

# ★ USAF & USSF ALMANAC 2022 WEAPONS & PLATFORMS

By Aaron M. U. Church

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**Bomber Aircraft**

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**Fighter & Attack Aircraft**

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**Special Operations Aircraft**

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## BOMBER AIRCRAFT



Senior Airman Ryan Grossklag



Senior Airman Eugene Oliver

### B-1B LANCER

Long-range conventional bomber

**Brief:** The B-1B is a conventional, long-range, supersonic, penetrating strike aircraft derived from the canceled B-1A. The B-1A first flew on Dec. 23, 1974, and four prototypes were developed and tested before the program was canceled in 1977. The Reagan administration revived the program as the B-1B in 1981, adding 74,000 lb of usable payload, improved radar, and reduced radar cross section, while speed was reduced to Mach 1.2. Its three internal weapons bays can carry the largest payload of guided/unguided weapons in the Air Force inventory and its blended wing/body and variable-geometry wing permit long-range/loiter time. Offensive avionics include terrain following SAR and a fully integrated Sniper ATP to track and target moving vehicles. B-1B made its combat debut over Iraq during Desert Fox in 1998. The B-1B fleet completed its most comprehensive upgrade to date in September 2020. The three-part Integrated Battle Station (IBS) program begun in 2021 added an all-digital glass cockpit, Fully Integrated Data Link (FIDL) to enhance targeting/LOS/BLOS C2, and Central Integrated Test System (CITS) for real-time simplified troubleshooting. Development includes Multifunctional Information Distribution System/Joint Tactical Radio System (MIDS/JTRS) to improve situational awareness and retargeting abilities, and updated BLOS cryptography to sustain the aircraft's connectivity. The B-1B is USAF's sole Long-Range Anti-Ship Missile (LRASM) carrier and its range, speed, and payload make it a key power-projection asset in USAF's Indo-Asia Pacific strategy. USAF is expanding the B-1B's capacity to carry future weapons such as the AGM-183 ARRW hypersonic missile or 5,000 lb-class guided bombs. Recent demonstrations reconfigured the bomb bay to expand internal capacity, as well as use of the bomber's previously deactivated external pylons to carry JDAM. AFGSC retired 17 of its least serviceable airframes to free resources for sustainment in FY21 but plans to keep enough B-1Bs to maintain bomber capacity until the fleet is fully replaced by the B-21, targeted for 2032.

**Contractor:** Boeing (formerly Rockwell International).

**First Flight:** Oct. 18, 1984 (B-1B).

**Delivered:** June 1985-May 1988.

**IOC:** Oct. 1, 1986, Dyess AFB, Texas.

**Production:** 104.

**Inventory:** 45.

**Operator:** AFGSC, AFMC.

**Aircraft Location:** Dyess AFB, Texas; Edwards AFB, Calif.; Eglin AFB, Fla.; Ellsworth AFB, S.D.

**Active Variant:**

•B-1B. Upgraded production version of the B-1A.

**Dimensions:** Span 137 ft (forward sweep) to 79 ft (aft sweep), length 146 ft, height 34 ft.

**Weight:** Max T-O 477,000 lb.

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

**Performance:** Speed 900+ mph at S-L, range approx. 7,455 miles (further with air refueling).

**Ceiling:** 30,000+ ft.

**Armament:** 84 Mk 82 (500-lb) or 24 Mk 84 (2,000-lb) general-purpose bombs; 84 Mk 62 (500-lb) or eight Mk 65 (2,000-lb) Quickstrike naval mines; 30 CBU-87/89 cluster bombs or 30 CBU-103/104/105 WCMDs; 24 GBU-31 or 15 GBU-38 JDAMs/GBU-54 JDAM; 24 AGM-158A JASSM, JASSM-ER, or LRASM.

**Accommodation:** Pilot, copilot, and two WSOs (offensive/defensive) on ACES II zero/zero ejection seats.

### B-2 SPIRIT

Long-range heavy bomber

**Brief:** The B-2 is a stealthy, long-range, penetrating nuclear and conventional strike bomber. It is based on a flying wing design combining LO with high aerodynamic efficiency. The aircraft's blended fuselage/wing holds two weapons bays capable of carrying nearly 60,000 lb in various combinations. Spirit entered combat during Allied Force on March 24, 1999, striking Serbian targets. Production was completed in three blocks, and all aircraft were upgraded to Block 30 standard with AESA radar. Construction was limited to 21 aircraft due to cost and political considerations and a single B-2 was subsequently lost in a crash at Andersen on Feb. 23, 2008. Aircraft modernization is focused on safeguarding the B-2A's penetrating strike capability in high-end threat environments, though Defensive Management System upgrades to improve survivability were cut due to program delays. The B-2 fleet recently completed VLF/LF mods to assure world-wide secure, survivable C2 in the nuclear strike role. Flex Strike upgrades also added digital interface to integrate the modernized B61-12 nuclear weapon by feeding GPS guidance pre-release to thwart jamming. A notional Phase 2 would enable similar capabilities for conventional carriage. The Radar Aided Targeting System (RATS) currently in development will eventually allow the B-2 to utilize radar to guide nuclear weapons in GPS-denied environments. Further efforts are under way to increase loadout, improve hardened/buried target strike, and integrate the longer range JASSM-ER cruise missile. Ongoing upgrades include replacing the primary cockpit displays, the Adaptable Communications Suite (ACS) to provide Link 16-based jam-resistant in-flight retasking, advanced IFF, crash-survivable data recorders, and weapons integration. USAF is also working to enhance the fleet's maintainability with low-observable signature improvements to coatings, materials, and radar-absorptive structures such as the radome and engine inlets/exhausts. A B-2 was damaged in a landing accident at Whiteman on Sept. 14, 2021. USAF plans to retire the fleet once the B-21 Raider enters service in sufficient number around 2032.

**Contractors:** Northrop Grumman; Boeing; Vought.

**First Flight:** July 17, 1989.

**Delivered:** December 1993-December 1997.

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

**Production:** 21.

**Inventory:** 20.

**Operator:** AFGSC, AFMC, ANG (associate).

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

**Active Variant:**

•B-2A. Production aircraft upgraded to Block 30 standards.

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

**Weight:** Max T-O 336,500 lb.

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

**Performance:** Speed high subsonic, range 6,900 miles (further with air refueling).

**Ceiling:** 50,000 ft.

**Armament:** Nuclear: 16 B61-7, B61-12, B83, or eight B61-11 bombs (on rotary launchers). Conventional: 80 Mk 62 (500-lb) sea mines, 80 Mk 82 (500-lb) bombs, 80 GBU-38 JDAMs, or 34 CBU-87/89 munitions (on rack assemblies); or 16 GBU-31 JDAMs, 16 Mk 84 (2,000-lb) bombs, 16 AGM-154 JSOWs, 16 AGM-158 JASSMs, or eight GBU-28 LGBs.

**Accommodation:** Two pilots on ACES II zero/zero ejection seats.



Staff Sgt. Zade Vadnais

## B-52 STRATOFORTRESS

Long-range heavy bomber

**Brief:** The B-52H is a long-range nuclear/conventional bomber and USAF's primary stand-off cruise missile carrier. The YB-52 prototype first flew on April 15, 1952, and Strategic Air Command declared IOC with the B-52A on June 19, 1955. Boeing produced a total of 744 B-52s culminating in the last Stratofortress variant still in service, the B-52H. Multimission capabilities include long-range precision strike, CAS, air interdiction, defense suppression, and maritime surveillance utilizing both Litening and Sniper targeting pods. The B-52 is undergoing major upgrades to replace key obsolescent systems including engines, radar, comms, and weapons interface to extend the fleet through the 2050s. Combat Network Communications Technology (CONNECT) replaces cockpit displays and comms and adds integrated mission-management, including Link 16 and machine-to-machine tasking/retargeting. CONNECT also forms the digital backbone of the B-52's Internal Weapons Bay Upgrade which transitions Conventional Rotary Launchers designed for CALCM to carry the modern AGM-158B JASSM-ER. This upgrade nearly doubles the B-52s payload of advanced weapons such as JASSM, JDAM, and MALD, while reducing drag and increasing range. CONNECT completion slipped to FY23 and ongoing associated mods include Tactical Data Link to add low-latency,

jam-resistant C2/comms, and GPS updates. Major development includes the Radar Modernization Program to replace the AN/APQ-166 with an AESA radar and the Commercial Engine Replacement Program (CERP). USAF awarded Rolls-Royce the \$2.6 billion CERP contract to re-engine the B-52 with its' more modern, efficient, and reliable F130 engine on Sept. 24, 2021. The bomber will retain its currently pylon-mounted eight-engine arrangement, and fleetwide retrofits are expected to wrap-up by 2038. AESA radar is slated for introduction in 2026, and future upgrades include VLF/LF receiver modernization, ATP color MFDs to enhance targeting and situational awareness, and AEHF SATCOM installation. Integration of the future Long-Range StandOff (LRSO) nuclear cruise missile will cement the B-52's nuclear role, complementing the B-21 Raider after retirement of the B-1 and B-2, potentially continuing to serve through the 2050s.

**Contractors:** Boeing (airframe/CONNECT), Rolls-Royce (CERP)/Collins Aerospace (nacelles), Raytheon (RMP).

**First Flight:** July 20, 1960 (B-52H).

**Delivered:** May 9, 1961-Oct. 26, 1962 (B-52H).

**IOC:** May 1961 (B-52H).

**Production:** 102 (B-52H).

**Inventory:** 76.

**Operator:** AFGSC, AFMC, AFRC.

**Aircraft Location:** Barksdale AFB, La.; Edwards AFB, Calif.; Minot AFB, N.D.

**Active Variants:**

•B-52H. Longer-range development of the original B-52A with more efficient turbofan engines.

**Dimensions:** Span 185 ft, length 159.3 ft, height 40.7 ft.

**Weight:** Max T-O 488,000 lb.

**Powerplant:** Eight Pratt & Whitney TF33-P-3 turbofans, each 17,000 lb thrust.

**Performance:** Speed 650 mph, range 8,800 miles (further with air refueling).

**Ceiling:** 50,000 ft.

**Armament:** Nuclear: 12 AGM-86B ALCMs externally, and eight ALCMs or gravity weapons internally. Conventional: 12 AGM-158 JASSM externally, and eight JASSM-ER/MALD/ MALD-J internally (upgraded aircraft), as well as Mk 62 sea mines, Mk 82/84 bombs, CBU-87/89 cluster bombs, CBU-103/104/105 WCMDs, GBU-31/38 JDAMs, AGM-158A JASSMs, and GBU-10/12/28 LGBs, MALD, and MALD-J jammer variant.

**Accommodation:** Two pilots, navigator, radar navigator, and EWO on upward/downward ejection seats.



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## FIGHTER & ATTACK AIRCRAFT



Andrea Jenkins/USAF



Senior Master Sgt. Vincent De Groot/ANG

### AT-6 WOLVERINE

Light attack/armed reconnaissance

**Brief:** The AT-6E is a turboprop, light attack/armed reconnaissance aircraft developed from the T-6 primary trainer. Wolverine incorporates the A-10C's mission computer, the F-16's Hands-On-Throttle Stick, HMCS, and a digital glass cockpit with three color MFDs for integrated navigation, sensor, and weapon's management/delivery. The aircraft can carry a wide array of air-to-ground weapons on six wing pylons and can carry a centerline-mounted MX-15D EO/IR sensor for targeting and tactical ISR. The AT-6 is equipped with LINK-16/SADL data links, real-time FMV/ROVER for integration with ground forces, and tactical VHF/UHF/SATCOMS. The type was originally proposed for USAF's Light Attack/Armed Reconnaissance (LAAR) requirement which fell prey to budget cuts a decade ago. The service launched a renewed effort in 2017, kicking off the Light Attack Experiment (OA-X) which evaluated rapidly procurable off-the-shelf CAS/ISR platforms to relieve pressure on existing fleets. USAF opted to procure two AT-6 Wolverines (in addition to an equal number of AFSOC A-29 Super Tucanos) to continue experimenting with rapidly procurable light CAS/ISR platforms to develop allied capability. The AT-6s will initially aid in developing "AERONet" secure-tactical networking for U.S./partner-nation COIN applications at Nellis, while USSOCOM announced it is one of the five types under consideration to replace the U-28A. The command plans to procure upward of 75 aircraft to provide armed tactical ISR in support of special operations. Thailand became the type's first international customer ordering eight aircraft on Nov. 14, 2021, followed by Tunisia. USAF's first two aircraft arrived at Moody AFB, Ga., on Jan. 12, 2022, after nearly a year of type-certification at the manufacturer's facilities in Wichita.

**Contractor:** Beechcraft/Textron Aviation Defense (formerly Raytheon); Lockheed Martin (mission systems), Esterline (glass cockpit), L3/Harris (sensors).

**First Flight:** Sep. 10, 2009 (AT-6).

**Delivered:** Feb. 17, 2021-present.

**IOC:** N/A.

**Production:** Three (planned).

**Inventory:** Two.

**Operator:** ACC.

**Aircraft Location:** Moody AFB, Ga. Planned: Nellis AFB, Nev.

**Active Variants:**

•AT-6E Wolverine. Light attack/armed reconnaissance variant of the T-6A.

**Dimensions:** Span 33.5 ft, length 33.4 ft, height 10.7 ft.

**Weight:** Max T-O 10,000 lb.

**Power Plant:** One Pratt & Whitney Canada PT6A-68D turboprop 1,600 shp.

**Performance:** Speed 360 mph, range 1,700 miles (with four external tanks), mission endurance 4.5 hr (7.5 hr ferry).

**Ceiling:** 31,000 ft.

**Armament:** Wide array of laser/inertial-guided PGMs as well as laser-guided rockets (APKWS), AGM-114 Hellfire, and/or .50 cal gun on six wing-mounted hardpoints.

**Accommodation:** Two pilots on Martin Baker MK16LA zero/zero ejection seats.

### A-10 THUNDERBOLT II

Attack, close-air support, forward air control

**Brief:** The A-10 "Warthog" is a specialized CAS aircraft tasked with interdiction, Forward Air Controller-Airborne (FAC-A), CSAR, and Strike Control & Reconnaissance. It combines a heavy, diverse weapons load with low-level maneuverability, a large combat radius, and long loiter time. The A-10 is capable of carrying up to 16,000 lb of ordnance in addition to its 30 mm cannon which can destroy heavy armor while the pilot is protected by a titanium-armored cockpit. The prototype YA-10A first flew on May 10, 1972, winning USAF's A-X competition for a new attack aircraft. The A-10A development aircraft first flew on Feb. 15, 1975, and A-10As were delivered

between October 1975 and March 1984. USAF declared A-10A IOC in October 1977. The fleet was modernized under the Precision Engagement Program, resulting in the A-10C which first flew at Eglin in 2005. The A-10C adds color cockpit MFDs, a Helmet Mounted Cueing System (HMCS), hands-on throttle and stick, digital stores management, improved fire-control, GPS-guided weapons, Litening/Sniper pods, advanced data links, and integrated sensors. The A-10C debuted in combat during Iraqi Freedom in 2007. With NVGs and targeting pods, the A-10C can operate under ceilings as low as 1,000-ft including at night. The Operational Flight Program (OFP) continuously updates the A-10's systems and software and OFP Suite 11 is planned for fielding in FY22. USAF plans to cut the fleet to 218 aircraft and upgrade the remaining fleet for service through 2030 or beyond. Upgrades include replacing primary cockpit instruments with a high-resolution digital glass display, adding directional audio threat cueing, modernizing ARC-210 UHF/VHF comms, adding Ethernet, and integrating Small Diameter Bomb I. Fleetwide re-winging is key to the aircraft's longevity and a total 218 aircraft are slated for retrofit through FY30. Congress denied the Air Force's request to retire A-10s in FY21 as well as a request to cut 42 aircraft in FY22.

**Contractors:** Fairchild Republic (Lockheed Martin); Boeing (re-wing).

**First Flight:** Jan. 20, 2005 (A-10C).

**Delivered:** 2006-2012 (A-10C).

**IOC:** September 2007 (A-10C).

**Production:** 713.

**Inventory:** 281.

**Operator:** ACC, AFMC, PACAF, ANG, AFRC.

**Aircraft Location:** Barksdale AFB, La.; Boise Air Terminal, Idaho; Davis-Monthan AFB, Ariz.; Eglin AFB, Fla.; Fort Wayne Arpt., Ind.; Martin State Arpt., Md.; Moody AFB, Ga.; Nellis AFB, Nev.; Osan AB, South Korea; Selfridge ANG, Mich.; Whiteman AFB, Mo.

**Active Variant:**

•A-10C. Upgraded version of the A-10A ground attack aircraft.

**Dimensions:** Span 57.5 ft, length 53.3 ft, height 14.7 ft.

**Weight:** Max T-O 51,000 lb.

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

**Performance:** Speed 518 mph, range 800 miles (further with air refueling).

**Ceiling:** 45,000 ft.

**Armament:** One internally mounted 30 mm, seven-barrel GAU-8/A cannon (1,174 rd of high-explosive incendiary (HEI) or HEI/armor-piercing incendiary); four AIM-9 Sidewinders, AGM-65 Mavericks, laser-guided rockets, most free-fall or guided air-to-surface weapons in USAF inventory, as well as ECM and advanced targeting pods.

**Accommodation:** Pilot on ACES II zero/zero ejection seat.

### F-15 EAGLE

Air superiority fighter

**Brief:** The F-15 Eagle has been the world's dominant, supersonic, all-weather, day/night air-superiority fighter for more than 40 years. The F-15A first flew on July 27, 1972, and F-15A/Bs were delivered between 1974 and 1979, attaining IOC in September 1975. F-15C/Ds began replacing F-15A/Bs in 1979, offering superior maneuverability, acceleration, range, weapons, and avionics. The C/D incorporates internal EW countermeasures and an added 2,000 lb of internal fuel (with provision for CFTs). The aircraft accounted for 34 of 37 USAF air-to-air kills during its combat debut in Desert Storm. The final 43 production aircraft received the F-15E's APG-70 radar, and the subsequent Multi-Stage Improvement Program (MSIP) enhanced its tactical capabilities. USAF received the first APG-63(V)3 AESA-modified F-15 in 2010, but comprehensive modernization, including Eagle Passive/Active Warning Survivability System (EPAWSS) was cut after the decision to replace the fleet with up to 144 new-build F-15EXs. USAF also reduced the number of aircraft slated for MIDS/JTRS upgrades to add higher capacity, jam-resistant Link 16 and UHF satcom to 101, and



Staff Sgt. Benjamin Raughton

sharply trimmed SLEP efforts. Though two-thirds of the F-15C/D fleet have exceeded their design lives and suffer performance-limiting structural issues, USAF determined SLEP is not cost-effective and reduced mods to only 63 airframes through FY22. DOD European Deterrence Initiative funds continue to retain F-15C/Ds at Lakenheath, buttressing NATO's enhanced air defense posture against increased threats from Russia. USAF requested to divest 48 aircraft in FY22 ahead of fleetwide recapitalization by the F-15EX. An F-15C successfully fired an AIM-120 using IRST guidance for the first-time during tests with the Legion targeting pod at Eglin on Aug. 5, 2021.

**Contractors:** Boeing (previously McDonnell Douglas).

**First Flight:** Feb. 26, 1979 (F-15C).

**Delivered:** 1979-85 (F-15C/D).

**IOC:** 1979 (F-15C/D).

**Production:** 874.

**Inventory:** 209 (F-15C); 23 (F-15D).

**Operator:** ACC, AFMC, PACAF, USAF, ANG.

**Aircraft Location:** Barnes Arpt., Mass.; Eglin AFB, Fla.; Fresno ANGB, Calif.; Jacksonville Arpt., Fla.; Kadena AB, Japan; Klamath Falls (Kingsley Field), Ore.; NAS JRB New Orleans, La.; Portland Arpt., Ore.; RAF Lakenheath, U.K.

**Active Variants:**

•F-15C. Upgraded version of the single-seat F-15A.

•F-15D. Upgraded version of the two-seat F-15B.

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

**Weight:** Max T-O 68,000 lb.

**Power Plant:** Two Pratt & Whitney F100-PW-220 augmented turbofans, each 23,450 lb thrust; or two P&W F100-PW-229 augmented turbofans, each 29,000 lb thrust.

**Performance:** Speed Mach 2.5, ferry range 2,878 miles (3,450 miles with CFTs and three external tanks; further with air refueling).

**Ceiling:** 60,000 ft.

**Armament:** One internally mounted M61A1 20 mm six-barrel cannon (940 rd); four AIM-9 Sidewinders and four AIM-120 AMRAAMs, or eight AIM-120s as well as ECM pods; in a one-time test, an Eagle successfully launched an anti-satellite missile.

**Accommodation:** Pilot (C); two pilots (D), on ACES II zero/zero ejection seats.



William Lewis/USAF

## F-15E STRIKE EAGLE

Multitrole fighter

**Brief:** F-15E is an upgraded, two-seat, all-weather F-15 capable of deep interdiction/attack, tactical nuclear delivery, and air-to-air combat. Strike Eagle is capable of sustaining 9 Gs throughout the flight envelope. It first saw combat in Desert Storm in 1991. F-15E's large, varied load of precision weapons and 20 mm cannon make it potent ground-attack platform and radar-guided and IR-homing missiles give it an additional air-to-air capability. Its advanced cockpit includes a wide-field-of-view HUD and helmet mounted cockpit-cueing. The F-15E's avionics permit all-weather day/night engagement and it carries LANTIRN, Sniper, and Litening ATPs on dedicated pylons. The "Dragon's Eye" SAR pod fielded in 2009 provides all-weather surveillance/reconnaissance capability. F-15Es are equipped with Link 16 and BLOS SATCOM. The Strike Eagle is undergoing major avionics modernization, centered on the new APG-82(V)1 AESA radar.

Eagle Passive/Active Warning Survivability System (EPAWSS) is a second major effort to replace its obsolete self-defense suite. Operational Flight Program software is transitioning to an annual update cycle to more quickly integrate new mission capabilities in tandem with the F-15C/D. Ongoing upgrades include upgraded cockpit display processors to fully utilize AESA radar and EPAWSS, and MIDS/ JTRS to enable higher capacity, jam-resistant Link 16. FY22 begins AESA-compatible large-area digital displays mods for improved targeting and fratricide prevention as well as Data Transfer Module replacement to improve flight planning and debrief. Future enhancements include Mobile User Objective System (MUOS) secure, jam-resistant SATCOM and NATO-interoperable SATURN UHF, as well as IRST to discreetly engage air targets. F-15Es conducted demos more than doubling JASSM carriage to five weapons for increased strike capability and ferrying up to 15 JDAMs to forward airfields for rapid arming and launch in 2021. An F-15E also conducted the first test-drop of the GBU-72 5,000 lb Advanced 5K Penetrator as part of developmental testing over the Eglin test range, Oct. 7, 2021.

**Contractors:** Boeing (previously McDonnell Douglas); BAE Systems (EPAWSS); Raytheon (AESA).

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

**Delivered:** April 1988-2004.

**IOC:** September 1989.

**Production:** 236.

**Inventory:** 218.

**Operator:** ACC, AFMC, USAF.

**Aircraft Location:** Eglin AFB, Fla.; Mountain Home AFB, Idaho; Nellis AFB, Nev.; RAF Lakenheath, U.K.; Seymour-Johnson AFB, N.C.

**Active Variant:**

•F-15E. All-weather strike aircraft derived from the F-15C/D.

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

**Weight:** Max T-O 81,000 lb.

**Power Plant:** Two Pratt & Whitney F100-PW-220 augmented turbofans, each 23,450 lb thrust; or two F100-PW-229 augmented turbofans, each 29,000 lb thrust.

**Performance:** Speed Mach 2.5, range 2,762 miles with CFTs and three external tanks (further with air refueling).

**Ceiling:** 50,000 ft.

**Armament:** One internally mounted M61A1 20 mm six-barrel cannon (500 rd); four AIM-9 Sidewinders and four AIM-120 AMRAAMs or eight AIM-120s; most air-to-surface weapons in USAF inventory (nuclear and conventional) including GBU-53 Stormbreaker and B61-12 nuclear free-fall weapon, as well as ECM, SAR, and advanced targeting pods.

**Accommodation:** Pilot and WSO on ACES II zero/zero ejection seats.



1st Lt. Savannah Bray

## F-15EX EAGLE II

Air superiority fighter

**Brief:** F-15EX is the most advanced Eagle variant based on the F-15QA as a replacement for the legacy F-15C/D. The Eagle II is the first USAF F-15 to boast digital fly-by-wire flight controls, Large Area Display (LAD) glass-cockpit with touch-screen interface, and incorporate APG-82 AESA radar, Joint Helmet Mounted Cueing System (JHMCS), and EPAWSS self-defense suite from the outset. The aircraft pioneers Open Mission System (OMS) software to enable rapid upgrades and capability enhancement, as well as the latest Suite 9.1 software in common with upgraded legacy aircraft. F-15EX promises higher speed, longer range, increased payload (including two additional weapon stations), and lower operating costs than previous variants. Due to insufficient F-22 procurement, the F-15C/D fleet has continued flying beyond its designed service life, posing a serious risk of structural failure. Similar infrastructure, support, and training requirements will permit existing F-15 units to quickly transition to the F-15EX. The F-15EX incorporates two-seats enabling future crew/mission expansion. FY22 efforts focus on integrating F-15EX-unique software into the common F-15 Operational Flight Program build, ramping up production capability, and continuing capability enhancement such as passive IRST targeting for highly contested engagements. USAF awarded Boeing a \$1.2 billion contract for the first eight of up to 144 new-build F-15EX on July 13, 2020. Both FY21

and FY22 supported procurement of 12 aircraft and Congress added an additional five aircraft for FY22. The first aircraft delivered to Eglin in Mar. 11, 2021, supports AFMC developmental testing while the second delivered April 20, 2021, was assigned to ACC for operational testing. The next six jets are slated for delivery in 2023, followed by upward of 76 over the next five years. F-15EXs flew their first operational test sortie from Nellis on Oct. 21, 2021, though the majority of flight-testing is currently developmental.

