Bombers

B-1 Lancer

**Brief:** A long-range, air refuelable multimode 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, AFMC.

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


**Production:** 104.

**Inventory:** 67.

**Unit Location:** Dyess ABF, Tex.; Ellsworth ABF, S.D.; Edwards ABF, Calif.

**Contractor:** Boeing; AIL Systems; General Electric.

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

**Accommodation:** Four, pilot, copilot, and two systems officers (offensive and defensive), on zero/ejector seat.

**Dimensions:** Span spread 137 ft, swept aft 79 ft, length 146 ft, height 34 ft.

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

**Performance:** Max speed at low level high-subsonic; 900+ mph (Mach 1.2 at 51,000 ft); range intercontinental.

**Armament:** Three internal weapons bays capable of accommodating a wide range of weapons including up to 84 Mk 82 (500-lb) bombs or Mk 62 naval mines; up to 30 AGM-86A/B (CMU kits), 12 AGM-154 Joint Standoff Weapons (JSOWs), up to 24 AGM-158 Joint Direct Attack Munitions (JDAMs), and 15 AGM-158 Joint Air-to-Surface Standoff Missile (JASSM). GBU-38 (500-lb) JDAM integration under way.

**COMMENTARY**

Of blended wing/body configuration, the B-1’s variable-geometry design and turbofan engines combine to provide greater range and high speed at low level, with enhanced survivability. Unsewn wing settings provide for maximum range during high-altitude cruise. The fully swept position is used in supersonic flight and for high subsonic, low-altitude penetration.

The bomber’s offensive avionics include synthetic aperture radar (SAR), ground moving target indicator (GMTI), ground moving target track (GMTT), and terrain-following radar (TFR), 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-guided 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,** initiated in 1981, the first production model of the improved variant B-1 flew in October 1984. USAF produced a total of 100. The active B-1B inventory was recently reduced to 67 aircraft (from the remaining 92) along with a consolidation to two main operating bases within Air Combat Command at Dyess ABF, Tex., and Ellsworth ABF, N.D. First used in combat against Iraq during Desert Fox in December 1998, the B-1B has recently reduced to 67 aircraft (from the remaining 92) along with a consolidation to two main operating bases within Air Combat Command at Dyess ABF, Tex., and Ellsworth ABF, N.D. First used in combat against Iraq during Desert Fox in December 1998, the B-1B has been deployed to support operations in Afghanistan in Enduring Freedom and in Iraqi Freedom.

**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.**

The ongoing conventional mission upgrade program (CMUP) is significantly enhancing B-1B lethality and survivability. Completed Block D upgrades include GPS receivers, a MIL-STD-1760 weapon interface, secure interoperable radios, and improved computers to support precision weapons, initially the GBU-31 JDAM. Block E, now in production, includes follow-on computer and software upgrades permitting simultaneous carriage of mixed guided and unguided weapons and WCMG/JSOW/JASSM integration. Integration of the JDAM (GBU-38) is also under way. Officials are continuing to assess options for future improvements to the B-1B’s defensive system. In addition, planning is under way for a network-centric upgrade program aimed at improving B-1B avionics and sensors, with cockpit upgrades to enhance crew communications and situational awareness. An effort to provide a fully integrated data link capability, including Link 16 and Joint Range Extension along with upgraded displays at the rear crew stations, is slated for FY05.

**B-2 Spirit**

**Brief:** Stealthy, long-range multimode 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, 1993-2002.

**IOC:** April 1997, Whiteman ABF, Mo.

**Production:** 21.

**Inventory:** 21.

**Unit Location:** Whiteman ABF, Mo.

**Contractor:** Northrop Grumman; Boeing; LTV.

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

**Accommodation:** Two, mission commander and pilo- lot, on zero/ejection seats.

**Dimensions:** Span 172 ft, length 69 ft, height 17 ft.

**Weight:** Empty 125,000-153,700 lb, typical T-O weight 336,500 lb.

**Ceiling:** 50,000 ft.

**Performance:** Minimum approach speed 140 mph, typical estimated unrefueled range for a hi-lo-hi mission with 16 B61 nuclear fall-out bombs 5,000 miles, with one aerial refueling fewer than 10,000 miles.

**Armament:** In a nuclear role: up to 16 nuclear weapons (B61 Mod 6, B61 Mod II, B61) on rotary launchers. In a conventional role, 80 Mk 82 500-lb bombs, 36 750-lb JDAMs, 12 AGM-154 JSOWs, 12 AGM-158 JDAMs, or up to 16 rotary launcher-mounted weapons: 16 GBU-31 (2000-lb) JDAMs, or a penetration version of a BLU-109, or 16 Mk 84 2000-lb bombs; 16 JSOWs, 16 JASSMs, or eight 7400-lb GBU-37/GBU-28 guided weapons. Wind-Corrected Munitions Dispenser (WCMOD) to follow.

**COMMENTARY**

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.

Based on the flying wing concept, the B-2 has no vertical tail surfaces. The smoothly blended “tuselage” section accommodates two flight crew and two large weapons bays side by side in the lower centerbody. These bays contain rotary launchers or bomb rack assemblies capable of carrying up to 40,000 lb of weapons.

Four nonafterburning turbofan engines are mounted in pairs within the wing structure, with scalloped overwing intake ducts and shielded over-wing trailing edge nozzles. The aircraft has a quadruple-redundant flyby-wire digital 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 airliner.

**B-2A**

B-2 production represents three successive blocks of capability: Block 10 aircraft carried B63 nuclear bombs or 16 Mk 84 2000-lb conventional munitions. Block 20 aircraft additionally carried B61/7 and B61/11...
nuclear bombs, as well as GPS-aided munitions (GAMs), and GBU-36B, on two rotary launcher assemblies, providing an interim, near-precision strike capability. All Block 10 and 20 aircraft have been upgraded to Block 30. (The last original Block 20 B-2, used as a test aircraft at Edwards AFB, Calif., was refurbished as an operational bomber and entered operational service in September 2002.)

Block 30 configuration retains weapons capability introduced in Blocks 10 and 20 and adds significant new capability. Using the rotary launcher assembly, all B-2s are capable of carrying 16 Mk 84 JDAMs, 16 JSOWs, 16 AGM-129s, 80 500-lb Mk 82s, 36 500-lb M117s, 34 tactical munitions dispensers, or 80 Mk 62 sea mines. Modifications to the bomb racks add carriage of 80 independent targeting pods, repositioned with the rest of the crew. Initial flight August 1958, with the first of 193 aircraft entering service in February 1959. Retired 1994.

B-52H. The only version still in service, the H intro-duced TF33 turbofans, providing increased unfuelled weight and larger under-wing tanks. Powered by J57-P-19W or -29WA engines. First flown March 1956; 35 were delivered June-December 1956. Majority retired 1971.


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 con-trolled 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. Retired 1994.

B-52H. The only version still in service, the H intro-
duced TF33 turbofans, providing increased unfuelled range, and improved defensive armament. First flown July 1960, 102 were built, with deliveries between May 1961 and October 1962.

Primary role of the B-52 is still that of cruise missile carrier with multiple cruise missile launches at high altitude, often followed by B-52 penetration to conduct close air support and attack additional targets using GPS/INS guided weapons.

Ongoing modernization of its conventional capabili-ties is extending the B-52’s service life well into this century, with the ability to provide massive firepower in low- to mid-threat environments supplemented by a standoff attack capability. Iraqi Freedom saw B-52s delivering laser guided bombs for the first time using newly installed Litening targeting pods. Modification of heavy stores adapter beams will enable aircraft to carry all B-52-certified munitions. Avionics improve-ments include the avionics midlife improvement (AMI) program, which replaces the current system processors and data transfer cartridges. Electronic attack improvements include the ECM improvement upgrade to the ALQ-172 set. The Combat Network Communica-
tions Technology (CONECT) improvement will provide a modern cockpit information avionics architecture, in-flight beyond line of sight (BLOS) and LOS Link 16 in-tratheater data link connectivity and mission/weapon reprogramming capability. In the projected standoff jammer role, B-52Hs (B-52G) will carry new wingtip jamming pods, starting in 2009. Current plans call for 76 aircraft to be so equipped.
AC-130 Gunship

**Brief:**
Air superiority fighter.

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

**First Flight:**

**Delivered:**
November 1974-85.

**IOC:**
September 1975.

**Production:**
874.

**Weight:**
Gross 155,000 lb.

**Dimensions:**
Span 132.6 ft, length 99 ft, height 38.5 ft.

**Ceiling:**
25,000 ft.

**Performance:**
Speed 289 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 105 mm howitzer with 130 rd.

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

**Contractor:**
MAC/AFSOC; Rockwell, now Boeing (AC-130U).

**Unit Location:**
Active: Davis-Monthan AFB, Ariz.; Whiteman AFB, Mo.; Cannon AFB, N.M.; Columbus AFB, Miss.; Lakenheath, UK; Robins AFB, Ga.; Osan AB, Republic of Korea; Ayukutabaru AB, Germany; ANG: Barnes Arpt., Mass.; Otis ANGB, Mass.; Port Columbus NAS, Ohio; NAS JRB New Orleans, La.; Whiteman AFB, Mo.

**Production:**
39; conversion of four additional C-130s to AC-130 standard contracted.

**Inventory:**
7 (AC-130H); 13 (AC-130U).

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

**Contract:**
Awarded for conversion of four additional A-10s to AC-130 standard.

**Function:**
Air defense, CAS, and night attack.

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

**Dimensions:**
Span 57.5 ft, length 53.7 ft, height 14.7 ft.

**Weight:**
Empty 28,080 lb, max gross 31,000 lb.

**Ceiling:**
37,000 ft.

**Performance:**
Speed 518 mph, combat range with 9,000 lb of weapons and 1.7 hr loiter, 20 min reserve, 288 miles.

**Armament:**
a 30 mm, seven-barrel, 1,174-rd capacity GAU-8/A 40 mm Bofors cannon with 256 rd, and one 105 mm howitzer with 130 rd (AC-130H); one 25 mm Gatling gun (AC-130U).

**Vision:**
Cockpit is protected with titanium armor, capable of withstanding projectiles up to 23 mm. A-10s were used extensively in Desert Storm, Kosovo, Enduring Freedom, and Operation Iraqi Freedom missions, including ground-attack, interdiction, and CAS.

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

**Dimensions:**
Span 600 ft, length 288 miles.

**Weight:**
Gross 155,000 lb.

**Ceiling:**
25,000 ft.

**Performance:**
Speed 289 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 105 mm howitzer with 130 rd.

**Commentary:**
The AC-130 is a C-130 modified with gun systems, electronic and EO sensors, fire-control systems, enhanced navigation systems, sophisticated communications, defensive systems, and in-flight 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. During operations in Afghanistan and Iraq, the AC-130 gunships were employed in conjunction with the MQ-1 Predator, the latter providing live video and target referencing information.

**Operator:**
AFSOC.

**Contractor:**
Boeing.

**Unit Location:**

**Production:**
15; Pratt & Whitney F100-PW-220 turbofans, each 25,000 lb thrust, with max afterburner.

**Function:**
Attack aircraft.

**Operator:**
AFSOC.

**Commentary:**
Upgraded; an infrared suppression system (IRS) overhaul is underway. In addition, USAF is evaluating wingtip tanks as replacements for the existing underwing tanks as a means of improving performance.
F-16 Fighting Falcon

**Brief:** A compact, versatile, and low-cost multirole fighter that is highly maneuverable and has repeatedly proved itself in air-to-air combat and air-to-surface attack.

**Function:** Multirole fighter.

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

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

**Delivered:** August 1978-2007 (planned).

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

**Production:** 2,206.

**F-15E Strike Eagle (MGen. Shaun Withers)**

**Inventory:** 1,346.

**Unit Location:** 13 active wings, 28 ANG, and five AFRC units (one associate).

**Contractor:** Lockheed Martin; Northrop Grumman.

**Power Plant:** One augmented turbofan. General Electric F110-GE-100 (27,600 lb thrust) and Pratt & Whitney F100-PW-220 (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-PW-229 (29,100 lb thrust).

**Accommodation:** Pilot only; zero/zero ejection seat.

**Dimensions:** Wingspan with missiles 32.7 ft, length overall 48.4 ft, height 16.7 ft

**Weight:** (F-16C) empty (F100-PW-229) 18,591 lb, (F110-GE-129) 18,917 lb; gross, with external load (Block 40/42) 42,000 lb.

**Ceiling:** 50,000 ft.

**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; combat range 575 miles.

**Armament:** One M61A1 20 mm 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, constituting more than 50 percent of its strength through at least 2010. The 200+ USAF F-16 multirole fighters deployed to the Persian Gulf Theater flew more sorties than any other type during Desert Storm, with 13,500 missions. In Iraqi Freedom, the F-16 flew hundreds of missions helping to destroy the unit cohesion of the Republican Guard.

**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-lb rd 20 mm internal gun.

**Production:** Of the F-16A and B for USAF ended in 1985. Most now belong to ANG. A midlife update program, undertaken cooperatively by USAF and NATO.

**F-15E Strike Eagle**

**First Flight:** April 1988-2004.

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

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

**Production:** 2,206.

**Accommodation:** Pilot only in F-15A/C; two seats in F-15B/D.

**Dimensions:** Span 42.8 ft, length 63.8 ft, height 18.7 ft.

**Weight:** Empty 28,600 lb, gross 68,000 lb.

**Ceiling:** 65,000 ft.

**Performance:** F-15C: Max speed Mach 2.5, T-O run 900 ft, landing run without braking parachute 3,500 ft, ferry range with external fuel tanks more than 2,878 miles.

**Armament:** One internally mounted M61A1 20 mm six-barrel cannon; up to four AIM-9/L/M Sidewinder and up to four AIM-7 Sparrow air-to-air missiles, or up to eight AIM-120 Advanced Medium-Range Air-to-Air Missiles (AMRAAMS), carried externally. Deliveries of AIM-9X from November 2003.

**Commentary:** Superior maneuverability and acceleration, range, weapons, and avionics enable the F-15 to penetrate hostile defenses and establish air superiority over enemy systems. F-15 fighters deployed to the Persian Gulf for Desert Storm accounted for 34 of the 37 USAF air-to-air victories, and in Iraqi Freedom F-15Cs led coalition aircraft in maintaining aerial dominance.

**F-15A** (single-seat) and **F-15B** (two-seat) fighters became USAF’s front-line fighter immediately upon introduction in the mid-1970s. A multimission avionics system includes APG-63 pulse-Doppler radar for long-range detection and tracking of small high-speed objects down to treetop level and effective weapons delivery, a HUD for close-in combat, identification, friend or foe (IFF), and INS. F-15A/Bs now serve with ANG. In February 2004, Florida’s 125th FW received the first of 19 F-15A/Bs retrofitted with E-2K upgrades providing additional thrust and improved combat capability. Other units are expected to follow.

**F-15C** (single-seat) and **F-15D** (two-seat) models followed in June 1979. Improvements included 2,000 lb of additional internal fuel and provision for carrying conformal fuel tanks (CFTs), reducing in-flight refueling requirements and increasing time in the combat zone. From 1983 through 1997, tactical capabilities were enhanced extensively through the multilayered improvement program (MSIP), a program of installation of new or modification of existing avionics equipment, which allows for the carriage of more advanced weapons, and increased self-protection. The last 43 aircraft included improved APG-70 radar, and F-15C/Ds are receiving an APG-63 upgrade, the APG-63(V1). One squadron in Alaska received the later APG-63(V2), featuring an active electronically scanned array (AESA), permitting the aircraft to track multiple targets and to guide air-to-air missiles against them. The Joint Helmet-Mounted Cueing System (JHMCS), a “look and shoot” head-mounted system, will, along with the AIM-9X, significantly enhance lethality in close-range air-to-air combat. Other modifications include improved engines, GPS equipment, and the Link 16 fighter data link.

