surface missile carried by fighters and designed for use in CAS, interdiction, and defense suppression missions, having standoff capability and high probability of strike against a wide range of targets.

Function: Air-to-surface guided missile.

First Flight: August 1969.
Delivered: from August 1972.
Production: sustainment phase.
Inventory: 7,300 AGM-65A/B/H (EO guidance); 12,000 AGM-65D/G (IR guidance).
Contractor: Raytheon.
Power Plant: Thermojet TX-481 solid-propellant rocket motor.
Guidance: self-homing, EO guidance system (IR on D and G models).
Warhead: AGM-65A/B/D/H 125-lb high-explosive, shaped charge; AGM-65K 298-lb blast fragmentation warhead.
Dimensions: length 8 ft 2 in, body diameter 1 ft 1 in, wingspan 2 ft 4 in.
Weight: launch weight (AGM-65A) 462 lb, (AGM-65G) 677 lb.
Performance: range 0.6 to 14 miles.

**COMMENTARY**
Maverick missiles were first employed by USAF in Vietnam and were used extensively during the Persian Gulf War. They currently equip A-10, F-15E, and F-16 aircraft for use against tanks and columns of vehicles and in the SEAD role.

**AGM-65A**

The basic Maverick is a launch-and-leave, TV-guided air-to-surface missile that enables the pilot of the launch aircraft to seek other targets or leave the target area once the missile has been launched. Production was initiated in 1971, following successful test launches over distances ranging from a few thousand feet to many miles and from high altitudes to treeline level.

**AGM-65B**

A version with a “scene magnification” TV seeker that enables the pilot to identify and lock on to smaller or more distant targets.

**AGM-65D**

System developed to overcome limitations of the TV Maverick, which can be used only in daylight and clear-weather conditions. This version has an IR seeker as well as a lower-smoke motor. IIR Maverick became operational on A-10s in February 1986.

**AGM-65G**

Uses the IIR seeker with an alternate 298-lb fragmentation warhead for use against hardened targets. Software has been modified to include options for targeting ships and large land targets as well as mobile armor. This version also has a digital autopilot and a pneumatic, rather than hydraulic, actuation system. USAF received its first G model in 1989.

**AGM-65H**

AGM-65B modified with an upgraded TV seeker providing significant reliability, maintainability, and performance improvements over the AGM-65B seeker and double the standoff range.

**AGM-65K**

AGM-65G modified with the same upgraded TV seeker as in the AGM-65H to provide a TV-guided version of the Maverick with the 298-lb blast fragmentation warhead.

**AGM-84 Harpoon**

Brief: An adverse weather capable, sea-skimming, active radar-guided, anti-ship cruise missile system capable of being fired from B-52H aircraft, ships, and submarines.

Function: Air-to-surface anti-ship missile.

First Flight: March 1974 (for USN).
Delivered: from 1977 (USN).
IOC: circa 1985 (USAF).
Production: sustainment phase.
Inventory: 68.
Contractor: McDonnell Douglas (now Boeing).
Power Plant: Teledyne CAE CJ402-CA-400 turbojet, 660 lb thrust.
Guidance: sea-skimming cruise monitored by radar altimeter, active radar terminal homing.
Warhead: penetration-high-explosive blast type, weighing 488 lb.
Dimensions: length 12 ft 7 in, body diameter 1 ft 1 in, wingspan 3 ft.
Weight: 1,145 lb.
Performance: speed high subsonic, range more than 57 miles.

**COMMENTARY**
Harpoon and its launch control equipment provide USAF the capability to interdict ships at ranges well beyond those of other aircraft. Originally acquired to equip two squadrons of now-retired B-52G aircraft for maritime anti-surface operations, the Harpoon all-weather anti-ship missile currently arms conventional-mission B-52Hs.

**AGM-84D**

A variant of the USN Harpoon that has been adapted for use on B-52 bombers, which can carry eight missiles.
AGM-88 HARM
Brief: An air-to-surface tactical missile designed to seek and destroy enemy radar-equipped air defense systems, using an advanced guidance system that senses and homes in on enemy radar emissions.


Production: Sustainment phase.

Inventory: currently 7,500.

Contractor: Raytheon.

Power Plant: Thokol smokeless, dual-thrust, solid-propellant rocket motor.

Guidance: passive homing guidance system, using seeker head that homes on enemy radar emissions.

Warhead: high-explosive fragmentation, weighing 145 lb.

Dimensions: length 13 ft 9 in, body diameter 10 in, wingspan 3 ft 9 in.

Weight: 807 lb.

Performance: cruising speed supersonic, altitude limits S/L to 40,000 ft, range more than 10 miles.

Commentary
The High-Speed Anti-Radiation Missile (HARM) exhibits great velocity along with an ability to cover a wide range of frequency spectrums through the use of programmable digital processors in both the carrier aircraft’s avionics equipment and in the missile. The combination gives this second-generation anti-radiation missile greatly improved capability over first-generation Shrikes and Standards. The AGM-88 proved highly effective against enemy ground radar during the Persian Gulf War and continues in use in current operations. HARMs equip F-16 Block 50/52s dedicated to the SEAD mission.

AGM-88A. A factory-programmed version used to equip the now-retired F-4G Wild Weasel to increase its offensive electronic combat.

AGM-88B. Older versions of the AGM-88B are being upgraded with the new, enhanced capability guidance seeker currently equipping the C version.

AGM-88C. This current production version has a more lethal warhead, containing tungsten alloy cubes, rather than steel, and the enhanced-capability AGM-88C-1 guidance head.

Erasable electronically programmable read-only memory has been retrofitted on USAF, PACAF, and ACC HARMs, permitting changes to missile memory in the field. Current upgrade initiatives are aimed at increasing capability of both B and C versions against target shutdown, blanking, and blinding and at reducing potential damage to friendly radars in the target area. A home-on-jamming capability will be added to the C. Further upgrades under development will introduce GPS precision navigation capability.