**Contractors:** Boeing; BAE Systems (EPAWSS); Raytheon (AESA).

**First Flight:** Feb. 2, 2021.

**Delivered:** Mar. 11, 2021-present.

**IOC:** 2023 (planned).

**Production:** 144 (planned).

**Inventory:** Two.

**Operator:** ACC, AFMC. Planned: ANG.

**Aircraft Location:** Eglin AFB, Fla. Planned: Klamath Falls (Kingsley Field) and Portland Arpt., Ore.

**Active Variant:**

•F-15EX. Future F-15C/D replacement based on the F-15QA developed for Qatar.

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

**Weight:** Max T-O 81,000 lb.

**Power Plant:** Two General Electric F110-GE-129 augmented turbofans, each 29,000 lb thrust.

**Performance:** Speed Mach 2.5, range approx. 2,762 miles (air refuelable).

**Ceiling:** 60,000 ft.

**Armament:** One internally mounted M61A1 20 mm six-barrel cannon (500 rd); combination of up to 12 AIM-9 Sidewinders or AIM-120 AMRAAMs, or combination of up to 24 air-to-ground munitions.

**Accommodation:** Pilot and (optional) second aircrew member on ACES 5 zero/zero ejection seats.



Senior Airman Madeline Herzog

## F-16 FIGHTING FALCON

Multirole fighter

**Brief:** The F-16 is a lightweight, multirole fighter capable of air-to-air, CAS, SEAD, interdiction, FAC-A, tactical nuclear delivery and all-weather strike missions. The "Viper" makes up roughly half the fighter inventory, carries the majority of PGMs in service, and is one of the most maneuverable fighters ever built. The prototype YF-16 first flew Feb. 2, 1974, competing in the USAF Lightweight Fighter competition. After selection, F-16A flew on Dec. 8, 1976, followed by the two-seat F-16B on Aug. 8, 1977. Deliveries began in August 1978, and USAF declared F-16A IOC in October 1980. F-16C/D deliveries began at Block 25 in 1984, adding the APG-68 radar and AMRAAM missile as well as cockpit, airframe, and avionics improvements. Block 30/32 added the HARM missile and more powerful engines, and Block 40/42 introduced the terrain following LANTIRN pod and wide-angle HUD for high-speed night/all-weather penetration. These airframes boasted higher take-off weight and G-limits and an expanded flight envelope starting in 1988. Block 50/52 was introduced to replace the F-4G in the "Wild Weasel" SEAD-role armed with the HARM missile, longer-range radar, and even higher performance engines. The F-16 entered combat during Desert Storm in 1991 and scored its sole USAF air-to-air kill during Southern Watch on Dec. 27, 1992. The fleet is now cockpit-standardized with color MFD, modular mission computer, Helmet Mounted Integrated Targeting (HMIT), and Link 16. The Operational Flight Program (OFF) continuously updates the F-16's software and most recently added JASSM-ER and enhanced AMMRAM. Most upgrades are managed in Pre-Block (Blocks 25-32) and

Post-Block (Blocks 40-52) tranches. USAF is currently retiring Pre-Block aircraft including 47 airframes in FY22, while extending and modernizing the Post-Block fleet. A total of 450 Post-Block airframes are undergoing SLEP to stretch beyond 8,000 flying hours. Modernization centers on the new AN/APG-83 AESA radar, specifically aimed at countering cruise missile threats to the homeland, which received added congressional funding in FY22. A total of 330 Post-Block aircraft will also receive digital RWR (as part of a future, fully integrated EW suite), as well as mission computer and cockpit display upgrades through FY25. Ongoing mods include anti-jam UHF comm, MIDS/JTRS for higher capacity, jam-resistant Link 16, Mode 5 IFF, navigation improvements, and Auto Ground Collision Avoidance System (AGCAS) to prevent flight into terrain. A single F-16 assigned to the Oklahoma ANG was lost in a training accident near Fort Polk, La., on March 23, 2022.

**Contractors:** Lockheed Martin (previously General Dynamics); Northrop Grumman (AESA).

**First Flight:** June 19, 1984 (F-16C).

**Delivered:** July 13, 1984-2005 (F-16C/D).

**IOC:** 1981 (Block 25-32); 1989 (Block 40/42); 1994 (Block 50/52).

**Production:** 2,206.

**Inventory:** 780 (F-16C); 155 (F-16D).

**Operator:** ACC, AETC, AFMC, PACAF, USAF, ANG, AFRC.

**Aircraft Location:** Aviano AB, Italy; Edwards AFB, Calif.; Eglin AFB, Fla.; Eielson AFB, Alaska; Holloman AFB, N.M.; Homestead ARB, Fla.; Kunsan AB, South Korea; Luke AFB, Ariz.; Misawa AB, Japan; NAS JRB Fort Worth, Texas; Nellis AFB, Nev.; Osan AB, South Korea; Shaw AFB, S.C.; Spangdahlem AB, Germany; and ANG in Alabama, Arizona, Colorado, District of Columbia (flying from Maryland), Minnesota, New Jersey, Ohio, Oklahoma, South Carolina, South Dakota, Texas, Wisconsin. Planned: Fort Wayne Arpt., Ind.

**Active Variants:**

•F-16C/D Block 30/32. Multinational Staged Improvement Program II upgraded with new engines, flown by ANG, AFRC, and test/aggressor units.

•F-16CG Block 40/42. Optimized for night/all-weather attack.

•F-16CJ Block 50/52. Optimized for SEAD with long-range radar, engines, and weapons.

**Dimensions:** Span 32.8 ft, length 49.3 ft, height 16.7 ft.

**Weight:** Max T-O 37,500 lb (Block 30/32); 42,300 lb (Block 40/42); 48,000 lb (Block 50/52).

**Power Plant:** GE Aviation F110-GE-100 augmented turbofan, 29,000 lb thrust (Block 30); Pratt & Whitney F100-PW-220 augmented turbofan, 24,000 lb thrust (Block 32/42); F110-GE-129 turbofan, 29,000 lb thrust (Block 50); F100-PW-229 augmented turbofan, 29,000 lb thrust (upgraded Block 42, Block 52).

**Performance:** Speed Mach 2+, ferry range 2,002+ miles.

**Ceiling:** 50,000 ft.

**Armament:** One M61A1 20 mm cannon (500 rd); up to six AIM-9 Sidewinder or AIM-120 AMRAAMs air-to-air missiles, most air-to-surface weapons in USAF inventory (nuclear and conventional) including JASSM-ER, as well as ECM and advanced targeting pods.

**Accommodation:** Pilot (C), two pilots (D), on ACES II zero/zero ejection seats.



Senior Airman Tiffany Emery

## F-22 RAPTOR

Air superiority/multirole fighter

**Brief:** The F-22 is a stealthy, penetrating, air dominance, and multirole fighter built for day, night, and adverse weather, full-spectrum operations. The world's most advanced fighter, it combines stealth, supercruise, and high maneuverability. Its integrated avionics and data links permit simultaneous multitarget engagement. Advanced flight controls and thrust-vectoring, high-performance engines enable high maneuverability. Features include six LCD color cockpit displays, APG-77 AESA radar, EW system with RWR and missile launch detection, JTIDS, IFF, and INS/GPS navigation. The prototype YF-22 first flew as part of USAF's Advanced

Tactical Fighter competition on Sept. 29, 1990, followed by the flight of the first F-22 test aircraft in 1997. The Raptor flew its first operational sortie during Noble Eagle in 2006 and debuted in combat striking Islamic State ground targets during Inherent Resolve in 2014. The F-22 program uses an “agile” modernization strategy to rapidly and continuously develop, test, and field incremental improvements. The fleet recently received Increment 3.2B software which added high-resolution ground mapping SAR, threat geolocation, EA capability, and integration of SDB I, AIM-120D, and AIM-9X. Ongoing iterative software is improving radar and tactical data links. Significant efforts include the Reliability, Availability, and Maintainability Program (RAMP), Link 16 (previously TACLink-16), and next-generation targeting sensor development. RAMP is improving electrical power, replacing avionic-fiberoptics, adding more durable LO, as well as structural and wiring fixes. Link 16 will enable two-way networking with legacy aircraft via Multifunctional Information Distribution System/ Joint Tactical Radio System (MIDS/JTRS). Initial installs began in FY22 and fleet-wide upgrade is now planned for FY25. Preserving the F-22’s “first-shot, first-kill” advantage against peer threats is critical to deterrence, specifically in the Indo-Pacific region. USAF is evaluating lethality enhancements, including a next generation air-to-air targeting sensor now planned for flight demonstration, potentially this year. The service aims to leverage technology from its Next Generation Air Dominance (NGAD) program to ultimately replace the F-22 to also make the Raptor more lethal and survivable. NGAD could begin replacing the F-22 fleet as early as the 2030s. The service proposed to begin retiring early production aircraft currently used for pilot training as early as next year. An F-22 suffered a landing accident at Eglin on March 22, 2022, approximately a year after a similar F-22 mishap occurred at the base in March 2021.

**Contractors:** Lockheed Martin; Boeing (production partner).

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

**Delivered:** Oct. 23, 2002-May 2, 2012.

**IOC:** Dec. 15, 2005.

**Production:** 195.

**Inventory:** 185.

**Operator:** ACC, AFMC, AFRC (associate), PACAF, ANG.

**Aircraft Location:** Edwards AFB, Calif.; Eglin AFB, Fla.; JB Elmendorf-Richardson, Alaska; JB Langley-Eustis, Va.; JB Pearl Harbor-Hickam, Hawaii; Nellis AFB, Nev.

**Active Variant:**

•F-22A. Fifth-generation air dominance fighter.

**Dimensions:** Span 44.5 ft, length 62 ft, height 16.6 ft.

**Weight:** Max T-O 83,500 lb.

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

**Performance:** Speed Mach 2 with supercruise capability, ferry range 1,850+ miles with two external wing fuel tanks (further with air refueling).

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

**Armament:** One internal M61A2 20 mm gun (480 rds); two AIM-9 Sidewinders inside internal weapons bays; six AIM-120 AMRAAMs (air-to-air loadout), or two AIM-9, two AIM-120s, two GBU-32 JDAMs or eight SDBs (air-to-ground loadout) in main internal weapons bay.

**Accommodation:** Pilot on ACES II zero/zero ejection seat.

## F-35 LIGHTNING II

Multirole fighter

**Brief:** The F-35 Lightning II is a multirole, stealthy, penetrating, all-weather fighter/attack family of tactical aircraft produced by the multinational Joint Strike Fighter program. USAF’s conventional F-35A is complemented by the F-35B short takeoff and vertical landing (STOVL) version for USMC, and the carrier-capable F-35C for the Navy. The X-35 demonstrator first flew on Oct. 24, 2000, winning the go-ahead for the F-35A which first flew in developmental form in 2006. Lightning II is planned to replace the A-10 and F-16, offering better penetrating capability against advanced A2/AD threats to strike heavily defended targets. USAF’s F-35A can carry up to 22,000 lb of weapons on 10 stations: two internal bays for stealth, and/or six wing and fuselage pylons for max loadout. An Israeli Air Force F-35I “Adir” drew first blood, hitting Iranian targets in Syria in May 2018, followed by USAF’s initial combat sortie during Inherent Resolve on April 30, 2019. The next Block 4 software iteration dubbed Continuous Capability Development and Delivery (C2D2) and supporting hardware mods are the core of ongoing development and modernization. Block 4 will correct deficiencies discovered in concurrent development/testing and add B61-12, developmental Stand-in Attack Weapon (SiAW), and SDB II weapons as well as improved sensors, EW, and maritime strike capability. USAF is continuing lower delivery rates until Block 4 production begins in 2023 to minimize



Senior Airman Tiffany Emery

retrofit cost, and FY22 funds procure a total of 48 airframes. The current fleet-standard Block 3F software enables full combat capability with an array of precision guided weapons across mission sets including interdiction, basic CAS, and limited SEAD. The F-35A will require a performance increase to keep pace with Block 4 capabilities, and USAF is seeking to potentially re-engine the fleet starting as early as 2027. Both GE and Pratt & Whitney are testing prototype engines that could increase efficiency and performance, offering as much as a 30 percent increase in range. Evaluation of the F-35A sim in the DOD’s Joint Simulation Environment most recently delayed completion of operational testing originally slated for 2019. Testing delays prevent a full-rate production decision and inhibit cost-saving multiyear block buys. NATO ally Germany and European partners Finland and Switzerland recently announced plans to purchase F-35s to replace their Tornado IDS and F/A-18 fleets respectively. USAF’s first F-35s arrived at Lakenheath on Dec. 15, 2021, and aircraft from Hill conducted NATO air policing for the first time deploying to Romania in response to Russia’s invasion of Ukraine in February 2022.

**Contractors:** Lockheed Martin; BAE Systems; Northrop Grumman; Pratt & Whitney (engine).

**First Flight:** Dec. 15, 2006.

**Delivered:** April 2011-present.

**IOC:** Aug. 2, 2016.

**Production:** Planned: 1,763 (USAF F-35As).

**Inventory:** 302 (USAF).

**Operator:** ACC, AETC, AFMC, AFRC (associate), ANG, PACAF, USAF.

**Aircraft Location:** Burlington ANGB, Vt.; Edwards AFB, Calif.; Eglin AFB, Fla.; Eielson AFB, Alaska; Hill AFB, Utah; Luke AFB, Ariz.; Nellis AFB, Nev.; RAF Lakenheath, U.K. Planned: Dannelly Field, Ala.; NAS JRB Fort Worth, Texas; Truxav Field, Wis.; Tyndall AFB, Fla.

**Active Variant:**

•F-35A. Conventional takeoff and landing (CTOL) variant for the Air Force.

**Dimensions:** Span 35 ft, length 51.4 ft, height 14.4 ft.

**Weight:** Max T-O 70,000 lb.

**Power Plant:** F-35A: one Pratt & Whitney F135-PW-100 augmented turbofan, 40,000 lb thrust. Performance: Speed Mach 1.6 with full internal weapons load, range 1,380 miles.

**Ceiling:** 50,000 ft.

**Armament:** F-35A: one 25 mm GAU-22/A cannon; standard internal loadout: two AIM-120 AMRAAMs and two GBU-31 JDAMs.

**Accommodation:** Pilot on Martin Baker MK16 zero/zero ejection seat.



Capt. Jason Sanchez

## F-117 NIGHTHAWK

Test and training

**Brief:** The F-117 was the world’s first operational stealth aircraft, designed to expand USAF’s ability to strike critical, heavily defended targets. Its small radar signature, LO technologies, and advanced targeting system allowed the aircraft to penetrate dense threat environments and deliver precision weapons against heavily defended, high-value targets with pinpoint accuracy. Primary missions included precision attack, air interdiction, SEAD, and special operations. The type was first publicly acknowledged in November 1988 and conducted its first operational deployment during Just Cause over Panama in 1989. Highly classified F-117A development and manufacture

began simultaneously in November 1978, using many parts transferred or modified from existing aircraft. The F-117As were first stationed at Tonopah Test Range in Nevada to conduct test flying before transferring operationally to Holloman in 1992. A single aircraft was shot down in combat over Serbia on March 27, 1999, and the F-117 fleet was officially retired on April 22, 2008. The remaining airframes entered climate-controlled storage at Tonopah, with several being maintained in flyable condition for the Air Force Flight Test Center. F-117s have recently reemerged, notably supporting several exercises in 2020 and operating more frequently and openly alongside Aggressor aircraft at Nellis and MCAS Miramar. USAF has acknowledged a need for more advanced, threat-representative training and recently reactivated the 65th Aggressor Squadron at Nellis with early F-35As to enhance fifth-generation combat training.

**Contractor:** Lockheed Martin.  
**First Flight:** June 18, 1981.  
**Delivered:** 1982-summer 1990.  
**IOC:** October 1983.  
**Production:** 59.  
**Inventory:** N/A.  
**Operator:** AFMC.  
**Aircraft Location:** Tonopah Test Range, Nev.  
**Active Variants:**

•F-117A. First-generation stealth attack aircraft.  
**Dimensions:** span 43.3 ft, length 65.9 ft, height 12.4 ft.  
**Weight:** max gross 52,500 lb.  
**Weight:** Max T-O 70,000 lb.  
**Power Plant:** two General Electric F404-GE-F1D2 nonafterburning turbojets, each 9,040 lb thrust.  
**Performance:** Speed 0.9 Mach, mission radius unrefueled (5,000-lb weapons load) 656 miles.  
**Ceiling:** 35,000 ft.  
**Armament:** Full internal carriage of a variety of tactical weapons, incl laser- and GPS-guided 2,000-lb munitions.  
**Accommodation:** Pilot on ACES II zero/zero ejection seat.

## SPECIAL OPERATIONS AIRCRAFT



Sierra Nevada Corp.

### A-29 SUPER TUCANO

Light attack

**Brief:** The A-29 Super Tucano is a turboprop light attack/armed reconnaissance aircraft designed by Embraer in Brazil and built under license by Sierra Nevada Corp. USAF has long sought a cost-effective, manned light CAS/tactical ISR platform for operations in permissive counter-insurgency type scenarios. The A-29 was initially a contender for the Air Force's Light Attack/Armed Reconnaissance (LAAR) requirement for approximately 100 aircraft which fell prey to budget cuts a decade ago. The service launched a renewed effort in 2017, kicking off the Light Attack Experiment (OA-X) to rapidly evaluate off-the-shelf CAS/ISR platforms to relieve pressure on existing, higher-cost fleets such as the A-10 and F-16. A fatal A-29 crash abruptly ended the flight segment of evaluations at Holloman on June 22, 2018. Trials, however, yielded sufficient data for USAF to opt for two AT-6Bs, and two—later increased to three—A-29s to Form the Combat Aviation Advisor and SOF-support capability. The A-29 was not selected as one of the five aircraft USSCOM is currently evaluating to replace the AFSOC-operated U-28A fleet. AETC's 81st Fighter Squadron at Moody also operates the A-29, initially training Afghan Air Force crews. The unit trained a total of 64 Nigerian Air Force pilots through September 2021, supporting the sale of 12 A-29s to Nigeria. A total of 13 countries operate the type worldwide. Sierra Nevada delivered all three aircraft to Hurlburt early this year with the third and final aircraft touching down March 31, 2021.

**Contractor:** Sierra Nevada Corp.  
**First Flight:** June 2, 1999.  
**Delivered:** Feb. 23, 2021-present.  
**IOC:** N/A.  
**Production:** Three.  
**Inventory:** N/A.  
**Operator:** AETC (AAF), AFSOC.  
**Aircraft Location:** Hurlburt Field, Fla.; Moody AFB, Ga.  
**Active Variants:**

•A-29 Super Tucano. License-built version of the Embraer EMB-314 light attack aircraft.  
**Dimensions:** Span 36.5 ft, length 37.3 ft, height 13 ft.  
**Weight:** Max T-O 11,905 lb.  
**Power Plant:** One Pratt & Whitney Canada PT6A-68C turboprop, 1,604 shp.  
**Performance:** Speed 368 mph, range 1,900 miles (with wing-mounted external tanks).  
**Ceiling:** 35,000 ft.  
**Armament:** Two internal wing-mounted .50-caliber machine guns (200 rd each), up to 3,714 lb of external weapons on four wing and one centerline station.  
**Accommodation:** Two aircrew on Martin Baker MK10 zero/zero ejection seats.



Capt. Renee Douglas

### AC-130J GHOST RIDER

Attack

**Brief:** The AC-130J is the primary gunship CAS, air interdiction, and armed reconnaissance platform optimized for convoy escort, point defense, and supporting urban combat. The next-generation gunship is designed to provide ground forces a persistent direct-fire platform and is based on a highly modified MC-130J. Airframes are retrofit after delivery with a modular precision strike package, wing-mounted weapons, and gunship-specific systems. The AC-130J is replacing both the AC-130W and the now-retired AC-130U and was deployed to combat for the first time in Afghanistan in June 2019. AC-130Js are upgraded and managed in common with the HC/MC-130J, and are receiving Block 8.1 avionics upgrades along with the baseline C-130J. SOF-specific enhancements are rapidly developed and integrated in response to operational requirements. The aircraft's PSP weapons system includes a dual mission management console, robust communications suite, two EO/IR sensors, advanced fire-control equipment, PGM delivery capability, and trainable cannons. Block 20 added/retrofit a 105 mm gun, laser-guided SDB, side-facing pilot tactical HUD, and Large Aircraft Infrared Countermeasures (LAIRCM). The configuration was deemed operationally effective for most taskings in 2018. Upgrades based on initial operational testing resulted in the Block 20+/30 configuration which improved gun accuracy, hardened GPS, and added Hellfire missile and Small Glide Munition capability. The first Block 30 was delivered for testing in 2019 and fleetwide retrofit is planned by FY25. Lockheed Martin delivered the first Airborne High Energy Laser (AHEL) weapon in October 2021, to begin testing on the AC-130J. Ongoing upgrades include radio frequency countermeasures (RFCM) to detect, locate, and respond to threats, defensive systems upgrades, and HF/VHF/UHF/SATCOM suite modernization. FY22 funds delivery/conversion of four airframes and continues the multiyear contract for 23 combined AC/MC-130J airframes. AFSOC announced plans to shift AC-130J formal training from Hurlburt to Kirtland starting in FY22, and Cannon received its first AC-130J on July 19, 2021.

**Contractors:** Lockheed Martin, Sierra Nevada Corp. (RFCM).  
**First Flight:** Jan. 31, 2014.  
**Delivered:** July 29, 2015-present.



**IOC:** Sept. 30, 2017.

**Production:** 24 (38 to be converted from new-build MC-130Js, including a loss replacement for the initial aircraft).

**Inventory:** 24.

**Operator:** AFSOC; Planned: AETC.

**Aircraft Location:** Hurlburt Field, Fla.; Cannon AFB, N.M. Planned: Kirtland AFB, N.M.

**Active Variants:**

•AC-130J Ghost Rider Block 20. Production standard gunship with additional 105 mm gun.

•AC-130J Ghost Rider Block 30. Production aircraft with post operational test upgrades.

**Dimensions:** Span 132.6 ft, length 97.7 ft, height 39.1 ft.

**Weight:** Max T-O 164,000 lb.

**Power Plant:** Four Rolls-Royce AE 2100D3 turboprops, each 4,700 shp.

**Performance:** Speed 416 mph, range 3,000 miles (further with air refueling).

**Ceiling:** 28,000 ft.

**Armament:** Trainable 30 mm GAU-23/A cannon; 105 mm cannon; up to eight wing pylon-mounted GBU-39 SDB or AGM-114 Hellfire, and aft-firing GBU-69B Small Glide Munition and AGM-176 Griffin (deployed from 10 Common Launch Tubes integrated into the aircraft's ramp/door).

**Accommodation:** Two pilots, CSO, WSO, sensor operator, loadmaster, and three gunners.



Staff Sgt. Westin Warburton

## AC-130W STINGER II

**Attack, armed reconnaissance**

**Brief:** The AC-130W is a gunship-modified C-130H optimized for CAS, interdiction, armed reconnaissance, convoy escort, strike coordination, overwatch, and point defense. AC-130Ws also provide strike coordination, nontraditional ISR, and C2. Airframes are significantly modified with improved navigation, threat detection, countermeasures, comms, and a standoff Precision Strike Package. PSP mod includes a mission management console, communications suite, and flight-deck hardware. The variant is entirely distinct from the retired AC-130H Spectre and AC-130U Spooky. The airframes were originally designated MC-130W Combat Spear and converted for SOF infiltration/exfiltration and in-flight refueling. The type was redesignated Dragon Spear with the addition of the roll on/roll off PSP in 2010 and finally rebranded AC-130W Stinger II after further enhancements in 2012. Upgrades include Enhanced Situational Awareness (ESA) for near real-time intel and data fusion including threat detection, avoidance, geolocation, and adversary-emitter identification, IR suppression, and the 105 mm gun (in common with the AC-130J). AFSOC plans to fully replace the fleet with the AC-130J by the end of FY22, and the command ended aircrew mission qualification with a final flight at Cannon on April 29, 2021.

**Contractor:** Lockheed Martin.

**First Flight:** Circa 2006 (Combat Spear).

**Delivered:** November 2010 (Dragon Spear).

**IOC:** 2010 (Dragon Spear).

**Production:** 12 (converted).

**Inventory:** Seven.

**Operator:** AFSOC.

**Aircraft Location:** Cannon AFB, N.M.

**Active Variant:**

•AC-130W Stinger II. Converted MC-130W armed with PSP and PGMs.

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

**Weight:** Max T-O 155,000 lb.

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

**Performance:** Speed 300 mph, range 2,875 miles.

**Ceiling:** 28,000 ft.

**Armament:** 105 mm cannon, 30 mm GAU-23/A Bushmaster II chain gun; PGMs, incl GBU-39 SDB, GBU-69B Small Glide Munition, and AGM-176A Griffin.