**F-15E Strike Eagle**

**Brief:** A heavily modified, two-seat, dual-role variant of the original F-15, with weapons systems totally integrated for all-theater deep interdiction missions as well as air-to-air combat.

**Function:** Dual-role fighter.

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

**First Flight:** Dec. 11, 1986.

**Delivered:** April 1988-2004.

**IOC:** May 1989.

**Production:** 236.

**Inventory:** 222.

**Unit Location:** Eglin AFB, Fla., Elmendorf AFB, Alaska, Mountain Home AFB, Idaho, Nellis AFB, Nev., RAF Lakenheath, UK, Robins AFB, Ga., Seymour Johnson AFB, N.C.

**Contractor:** McDonnell Douglas (now Boeing); Raytheon.

**Power Plant:** Two Pratt & Whitney F100-PW-220, each 25,000 lb thrust; or F100-PW-229 turbofans, each 29,000 lb thrust with max afterburner.

**Accommodation:** Crew of two, on zero/zero ejection seats.

**Dimensions:** Span 42.8 ft, length 63.8 ft, height 18.5 ft.

**Weight:** Empty 45,000 lb, gross 81,000 lb.

**Ceiling:** 50,000 ft.

**Performance:** Max speed level at altitude Mach 2.5, ferry range with CFTs 3,000 miles.

**Armament:** One internally mounted M61A1 20 mm six-barrel cannon; up 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; EGBU-15 and GBU 10/15/24/28 guided munitions; CBU 87/89/97 unguided cluster munitions; unguided munitions; JSOW, JDAM, CBU-103/104/ 105 Wind-Corrected Munitions Dispenser (WCMD)-guided cluster munitions, and nuclear weapons.

**Commentary:** F-15E has a strengthened airframe for increased gross weight at takeoff and maneuver at nine Gs through out the flight envelope. Cockpit controls and displays are improved, and a wide-field-of-view (WFOV) 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 radar which provides a high-resolution synthetic aperture radar (SAR) map and LANTIRN (Low-Altitude Navigation and Targeting Infrared for Night) pods, with wide-field FLIR. The APG-70 gives the F-15E, with its APG-63(V2), a look and shoot head-mounted system, with, along with the AIM-9X, significantly enhance lethality in close-range aerial combat. Other modifications include improved engines, GPS equipment, and the Link 16 fighter data link.**

**F-16 CJ Fighting Falcon** (Ted Carlson)
operators, includes improvement to the radar, fire- control computer, stores-management computer, and avionics software, giving F-16A/Bs the ability to use new weapons and to or-tourlength missions.

Reliability and maintainability improvements include a ring-laser gyro INS and installation of the upgraded F100-PW-220E turbofan engine.

The Multinational Staged Improvement Program, implemented in 1980, ensured the aircraft could accept systems upgrademeent, thereby minimizing retrofit costs. All F-16s delivered since November 1981 have had built-in structural and wiring provisions and systems architectures that expand the single-seater’s multirole flexibility to perform precision strike, night attack, and beyond-visual-range intercept missions.

F-40s, single-seat and F-16s (two-seat), were introduced at production Block 25 with MSIP II improvements in the cockpit, airflow, and core avionics and an increased range APG-68 radar. Block 30 and 40 aircraft incorporate the General Electric F110-GE-100 engine. Deliveries began in 1984. With the exception of IOC on CC/R(C) all of the active and many of the Guard and Reserve units have since converted to F-16Cs.

ANG and AFRIC Block 25/30/32 F-16s are receiving upgrades aimed at increasing throughput and memory for new weapon capabilities, including the 500-lb JDAM, plus Advanced Identification Friend/Foe (AIFF) to reduce the risk of fratricide.

F-16C Block 40/42 aircraft specialize in night attack operations with precision guided weapons. Follow-on improvements include ALE-47 improved defensive countermeasures, ALR-56M advanced RWR (Block 40 only). Very High Speed Integrated Circuit (VHSC) technology in the APG-68(VS) fire-control radar, a ring-laser gyro INS, GPS, a LANTIRN nav/attack system, core avionics hardware, enhanced-envelope gunship, digital flight controls, automatic terrain following, increased takeoff weight and maneuvering limits, an 8,000-hour airframe, IPES, and expanded envelope nine-G capability.

F-16s designated Block 50/52 aircraft are equipped with the High-speed Anti-Radiation Missile (HARM) targeting system (HTS) for suppression of enemy air defenses (SEAD). Block 50/52 F-16Js have MSIP Stage III improvements, which also show up in selected retrofits of earlier F-16 blocks. These aircraft incorporate the General Electric F110 and Pratt & Whitney F100 increased performance engines (IPES), the latest cockpit control and display technology, including a wide-angle HUD. Weapons improvements include multi-shot AMRAAM compatibility, AGM-154 JSOW, and Wind-Corrected Munitions Dispenser (WCMD).

Block 50/52 aircraft equipped by Block 40/42 from 2006-10, are being retrofitted with a new modular mission computer being developed under an F-16 common configuration implementation program (CCIP), aimed at extending operational flexibility and maintenance commonality. This effort includes the participating Eu- ropean governments of the F-16 Multinational Fighter Program. CCIP also includes new color displays, Sniper XR targeting pod, JHMCS, AIM-9X, Link 16, and improved weapons capabilities. First delivery made on January 2002. The Block 50/52 aircraft will have dual or alternate carriage of HARM targeting system (HTS) and Smart Targeting and Identification via Networked Geolocation (STING) and advanced targeting pods (ATP) in FY07. Planned future upgrades include enhanced GPS/INS (NGPS) and upgraded radar with SAR capability (GC aircraft).

Under Falcon STAR (Structural Augmentation Roadmap), all blocks of F-16 aircraft are undergoing a structural modification program to remedy fatigue problems caused by increased usage rates and heavier than forecast gross weights. Delivery of modified aircraft started October 2004 and is scheduled to con- tinue to 2014.

F/A-22 Raptor

Brief: High-technology follow-on for the F-15C. An all-weather, multirole fighter that combines an extremely maneuverable airframe with stealth technology, supercruise, and integrated avionics to help it pen- etrate through advanced anti-air threats and achieve air dominance.

Function: Fighter.

Operator: ACC, AETC, AFMC.


Delivery: 2001 (first production representative aircraft).

IOC: December 2005 (planned).

Production: Stated requirement TBD.

Inventory: 27.

Unit Location: Langley AFB, Va. (designated first operational location), Edwards AFB, Calif., Nellis AFB, Nev., and Tyndall AFB, Fla. (fighter training unit).

Contractor: Lockheed Martin; Boeing.

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

Accommodation: Pilot only, on zero/zero ejection seat.

Dimensions: Span: 44.5 ft; length 62 ft; height 16.6 ft.

Weight: Gross 50,000 lb.

Ceiling: 50,000 ft.

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

Armament: one internal M61A2 20 mm gun, two AIM-9 Sidewinders stored internally in the side weap- ons bays; six AIM-120 AMRAAMs in the main weapons bay; for ground attack two 1,000-lb JDAMs replace four AMRAAMs internally; up to eight Small Diameter Bombs (SDBs) can be carried in place of the two JDAMs (projected by 2009).

Accommodation: Pilot only, on zero/zero ejection seat.

Dimensions: Span: 44.5 ft; length 62 ft; height 16.6 ft.

Weight: Gross 50,000 lb.

Ceiling: 50,000 ft.

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

Armament: one internal M61A2 20 mm gun, two AIM-9 Sidewinders stored internally in the side weap- ons bays; six AIM-120 AMRAAMs in the main weapons bay; for ground attack two 1,000-lb JDAMs replace four AMRAAMs internally; up to eight Small Diameter Bombs (SDBs) can be carried in place of the two JDAMs (projected by 2009).

FUNCTION: The F-22’s unparalleled combination of stealth, supercruise (ability to cruise at supersonic speed with- out using afterburners), maneuverability, and inte- grated avionics allows it to counter multiple anti-ac- cess threats. Integrated avionics and intraflight data link permit simultaneous engagement of multiple tar-gets. The combination of flight controls, structural strength, and high-performance engines with thrust vectoring nozzles results in exceptional maneuverabil-
This advanced multimission fighter is designed to penetrate high-threat enemy airspace and engage all enemy targets in any conflict. In addition to its advanced stealth design, the F-35 incorporates maneuverability, long range, and highly advanced avionics to accomplish the bulk of USAF missions. Its fully integrated avionics and weapons systems will permit simultaneous engagement of multiple targets in enemy airspace. USAF has stated intent to buy approximately 250 F-35B STOVL variants.

The concept demonstration phase (CDP) of the program commenced November 1996, with competitive contract awards to Lockheed Martin (X-35A) and Boeing (X-32A). CDP concluded in fall 2001 with Lockheed Martin declared the winner. The system development and demonstration (SDD) phase, begun in October 2001, focuses on system development, test and evaluation, logistics support, and LRIP planning. Flight testing is projected to begin in 2006. The F-35 is powered by a derivative of the Pratt & Whitney F119 engine, called the F135. General Electric is developing a physically and functionally interchangeable power plant, the F136, for competition in production.

F-117 Nighthawk

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

**Function:** Attack aircraft.

**Operator:** ACC, AFMC.

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

**Delivered:** 1982-summer 1990.

**IOC:** October 1983.

**Production:** 59.

**Inventory:** 55 (52 F-117A; 3 YF-117).

**Unit Location:** Egin AFB, Fla.; Holloman AFB, N.M.

**Contractor:** Lockheed Martin; Raytheon.

**Power Plant:** General Electric F404-GE-F1D2 nonafterburning turbojets, each 9,040 lb thrust.

**Accommodation:** Pilot and co-pilot.

**Dimensions:** span 43.3 ft, length 65.9 ft, height 12.4 ft.

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

**Ceiling:** 35,000 ft.

**Performance:** high subsonic, top speed 646 mph (0.9 Mach), mission radius, unrefueled, (5,000-lb weapons load) 656 miles.

**Armament:** full internal carriage of a variety of tactical weapons, incl laser- and GPS-guided 2,000-lb munitions, unguided general-purpose bombs, and cluster munitions. JDAM capability being introduced.

**Commentary**

The F-117 is the Air Force’s primary attack aircraft for penetrating high-threat target areas with precision weapons. Its small radar signature, LO technologies, and advanced targeting system allow the aircraft to penetrate dense threat environments and to deliver precision weapons against heavily defended, high-value targets with pinpoint accuracy. Primary missions include precision attack, air interdiction, SEAD, and special operations.

Acknowledged publicly in November 1988, the F-117’s first operational deployment was to Panama in 1989 for Just Cause.

The 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-117As were deployed with the 4450th Tactical Group ( redesignated 37th TFW in 1989) at Tonopah Test Range Airfield, Nev., where operations were restricted mainly to night flying to maintain secrecy. In 1992, they were transferred to the 49th FW at Holloman AFB, N.M.

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 at 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 turbofans 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. A high-precision INS coupled to GPS is installed. An upgraded dual-turret IR targeting system, combined with boresight laser designators and autocrafter, ensures precision attack.

Other improvements since 1989 have included upgraded cockpit display and instrumentation and advanced weather capability via advanced weapons. Current and ongoing modifications provide a single, fleet-wide, optimum LO configuration, upgraded avionics to Block 2 configuration, integration of new weapons including JDAM for all-weather strike capability, and replacement of obsolete components to sustain the fleet through its service life. The F-117 is expected to remain in USAF service into the 2020s.

J-UCAS

**Brief:** A joint DARPA/USAF/Navy program to develop the technical feasibility, military usefulness, and operational value of a networked system of affordable, sophisticated stealth weaponized unmanned combat air vehicles (UCAVs) capable of performing SEAD, strike, and electronic attack for the Air Force (X-45) and intelligence-surveillance-reconnaissance (ISR) missions for the Navy (X-47).

**Function:** Concept demonstrator UCAVs for SEAD/ strike/electronic attack/reconnaissance missions.

**First Flight:** May 22, 2002.

**Delivered:** TBD.

**Contractor:** X-45: Boeing; X-47: Northrop Grumman.

**Production:** TBD;

**Inventory:** TBD;

**Unit Location:** TBD.

**Contractor:** Boeing (ABL platform; battle management (BM) system); TRW (now Northrop Grumman) (COIL and subsystems); Lockheed Martin (beam control system).

**Power Plant:** four GE CF6-80 turbofans, each 61,500 lb thrust.

**Accommodation:** flight crew of two, plus four mission specialists.

**Dimensions:** span 211.4 ft, length 228.8 ft, height 63.7 ft

**Weight:** empty 423,882 lb, gross 800,000 lb.

**Ceiling:** 45,000 ft.

**Performance:** max operating speed Mach 0.83, max laser weapon range hundreds of miles, unrefueled endurance at 40,000 ft with operational laser weapon load approx six hr. Chemical fuel carried on board will enable more than 20 shots.

**Commentary**

The Airborne Laser (ABL) will become the first directed energy weapon in the US arsenal. The Missile Defense Agency (MDA) assumed overall direction and budget authority for the program in summer 2001. USAF continues to man and develop the program through its Airborne Laser

**YAL-1A Attack Airborne Laser**

**Brief:** The prototype YAL-1A, using a modified 747-400F platform, will be the world’s first operational airborne high-energy laser weapon system.

**Function:** Attack laser.

**Operator:** ACC.

**First Flight:** July 18, 2002 (Block 04 test bed).

**Delivered:** First aircraft undergoing testing of beam control system; separate testing of COIL system, stabilization of laser system.

**IOC:** FY12 (planned).

**Production:** TBD;

**Inventory:** TBD;

**Unit Location:** TBD.

**Contractor:** Boeing (ABL platform; battle management (BM) system); TRW (now Northrop Grumman) (COIL and subsystems); Lockheed Martin (beam control system).

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expected to culminate in a test destruction of a boost
tests of the entire ABL configuration. Initial tests are
preparation for a rigorous series of ground and air
ule test was completed in 2002, and, in late 2002, the
Boeing's Wichita, Kan., facility. A 10-month laser mod-
sures atmospheric disturbance.

because of its IR wavelength. In addition to the COIL,
missiles as they are launched.

the pressurized fuel within to explode. The ABL can
track ballistic missiles and maintain laser focus on
their skin, which, when sufficiently heated, will cause
the pressurized fuel within to explode. The ABL can
target ballistic missiles hundreds of miles away and
thus can remain over friendly territory to kill ballistic
missiles as they are launched.

The lightweight, megawatt-class COIL technology can
deliver high energy over a great distance largely
because of its IR wavelength. In addition to the COIL,
the ABL houses three other lasers: the active range
system, which provides preliminary tracking data; the
track illuminator laser, which produces more refined
data; and the beacon illuminator laser, which mea-
sures atmospheric disturbance.