AGM-130
Brief: A powered TV– or IR-guided air-to-surface small mine, carried by the F-15E and designed for high- and low-altitude strikes at standoff ranges against heavily defended targets.

Function: Air-to-surface guided and powered bomb.


Production: Sustainment phase.

Inventory: 490 (as of Sept. 30, 2000).

Contractor: Boeing.

Guidance: TV or IR seeker, or DME transponder.

Warhead: Mk 84 bomb (2,000-lb unitary) or BLU-109.

Dimensions: length 12 ft 10 in, body diameter 1 ft 6 in, wingspan 4 ft 11 in.

Weight: launch weight 2,917 lb.

Performance: cruising speed subsonic, ceiling in excess of 30,000 ft.

Commentary
AGM-130 is a product improvement to the GBU-10 glide bomb, with a guidance system designed to give pinpoint accuracy from low or medium altitudes. The AGM-130 adds a rocket motor, radar altimeter, and digital control system, providing it with double the standoff range of the GBU-15.

Upgrades include a new solid-state TV seeker, an improved IR seeker, and INS/GPS guidance that permits operation in adverse weather and improve target acquisition.

AGM-130s have been used extensively in Iraq and the Balkans.

AGM-130A, with the Mk 84 warhead.

AGM-130C, with the BLU-109/B penetrating warhead.

AGM-142 Have Nop
Brief: A medium-range standoff attack missile that is carried by USAF B-52Hs to provide this long-range aircraft with a conventional precision strike capability.

Function: Air-to-surface guided missile.

First Flight: 1990.


Production: 240.

Inventory: 186.

Contractor: Rafael (Israel).

Power Plant: Solid-propellant rocket motor.

Guidance: inertial, with data link, TV, or IR homing.

Warhead: 750 lb blast/fragmentation or 800-lb penetrating.

Dimensions: length 15 ft 11 in, body diameter 1 ft 9 in.

Weight: 2,998 lb.

Performance: range approx 50 miles.

Commentary
The AGM-142 missile system provides a conventional, precision, standoff hard target penetrator weapon for the B-52H. The system consists of a standoff, air-to-ground EO precision guided missile, weapon data link pod, and associated support and training equipment. Initial operational test and evaluation launches were completed in May 1990. There are six variants of the AGM-142.

AGM-142A, TV seeker with 750-lb blast/frag warhead.

AGM-142B, IR seeker with 750-lb blast/frag warhead.

AGM-142B-1, IR-Z seeker with 750-lb blast/frag warhead.

AGM-142C, TV seeker with 800-lb penetrator warhead.

AGM-142D, IR seeker with 800-lb penetrator warhead.

AGM-142D-1, IR-Z Improved seeker with 800-lb penetrator warhead.

AGM-154 Joint Standoff Weapon
Brief: First in a joint USAF and Navy family of low-altitude strike weapons, with follow-on capability on B-1B, F-15E, and F-16 Block 30/40.

IOC: FY98 (USAF planned); TBD (Navy).

Inventory: TBD.

Contractor: Lockheed Martin.

Power Plant: Turboprop Continental Motors.

Dimensions: 14 ft.

Weight: 2,250 lb.

Performance: 1,000-lb class warhead (both versions).

Commentary
JASSM is intended to be an affordable, stealthy standoff cruise missile with autonomous guidance and conventional warhead for use against high-value, heavily defended or mobile targets. The missile will use an IR seeker for terminal guidance, with GPS/INS for mid-course and backup terminal guidance. EMD program completed November 1999. Initial Operational Capability planned for F-15E and F-16 (September 2002). The BLU-97 is a product improvement to the AGM-154.

AGM-154A. The baseline BLU-97 variant for use against area targets; in full-rate production.

AGM-154B. The BLU-108 variant providing antiarmor capability; began production in FY99.

AGM-154C. The third variant (used by Navy only), JSOW/Unitary integrates an IR terminal seeker and a 500-lb unitary warhead.

AGM-158A Joint Air-to-Surface Standoff Missile
Brief: An advanced weapon designed to attack heavily defended targets with high precision at great standoff ranges.

Function: Air-to-surface guided weapon.

First Flight: April 8, 1999.

Delivered: TBD.

IOC: FY03 (planned).

Production: 2,400 (USAF planned); TBD (Navy).

Inventory: TBD.

Contractor: Lockheed Martin.

Power Plant: Turbofan Continental Motors.

Dimensions: 14 ft.

Weight: 2,250 lb.

Performance: 1,000-lb class warhead (both versions).

Commentary
JASSM is intended to be an affordable, stealthy standoff cruise missile with autonomous guidance and conventional warhead for use against high-value, heavily defended or mobile targets. The missile will use an IR seeker for terminal guidance, with GPS/INS for mid-course and backup terminal guidance. EMD program completed November 1999. Initial Operational Capability planned for F-15E and F-16 (September 2002). The BLU-97 is a product improvement to the AGM-154.

AGM-158A. The baseline BLU-97 variant for use against area targets; in full-rate production.

AGM-158B. The BLU-108 variant providing antiarmor capability; began production in FY99.

AGM-158C. The third variant (used by Navy only), JSOW/Unitary integrates an IR terminal seeker and a 500-lb unitary warhead.

CBU-87/101 Combined Effects Munition
Brief: The CBU-87 CEM is an area cluster munition effective against light armor, materiel, and personnel and used by USAF and Navy fighters and bombers for interdiction.

Function: Area cluster munition.

Production: Sustainment phase.

Inventory: 122,416 (CBU-87); 280 (CBU-101).

Contractor: Aerojet General/Honeywell.

Guidance: none (CBU-87).

Dimensions: length 7 ft 1 in; diameter 1 ft 4 in; weight 950 lb.