**Accommodation:** Two pilots, two CSOs, flight engineer, two special-mission aviators.



Tech. Sgt. Sam King

## C-145 COMBAT COYOTE

**Training and light special air mobility**

**Brief:** The C-145 "Combat Coyote" is a STOL multipurpose utility and SOF proficiency training aircraft based on the Polish-built PZL Mielec M-28 Skytruck. The high-wing STOL aircraft features nonretractable landing gear for austere operations. USSOCOM assets are operated by AFSOC as a nonstandard fleet, initially supporting small combat teams. The aircraft first deployed in 2011 to Afghanistan. It is reconfigurable for 2,400 lb of cargo airdrop, casualty evacuation, CSAR, and humanitarian missions. C-145As later shifted to partnership capacity building Aviation Foreign Internal Defense (AvFID) missions. AFSOC now uses contract aircraft to provide partner countries with more tailored assistance and opted to cut the fleet from 16 to the current five aircraft in 2015. C-145s now provide aircrew proficiency for combat aviation advisers. USSOCOM selected the armed MC-145 Coyote as one of five aircraft it is evaluating as candidates to replace the U-28A. The MC-145 prototype completed a demonstration at Eglin as part of the Armed Overwatch Program in July 2021. The command plans to procure upward of 75 aircraft to provide armed tactical ISR in support of special operations.

**Contractor:** PZL Mielec (Lockheed Martin/Sikorsky subsidiary).

**First Flight:** July 1993 (PZL M-28).

**Delivered:** 2009-2013.

**IOC:** N/A.

**Production:** 16.

**Inventory:** Five, USSOCOM-owned.

**Operator:** AFSOC, AFRC (associate).

**Aircraft Location:** Duke Field, Fla.

**Active Variant:**

•C-145A. Militarized civilian M-28 Skytruck used for SOF support and training.

**Dimensions:** Span 72.3 ft, length 43 ft, height 16.1 ft.

**Weight:** Max T-O 16,534 lb.

**Power Plant:** Two Pratt & Whitney PT6A-65B turboprops, 1,100 shp.

**Performance:** Speed 256.5 mph, range 1,010 miles.

**Ceiling:** 25,000 ft.

**Accommodation:** Two pilots, one loadmaster. **Load:** 16 passengers or 10 paratroopers; up to four litters; max cargo 5,000 lb.

## C-146 WOLFHOUND

**Special operations mobility**

**Brief:** The C-146 provides flexible, responsive airlift for special operations teams operating from austere and semi-prepared airfields worldwide. Wolfhound is based on the German-built Dornier 328 regional airliner and was purchased by USSOCOM, modified by Sierra Nevada Corp., and designated C-146. The aircraft are operated by AFSOC as a nonstandard fleet providing direct support to SOF teams worldwide, often from austere airstrips. Modifications include ARC-231, PRC-117, and Iridium communications suite, troop/cargo-capable cabin, casualty evacuation capability, NVG compatibility, and STOL/austere operations enhancements. The aircraft first deployed in support of USAFRICOM in 2011. Recent upgrades include navigation enhancements to permit ops in GPS-degraded environments.



Senior Airman Dylan Gentile

C-146s notably participated in the first tactical landing exercise on a US highway on Aug. 5, 2021, as well as relief operations in Haiti evacuating earthquake victims from remote landing zones in early September last year.

**Contractors:** Fairchild-Dornier; Sierra Nevada Corp.

**First Flight:** December 1991 (Dornier 328).

**Delivered:** 2011-2017.

**IOC:** Circa 2011.

**Production:** 20 (converted).

**Inventory:** 20 (USSOCOM-owned).

**Operator:** AFSOC.

**Aircraft Location:** Cannon AFB, N.M.; Duke Field, Fla.

**Active Variant:**

•C-146A. Preowned civil Dornier 328 modified for SOF airlift.

**Dimensions:** Span 69.6 ft, length 68.8 ft, height 23.8 ft.

**Weight:** Max T-O 30,843 lb.

**Power Plant:** Two Pratt & Whitney PW-119C turboprops, each 2,282 shp.

**Performance:** Speed 310 mph, range 1,500 miles (2,000 lb cargo).

**Ceiling:** 31,000 ft.

**Accommodation:** Two pilots, one loadmaster.

**Load:** 27 passengers; up to four litters; max cargo 6,000 lb.



Staff Sgt. Jeremy McCullifin

## CV-22 OSPREY

Multimission lift

**Brief:** The CV-22 is a medium-lift, vertical takeoff and landing (VTOL) tilt-rotor, primarily used for clandestine long-range, all-weather penetration to insert, recover, and support SOF teams in hostile, denied, and politically sensitive areas. Derived from the V-22, which flew in prototype form on March 19, 1989, USAF CV-22Bs are equipped with a fully integrated precision TF/TA radar navigation, digital cockpit management system, FLIR, integrated NVG/HUD, digital map system, robust self-defense systems, and secure anti-jam comms. The CV-22 can conduct shipboard and austere forward operations. It is capable of operating in nuclear, biological, and chemical (NBC) warfare conditions. CV-22s first deployed to Africa in November 2008 and debuted in combat in Iraq in 2009. AFSOC is retrofitting the CV-22 to Block 20 standards, in common with USMC MV-22s. Mods include new cabin lighting, Color Helmet Mounted Displays, IR searchlight, lightweight ballistic armor, EW upgrades, avionics, self-defense improvements, weapons integration, and ISR and situational awareness enhancements. USSOCOM is replacing the CV-22's legacy APQ-186 radar with the Silent Knight TF/TA radar (in common with the MC-130J) under a three-year contract awarded in FY21. A CV-22 test flew the stealthier, low-altitude, night/all-weather navigation radar for the first time in 2020. Integration of a ventral-mounted 7.62 mm minigun will eventually give pilots a helmet-cued, 360-degree field of defensive fire to complement the ramp-mounted weapon.

Priority development includes improving the Osprey's rapid, long-distance self-deployment capabilities, and modifying its nacelles to improve maintainability, engine IR suppression, and reduce dust/debris ingestion. USAF is slated to receive its final airframe under the current multiyear contract in 2022.

**Contractors:** Boeing; Bell Helicopter Textron.

**First Flight:** February 2000 (CV-22).

**Delivered:** Sept. 19, 2005-present.

**IOC:** 2009.

**Production:** 54 (planned).

**Inventory:** 52.

**Operator:** AETC, AFSOC, ANG (associate).

**Aircraft Location:** Cannon AFB, N.M.; Hurlburt Field, Fla.; Kirtland AFB, N.M.; RAF Mildenhall, U.K.; Yokota AB, Japan.

**Active Variant:**

•CV-22B. Air Force special operations variant of the V-22 Osprey.

**Dimensions:** Span 84.6 ft, length 57.3 ft, height 22.1 ft, rotor diameter 38 ft.

**Weight:** Max vertical T-O 52,870 lb; max rolling T-O 60,500 lb.

**Power Plant:** Two Rolls-Royce-Allison AE1107C turboshafts, each 6,200 shp.

**Performance:** Cruise speed 277 mph, combat radius 575 miles with one internal auxiliary fuel tank, self-deploys 2,100 miles with one in-flight refueling.

**Ceiling:** 25,000 ft.

**Armament:** One ramp-mounted .50-caliber machine gun. Planned: One belly mounted forward firing GAU-17 (modified) 7.62 mm minigun Full-azimuth Defensive Weapon System (FDWS).

**Accommodation:** Two pilots, two flight engineers.

**Load:** 24 troops seated, 32 troops on floor, or 10,000 lb cargo.



Staff Sgt. Tony Harp

## EC-130J COMMANDO SOLO/SUPER J

Psychological warfare/special operations airlift

**Brief:** The EC-130J is the Air Force's primary psychological warfare platform, providing military information support operations (MISO) and civil affairs broadcast. Roles include offensive counterinformation radio, television, and military communications broadcast, EA, and/or SOF mobility. Aircraft are also equipped with enhanced self-protection including Large Aircraft IR Countermeasures (LAIRCM) to counter MANPAD threats. Legacy Commando Solo variants have conducted psychological operations in almost every US contingency since 1980 and the EC-130J debuted in combat as part of Operation Enduring Freedom in 2001. With transition to the J-model, USAF added a new, secondary mission resulting in the "Super J" variant. Three heavily modified EC-130J Commando Solo served as a standard broadcasting station for psychological warfare operations while the four "Super Js" performed secondary, low-cost EA in addition to special operations. USAF began modernizing the fleet with the new Multi-Mission Platform-Heavy (MMP-H) digital broadcast system in 2018. The system includes a roll-on internal payload as well as the external podded Communication EA Surveillance and Reconnaissance (CEASAR) and Long-Range Broadcast System (LRBS). MMP-H will give Super-J full MISO/EA capabilities in common with Commando Solo while retaining a de-configured SOF mobility role. The software-defined digital system is capable of UHF/VHF and AM/FM radio, cellular, and television broadcast as well as advanced EA at a stand-off range of up to 175 miles. USAF is currently working to develop an Operational Flight Program Block upgrade cycle for the EC-130J's mission specific equipment, and the airframe is undergoing Block 8.1 upgrades in tandem with the baseline C-130J. EC-130Js are also receiving hardened GPS, defensive system upgrades, and Link 16 to fully integrate with other SOF assets. Required upgrades include MMP-H payload and associated mods for Super-J aircraft as well as fleet-wide Airborne Mission Networking (AbMN) to enhance aircrew air/ground situational awareness.

**Contractors:** Lockheed Martin; Raytheon; Sierra Nevada Corp. (Link 16/AbMN).

**First Flight:** November 2003.

**Delivered:** Oct. 17, 1999-2006.

**IOC:** 2004.

**Production:** Seven.

**Inventory:** Three (Commando Solo); four (Super J).

**Operator:** ANG.

**Aircraft Location:** Harrisburg Arpt., Pa.

**Active Variants:**

- EC-130J Commando Solo. Modified C-130J used for broadcast and psyops.
- EC-130J Super J. Modified C-130J used for SOF mobility and psyops.

**Dimensions:** Span 132.6 ft, length 97.8 ft, height 38.8 ft.  
**Weight:** Max T-O 164,000 lb.  
**Power Plant:** Four Rolls-Royce-Allison AE2100D3 turboprops, each 4,637 shp.  
**Performance:** Speed 335 mph cruise, range 2,645 miles (air refuelable).  
**Ceiling:** 28,000 ft.  
**Accommodation:** Two pilots, flight systems officer, mission systems officer; two loadmasters, five electronic communications systems (CS) operators.



Travis Burcham/USAF

## MC-12W LIBERTY

Tactical ISR

**Brief:** The MC-12W is a manned, medium/low-altitude tactical ISR, SIGINT, and targeting platform based on the Beechcraft King Air 350ER (Extended Range). It was hastily developed under Project Liberty to meet an urgent operational need for manned battlefield ISR and deployed to Iraq and Afghanistan in less than a year in 2009. MC-12W is capable of complete ISR collection, processing, analysis, and dissemination. The aircraft provides targeting data and tactical ISR direct to special operations ground forces. Specialized equipment includes FMV, laser designation, SIGINT, advanced BLOS connectivity, and advanced SATCOM. ACC passed 20 airframes to USSOCOM in 2015, and the Oklahoma ANG formed a dedicated SOF support mission with the remaining aircraft, deploying for the first time to Afghanistan in 2015. The unavailability of aircraft pooled within SOCOM hampered reaching full operational capability, and the ANG is working with AFSOC to ensure at least nine aircraft are available to support training and deployed operations. The fleet requires sensor modernization to meet COCOM requirements including SAR for ground-moving target tracking in poor visibility, and a second high-fidelity EO/IR/full motion video sensor in addition to a modernized tactical data link. The ANG procured five-bladed propellers to overcome performance limitations due to the aircraft's high gross weight, which are awaiting installation and flight-testing.

**Contractors:** Beechcraft; L3Harris (EO/IR sensors).

**First Flight:** April 28, 2009.

**Delivered:** April 2009-2012.

**IOC:** June 2009.

**Production:** 42.

**Inventory:** 13.

**Operator:** ANG.

**Aircraft Location:** Will Rogers ANGB, Okla.

**Active Variant:**

- MC-12W. Modified Beechcraft King Air 350ER equipped for battlefield ISR and targeting.

**Dimensions:** Span 57.9 ft, length 46.7 ft, height 14.3 ft.

**Weight:** Max T-O 16,500 lb.

**Power Plant:** Two Pratt & Whitney Canada PT6A-60A turboprops, each 1,050 shp.

**Performance:** Speed 359 mph, range 2,760 miles.

**Ceiling:** 35,000 ft.

**Accommodation:** Two pilots, two sensor operators.

## MC-130H COMBAT TALON II

Special operations airlift/aerial refueling

**Brief:** The MC-130H is a special operations tanker/mobility aircraft based on the C-130H. Its primary missions are covert day, night, and adverse weather infiltration, exfiltration, and resupply of special operations forces in hostile or denied territory. MC-130H also provides air-drop resupply, rotary wing aerial refueling, and psyops. The aircraft are equipped with TF/TA radar, precision INS/GPS navigation, and electronic and IR countermeasures for self-protection. The fleet is fitted with wing-mounted external fuel tanks and drogue refueling pods to refuel HH-60 and CV-22 and can also receive fuel in-flight. Aircraft are capable of airdrop using the Joint



Staff Sgt. Rito Smith

Precision Airdrop System and operating from austere and unmarked strips. The original MC-130Es were converted in the mid-1960s, followed by the MC-130P (previously HC-130N/P), which were delivered in the mid-1980s and retired in 2017. MC-130Hs were converted from base-model C-130H to supplement the Combat Talon I and Combat Shadow fleets in the late 1980s and early 1990s. MC-130H have integrated glass cockpit and a modernized pod-based aerial refueling system but are being phased-out in favor of the new MC-130J. A final MC-130H completed programmed depot maintenance at Robins in August 2021, and two aircraft supported humanitarian evacuations from Afghanistan as part of Operation Allies Refuge through October 2021.

**Contractors:** Lockheed Martin (airframe); Boeing.

**First Flight:** 1984.

**Delivered:** 1991-1994.

**IOC:** June 30, 1993.

**Production:** 24.

**Inventory:** 10.

**Operator:** AFSOC.

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

**Active Variant:**

- MC-130H Combat Talon II. SOF support and aerial refueling tanker fielded in 1991.

**Dimensions:** Span 132.6 ft, height 38.5 ft, length 99.8 ft.

**Weight:** Max T-O 155,000 lb.

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

**Performance:** Speed 300 mph, range 3,105 miles.

**Fuel Capacity:** Approx. 63,000 lb (81,120 lb with additional internal tanks) at up to 450 gpm.

**Ceiling:** 33,000 ft.

**Accommodation:** Two pilots, navigator, EWO, flight engineer, two loadmasters. Load: 77 troops, 52 paratroops, or 57 litters.



Airman 1st Class Stephen Pultar

## MC-130J COMMANDO II

Special operations airlift/aerial refueling

**Brief:** The MC-130J is USAF's next-generation special operations tanker/mobility aircraft based on the C-130J. Designated Commando II (previously Combat Shadow II) in honor of the WWII C-47, the aircraft are tasked with covert day, night, and adverse weather infiltration, exfiltration, and resupply of special operations forces in hostile or denied territory. They also provide air-drop resupply, rotary wing aerial refueling, and psyops. MC-130J are fitted with wing-mounted external fuel tanks and drogue refueling pods to refuel HH-60 and CV-22, and can also receive fuel in-flight. Specialized systems include fully integrated INS/GPS, color cockpit LCDs, NVG lighting, HUDs, integrated defensive systems including LAIRCM, digital moving map display, EO/IR system, dual secure voice/data SATCOM, enhanced cargo handling, and extended-life wings. MC-130Js have secondary leaflet and rubber raiding craft aerial delivery roles for psyops and littoral ingress/egress. The aircrew is smaller than legacy

models, but includes CSO/auxiliary flight deck stations to handle aerial refueling (otherwise performed by the flight engineer). Loadmasters handle remaining flight engineer/comms functions. FY22 funds procure three airframes under a follow-on multiyear contract ending this fiscal year. Funds continue Radio Frequency Countermeasure (RFCM) installation to detect, locate, and respond to emerging threats, as well as Airborne Mission Networking (AbMN), which gives aircrew a common air/ground picture to better manage complex workloads. MC-130J will begin Block 8.1 software upgrades in FY22 after being pulled out of the baseline C-130J Block 7/8.1 upgrade to fund SOF-specific requirements. The fleet received Link 16 and CSO station upgrades separately from Block 8.1. Ongoing mods include HF/VHF/UHF SATCOM Communications Modernization, lightweight armor, self-defensive updates, and variable-speed drogue to refuel diverse aircraft types during a single sortie. USAF completed Silent Knight TF/TA radar developmental testing on the MC-130J in FY21. The system housed in a second radome between the nose and cockpit will give the aircraft low-level nighttime/adverse weather penetrating capability to fully replace the legacy MC-130H. AFSOC plans to equip an MC-130J with floats to conduct an amphibious demo in 2022, aimed at increasing flexibility of operations in the INDOPACOM theater.

**Contractors:** Lockheed Martin (airframe); Boeing; Sierra Nevada Corp. (RFCM); Raytheon (TF/TA radar).  
**First Flight:** April 20, 2011.  
**Delivered:** Sept. 29, 2011-present.  
**IOC:** Dec. 7, 2012.  
**Production:** 57 (planned).  
**Inventory:** 46.  
**Operator:** AETC, AFSOC.  
**Aircraft Location:** Cannon AFB, N.M.; Kadena AB, Japan; Kirtland AFB, N.M.; RAF Mildenhall, U.K.  
**Active Variant:**  
 •MC-130J. Next-generation SOF support and aerial refueling tanker based on the C-130J.  
**Dimensions:** Span 132.6 ft, length 97.8 ft, height 38.8 ft.  
**Weight:** Max T-O 164,000 lb.  
**Power Plant:** Four Rolls-Royce AE2100D3 turboprops, each 4,591 shp.  
**Performance:** Speed 416 mph, range 3,000 miles (further with air refueling).  
**Fuel Capacity:** 61,360 lb at 150-300 gpm (100 gpm dual, simultaneous refueling).  
**Ceiling:** 28,000 ft with 42,000-lb payload.  
**Accommodation:** Two pilots, CSO, two loadmasters. **Load:** 42,000 lb of cargo/personnel (see C-130J for configurations).



Senior Airman Vernon Walter III

## U-28A DRACO

Tactical ISR

**Brief:** The U-28A is a manned, tactical ISR and targeting platform based on the Pilatus PC-12. The USSOCOM-owned aircraft are operated by AFSOC as a nonstandard fleet. Draco is employed worldwide in support of special operations ground forces, humanitarian efforts, and search and rescue. AFSOC first employed the aircraft during Enduring Freedom in Afghanistan as well as Iraqi Freedom. Mission equipment includes advanced radio-comms suite, IR suppression, missile, hostile fire, and laser warning, EO sensors, remote SIGINT, and advanced navigation systems. The primary Multispectral Targeting System includes FMV, EO-IR, IR real-time video, and co-aligned laser designator. Recent upgrades include U-28 EQ+ mods which add high-definition, FMV to EQ/PC-12 configured aircraft for extended standoff “find, fix, finish” capabilities in support of counter-ISIS ops. Additional improvements include Enhanced Ground Proximity Warning to prevent flight-into-terrain accidents, updated BLOS SATCOM connectivity, and navigation mods to enable ops in GPS-degraded environments. USSOCOM sought to replace the fleet with 75 “armed overwatch” aircraft capable of tactical ISR and light CAS but was denied congressional funds through FY23 pending study and justification. Two aircraft were lost to fatal mishaps in Djibouti in 2012 and at Cannon in 2017, and Congress authorized FY21 funds to replace an airframe lost in an

airfield attack at a forward location. AFSOC surpassed 600,000 flying hours including 328,000 in direct support of combat operations in early 2021.

**Contractor:** Pilatus Aircraft Ltd.  
**First Flight:** May 31, 1991 (PC-12).  
**Delivered:** 2006-present.  
**IOC:** June 2006.  
**Production:** 36.  
**Inventory:** 30 (U-28A); five (PC-12) (USSOCOM-owned).  
**Operator:** AFSOC, AFRC.  
**Aircraft Location:** Cannon AFB, N.M.; Hurlburt Field, Fla.  
**Active Variant:**  
 •U-28A. Special operations tactical ISR aircraft based on the Pilatus PC-12.  
 •PC-12. Converted civilian Pilatus PC-12 equipped for SOF support/training.  
**Dimensions:** Span 53.3 ft, length 47.3 ft, height 14 ft.  
**Weight:** Max T-O 10,935 lb.  
**Power Plant:** Single Pratt & Whitney PT6A-67B, 1,200 shp.  
**Performance:** Speed 253 mph, range 1,725 miles.  
**Ceiling:** 30,000 ft.  
**Accommodation:** Two pilots, CSO, tactical systems officer; up to nine passengers or 3,000 lb cargo (configuration dependent).

## COMMAND, CONTROL, COMMUNICATION/BATTLE MANAGEMENT AIRCRAFT



Stefano Benedetto

## C-143 COMBAT FLIGHT INSPECTION

Combat flight inspection

**Brief:** The C-143B is a modified Bombardier Challenger CL-600 long-range, executive-class jet equipped with specialized instrumentation for Combat Flight Inspection (CFIN). The three-aircraft fleet is owned by the Federal Aviation Administration and operated by FAA/USAF to certify air base NAVAIDs (Navigational Aids) such as TACAN, VOR, and ILS, as well as approach/departure procedures are safe and meet applicable standards for all-weather flight operations. USAF has lacked a fully organic CFIN capability since retiring the C-29A and handing flight inspection over to the FAA in 1991. The FAA and USAF jointly funded replacing the aging and range-limited C-29A, and USAF procured a single airframe in FY09. Due to the high-risk environment, Air Force Flight Standards Agency Det. 1 crews from Will Rogers ANGB conduct flight checks in combat theaters, as well as forward locations including Antarctica. In addition to combat ops, the fleet is tasked with inspecting CONUS, OCONUS, and dual U.S.-partner-nation facilities worldwide. USAF funds support procurement and maintenance of military-specific equipment required for CFIN, including secure anti-jam radios, IFF, Mode 4/5 transponders, and self-defensive suites for protection during forward-deployed operations. Recent upgrades include addition of Large Aircraft IR Countermeasures (LAIRCM) to two airframes to improve self-defensive capabilities against MANPADS and small arms fire.

**Contractor:** Canadair (Bombardier).  
**First Flight:** Nov. 8, 1978.  
**Delivered:** 2009.  
**IOC:** Circa 2010.  
**Production:** N/A.  
**Inventory:** Three (FAA-owned).  
**Operator:** AMC, AFRC (associate).  
**Aircraft Location:** Will Rogers ANGB, Okla.  
**Active Variant:**  
 •C-143B. CL-600-2B16 business jet equipped with specialized systems for military flight-check.  
**Dimensions:** Span 61.8 ft, length 68.4 ft, height 20.6 ft.  
**Weight:** Max T-O 40,125 lb.  
**Power Plant:** Two GE Aviation CF34 turbofans, each 9,140 lb thrust.  
**Performance:** speed Mach 0.83, range 3,915 miles.  
**Ceiling:** 45,000 ft.  
**Accommodation:** Two pilots, flight inspection technician.

## E-3 SENTRY

Battle management/early warning/C2

**Brief:** The E-3 Airborne Warning and Control System (AWACS) is a heavily modified Boeing 707-320B tasked with all-weather, air and maritime surveillance, command and control, battle management, target, threat, and emitter detection, classification, and tracking. The aircraft is capable of surveilling airspace in excess of a 250-mile radius from surface to stratosphere. AWACS coordinates theater air operations in direct subordination to joint/combined air and space operations centers. It can simultaneously conduct C2, BM, and target detection/tracking. E-3Bs were upgraded to Block 30/35 standards in 2001. Block 40/45 aircraft are redesignated E-3G. The upgrade is the most comprehensive enhancement to date and improves tracking/identification, system reliability, and life-cycle cost. Mods include open-architecture computing, operator workload reduction, new consoles, improved electronic support measures (ESM), and passive surveillance capability. DRAGON (Diminishing manufacturing sources Replacement of Avionics for Global Operations and Navigation) upgrades add a digital cockpit and next-generation CNS/GATM. Three USAF aircraft are slated for DRAGON in FY22 and mods are slated for completion fleetwide by 2027. Development includes Electronic Protection (EP) to improve radar processing for classified requirements, modernizing airborne moving target indication, and fourth-to-fifth generation connectivity (to integrate F-22 and F-35). Ongoing mods include accelerated Mode 5 IFF install (as an



Ronald Bradshaw/USAF

airspace compliance bridge to DRAGON), Communication Network Upgrade (CNU) to add high-speed jam-resistant Link 16, and high-bandwidth internet to quickly prosecute time-sensitive targets. FY22 begins AWACS Communications Integration Program (ACIP) upgrades including BLOS SATCOM/second-generation NATO UHF, and anti-jam GPS. Two airframes will begin upgrade to Block 40/45 standards and five airframes will be redelivered as E-3Gs in FY22, achieving 28 of the 31 planned upgrades. USAF aims to eventually replace AWACS with a space-based capability. Due to a lack of mature space-based solutions and difficulty sustaining the E-3, USAF requested information to possibly procure Boeing's E-7A Wedgetail as an AWACS bridge capability.

**Contractors:** Boeing, Northrop Grumman (radar); Lockheed Martin (computer); Collins Aerospace (DRAGON cockpit upgrade).

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

**Delivered:** March 1977-1984.

**IOC:** 1977; July 28, 2014 (Block 40/45).

**Production:** 31.

**Inventory:** 10 (E-3B); 21 (E-3G).

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

**Aircraft Location:** JB Elmendorf-Richardson, Alaska; Kadena AB, Japan; Tinker AFB, Okla.

**Active Variants:**

•E-3B. Block 30/35 upgraded aircraft.

•E-3G. Block 40/45 upgraded aircraft.