Following a two-year structural modification, the ABL
platform’s first flight took place July 18, 2002, from
Boeing’s Wichita, Kan., facility. A 10-month laser mod-
ification was completed in 2002, and, in late 2002, the
platform was flown to Edwards AFB, Calif. While YAL-
1A is in the hangar, tests are being conducted inde-
pendently on the ABL optical system and the six laser
modules that make up the complete COIL system. All
six modules were successfully tested on Nov. 10,
2004. Tests will continue for several months. Once
proved effective, they will be installed on the aircraft in
preparation for the next round of ground laser and laser
beam spot test of the entire ABL configuration. Initial tests are
expected to culminate in a test destruction of a boost-
ing ballistic missile over the Pacific.

Reconnaissance and Surveillance Aircraft

E-3 Sentry

Brief: A modified Boeing 707 equipped with a large,
canoe-shaped radome mounted under the forward part
of the fuselage, housing long-range, air-to-ground ra-
dar capable of locating, classifying, and tracking ve-
hicles moving at 1300 miles per hour, 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, battle management
(BM), C2 aircraft.

Operator: ACC and ANG, as the blended 116th Air
Control Wing.


Delivered: May 1995.


Inventory: 17.

Unit Location: Robins AFB, Ga.

Contractor: Northrop Grumman; Motorola; Cubic;
Raytheon.

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

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

Dimensions: span 145.8 ft, length 152.9 ft, height
42.5 ft.

Weight: gross 336,000 lb.

Ceiling: 42,000 ft.

Performance: max operating speed Mach 0.84, en-
durance with one in-flight refueling 20 hr.

COMMENTARY
Joint STARSTarget Attack Radar System
is a battle management (BM) platform capable of
providing commanders with transformational C2 and
near-real-time area-wide surveillance ultimately pass-
ing targeting information to air and ground command-
ners. Joint STARSTarget battle managers use the sensor
and robust communications suite to engage enemy forces
in day, night, and adverse weather conditions. The
radar subsystem features a multimode, side-looking,
phased-array radar that provides interlaced moving
target indicator (MTI) information, synthetic aperture
radar (SAR) imagery, and fixed target indicator imag-
ery. Joint STARSTargets downlinks via a secure, jam-resistant
digital data link and beyond line of sight satellite radio
communications. Multiple receivers are in use, pre-
dominantly the US Army’s Common Ground Station and Joint
Services Work Station.

As part of their operational test and evaluation, Joint
STARSTarget aircraft flew more than 150 operational mis-
sions during Desert Storm (with two E-8A development
aircraft) and Joint Endeavor (with one E-8A and one
test bed E-8C). During Iraqi Freedom, EC-8C Joint
STARS aircraft flew more than 24 hours a day to help
coalition forces maintain battlefield awareness. The
E-8C’s unique, long-dwell MTI capability is being used in
increasingly creative ways, keeping it relevant to the
joint force commander for the foreseeable future.

E-8A. Prototype version, with specialized equipment
installed aboard two specially modified 707-300 air-
frames. One was converted to an in-flight pilot trainer
in 1997, and the second was scrapped.

E-8C. Production version, based on former commer-
cial 707-300 airframes. Equipped with 18 operations
and control consoles, two of which double as commu-
nications stations, all the aircraft are now the more
Block 20 aircraft, equipped with more powerful computers and an Internet protocol/local area network. The first E-6C became operational in 1996, and the airframes are expected to remain airworthy until at least 2034. System improvements under way include Link 16 upgrades for data transmission to attack aircraft; enhanced radar modes; new satellite communications radios; upgrades to allow Joint STARS to assume the Airborne BattleField Command and Control Center (ABCC) mission of attack support to ground force commanders; and communications navigation surveillance/air traffic management upgrades to permit use of optimum altitudes and flight routes in increasingly congested commercial airspace in response to new stringent international navigation standards.

**E-10**

**Brief:** A multisensor command and control aircraft (MC2A) that will provide ground surveillance and cruise missile defense as well as battlefield management command and control (BMC2).

**Function:** Ground surveillance, cruise missile defense, and BMC2 aircraft.

**Production:** Five planned.

<table>
<thead>
<tr>
<th>Inventory: TBD. Unit Location: TBD. Contractor: Boeing (airframe).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Plant: Four Pratt &amp; Whitney PW4062 turbofans or four General Electric CF6-80C2B8F turbofans.</td>
</tr>
<tr>
<td>Accommodation: mission crew of between 30 and 50, depending on mission.</td>
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<tr>
<td>Dimensions: span 170.3 ft, length 201.3 ft, tail height 55.3 ft.</td>
</tr>
<tr>
<td>Weight: TBD. Ceiling: TBD.</td>
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<tr>
<td>Performance: TBD.</td>
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**COMMENTARY**

The E-10A is intended to be the central platform in USAF’s new Command and Control Constellation, initially supplementing the E-8 Joint STARS aircraft and, possibly, assuming missions currently performed by other aircraft such as the RC-135 Rivet Joint and E-3 AWACS aircraft. The Command and Control Constellation is to be a fully connected system of sensors (land, air, and space) that will relay information automatically, using common standards and communications protocols.

USAF has ordered the first of five planned E-10As, which are based on the Boeing 767-400ER airframe, to serve as the program flying test bed. In May 2003, a team comprising Northrop Grumman, Boeing, and Raytheon was awarded a presystem development and demonstration contract for weapons system integration on the initial E-10A. Development of the demonstration radar system was awarded to Northrop Grumman in April 2004.

The E-10B is slated to provide cruise missile defense and advanced airborne ground surveillance and targeting capability via Northrop Grumman/Raytheon’s new AESA, developed under the Multiplatform Radar Technology Insertion Program (MP-RTIP), and an advanced BMC2 subsystem.

The shape of E-10C, which includes provision of an airborne moving target indicator with a 360-degree scan, will depend on the decision whether to co-host the airborne early warning and control (AEW&C) system on the same platform or to create a dedicated AEW&C platform.

<table>
<thead>
<tr>
<th>MQ-1 Predator (SSgt. Suzanne M. Jenkins)</th>
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<tbody>
<tr>
<td>Predators UAV has evolved into a trusted component in USAF’s warfighting inventory. A Predator system includes four air vehicles, a ground control station, satellite link, and about 55 personnel for 24-hour operations. The Predator crew comprises a pilot and two sensor operators. DOD first used the advanced concept technology demonstration (ACTD) Predator in 1995 to support Provide Promise. In 1997, USAF took over the Predator program, and in 1999, while the UAV was still in development, the service deployed the system operationally for surveillance missions over Bosnia and Iraq. In July 2001, USAF successfully experimented with Predators armed with Hellfire missiles, and the system has since been used to attack targets in Afghanistan, Yemen, and Iraq. USAF changed the designation for Predator A to MQ-1 to denote its multimission capability for both reconnaissance and strike. MQ-1 designates the weaponized Predator A. It carries an MTS sensor ball supplied by Raytheon in place of the Wescam sensor ball. The MTS provides a laser target designator with EO/IR sensors in a single package, where, previously, one video camera had to be removed to house a laser designator. The SAR is removed to make room for one of the laser designator equipment.</td>
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<th>MQ-9 Reaper (Capt. Frank W. Carman)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predators UAV has joined the MQ-9 Reaper as a new MQ-9A. The MQ-9A has been designed to perform as an armed reconnaissance and strike system in conjunction with Predators armed with Hellfire missiles, and the system has since been used to attack targets in Afghanistan, Yemen, and Iraq. USAF changed the designation for Predator A to MQ-1 to denote its multimission capability for both reconnaissance and strike. MQ-1 designates the weaponized Predator A. It carries an MTS sensor ball supplied by Raytheon in place of the Wescam sensor ball. The MTS provides a laser target designator with EO/IR sensors in a single package, where, previously, one video camera had to be removed to house a laser designator. The SAR is removed to make room for one of the laser designator equipment.</td>
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RC-135S Cobra Ball (CB). Three aircraft. Cobra Ball collects measurement and signature intelligence (Masint) data, providing the capability to monitor missile-associated signal activity and to track missiles during boost and re-entry phases of flight. Cobra Ball can deploy anywhere in the world in 24 hours and provide on-scene EO reconnaissance for treaty verification and theater ballistic missile proliferation. Equipment includes wide-area IR sensors, long-range optical cameras, and an advanced communications suite.

RC-135U Combat Sent (CS). Two aircraft. Each Combat Sent aircraft has a specifically designed signals intelligence (Sigint) suite used primarily to collect scientific and technical (S&T) electronic intelligence (Elint) data against air-, land-, and sea-based emitter systems. The accuracy of CS data is critical to the effective design, programming, and reprogramming of radar warning receivers as well as jammers, decays, and anti-radiation missiles and to the development of effective threat simulators.

RQ-4 Global Hawk (USAF photo/Mike Charlie)

RC-135V/W Rivet Joint (RJ). Sixteen aircraft. Rivet Joint is a self-contained standoff airborne signals intelligence (Sigint) collection system. Its primary role is to exploit the “electronic” battlefield and deliver near-real-time (NRT) intelligence-surveillance-reconnaissance (ISR) information to tactical forces, unified command authorities, and national command authorities across the full spectrum of conflict. Onboard collection capabilities encompass rapid search, detection, measurement, identification, demodulation, geolocation, and fusion of data from potentially thousands of electronic emitters.

TC-135S/W. Used for training purposes.

RQ-4 Global Hawk

Brief: High-altitude, long-range, long-endurance UAV.
Function: Unmanned reconnaissance aircraft.
Operator: ACC.
Delivered: Seven advanced concept technology demonstrators; two production vehicles.
Production: LRIP. (Plans call for nine production RQ-4As before switching to the larger, more capable RQ-4B version.)
Inventory: Six.
Unit Location: Beale AFB, Calif.; Eglin AFB, Fla.; Northrop Grumman (prime); Raytheon.
Power Plant: One Rolls Royce-Allison AE3007H turbofan, 7,600 lb thrust.
Accommodation: Unmanned system.
Dimensions: Length 44 ft; height 15.2 ft; span 716 ft.
Weight: Empty 9,200 lb, gross 25,600 lb.
Ceiling: 65,000+ ft.
Performance: Objective endurance up to 40 hr at a cruise speed of 340 mph and at altitudes of 56,000 ft allowing loiter on station 1,380 miles from base for 24 hr. Combat range 15,525 miles.
Armament: None.

COMMENTARY

The RQ-4A is a high-altitude endurance UAV carrying a 1,960-lb payload, incorporating E/OIR and SAR sensors that permit switching among radar, IR, and visible wavelengths as required. The objective of the RQ-4B system is to increase available payload up to 3,000 lb for future sensors/capabilities. Navigation is by 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 began as an advanced concept technology demonstrator in 1995. Engineering and manufacturing development (EMD) was approved in March 2001. While still a development system, Global Hawk deployed operationally to support Enduring Freedom in Afghanistan in November 2001, flying more than 50 missions and 1,000 combat hours.

Global Hawk provides continuous, all-weather, day/night, wide area surveillance. It will operate in low-to-moderate air defense threat environments with the ability to fly above or stand off from enemy defenses.

The Navy is purchasing two Global Hawks for a maritime demonstration.

U-2 Dragon Lady (TSgt. Erik Gudmundson)

Although the U-2 was designed initially in the 1950s, current aircraft were produced primarily in the 1980s, when the production line was reopened to produce the TR-1, a significantly larger and more capable version than the earlier aircraft. Deliveries ended in October 1989.

U-2R (single-seat) and U-2RT (two-seat) aircraft. In 1992, all existing U-2s and tactical TR-1s were consolidated under the designation U-2R.

U-2S (single-seat) and U-2ST (two-seat). The current designations of all 34 aircraft (29 U-2S mission aircraft, five U-2ST trainers) in the inventory. Conversion to S model configuration began in October 1984. Included in the on-going $1.5 billion improvement program are new F118-GE-101 engines, a complete electronic system replacement, a new multifunction displays (MFDs), a digitalautopilot, an electro-optical view sight, and a new electronic warfare system. Sensors upgrades include the ASARS-2A radar sensor, which provides enhanced imaging modes and improves geo-location accuracy; the SYERS-2 EO imager, which provides multispectral and IR capability; enhanced RF-intelligence capability; and new data links enabling the U-2 to connect in near real time with network-centric hubs as well as line of sight ground stations, airborne data relays, and beyond line of sight satellite data relays.

NASA has two ER-2 versions of the U-2 used for high-altitude scientific experiments and atmospheric research, including investigation of global ozone depletion.

WC-130 Hercules

Brief: A high-wing, medium-range aircraft flown by AFRC for weather reconnaissance missions. It flies into the eye of tropical cyclones or hurricanes, collecting weather data from within the storm’s environment.

Function: Weather reconnaissance aircraft.
Operator: AFRC.
First Flight: Circa 1959.
IOC: 1959.
Production: No new-build WC-130H; 10 WC-130J.
Inventory: 20 (10 H, 10 J).
Unit Location: AFRC: Keesler AFB, Miss.; AFRC: Wright-Patterson AFB, Ohio; Lockheed Martin.
Power Plant: WC-130J: four Rolls Royce AE2100D3 turboprops, each 4,500 shp.
Accommodation: Six.
Dimensions: WC-130J: span 132.6 ft, length 97.8 ft, height 36.9 ft.
Weight: WC-130J: gross 175,000 lb.
Ceiling: WC-130J: 30,500 ft.
Performance: Speed 374 mph at 20,000 ft.

COMMENTARY

The WC-130 is flown by AFRC organizations known as the Hurricane Hunters. The hurricane reconnaissance area includes the Atlantic Ocean, Caribbean Sea, Gulf of Mexico, and central Pacific Ocean areas.

WC-130B/E. Earlier version C-130 modifications used for weather reconnaissance. Now retired.

WC-130H. Improved version, operated by the 53rd WRS for weather reconnaissance duties, including penetration of tropical storms, to obtain data for forecasting storm movements. Equipment includes two external 1,400-gallon fuel tanks, an internal 1,600-gallon fuel tank, and an externalstoreable composite propellers. First of 10 aircraft replacing the WC-130H was delivered Oct. 12, 1999. An average weather reconnaissance mission might
last 11 hours and cover almost 3,500 miles while the crew collects and reports weather data every minute. Results are transmitted via satellite to the National Hurricane Center, Miami.

Special Duty Aircraft

E-4B National Airborne Operations Center

Brief: A four-engine, swept-wing, long-range, high-altitude airplane providing a highly survivable C3 center allowing national/defense leaders to direct US forces, execute emergency war orders, and coordinate actions by civil authorities.

Function: Airborne operations center.

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).

Production: Four.

Inventory: Four.

Unit Location: Offutt AFB, Neb.

Contractor: Boeing; Rockwell; Raytheon E-Systems.

Power Plant: Four General Electric CF6-50E2 turbofans, each 52,550 lb thrust.

Accommodation: Up to 114 (63 crew/battle staff; 51 passengers).

Dimensions: Span 195.7 ft, length 231.3 ft, height 63.4 ft.

Weight: Gross 800,000 lb.

Ceiling: Above 40,000 ft.

Performance: 6,900+ miles; unrefueled endurance in excess of 12 hr; with aerial refueling up to 72 hr.

COMMENTARY

A militarized version of the Boeing 747-200, E-4B performs the National Airborne Operations Center (NAOC) mission. The E-4B fleet provides a survivable C3 infrastructure supporting the aircraft’s primary electronic and information warfare platform. Modifications include ECM system and air refueling capability. Further upgrades, including an updated receiver subsystem, will improve reliability and expand the E-4B’s offensive counterinformation (OCI) capability against modern C2 systems. Completion expected FY10.

EC-130J Commando Solo II (SRA. Matt Schwartz)

EC-130J Commando Solo aircraft have been used in numerous military operations, including Iraqi Freedom. They also have a role in civil emergencies. Secondary mission is electronic attack in the military frequency spectrum.