Performance: dispenses 202 BLU-97 Combined Effects Bomblets over an area roughly 800 ft by 400 ft.

Commentary
The CBU-87 Combined Effects Munition dispenses 202 BLU-97 shaped charge anti-personnel/anti-material fragmentation/inertial bomblets over the target in a rectangular pattern. It is currently delivered by USAF and Navy aircraft as an unguided gravity weapon. Density and size of the area covered depends on release parameters and spin rates. During Desert Storm USAF dropped 10,035 CBU-87s.

CBU-103, USAF is retrofiting its inventory of CEMs with the WCMC tail kit. The WCMC will improve the munitions delivery accuracy when released from medium to high altitude. Tail kit purchases are based on available funding.

CBU-89/104 Gator
Brief: The CBU-89 Gator is an anti-armor/anti-personnel mine dispenser used by USAF and Navy fighters and bombers for interdiction.

Function: Scatterable mines.

Production: Sustainment phase.

Inventory: 9,236 (CBU-89).

Contractor: Aerojet General/Honeywell.

Guidance: none (CBU-89).

Dimensions: length 7 ft 8 in; diameter 1 ft 4 in; weight 710 lb.


Commentary
The CBU-89 Gator dispenser holds 94 mines, of which 72 are anti-tank and 22 are anti-personnel. The mines are dispersed over the target in a rectangular pattern. The
anti-tank mines, which can be fused for up to a 72-hour delay, have a magnetic influence fuze to sense armor.

GBU-104, USAF is retrofitting its inventory of Gators with the WCMOD tail kit, which will improve the munitions delivery accuracy when released from medium to high altitude. Tail kit purchases are based on available funding.

GBU-97/105 Sensor Fuzed Weapon

The GBU-97 Sensor Fuzed Weapon comprises an SUU-66/B tactical munitions dispenser with an FZU-39 fuze. Each tactical munitions dispenser contains 10 BLU-108/B submunitions, and each submunition contains four “skew” projectiles that, upon being thrown out, seek out their target and deliver a projectile. Each SFW can deliver a total of 40 lethal projectiles over an area of about 500 ft by 1,200 ft.

GBU-15

**Brief:** An unpowered glide weapon carried by the F-15E and used to destroy high-value enemy targets from short standoff distances.

**First Flight:** 1975.

**Delivered:** from 1983.

**IOC:** 1983.

**Production:** more than 2,000.

**Inventory:** 1,650 (as of Sept. 30, 2000).

**Contractor:** Boeing and Raytheon.

**Guidance:** TV or IIR seeker.

**Warhead:** Mk 84 bomb (2,000-lb unitary) or BLU-109.

**Dimensions:** length 12 ft 10 in, body diameter 1 ft 6 in, wingspan 4 ft 11 in.

**Weight:** 2,450 lb.

**性能:** cruising speed subsonic.

**COMMENTS**

GBU-15 is an air-launched, cruciform-wing glide bomb fitted with a guidance system designed to give it pinpoint accuracy from low or medium altitudes. It also has a standoff capability. Development began in 1974, based on experience gained in Vietnam with the earlier Pave Strike GBU-8 modular weapon program. The GBU-15 is intended for tactical use to suppress enemy defenses and to destroy heavily defended targets. The target-detecting device is placed on the front of the warhead. The control module, with autopilot and data link module, attaches to the rear.

The weapon has two modes of attack. In direct attack, the weapon is locked on to the target before launch and flies a near line-of-sight profile to impact. In the indirect mode, the seeker can be locked on to the target prior to launch, or the operator can fly the weapon manually to impact. Using guidance updates provided through the data link, a “buddy” system may be operated whereby the weapon is launched from one aircraft and controlled by another. The GBU-15 is deployed with the F-15E.

GBU-15(V)/1/B. A TV-guided variant, qualified for operational service in 1983 (production complete).


GBU-15-I. Combines accuracy of GBU-15 with the penetration capability of the improved 2,000-lb BLU-108/P meteor bomb.

**Performance:** Air-to-surface guided bomb.

**FUNCTION**

During Desert Storm F-111Fs used BLU-15 glide bombs with great effect to address numerous targets.

**EGBU-15.** GPS-guided variant, allowing pilot to select either TV, IR, or GPS guidance over the target, depending on weather and/or threat conditions. USAF had 100 initially produced for Allied Forces, with field-level upgrade of over 1,200 existing GBU-15s due for completion FY01.

**EGBU-24**

**Brief:** A precise air-to-ground penetrating glide bomb equipped with an advanced guidance kit.


**Delivered:** from 1986.

**IOC:** 1986.

**Production:** USAF 14,000; Navy 12,000.

**Performance:** Air-to-surface guided bomb.

**FUNCTION**


**EGBU-28.** Integrates GPS/INS guidance into the existing GBU-27 laser seeker to provide adverse weather capability and improved target location. Entered production in FY98.

**GBU-28**

**Brief:** A large 5,000-lb-class air-to-ground penetrating glide bomb equipped with an advanced laser guidance kit, used for striking and destroying hard-underground targets.

**First Flight:** November 1988.

**IOC:** 1991.

**Production:** approx 500.

**Inventory:** classified.

**Contractor:** Raytheon.

**Dimensions:** length 19 ft 2 in, diameter 1 ft 2 in.

**Weight:** 4,676 lb.

**Performance:** classified.

**COMMENTS**

Under USAF’s rapid-response program, the GBU-28 laser-guided bunker-busting weapon was developed for Desert Storm for use against deeply buried, hardened C2 facilities. Four of the GBU-28 weapons were used during the war: two for testing and two by F-111Fs against a bunker complex Feb. 27, 1991. Guidance is by a modified GBU-27 system.

**EGBU-28.** Integrates GPS/INS guidance into the existing GBU-28 glide bomb control unit to provide adverse weather capability and improved target location. Entered production in FY99.