**Dimensions:** Span 145.8 ft, length 152.9 ft, height 41.8 ft.

**Weight:** Max T-O 335,000 lb.

**Power Plant:** Four Pratt & Whitney TF33-PW-100A turbofans, each 21,000 lb thrust.

**Performance:** Speed 360 mph, range 5,000+ miles (air refuelable).

**Ceiling:** Above 35,000 ft.

**Accommodation:** Two pilots, navigator, flight engineer, 13-19 mission specialists.

## E-4 NATIONAL AIRBORNE OPERATIONS CENTER

Nuclear command and control

**Brief:** The E-4B is a highly survivable flying C3 center enabling national leaders to direct nuclear and conventional forces, execute emergency war orders, and coordinate civil response actions in support of the National Military Command System (NMCS). It is hardened against the effects of



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nuclear detonations, including electromagnetic pulse (EMP). Comms and data processing capabilities include EHF Milstar SATCOM, six-channel International Maritime Satellite, and a triband radome houses the SHF communications antenna. All aircraft underwent Block 1 upgrades, enhancing electronic and communications infrastructure with commercial off-the-shelf (COTS) systems. Ongoing upgrades include replacing Milstar data links with AEHF-compatible FAB-T, replacing the VLF/LF transmitter, and replacing legacy SHF with Survivable Super High Frequency (SSH) enabling uninterrupted, jam-resistant nuclear C2 fleetwide by 2023. E-4B airframes are viable to approximately 2033, but phaseout of commercial 747-200s hampers continued sustainment. USAF plans to replace the E-4B with the Survivable Airborne Operations Center (SAOC) and issued a request to industry for development of up to four, potentially used, but similarly sized commercial-derivative airframes in December 2020. Changes to acquisition strategy delayed initial solicitations but the service is aiming to conclude technology maturation in FY23 and take delivery of the initial aircraft by the early 2030s.

**Contractors:** Boeing; Raytheon (FAB-T); L3Harris (SSH); Boeing/Collins Aerospace (Low-Frequency Transmit System).

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

**Delivered:** December 1974-1985.

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

**Production:** Four.

**Inventory:** Four.

**Operator:** AFGSC.

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

**Active Variant:**

•E-4B. Modified Boeing 747-200 equipped as a NAOC.

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

**Weight:** Max T-O 800,000 lb.

**Power Plant:** Four General Electric CF6-50E2 turbofans, each 52,500 lb thrust.

**Performance:** Speed 602 mph, range 7,130 miles, 12-hr normal endurance, 72-hr with air refueling.

**Ceiling:** Above 30,000 ft.

**Accommodation:** Two pilots, navigator, flight engineer, up to 110 battle staff/mission crew.

## E-8 JSTARS

Command and control/ISR

**Brief:** E-8C is a ground moving target indication (GMTI), airborne battle-field management/command and control platform. Its primary mission is providing theater commanders with ground surveillance data to support tactical operations. E-8 evolved from the Army/Air Force Joint Surveillance Target Attack Radar System (JSTARS) program. The aircraft made its first radar-equipped test flight in December 1988, and the first two aircraft deployed for Desert Storm while the system was still under development. Early airframes were eventually retrofitted to Block 20 production standards featuring more powerful computers, an internet protocol local area network, and BLOS connectivity. JSTARS is equipped with a canoe-shaped radome under the forward fuselage housing a 24-ft-long, side-looking phased array radar antenna. It can locate, classify, and track vehicles and ships at distances exceeding 124 miles, and more recent refinements added human-target tracking. Target data is transmitted via data link to ground stations or other aircraft. USAF began efforts to improve fleetwide availability starting in FY18, aiming to simultaneously have six aircraft deployable by 2022. USAF dropped plans to replace JSTARS with a modern, business-class aircraft pursuing the Advanced Battle Management System (ABMS) instead. ABMS notionally disaggregated JSTARS functions among several platforms but was drastically cut in FY21, refocusing on technology development. USAF now plans to shift future GMTI efforts to a space-based approach to overcome anti-access/area denial threats. Ongoing upgrades include Secure Common Data



Barry Bena/USAF

**First Flight:** June 1983 (DHC-8).  
**Delivered:** 1988.  
**IOC:** June 1988.  
**Production:** Two.  
**Inventory:** Two.  
**Operator:** ACC.  
**Aircraft Location:** Tyndall AFB, Fla.  
**Active Variant:**  
 •E-9A. Military surveillance version of the DHC-8 commuter airliner.  
**Dimensions:** Span 85 ft, length 73 ft, height 24.5 ft.  
**Weight:** Max T-O 34,500 lb.  
**Power Plant:** Two Pratt & Whitney PW-120A turboprop engines, each 1,800 shp.  
**Performance:** Speed 280 mph, range 1,000 miles.  
**Ceiling:** 30,000 ft.  
**Accommodation:** Two pilots, two mission operators.

Link (SDL) for LOS networking to Common Ground Stations and UHF/VHF SATCOM modernization. Congress approved divestiture of JSTARS starting in FY22 with the retirement of four aircraft, the first of which left Robins for storage at Davis-Monthan on Feb. 11, 2022.

**Contractors:** Northrop Grumman; Raytheon.  
**First Flight:** April 1, 1988.  
**Delivered:** March 22, 1996-March 23, 2005.  
**IOC:** Dec. 18, 1997.  
**Production:** 18.  
**Inventory:** 16 (E-8C); one (TE-8).  
**Operator:** ANG.  
**Aircraft Location:** Robins AFB, Ga.  
**Active Variants:**  
 •E-8C. Block 20 upgraded JSTARS platform based on the Boeing 707-300.  
 •TE-8A. Crew training aircraft based on the E-8.  
**Dimensions:** Span 145.8 ft, length 152.9 ft, height 42.5 ft.  
**Weight:** Max T-O 336,000 lb.  
**Power Plant:** Four Pratt & Whitney TF33-102C turbojets, each 19,200 lb thrust.  
**Performance:** Speed 584 mph (optimal orbit), range 11 hr normal endurance (longer with air refueling).  
**Ceiling:** 42,000 ft.  
**Accommodation:** Two pilots, navigator, flight engineer, 15 Air Force/three Army mission crew (mission dependent).



Staff Sgt. Bennie Davis III

## E-9A WIDGET

### Range control

**Brief:** The E-9A is a modified DHC-8 commuter aircraft that provides air-to-air telemetry support for weapons testing, target drone operations, and range clearance. The aircraft supports operations at the Eglin Test and Training Range over the Gulf of Mexico and provides telemetry for weapons system evaluation at Holloman and the Utah Test and Training Range. Mission modifications include AN/APS-143(V-1) airborne sea surveillance radar, UHF telemetry, and signal relay systems. The E-9 is able to track flying and surface targets. It can detect small watercraft at ranges up to 25 miles. The fleet operates in concert with three drone recovery vessels and two patrol boats to clear waterways and airspace of civil traffic before live-fire testing or hazardous military activities commence. It also provides tracking and assistance with recovering targets. The aircraft can remotely initiate destruction of damaged or malfunctioning aerial target drones. FY22 funds are limited to low-cost sustainment and development upgrades.

**Contractors:** Bombardier (formerly De Havilland Canada); Sierra Nevada Corp. (conversion).



Senior Airman Jacob Wrightsman

## E-11A BATTLEFIELD AIRBORNE COMMUNICATIONS NODE

### Communications relay

**Brief:** The E-11A is a modified, Bombardier Global Express 6000/BD-700-1A10 business jet equipped with specialized communications relay equipment to translate between tactical comm and data links. It provides joint range extension, BLOS C2, and internet protocol-based data transfer between dissimilar systems. E-11A was fielded to meet an urgent operational need for BLOS air-to-ground relay and enables troops to overcome comm limitations in rugged terrain. The system entered combat in Afghanistan in 2008, and a single E-11 crashed north of Kandahar Airfield, Afghanistan, on Jan. 27, 2020, killing both aircrew members. The fleet was designated E-11A after USAF purchased the first previously leased aircraft in 2011. The Battlefield Airborne Communications Node (BACN) payload was integrated on a mixed fleet of manned E-11As and unmanned EQ-4B Global Hawks. ACC retired the EQ-4B in July 2021 and began procuring six additional airframes at a rate of one aircraft per year starting in FY21. FY22 funds support procurement and modification of two aircraft. Northrop Grumman was awarded a \$3.6 billion five-year support contract in early 2021, which also includes funding for research, development and testing, as well as the integration of future payloads. Ongoing upgrades include adding military GPS to operate in higher-end threat environments, advanced navigation, and flight safety, along with reliability, performance, and self-defensive improvements. Efforts are underway to standardize and transition the fleet to a Program of Record eventually based at Robins.

**Contractors:** Bombardier, Northrop Grumman (integration and support).  
**First Flight:** August 2007.  
**Delivered:** Dec. 2008-Aug. 30, 2012.  
**IOC:** Circa 2011.  
**Production:** Four (nine planned).  
**Inventory:** Three.  
**Operator:** ACC.  
**Aircraft Location:** Al Dhafra AB, UAE. Planned: Robins AFB, Ga.  
**Active Variant:**  
 •E-11A. Modified Bombardier BD-700 equipped with the BACN payload.  
**Dimensions:** Span 94 ft, length 99 ft 5 in, height 25 ft 6 in.  
**Weight:** Max T-O 99,500 lb.  
**Power Plant:** Two Rolls-Royce BR710A2-20 turbofans, each 14,750 lb thrust.  
**Performance:** Speed Mach 0.88, range 6,900 miles.  
**Ceiling:** 51,000 ft.  
**Accommodation:** Two pilots.



BAE Systems

## EC-37B COMPASS CALL

### Electronic warfare/electronic attack

**Brief:** The EC-37B is a next-generation, tactical jamming platform tasked with disruption of enemy C3, radar, and navigation. It will also offer offensive counterinformation, EA, and SEAD support. The aircraft is based on the ultra-long-range Gulfstream G550 business aircraft and adapted from the Navy's special mission configuration. USAF awarded L3 Technologies a contract on Sept. 7, 2017, to replace the EC-130H in the tactical EA role and transplant its "Compass Call" systems to a more modern aircraft. The program, originally dubbed "EC-X" will "re-host" upgraded EC-130H mission equipment directly to the EC-37 with nearly 70 percent remaining unchanged. EC-37B is faster, more economical, capable of higher altitude operations, and more survivable than the EC-130H. Upgrades will allow it to conduct standoff jamming/EA from greater distance for attacks against A2/AD targets. The first aircraft was purchased in FY17, followed by a second in FY18. Congress accelerated the program by funding two airframes in FY19, and USAF plans to procure and modify one aircraft a year through FY25. The first five aircraft are receiving the EC-130H's upgraded Baseline 3 package, including Advanced Radar Countermeasure System (ARCS) and other significant capability enhancements. EC-37 will not receive comparable low-band capability until Baseline 4 which will debut on the sixth airframe, procured in FY21 and slated for deployment in 2026. USAF postponed buying the seventh airframe in FY22 to focus on Baseline 4 development, installing equipment on the sixth airframe, and implementing technical changes. Baseline 4 will debut the System-Wide Open Reconfigurable Dynamic Architecture (SWORD-A) to enable rapid future upgrades. An EC-37B completed its first flight from Savannah-Hilton Head Airport on Aug 25, 2021. Air Combat Command plans to field the first five Baseline 3 EC-37Bs in 2023.

**Contractors:** Gulfstream Aerospace (airframe); BAE Systems; L3 Harris (mission equipment).

**First Flight:** Aug. 25, 2021.

**Delivered:** 2023 (planned).

**IOC:** 2023 (planned).

**Production:** 10 (planned).

**Inventory:** N/a.

**Operator:** ACC (planned).

**Aircraft Location:** Davis-Monthan AFB, Ariz. (planned).

#### Active Variant:

-EC-37B. Military Electronic Attack version of the Gulfstream G550.

**Dimensions:** Span 93.5 ft, length 96.4 ft, height 25.8 ft.

**Weight:** Max T-O 90,500 lb.

**Power Plant:** Two BR710C4-11 turbofans, each 15,385 lb thrust.

**Performance:** Speed 600 mph, range 6,300 miles.

**Ceiling:** 51,000 ft.

**Accommodation:** Two pilots; TBD.

## EC-130H COMPASS CALL

### Electronic warfare/ Electronic Attack

**Brief:** The EC-130H is a modified C-130H designed to disrupt enemy C3 and limit adversary coordination and force management. Tasks include tactical jamming/disruption of communications, radar, and navigation, offensive counterinformation, EA, and SEAD support. The fleet has been deployed near-constantly since the beginning of combat operations in Afghanistan in 2001. The aircraft was designed to be easily updated and modified. All aircraft have been retrofitted to Block 35 standards and are aerial refuelable. Mission equipment upgrades occur approximately every three years to ensure continued protection and effectiveness against evolving threats. Baseline 2 mods are ongoing, and the Baseline 3 configuration, including the Advanced Radar Countermeasure System (ARCS) and other significant capability enhancements, is slated for fielding in 2023. Baseline 4 will be fielded on the next-generation EC-37B in

2026, and some 70 percent of the EC-130H's mission equipment will be directly cross-decked to its successor platform. Funding delays required extending the EC-130H with center wing box replacement/structural mods (in common with the C-130H fleet) and upgrades include digital glass cockpits, Mode 5 IFF/airspace compliant CNS/ATM, and color weather radar. Ongoing system upgrades include counter-radar/counter satellite navigation, third-generation Special Purpose Emitter Array (SPEAR), and adaptive EA to quickly react to emerging threats. AFCENT inactivated the 41st Expeditionary Electronic Combat Squadron at Al Dhafra on Sept.



Senior Airman Alex Miller

28, 2021. The unit logged 14,753 sorties in-theater totaling 90,000 hours since initially deploying to Afghanistan in 2001. The first aircraft retired to the boneyard at Davis-Monthan on Aug. 31, 2021, followed two additional airframes on Nov. 8, 2021, and March 2, 2022.

**Contractors:** Lockheed Martin; BAE Systems (mission equipment); L3Harris (integration and sustainment).

**First Flight:** 1981.

**Delivered:** March 19, 1982-unk.

**IOC:** 1983; Block 35 from 2011.

**Production:** (Converted).

**Inventory:** Nine (EC-130H).

**Operator:** ACC.

**Aircraft Location:** Davis-Monthan AFB, Ariz.

#### Active Variant:

-EC-130H. Electronic attack variant of the C-130H.

**Dimensions:** Span 132.6 ft, length 99 ft, height 38 ft.

**Weight:** Max T-O 155,000 lb.

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

**Performance:** Speed 300 mph at 20,000 ft, unrefueled range 2,295 miles, seven hr normal endurance (air refuelable).

**Ceiling:** 25,000 ft.

**Accommodation:** Two pilots, navigator, flight engineer; mission crew: two EWOs; mission crew supervisor (cryptologic), four cryptologic linguists, acquisition operator, and airborne maintenance technician.

## INTELLIGENCE, SURVEILLANCE, RECONNAISSANCE AIRCRAFT



Thomas Acevedos/Vimages

## P-9A PALE ALE

### Maritime patrol, detection, and monitoring

**Brief:** The P-9A is a heavily modified Bombardier CRJ-900 (DHC-8) commuter aircraft equipped for maritime patrol as well as advanced Detection and Monitoring (D&M) missions. The three-aircraft fleet is owned by ACC and primarily tasked to USSOUTHCOM to detect and monitor narcotic and illicit trafficking from South and Central America, as well as the Caribbean. The P-9A is a Government Owned Contractor Operated (GOCO) fleet and conducts more than 7,200 flying hours per year, primarily based from

the Navy's Counterdrug Cooperative Security Location in Comalapa, El Salvador. Aircraft also conduct forward-deployed operations from airfields throughout the Caribbean as well as South and Central America, lasting approximately 730 days.

**Contractors:** Bombardier (formerly De Havilland Canada); Sierra Nevada Corp. (operator).

**First Flight:** N/A.

**Delivered:** N/A.

**IOC:** N/A.

**Production:** Three.

**Inventory:** Three (Contractor operated).

**Operator:** ACC.

**Aircraft Location:** Comalapa, El Salvador; forward operating locations across USSOUTHCOM.

**Active Variant:**

•P-9A. Maritime patrol, detection and monitoring aircraft converted from the Bombardier Q202 commuter airliner.

**Dimensions:** Span 85 ft, length 73 ft, height 24.6 ft.

**Weight:** Max T-O 36,300 lb.

**Power Plant:** Two Pratt & Whitney PW-123C/D turboprop engines, each 2,150 shp.

**Performance:** Speed 333 mph, range approx. 1,300 miles.

**Ceiling:** 25,000 ft.

**Accommodation:** Two pilots, unk. mission crew.



Airman 1st Class Thomas Cox

## RC-26 CONDOR

Tactical ISR

**Brief:** The RC-26 is a modified Fairchild Metro 23 tasked with counter-narcotics, manned tactical ISR, disaster response, and civil support missions. USAF selected the C-26 to fulfill a joint ANG and Army National Guard airlift requirement in 1988, subsequently modifying the airframes to the RC-26 configuration. The aircraft is equipped with specialized digital cameras, IR video, and communications equipment to enable domestic and international anti-trafficking. The aircraft has a secondary role providing real-time video streaming to responders following hurricanes, wildfires, and other disasters. In the fire-support role, aircraft sensors can detect fires at up to 80 miles and accurately map them from up to 3 miles away. An extensive comm suite allows communications from 29 to 960 MHz including provisions for plugged-in 800 MHz handheld radio and airphones. The fleet is currently split between six Block 25R and five Block 20 configured aircraft. ANG priorities include bringing the fleet to a common standard with updated mission system/sensor management, integrated comms, and upgraded VHF/UHF/LOS SATCOM. If retained in service, the RC-26's sensor suite requires modernization with an integrated targeting/EO/IR/full-motion video sensor as well as an all-weather ground moving target sensor for border enforcement and maritime interdiction missions. Other needed upgrades would include LOS/BLOS-secure FMV downlinks and airspace compliance mods to meet FAA mandates. The ANG was barred from divesting the platform starting in FY20 unless it demonstrates the fleet's missions can be performed by other assets. RC-26s notably supported wildfire fighting efforts across the Northwestern U.S. during the 2021 fire season.

**Contractors:** Fairchild (airframe); Elbit Systems (avionics upgrade).

**First Flight:** 1990.

**Delivered:** March 1989-1996 (delivered as C-26A/B).

**IOC:** N/A.

**Production:** 10 (C-26A); 33 (C-26B); 11 (RC-26).

**Inventory:** 11.

**Operator:** ANG.

**Aircraft Location:** Des Moines Aprt., Iowa; Ellington Field, Texas; Fairchild AFB, Wash.; Fresno Yosemite Arpt., Calif.; Key Field, Miss.; Kirtland AFB, N.M.; Montgomery Regional Arpt., Ala.; Truax Field, Wis.; Tucson Arpt., Ariz.; Yeager Arpt., W.Va.

**Active Variants:**

•RC-26B. Surveillance version of the Fairchild C-26.

**Dimensions:** Span 57 ft, length 59.5 ft, height 16.6 ft. Weight: Max T-O 16,500 lb.

**Power Plant:** Two Garrett TPE331-12UAR-701 turboprops, each 1,100 shp.

**Performance:** Speed 334 mph, range 2,070 miles.

**Ceiling:** 25,000 ft.

**Accommodation:** Two pilots, navigator/mission systems operator.



Airman Jacob Skovo

## RC-135S COBRA BALL

Electronic reconnaissance

**Brief:** The RC-135S gathers measurement and signature intelligence (MASINT) on missile-associated signatures and tracks during boost and reentry. Cobra Ball superseded Rivet Ball and Rivet Amber, receiving the current designation on Oct. 24, 1969, and collects both optical and electronic data on ballistic missile activity. A single aircraft was lost in a crash during inclement weather at Shemya AFB, Alaska, on March 15, 1981. The variant's specialized equipment includes the long-range Medium Wave Infrared Array (MIRA) EO/IR sensor suite, all-weather tracking radar, and an advanced communications suite. Reconnaissance data is used to assess missile threats, evaluate missile performance, characterize adversary missiles, and analyze weapons testing and technology. Data also supports treaty verification and theater ballistic missile nonproliferation. It can deploy anywhere in the world in 24 hours and provide on-scene EO reconnaissance. Continuous baseline upgrades are now projected to keep the fleet viable through 2050, and flexible funding permits rapid, variant-specific mods in response to emerging/evolving threats. Aircraft are currently undergoing integration and testing of Baseline 7 mods (similar to Rivet Joint Baseline 12). Baseline 7 includes integrating Rivet Joint's COMINT suite, digital electromagnetic signature direction finding, digital search, and SATCOM-aided target discrimination.

**Contractors:** Boeing (airframe); L3Harris, Textron Systems (mission systems).

**First Flight:** Circa 1969.

**Delivered:** Jan. 11, 1970-November 2000 (redelivery as RC-135S).

**IOC:** March 1972 (Cobra Ball II).

**Production:** Four converted.

**Inventory:** Three.

**Operator:** ACC.

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

**Active Variant:**

•RC-135S Cobra Ball. Modified C-135 equipped for MASINT/treaty verification.

**Dimensions:** Span 131 ft, length 135 ft, height 42 ft.

**Weight:** Max T-O 297,000 lb.

**Power Plant:** Four CFM International F108-CF-201 turbofans, each 21,600 lb thrust.

**Performance:** Speed 517+ mph, range 3,900 miles (farther with air refueling).

**Ceiling:** 45,000 ft.

**Accommodation:** Two pilots, navigator, three EWOs, two airborne systems engineers, two airborne mission specialists.





Sunekuma

## RC-135U COMBAT SENT

### Electronic reconnaissance

**Brief:** The RC-135U is tasked with strategic reconnaissance and technical intelligence (TECHINT) gathering on radar/emitter systems. Three Combat Sent aircraft were converted from RC-135Cs in 1970-71 to fill a critical need for data collection on adversary radar threats and defenses. Combat Sent's distinctive chin and wingtip antenna arrays, large cheek fairings, and extended tail contain specialized sensor suites to collect data and analyze airborne, land, and naval radar/emitter systems. Each airframe incorporates a different, tailored sensor suite, and the data gathered is critical to the effective design and programming of RWR (radar warning receivers), jammers, decoys, anti-radiation missiles, and threat simulators. Combat Sent additionally enables strategic analysis for National Command Authorities and combatant forces. The aircraft utilizes radar/solid-state doppler, INS, celestial, and GPS for navigation, and is capable of both operator, automated, and blended signal gathering and analysis. Continuous baseline upgrades are now projected to keep the fleet viable through 2050, and flexible funding permits rapid variant-specific mods in response to emerging/evolving threats. FY22 focuses on sustaining Baseline 5 and completing upgrades to Baseline 6 (similar to Rivet Joint Baseline 12). Baseline 6 includes wideband SATCOM reachback, integrating Rivet Joint's COMINT suite, improving operator interface, enhancing antennas and processors, and capability upgrades for dense signal environments.

**Contractors:** Boeing (airframe); L3Harris, Textron (mission systems).

**First Flight:** N/A.

**Delivered:** May-December 1971 (RC-135U).

**IOC:** 1971.

**Production:** Three converted.

**Inventory:** Two.

**Operator:** ACC.

**Aircraft Location:** Offutt AFB, Neb.; forward operating locations: Al Udeid AB, Qatar; NSF Diego Garcia, U.K.; Eielson AFB, Alaska; Kadena AB, Japan; RAF Mildenhall, U.K.; NSA Souda Bay, Greece.

**Active Variant:**

•RC-135U Combat Sent. Modified C-135 equipped for radar/emitter analysis.

**Dimensions:** Span 135 ft, length 140 ft, height 42 ft.

**Weight:** Max T-O 322,500 lb.

**Power Plant:** Four CFM International F108-CF-201 turbofans, each 21,600 lb thrust.

**Performance:** Cruise speed 517 mph, range 4,140 miles, 8-hr normal endurance, 24-hr crew endurance (farther with air refueling).

**Ceiling:** 42,000 ft.

**Accommodation:** Two pilots, two navigators, three airborne systems engineers; Mission crew: 10 EW officers, six or more electronic, technical, mission-area specialists.



Courtesy photo

## RC-135V/W RIVET JOINT

### Electronic reconnaissance

**Brief:** The RC-135V/W is tasked with real-time electronic and signals intelligence-gathering, analysis, and dissemination in support of theater and strategic-level commanders. The extensively modified C-135s detect, identify, and geolocate signals throughout the electromagnetic spectrum. Rivet Joint is mostly used to exploit electronic battlefield intelligence and deliver near-real-time ISR information to tactical forces, combatant commanders, and National Command Authorities. The British Royal Air Force also operates three RC-135W Airseeker aircraft, which are co-manned

by USAF/RAF personnel. Onboard capabilities encompass rapid search, detection, measurement, identification, demodulation, geolocation, and fusion of data from potentially thousands of electronic emitters. Continuous baseline upgrades keep the fleet viable and drive standards for Combat Sent/Cobra Ball. Flexible funds permit rapid, variant-specific mods in response to emerging/evolving threats. The fleet recently underwent Baseline 11/12 upgrades, adding new direction finding COMINT, precision ELINT/SIGINT system integration, wideband SATCOMs, enhanced near real-time data dissemination, as well as new steerable beam antenna, improved weather radar, digital cockpit instruments, and compliant CNS/ATM. Baseline 12 modernized operator interface, improved dense-signal environment capabilities, increased signal bandwidth/exploitation, added operator 3D maps, and integrated RC-135 with the Distributed Common Ground Station (DCGS). FY22 efforts focus on upgrading a total of 10 Baseline 11 airframes to the next Baseline 13, enhancing Baseline 12, and upgrading the aircraft's autopilot. Development includes automated search and detection and employment of artificial intelligence and collaboration to speed collection, analysis, and distribution. USAF's most recent utility assessment projected the upgraded fleet will remain relevant through 2050, and the RAF extended its agreement with USAF to continue operating the type through at least 2035.