EC-130H Compass Call

Brief: A heavily modified C-130 for electronic combat.

Function: Electronic warfare.

Operator: ACC.

First Flight: 1981.


IOC: 1983; (Block 30) February 1999.

Production: (converted).

Inventory: 14.

Unit Location: Davis-Monthan AFB, Ariz.

Contractor: Lockheed Martin.


Accommodation: Standard crew 13.

Dimensions: Span 132.6 ft, length 98 ft, height 38 ft.

Weight: 155,000 lb.

Ceiling: 25,000 ft.

Performance: Speed 374 mph at 20,000 ft.

COMMENTARY

A variant used as an airborne communications jamming and information warfare platform. Modifications include ECM system and air refueling capability. Further upgrades, including an updated receiver subsystem, will improve reliability and expand the EC-130H’s offensive counterinformation (OCI) capability against modern C2 systems. Completion expected FY10.

Tanker Aircraft

HC-130N/P

Brief: An extended-range, combat search and rescue (CSAR)-configured C-130 that extends the range of rescue helicopters through in-flight refueling and performs tactical delivery of pararescue jumper (PJ) specialists and/or equipment in hostile environments.

Function: Aerial refueling/transport.

Operator: AETC, AFSOC, ANG, AFRC.

First Flight: Dec. 8, 1964 (as HC-130H).

Delivered: from 1965.


Production: (converted).

Inventory: 32.


Contractor: Lockheed (now Lockheed Martin).


Accommodation: Four flight crew, plus mission crew.

Dimensions: Span 132.6 ft, length 98.8 ft, height 38.5 ft.

Weight: Gross 155,000 lb.

Ceiling: 33,000 ft.

Performance: Speed 289 mph, range more than 4,000 miles.

COMMENTARY

The HC-130 can perform extended visual/electronic searches over land or water and operate from unimproved airfields. A three-man PJ team, trained in emergency trauma medicine, harsh environment survival, and assisted evasion, is part of the normal mission crew complement. Combat air forces’ HC-130 aircraft are equipped with 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 EHF Militar satellite terminals and six-channel International Maritime Satellite (Inmarsat). A tri-band radome also houses the E-4B’s superhigh frequency (SHF) frequency division multiple access (FDMA) communications antenna, the only such system on an airborne platform.

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 SDI 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 changes to the aircraft’s interior configuration, internal noise reduction modifications, BM improvements, and Global Air Traffic Management (GATM) avionics modifications, ensure
an integrated GPS/INS navigation package, radar/mis-
sile warning receivers, and chaff/flare countermea-
sures dispensers. Some aircraft have FLR systems and
personnel locating systems (PLS) compatible with
aircrew survival radios. Additional modifications in-
clude an in-flight refueling pod, radar, inte-
grated satellite communications radio, NVG-compat-
ible interior/exterior lighting, and cockpit armor. The C-130 avionics modernization program (AMP) provides
for complete update of the HC-130 avionics. Four
retired EC-130E ABCC and 10 WC-130H aircraft are continuing to HC-130 standard.

**MC-10E Extender**

**Brief:** A modified McDonnell Douglas DC-10 that combines in a single aircraft the operations of aerial refueling and long-range cargo transport.

**Function:** Aerial refueling/cargo transport.

**Operator:** AMC, AFRC (assoc.).

**First Flight:** April 1980.

**Delivere**r: March 1981-April 1990.

** IOC:** August 1982.

**Production:** 60.

**Unit Location:** McGuire AFB, N.J., Travis AFB, Cal-
lifornia, McGuire AFB, Calif., McGuire AFB, N.J.

**Contractor:** McDonnell Douglas (now Boeing).

**Power Plant:** Three General Electric CF6-50C2 turbo-
fan engines, each 52,500 lb thrust.

**Accommodation:** Crew of four; additional seating
possible for up to 75 persons with 17 pallets; max 27
pallets; max cargo payload 169,409 lb.

**Dimensions:** Span 130.8 ft, length 136.2 ft, height
38.3 ft.

**Weight:** Empty 119,231 lb, gross 593,000 lb.

**Performance:** Speed 289 mph, range more than
38.5 ft. Range with max fuel 11,015 miles.

**Commentary**

Mainstay of the USAF tanker fleet, the long-serving KC-135 is similar in size and appearance to commercial 707 aircraft but was designed to military specifications, incorporating different structural details and materials. The KC-135 fuel tanks are located in the “wet wings” and in fuel tanks below the floor in the fuselage.

**KC-135A**

Original version with J57 turbojets. USAF built 732; since modified to other standards.

**KC-135E/D**

The JT3-D re-engining program upgraded USAF, AFRC and ANG KC-135As to KC-135E stan-
dard with JT3-D turbofans and related components
removed from surplus commercial 707Fs; fuel carrying
capacity increased by 20 percent. One hundred and
fifteen KC-135Es remain in service with the ANG and
AFRC, representing some of the oldest aircraft in the
USAF inventory. Four KC-135Ds are similar but have
minor configuration differences as they were converted
from KC-135A aircraft.

**KC-135R/T**

Designation of re-engined KC-135As and Es with F108 turbofans. They embody modifications to 25 major systems and subsystems and not only carry more fuel farther but have reduced maintenance costs, are able to use shorter runways, and meet Stage III requirements. The first KC-135R flight was in October 1982, and redeliveries began in July 1984. KC-135T aircraft (formerly KC-135O) were capable of refueling the now-retired SR-71s and retain the capability to carry different fuels in the wing and body tanks. Eight KC-135Rs are air refuelable. Twenty KC-135Rs have wing-mounted refueling pods for enhanced refueling of USN and NATO aircraft.

Ongoing modifications are extending the capability
and operational utility of the KC-135. The Pacer CRAG avionics modernization program installed a new com-
pass, radar, and GPS navigation systems, a traffic alert and collision avoidance system (TCAS), and new digi-
tal multifunctional cockpit displays. The Global Air Traffic Management (GATM) modification further im-
proves the avionics, ensuring future access into pre-
mium airspace. Forty KC-135TR aircraft are outfitted with the capability to relay Link 16 tactical information beyond other aircraft’s line of sight. USAF began a full assessment of the entire KC-135 fleet in late 2004.

**MC-130P Combat Shadow**

**Brief:** Aircraft that flies clandestine or low-visibility, low-level missions into denied areas to provide air refu-
eling for special operations forces (SOF) helicopters or
to air-drop small-special operations teams, small bundles,
and Zodiac and combat rubber raiding craft.

**Function:** Air refueling for SOF helicopters/airdrop.

**Operator:** AETC, AFSC, ANG, AFRC.

**First Flight:** Dec. 8, 1964 (as HC-130H).

**Delivered:** From 1965.

**IOC:** 1986.

**Production:** (converted).

**Inventory:** 27.

**Unit Location:** Active: Egin AFB, Fla., Kadena AB, Japan, Kirkland AFB, N.M., RAF Mildenhall, UK, ANG-
Kulis ANGB, Alaska, Moffett Federal Airfield, Calif.

**Contractor:** Duke Field, Fla.

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

**Accommodation:** Four flight crew, plus four mission
crew.

**Dimensions:** Span 132.6 ft, length 98.8 ft, height
38.5 ft.

**Weight:** Gross 155,000 lb.

**Ceiling:** 33,000 ft.

**Performance:** Speed 289 mph, range more than
4,000 miles.

**Commentary**

MC-130P Combat Shadow aircraft are currently tasked
with clandestine formation or single-ship intrusion of hostile territory to provide aerial refueling of special operations helicopters, infiltration, exfiltration, and resupply of SOF by airdropping or air operations.

To perform these missions, depending upon the enemy threat, crews navigate using both visual and electronic means or visual means only. Primary emphasis is on NVG operations.

Modifications include improved secure communica-
tions, advanced integrated navigation equipment, in-
cluding digital scan radar, ring-laser gyro INS, FLIR,
GPS, and dual nav stations, and missile warning sys-
tems and countermeasures for refueling missions in hostile environments. Some aircraft have been modi-
fied with an in-flight refueling system allowing them to
be air refuelable.
massive strategic airlift over long ranges, including outsize cargo. Supports special operations missions.

**Function**: Cargo and troop transport.

**Operator**: AETC, AFMC, AMC, ANG, AFRIC.

**First Flight**: June 30, 1968.


**IOC**: September 1970.

**Production**: 121.

**Inventory**: 118.

**Unit Location**: Active: Altus AFB, Okla., Dover AFB, Del., Travis AFB, Calif., ANG: Stewart Arpt., N.Y. AMC: Dover AFB, Del., Lackland AFB, Tex., Travis AFB, Calif., Westover ARB, Mass.

**Contractor**: Lockheed.

**Power Plant**: Four General Electric TF39-GE-1C turbofans, each 41,000 lb thrust.

**Accommodation**: normal crew of six (two pilots, two engineers, and two loadmasters), plus rest area for 15 (relief crew, etc.) and seating for 73. There is no place of Army combat equipment the C-5 can't carry. Possible loads: six Apache helicopters, two M1 main battle tanks (each weighing 135,400 lb), six Bradley vehicles, three CH-47 helicopters, the 74-ton mobile bridge, a quarter-million pounds of relief supplies, or a maximum of 340 passengers in an Airbus configuration. Airdrop capability for single platforms weighing up to 42,000 lb.

**Dimensions**: span 222.8 ft, length 247.9 ft, height 65.1 ft.

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

**Ceiling**: 45,000 ft.

**Performance**: max speed at 25,000 ft 571 mph, 35,750 ft, T-O run at S/L 2,248 ft, range with max payload 3,900 miles, range with max fuel 7,254 miles. Normal cruising speed at altitude 518 mph (Mach 0.77), unlimited range with in-flight air refueling.

**Cargo Capabilities**: includes all tactical and strategic loads, ranging from troops, vehicles, ammunition, medical supplies, and equipment to outsize cargo. Supports special operations missions.

**Function**: Cargo and troop transport.

**Operator**: AETC, AFMC, AMC, ANG, AFRIC.


**Production**: 180 (contractual).

**Inventory**: 126.


**Contractor**: Boeing.

**Power Plant**: Four Pratt & Whitney F117-PW-100 turbofans, each 44,400 lb thrust.

**Accommodation**: normal flight crew of three (two pilots plus loadmaster); additional pilot may be carried. Provisions for full range of military airlift missions, including theater and special use operations and airlift platform.

**Function**: Long-range, air refuelable troop and cargo airlift.

**Operator**: AFRIC.

**First Flight**: Dec. 17, 1963.

**Delivered**: October 1964-June 1982.

**IOC**: May 1965.

**Production**: 285.

**Inventory**: 20.

**Unit Location**: March ARB, Calif., McGuire AFB, N.J., Wright-Patterson AFB, Ohio.

**Contractor**: Lockheed Martin.

**Power Plant**: Four Pratt & Whitney TF33-P-7 turbofans, each 21,000 lb thrust.

**Accommodation**: crew of five; cargo on 13 standard 46SL pallets. Alternative freight or vehicle payloads, 200 fully equipped troops, 155 paratroops, or 133 litter patients plus attendants.

**Dimensions**: span 159.9 ft, length 168.3 ft, height 39.2 ft.

**Weight**: operating payload 38,000 lb; max payload 68,725 lb normal, 89,000 lb emergency war flying; gross 325,000 lb normal, 344,000 lb emergency war flying.

**Ceiling**: 45,000 ft.

**Performance**: max cruising speed 466 mph, range 1,590 miles with air refueling.

**COMMENTARY**

Longest mainstay of USAF’s airlift force, the C-141 was the first jet aircraft designed to meet military standards as a troop and cargo carrier. The last active duty C-141 retired in September 2004, and with the continuing deployment of C-17 aircraft, all will be retired by 2006.

C-141B entered service with SAC in April 1965; 285 were built, some of which were structurally modified to accommodate the Minuteman ICBM. C-141B is a stretched C-141A with in-flight refueling capability. All C-141As (except four AFMC aircraft used for test purposes) were lengthened by 23 ft 4 in to extend lift capacity. First flight of 90 additional C-141-140 aircraft. Subsequent improvements include structural upgrades, a state-of-the-art autopilot and all-weather landing system, and improved airborne systems. Modification of 13-151Bs increased their SOLL capability and survivability.

C-141C is a C-141B modified with computerized glass cockpit instrumentation and digital flight-management system, with integrated GPS data for navigation and modern navigation safety equipment. The first production, which rolled out at Warner Robins ALC, Ga., Oct. 1, 1997, was assigned to AFRIC's 452nd AMW.

**C-9 Nightingale**

 Brief: A twin-engine, medium-range, swept-wing jet aircraft used for DV duties.

**Function**: DV duties.

**Operator**: AMC, CSAF, AFRIC.

**First Flight**: August 1968.

**Delivered**: August 1968-February 1975.

**IOC**: circa 1968.

**Production**: 24.

**Inventory**: eight.

C-17 Globemaster III (Sgt. Scott F. Reed)
Four C-20H aircraft were reconfigured for USAFE to replace retired C-20As. Upgrades for C-20H aircraft include GPS, vertical separation equipment, GATM, and TCAS.

C-21

Brief: Aircraft designed to provide cargo and passenger airlift and transport littlers during medical evacuations.

Function: Pilotseasoning, passenger and cargo airlift.

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


Production: 84.

Inventory: 77.

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

Contractor: Gates Learjet.

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

Weight: each 1,100 shp.

C-12J

Brief: A modified Boeing 757-200 used to provide transportation for the vice president, Cabinet, Congressional members, and other high-ranking US and foreign officials.

Function: VIP air transport.

Operator: AMC.


Delivery: June-December 1998.


Production: six.

Inventory: four.

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

Contractor: Boeing.

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

Accommodation: 16 crew and 45 passengers.

Dimensions: span 124.8 ft, length 155.2 ft, height 44.5 ft.

Weight: empty 128,700 lb, gross 255,000 lb.

Performance: cruise speed Mach 0.80-0.86 (530 mph), range 5,700 nm.

COMMENTARY

A military version of the commercial Boeing 757-200, four new C-12Js were purchased as replacements for the C-137/B/C aircraft. The commercial DI interior includes a crew rest area, DV stateroom, conference area, and general passenger area. The passenger communications system provides worldwide clear and secure voice and data communications. Modern flight deck avionics allow operations to any suitable civil or military airfield and provide an upgrade path as new capabilities become available. Upgrades include installation of a digital communications management system and broadband data transmit and receive, providing an office-in-the-sky capability.

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, PACAF.


Delivery: October 1998-present.


Production: one.

Inventory: nine.

Unit Location: Andrews AFb, Md., Chievres, Belgium, Hickam AFb, Hawaii, Akita AB, Japan.

Contractor: Gulfstream.

Power Plant: two BMW Rolls Royce BR710A1-10 turbofans, each 7,500 lb thrust.

Accommodation: five crew and 12 passengers.

Dimensions: span 93.5 ft, length 96.4 ft, height 25.8 ft.

Weight: empty 47.60 lb, gross 90.50 lb.

Ceiling: 51,000 ft.

Performance: cruise speed Mach 0.8 (530 mph), range 6,095 miles.