JDAM (Joint Direct Attack Munitions) Navigation Kit Brief: The JDAM navigation kit is a combination of GPS and INS avionics system. Once released, the inertial guidance kit will take over and, with periodic GPS updates to the INS, will guide the weapon to its target. JDAM is intended for use on a variety of aircraft, including the B-1B, B-2, B-52, F-14, F-15E, F-16, F-22, F-17, A-10C/D and E/F, AV-8B, and JSF. 

Dimensions: Wt. 59 lb; length 42.5 in; diameter 10 ft; for Atlas II D; D–401; D–501; D–502; D–511; D–601; D–602; D–603; D–611; D–621. Performance: Range up to 30 miles. 28 ft 8 in CEP with GPS; 99 ft CEP with INS only. 

JDAM will upgrade the existing inventory of general-purpose bombs by integrating them with a GPS/INS guidance kit to provide accurate all-weather attack with JDAM 12 ft 5 in; Mk 83 with JDAM 10 ft. When dropped from high altitude its inertial guidance system corrects for launch transients and wind effects to enhance accuracy. 

Production: Upgraded version of the Atlas Centaur vehicle developed to meet USAF's continuing medium launch vehicle requirement. The familiar stage-and-a-half configuration of the original ICBM is retained. Changes include lower-cost advanced avionics, an improved flight computer, booster engines with greater thrust, and longer propellant tanks. The engine and tank changes were made to both the Atlas and Centaur stages.

The Atlas IIA is essentially the same booster as the IIA but adds four Thielok Castor IVA solid rocket motors. The first Atlas IIA DS2C launch took place from Cape Canaveral AFS, Fla., on July 2, 1992. Atlas III. Commercial version which includes a new nose section and a single burn stage. The Atlas IIIA is an additional lengthening of the Atlas booster, a single-engine Centaur upper stage for the Atlas IIIA, and a dual engine, stretched Centaur for the upcoming Atlas IIIB. The first Atlas IIIA mission successfully launched a commercial communications satellite May 24, 2000. 

Centaur Upper Stage Brief: A four-engine upper stage with multiburn and extended coast capability. 

Launch Vehicles 


Power Plant: stage 1: Boeing RS-27A liquid-propellant engine, 237,000 lb thrust; stage 2: Pratt & Whitney RL-10A-4-1 engine, 4,000 lb thrust; nine strap-on SRMs, 100,270 lb thrust (s/l). Delta III stages 1, 2: Boeing RS-27A liquid-propellant engine, 237,000 lb thrust; stages 2, 3: Pratt & Whitney RL-10A-4-2 engine, 20,500 lb thrust; stage 3: Thiokol Star 48B (modified); nine strap-on SRMs producing 25 percent more thrust. Dimensions: Delta II: length 125 ft, diameter 8 ft; bulbous payload fairing, maximum diameter 10 ft. Delta III: length 148 ft, diameter 1 ft; payload fairing, diameter 10 ft; payload fairing, diameter 13 ft. Launch Weight: Delta II: 511,190 lb; Delta III: 663,200 lb. Performance: Delta II: up to 11,100 lb to near Earth orbit (LEO); up to 4,010 lb to GTO; up to 2,000 lb to LEO. Delta III: up to 8,930 lb to GTO; up to 18,280 lb to Low Earth Orbit (LEO). 

COMMENTARY: Delta II was the first US high-energy upper stage and the first to use liquid hydrogen as a propellant. Its multiburn and extended coast capability were first used operationally during the 1977 Mariner Jupiter/Saturn missions. 

D-1A. The D-1A version used with the Atlas demonstrated a wide range of applications and capabilities. The nose section of Atlas was modified to a constant 10-ft diameter to accommodate the Centaur, which, in turn, provided most of the electronic C2 systems for the launch vehicle. A 10-ft-diameter fairing protected payload for the Centaur DA-1. D-2A. The D-2A, used with the current Atlas II, has been stretched 3 ft to include more propellant and thus has increased thrust. Payloadings of either 1-ft or 14-ft diameter can be used. Centaur upper stages used in the Atlas IIIA will have a single RL-10A-4-1 engine; a dual-engine, extended-coast capability stage for the Atlas IIIB; and a dual-engine Centaur for the upcoming Atlas IIIB. The first Atlas IIIA mission successfully launched a commercial communications satellite May 24, 2000. 

Centaur V. See EELV below. 

Atlas/Centaur (DOD photo) 


Location: Cape Canaveral AFS, Fla., Vandenberg AFB, Calif. 

Contractor: Lockheed Martin. 

Power Plant: for Atlas IIA/IAS configuration, two Pratt & Whitney RL-10A-4-1 engines; for Atlas IIIB/Atlas V, one or two RL-10A-4-2 engines, each with 2,300 lb thrust; for Delta III, one or two RL-10B-2 engines; for G–prime: two RL-10A-3-3A engines, each with 16,500 lb thrust. 

Dimensions: For Atlas IIIA, length 38 ft 6 in, diameter 10 ft; for Atlas IIIB, length 38 ft 6 in; G–prime: length 29 ft, diameter 14 ft 2 in. 

Launch Weight: D–2A (approx) 45,000 lb; G–prime-mod (approx) 53,000 lb. 

COMMENTARY: Delta III was the only Atlas ICBM to be launched. The first was a strategic-missile booster. Delta IIIB served as a test vehicle for the Atlas IIOC and was the latest version of the Atlas ICBM. 

Delta Brief: An expendable, medium-lift launch vehicle now used to launch Navstar Global Positioning System satellites into orbit, providing navigational data to military and civilian users, and to launch commercial payloads into low Earth, polar, geo transfer, and geosynchronous orbits. 


Contractor: Boeing. 