**Contractors:** Boeing (airframe); L3Harris (mission systems).

**First Flight:** N/A.

**Delivered:** Circa 1973-99 (continuous equipment updates).

**IOC:** Circa 1973.

**Production:** Converted.

**Inventory:** Eight (RC-135V); nine (RC-135W); three (TC-135W); one (NC-135W).

**Operator:** ACC, AFMC.

**Aircraft Location:** Offutt AFB, Neb.; Kadena AB, Japan; RAF Mildenhall, U.K.; RAF Waddington, U.K. (USAF co-manned).

**Active Variants:**

•RC-135V/W Rivet Joint. Standoff airborne SIGINT variant of the C-135.

•TC-135W. Training version of the operational aircraft.

•NC-135W. Rivet Joint systems integration testbed operated by AFMC.

**Dimensions:** Span 131 ft, length 135 ft, height 42 ft.

**Weight:** Max T-O 297,000 lb.

**Power Plant:** Four CFM International F108-CF-201 turbofans, each 21,600 lb thrust.

**Performance:** Speed 500+ mph, range 3,900 miles (farther with air refueling).

**Ceiling:** 50,000 ft.

**Accommodation:** Three pilots, two navigators, three EWO, 14 intelligence operators, four airborne maintenance technicians (six additional, if required).



William Lewis/USAF

## U-2S DRAGON LADY

### High-altitude reconnaissance

**Brief:** U-2S is the Air Force's only manned, strategic, high-altitude, long-endurance ISR platform and is capable of SIGINT, IMINT, and MASINT collection. The aircraft's modular payload systems allow it to carry a wide variety of advanced optical, multispectral, EO/IR, SAR, SIGINT, and other payloads simultaneously. Its open system architecture also permits rapid fielding of new sensors to counter emerging threats and requirements. The original U-2A first flew on Aug. 4, 1955. The type was further developed into the larger, more capable U-2R which first took flight on Aug. 28, 1967, and was delivered between 1967 and 1968. Current U-2s date to the 1980s when U-2R production was reopened under the designation TR-1 (later returned to U-2R designation in 1992). The TR-1A first flew on Aug. 1, 1981, and was re-engined and modernized starting in 1994, emerging as the U-2S. Current Block 20 U-2S features glass cockpits, digital autopilot, modernized EW system, and updated data links. Its major sensors are the ASARS-2A SAR, SYERS-2A multispectral EO/IR imagery system, and enhanced Airborne Signals Intelligence Payload (ASIP). Modification and upgrades are focused on sustaining U-2 capability through its currently planned retirement in FY26, while meeting current and emerging requirements. Current development and mods support Block 20.1 upgrades. Major efforts include ASARS-2B/C integration, avionics and navigation refresh, (Link-16/ IFDL, MADL) modernization, next-generation SIGINT, and quick-response capabilities to meet emergent ISR requirements. ASARS-2B/C significantly improves the U-2's high-altitude, deep-look radar ground mapping, moving target, and maritime capabilities and

moves to an open, easily upgradable architecture. ASARS-2B/C will begin flight-testing in FY22, and IOC is expected in FY23. Other ongoing efforts include GPS refresh, quick-change modular mission systems and unmanned-system interoperability, EW system upgrades, and a helmet and pressure suit refresh. The program continues to prioritize experimental sensors, systems, and software to meet emerging threats and develop networked, next-generation BM/C2.

**Contractors:** Lockheed Martin, Northrop Grumman (ASIP); Raytheon (ASARS); UTC Aerospace (SYERS/Optical Bar Camera).

**First Flight:** October 1994 (U-2S).

**Delivered:** September 1981-October 1989 (TR-1/U-2R).

**IOC:** Circa 1981 (U-2R).

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

**Inventory:** 27 (U-2); four (TU-2).

**Operator:** ACC.

**Aircraft Location:** Beale AFB, Calif.; permanent forward operating locations worldwide.

**Active Variants:**

•U-2S. Current variant of the U-2/TR-1.

•TU-2S. A two-seat trainer aircraft originally designated U-2ST.

**Dimensions:** Span 105 ft, length 63 ft, height 16 ft.

**Weight:** Max T-O 40,000 lb.

**Power Plant:** GE Aviation F118-GE-101A turbofan, 17,000 lb thrust.

**Performance:** Speed 410 mph, range 7,000+ miles.

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

**Accommodation:** Pilot (U-2S); two pilots (TU-2S) on RQ201 zero/zero ejection seats.



Staff Sgt. Kristen Pittman

## WC-130J

**Weather reconnaissance**

**Brief:** The WC-130J "Weatherbird" is a modularly configurable C-130J equipped with specialized systems to penetrate tropical and winter storms, capture meteorological data, and aid severe weather forecasting. Early WC-130Bs entered service in 1959, followed by the WC-130E in 1962, and WC-130H in 1964. The WC-130J began replacing legacy variants in 1999, though several H models remained in service with the Puerto Rico ANG until a fatal crash resulted in the fleet's retirement in 2019. All WC-130Js are operated by AFRC's 53rd Weather Reconnaissance Squadron "Hurricane Hunters" at Keesler. Mission equipment includes a pod-mounted Stepped-Frequency Microwave Radiometer (SFMR) for monitoring surface winds and precipitation rates, parachute-deployed GPS dropsondes to gather vertical atmospheric profiles, and palletized operator stations/equipment running specialized software. WC-130Js are optionally equipped with two external wing tanks, as well as an internal auxiliary fuel tank to increase range and endurance. Crews include an added aerial weather reconnaissance officer/flight director and weather system specialist/loadmaster. Aircraft are capable of penetrating tropical cyclones from up to 10,000 ft to as low as 500 ft. The fleet primarily monitors oceanic weather over the Atlantic, Central Pacific, Caribbean, and Gulf of Mexico. Airframes are modernized alongside the baseline C-130J fleet, including Block 8.1 upgrades, airspace compliance mods, and enhanced service-life center wing sections. WC-130Js recently tested a new SATCOM that would enable continuous real-time streaming of radar and storm data from the aircraft to forecasters on the ground. The modular X-band antenna tested during the 2021 hurricane season was mounted in a dome fairing in place of the flight deck escape hatch.

**Contractor:** Lockheed Martin.

**First Flight:** April 5, 1996 (C-130J).

**Delivered:** Sept. 30, 1999-September 2005.

**IOC:** October 2006.

**Production:** 10.

**Inventory:** 10.

**Operator:** AFRC.

**Aircraft Location:** Keesler AFB, Miss.

**Active Variant:**

•WC-130J. Weather reconnaissance version of the C-130J.

**Dimensions:** Span 132.6 ft, length 97.8 ft, height 38.8 ft.

**Weight:** Max T-O 155,000 lb; max payload 42,000 lb.

**Power Plant:** Four Rolls-Royce AE2100D3 turboprops, each 4,700 shp.

**Performance:** Speed 417 mph; range with 35,000 lb payload 1,841 miles (3,000+ miles with external/auxiliary tanks).

**Ceiling:** With max payload, 26,000 ft.

**Accommodation:** Two pilots, aerial reconnaissance weather officer, loadmaster/dropsonde operator. Load: palletized weather systems.



Susan Romano/USAF

## WC-135 CONSTANT PHOENIX

**Air sampling and collection**

**Brief:** WC-135's primary mission is nuclear test monitoring, airborne radiological sampling, and arms control treaty verification. The fleet are currently modified C-135Bs equipped with air sampling and collection equipment. The aircraft primarily support monitoring under the 1963 Limited Nuclear Test Ban Treaty. Air sampling WB-29s detected debris from the Soviet Union's first atomic test in 1949, and subsequent aircraft have monitored recent weapons tests in North Korea, as well as the Chernobyl and Fukushima nuclear disasters. The WC-135's sampling and collection suite allows mission crew to detect radioactive "clouds" in real time. The collection system uses external flow-through devices to collect particles on filter paper for later analysis. The podded particulate sampler/Radiation Monitoring and Analysis System (RMAS) detects radiation contact, and the Directional Gamma Sensor System (DGSS) guides the crew toward the plume for collection. The Whole Air Collection System (WACS) captures and stores radioactive samples from the aircraft's bleed-air system. An integrated control system permits real-time mission system interface and monitors internal and external radiation levels for safety and analysis. USAF deemed replacing the aging fleet to be more cost-effective than re-engining and modernization. Conversion of three KC-135R tankers to WC-135R standards began in 2019 utilizing the same sensor suite. The C-130J-mounted Harvester WACS/Particulate Airborne Collection Systems (PACS) augments Constant Phoenix and a modular system deployable on the KC-46 or RPA platform is under development. The sole WC-135C—serial 62-3582—retired on Nov. 16, 2020, and the remaining aircraft will be sustained until replaced by the WC-135R. The first WC-135R is slated for completion in 2022, followed by delivery of the remaining two aircraft in 2023.

**Contractors:** Boeing; L3 Technologies (WC-135R conversion).

**First Flight:** 1965.

**Delivered:** 1965-96; 2021 (WC-135R).

**IOC:** December 1965; 2022 (WC-135R) planned.

**Production:** Two (WC-135C/W); three (WC-135R) (planned).

**Inventory:** Two (WC-135R); one (WC-135W).

**Operator:** ACC.

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

**Active Variants:**

•WC-135R. Modified KC-135R tankers, planned to replace the aging WC-135C/W fleet.

•WC-135W. Modified C-135B equipped for radiological monitoring and air sampling.

**Dimensions:** Span 130.8 ft, length 136.3 ft, height 41.7 ft.

**Weight:** Max T-O 300,500 lb. (WC-135C/W); 322,500 lb. (WC-135R).

**Power Plant:** Four Pratt & Whitney TF33-P-5 turbofans, each 16,050 lb thrust. (WC-135C/W); Four CFM International CFM56-2 turbofans, each 21,634 lb thrust (WC-135R).

**Performance:** Speed 403 mph, range 4,600 miles (farther with air refueling) (WC-135C/W); speed 530 mph, range approx. 3,900 miles (farther with air refueling) (WC-135R).

**Ceiling:** 40,000 ft. (WC-135C/W); 50,000 ft. (WC-135R).

**Accommodation:** Two pilots, navigator, up to 31 special equipment operators/observers as required.

## TANKER AIRCRAFT



Senior Airman Jacob Stephens

### HC-130J COMBAT KING II

Aerial refueling/airlift

**Brief:** The HC-130J is tasked with helicopter in-flight refueling support for CSAR/personnel recovery, tactical C2, and pararescue (PJ) deployment. It replaces legacy HC-130N/Ps and is based on the USMC's KC-130J tanker. It adds an enhanced service-life wing, improved cargo handling system, refueling receptacle, EO/IR sensor, flight deck CSO console, and dual SATCOM. Features include integrated INS/GPS, NVG-compatible lighting, FLIR, and integrated situational awareness. Recently added Advanced Threat Warning and RF countermeasures, as well as chaff/flares give the HC-130 the latest self-defensive capability for recovery operations in contested environments. USAF plans to standardize HC/AC/MC-130J block upgrades, and current efforts bring all HC-130Js to a common standard. Ongoing development and upgrades include avionics Block 8.1 (in common with the C-130J fleet), Lightweight Airborne Radio System (LARS), Situational Awareness Capabilities Upgrade (SACU), and radio frequency countermeasures (RFCM) to detect, locate, and respond to threats. ACC plans to complete fleetwide LARS upgrades in FY22 transitioning to the new 406 MHz distress frequency and improving timely location of aircraft, vessels, and personnel. SACU replaces the legacy data link with Link 16, blue force tracking, advanced mission planning, and new displays to enhance secure networking/comms fleetwide by 2023. USAF also expects to complete total fleet recap by 2023.

**Contractor:** Lockheed Martin.

**First Flight:** July 29, 2010.

**Delivered:** Sept. 24, 2010-present.

**IOC:** April 25, 2013.

**Production:** 39 (planned).

**Inventory:** 37.

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

**Aircraft Location:** Davis-Monthan AFB, Ariz.; Francis S. Gabreski Arpt., N.Y.; JB Elmendorf-Richardson, Alaska; Kirtland AFB, N.M.; Moffett Field, Calif.; Moody AFB, Ga.; Patrick SFB, Fla.

**Active Variants:**

•HC-130J, KC-130J modified for CSAR and aerial refueling.

**Dimensions:** Span 132.6 ft, length 97.8 ft, height 38.8 ft.

**Weight:** Max T-O 164,000 lb.

**Power Plant:** Four Rolls-Royce AE2100D3 turboprops, each 4,591 shp.

**Performance:** Speed 363.4 mph at S-L, range 4,000+ miles (farther with air refueling).

**Ceiling:** 33,000 ft.

**Fuel Capacity:** 61,360 lb at 150-300 gpm (100 gpm dual, simultaneous refueling).

**Accommodation:** Two pilots, CSO, two loadmasters, three PJs.

### KC-10 EXTENDER

Aerial refueling/airlift

**Brief:** The KC-10 is a multirole tanker/transport capable of aeromedical evacuation, based on the McDonnell Douglas DC-10-30CF. The aircraft is USAF's largest air-refueling aircraft. It is simultaneously capable of tanker and cargo roles, enabling it to support worldwide fighter deployments. The aircraft employs an advanced aerial refueling boom and hose/drogue system allowing it to refuel a wide variety of U.S. and allied aircraft, including the CV-22 tilt-rotor, within the same mission. The aircraft has three large fuel tanks under the cargo floor and an air-refueling operator's station recessed into the aft fuselage. It is also refuelable by



Airman 1st Class Sean Hetz

boom-equipped tankers. Ongoing mods include modernized navigation, surveillance, and air traffic management (CNS/ATM) to bring the fleet into compliance with FAA mandates, and advanced Mode 5 IFF. The fleet amassed more than 2.3 million flying hours before the first three tankers retired in 2020. Congress prevented USAF from making drastic KC-10 cuts last year citing capacity concerns with delays to the KC-46 program, but removed limitations for FY22. AMC shed eight airframes last year and aims to accelerate to retiring 14 aircraft this year, proposing a new "roadmap" to reinvest in KC-46 and future capabilities through the planned divestiture of the fleet in 2024.

**Contractors:** McDonnell Douglas (now Boeing); Collins Aerospace (CNS/ATM).

**First Flight:** April 1980.

**Delivered:** March 1981-April 1990.

**IOC:** August 1982.

**Production:** 60.

**Inventory:** 48.

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

**Aircraft Location:** JB McGuire-Dix-Lakehurst, N.J.; Travis AFB, Calif.

**Active Variant:**

•KC-10A. Modified McDonnell Douglas DC-10 designed as a multirole cargo-tanker.

**Dimensions:** Span 165.4 ft, length 181.6 ft, height 58 ft.

**Weight:** Max T-O 590,000 lb.

**Power Plant:** Three GE Aviation CF6-50C2 turbofans, each 52,500 lb thrust.

**Performance:** Speed 619 mph, range 11,500 miles, or 4,400 miles with max cargo (air refuelable).

**Ceiling:** 42,000 ft.

**Fuel Capacity:** 356,000+ lb. at 1,100 gpm (boom), 470 gpm (drogue).

**Accommodation:** Two pilots, flight engineer, boom operator; AE crew: two flight nurses, three medical technicians; other crew depending on mission.

**Load:** Up to 75 people and 17 pallets or 27 pallets up to approx. 170,000 lb.



Staff Sgt. Nathan Eckert

### KC-46 PEGASUS

Aerial refueling/airlift

**Brief:** The KC-46A is a heavily modified Boeing 767-200ER multirole passenger/cargo-tanker equipped with flying boom and probe/drogue refueling capability using the Wing Air Refueling Pod (WARP) system. It is also equipped for aeromedical evacuation. KC-46 incorporates the 787's state-of-the-art cockpit, a fly-by-wire boom, remote boom-operator's station, advanced self-defensive suite including Large Aircraft IR Countermeasures (LAIRCM), RWR, tactical situational awareness, comms relay hosting, and nuclear/chem/bio hardening. In 2011 Boeing was awarded a contract for 179 KC-46A tankers, the first increment (KC-X), to replace about half of USAF's KC-135R fleet. Compared to the 50-year-old KC-135, the KC-46A has more fuel capacity, improved efficiency, and enhanced cargo and AE capability. Like the KC-10, it employs an advanced refueling boom and independently operating hose/drogue system. The program's provisioned 767-2C prototype (minus refueling boom) flew on Dec. 28, 2014, and received FAA type certification in December 2017. USAF accepted its first production KC-46 from Boeing on Jan. 10, 2019. The service awarded LRIP contracts for 19 aircraft in 2016, a follow-on Lot 3 contract for 15 aircraft in 2017, 18 aircraft in 2018, and 15 in 2019. USAF awarded

the most recent Lot 6 and Lot 7 contracts for a combined 27 aircraft in January 2021, raising the quantity on-contract to 94 airframes. Full-rate production was initially planned to start at Lot 3 but has been pushed to Lot 10 due to program delays. FY22 funds support purchase of 14 tankers. Boeing delivered the first of up to six KC-46s to the Japan Air Self-Defense Force on Oct. 29, 2021, and Israel became the type's second international customer with an order for two tankers last December. The KC-46 completed developmental testing and entered operational testing in 2019, though planned IOC and full-rate production has slipped to FY24 or later due to remaining deficiencies with the boom and remote vision system (RVS). USAF is currently reviewing the proposed RVS redesign and Boeing aims to retrofit an initial 12 aircraft with RVS 2.0 starting in 2023, integrating the system into production airframes by 2024. AMC began employing KC-46 for noncombat refueling of a limited number of types starting in 2021 and expanded its "interim capability" to refuel nearly 70 percent of receiver types, accomplishing 2,500 sorties by year's end. USAF aims to deploy the first element of its Advanced Battle Management System (ABMS), a C2 pod to networking fifth-generation aircraft in high-threat environments, on the KC-46. McGuire received the first two of 24 planned aircraft on Nov. 9, 2021, and MacDill was selected as the next preferred alternative to host KC-46s the following month.

**Contractor:** Boeing.  
**First Flight:** Sept. 25, 2015 (KC-46A).  
**Delivered:** December 2018-present.  
**IOC:** FY24 (planned).  
**Production:** 179 (planned).  
**Inventory:** 48 (KC-46A).  
**Operator:** AFMC, AMC, ANG.  
**Aircraft Location:** Altus AFB, Okla.; Edwards AFB, Calif.; JB McGuire-Dix-Lakehurst, N.J.; McConnell AFB, Kan.; Pease ANGB, N.H.; Seymour-Johnson AFB, N.C. Planned: MacDill AFB, Fla.; Travis AFB, Calif.; others TBD.  
**Active Variant:**  
 •KC-46A. Modified Boeing 767 designed as a multirole cargo tanker.  
**Dimensions:** Span 156 ft, length 165.5 ft, height 52.8 ft.  
**Weight:** Max T-O 415,000 lb.  
**Power Plant:** Two Pratt & Whitney PW4062, each 62,000 lb thrust.  
**Performance:** Speed 650 mph, range 7,350 miles (farther with air refueling).  
**Ceiling:** 43,000 ft.  
**Fuel Capacity:** 212,299 lb., max transfer load 207,672 lb at 1,200 gpm (boom), 400 gpm (drogue).  
**Accommodation:** Two pilots, boom operator, and up to 12 additional crew; 15 crew seats, incl AE crew. Passenger Load: 58 or up to 114 for contingency operations. AE load: 58 patients (24 litters and 34 ambulatory).  
**Cargo Load:** 18 pallet positions, max 65,000 lb.



Airman 1st Class Megan Estrada

## KC-135 STRATOTANKER

Aerial refueling/airlift

**Brief:** The KC-135 is an aerial tanker capable of simultaneous cargo and AE missions and has been the mainstay of the USAF tanker fleet for more than 60 years. The C-135 family is similar in appearance to the commercial 707 but designed to unique military specifications and first flew on Aug. 31, 1956. The KC-135A fleet was delivered between June 1957 and January 1965, reaching IOC at Castle AFB, Calif., in 1957. KC-135s were re-engined under two separate but concurrent programs and redelivered as the KC-135E and finally the current KC-135R beginning in July 1984. Twenty KC-135Rs received Multipoint Refueling System (MPRS) hose/drogue pods on each wing to simultaneously refuel two NATO or Navy aircraft. (Standard KC-135s can use a single drogue adapter attached to the boom). A small number of McConnell-based aircraft are also receiver-capable, incorporating a forward-fuselage receptacle. KC-135s can be equipped with a podded Large-Aircraft IR Countermeasures (LAIRCM) system to track/jam IR missiles for high-threat missions. Modern features include a digital flight deck, Global Air Traffic Management upgrades completed in 2011, and Link 16 on a limited number of upgraded aircraft. Significant ongoing modernization includes Block 45 cockpit upgrades, Aero-I SATCOM replacement, and rudder position indicator retrofit. Block 45 cockpit mods enhance the modernized PACER CRAG flight deck with

an additional glass cockpit display for engine instrumentation, a radar altimeter, advanced autopilot, and modern flight director. The obsolete Aero-I long-distance oceanic satellite tracking/C2 will be replaced with a commercially available Iridium SATCOM fleetwide by 2026, while adding a rudder indicator aims to prevent accidents like the fatal 2013 crash in Kyrgyzstan. Congress barred KC-135 retirements last year due to capacity shortfall caused by KC-46 delays but will permit retiring 18 aircraft in FY22 to make room for KC-46 beddown. USAF plans to retain the fleet to at least 2050, but announced plans to possibly pursue a "bridge tanker" to augment KC-46 until a notional Advanced Air Refueling Tanker emerges.

**Contractors:** Boeing; Collins Aerospace (Block 45/Iridium SATCOM).  
**First Flight:** Aug. 4, 1982 (KC-135R).  
**Delivered:** July 1984-June 9, 2005 (KC-135R).  
**IOC:** June 1957.  
**Production:** 732 (420 converted to KC-135R).  
**Inventory:** 340 (KC-135R); 54 (KC-135T).  
**Operator:** AETC, AFMC, AMC, PACAF, USAF, ANG, AFRC.  
**Aircraft Location:** Altus AFB, Okla.; Beale AFB, Calif.; Fairchild AFB, Wash.; Grissom ARB, Ind.; JB Andrews, Md.; Kadena AB, Japan; MacDill AFB, Fla.; March ARB, Calif.; McConnell AFB, Kan.; RAF Mildenhall, U.K.; Seymour-Johnson AFB, N.C.; Tinker AFB, Okla.; and ANG in Alabama, Alaska, Arizona, Hawaii, Illinois, Iowa, Kansas, Maine, Michigan, Mississippi, Nebraska, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Utah, Washington, Wisconsin. Planned: Eielson AFB, Alaska (Active duty).  
**Active Variants:**  
 •KC-135R. Re-engined KC-135A fitted with CFM turbofan engines.  
 •KC-135T. Reengined former KC-135Qs, able to carry different fuels in wing and fuselage tanks.  
**Dimensions:** Span 130.8 ft, length 136.3 ft, height 41.7 ft.  
**Weight:** Max T-O 322,500 lb.  
**Power Plant:** Four CFM International CFM56-2 (USAF designation F108) turbofans, each 21,634 lb thrust.  
**Performance:** Speed 530 mph at 30,000 ft, range 1,500 miles with 150,000 lb transfer fuel, up to 11,015 miles for ferry missions.  
**Ceiling:** 50,000 ft.  
**Fuel Capacity:** Max transfer load 200,000 lb at 1,100 gpm (boom), 450 gpm (MPRS pods).  
**Accommodation:** Two pilots, navigator, boom operator, AE crew: two flight nurses, three medical technicians (adjusted as needed).  
**Load:** 37 passengers, six cargo pallets, max 83,000 lb.

## AIRLIFT AIRCRAFT

### C-5 GALAXY

Strategic airlift

**Brief:** The C-5 is USAF's largest airlifter and one of the world's largest aircraft, capable of lifting unusually large/heavy cargo over intercontinental ranges. It is also able to take off and land in relatively short distances, and taxi on substandard surfaces if required. The Galaxy's front and rear cargo doors permit simultaneous drive-through loading/unloading. The aircraft's unique upper deck is split between the flight deck with galley and crew rest area forward of the wing and a troop compartment seating 75 passengers and a second gallery/lavatory aft of the wing. The C-5A first flew on June 30, 1968, and a total of 81 were delivered between 1969 and 1973 reaching IOC in September 1970. C-5As underwent major wing modifications to extend their service lives and all but one (converted to C-5M) are now retired. The C-5B first flew in 1985 and was delivered between 1986 and 1989. C-5Bs incorporated all C-5A improvements including strengthened wings, uprated turbofans, color weather radar, triple INS, and defensive systems (on some aircraft). Two C-5As were modified for outsize space cargo and redelivered as C-5Cs in 1989 and



W.C. Pope/USAF

1990. The combined Avionics Modernization Program (AMP) and Reliability Enhancement and Re-engining Program (RERP) resulted in the C-5M Super Galaxy. Upgraded aircraft incorporate new engines with 20 percent increase in thrust, as well as avionics, structural, and reliability fixes. A total of 49 B models, two C models, and a single C-5A were converted. Ongoing mods include CNS/ATM upgrades, new mission computers and off-the-shelf color weather radar, Large Aircraft IR Countermeasures (LAIRCM) improvements, and a lavatory redesign to address corrosion. USAF is also replacing key, nose landing gear components and is limiting "kneeling" to reduce wear following a spate of malfunctions.