COMMENTARY

The C-37A is a military version of the Gulfstream V. Two C-37As, along with the C-32s, were purchased as replacements for the VC-137/C/B aircraft. The interior includes a separate DV and passenger area and a communications system capable of worldwide clear and secure voice and data. Aircraft are capable of operating at any suitable civil or military airfield worldwide. A third C-37A was purchased for combatant commander airlift support and was based at Chievres, Belgium. It has since been transferred to Andrews AFb, Md. Two more C-37s were purchased for crisis response support. Five C-37As are being leased from Gulfstream Aerospace to the combatant commander support aircraft; three are assigned to MacDill AFb, Fla.; one to Chievres; and one to Hickam AFb, Hawaii. Upgrades include GATM and continued passenger communications system upgrades to the Andrews-based aircraft.

C-38A

Brief: A twin-engine transcontinental aircraft used to provide VIP air transport for the vice president, Cabinet, or other high-ranking military members. It can also be configured for medevac and a wide range of special missions including C3 in time of war.

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 4,250 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 54.6 ft, length 55.6 ft, height 18.2 ft.

Weight: gross 24,800 lb.

Ceiling: cruise, 33,300 ft.

Performance: cruise speed Mach 0.87.

COMMENTARY

The C-38A is a military version of the Astor SPX produced by IAI and supported worldwide by Galaxy Aerospace. Two aircraft are operated by ANG’s 201st AS replacing Learjet C-21As. Equipment includes the most up-to-date navigation, communication, vertical separation, and safety equipment as well as state-of-the-art avionics. The contract includes an option for two additional aircraft.

C-40

Brief: A Boeing 727-700 used by ANG as its primary medium-range aircraft for airlift of personnel.

Function: Passenger transportation.

Operator: ANG.


Delivered: April 1999.

Production: seven.

Inventory: five.

Unit Location: Andrews AFb, Md., Hickam AFb, Hawaii.

Contractor: Boeing.

Power Plant: two General Electric CFM56-7 turbofans, each 42,000 lb thrust.

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

Dimensions: span 112 ft 7 in, length 110 ft 4 in, height 41 ft 10 in.

Weight: gross 171,000 lb.

Ceiling: 41,000 ft.

Performance: cruise speed 0.80-0.82 Mach, range 3,450 miles.

COMMENTARY

The C-40 is a military version of the commercial Boeing 737-700 increased gross weight aircraft. C-40s are used for SAM and support of combatant commanders.

C-40B

The B model is equipped with a DV suite, staff work area, conference area, and worldwide secure communications and data capability. USAF purchased two C-40Bs for delivery to Andrews AFb, Md., and Hickam AFb, Hawaii, in FY03 to support combatant commanders. One additional C-40B has been purchased and one leased for SAM missions and are assigned to Andrews. The C-40C model has a DS seating area, general passenger seating area, and secure communications capability. Three leased C-40Cs operate from Andrews.

C-130 Hercules

Brief: A rugged aircraft capable of operating from
rough dirt strips to provide theater airlift and para-

C-130 Hercules (SSgt. Suzanne M. Jenkins)

dropping of troops and equipment into hostile areas.

Function: Inter- and intratheater airlift.

Operator: AETC, AMC, PAGAF, USAFE, ANG, AFRC.

First Flight: August 1954 (C-130A).

Delivered: December 1956-present (C-130J).

Length: 132.7 ft.

Production: more than 15.

Width: 93 ft.

Wheelbase: 119 ft.

Unit Location: Active: Dyess AFB, Tex., Elmendorf AFB, Alaska, Little Rock AFB, Ark., Pope AFB, N.C., Ramstein AB, Germany, Yokota AB, Japan. ANG: 23 units. AFRC: 10 units.

Contractor: Lockheed Martin.

Power Plant: (C-130H) four Rolls Royce-Allison T56-A-15 turboprops, each 4,300 shp. (C-130J) four Rolls Royce-Allison AE2100D3 turboprops, each 4,591 shp.

Weight: C-130H: empty 81,000 lb, fuel/cargo max gross 155,000 lb; C-130J: gross 175,000 lb.

Power Plant: (C-130H) four Rolls Royce-Allison T56-A-15 turboprops, each 4,300 shp. (C-130J) four Rolls Royce-Allison AE2100D3 turboprops, each 4,591 shp.

Weight: C-130H: empty 81,000 lb, fuel/cargo max gross 155,000 lb; C-130J: gross 175,000 lb.

Performance: (C-130H) max cruising speed 430 mph, T-O run 3,585 ft, landing run (at 130,000 lb) 1,700 ft, range with 40,000-lb payload 2,240 miles; range 3,450 miles.

Commentary: First flown 48 years ago, the C-130 Hercules transport continues 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 (AFRC), fire-fighting duties (AFRC and ANG) 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 T56-A-1 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 turboprops; 134 were produced, with deliveries beginning in April 1959. Twelve were modified beginning 1961 as JC-130Bs for air-snarfi satellite recovery 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 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.

C-130H is generally similar to the E model but has updated turboprops, a redesigned outer wing, and improved pnumatic systems; delivery began in July 1974. Subsequent improvements include updated avionics, improved low-power color radar, and other minor modifications. Night vision instrumentation system was introduced from 1993. TCAS II in new aircraft from 1994. ANG LC-130H aircraft are modified with wheel-ski gear to support Arctic and Antarctic operations. Two DC-130Hs were modified for UAV control duties.

A major AMP scheduled for the C-130E/H includes digital displays, flight-management systems, multifunction radar, new communications systems, and a single air data computer. Planned completion is for 2016. The AMP upgrade includes all C-130 models (LC/EC/HC) except the C-130J-30.

C-130J. This newest model features a three-crew flight operation system, 6,000 shp Rolls Royce-Allison AE2100D3 turboprops, each 4,591 shp.

Weight: C-130J-30: USAF is acquiring a stretched version of the C-130J, with an additional 15 ft to the fuselage, capable of carrying up to 124 ground troops or 92 paratroops, to replace its oldest 1960s-vintage C-130Es. ANG received three in 2001 and two in 2002. Of the five on contract for 2004 delivery, one was slated for active duty; ANG, three; AFRC, one. USAF awarded a multipyear contract in 2002 with deliveries from 2005-09.

CV-22 Brief: A tilt-rotor, multimission transport aircraft designed to have the maneuverability and lift capability of a helicopter and the speed of a fixed-wing aircraft.

Function: Multimission airlift.

Operator: AFSOC.

First Flight: March 19, 1989 (V-22).

Delivery: 2006 (planned).

IOC: 2009 (planned).

Production: 50 (planned).

Inventory: 50 (planned).

Unit Location: Hurlburt Field, Fla., Kirtland AFB, N.M., and IOC for early 2009 at Hurlburt Field, Fla. USAF may place detachments of CV-22s in US European Command and US Pacific Command theaters.

MC-130/H Combat Talon Brief: A modified C-130 able to provide global, day, night, and adverse weather capability to air-drop personnel and to deliver personnel and equipment to support US and allied SOF.

Function: SOF infiltration, exfiltration, and resupply.

Operator: AETC, AFSOC, AFRC.

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

Delivered: initially 1966.

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

Production: 22 new-build Hs.

Inventory: 14 (E); 22 (H).

Unit Location: Active (assoc.) and AFRC MC-130Es at Duke Field, Fla. Active: MC-130H at Hurlburt Field, Fla.; Kadena AB, Japan; Kirtland AFB, N.M., RAF Mildenhall, UK.

Contractor: Lockheed Martin (airframe); Boeing integrated weapons system support.


Accommodation: E: crew of nine; 53 troops or 26 paratroops; H: crew of seven; 77 troops, 52 paratroops, or 57 litters.

Dimensions: span 132.7 ft, height 38.6 ft, length 100.8 ft (E), 99.8 ft (H).
MC-130H Combat Talon II (A1C Kimberly Gilligan)

The Beech 400A used in the advanced phase of joint specialized undergraduate pilot training (JSUPT) for students selected to go on to fly transports such as the C-5 and C-17 or tankers such as the KC-10 and KC-135. It has cockpit seating for an instructor and two students. Special mission equipment includes GPS, an electronic flight instrument system (EFIS) avionics system, a single-point refueling system, an additional fuselage fuel tank, and increased bird-strike protection in the windshield and leading edges for sustained low-level operation. T-1As typically log 100,000 flying hours a year, supporting all-weather training operations at high and low altitudes.

T-6A Texan II

Brief: A single-engine turboprop aircraft 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, AFRC.

First Flight: September 1955.

Delivered: December 1956-68.

IOC: 1957.

Production: 885.

Inventory: 283.

Unit Location: Active: Columbus AFB, Miss., Randolph, and Sheppard AFBs, Tex., Vance AFB, Okla., AFRC (assoc.) Randolph AFB, Tex.

Contractor: Cessna.

Power Plant: Two Continental J69-T-25 turbojets, each 1,025 lb thrust.

Performance: max speed 368 mph, range 920 miles.

Dimensions: span 33.5 ft, length 33.4 ft, height 10.7 ft.

Weight: empty (approx) 4,707 lb; gross 6,500 lb.

Performance: max speed at S/L 315 mph, range 460 miles.

COMMENTARY

USAF’s first purpose-built jet trainer, the T-37 has been AETC’s standard two-seat primary trainer for several decades. Its 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 1958 by the T-37B, with improved radio navigational equipment, UHF radio, and upgraded instruments. 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 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.

**Delivered:** 1961-1972.

**IOC:** March 1961.

**Production:** more than 1100.

**Inventory:** T-38: 453, AT-38: 31.

**Unit Location:** Active: Beale and Edwards AFBs, Calif., Columbus AFB, Miss., Holloman AFB, N.M., Laughlin, Randolph, and Sheppard AFBs, Tex., Moody AFB, Ga., Vance AFB, Okla., Whiteman AFB, Mo. AFRC; (assoc.) Randolph AFB, Tex.

**Contractor:** Northrop Grumman.

**Power Plant:** Two General Electric J85-GE-5A turbojets, each 2,680 lb thrust dry, 2,900 lb thrust with afterburning.

**Accommodation:** Two, in tandem, on ejection seats.

**Dimensions:** span 23.5 ft, length 46.3 ft, height 12.8 ft.

**Weight:** empty 7,164 lb, gross 12,500 lb.

**Ceiling:** above 55,000 ft.

**Performance:** max level speed 812 mph, range 10,000 miles.

**COMMENTARY**

Most of the T-38s in service are used by AETC for advanced bomber-fighter training and in JSUPT. Capabilities are being enhanced through an ongoing program of modifications and renewal, including a full avionics upgrade with a HUD and integrated GPS/INS, and a propeller modernization. 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 to be used to teach supersonic techniques, aerobatics, formation, night and instrument flying, and cross-country and low-level navigation. The aircraft is also used by AFMC to train test pilots and flight-test engineers at Edwards AFB, Calif., in experimental techniques, and by ACC to maintain pilot proficiency.

T-38B. A slightly different version, with a gunsight and practice bomb dispenser, the AT-38B is used by USAFA for introductory glider training, instructor upgrade training, and cross-country soaring training.

T-41D, a military version of the Cessna 172, is used by USAFA to provide operational support to assigned commands.

T-10B Merlin

**Brief:** Two-seat medium-performance sailplane used for introductory glider training, instructor upgrade training, spin training, and basic cross-country soaring training.

**Function:** Trainer.

**Operator:** USAFA.

**Delivered:** May 2002.

**IOC:** December 2002.

**Production:** four.

**Inventory:** four.

**Unit Location:** USAFA, Colo.

**Contractor:** Blanik.

**Accommodation:** single.

**Dimensions:** span 46.3 ft, length 21.7 ft, height 4.7 ft.

**Weight:** 750 lb.

**Performance:** speed 149.5 mph, glide ratio 33:1.

**COMMENTARY**

The T-10B is an L-33 Solo Blanik sailplane produced in the Czech Republic. It is a medium performance sailplane that allows students to master basic flight maneuvers while solo, before progressing to a more advanced sailplane. It is primarily used for cross-country training and high-altitude wave flight.

T-41C Kestrel

**Brief:** Two-seat medium-performance sailplane used for spin and aerobatic training.

**Function:** Trainer.

**Operator:** USAFA.

**Delivered:** May 2002.

**IOC:** December 2002.

**Production:** five.

**Inventory:** four.

**Unit Location:** USAFA, Colo.

**Contractor:** Grupo Aeromot, Brazil.

**Power Plant:** one Rotax 912A, 81 hp engine.

**Weight:** gross 115.5 lb.

**Ceiling:** 37,000 ft.

**Performance:** speed 142.6 mph, glide ratio 28:1.

**COMMENTARY**

The T-41C is a two-place, side-by-side motorized glider for use by USAFA in its Introductory Flight Training Program (IFT) flight screening/primary training program.

**Function:** Trainer.

**Operator:** USAFA.

**Delivered:** September 2002.

**IOC:** December 2002.

**Production:** 14.

**Inventory:** 14.

**Unit Location:** USAFA, Colo.

**Contractor:** Grupo Aeromot, Brazil.

**Power Plant:** one Rotax 912A, 81 hp engine.

**Weight:** gross 115.4 lb.

**Ceiling:** 37,000 ft.

**Performance:** speed 149.5 mph, glide ratio 33:1.

**COMMENTARY**

The T-10B is an L-33 Solo Blanik sailplane produced in the Czech Republic. It is a medium performance sailplane that allows students to master basic flight maneuvers while solo, before progressing to a more advanced sailplane. It is primarily used for cross-country training and high-altitude wave flight.

T-41D 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.

**Delivered:** 1961-1972.

**IOC:** March 1961.

**Production:** more than 1100.

**Inventory:** T-38: 453, AT-38: 31.

**Unit Location:** Active: Beale and Edwards AFBs, Calif., Columbus AFB, Miss., Holloman AFB, N.M., Laughlin, Randolph, and Sheppard AFBs, Tex., Moody AFB, Ga., Vance AFB, Okla., Whiteman AFB, Mo. AFRC; (assoc.) Randolph AFB, Tex.

**Contractor:** Northrop Grumman.

**Power Plant:** Two General Electric J85-GE-5A turbojets, each 2,680 lb thrust dry, 2,900 lb thrust with afterburning.

**Accommodation:** Two, in tandem, on ejection seats.

**Dimensions:** span 23.5 ft, length 46.3 ft, height 12.8 ft.

**Weight:** empty 7,164 lb, gross 12,500 lb.

**Ceiling:** above 55,000 ft.

**Performance:** max level speed 812 mph, range 10,000 miles.

**COMMENTARY**

Most of the T-38s in service are used by AETC for advanced bomber-fighter training and in JSUPT. Capabilities are being enhanced through an ongoing program of modifications and renewal, including a full avionics upgrade with a HUD and integrated GPS/INS, and a propeller modernization. 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 to be used to teach supersonic techniques, aerobatics, formation, night and instrument flying, and cross-country and low-level navigation. The aircraft is also used by AFMC to train test pilots and flight-test engineers at Edwards AFB, Calif., in experimental techniques, and by ACC to maintain pilot proficiency.

T-38B. A slightly different version, with a gunsight and practice bomb dispenser, the AT-38B is used by USAFA for introductory glider training, instructor upgrade training, and cross-country soaring training.

T-43. A two-place, side-by-side motorized glider used by USAFA to provide operational support to assigned commands.