Power Plant: stage 1: Boeing RS-27A liquid-propellant engine, 237,000 lb thrust; stage 2: Pratt & Whitney RL-10A-4-2 engine, 20,500 lb thrust; stage 3: Thiokol Star 48B (modified); nine strap-on SRMs producing 25 percent more thrust. 

Dimensions: Delta II: length 125 ft, diameter 8 ft; bulbous payload fairing, maximum diameter 10 ft. Delta III: length 148 ft, diameter 1 ft; payload fairing, diameter 10 ft; payload fairing, diameter 13 ft. Launch Weight: Delta II: 511,190 lb; Delta III: 663,200 lb. Performance: Delta II: up to 11,100 lb to near Earth orbit (LEO); up to 4,010 lb to GTO; up to 2,000 lb to LEO. Delta III: up to 8,930 lb to GTO; up to 18,280 lb to Low Earth Orbit (LEO). 

COMMENTARY: Delta I. Delta launch vehicle family began in 1959 with a contract to Douglas Aircraft Co. (now Boeing) for the production and integration of 12 Vanguard rockets, used primarily for hiccups. The Delta used components from USAF's Thor intermediate-range ballistic missile as its first stage and Navy's Vanguard as its second stage. The first Delta was launched from Cape Canaveral and had the ability to deliver a 100-lb-spacecraft to GEO.

Delta II. Selected by the Air Force in 1987 to launch the NavStar GPS satellites, the Delta II is slightly larger than the earlier Delta rocket, used to launch USAF's medium-payload requirement. The first launch took place in February 1989, and AFSPC continues to maintain a
fully operational 24-satellite constellation.

Delta II is a three-stage booster surrounded by nine solid-propellant Graphite Epoxy Motors. For LES missions, stage 3 is typically not used. In December 1995, a newly assigned vehicle, complete with new avionics, an increased expansion ratio on three of the GEMs, and a new launch control system, successfully placed a NASA payload into orbit. Delta II will continue to support GPS by replenishing aging satellites as they fail and is supporting other DOD payloads.

Delta III. Developed to address the needs of the commercial market. Delta III increases GTO capability by 8,930 lb. Notable features include a cryogenically propelled single-engine upper stage, bigger and more powerful strap-on SRMs than Delta II, three of which are equipped with thrust-vector control, and a larger composite fairing to house bigger payloads.

Delta IV. See EELV below.

Evolved Expendable Launch Vehicle: Delta IV / Atlas V

Brief: EELV is USAF’s spacelift modernization program to field two new families of expendable launch vehicles wth DOD and NASA payloads.

Function: Medium/heavy expendable launch vehicle.

Operator: commercial (AFSPC)

IOC: TBD

Launches Scheduled: first government FY02.

Unit Location: Cape Canaveral AFS, Fla., Vandenberg AFB, Calif.

Contractor: Boeing (Delta IV) and Lockheed Martin (Atlas V)

Power Plant: Delta IV: Rocketdyne RS-68 (Heavy, two additional core engines), 650,000 lb thrust; stage 2: Pratt & Whitney RL-10B-2. Atlas V: RD AMROSS LLC RD-180 (Heavy, two additional engines), 860,200 lb thrust; up to five strap-on solid rocket boosters: stage 2 (both) Centaur: one or two Pratt & Whitney RL-10A-4s, each 22,300 lb thrust.

Dimensions: Delta IV: length 235 ft, diameter (Medium) 13 ft, (Heavy) 16 ft 8 in. Atlas V: length 110 ft 2 in, diameter 12 ft 6 in.

Launch Weight: Delta IV: 565,000–1,600,000 lb. Atlas V: (Medium) 32,600 lb, (Heavy) 42,000 lb to LEO.

Performance: Delta IV: (Medium) 9,200 lb to GTO; (Heavy) 29,000 lb to GTO. Atlas V: (Medium) 18,900 lb to LEO, (Heavy) 42,000 lb to LEO.

Commentary

EMD and Initial Launch Services (ILS) contracts were awarded Oct. 16, 1998, to Boeing and Lockheed Martin. The ILS contracts cover the first 28 government EELV launches between FY02–06. Due to a recent realignment of the ILS contracts, Boeing will have 21 of the launches and Lockheed Martin seven. The first commercial launch is scheduled for FY01. In testing a quick-readiness, mobile launch facility.

Inertial Upper Stage

Brief: An upper stage for use with DOD’s Titan IV launchers as well as America’s AShuttle function. Upper stage for space launches.

Operator: commercial (AFSPC oversight).

First Launch: October 1982.


Unit Location: Cape Canaveral AFS, Fla., Vandenberg AFB, Calif.

Contractor: Boeing.

Power Plant: all-stage SRM 41,700 lb thrust; forward stage, SRM 17,200 lb thrust.

Guidance: inertial.

Dimensions: length 17 ft, diameter 9 ft 6 in.

Launch Weight: 32,600 lb.

Performance: 5,350 lb into GEO when used on Titan IV.

Commentary

Serving as an upper stage for the Titan IV for DOD, as well as with the shuttle for NASA, the highly reliable IUS consists of an aft skirt, an aft-stage SRM, an interstage, a forward-stage SRM, and an equipment support structure.

Pegasus

A small, winged launcher tasked to carry small payloads to LEO.

Function: Expendable launch vehicle.

Operator: commercial (AFSPC oversight for DOD payloads).

First Launch: April 5, 1990.


Launches Scheduled: none for DOD (FY01/02).

Contractor: Orbital Sciences/Alliant.

Power Plant: three solid-propellant motors developing 109,400 lb, 27,600 lb, and 7,800 lb thrust, respectively.

Titan IV (DOD Photo)

Guidance: inertial guidance.

Dimensions: length 49 ft, wingspan 22 ft, diameter 4 ft 2 in.

Launch Weight: 42,000 lb.

Performance: 850–1,050 lb payloads to LEO.