**Contractors:** Lockheed Martin; Collins Aerospace and Honeywell (CNS/ATM, weather radar/mission computer).

**First Flight:** June 6, 2006 (C-5M).

**Delivered:** Feb. 9, 2009-Aug. 2, 2018 (C-5M).

**IOC:** Feb. 21, 2014 (C-5M).

**Production:** 131 (52 converted to C-5M).

**Inventory:** 50 (C-5M); two (C-5M-SCM).

**Operator:** AMC, AFRC.

**Aircraft Location:** Dover AFB, Del.; JBSA-Lackland, Texas; Travis AFB, Calif.; Westover ARB, Mass.

**Active Variants:**

- C-5M. Super Galaxy converted from C-5A/B, incorporating AMP and RERP.
- C-5M-SCM. Super Galaxy converted from C-5C to carry large NASA/ space cargo.

**Dimensions:** Span 222.8 ft, length 247.8 ft, height 65.1 ft.

**Weight:** Max T-O 840,000 lb.

**Power Plant:** Four GE Aviation F138-GE-100 (CF6-80C2) turbofans, each 50,580 lb thrust.

**Performance:** Speed 518 mph, range 5,524 miles with 120,000 lb of cargo.

**Ceiling:** 45,000 ft.

**Accommodation:** Two pilots, two flight engineers, three loadmasters.

**Load:** 81 troops and 36 standard pallets, max 285,000 lb; incl seven MRAP vehicles, six AH-64 Apache helicopters, four M2 Bradley fighting vehicles, or two M1 Abrams main battle tanks.

**Operator:** AFMC, PACAF.

**Aircraft Location:** Edwards AFB, Calif.; Holloman AFB, N.M. (J); JB Elmendorf- Richardson, Alaska; Yokota AB, Japan (J); various U.S. embassies.

**Active Variants:**

•C-12C. C-12As retrofit with PT6A-41 engines.

•C-12D. C-12 with an enlarged cargo door and strengthened wings.

•C-12F. C-12 with uprated PT6A-42 engines, eight-passenger seating, and AE capability.

•C-12J. Military version of the Beechcraft Model 1900C commuter airliner.

**Dimensions:** Span 54.5 ft, length 43.8 ft, height 15 ft (C/D/F); span 54.5 ft, length 57 ft, height 15 ft (J).

**Weight:** Max T-O 15,000 lb (F); 16,710 lb (J).

**Power Plant:** Pratt & Whitney Canada PT6A-41 (C/D) or PT6A-42 (F) turboprops, each 850 shp; PT6A-65B turboprops, each 1,173 shp (J).

**Performance:** Speed 300 mph (C/D) 336 mph (F) range 2,271 miles; 284 mph, range 1,669 miles (J).

**Ceiling:** 31,000 ft (C/D); 35,000 ft (F); 25,000 ft (J).

**Accommodation:** Two pilots.

**Load:** eight passengers (C/D/F), 19 passengers or 3,500 lb cargo (C-12J).



Tech. Sgt. Paul Duquette

## C-17 GLOBEMASTER III

Tactical/strategic airlift

**Brief:** C-17 is a heavy-lift, strategic transport capable of direct tactical delivery of all classes of military cargo. It is the U.S. military's core airlift asset, capable of operating on small, austere airfields (3,500 ft by 90 ft) previously limited to C-130s. It is the only aircraft able to directly deliver or airdrop outsize cargo into a tactical environment and it is the first military transport to feature fully digital, fly-by-wire control. Boeing delivered the 223rd and final USAF aircraft on Sept. 12, 2013, and the final international aircraft on Nov. 29, 2015. Block 16 avionics and weather radar mods were completed in 2015. Block 20 upgrades included some 60 programs to bring early production aircraft to a common configuration, and Block 21 including Mode 5 IFF and airspace compliance were completed fleetwide in 2020. FY22 continues fleetwide HUD replacement through FY28, and funds enhanced high-bandwidth BLOS voice/data SATCOMS. Ongoing upgrades also include next-generation Large Aircraft Infrared Countermeasures (LAIRCM) to combat man-portable air defenses, as well as safety and sustainment mods. A roll-on/roll-off C2 capsule to replace the "Silver Bullet" for in-flight conferencing is currently finishing development and testing. The C-17 fleet was heavily tasked evacuating U.S. and allied personnel from Afghanistan during Operation Allies Refuge in August 2021, including carrying a record-breaking 823 passengers on a single flight on Aug. 15, 2021.

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

**First Flight:** Sept. 15, 1991.

**Delivered:** June 1993-September 2013.

**IOC:** Jan. 17, 1995.

**Production:** 257.

**Inventory:** 222.

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

**Aircraft Location:** Altus AFB, Okla.; Dover AFB, Del.; JB Charleston, S.C.; JB Elmendorf-Richardson, Alaska; JB Lewis-McChord, Wash.; JB McGuire-Dix- Lakehurst, N.J.; JB Pearl Harbor-Hickam, Hawaii; March ARB, Calif.; Pittsburgh Arpt., Pa.; Travis AFB, Calif.; Wright-Patterson AFB, Ohio; and ANG in Hawaii (associate), Mississippi, North Carolina, West Virginia, and New York.

**Active Variant:**

•C-17A. Long-range tactical/strategic airlifter.

**Dimensions:** Span 169.8 ft, length 174 ft, height 55.1 ft.

**Weight:** Max T-O 585,000 lb.

**Power Plant:** Four Pratt & Whitney F117-PW-100 turbofans, each 40,440 lb thrust.



Lance Cpl. Krysten Houk/USMC

## C-12 HURON

Light airlift

**Brief:** C-12 is tasked with multimission passenger and priority light-cargo airlift, medevac, as well as diplomatic and flight-test support. The family of aircraft includes military versions of the Beechcraft King Air and 1900C (C-12J). Flight decks and cabins are pressurized for high-altitude flight. The C-12D incorporates a cargo door with an integral airstair, high-flotation landing gear, structural improvements, and optional external wingtip tanks. Both C-12C and C-12D are deployed to U.S. embassies worldwide and incorporate earlier three-bladed propellers. The C-12F incorporated uprated engines, four-bladed propellers, and an increased service ceiling. The C-12J is a completely different aircraft based on the Beechcraft 1900C commuter airliner with a large, aft cargo door. C-12Js are operated by AFMC for testing and PACAF in support of U.S. Forces Japan with provision for two litters or 10 ambulatory patients in the AE role. C-12Js incorporate extensive avionics upgrades, including three MFDs, integrated GPS, flight management systems, autopilot, VHF/UHF radios, and weather radar.

**Contractor:** Beechcraft.

**First Flight:** Oct. 27, 1972 (Super King Air 200), March 1, 1990 (1900C).

**Delivered:** 1974-mid 1990s.

**IOC:** Circa 1974.

**Production:** 30 (C-12A/C); six (C-12D); 46 (C-12F); four (C-12J).

**Inventory:** 16 (C-12C); six (C-12D); three (C-12F); four (C-12J).

**Performance:** Speed 518 mph at 25,000 ft, range 2,760 miles with 169,000 lb payload (farther with air refueling).

**Ceiling:** 45,000 ft.

**Accommodation:** Two pilots, loadmaster; AE crew: Two flight nurses, three medical technicians (mission dependent).

**Load:** 102 troops/paratroopers; 36 litter and 54 ambulatory patients; 18 pallets up to max payload 170,900 lb.



1st Lt. Sam Eckholm

## C-21

Light airlift

**Brief:** The C-21 is a militarized Learjet 35 used for passenger and priority light-cargo airlift and aeromedical transport. It is equipped with color weather radar, TACAN, and HF/VHF/UHF radios. It provides medium-range operational support for time-sensitive movement of people and cargo throughout the U.S. and the European theater, including AE missions if required. Recent efforts include the C-21 Avionics Upgrade Program (AUP), which added a modern glass cockpit, digital weather radar, GPS, flight management system, satellite-updating real-time flight information, digital black boxes, and ADS-B/Mode 5 transponder. USAF added BLOS comms concurrently with AUP to save costs. The fleet was also retrofitted with enlarged aft-fuselage "delta fins" to improve low-speed stability and control, eliminating previous approach/landing flight restrictions. Bombardier ended Learjet production in 2021 but plans to continue supporting in-service aircraft.

**Contractor:** Bombardier (previously Gates Learjet).

**First Flight:** January 1973.

**Delivered:** April 1984–October 1985.

**IOC:** April 1984.

**Production:** 84.

**Inventory:** 19.

**Operator:** AMC, USAFE.

**Aircraft Location:** Ramstein AB, Germany; Scott AFB, Ill.

**Active Variant:**

•C-21A. Military version of the Learjet 35A.

**Dimensions:** Span 39.5 ft, length 48.6 ft, height 12.2 ft.

**Weight:** Max T-O 18,300 lb.

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

**Performance:** Speed 530 mph at 41,000 ft, range 2,306 miles.

**Ceiling:** 45,000 ft.

**Accommodation:** Two pilots; AE crew: Flight nurse, two medical technicians (mission dependent).

**Load:** eight passengers, 3,153 lb cargo; one litter or five ambulatory patients (AE role).

## C-32

VIP transport

**Brief:** The C-32A provides dedicated vice presidential and DV airlift while the C-32B is tasked with politically sensitive crisis-mobility. Both types were acquired as commercial Boeing 757s. Aircraft assigned to the 89th Airlift Wing at Andrews fly under the call sign "Air Force Two" during vice presidential missions, but additionally serve the First Lady, Congress, and Cabinet officials. The cabin is divided into sections, including a worldwide clear and secure voice and data communications suite, first-class cabin, two business-class cabins, center galley, lavatories, fully enclosed state-room, and a conference and staff area. The C-32B provides DOD discreet, rapid, global airlift in support of government crisis response efforts. The C-32's modern flight deck is designed to be easily upgraded. The C-32A fleet recently underwent a full cabin refurbishment to match the VC-25 as well as installation of fully reclining crew rest seats to enable long endurance missions without pre-positioned relief crews. FY22 launches Senior Leader Communication Modernization across the executive fleets including Wideband SATCOM, secure air-to-air/ground comms, commercial WiFi, in-flight information, and enhanced airborne executive phones. DOD completed analysis to replace the C-32, E-4B, and Navy E-6B Mercury



Tech. Sgt. Benjamin Mota

with a common airframe but opted to retain the fleet potentially through 2040, shifting funds to explore future supersonic transport technology.

**Contractor:** Boeing.

**First Flight:** Feb. 11, 1998 (C-32A).

**Delivered:** June–December 1998.

**IOC:** 1998.

**Production:** Six.

**Inventory:** Four (C-32A); two (C-32B).

**Operator:** AMC, ANG.

**Aircraft Location:** JB Andrews, Md. (A); JB McGuire-Dix-Lakehurst, N.J. (B).

**Active Variants:**

•C-32A. Presidential support-configured commercial Boeing 757-200 airliner.

•C-32B. Commercial Boeing 757-200 tasked with global crisis response airlift.

**Dimensions:** Span 124.6 ft, length 155.2 ft, height 44.5 ft.

**Weight:** Max T-O 255,000 lb.

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

**Performance:** Speed 530 mph, range 6,325 miles.

**Ceiling:** 42,000 ft.

**Accommodation:** Two pilots, up to 14 cabin and maintenance crew (varies with mission).

**Load:** Up to 45 passengers.



Airman 1st Class Emily Farnsworth

## C-37

VIP transport

**Brief:** The C-37 family provides worldwide special air mission and DV support, consisting of military versions of the ultra-long-range Gulfstream business aircraft. The C-37A is based on the Gulfstream V and is equipped with separate VIP and passenger areas, secure global voice and data communications suites, enhanced weather radar, autopilot, and advanced HUD. The C-37B, first delivered in 2004, is based on the G550 and adds directional IR countermeasures for self-defense and the advanced Honeywell Plane-View flight deck. Ongoing mods include commercial wideband SATCOM, to ensure senior leaders' access to secure data and voice networks, and FAA-required CNS/ATM updates. FY22 begins wideband SATCOM upgrades as part the Senior Leader Communication Modernization effort across USAF's executive fleets. A total of 15 aircraft will be modified to ensure redundant, survivable and secure/top-secret voice, data, and video conferencing for uninterrupted worldwide C2. Existing aircraft will receive modernized enroute air traffic SATCOMS which will be standard on future airframes. USAF aims to expand the fleet by as many as 40 additional aircraft to backfill the now-retired C-20, leading to delivery of a fourth and fifth C-37B in 2019 and 2020 respectively. The service awarded Gulfstream a \$127.4 million fleet expansion contract for another two aircraft, the first of which was delivered to Andrews Nov. 3, 2021.

**Contractor:** Gulfstream Aerospace.

**First Flight:** October 1998 (C-37A).  
**Delivered:** Oct. 14, 1998-present.  
**IOC:** Dec. 9, 1998.  
**Production:** 16 (planned).  
**Inventory:** Nine (C-37A); seven (C-37B).  
**Operator:** AMC, PACAF, USAF.  
**Aircraft Location:** JB Andrews, Md.; JB Pearl Harbor- Hickam, Hawaii; Ramstein AB, Germany.  
**Active Variants:**  
 •C-37A. Military version of the Gulfstream V.  
 •C-37B. Military version of the Gulfstream G550.  
**Dimensions:** Span 93.5 ft, length 96.4 ft, height 25.8 ft.  
**Weight:** Max T-O 90,500 lb. (A); 91,000 lb. (B).  
**Power Plant:** Two BMW/Rolls-Royce BR710A14-10 turbofans, each 14,750 lb thrust (A); two BMW/Rolls-Royce BR710C4-11 turbofans, each 15,385 lb thrust (B).  
**Performance:** Speed 600 mph (cruise 345 mph); range 6,300 miles (A), 6,700 miles (B).  
**Ceiling:** 51,000 ft.  
**Accommodation:** Two pilots, flight attendant, crew chief.  
**Load:** Up to 12 passengers (A); 14 passengers (B).



Maj. Stanley Paregien

## C-40 CLIPPER

VIP transport

**Brief:** The C-40 is a medium-range DV airlift aircraft based on the commercial Boeing 737-700. It is used to transport senior military commanders, Cabinet officials, and members of Congress, as well as performing other support missions. C-40Bs are equipped with an office-in-the-sky arrangement, including clear and secure voice/data communication and broadband data/video. C-40Cs lack the advanced communications suite, are VIP configured with sleep accommodations, and are reconfigurable to carry 42 to 111 passengers. Both versions have modern avionics, integrated GPS and flight-management system/electronic flight instrument system, and HUD. Each aircraft has auxiliary fuel tanks and managed passenger communications. Recent mods add fully reclining crew rest seats to enable long endurance missions without pre-positioned relief crews. FY22 launches Senior Leader Communication Modernization across the executive fleets including Wideband SATCOM, secure air-to-air/ground comms, commercial WiFi, in-flight information, and enhanced airborne executive phones. Updates will ensure redundant, survivable and secure/top-secret voice, data, and video conferencing for uninterrupted worldwide C2.

**Contractors:** Boeing, L3Harris (Wideband SATCOM).  
**First Flight:** April 14, 1999 (C-40A).  
**Delivered:** 2002-2007.  
**IOC:** Feb. 28, 2003.  
**Production:** 11.  
**Inventory:** Six (C-40B); seven (C-40C).  
**Operator:** AMC, ANG, AFRC.  
**Aircraft Location:** JB Andrews, Md.; Scott AFB, Ill.  
**Active Variants:**  
 •C-40B. VIP military-configured Boeing 737-700 with advanced comms.  
 •C-40C. Passenger-configured Boeing 737-700, lacking advanced comms.  
**Dimensions:** Span 117.4 ft, length 110.3 ft, height 41.2 ft.  
**Weight:** Max T-O 171,000 lb.  
**Power Plant:** Two GE Aviation CFM56-7 turbofans, each 27,000 lb thrust.  
**Performance:** Speed 530 mph, range 5,750 miles.  
**Ceiling:** 41,000 ft.  
**Accommodation:** Two pilots, up to eight cabin and maintenance crew (varies by model/mission). Load: Up to 89 passengers (B); up to 111 passengers (C).



Master Sgt. Joe Harwood/ANG

## C-130H HERCULES

Tactical airlift

**Brief:** The C-130H is an all-purpose theater transport that performs diverse roles, including tactical and inter-theater airlift and airdrop, AE, aerial spraying, aerial firefighting, and humanitarian support. The developmental YC-130A first flew in August 1954 with the C-130A entering USAF service in 1956. The H model improved on the later C-130E and was delivered starting in 1965, with delivery of the current, more advanced models starting in 1974. Improvements included updated engines, redesigned outer wing, improved pneumatic systems, new avionics, improved radar, and NVG lighting. USAF intends to partially recapitalize the C-130H fleet with the C-130J and modernize the remaining fleet with new avionics, safety, and performance improvements. Ongoing upgrades include critical center wing box replacement, electronic propeller controls/engine efficiency mods, NP2000 propellers, and the C-130H Avionics Modernization Program (previously Viability and Airspace Access Program). A total of 16 aircraft including Modular Airborne Fire Fighting Systems (MAFFS)-equipped airframes have been retrofit with NP2000 propellers to enhance performance and safety. USAF has 83 aircraft currently on-contract for NP2000 installs with the goal of eventually retrofitting the entire fleet. AMP increment 1 was completed fleetwide in April 2021, adding new CNS/ATM and bringing legacy C-130s into compliance with international airspace rules. Increment 2 will add terrain awareness and warning, new flight management, and modern glass cockpit displays starting in FY22. The service is also evaluating future replacement options for the C-130H's Station Keeping Equipment (SKE) used for tactical formation flight. The Kentucky ANG's 123rd AW officially transitioned to the C-130J, transferring its last C-130H to the Delaware ANG on Sept. 24, 2021. USAF plans to retire 13 C-130Hs in FY22, and Congress barred the service from cutting the total tactical airlift fleet below 279 aircraft.

**Contractors:** Lockheed Martin (airframe); L3Harris (AMP Increment 2); Collins Aerospace (NP2000).  
**First Flight:** 1965 (C-130H).  
**Delivered:** March 1965 onward (C-130H1); April 1975-96 (current C-130H2/H3).  
**IOC:** Circa 1974.  
**Production:** 1,202 (C-130H).  
**Inventory:** 141.  
**Operator:** ANG, AFRC.  
**Aircraft Location:** Dobbins ARB, Ga.; Little Rock AFB, Ark.; Maxwell AFB, Ala.; Minneapolis-St. Paul Arpt./ARS, Minn.; Peterson SFB, Colo. (MAFFS); Youngstown ARS, Ohio (Aerial Spray); and ANG in Arkansas, Connecticut, Delaware, Georgia, Illinois, Minnesota, Missouri, Montana, Nevada (MAFFS), Ohio, Texas, West Virginia, Wyoming (MAFFS).  
**Active Variant:**  
 •C-130H Hercules. Updated late-production version of the legacy C-130.  
**Dimensions:** Span 132.6 ft, length 97.8 ft, height 38.8 ft.  
**Weight:** Max T-O 155,000 lb; max payload 42,000 lb.  
**Power Plant:** Four Allison T56-A-15, or Rolls-Royce T56 3.5 turboprops, each 4,591 shp.  
**Performance:** Speed 366 mph; range with 35,000 lb payload 1,496 miles.  
**Ceiling:** With max payload, 23,000 ft.  
**Accommodation:** Two pilots, navigator, flight engineer, loadmaster.  
**Load:** Up to 92 combat troops or 64 paratroopers or 74 litters or six cargo pallets or 16 Container Delivery System (CDS) bundles or any combination of these up to max weight.

## C-130J SUPER HERCULES

Tactical airlift

**Brief:** The C-130J is the redesigned, current production version of the C-130 all-purpose theater transport. Missions include tactical and inter-theater airlift, airdrop, AE, wildfire suppression using the Modular Airborne Fire Fighting System (MAFFS), and humanitarian relief. The aircraft first deployed to combat in Southwest Asia in 2004. The Super Hercules



Senior Airman Laura Weaver

features three-crew flight operations, more powerful engines, composite six-blade propellers, and digital avionics and mission computers. The C-130J can fly faster, higher, and farther than the C-130H. The C-130J-30 variant features a 15-foot longer "stretched" fuselage. The combined fleet is sustained via block upgrades. USAF combined Block 7/8.1 upgrades to reduce modification downtime. Block 7 includes Link 16, new flight management systems, civil GPS, and a special mission processor. Ongoing Block 8.1 upgrades add improved LOS data link and BLOS comms, improved precision navigational aids, enhanced covert lighting, replaces UHF comms with SATCOMS, and updates mission planning systems. Block 8.1's Mode 5 IFF and air traffic management upgrades were successfully fielded ahead of cycle to meet FAA and global airspace requirements. Airframes delivered since 2009 incorporate enhanced service life center wings, and two of the 23 early production airframes programmed will be retrofitted in 2022. Major development focuses on modernized secure, jam-resistant HF/UHF/SATCOM voice and data as well as data links to keep pace with newer satellites and networking. USAF is procuring a total of 24 C-130J variants under a third multiyear contract option for a mix of HC/MC-130Js scheduled for delivery through 2025. ANG units in Texas, Kentucky, and West Virginia received their first C-130Js and beginning transition from the C-130H in 2021. Georgia is slated to receive J models as they become available and Congress added funds for an additional 20 C-130Js including 16 ANG and four AFRC aircraft in the FY22 defense budget.

**Contractor:** Lockheed Martin.

**First Flight:** April 5, 1996.

**Delivered:** February 1999-present.

**IOC:** October 2006.

**Production:** 2,600+ worldwide, 141 (USAF).

**Inventory:** 144.

**Operator:** AETC, AMC, PACAF, USAF, ANG, AFRC.

**Aircraft Location:** Dyess AFB, Texas; Keesler AFB, Miss.; Little Rock AFB, Ark.; Ramstein AB, Germany; Yokota AB, Japan; and ANG in California, Kentucky, Rhode Island, Texas, and West Virginia. Planned: ANG in Georgia.

**Active Variants:**

- C-130J Super Hercules. Current production version.
- C-130J-30 Super Hercules. Stretched version capable of accommodating larger loads.

**Dimensions:** Span 132.6 ft, length 97.8 ft, height 38.8 ft.; (J-30 length) 112.8 ft.

**Weight:** Max T-O 155,000 lb (J), 164,000 lb (J-30); max payload 42,000 lb (J), 44,000 lb (J-30).

**Power Plant:** Four Rolls-Royce AE2100D3 turboprops, each 4,700 shp.

**Performance:** Speed 417 mph (J), 410 mph (J-30); range with 35,000 lb payload 1,841 miles (J), 2,417 miles (J-30).

**Ceiling:** With max payload, 26,000 ft (J), 28,000 ft (J-30).

**Accommodation:** Two pilots, loadmaster.

**Load:** Up to 92 combat troops or 64 paratroopers or 74 litters or six cargo pallets or 16 Container Delivery System (CDS) bundles or any combination of these up to max weight (J); 128 combat troops or 92 paratroopers or 97 litters or eight pallets or 24 CDS bundles or any combination of these up to max weight (J-30).

## LC-130H SKIBIRD

Arctic support/tactical airlift

**Brief:** The LC-130H is a ski-equipped, Arctic-support derivative of the C-130H. It is capable of direct resupply of Antarctic research stations and high-arctic radar sites utilizing ice and snowpack runways. The LC-130H fleet supports the National Science Foundation's (NSF) Antarctic research, ferrying much of the material, provisions, and personnel between Christchurch, New Zealand, and McMurdo Station, Antarctica. The aircraft also provide ongoing support to the remote Amundsen-Scott South Pole Station. USAF began augmenting the Navy's "Operation Deep Freeze" with the C-124 in 1956. C-130s began Antarctic support in 1959, operating without skis until the initial ski-borne deployment of the C-130D in January 1960. By 1975, the New York ANG's 109th AW operated USAF's only ski-equipped LC-130 supporting Distant Early Warning sites



Mej. David Price/ANG

in the high-Arctic. The unit began augmenting Navy LC-130s during Deep Freeze in 1988, before taking over primary responsibility in 1999. Three aircraft were converted from ex-Navy LC-130Rs, and the NSF funded an additional three new-build aircraft in 1995-96. LC-130s have been upgraded with eight-bladed NP-2000 propellers to increase take-off performance, digital cockpit displays and flight management systems, multifunction radar, modernized comms, and a single air data computer. LC-130s are upgraded along with the baseline C-130H fleet, including center wing box replacement, Mode 5 IFF, as well as the C-130H Avionics Modernization Program which enters Increment 2 in FY22. Ice Pod experiments utilizing an aft, externally mounted sensor suite to record ice composition and density began in 2015. The pod includes radar, laser, and optical sensors. Required upgrades include NVG-compatible flight deck, secure BLOS data link, and increased reliability commercial SATCOM. The fleet also currently lacks self-defensive/missile warning capability, and engine upgrades to maximize performance in conjunction with the eight-bladed propellers. Strict pandemic quarantine requirements greatly curtailed Antarctic support in FY21 but LC-130s flew an extended season in Greenland airlifting a combined 2 million pounds of cargo, 32,000 gallons of fuel, and 1,058 personnel in support of NSF research. Congress is pressing USAF to recapitalize the LC-130 (likely with C-130J) in line with its other special-mission C-130 fleets.

**Contractor:** Lockheed Martin.

**First Flight:** 1957 (ski-equipped C-130D).

**Delivered:** 1974-96.

**IOC:** Circa October 1984.

**Production:** 10.

**Inventory:** 10.

**Operator:** ANG.

**Aircraft Location:** Stratton ANGB, N.Y.

**Active Variants:**

- LC-130H Skibird. Arctic support variant with wheel-ski gear and eight-bladed propellers.

**Dimensions:** Span 132.6 ft, length 97.8 ft, height 38.8 ft.; Nose Ski 10 ft by six ft wide, main gear skis 12 ft by six ft wide.