**Dimensions:** span 93 ft, length 100 ft, height 37 ft.
### Helicopters

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### UV-18 Twin Otter

**Brief:** Modified utility transport used for parachute jump training.

**Function:** Parachute.

**Contractor:** de Havilland Aircraft of Canada.

**Unit Location:** USAFA, Colo.

**Production:** Three.

**Dimensions:** span 57.3 ft, length 26.4 ft, height 6.3 ft.

**Weight:** 1,874 lb.

**Performance:** cruise speed 110 mph, glide ratio 31:1, range 690 miles at high-speed cruise, max endurance seven hr.

### T-34B

**Brief:** Single-seat high-performance advanced trainer/cross-country sailplane.

**Operator:** USAFA.

**Unit Location:** USAFA, Colo.

**Inventory:** Two.

**Production:** 104.

**Dimensions:** span 66.5 ft, length 28.3 ft.

**Weight:** 1,543 lb.

**Performance:** max permitted speed 155 mph, aspect ratio 24:4.

### TG-6A

**Brief:** Military version of the Turbo Commander 105.

**Operator:** USAFA.

**Unit Location:** USAFA, Colo.

**Inventory:** Three.

**Production:** 50.

**Dimensions:** span 49.7 ft, length 32.3 ft.

**Weight:** 5,117 lb.

**Performance:** max permitted speed 155 mph, aspect ratio 22.2.

### TG-15A

**Brief:** Single-seat high-performance advanced trainer/cross-country competition sailplane.

**Operator:** Schempp-Hirth, Germany.

**Unit Location:** USAFA, Colo.

**Inventory:** Two.

**Production:** 50.

**Dimensions:** span 65 ft, length 51.8 ft, height 19.5 ft.

**Accommodation:** Crew of two and up to 20 passengers.

**Performance:** max cruising speed 210 mph, range 690 miles at high-speed cruise, max endurance 7 hours.

### MH-53M

**Brief:** Long-range deep penetration helicopter.

**Operator:** Sikorsky.

**Unit Location:** AETC: Kirtland AFB, N.M. AFSOC: Hurlburt Field, Fla., RAF Mildenhall, UK.

**Production:** Not available.

**Dimensions:** rotor diameter 53.6 ft, length of fuselage 64.7 ft, height 16.7 ft.

**Weight:** empty 12,330 lb, max gross 22,000 lb.

**Performance:** max speed 173 mph, max range 373 miles (internal fuel), 500 miles (auxiliary tank).

**Armament:** Two 7.62 mm miniguns, plus provision for two .50-caliber machine guns in cabin doors.

### UV-18 Twin Otter

**Brief:** Modified utility transport used for parachute jump training.

**Function:** Parachute.

**Operator:** USAFA.

**First Flight:** May 1965.

**IOC:** circa 1965.

**Production:** Three.

**Dimensions:** span 57.3 ft, length 26.4 ft, height 6.3 ft.

**Weight:** 1,874 lb.

**Performance:** cruise speed 110 mph, glide ratio 31:1, range 690 miles at high-speed cruise, max endurance seven hr.

### COMMENTARY

The TG-6A is a high-performance advanced trainer/cross-country sailplane for use by USAFA cadets in support of glider competition events nationwide.

The TG-15A is a single-seat high-performance advanced trainer/cross-country sailplane manufactured by Schempp-Hirth of Germany. This world-class competition glider is dual-seated and will be used nationwide by USAFA cadets for glider competition events.

The TG-15B is a single-seat high-performance advanced trainer/cross-country sailplane for use by USAFA cadets for glider competition events nationwide.

The T-34B is a high-performance advanced trainer/cross-country sailplane manufactured by Schempp-Hirth of Germany under the civilian designation Discus 2b. This world-class competition glider is single-seated and will be used nationwide by USAFA cadets for glider competition events.

The UV-18 Twin Otter is a military version of the DHC-6 Twin Otter.

The HH-60G Pave Hawk is a military version of the DHC-6 Twin Otter.

The HH-53J Pave Low III is a version of the MH-53J.

The MH-53M is a long-range deep penetration helicopter.

The UV-18 Twin Otter is a high-performance advanced trainer/cross-country sailplane manufactured by Schempp-Hirth of Germany under the civilian designation Duo Discus. This world-class competition glider is dual-seated and will be used nationwide by USAFA cadets for glider competition events.

The T-34B is a high-performance advanced trainer/cross-country sailplane for use by USAFA cadets in support of glider competition events nationwide.

The TG-15A is a single-seat high-performance advanced trainer/cross-country sailplane manufactured by Schempp-Hirth of Germany. This world-class competition glider is dual-seated and will be used nationwide by USAFA cadets for glider competition events.

The TG-15B is a single-seat high-performance advanced trainer/cross-country sailplane for use by USAFA cadets for glider competition events nationwide.

The T-34B is a high-performance advanced trainer/cross-country sailplane manufactured by Schempp-Hirth of Germany under the civilian designation Discus 2b. This world-class competition glider is single-seated and will be used nationwide by USAFA cadets for glider competition events.

The UV-18 Twin Otter is a military version of the DHC-6 Twin Otter.

The HH-60G Pave Hawk is a military version of the DHC-6 Twin Otter.

The HH-53J Pave Low III is a version of the MH-53J.

The MH-53M is a long-range deep penetration helicopter.
Integrated digital map, and mission commander situation awareness panel in the cabin area.

**UH-1 Iroquois**

**Brief:** Modified Bell helicopter used to support Air Force ICBM facilities and for administrative airlift.

**Function:** Utility helicopter.

**Operator:** AETC, AFMC, AFSOC, AFSPC, AMC, PACAF.

**First Flight:** circa 1956.

**Delivered:** from September 1970.

**IOC:** 1970.

**Production:** 79 (USAF).

**Inventory:** 89.

**Unit Location:** Andrews AFB, Md., Fairchild AFB, Wash., F.E. Warren AFB, Wyo., Hurlburt Field, Fla., Kirtland AFB, N.M., Malmstrom AFB, Mont., Minot AFB, N.D., Robins AFB, Ga., Vandenberg AFB, Calif., Yokota AB, Japan.

**Contractor:** Bell.

**Power Plant:** General Electric TF-34 and Honeywell Canada T400-CP-400 Turbo “Twin-Pac.”

**Accommodation:** two pilots and 14 passengers or one internal load of 4,000 lb.

**Dimensions:** rotor diameter (with tracking tips) 48.1 ft, fuselage length 42.3 ft, height 14.3 ft.

**Weight:** gross and mission weight 11,200 lb.

**Ceiling:** 13,000 ft.

**Performance:** max cruising speed at S/L 115 mph, max range, no reserves, 261 miles.

**Armament:** (optional) two General Electric 7.62 mm miniguns or two 40 mm grenade launchers; two seven-tube 2.75 in. rocket launchers.

**COMMENTARY**

**UH-1N** is a twin-engine version of the UH-1 utility helicopter (Boeing Model 205), most of which are allocated for AFSPC missile site support and for administrative/DV airlift. The UH-1N is also used by AETC's 58th SOW, Kirtland AFB, N.M., for training purposes and by the 336th TG, Fairchild AFB, Wash., for aircrew survival training. Two UH-1N helicopters are maintained by AFOSI for aviation advisory aircrew flight proficiency.

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**Strategic Missiles**

**AGM-86 Air Launched Cruise Missile**

**Brief:** A small, winged air vehicle, 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 (full-scale development).

**Delivered:** from 1981.

**IOC:** December 1988.

**Production:** 79 (USA).

**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.

**Warhead:** AGM-86B: W80-1 nuclear; AGM-86C: blast fragmentation or conventional; AGM-86D: hard target penetrator.

**Warhead:** Dimensions: length 20.8 ft, body diameter 2 ft, wingspan 12 ft.

**Weight:** 3,150 lb (B), 3,277 lb (C).

**Performance:** (approx) speed 550 mph (Mach 0.6), range 1,500+ miles (AGM-86B).

**COMMENTARY**

**AGM-86A** is a prototype cruise missile, developed in the mid-1970s. Although smaller than the later versions, it never entered production.

**AGM-86B** is the production version, the B is probably the most important for strategic attack on surface targets. Small radar signature and low-level flight capability enhance the missile’s effectiveness. The last of 1,715 produced was delivered in October 1986. Undergoing SLEP to extend life to FY30.

**AGM-86C** is a conventional warhead version, developed from June 1986, the Conventional Air Launched Cruise Missile (CALCM) was first used operationally during Gulf War I and has since been used widely in combat operations. CALCM provides the warfighter with an adverse weather, day/night, air-to-surface, accurate, standoff outside theater defenses strike capability with a range greater than 500 miles and a 3,000-lb class warhead. CALCM is equally effective for stand-alone, clandestine/punitive strikes and fully integrated theater warfare. From 1986, Boeing converted 622 Bs to the conventional configuration, the first of which was delivered in December 1987. The remaining CALCMs have Block 1A enhancements with improved accuracy and increased immunity to electronic jamming. Since Iraqi Freedom, few CALCMs remain.

**AGM-86D,** CALCM penetrator version with a Lock- heed Martin AUP-3(M) warhead. The CALCM penetrator provides the warfighter with a cost-effective, standoff outside theater defenses capability against a wide range of hardened, deeply buried targets. The CALCM penetrator was used with success in Israeli Freedom.

**AGM-129 Advanced Cruise Missile**

**Brief:** A stealthy, long-range, winged air vehicle equipped with a nuclear warhead and designed to evade enemy air and ground-based defenses in order to strike hard, heavily defended targets at standoff distances.

**Function:** Strategic air-to-surface cruise missile.

**Operator:** ACC.

**First Flight:** July 1985.

**Delivered:** June 1990-August 1993.

**IOC:** circa 1993.

**Production:** 461.

**Unit Location:** Barksdale AFB, La., Minot AFB, N.D.

**Contractor:** General Dynamics (now Raytheon); McDonnell Douglas (now Boeing).

**Power Plant:** Williams International F11W-120 turbofan.

**Guidance:** inertial, with TERCOM update.

**Warhead:** W80-1 nuclear.

**Dimensions:** length 20.8 ft, body width 2.2 ft, wingspan 10.2 ft.

**Weight:** 3,700 lb.

**Performance:** range 2,300+ miles, speed 550 mph.

**COMMENTARY**

**AGM-129A**, embodying stealth technology, the AGM-129A is an air-launched strategic cruise missile with significant improvements over the AGM-86B in range, accuracy, and survivability. Armed with a W-80 warhead, it is designed to evade air- and ground-based defense systems in order to strike heavily defended, hardened targets at any location within an enemy's territory. Developed by General Dynamics, McDonnell Douglas was certified as second source for this advanced system, which is carried externally on B-52H aircraft. The AGM is undergoing modification to extend its service life to 2030.

**LG-118 Peacekeeper**

**Brief:** A solid-fuel ICBM capable of being fired from silo or aircraft, having a thermonuclear payload of one to three warheads with high accuracy over great distances.

**Function:** Strategic surface-to-surface ballistic missile.

**Operator:** AFSPC.

**First Flight:** February 1961.

**Delivered:** 1962-December 1978.

**IOC:** December 1962, Malmstrom AFB, Mont.

**Production:** 1,800.

**Unit Location:** F.E. Warren AFB, Wyo., Malmstrom AFB, Mont., Minot AFB, N.D.

**Contractor:** Boeing.

**Power Plant:** stage 1: Thiokol M-55 solid-propellant motor, 210,000 lb thrust; stage 2; Aerojet General SR-19-AJ-1 solid-propellant motor, 60,300 lb thrust; stage 3: Thiokol SR73-AJ-1 solid-propellant motor, 34,400 lb thrust.

**Guidance:** inertial guidance system.

**Warheads:** one-three Mk 12/12A MIRVs (downloaded to one).

**Dimensions:** length 59.8 ft, diameter of first stage 5.5 ft.

**Weight:** launch weight (approx) 78,000 lb.

**Performance:** speed at burnout more than 15,000 mph, highest point of trajectory approx 700 miles, range with max operational load more than 6,000 miles.

**COMMENTARY**

**A key element in the US strategic deterrent posture, Minuteman is a three-stage, solid-propellant ICBM, housed in an underground silo.**

**LG-30 Minuteman/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 1969. USAF had deployed 150 A and 650 B missiles in 16 squadrons.

**LG-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 squadrons.

**LG-30G** The Minuteman III became operational in June 1970, providing improved range, rapid retargeting, and the capability to place three MIRVs on three targets with a high degree of accuracy. USAF initially deployed 550 in 11 squadrons.

A single re-entry vehicle configuration for some missiles has been demonstrated, planned for, and is being worked in accordance with strategic arms control negotiations. Currently a total of 23 Minuteman IIs are based at Minot AFB, N.D.; F.E. Warren AFB, Wyo.; and Malmstrom.

An extensive life extension program is ensuring Minuteman’s viability to 2020. Major upgrades include refurbishment of liquid propulsion post-boost rocket engine, remanufacture of the solid-propellant rocket motors, replacement of the environmental control system, repair of launch facilities, installation of updated, survivable communications equipment, and a G2 sustainment program.

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**Tactile Missiles and Weapons**

**AGM-65 Maverick**

**Brief:** A tactical, TV- or imaging infrared (IIR)-guided air-to-surface missile carried by fighters and designed for use in CAS, interdiction, and defense suppression missions, having standoff capability and high probabil-

---
ity of strike against a wide range of targets.

**Function:** Air-to-surface guided missile.

**First Flight:** August 1969.

**Delivered:** from August 1972.

**IOC:** February 1973.

**Production:** sustainment phase.

**Contractor:** Raytheon.

**Power Plant:** Thiokol TX-481 solid-propellant rocket motor.

**Guidance:** self-homing, EO guidance system (IR and D and G models).

**Warhead:** AGM-65A/B/D/H 125-lb high-explosive, shaped charge; AGM-65G/K 298-lb blast fragmentation warhead.

**Dimensions:** length 8.2 ft, body diameter 1 ft, wing-span 3 ft.

**Weight:** launch weight (AGM-65A) 462 lb, (AGM-65G) 670 lb.

**Performance:** range about 9.2 miles.

**COMMENTARY**
Maverick missiles have a long and distinguished combat record. They were first employed by USAF in Vietnam and were used extensively during Gulf War I and II. 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 treetop 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 in February 1986 on A-10 aircraft.

**AGM-65G.** Uses the IIR seeker with an alternate 298-lb blast fragmentation warhead for use against hardened targets. Software is 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.

**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, antiship cruise missile system capable of being fired from E-52H aircraft, ships, and submarines.

**Function:** Air-to-surface antiship missile.

**First Flight:** March 1974 (for USN).

**Delivered:** from 1977 (USN).

**IOC:** circa 1985 (USAF).

**Production:** sustainment phase.

**Contractor:** Boeing (McDonnell Douglas).

**Power Plant:** Teledyne CAE J402-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 500 lb.

**Dimensions:** length 12.6 ft, body diameter 1.1 ft, wing-span 3 ft.

**Weight:** 1,172 lb.

**Performance:** speed high subsonic, range more than 57 miles.

**COMMENTARY**

Harpone and its launch control equipment provide USAF the capability to intercept ships at ranges well beyond those of other aircraft. Originally equipped to equip two squadrons of now-retired B-52G aircraft for maritime antiship operations, the Harpoon all-weather antiship missile currently arms conventional missions B-52Hs.

**AGM-84D** is 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.

**Function:** Air-to-surface antiradiation missile.

**First Flight:** April 1979.

**Delivered:** 1982-98.

**IOC:** circa 1984.

**Production:** sustainment phase.

**Contractor:** Raytheon.

**Power Plant:** Thiokol 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 13.7 ft, body diameter 10 in, wing-span 3.7 ft.