Commentary

This three-stage winged vehicle was air-launched originally from a B-52. Orbital Sciences currently uses L-1011 aircraft. Developed jointly as a private venture by Orbital and Hercules, the vehicle was under contract to the Defense Advanced Research Projects Agency (DaRTPA) for its initial two flights. In July 1991, it successfully placed seven minisatellites in orbit. The Air Force now manages DOD launches for the USAF space test program and the Ballistic Missile Defense Organization. The enhanced-performance Pegasus XL successfully launched a DOD payload into polar orbit March 8, 1996, following two earlier, unsuccessful launch attempts.

Taurus

Brief: A small ground-based launch vehicle for use in testing a quick-readiness, mobile launch facility.

Function: Expendable launch vehicle.

Operator: commercial (AFSPC oversight for DOD payloads).


Launches Scheduled: none for DOD (FY01/02).

Contractor: Orbital Sciences.

Power Plant: four solid-propellant motors generating 495,400 lb, 109,140 lb, 26,900 lb, and 7,200 lb thrust, respectively.

Dimensions: length 89 ft, max body diameter 50–92 in.

Weight: gross 29,000 lb.

Performance: capable of lifting 3,000 lb to LEO and 800 lb to GTO using a Star 37 perigee kick motor.

Commentary

A more powerful version of the Pegasus space launch vehicle, using an LGM-118 Peacekeeper mis- sile-first-stage and with the Pegasus wings removed. Taurus is ground-launched from regular launch complexes. The first launch, March 13, 1994, put two USAF and DARPA satellites into a 340-mile polar orbit.

Minotaur

Brief: Low-cost ground-based launch vehicle tasked to deliver small satellites into orbit.

Function: Expendable launch vehicle.

Operator: commercial (AFSPC oversight for DOD payloads).


IOC: January 2000.

Launches Scheduled: none for DOD as of September 2000.

Contractor: Orbital Sciences.

Power Plant: first and second stages: deactivated Minuteman II rocket motors; third and fourth stages: Orion 50 and Orion 38 solid-propellant motors.

Dimensions: length 53 ft 7 in, alternative payload fairings for 3 ft 10 in in diameter payloads.

Performance: capable of lifting up to 750 lb into orbit.

Commentary

Minotaur is a low-cost, four-stage rocket for use in USAF’s Orbital/Suborbital program. First and second stages comprise decommissioned motors from deac- tivated Minuteman II ICBMs; third and fourth stages utilize Orion motors derived from the Pegasus XL launcher. Together with the guidance and control tech- nology from that system. Two successful launches conducted in 2000.

Titan II

Brief: Modified ICBM used to launch military, classi- fied and NASA payloads.

Function: Expendable launch vehicle.

Operator: commercial (AFSPC oversight).

First Launch: April 1984 (NASA’s Titan II–Geminii).

IOC: Sept. 5, 1988 (USA).

Launches Scheduled: one (FY01); none (FY02).

Unit Location: Vandenberg AFB, Calif.

Contractor: Lockheed Martin.

Power Plant: stage 1 and V: 2. Aerogel liquid hyper- golic propellant rocket engines; stage 1: 430,000 lb thrust; stage 2: 100,000 lb thrust.

Guidance: inertial guidance system.

Dimensions: stage 1 and 2: height 110 ft, diameter 10 ft; payload fairing heights 20, 25, and 30 ft, diameter 10 ft.

Launch Weight: 408,000 lb.

Performance: more than 4,200 lb to polar LEO.

Commentary

Titan I. The Titan family was established in October 1955 when the Air Force awarded the then Martin Co. (now Lockheed Martin) a contract to build a heavy-duty space system. It became known as the Titan I, the nation’s first two-stage and first silo-based ICBM.

Titan II. Titan 1 provided many structural and propul- sion techniques that were later incorporated into the Titan II. The Titan II was launched in the 1960s for the manned Gemini flight.

Fourteen Titan II ICBMs were subsequently refur- bished and modified to provide expendable space launch capability. Ten successful launches have included the launch of the space probe Clementine I toward the Moon in January 1994, marking the first US lunar mission since Apollo 11 in December 1969. Remaining refurbished Titan IIIs are assigned to place Defense Meteorological Satellite Program (DMSP), National Oceanic and Atmospheric Administration (NOAA) sat- ellites, and other government agencies’ satellites into polar orbit.

Titan IV

Brief: A heavy-lift space launch vehicle used to carry DOD payloads such as Defense Support Program (DSP) and Militar satellites into space. It is the largest unmanned space booster used by the Air Force.

Function: Heavy expendable spaceflight vehicle.

Operator: commercial (AFSPC oversight).

First Launch: June 14, 1989 (Titan IVA); Feb. 23, 1997 (Titan IVB).

IOC: June 14, 1989.

Launches Scheduled: three (FY95); five (FY92).

Unit Location: Cape Canaveral AFS, Fla., Vanden- berg AFB, Calif.

 Contractor: Lockheed Martin.

Power Plant: Aerogel liquid hypergolic propellant rocket engines; stage 1: two engines 551,200 lb thrust each; stage 2: 106,150 lb thrust; two Alliant Techsystems SRMs, each 1.7 million lb thrust.

Guidance: digital avionics system on Titan IVB.

Dimensions: stage 1 and 2: height 119 ft 2 in, diameter 10 ft.

Launch Weight: 1.9 million lb.

Performance: 12,700 lb to GEO; 47,800 lb to LEO.

Commentary

USAF’s primary heavy-lift launch vehicle, Titan IV was selected in 1985 to augment the space shuttle and is used to launch critical military payloads, including DSP and Militar satellites. It is a growth version of the earlier Titan III, with more powerful engines, three-segment solid boosters, and a 16-ft 9-in-diam- eter payload fairing, with various heights of payload fairings available.