**Weight:** Max T-O 155,000 lb; max payload 45,000 lb.

**Power Plant:** Four Rolls-Royce T56 3.5 turboprops, each 4,591 shp.

**Performance:** Speed 366 mph; range with 35,000 lb payload 1,636 miles (with engine upgrades).

**Ceiling:** With max payload, 23,000 ft.

**Accommodation:** Two pilots, navigator, flight engineer, loadmaster.

**Load:** Up to 92 passengers or 74 litters; six cargo pallets, 16 Container Delivery System (CDS) bundles, or any combination up to max weight.



Adam Schultz/White House

## VC-25 AIR FORCE ONE

Presidential airlift

**Brief:** The VC-25 is a specially configured Boeing 747-200B equipped for airlifting the President and his entourage. VC-25s operate under the call sign "Air Force One" when the President is aboard, and SAM (Special Air Mission) during non-presidential flights. Aircraft are equipped with staff work areas, a conference room, a general seating area, and an executive office. Communications capability includes worldwide secure and clear



communications and a full suite of strategic C2 comm/data links. The aircraft also has a full self-defensive suite. The fleet is operated by the Presidential Airlift Group of the 89th Airlift Wing at JB Andrews. Congress directed retirement of the VC-25A by the end of 2025 and FY20 funded the fleet's final block upgrade, which included protected satcom, weather radar, digital voice/data comms, and networking. The modifications are aimed at keeping the fleet viable until replaced by the VC-25B (based on Boeing's modernized 747-8 Intercontinental). FY22 funds wideband SATCOM upgrades as part of AMC's Senior Leader Communication Modernization effort across the executive fleets. USAF issued Boeing a \$3.9 billion presidential aircraft replacement contract to modify two undelivered commercial 747-8s to VC-25B standards on Feb. 20, 2018. Work underway to modify the airframes though the anticipated delivery date has slipped a year to 2025 due to manufacturing delays. Specifications exclude aerial refueling capability to reduce program cost.

**Contractor:** Boeing.  
**First Flight:** Sept. 6, 1990 (VC-25A).  
**Delivered:** August-December 1990.  
**IOC:** Dec. 8, 1990; planned 2025 (VC-25B).  
**Production:** Two VC-25A; two VC-25B (undergoing modification).  
**Inventory:** Two (VC-25A); two (VC-25B).  
**Operator:** AMC.

**Aircraft Location:** JB Andrews, Md.

**Active Variants:**

•VC-25A. Specially configured presidential support version of the Boeing 747-200B.

•VC-25B. Next-generation presidential aircraft based on the Boeing 747-8 Intercontinental.

**Dimensions:** Span 195.8 ft, length 231.8 ft, height 63.4 ft (A); span 224.5 ft, length 250.2 ft, height 63.4 ft (B).

**Weight:** Max T-O 833,000 lb (A); max T-O 987,000 lb (B).

**Power Plant:** Four GE Aviation CF6-80C2B1 turbofans, each 56,700 lb thrust (A); four GE Aviation GEnx-2B turbofans, each 66,500 lb thrust (B).

**Performance:** Speed 630 mph, range 7,800 miles (farther with air refueling) (A); speed 660 mph, range 8,900 miles (B).

**Ceiling:** 45,100 ft.

**Accommodation:** Two pilots, navigator, flight engineer, up to 22 cabin and maintenance crew; Load: Up to 102 passengers (A); TBD (B).

## HELICOPTERS



Senior Airman Hayden Legg

### HH-60 PAVE HAWK

Personnel recovery/medium lift

**Brief:** The HH-60G Pave Hawk is an armed, all-weather day/night CSAR helicopter derived from the UH-60 Blackhawk. Additional missions include casualty/medical evacuation, disaster and humanitarian response, firefighting, and combat/utility support. The HH-60G is equipped with advanced INS/GPS/Doppler navigation systems, SATCOM, and secure/anti-jam communications, and personnel locating system (PLS) that aids location of a survivor's radio. It includes automatic flight control, NVG lighting, FLIR, an engine/rotor blade anti-ice system, in-flight refueling probe, additional fuel tanks, and an integral rescue hoist. Combat enhancements include a full, self-defensive suite and two miniguns (or .50-caliber guns). Major upgrades include Block 162 which encompasses Avionics Communications Suite Upgrade and replaces obsolete systems with color weather radar, improved TACAN, new RWR, auto direction finding, and digital intercoms. HH-60U are modified UH-60Ms operated by AFMC for testing and support. USAF initially pursued new-build UH-60Ms as loss replacements for the HH-60G before opting to modify Army surplus UH-60Ls instead. Delivery of the last of 21 UH-60L combat-loss replacements was expected in FY22. Ongoing mods include color cockpit displays, Mode 5 IFF, loss-replacement mission systems, and defensive system upgrades. Congress restored FY22 funds for canceled Degraded Visual Environment (DVE)/Terrain Awareness and Warning System (TAWS). USAF retired the first 34 airframes last year and intends to completely recapitalize the fleet with

the HH-60W by FY26. Moody retired its final HH-60G on Sept. 29, 2021.

**Contractor:** Lockheed Martin Sikorsky.

**First Flight:** October 1974.

**Delivered:** 1982-1998 (HH-60G).

**IOC:** 1982.

**Production:** 112 (HH-60G); three (HH-60U).

**Inventory:** 82 (HH-60G); three (HH-60U).

**Operator:** ACC, AETC, AFMC (HH-60U), PACAF, USAFE, ANG, AFRC.

**Aircraft Location:** Aviano AB, Italy; Davis-Monthan AFB, Ariz.; Eglin AFB, Fla.; Francis S. Gabreski Arpt., N.Y.; JB Elmendorf-Richardson, Alaska; Kadena AB, Japan; Kirtland AFB, N.M.; Moffett Field, Calif.; Nellis AFB, Nev.; Patrick SFB, Fla.

**Active Variants:**

•HH-60G. Modified UH-60 helicopter equipped for CSAR.

•HH-60U. Modified UH-60M helicopters utilized by AFMC for utility and test support.

**Dimensions:** Rotor diameter 53.6 ft, overall length 64.7 ft, height 16.7 ft.

**Weight:** Max T-O 22,000 lb.

**Power Plant:** Two GE Aviation T700-GE-700/701C turboshafts, each 1,560-1,940 shp.

**Performance:** Speed 184 mph; range 580 miles (farther with air refueling).

**Ceiling:** 14,000 ft.

**Armament:** Two 7.62 mm miniguns or two .50-caliber machine guns.

**Accommodation:** Two pilots, flight engineer, gunner.

**Load:** Up to three PJs and four non-ambulatory patients.



Airman 1st Class Karissa Dick

### HH-60 JOLLY GREEN II

Personnel recovery/medium lift

**Brief:** The HH-60W is an armed, all-weather day/night CSAR helicopter fielded to replace the HH-60G. The type is derived from the UH-60M Black Hawk and dubbed "Jolly Green II" in honor of the Vietnam-era HH-3 and HH-53. Additional missions include casualty/medical evacuation, disaster and humanitarian response, firefighting, and combat/utility support. The HH-60W features a fully digital glass cockpit, improved hot weather/high-altitude performance, onboard self-defenses capable of defeating higher-end threats, an enlarged cabin, and double the internal fuel capacity of the HH-60G. Features include digital RWR, laser/missile/hostile fire warning, integrated chaff/flares, cabin and cockpit armor, externally mounted 7.62 mm and .50 cal weapons, LINK 16, SADL, integrated cockpit/cabin displays, advanced comms, ADSB, tactical moving map displays, upturned IR-masking exhausts, and efficient wide-chord rotor blades. USAF awarded Sikorsky Aircraft the \$1.28 billion Combat Rescue Helicopter contract to replace the HH-60G on June 26, 2014. USAF revised its accelerated procurement plans and now aims to procure a total of 105 HH-60Ws over six lots (decreased from a planned 113 aircraft). A total of 55 LRIP helicopters will now be procured in four lots from FY19-FY22, with the final two lots procured through 2024—two years earlier than originally planned. FY22 funds procure 14 aircraft, bringing the total order to 65 aircraft with a full-rate production decision expected by 2023. Nine HH-60Ws support developmental testing at Eglin/Duke, and a tenth airframe was added for upgrade testing. Planned improvements include adding Distributed Aperture Infrared Counter Measure (DAIRCM), jam-resistant GPS, Degraded Visual Environment (DVE) system, Video Data Link (VDL), improved Blue Force Tracker, integrated system diagnostics, wideband-UHF and narrowband satcoms, and airspace compliance updates. HH-60Ws completed developmental testing at Eglin on April 13, 2021, paving the way of operational testing at Nellis in 2022. USAF accepted the first production aircraft from Sikorsky on May 18, 2021. Moody received its first two aircraft Nov. 5, 2020, followed by Kirtland Dec. 17, 2020. Both bases are receiving four initial aircraft for maintenance training and initial operational employment.

**Contractor:** Lockheed Martin Sikorsky.

**First Flight:** May 17, 2019.

**Delivered:** 2019-present.

**IOC:** 2022 (planned).  
**Production:** 105 (planned).  
**Inventory:** 13 (HH-60W).

**Operator:** ACC, AETC, AFMC. Planned: PACAF, USAFE, ANG, AFRC.  
**Aircraft Location:** Duke Field, Fla.; Kirtland AFB, N.M.; Moody AFB, Ga. Planned: Aviano AB, Italy; Davis-Monthan AFB, Ariz.; Francis S. Gabreski Arpt., N.Y.; JB Elmendorf-Richardson, Alaska; Kadena AB, Japan; Moffett Field, Calif.; Nellis AFB, Nev.; Patrick SFB, Fla.

**Active Variants:**

•HH-60W. Developmental next-generation Combat Rescue Helicopter based on the UH-60M.

**Dimensions:** Rotor diameter 53.6 ft, overall length 64.7 ft, height 16.7 ft.

**Weight:** Max T-O 22,500 lb.

**Power Plant:** Two GE Aviation T700-GE-701D turboshafts, each 1,857 shp.

**Performance:** Speed 176 mph; range 690 miles (air refuelable).

**Ceiling:** 20,000 ft.

**Armament:** Two 7.62 mm miniguns or two .50-caliber machine guns.

**Accommodation:** Crew: two pilots, flight engineer, gunner.

**Load:** TBD.



Airman 1st Class Bridgitte Taylor

## MH-139 GREY WOLF

Missile field security/light lift

**Brief:** The MH-139 is based on the Leonardo AW139 and is modified with mission-specific equipment, systems, and armament by prime contractor Boeing. Features include an open-architecture glass cockpit, weather radar, enhanced ground proximity warning, radar altimeter, engine IR signature reduction, and military UHF/satcoms. The helicopter also features defensive systems such as chaff/flares and missile warning, cockpit and cabin ballistic protection, and crashworthy, self-sealing fuel tanks. AFGSC aircraft will be optionally armed with cabin-mounted 7.62 mm M240 machine guns. USAF awarded Boeing the \$2.4 billion UH-1N replacement contract on Sept. 24, 2018, following cancellation of the earlier Common Vertical Lift Support Program (CVLSP). Requirements were driven by the MH-139's primary ICBM-field security and support role, but it will eventually replace UH-1Ns in the DV lift and aircrew survival training roles as well. The service plans to procure up to 84 MH-139s through FY27, basing 30 at Andrews, 11 each at F. E. Warren, Maxwell (schoolhouse), Malmstrom, Minot, and four each at Fairchild and Yokota, retaining two for integration work at Eglin. Since the commercial AW139 is a mature system, developmental testing will be streamlined and tests will focus largely on ability to meet mission requirements. A total of six engineering development airframes have been delivered to support contractor-led developmental flight and ground testing. Test flights at Duke Field starting in February 2020 uncovered performance-limiting deficiencies in crosswinds, degraded visual conditions, and austere operating conditions which have delayed FAA certification. USAF planned to procure eight aircraft per year starting in FY21 but requested no funding in FY22 pending type certification. The program pushed a planned full-rate production decision from September 2021 to at least January 2023, delaying ramp-up to delivery of the planned 15 aircraft per year. Malmstrom will be the helicopter's first operational location.

**Contractors:** Boeing (prime contractor); Leonardo (formerly Agusta-Westland) (airframe); Honeywell (avionics).

**First Flight:** 2019.

**Delivered:** Dec. 19, 2019-present.

**IOC:** 2023 (planned).

**Production:** 84 (planned).

**Inventory:** Six (contractor operated test assets).

**Operator:** AFMC. Planned: AETC, Air Force District of Washington, AFGSC.  
**Aircraft Location:** Duke Field, Fla. Planned: Fairchild AFB, Wash.; F. E. Warren AFB, Wyo.; JB Andrews, Md.; Malmstrom AFB, Mont.; Maxwell AFB, Ala.; Minot AFB, N.D.

**Active Variants:**

•MH-139A. Military version of the Agusta-Westland AW139 for utility support and light lift.

**Dimensions:** Rotor diameter 45.2 ft, length 54.7 ft, height 16.3 ft.

**Weight:** Max gross 14,110 lb.

**Power Plant:** Two Pratt & Whitney PT6C-67C turboshaft, each 1,100 shp.

**Performance:** Speed 167 mph, range 890 miles.

**Ceiling:** 20,000 ft.

**Armament:** Two M240 7.62 mm machine guns (mission dependent).

**Accommodation:** Two pilots, flight engineer.

**Load:** 15 passengers (depending on fuel, equipment, and atmospheric conditions) or up to four litters and five medical personnel.



Airman Allison Martin

## UH-1 HUEY/IROQUOIS

Light lift/training

**Brief:** The UH-1N aircraft initially provided search and rescue capabilities before replacing earlier Huey variants in the ICBM field security and support role. UH-1Ns also provide administrative/DV lift to U.S. National Capital Region at JB Andrews and U.S. Forces-Japan at Yokota, as well as supporting aircrew survival training at Fairchild. The TH-1H fleet provides Air Force helicopter pilot training at Fort Rucker. USAF converted all single-engine UH-1H models to TH-1H variants, extending their service lives' by at least 20 years. USAF awarded Boeing the \$2.4 billion UH-1N replacement contract for up to 84 MH-139s in 2018, but contract delays pushed initial fielding to 2023 or beyond. The fleet recently received NVG-compatible cockpits, upgraded sensors, and safety and sustainment improvements. The ongoing SLEP of up to 63 airframes aims to bridge the gap until the MH-139A is fielded. USAF plans to begin retiring the fleet in 2022 with full retirement by 2032. The UH-1N is the only DOD aircraft fleet to consistently achieve its target mission capable rate over the past decade.

**Contractors:** Bell Helicopter; Lockheed Martin (TH-1H prime).

**First Flight:** April 1969 (UH-1N).

**Delivered:** September 1970-1974; November 2005-2013 (TH-1H).

**IOC:** October 1970 (UH-1N); circa 2009 (TH-1H).

**Production:** 28 (TH-1H); 79 (USAF UH-1Ns).

**Inventory:** 28 (TH-1H); 63 (UH-1N).

**Operator:** AETC, Air Force District of Washington, AFGSC, AFMC, PACAF.

**Aircraft Location:** Eglin AFB, Fla.; Fairchild AFB, Wash.; F. E. Warren AFB, Wyo.; Fort Rucker, Ala.; JB Andrews, Md.; Kirtland AFB, N.M.; Malmstrom AFB, Mont.; Minot AFB, N.D.; Yokota AB, Japan.

**Active Variants:**

•TH-1H. Modified twin-engine version of UH-1H used for flight training.

•UH-1N. Military version of the Bell 212 used for utility support and light lift.

**Dimensions:** Rotor diameter 48 ft, length 57 ft, height 13 ft. (TH-1H); rotor diameter 48 ft, length 57.1 ft, height 12.8 ft. (UH-1N).

**Weight:** Max gross 10,500 lb.

**Power Plant:** One Honeywell T53-L-703 turboshaft, 1,800 shp (TH-1H); two Pratt & Whitney Canada T400-CP-400 turboshafts, 1,290 shp (UH-1N).

**Performance:** Speed 149 mph, range 300+ miles (UH-1N).

**Ceiling:** 15,000 ft (10,000 ft with 10,000+ lb).

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

**Accommodation:** Two pilots, flight engineer.

**Load:** Six to 13 passengers (depending on fuel, equipment, and atmospheric conditions) or up to six litters or, without seats, bulky, oversize cargo (UH-1N).

## TRAINER AIRCRAFT



Senior Airman Davis Donaldson

### T-1 JAYHAWK

Advanced trainer

**Brief:** The T-1A is a military version of the Beechcraft 400A business jet used in the advanced phase of JSUPT for tanker/transport pilot and CSO training pipelines. The cockpit seats an instructor and two students. Mods include UHF/VHF radios, INS, TACAN, airborne direction finder, increased bird-strike resistance, and an additional fuselage fuel tank. CSO training aircraft also incorporate GPS-driven SAR and simulated RWR, as well as a second student and instructor station. Upgrade efforts are focused on avionics modernization and include new MFD and terrain collision avoidance systems. USAF awarded a \$156 million Avionics Modernization Program (AMP) contract to replace the type's obsolescent flight deck with a commercial glass cockpit in 2018, and the first modified aircraft flew in March 2019. A total of 55 aircraft (including all CSO-training aircraft) were upgraded through October 2021. USAF announced plans to divest the majority of the fleet starting in FY23 citing cost-prohibitive obsolescence issues. The service plans to retain only the 21 CSO-configured trainers at Pensacola.

**Contractors:** Beechcraft (airframe); Field Aerospace/Collins Aerospace (AMP).

**Operator:** AETC.

**First Flight:** July 5, 1991.

**Delivered:** Jan. 17, 1992-July 1997.

**IOC:** January 1993.

**Production:** 180.

**Inventory:** 177.

**Aircraft Location:** Columbus AFB, Miss.; Laughlin AFB and JBSA-Randolph, Texas; Vance AFB, Okla.; NAS Pensacola, Fla.

**Active Variant:**

•T-1A. Military trainer version of Beechcraft 400A.

**Dimensions:** Span 43.5 ft, length 48.4 ft, height 13.9 ft.

**Weight:** Max T-O 16,100 lb.

**Power Plant:** Two Pratt & Whitney Canada JT15D-5B turbopfans, each 2,900 lb thrust.

**Performance:** Speed 538 mph, range 2,555 miles.

**Ceiling:** 41,000 ft.

**Accommodation:** Three pilots (two students side-by-side, instructor in jump-seat); one pilot, one CSO trainee side-by side, instructor in jump-seat, one radar/system student and one instructor at aft-consoles (CSO-training configured aircraft).



Senior Airman David Phaff

### T-6 TEXAN II

Primary trainer

**Brief:** The T-6 is a joint Air Force/Navy undergraduate pilot trainer developed under the Joint Primary Aircraft Training System program. The aircraft is based on the Swiss Pilatus PC-9 and the Navy version is designated T-6B. Mods include a strengthened fuselage, zero/zero

ejection seats, upgraded engine, increased fuel capacity, pressurized cockpit, bird-resistant canopy, and digital avionics with sunlight-readable LCDs. The tandem student and instructor positions are interchangeable, including single-pilot operation from either seat. The T-6 is fully aerobatic and features an anti-G system. USAF production was completed in 2010, with an expected service life of 21 years. Ongoing mods include a crash-survivable flight data recorder, updated training aids and Next-Generation Onboard Oxygen Generation System (OBOGS) to combat the hypoxia-like incidents. Improved maintenance and inspections will mitigate hypoxia risks until fleetwide retrofit is complete. Future development includes controlled flight into terrain avoidance.

**Contractor:** Beechcraft/Textron Aviation Defense (formerly Raytheon).

**First Flight:** July 15, 1998.

**Delivered:** May 2000-May 2010.

**IOC:** May 2000.

**Production:** 452 (USAF); 328 (USN).

**Inventory:** 442 (USAF).

**Operator:** AETC, USN.

**Aircraft Location:** USAF: Columbus AFB, Miss.; Laughlin AFB, JBSA-Randolph, and Sheppard AFB, Texas; Vance AFB, Okla.; NAS Pensacola, Fla.

**Active Variants:**

•T-6A. Joint service primary training aircraft, based on the Pilatus PC-9.

**Dimensions:** Span 33.5 ft, length 33.4 ft, height 10.7 ft.

**Weight:** Max T-O 8,300 lb (T-6).

**Power Plant:** One Pratt & Whitney Canada PT6A-68 turboprop, 1,100 shp.

**Performance:** Speed 320 mph, range 1,035 miles.

**Ceiling:** 31,000 ft.

**Accommodation:** Two pilots on Martin Baker MK16LA zero/zero ejection seats.



Boeing

### T-7A RED HAWK

Advanced trainer

**Brief:** The T-7A Red Hawk is the Air Force's developmental next-generation, supersonic advanced jet trainer. The service selected the joint-venture Boeing-SAAB aircraft as the winner of the \$9.2 billion "T-X" competition to replace the T-38 on Sept. 20, 2018. The Air Force dubbed the type "Red Hawk" in honor of the WWII Tuskegee Airmen. The T-7A was rapidly developed in less than three years using digital design techniques earning USAF's initial "e" prefix designating it part of the "Digital Century Series" to quickly field new, low-cost designs. eT-7A was designed from the outset to replicate the systems and performance of advanced fourth and fifth-generation aircraft including high-G/high angle of attack performance and a blend of synthetic and onboard systems including simulated radar, defensive systems, data links, and smart weapons. It incorporates fly-by-wire controls, a fully digital glass cockpit, "stadium seating" to improve backseat visibility, next-gen ACES 5 ejection seats, modular systems architecture, and maintainer-friendly design to cut downtime and lifecycle cost. T-7A is being developed in tandem with the Ground-Based Training System simulator and courseware to provide AETC with a seamless, comprehensive flight training program. The first of two "production ready" airframes first flew from Boeing's facility at Saint Louis on Dec. 21, 2016. The first two aircraft launched initial flight testing and five additional airframes will support Engineering and Manufacturing Development testing at Edwards beginning flight-envelope expansion. USAF reduced funding in FY22 due to supply chain delays and additional testing required to assess instability at high angles of attack discovered in early trials. USAF plans to procure an initial 351 aircraft, delivering the

first production T-7A to Randolph in 2023.

**Contractors:** Boeing-SAAB, General Electric (engine); Collins Aerospace (cockpit/ejection seats).

**First Flight:** Dec. 20, 2016 (T-X).

**Delivered:** 2023 onward (planned).

**IOC:** 2024 (planned).

**Production:** 351 (planned).

**Inventory:** Three (contractor-owned test airframes).

**Operator:** Boeing, AFMC; Planned: AETC.

**Aircraft Location:** Edwards AFB, Calif. Planned: Columbus AFB, Miss.; Laughlin AFB, JBSA-Randolph, and Sheppard AFB, Texas; Vance AFB, Okla.

**Active Variants:**

•eT-7A. Developmental next-generation advanced trainer.

**Dimensions:** Span 30.6 ft, length 46.9 ft, height 13.5 ft.

**Weight:** Max T-O 12,125 lb.

**Power Plant:** General Electric F404-GE-103 augmented turbofan, 17,200 lb thrust.

**Performance:** Speed Mach 1+, range approx. 1,140 miles.

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

**Accommodation:** Two pilots on ACES 5 zero/zero ejection seats.



Senior Airman Cameron Schultz

## T-38 TALON

Advanced trainer

**Brief:** The T-38 was the first supersonic trainer aircraft and primarily serves AETC's advanced JSUPT fighter/bomber tracks and Introduction to Fighter Fundamentals. The aircraft is used to teach supersonic techniques, aerobatics, formation, night and instrument flying, and cross-country/low-level navigation. The T-38 is also used by the USAF Test Pilot School to train test pilots and flight-test engineers and by ACC and AFGSC as a companion trainer to maintain pilot proficiency. ACC uses regenerated T-38s as dedicated Aggressor aircraft for F-22 training and companion trainers for the B-2 and U-2 programs. T-38Bs are equipped with a gun-sight and centerline station for mounting external stores including ECM pod/practice bomb dispensers. Aircraft were redesignated T-38Cs after avionics modernization that added a glass cockpit and HUD, color MFDs, mission computer, integrated INS/GPS, and reshaped engine inlets. T-38s were designed for 7,000 flying hours but many have surpassed 20,000 hours, requiring life-extension to bridge the gap to replacement by the T-7A. Pacer Classic III is the type's third structural renewal effort and the most intensive in its history. It replaces major longerons, bulkheads/formers, intakes, internal skins, and structural floors on 180 high-risk T-38Cs. The first airframe was redelivered in 2015 and a total of 20 aircraft will complete upgrades in FY22. An additional 159 T-38s will receive selected structural improvements to address longeron and wing root fatigue due to extended use. Other key efforts also include new forward canopy to improve bird-strike survivability, digital avionics, and airspace compliance. Four T-38s were involved in significant mishaps in 2021 including a gear-up landing at Sacramento-Mather Airport, and fatal crashes at Dannelly Field on Feb. 19, 2021 and Laughlin on Nov. 9, 2021.

**Contractors:** Northrop Grumman; Boeing (sustainment); CPI Aerostructures (Pacer Classic III kits).

**First Flight:** April 1959 (T-38A); July 8, 1998 (T-38C).

**Delivered:** 1961-72 (T-38A); 2002-07 (T-38C).

**IOC:** March 1961.

**Production:** 1,187.

**Inventory:** 53 (T-38A); six (AT-38B); 439 (T-38C).

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

**Aircraft Location:** Beale AFB and Edwards AFB, Calif.; Columbus AFB,

Miss.; Holloman AFB, N.M.; JB Langley-Eustis, Va.; JBSA-Randolph and Sheppard AFB, Texas; JB Langley-Eustis, Va.; Eglin AFB and Tyndall AFB, Fla., Vance AFB, Okla.; Whiteman AFB, Mo.