**Weight:** 795 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 (ARM) greatly improved capability over first-generation Shrikes and Standard ARMs. The AGM-88 proved highly effective against enemy ground radar in Gulf War I and in subsequent operations. HARMs equip F-16 Block 50/52s (F-16CJ) dedicated to the SEAD mission.

**AGM-88A.** A factory-programmed version used to equip the now-retired F-4G Wild Weasel to increase its lethality in electronic combat. No longer operational.

**AGM-88B.** Incorporates radar-guided or programmable read-only memory, permitting changes to missile memory in the field. Older versions of the AGM-88B have software upgrades to satisfy current-standard capability requirements.

**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.

Upgrade initiatives are aimed at increasing capability of both B and C versions against target shutdown, blinding, and blinking and at reducing potential damage to friendly radars in the target area. Further upgrades being evaluated include GPS-precision navigation capability through a modification of the control section known as the HARM Destruction of Enemy Air Defenses (DEAD) Attack Module, or HDAM.

**AGM-130**

**Brief:** A powered TV- or IR-guided air-to-surface missile, 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.

**First Flight:** 1984.

**Delivered:** November 1992-94.

**IOC:** 1994.

**Production:** sustainment phase.

**Contractor:** Boeing.

**Guidance:** TV or IIR seeker, or distance measuring equipment (DME) transponder.

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

**Dimensions:** length 12.8 ft, body diameter 1.5 ft, wing-span 4.9 ft.

**Weight:** launch weight 2,917 lb.

**Performance:** cruising speed subsonic, ceiling in excess of 30,000 ft, range greater than 34.5 miles, circular error probable (CEP) about 10 ft.

**COMMENTARY**
AGM-130 is a product improvement to the GBU-15 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 permit operation in adverse weather and improve target acquisition.

AGM-130s have been used extensively in recent operations.

**AGM-130A, with the Mk 84 warhead.**

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

**AGM-154 Joint Standoff Weapon**

**Brief:** First in a joint USAF and Navy family of low-cost, highly lethal glide weapons with a standoff capability, usable against heavily defended targets.

**Function:** Air-to-surface guided missile.

**First Flight:** December 1994.

**Delivered:** 2000-present.
AIM-120 AMRAAM (SMSGt. Chris Drudge)

Production: 6,114 (originally planned).
Contractor: Raytheon.
Guidance: INS/GPS.
Dimensions: length 13.3 ft. Weight: 1,065-1,500 lb.
Performance: range: low-altitude launch 17 miles, high-altitude launch 40+ miles.

AIM-9 Sidewinder (SMSGt. David H. Lipp)

Contractor: Raytheon; Loral.
Power Plant: Thiokol Mk 36 Mod 11 solid-propellant rocket motor.
Guidance: solid-state IR homing guidance.
Warhead: high-explosive, weighing 20.8 lb.
Dimensions: length 9.4 ft, body diameter 5 in, fins 2.1 ft.
Weight: launch weight 190 lb.
Performance: max speed Mach 2+, range 10+ miles.

AIM-9 Sidewinder Brief: A supersonic, short-range, IR-guided air-to-air missile carried by fighter aircraft, having a high-explosive warhead.

Function: Air-to-air guided missile.
First Flight: December 1983 (AIM-7M).
Delivered: from 1956.

AIM-120 AMRAAM Brief: A new generation supersonic, medium-range, active radar-guided air-to-air missile with a high-explosive warhead.

Function: Air-to-air guided missile.
Production: 10,917+ planned for USAF/USN.
Contractor: Raytheon.
Power Plant: Alliant boost-sustain solid-propellant rocket motor.
Guidance: inertial/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 2.1 ft.
Weight: 335 lb.
Performance: cruising speed approx Mach 4, range more than 23 miles.

AIM-9 Sidewinder Brief: A supersonic, medium-range, semiactive radar-guided air-to-air missile with a high-explosive directed fragmentation warhead.

Function: Air-to-air guided weapon.
First Flight: April 8, 1998. Delivered: through FY17 (planned).
Production: 2,853, plus 1,426 JASSM-ER (planned).
Contractor: Lockheed Martin; Raytheon; Honeywell.
Guidance: INS, GPS, and IIR terminal seeker.

Power Plant: Teledyne Continental Motors.
Dimensions: length 14 ft.
Weight: 2,250 lb.
Performance: 1,000-lb class penetrator and blast fragmentation warheads; standoff range greater than 200+ miles.

AIM-7 Sparrow Brief: A supersonic, medium-range, semiactive radar-guided air-to-air missile with all-altitude, all-altitude, and all-aspect offensive capability and a high-explosive warhead, carried by fighter aircraft.

Function: Air-to-air guided missile.
First Flight: December 1983 (AIM-7M).
Delivered: from 1956.

AIM-9 Sidewinder Brief: A supersonic, short-range, IR-guided air-to-air missile carried by fighter aircraft, having a high-explosive warhead.

Function: Air-to-air missile.
First Flight: September 1953.
Production: sustainment phase (AIM-9M); LRIP from November 2000 (AIM-9X).
maneuver capability. Significant improvements in operational effectiveness over the AIM-7 include increased average viable engagement range, improved fuzing, increased warhead lethality, multiple target engagement capability, improved clutter rejection in low altitude, enhanced electronic counter-countermeasures 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. A total of 612 AIM-120As were produced, with reprogrammable vari- ants of the AIM-120. The AIM-120C currently in production has smaller, clipped control surfaces to provide for internal carriage capability in the F/A-22 and F-35, with HOBs launch capability. The latest development effort (AMRAAM Phase 4) adds GPS to improve navigational accuracy and enhanced electronic countermeasures capabilities in the AIM-120D version, due to enter production in 2006.

CBU-87/103/113 Combined Effects Munition

Brief: The CBU-87 CEM is an area cluster munition effective against light armor, materiel, and personnel and can be used on USAF and Navy fighters and bombers for interdiction.

Function: Area cluster munition.

Performance: Delivered.

Contractor: Aerojet General; Honeywell; Alliant Tech.

Guidance: none (CBU-87).

Dimensions: length 7.7 ft; diameter 1.3 ft.

Weight: 949 lb.

Performance: dispenses 202 BLU-97 combined effects submunitions on an area roughly 800 ft by 400 ft.

COMMENTARY

The CBU-87 Combined Effects Munitions dispenses 202 BLU-97 submunitions with antitank and antipersonnel/antiamtial/antiaircraft submunitions. Each submunition contains four “skeet” projectiles, each of which contains 40 leatherticks. The skeet IR sensors can detect a vehicle in the vicinity of a submunition. A semiactive laser detector, if activated, can detect a direct attack capability and interdiction against C2 centers.

The BLU-97 FSEW is delivered as an unguided gravity weapon from the A-10, B-1, B-2, B-52H, F-15E, and F-16. The initial baseline SFW systems contained the BLU-109/B and BLU-109A/B submunitions. A planned product improvement SFW variant P31 submunition, the BLU-108/B, is in full-scale production, incorporating improvements such as an active laser sensor, multimission warhead, and increased footprint.

CBU-105, Designation of an unguided CBU-97 equipped with a Wind-Corrected Munitions Dispenser (WCMD) tali kit. The CBU-105 can be accurately delivered from high altitude and in adverse weather from the B-1, B-2, B-52H, F-15E, and F-16. Combat debut for the CBU-95 occurred April 2003, during Iraqi Free- dom, from a B-2.7

GBU-107 passive attack weapon

Brief: The GBU-107 Passive Attack Weapon (PAW) provides the capability to attack non-hardened surface targets, with a minimum of collateral and environmental damage.

Function: Wide-area cluster munition.


Delivered: 2002-03.

IOC: December 2002.

Production: not available, but completed March 2003.

Contractor: General Dynamics; Honeywell; Aerojet General; Olan; Alliant Tech.

Guidance: semiactive laser.

Weight: 1,050 lb.

Performance: deliveries through 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, F-16, B-1, B-2, B-52, F-117, and B-2 aircraft.

CBU-109 Gator

Brief: The CBU-109 Gator is an antiarmor/antipersonnel mine dispenser used by the USAF and Navy fighters and bombers for interdiction.

Function: Scatterable mines.

Production: sustained phase.

Contractor: Honeywell; Aerojet General; Olan; Alliant Tech.

Guidance: none (CBU-89).

Dimensions: length 7.7 ft; diameter 1.3 ft.

Weight: 705 lb.

Performance: dispenses 72 BLU-91 antiarmor and 22 BLU-91 antipersonnel mines.

COMMENTARY

The CBU-98 Gator dispenser holds 94 mines, of which 72 are antia -tank and 22 are antipersonnel. The mines are dispersed over the target in a circular pattern. The antitank mines, which can be fused for three different time delay settings, have a magnetic influence fuzing to sense armor.

CBU-104, 97/105/115 Sensor Fused Weapon

Brief: The GBU-104 or 105 LGB is an area maneuvers weapon that can be used on USAF and Navy aircraft. It is used primarily to strike fixed armored targets, with a minimum of collateral and environmental damage.

Function: Area cluster munition.

First Flight: circa 1990.


Production: 3,937 (planned).

Contractor: Textron; Boeing; Raytheon.

Guidance: IR sensors in each warhead search for targets, then detonate over them.

Dimensions: length 7.7 ft; diameter 1.3 ft.

Weight: 920 lb.

Performance: delivers 40 lethal projectiles over an area of about 9,500 ft by 1,200 ft.

COMMENTARY

The CBU-97 Sensor Fused Weapon (SFW) combines a munitions dispenser with an FZU-39 fuze and a payload of 10 BLU-108 submu-

nitions. Each tactical munitions dispenser contains 10 BLU-108 submunitions, and each submunition contains four “skeet” projectiles that, upon being thrown out, seek out and deliver an explosive target.
Dimensions: length 14.2 ft. Weight: 2,350 lb. Performance: range more than 11.5 miles.

**COMMENTARY**

**GBU-24/A/B.** An air-to-ground weapon equipped with the third generation Paveway III guidance kit, integrated with a BLU-109 penetrating warhead. The kit consists of an advanced guidance section and high-altitude airframe. It is extremely precise and highly effective against a broad range of high-value hard targets. The system can be employed from low, medium, or high altitudes, providing operational flexibility through the use of an adaptive digital autopilot and a high field-of-regard, highly sensitive scanning seeker. The GBU-24/A/B was highly successful during Desert Storm.

The GBU-24 adapts to conditions of release, flies an appropriate midcourse, and provides trajectory shaping for enhanced warhead effectiveness. The weapon is deployed on USAF F-15E, F-16, and F-117 and Navy F-14 and F/A-18.

**GBU-27**

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

**Function:** Air-to-surface guided glide bomb.

**First Flight:** Not available.

**Delivered:** from 1988.

**IOC:** 1998 (unconfirmed).

**Production:** Approx 3,000.

**Contractor:** Raytheon.

**Guidance:** Semiactive Laser.

**Dimensions:** Span 5.2 ft, length 13.9 ft.

**Weight:** 2,170 lb.

**Performance:** Range more than 11.5 miles.

**COMMENTARY**

To meet the unique requirements of the F-117A, the GBU-24/A/B was adapted to GBU-27 standard, incorporating specific guidance features to accomplish this mission. The GBU-27 is extremely precise and was used to great effect in Desert Storm.

**GBU-27**

Integrates GPS/INS guidance into the existing GBU-27 seeker to provide adverse weather capability and improved target location. Entered production in FY98. First operational use was in Iraq Freedom.

**GBU-28**

Brief: A large 5,000-lb class air-to-ground penetrat-

ing LGB equipped with an advanced laser guidance kit, used primarily for striking hard underground targets.

**Function:** Air-to-surface guided glide bomb.

**First Flight:** February 1991.

**Delivered:** circa 1991.

**IOC:** 1991.

**Production:** approx 500.

**Contractor:** Raytheon.

**Guidance:** Laser.

**Dimensions:** Length 19.2 ft, diameter 1.2 ft.

**Weight:** 4,676 lb.

**Performance:** Range more than 5.75 miles.

**COMMENTARY**

Under USAF’s rapid-response program, the GBU-28 bomb was designed for insertion into the B-2 bomb bay for use against deeply buried, hardened facilities. Four of the GBU-28 weapons were used during the war; two were lost. The GBU-28 has been adapted for 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 guidance control unit to provide adverse weather capability and improved target location. Entered production in FY99.

**GBU-31/32/38 Joint Direct Attack Munition**

**Brief:** Joint U.S./Navy/INS/GPS-guided weapon, carried by fighters and bombers, that provides highly accurate, autonomous, all-weather conventional bomb- ing capability.

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

**First Flight:** Oct. 22, 1996.

**Delivered:** 1998-2009 (planned).

**IOC:** 1998.

**Production:** 240,882 (planned).

**Contractor:** Boeing: Textron; Honeywell.

**Guidance:** INS/GPS.

**Dimensions:** Mk 84 with JDAM 12.8 ft; BLU-109 on JDAM 12.4 ft; Mk 83 with JDAM 10 ft.

**Weight:** Mk 84 2,036/2,056 lb (USA/USN); BLU-109 2,115/2,135 lb; Mk 83 1,013/1,028 lb.

**Performance:** Range up to 17 miles, CEP with GPS 42.9 ft; CEP with INS only 99 ft.

**COMMENTARY**

JDAM upgrades the existing inventory of general-purpose bombs by integrating them with a GPS/INS guidance kit to provide accurate all-weather attack from medium-to-high altitudes. While still aboard the launch aircraft, JDAM is passed target information through the aircraft’s avionics system. Once released, the inertial guidance kit takes over and, with periodic GPS updates to the INS, guides the weapon to its target. JDAM is intended for AV-8B, B-1, B-2, B-52, F-14, F-15E, F-16, F-35, F-117, F/A-18C/D/E/F, and F/A-22 aircraft.

**GBU-31**

Variant that adds an INS/GPS guidance kit to the 2,000-lb general-purpose Mk 84 bomb or the 2,000-lb BLU-109 penetrator. First used in combat March 24, 1999.

**GBU-32**

Variant that adds an INS/GPS guidance kit to the 1,000-lb general-purpose Mk 83 bomb or the 1,000-lb BLU-110 penetrator.

**GBU-38**

Variant that adds an INS/GPS guidance kit to the 500-lb general-purpose Mk 82 bomb. First production deliveries were in 2004 for the B-2.

Planned upgrades include an antispoofering GPS receiver and low-cost antennna antenna.

**Massive Ordnance Air Blast (MOAB) Bomb**

**Brief:** A massive precision guided munition (PGM) designed to be dropped by B-1, B-2, or B-52 bombers.

**Function:** Massive bomb.

**Guidance:** GPS/INS.

**Warhead:** 18,000 lb, high explosive.

**Dimensions:** Length 30 ft, diameter 3.3 ft.

**Weight:** 21,500 lb.

**COMMENTARY**

On March 11, 2003, USAF live-tested the largest PGM developed to date. Unlike the earlier unguided “Daisy Cutter” bomb, the MOAB does not require a parachute. Testing continues.

**Small Diameter Bomb**

**Brief:** Extended range all-weather, day/night 250-lb class near-precision guided munition. Provides increased loadout to achieve multiple kills per sortie and decreases collateral damage.