Titan IVA. The last Titan IVA was launched Aug. 12, 1998. This version was capable of placing a
### Satellite Systems

**Defense Meteorological Satellite Program**  
**Brief:** Satellites that collect air, land, sea, and space environmental data to support worldwide strategic and tactical military operations.  
**Function:** Environmental monitoring satellite.  
**Operator:** National Polar- orbiting Operational Environmental Satellite System (NPOESS) program offices.  
**First Launch:** circa 1960s (classified until 1973).  
**IOC:** classified but in use during Vietnam War.  
**Launch Vehicle:** Delta.  
**Design Life:** 48 months (Block 5D-2); 54 months (Block 5D).  
**Launch Vehicle:** Titan II.  
**Unit Location:** Suitland, Md.  
**Orbit Altitude:** approx 500 miles.  
**Power Plant:** Solar paddles deployed.  
**Dimensions:** length 20 ft 2 in (with array deployed), width 4 ft.  
**Weight:** 1,750 lb.  
**Performance:** DMSP satellites orbit Earth at about 500 miles altitude and scan an area 1,800 miles wide. Each system covers the Earth in about 12 hr.  

**The Defense Meteorological Satellite Program (DMSP) has been supporting US military operations for nearly 40 years. DMSP’s primary mission is to provide high-resolution visual and infrared cloud imagery to support both strategic and tactical operations anywhere in the world. In addition, DMSP satellites provide critical land, sea, and space environment data required by US forces in any operating environment. DMSP satellites have been launched by USAF. Procurement will continue for the In-Agency NPOESS late in this decade. NPOESS will consolidate current separate civil and military polar orbiting meteorological satellite systems into a single national program. NPOESS aims to provide increased capability to both civil and military users and avoid over $1.7 billion in costs by consolidating separate, but similar, weather satellite missions.**

**Block 5D-2.** Two operational DMSP Block 5D-2 satellites were launched Dec. 9, 1993. The first launch of the more advanced Phase II satellite was in 1982. Ten operational satellites are currently on orbit, with launches continuing until 2003. These satellites are nuclear hardened, can resist jamming, and are equipped with antennas capable of providing low-gain, Earth-field-of-view coverage and steerable, high-gain area coverage.  

**DSCS III/SLEP.** First two of four SLEP-modified DSCS III are currently in orbit. First launched Jan. 21, 2000.  

**Defense Support Program satellite atop an inertial upper Stage prior to launch. (NASA photo)**

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**Global Positioning System**  
**Brief:** A constellation of orbiting space vehicles that provide highly precise and reliable navigation data, 24 hours a day, to military and civilian users around the world. Signals permit calculation of location within 300 feet.  
**Function:** Worldwide navigation satellite.  
**Operator:** AFSPC.  
**First Launch:** Feb. 22, 1978.  
**IOC:** circa 1980.  
**Constellation:** 24.  
**Design Life:** six yr (II/IIA); 7.5 yr (IIR).  
**Launch Vehicle:** Delta.  
**Unit Location:** Schriever AFB, Colo.  
**Orbit Altitude:** 12,636 miles (IIA); 12,532 miles (IIR).  
**Contractor:** Boeing and Lockheed Martin.  
**Power Plant:** Solar arrays generating 700 watts (II/IIA); 1,136 watts (IIR).  
**Dimensions:** IIA: body 8 ft x 8 ft x 12 ft, incl solar arrays 11 ft 19 ft 19 ft; IIR: body 8 ft x 6 ft x 10 ft, span incl solar arrays 37 ft.  
**Weight:** 2,174 lb (IIA); 2,370 lb (IIR) on orbit.  
**Performance:** GPS satellites orbit the Earth every 12 hr, emitting continuous navigation signals. The signals are so accurate that time can be figured to within one-millionth of a second, velocity to within a fraction of a mile per hour, and location to within a few feet. Receivers are used in aircraft, ships, and land vehicles and can also be handheld.  

**COMMENTARY**  
The 24 satellites of the Navstar Global Positioning System (GPS) provide worldwide navigation services, including accurate, three-dimensional (latitude, longitude, and altitude) position, velocity, and precise time; passive, all-weather operation; continuous real-time information; support to an unlimited number of users and areas. Support to civilian users was enhanced May 1, 2000, when signals previously available to military users only were opened to civilians. Concern over potential enemy use of GPS is being addressed under the Navstar and GPS modernization efforts; future GPS satellites will have two jam-resistant channels for military-only use, as well as two new civilian-only channels. There are currently 23 satellites on orbit: five Block II, 18 IIA, and four IIR. Mapping, aerial refueling and rendezvous, precision guidance and SAR operations are just a few examples of the many GPS applications.  

**Milstar Satellite Communications System**  
**Brief:** A satellite communications system that provides secure, jam-resistant worldwide C-communication, tactical and strategic forces in all levels of conflict, linking command authorities to ground forces, ships, submarines, and aircraft.  
**Function:** Communications satellite.  
**Operator:** AFSPC.  
**First Launch:** Feb. 7, 1994.  
**IOC:** July 1997 (Milstar I).  
**Constellation:** three (three spares).  
**Design Life:** 10 yr.  
**Launch Vehicle:** Titan IV/Centaur.  
**Unit Location:** Schriever AFB, Colo.  
**Orbit Altitude:** 22,300 miles.  
**Contractor:** TRW, Aerojet.  
**Power Plant:** Solar arrays generating 5,000 watts.  
**Dimensions:** length 22 ft, height 32 ft 9 in, with solar paddles deployed.  
**Weight:** 5,000 lb (approx).  
**Performance:** orbits at approx 22,200 miles altitude in geosynchronous orbit; uses IR sensors to sense heat from missile and booster plumes against Earth’s background.  

**COMMENTARY**  
Milstar is a joint-service communications system that provides secure, jam-resistant operational communications.  

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medium-data-rate payloads able to transmit higher data rates to highly mobile forces.