**Function:** Air-to-surface guided munition.

**First Flight:** May 23, 2003 (guided).

**Delivered:** from FY06 (planned).

**IOC:** FY06.

**Production:** 24,000 munitions and 2,000 carriages (planned).

**Contractor:** Boeing.

**Guidance:** GPS/INS augmented by Differential GPS.

**Dimensions:** Length 70.8 in (munition); 126.4 in (carriage); 143.1 in (carriage with four munitions).

**Weight:** 285 lb (munition); 360 lb (carriage); 1,460 lb (carriage with four munitions).

**Performance:** Near-precision capability at standoff range up to 46 miles.

**COMMENTARY**

The Small Diameter Bomb (SDB) system employs a BRU-61A smart carriage capable of carrying four 250-lb class GBU-38/B near-precision guided air-to-surface munitions. It is capable of destroying high-priority fixed and stationary relocatable targets from both fighters and bombers in internal bays or on external hardpoints. SDBs can be targeted and released against single or multiple targets. Target coordinates are loaded in the weapon prior to release either on the ground or in the air by crew. As the weapon is released, it relies on GPS/INS augmented by Differential GPS to self-navigate to the impact point. SDB increases loadout, decreases collateral damage, and improves aircraft sortie generation times. Threshold aircraft for SDB is the A-10, B-2, and B-52.

**Wind-Corrected Munitions Dispenser-Extended Range (WCMD-ER)**

**Brief:** A WCMD tail and wing kit fitted to CEM/SFW (GBU-87/97) dispenser weapons. Augments WCMD baseline capability by adding GPS guidance and a wing kit for increased accuracy and standoff capability from outside point defense ranges.

**Function:** GPS guidance tail and wing kit.

**First Flight:** April 2005 (planned).

**Delivered:** 2006 (planned).

**IOC:** FY06.

**Production:** 7,500.

**Contractor:** Lockheed Martin.

**Dimensions:** Wing: length (wings stowed) 7 ft, width 1.3 ft, height 5 in.

**Weight:** less than 200 lb.

**Performance:** Standoff range about 40.25 miles.

**COMMENTARY**

USAF is developing a wing kit and incorporating GPS guidance into the WCMD tail kit to provide highly accurate delivery and standoff capability from outside point defense ranges for GBU-87/97 dispenser weapons. However, acquisition is subject to the current budget review.

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**Satellite Systems**

**Advanced EHF (AEHF)**

**Brief:** Joint service satellite communications system that provides global, secure, protected, and jam-resistant communications for high priority air, ground, and sea assets.

**Function:** Near-worldwide, secure, survivable satellite communications.

**Operator:** AFSPC.

**First Launch:** April 2008 (planned).

**IOC:** 2010 (planned).

**Constellation:** Three satellites.

**Design Life:** 14 years.

**Launch Vehicle:** Evolved Expendable Launch Vehicle (EELV).

**Unit Location:** Schriever AFB, Colo.

**GBU-31 Joint Direct Attack Munition** (MSgt. Glenn Wilkewitz)
Defence 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 office.
First Launch: May 23, 1962.
IOC: classified but in use during Vietnam War.
Orbit: polar orbiting; performance.
Design Life: 48 months (Block 5D-2); 54 months (Block 5D-3).
Launch Vehicle: Titan II.
Unit Location: Suitland, Md.
Orbit Altitude: approx 575 miles.
Contractor: Lockheed Martin; Northrop Grumman.
Power Plant: solar arrays generating 1,200-1,300 watts.
Dimensions: length 20.2 ft (with array deployed), width 4 ft.
Weight: 2,545 lb (including 592 lb sensor).
Performance: DSNG 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.
COMMENTARY
For the last 40 years, the DMSP constellation has provided high-quality, timely weather information to support strategic and operational warfighters worldwide. In addition, DMSP satellites provide critical land, sea, and space environment data required by US forces across the globe. The DMSP constellation will be replaced by the tri-agency NPOESS late in this decade.

Block 5D-2, two operational DMSP Block 5D-2 satellites survey the entire Earth four times a day. The last of the Block 5D-2 satellites was launched in December 1999. The 5D-2 satellites “see” visible and IR clouds that provide information to tactical and strategic warfighters. In 2002, the 5D-2 constellation will be joined by the first 5D-3 satellite, which represents a significant independent improvement over the operational linescan system. Secondary instruments in the 5D-3 spacecraft include a sounder and a suite of space environment sensors.

Block 5D-3, DMSP F16, the first Block 5D-3 satellite, was launched successfully on Oct. 18, 2003. (DMSP F15, with a 5D-3 satellite bus but 5D-2 sensors, was launched Dec. 12, 1999, and is credited as the first 5D-3 launch.) Blocks 5D-2 and 5D-3 have an improved space environment sensor designed to detect and track smaller missiles. The system was successfully deployed in 2003, and modernization of satellites in the constellation will continue for the remainder of the decade.

Dimethyl-Sulfide (DMS) satellite communications program
Brief: A spacecraft traveling in geosynchronous orbit and provides alert of possible ballistic missile attack on US forces or homeland.

Function: Strategic and tactical launch detection system. 
Operator: AFSPC.
First Launch: November 1970.
Constellation: classified.
Design Life: three yr.
Launch Vehicle: Titan IV/mental upper stage.
Unit Location: Schriever AFB, Colo.
Orbit Altitude: 22,000+ miles in geosynchronous orbit.
Contractor: TRW (now Northrop Grumman).
Power Plant: solar arrays generating 1,485 watts.
Dimensions: diameter 22 ft, height 32.8 ft, with solar panels: approx 575 miles.
Weight: 5,000 lb (approx).
Performance: orbits at approx 22,000 miles altitude in geosynchronous orbit; uses IR sensors to sense heat from missile and booster plumes against Earth’s background.

COMMENTARY
The incredibly flexible Defense Support Program (DSP) system was used extensively in Desert Storm to detect and track launches against coalition forces. Though not designed to spot and track smaller missiles, the system was highly successful in detecting launches, enabling timely warnings of Iraqi Scud attacks. Using existing sensors and data collection sources, global data related to theatre missile warning was transmitted to the Attack and Launch Early Reporting to Theater (ALERT) and Shield systems then located at the National Test Facility (NTF) at Schriever AFB, Colo. The Space Based Infrared System (SBIRS) mission control station (MCS), located at Buckley AFB, Colo., then performed timely operational feedback to early warning centers at Cheyenne Mountain AFS, Colo. Since the first launch, DSP satellites have provided an uninterrupted early warning capability to the US and its allies.

GPS satellites orbit the Earth every 24 hours, to day, to military and civilian users around the world. Signals permit calculation of location within less than 100 ft.

Global Positioning System
Brief: A constellation of orbiting space vehicles that provides highly precise and reliable navigation data, 24 hours a day, to military and civilian users around the world. Signals permit calculation of location within less than 100 ft.

Function: Worldwide navigation satellite.
Operator: AFSPC.
Constellation: classified.
Design Life: six yr (IIIA); 7.5 yr (IIR).
Launch Vehicle: Delta II.
Unit Location: Schriever AFB, Colo.
Orbit Altitude: 12,636 miles (IIA); 12,532 miles (IIR).
Contractor: Boeing (II, IIA, IIF); Lockheed Martin (IIR, IIF).
Power Plant: solar arrays generating 700 watts (II/IIIA); up to 2,900 watts (IIF).

Dimensions: IIR: body 5 x 6.3 x 6.2 ft, span incl solar arrays 38 ft. Weight: 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 they are required to remain within one-millionth of a degree, velocity being a fraction of a mile per hr, with accuracy extending to a fraction of a foot. GPS spacecraft orbit the Earth at a height of 11,000 miles, with an orbital period of 12 hr.

COMMENTARY
GPS navigational operations, such as precision bombing, CSAR, mapping, and rendezvous, are successful in part due to the 24-hour, worldwide navigation service provided by the Global Positioning System (GPS) navigation satellite constellation. Accurate three-dimensional (latitude, longitude, and altitude) position, velocity, and precise time are provided continuously in real time to support an unlimited number of users around the globe, both civilian and military. Concern over potential enemy jamming and spoofing under GPS modernization efforts. The modified Block IIR-M GPS satellites, launched in 2004, have two jam-resistant channels for military-only use. Block IIF satellites will be extended design life, faster processors, and a new civil signal on a third frequency launches 2006. Future generation GPS satellites are slated for launch 2012.

Milstar Satellite Communications System
Brief: A satellite communications system that provides secure, jam-resistant worldwide C2 communications to direct tactical and strategic forces to control their tactical and strategic forces.

Function: Communications satellite.
Operator: AFSPC.
IOC: July 1997 (Milstar I).
Constellation: five.
Design Life: 10 yr.
Launch Vehicle: Titan IV/Centaur.
Unit Location: Schriever AFB, Colo.
Orbit Altitude: 22,300 miles.
Contractor: Lockheed Martin; Boeing; TRW (now Northrop Grumman).
Power Plant: solar arrays generating 6,000 watts.
Dimensions: length 51 ft, width 116 ft with full solar array extension.
Weight: 10,000 lb.
Performance: constellation consists of three satellites in low-inclined geosynchronous orbit, providing worldwide coverage between 65° north and 65° south latitude.

COMMENTARY
The backbone of strategic tactical communications, Milstar is a joint service communications system that provides secure, jam-resistant EHF communications. World-wide operations are made possible by this 24-hr all-weather capability, available for immediate support at a moment’s notice. The Milstar inventory was fully deployed in 2002 and provides secure, jam-resistant communications will continue with the Advanced EHF (AEHF) constellation deployment.

Polar MILSATCOM
Brief: Payload on a classified satellite that provides secure, survivable communications, supporting peace-time, contingency, and wartime operations in the Northern Polar region, above 65° north latitude.

Function: Communications satellite.
Operator: USN.
First Launch: late 1997.
IOC: 1980+
Constellation: three.
Design Life: host satellite dependent.
Launch Vehicle: non-avaliable.
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.
Weight: 470 lb (payload).

COMMENTARY
Augmenting the Milstar constellation, the Polar MILSATCOM payload cost-effectiveness of means of providing secure communications for the northern polar region. Like Milstar, the system enables worldwide operations by linking strategic and tactical forces with secure non-jam-resistant EHF communication links. Polars 2 and 3 launch dates are 2004 and 2006, respectively. A much-improved next generation polar system is planned for launch circa 2012.

Space Based Infrared System High
Brief: Advanced surveillance system for missile warning, missile defense, battlespace characterization, and technical intelligence. System includes satel-
lites in geosynchronous Earth orbit (GEO) and highly elliptical orbit.
Function: IR space surveillance.
Operator: AFSPC.
First Launch: (planned) High GEO: FY07.
IOC: TBD.
Constellation: High: four GEO satls, two highly elliptical orbit sensors.
Design Life: not available.
Orbit Altitude: High: at approx 22,300 miles.
Contractor: Lockheed Martin; Northrop Grumman.
Weight: 5,442 lb.
COMMENTARY
The follow-on to the DSP is the Space Based Infrared System (SBIRS) High, an integrated “system of systems” including satellites in GEO, sensors hosted on satellites in highly elliptical orbits, and ground assets. SBIRS is being fielded incrementally. Increment 1 consolidated all DSP ground processing assets to one CO/NUS master control station at Buckley AFB, Colo. IOC was declared Dec. 18, 2001. Increment 2 will field the space and ground assets. SBIRS High is in the EMU phase led by a Lockheed Martin team. The system will integrate the Space Tracking and Surveillance System (STSS) capabilities as they become available.

Space Tracking and Surveillance System
Brief: Advanced surveillance system with IR and visible sensors for detecting and tracking ballistic missiles. STSS (formerly SBIRS Low) will have satellites in low Earth orbit (LEO) that work in concert with SBIRS High and other missile defense systems.
Function: Space surveillance.
Operator: AFSPC.
First Launch: FY06-07 (planned).
IOC: TBD.
Constellation: TBD (from nine up to 30 under consideration).
Design Life: not available.
Launch Vehicle: TBD.
Unit Location: TBD.
Orbit Altitude: LEO: 60-300 miles.
Contractor: Northrop Grumman (completion and launch of two LEO satellites); Raytheon.
Power Plant: TBD.
Dimensions: not available.
Weight: not available.
FORMATION
The Missile Defense Agency manages the Space Tracking and Surveillance System (STSS), which, in December 2002, replaced the program known as SBIRS Low. In April 2002, MDA ended the SBIRS Low program definition and risk reduction competition and named TRW (purchased by Northrop Grumman) as prime contractor for a redefined space-based sensor (R&D) element of MDA’s integrated Ballistic Missile Defense System (BMDS) (formerly SBIRS Low). The initial STSS contract calls for completion and launch of two LEO satellites in FY06-07 under Block 2006. New technologies will be integrated into subsequent R&D satellites under Block 2008 and beyond, leading to an operational system.

Wideband Gap-filler System (WGS)
Brief: Satellites that provide wideband communications to deployed tactical forces (air, land, and sea).
Function: Worldwide satellite communications.
Operator: AFSPC.
First Launch: Dec. 31, 2005 (planned); two further launches planned within a year.
IOC: August 2007 (planned).
Constellation: three-five satls.
Design Life: 14 years.
Launch Vehicle: EELV, Delta IV.
Unit Location: Schriever AFB, Colo.
Orbit Altitude: GEO.
Contractor: Boeing.
Power Plant: solar arrays generating 9,934 watts.
Dimensions: based on Boeing 702 Bus.
Weight: 13,200 lb at launch.
Performance: approx 12 times the capability of a DCS satellite.

Aerial Targets

BQM-34 Firebee
Brief: A jet-powered, variable speed, recoverable target drone.
Function: Aerial target.
Operator: ACC.
Delivered: from 1951.
IOC: circa 1951.
Production: 1,800+.
Inventory: 33.
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 including one 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 22.9 ft, body diameter 3.1 ft, span 12.9 ft.
Weight: launch weight 2,500 lb.
Performance: max level speed at 6,500 ft 690 mph, operating range 16,000 miles, max range 25,000 miles, max endurance 3 days.

BQM-167 Skeeter
Brief: A jet-powered, variable speed, recoverable target drone.
Function: Aerial target.
Operator: ACC.
Production: full-scale production began in 2004, with 360 Skeeters contracted over seven years.
Unit Location: Tyndall AFB, Fla.
Contractor: Composite Engineering Inc.
Power Plant: Microturbo Tri 60-5+ turbojet.
Guidance and Control: remote piloting methods.
Dimensions: length 20 ft, body diameter 2 ft, span 11 ft.
Weight: not available.
Performance: max level speed Mach 0.9 mph, operating range 20,000-50,000 ft, max endurance 3 hr.

MQM-107 Streaker
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.
Unit Location: Tyndall AFB, Fla. (detachment at Holloman AFB, N.M.).
Contractor: Marconi (formerly Tracor).
Power Plant: two General Electric J79-GE-17 turbojets, each with approx 17,000 lb thrust with afterburning.
Guidance and Control: remote-control methods including the GRDCUS (Tyndall) and the Drone Formation and Control System (Holloman); will also accommodate the tri-service Target Control System currently under development.
Dimensions: length 16 ft, height 6 ft, wingspan 38.4 ft.
Weight: mission operational weight 49,500 lb.
Performance: max speed Mach 2+, ceiling 55,000 ft, range (approx) 500 miles.

BQM-167A
Brief: Will replace both the aging MQ-107 and BQM-34A as the Air Force’s next subscale aerial target. It features an increased load capability, higher speeds, G-loads, a digital architecture for avionics, and a composite structure making it significantly lighter than the earlier platforms. Future development on this target will take it to supersonic speeds, internalize and miniaturize many countermeasures systems, and expand the flight envelope beyond any target system in the inventory today.

BQM-167 Skeeter (MSgt. Michael Ammons)