MILSATCOM Polar System
Brief: Satellite that provides secure, survivable communications, supporting peacetime, contingency, and wartime operations in the North Pole region.
Function: Communications satellite.
Operator: AFSPC.
First Launch: late 1997.
Constellation: three.
Launch Vehicle: not available
Unit Location: Schriever AFB, Colo.
Orbit Altitude: 25,300 miles.
Contractor: classified.
Power Plant: 410 watts consumed by payload (power from host solar array).
Dimensions: numerous items integrated throughout host satellite.
Weight: 470 lb (payload).
COMMENTARY
USAFA deployed a modified EHF payload on a host polar-orbiting satellite, providing an interim cheaper alternative to Milstar to ensure protected polar communica-
tions capacity. Two further satellites are under development, with payload availability scheduled for 2003 and 2004.

Space Based Infrared System
Brief: Advanced surveillance system for missile warning, missile defense, battlespace characterization, and technical intelligence. System includes two main components: High with satellites in GEO and Highly Elliptical Orbit, and Low with satellites in LEO.
Function: Infrared space surveillance.
Operator: AFSPC.
First Launch: (planned) High GEO: FY04; Low: FY06.
IOC: TBD
Constellation used: High: five GEO sats, two Highly Elliptical Orbit sensors; Low: (preliminary) 24 LEO sats.
Launch Vehicle: TBD
Unit Location: Buckley AFB, Colo.

Aerial Targets

MQM-107 Streaker
Brief: A jet-powered, variable speed, reconnaissance target drone.
Function: Aerial target.
Operator: ACC.
First Flight: not available
Delivered: from 1984 (B).
Production: 70 (B); 221 (D); 78 (E).
Inventory: 44 (D); 78 (E).
Unit Location: Tyndall AFB, Fla.
Contractor: Raytheon (D model); Marconi (formerly Tracor) (E model).
Power Plant: Initially on D model, one Teledyne CAE 373-8 engine, 950 lb thrust; MQM-107Ds delivered since 1989 have 950 lb thrust TRI 60-5 turbojets. Microturbo TRI 60-5 engine, 1,061 lb thrust or TCAE 373-88 (E model).
Guidance and Control: analog or digital, for both ground control and preprogrammed flight (D model); high–G autopilot provisions; digital autopilot and remote control by the Gulf Range Drone Control Upgrade System (GRDCUS), a multifunction C2 multilateration system (E model).
Dimensions: length 18 ft 1 in, body diameter 1 ft 3 in, span 9 ft 10 in.
Weight: max launch weight (excl booster) 1,460 lb. Performance: operating speed 207–630 mph, operating height 50–40,000 ft, endurance 2 hr 15 min.
COMMENTARY
MQM-107D, a third-generation version of the MQM-107 Streaker, is a recoverable, variable-speed target drone used for research, development, test, and evaluation and the Weapon System Evaluation Program. MQM-107E, Improved performance follow-on to the MQM-107D. In operational service, it replaces the MQM-107D and expands the flight envelope.

BQM-34 Firebee
Brief: A jet-powered, variable speed, recoverable target drone.
Function: Aerial target.
Operator: ACC.
First Flight: 1951, 1958 (BQM-34A).
Delivered: from 1951.
IOC: circa 1951.
Production: 1,800+.
Inventory: 49.
Unit Location: Tyndall AFB, Fla.
Contractor: Teledyne Ryan.
Power Plant: one General Electric J85-GE-100 turbojet, 2,850 lb thrust.
Guidance and Control: remote-control methods incl choice of radar, radio, active seeker, and automatic navigator developed by Teledyne Ryan; the current model of the BQM-34A is configured to accommodate the GRDCUS, which allows multiple targets to be flown simultaneously.
Dimensions: length 22 ft 11 in, body diameter 3 ft 1 in, span 12 ft 11 in.
Weight: launch weight 2,500 lb.
Performance: max level speed at 6,500 ft 690 mph, operating height range 10 ft to more than 60,000 ft, max range 796 miles, endurance (typical configuration) 30 min.
COMMENTARY
More than 1,800 of these jet target vehicles have been delivered to USAFA since its initial development of the BQM-34A in the 1950s. Current BQM-34As, with an upgraded General Electric J85-100 engine that provides a thrust-to-weight ratio of 1.1, enables this version to offer higher climb rates and 6 G maneuvering capability. A new microprocessor flight control system provides a prelaunch and in-flight self-test capability. Used for weapon system evaluation.

QF-4
Brief: A converted, remotely piloted F-4 Phantom fighter used for full-scale training or testing.
Function: Aerial target.
Operator: ACC.
First Flight: August 1993.
IOC: not available
Inventory: 72.
Unit Location: Tyndall AFB, Fla. (detachment at Holloman AFB, N.M.)
Contractor: Marconi (formerly Tracor).
Power Plant: two General Electric J79-GM-17 turbojets, each with approx 17,000 lb thrust with after-burning.
Guidance and Control: remote-control methods incl the GRDCUS (Tyndall) and the Drone Formation and Control System (Holloman); will also accommodate the tricervice Target Control System currently under development.
Dimensions: length 63 ft, height 16 ft 6 in, wingspan 38 ft 5 in.
Weight: mission operational weight 49,500 lb.
Performance: max speed Mach 2+, ceiling 55,000 ft, range (typ) 500 miles.
COMMENTARY
The F-4 was selected as the source aircraft for the replacement of the QF-106 Full-Scale Aerial Target (FSAT) when the F-106 inventory was depleted. The QF-4 provides for a larger operational performance envelope (maneuvering) and greater payload capability compared with its predecessors. A complement of 326 F-4E, F-4G, and RF-4C aircraft have been identified for conversion to FSATs.

Orbit Altitude: High at approx 22,300 miles; Low at 60–300 miles.
Contractor: Lockheed Martin (High); TRW and Spectra

QF-4E (Ted Carlson)