**Active Variants:**

•T-38A. Upgraded version with Pacer Classic I and II mods.

•AT-38B. Armed weapons training version.

•T-38C. Modernized airframes incorporating glass cockpits and upgraded engines.

**Dimensions:** Span 25.3 ft, length 46.3 ft, height 12.8 ft.

**Weight:** Max T-O 12,093 lb.

**Power Plant:** Two General Electric J85-GE-5 augmented turbojets, each 2,900 lb thrust.

**Performance:** Speed 812 mph, range 1,093 miles.

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

**Accommodation:** Two pilots on Martin Baker MK16T zero/zero ejection seats.

## EXPERIMENTAL AND TEST VEHICLES



U.S. Air Force courtesy photo

## X-37B ORBITAL TEST VEHICLE

Orbital test

**Brief:** X-37B is an unmanned experimental Orbital Test Vehicle (OTV) aimed at developing and maturing a reusable space-launch capability and conducting classified, extended, on-orbit missions/experiments and/or launching small satellites. NASA launched the X-37 program in 1999, with the intention of building two demonstrators to validate technologies for both launch/on-orbit flight, and reentry/landing. Only the Approach and Landing Test Vehicle (ALTV) was built before NASA handed over the program to DARPA, which completed ALTV captive-carry/drop testing with the subscale X-40A in 2006. The X-37B is based on NASA's notional OTV and is boosted into low-Earth orbit atop a standard Atlas V or SpaceX Falcon 9 launch vehicle for long-endurance space missions. The vehicle autonomously re-enters the atmosphere upon command from a ground control station, and it recovers conventionally to the runway. X-37 launches from Cape Canaveral and lands at either Cape Canaveral or Vandenberg. Development includes advanced guidance, navigation and controls, avionics, thermal-resistant materials, propulsion, and autonomous control systems. The program's two test vehicles have successfully completed five orbital missions. The first mission (OTV-1) launched in 2010 and remained on orbit 224 days. The OTV-2 and OTV-3 missions launched in 2011 and 2012, and remained on orbit 468 days and 674 days, respectively. The OTV-4 mission remained aloft for 718 days and landed at Cape Canaveral for the first time on March 25, 2017. The OTV-5 mission marked the type's first launch atop a SpaceX Falcon 9 on Sept. 7, 2017, setting a new record of 780 days on orbit when it touched down at Cape Canaveral on Oct. 27, 2019. USSF launched its inaugural X-37B mission, OTV-6 (USSF-7), on May 17, 2020, surpassing 600 days on orbit on Jan. 7, 2022.

**Contractor:** Boeing.

**Operator:** USSF.

**First Launch:** April 22, 2010.

**IOC:** N/A.

**Launch Vehicle:** Atlas V, Falcon 9.

**Production:** Two.

**Inventory:** Two.

**Operational Location:** Cape Canaveral SFS, Fla. (launch/landing); Vandenberg SFB, Calif. (landing).

**Active Variant:**

•X-37B. DARPA/USAF-developed Orbital Test Vehicles.

**Dimensions:** Span 14 ft, length 29.25 ft, height 9.5 ft. Weight: 11,000 lb at launch.

**Propulsion:** Single liquid-propellant rocket motor.

**Endurance:** 780+ days on orbit.

**Orbit Altitude:** Low-Earth orbit (LEO) at 110-500 miles.

**Power:** Gallium arsenide solar cells with lithium-ion batteries.



Alex Lloyd/USAF

## X-62 VARIABLE-STABILITY IN-FLIGHT TEST AIRCRAFT

In-Flight simulator

**Brief:** The X-62 Variable-stability In-flight Simulator Test Aircraft (VISTA) is a highly modified F-16D Block 30 capable of replicating the flight characteristics of a wide array of aircraft. VISTA was initially modified to support the Multi-Axis Thrust-Vectoring (MATV) program which tested the combat potential of high-angle of attack maneuver starting in July 1993. VISTA completed 95 test flights with the Axisymmetric Vectoring Exhaust Nozzle (AVEN) and General Electric F110-GE-100 engine before the program terminated in 1994. The aircraft subsequently became a mainstay of the USAF Test Pilot School's program training test pilots and flight test engineers to evaluate unstable or unpredictable aircraft with relative safety. The VISTA aircraft recently aided in the development and testing of Automatic Integrated Collision Avoidance Systems (ICAS), enhancing the safety of the F-16 and other fighter fleets. Originally designated NF-16D, the aircraft has a second, center-control stick that is paired with the VISTA Simulation System (VSS) computers to generate differing flight dynamics for the pilot. The aircraft also incorporates a nonstandard, enlarged dorsal spine and drag-chute in common with some export variants of the F-16. The NF-16D recently completed service-life extension mods, and ongoing upgrades include replacing VSS with a modernized system and installing the new System for Autonomous Control of Simulation (SACS). SACS will enable the aircraft to support paired, autonomous aircraft testing including Air Force Research Laboratory's Skyborg program. These extensive modification and modernization efforts prompted USAF to redesignate the aircraft X-62 on June 14, 2021. The X-62 is operated in partnership with Calspan Aviation and will continue to support the AFTPS syllabus in addition to conducting AFRL testing.

**Contractors:** Lockheed Martin (previously General Dynamics); Calspan (VISTA program).

**First Flight:** 1992 (NF-16D VISTA).

**Delivered:** January 1995.

**IOC:** 1992.

**Production:** One.

**Inventory:** One.

**Operator:** AFMC (Calspan).

**Aircraft Location:** Edwards AFB, Calif.

**Active Variants:**

•X-62A. Highly modified F-16D Variable stability In-Flight Simulator Aircraft (VISTA).

**Dimensions:** Span 32.8 ft, length 49.3 ft, height 16.7 ft.

**Weight:** Max T-O 37,500 lb (Block 30).

**Power Plant:** F100-PW-229 augmented turbofan, 29,000 lb thrust.

**Performance:** Speed Mach 2+, ferry range 2,002+ miles.

**Ceiling:** 50,000 ft.

**Accommodation:** Two pilots on ACES II zero/zero ejection seats.

## UNMANNED AIRCRAFT SYSTEMS



Sara Vidoni/USAF

## BMQ-167 SUBSCALE AERIAL TARGET

Full-scale aerial target

**Brief:** BQM-167A is a subscale, unmanned aerial target and threat simulator serving missile/weapons development, testing, validation, and training over the Eglin Test and Training Range. The 82nd Aerial Targets Squadron employs the cheaper subscale targets to complement its QF-16 full scale aerial target fleet operating from Tyndall. The BQM-167 is boosted to flying speed from a launch rail via a solid-fuel Rocket-Assisted Take Off (RATO) motor which is then jettisoned. BQM-167 is capable of representing air targets maneuvering at up to 9 Gs at speeds up to Mach 0.91 and altitudes between 50 and 50,000 feet. The drone is constructed of durable, lightweight composites, equipped with a recovery parachute, and depending on its condition capable of being refurbished and reused. BQM-167s incorporate a scoring system and a range of threat-simulating systems/stores including IFF, EA pods, IR/radar countermeasures as well as IR/radar signature augmentation to simulate a variety of threats. The Air Force competitively awarded the first BQM-167 production contract in 2002 and most recently awarded a \$338 million contract for Lot 17 through 21 covering 79 targets in September 2021. FY22 funds support Lot 18 production of 10 subscale targets.

**Contractors:** Kratos Unmanned Aerial Systems.

**First Flight:** Dec. 8 2004.

**Delivered:** 2004-present.

**IOC:** 2008.

**Production:** 800+ (planned).

**Inventory:** Approx. 37.

**Operator:** ACC.

**Aircraft Location:** Tyndall AFB, Fla.

**Active Variants:**

•BQM-167A. Subscale aerial target.

**Dimensions:** Span 10.5 ft, length 20 ft, height 4 ft.

**Weight:** Max T-O 2,050 lb.

**Power Plant:** MicroTurbo (Safran) Tri 60-5 turbofan, 1,000 lb thrust.

**Performance:** Speed Mach 0.91, range unk.

**Ceiling:** 50,000 ft.

**Defensive Systems:** Chaff/flares, EA pods, IR/RF wing pods (augmentation).

**Accommodation:** Preprogramed, unmanned.

## MQ-9 REAPER

Attack/armed reconnaissance

**Brief:** The MQ-9B is a medium-to high-altitude, long-endurance hunter-killer RPA, primarily tasked with eliminating time-critical and high-value targets in permissive environments. Additional roles include CAS, CSAR, precision strike, armed overwatch, target development/designation, and terminal weapon guidance. The MQ-9 fulfills a secondary tactical ISR role utilizing its Multispectral Targeting System-B (MTS-B), Lynx SAR, and/or Gorgon Stare wide-area surveillance (fielded on seven modified aircraft). MTS-B integrates EO/IR, color/monochrome daylight TV, image-intensified TV, and a laser designator/illuminator. MTS-B provides FMV as separate video streams or fused together. The MQ-9 employs SAR for JDAM targeting



Tech Sgt. Emerson Nuñez

and dismounted target tracking. A Reaper system comprises three aircraft, GCS, LOS/BLOS satellite and terrestrial data links, support equipment/personnel, and crews for deployed 24-hour operations. MQ-9B debuted in combat in Afghanistan in 2007. MQ-9 fleet is evenly split between earlier Block 1 and later Block 5 aircraft which are flexibly retrofitted to meet operational demand resulting in a number of different configurations and capabilities. USAF is upgrading a total of 113 Block 1, and 136 Block 5 aircraft to Extended-Range standards. ER mods add external fuel tanks, a four-bladed propeller, engine alcohol/water injection, heavyweight landing gear, longer wings and tail surfaces, and other enhancements. USAF plans to begin transitioning the fleet from counterinsurgency to future roles in or near contested airspace. The future MQ-9 Multi-Domain Operations (M2DO) configuration will enhance data link and control robustness, enable plug-and-play system integration, and double power output to integrate future advanced sensors, systems, and algorithms. M2DO enhancements include anti-jam GPS, Link 16, internet-protocol and modular mission system architecture, enhanced C2 resiliency, and greater flight autonomy/automation. An initial 71 airframes will be upgraded to M2DO standards. FY22 funds GCS Block 30, ER conversions, DAS-4 high-definition EO/IR sensor, data link, GPS, and Gorgon Stare improvements, reliability mods, and capability enhancements. USAF plans to retire the fleet by 2035 and is seeking to replace Reaper with a more survivable, flexible, and advanced platform as early as 2031. Congress, however, added funds to buy four additional MQ-9s in the FY22 defense budget.

**Contractors:** General Atomics Aeronautical Systems; L3Harris; Raytheon (sensors).

**First Flight:** February 2001.

**Delivered:** November 2003-present.

**IOC:** October 2007; 2015 (ER).

**Production:** 337 (planned).

**Inventory:** 323.

**Operator:** ACC, AFMC, AFRC (associate), AFSOC, ANG.

**Aircraft Location:** Cannon AFB, N.M.; Creech AFB, Nev.; Eglin AFB, Fla.; Ellington Field, Texas; Fort Drum, N.Y.; Fort Huachuca, Ariz.; Hancock Field, N.Y.; Hector Arpt., N.D.; Holloman AFB, N.M.; March ARB, Calif.; Nellis AFB, Nev., and deployed locations worldwide. Planned: Tyndall AFB, Fla.; Whiteman AFB, Mo.

**GSC Location:** Cannon AFB, N.M.; Creech AFB, Nev.; Battle Creek ANGB, Mich.; Davis-Monthan AFB, Ariz.; Des Moines Arpt., Iowa; Ellington Field, Texas; Ellsworth AFB, S.D.; Fort Smith Arpt., Ark.; Hancock Field, N.Y.; Hector Arpt., N.D.; Holloman AFB, N.M.; Horsham AGS, Pa.; Hurlburt Field, Fla.; March ARB, Calif.; Springfield-Beckley Arpt., Ohio. Planned: Niagara Falls Arpt., N.Y.; Shaw AFB, S.C.; Tyndall AFB, Fla.; Whiteman AFB, Mo.

**Active Variants:**

- MQ-9B Reaper Block 1. Air Force version of the General Atomics Predator B.
- MQ-9B Reaper Block 5. Improved, current production Reaper.
- MQ-9B Reaper ER. Extended-range MQ-9 with external fuel tanks, longer wings, and other enhancements.

**Dimensions:** Span 66 ft (79 ft, ER), length 36 ft, height 12.5 ft.

**Weight:** Max T-O 10,500 lb.

**Power Plant:** One Honeywell TPE331-10GD turboprop, max 900 shp.

**Performance:** Cruise speed 230 mph, range 1,150 miles, endurance 27 hr; 34 hr (ER).

**Ceiling:** 50,000 ft.

**Armament:** Combination of AGM-114 Hellfire (up to eight), GBU-12/49 Paveway II, and GBU-38 JDAMs.

**Accommodation:** Pilot, sensor operator (operating from GCS).



Airman 1st Class Emily Kenney

## QF-16 FULL-SCALE AERIAL TARGET

Full-scale aerial target

**Brief:** QF-16 is a manned/unmanned aerial target and threat simulator serving missile/weapons development, testing, validation, and training. QF-16s began replacing the dwindling and obsolescent QF-4 Full-Scale Aerial Target (FSAT) starting in 2015, through the type's retirement in December 2017. QF-16s are capable of manned or "not under live local operator" (NULLO) control operations. The first of 13 LRIP QF-16s was delivered to Tyndall in early 2015. Boeing is under contract to deliver 121 converted airframes in five production lots through April 2021. FY22 funds will procure 12 conversions under a follow-on sixth lot contract. Recent upgrades include EA pod and software modernization to more accurately replicate adversary capabilities and tactics, ground-control modernization, and threat realism/countermeasure improvements. Boeing and USAF opened a second QF-16 conversion line at Davis-Monthan to augment production at Cecil Field in Jacksonville, Fla., which delivered its first airframe in mid-2020.

**Contractors:** Lockheed Martin; Boeing (drone conversion).

**First Flight:** May 4, 2012.

**Delivered:** February 2015-present.

**IOC:** Sept. 23, 2016.

**Production:** 126 (planned).

**Inventory:** 17 (QF-16A); 49 (QF-16C).

**Operator:** ACC.

**Aircraft Location:** Holloman AFB, N.M., Tyndall AFB, Fla.

**Active Variants:**

- QF-16A. Converted from retired F-16A Block 15.
- QF-16C. Converted from retired F-16C Block 25 and Block 30.

**Dimensions:** Span 32.8 ft, length 49.3 ft, height 16.7 ft.

**Weight:** Max T-O 37,500 lb.

**Power Plant:** Pratt & Whitney F100-PW-200 augmented turbofan, 23,830 lb thrust (Block 15); Pratt & Whitney F100-PW-220 augmented turbofan, 23,830 lb thrust (Block 25); GE Aviation F110-GE-100 augmented turbofan, 29,000 lb thrust (Block 30).

**Performance:** Speed Mach 2, ferry range 2,000+ miles.

**Ceiling:** 50,000 ft.

**Defensive Systems/stores:** Chaff/flares; EA pods: ALQ-188, ALQ-167; Towed Aerial Target Gunnery System.

**Accommodation:** Safety pilot (optional) on ACES II zero/zero ejection seat.

## RQ-4 GLOBAL HAWK

High-altitude reconnaissance

**Brief:** The Global Hawk is a strategic, long-endurance, high-altitude "deep look" ISR platform complementing satellite and manned ISR. It is capable of imagery, SIGINT, and ground moving target indication (GMTI), depending on variant. The system consists of the aircraft and sensors, launch and recovery element (LRE), mission control element (MCE), and comms/mission planning cell. The preproduction Block 10 debuted in combat in 2001 and retired in 2011. Block 20 was initially equipped with the Enhanced Integrated Sensor Suite (EISS) for imagery intelligence (IMINT). Five were converted as EQ-4B Battlefield Airborne Communications Node (BACN) relays, and four remained active following a loss replacement in 2018. Block 30 is a multi-intelligence platform equipped with EO/IR, SAR, and SIGINT sensors. It is also equipped with a universal payload adapter that enables (previously) U-2-unique payloads including the MS-117 and SYERS II EO sensors, and a wet-film Optical Bar Camera to be carried. The Airborne Signals Intelligence Payload (ASIP) was only installed on three of the 11 planned airframes, subsequently designated Block 30M. Block 40 is a ground-moving target surveillance platform equipped with



Staff Sgt. Ramon Adelan

the Multiplatform Radar Technology Insertion Program (MP-RTIP). Its AESA and SAR simultaneously conduct moving target and cruise missile tracking, as well as stationary imagery collection. Block 30 foreign military customers include South Korea and Japan, while NATO operates a pooled fleet of RQ-4Ds based on the Block 40. Northrop Grumman test flew the first of three Block 30i for Japan and NATO declared initial operating capability with the Allied Ground Surveillance fleet in 2021. USAF began retiring the EQ-4B Block 20 in FY21 and RQ-4B Block 30 in FY22 retaining only the Block 40 to free funding for future penetrating ISR capabilities. FY22 funds support Block 40 sustainment and the Ground Station Modernization Program which is in operational testing ahead of fielding in FY23. A single RQ-4 Block 40 was destroyed in a crash near Grand Forks on Aug. 6, 2021.

**Contractors:** Northrop Grumman, Raytheon, L3Harris.  
**First Flight:** Feb. 28, 1998.  
**Delivered:** August 2003-present.  
**IOC:** August 2011 (Block 30); August 2016 (Block 40).  
**Production:** 45 (USAF).  
**Inventory:** 31 (including 10 Block 40s).  
**Operator:** ACC, AFMC.

**Aircraft Location:** Beale AFB, Calif. (Block 30); Edwards AFB, Calif.; Grand Forks AFB, N.D. (Block 20/40); forward operating locations: Andersen AFB, Guam; NAS Sigonella, Italy; Yokota AB, Japan.

**Active Variants:**

- EQ-4B Block 20. Battlefield Airborne Communications Node (BACN) comm relay platform.
- RQ-4B Block 30. Multi-intelligence platform equipped with EO/IR and SAR sensors.
- RQ-4B Block 40. AESA and SAR equipped ground moving target indication (GMTI) and battlefield ISR platform.

**Dimensions:** Span 130.9 ft, length 47.6 ft, height 15.3 ft.

**Weight:** Max T-O 32,250 lb; max payload 3,000 lb.

**Power Plant:** One Rolls-Royce North American F137-RR-100 turbofan, 7,600 lb thrust.

**Performance:** Speed 356.5 mph, range 14,150 miles, endurance 32+ hrs (24 hrs on-station loiter at 1,200 miles).

**Ceiling:** 60,000 ft.

**Accommodation:** LRE Pilot, MCE pilot, MCE sensor operator (operating from LRE/MCE).



USAF

## RQ-170 SENTINEL

Unmanned surveillance and reconnaissance

**Brief:** RQ-170 is an unmanned, stealthy, penetrating, day/night tactical ISR platform. Although the RQ-170 was still under development and test, USAF employed it in Southwest Asia during Enduring Freedom. The RPA was developed in response to DOD's call for additional RPA support for combatant commanders. USAF publicly acknowledged the aircraft after photos appeared in foreign news media of operations over Afghanistan in 2009. The type is operated by the 432nd Wing at Creech and the 30th

Reconnaissance Squadron at Tonopah Test Range. In 2011, an RQ-170 was captured almost intact by Iranian forces. Iran allegedly reverse-engineered a copy of the aircraft, which the Israeli Air Force reported shooting down during an engagement inside Israeli territory on Feb. 10, 2018. The RQ-170 took part in a joint-exercise at Nellis in August 2020, testing its ability to accompany a B-2 on penetrating operations aided by SEAD F-35s.

**Contractor:** Lockheed Martin.

**Operator:** ACC.

**GCS Location:** Creech AFB, Nev.; Tonopah Test Range, Nev.

**Aircraft Location:** Tonopah Test Range, Nev.; deployed worldwide.

**Known Active Variant:**

- RQ-170. No data available.

**Dimensions:** Span 65.6 ft, length 14.75 ft.

## STRATEGIC WEAPONS



Airman 1st Class Jacob Wrightsman

### AGM-86 AIR-LAUNCHED CRUISE MISSILE (ALCM)

Strategic air-to-surface cruise missile

**Brief:** The AGM-86 is a low-level, penetrating nuclear strike weapon for use against strategic surface targets. ALCM's small radar signature and low-level flight capability enhance the missile's effectiveness. The nuclear AGM-86B was the first production version with a total of 1,715 delivered through 1986. USAF plans to cut the inventory from its current level to an eventual 528 ALCM. Some ALCMs were modified for conventional use with INS/GPS-guidance and a blast fragmentation warhead and redelivered in 1987 as the AGM-86C CALCM. CALCM was operationally employed for the first time in Desert Storm and widely used in subsequent operations. CALCM was capable of adverse weather, day/night, air-to-surface, accurate, standoff strike capability at ranges greater than 500 miles. The AGM-86D was CALCM's Block II penetrator version with AUP-3(M) warhead used for standoff strikes on hardened, deeply buried targets in Afghanistan. CALCM was retired in early 2019 and the remaining AGM-186C/D were sent to Barksdale for storage awaiting disposal. ALCM is undergoing SLEP/component remanufacture to stretch its service life to 2030, pending replacement by the Long-Range Standoff (LRSO) missile. USAF awarded technology-maturation and risk-reduction contracts for the LRSO in 2017, resulting in the selection and continued development of Raytheon's AGM-181 Long-Range Standoff Weapon in April 2020. Plans call for fielding the nuclear AGM-181 by the late 2020s, possibly followed by a conventional derivative thereafter.

**Contractor:** Boeing.

**First Flight:** June 1979 (full-scale development).

**Delivered:** 1981-1986.

**IOC:** December 1982 (B); January 1991 (C); November 2001 (D).

**Production:** 1,715.

**Inventory:** Approx. 536 (B).

**Operator:** AFGSC.

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

**Active Variants:**

- AGM-86B. Nuclear ALCM variant.

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

**Weight:** 3,150 lb.

**Power Plant:** Williams/Teledyne CAE F107-WR-10 turbofan, 600 lb thrust.

**Performance:** Speed 550 mph, range 1,500+ miles (B).

**Guidance:** Inertial plus Terrain Contour Matching (B). Warhead: W80-1 nuclear warhead (B).

**Estimated Yield:** W80-1 warhead: five-150 kilotons (preselectable).

**Integration:** B-52H.



Giancarlo Casem/USAF

## **AGM-183 AIR-LAUNCHED RAPID RESPONSE WEAPON (ARRW)**

**Hypersonic air-to-surface weapon**

**Brief:** The AGM-183A is a developmental boost-glide hypersonic missile to provide future, nonnuclear strike against time-sensitive, heavily defended, high-value targets from standoff range. The missile is designed to accelerate to speeds well in excess of Mach 5 before releasing a non-powered glide vehicle which maneuvers to the intended target. USAF completed a series of seven captive flight-tests utilizing an instrumented test article on a B-52H at Edwards, culminating in an aborted boost-test in December 2020. An attempted boost test over the Point Mugu Test Range on April 5, 2021, failed to leave the aircraft. A third attempt on July 28, 2021, proved safe separation and targeting acquisition but the booster failed to ignite. The tests aim to eventually achieve safe separation, booster ignition, and deployment of a dummy glide vehicle. FY22 funds to procure 12 prototype AGM-183s to support testing and potential transition to an early operational capability were cut due to setbacks in testing. AFGSC aims to operationally deploy the weapon on the B-52 and B-1 previously targeting as early as 2022, with possible, later integration on the F-15E/EX.

**Contractor:** Lockheed Martin.

**First Flight:** N/A.

**Delivered:** N/A.

**IOC:** 2022 (planned).

**Production:** 12 (planned).

**Inventory:** N/A.

**Operator:** AFMC, Planned: AFGSC.

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

**Active Variants:**

•AGM-183A. Developmental prototype hypersonic boost-glide weapon.

**Dimensions:** Unk.

**Weight:** Unk.

**Propulsion:** Solid fuel rocket.

**Performance:** Mach 5+, range approx. 1,000 miles.

**Guidance:** Unk.

**Warhead:** Boost-glide vehicle

**Integration:** Planned: B-1B, B-52H, F-15E, F-15EX.



## **B61 THERMONUCLEAR BOMB**

**Air-to-surface thermonuclear bomb**

**Brief:** B61 is an air-dropped battlefield/tactical nuclear weapon equipping the F-16 and F-15E in the forward-deployed, allied extended deterrent role. It is also the B-2's primary strategic weapon. B61 was first delivered in 1966, and the B61 Mod 11 introduced in 1997 adds a ground-penetrating capability, enhancing its effect against buried and hardened targets. The weapon incorporates several preselectable yield options tailored to mission requirements. Work is underway on the B61 Mod 12 Life Extension Program (LEP) begun in 2016 to consolidate the B61-3, -4, -7, and -10 into a single, standardized configuration. The LEP refurbishes the warhead to improve the safety, security, and reliability through 2040. B61-12 also adds a guided tail kit, making it the first precision guided weapon of its type, thus permitting higher effectiveness at lower yields. USAF and the National Nuclear Security Administration finished B61-12 qualification flight-testing on June 9, 2018. The 31 inert test drops greatly exceeded

National Nuclear Security Administration

performance requirements, validating nonnuclear components such as arming/fire control, guidance, spin-rocket motors, and software. B61-12 was approved for production and completed operational flight-testing on the F-15E and B-2A in 2019. Operational testing included 15 drops, certifying the F-15E as the first aircraft capable of delivering the B61-12 on June 8, 2020. The Department of Energy conducted nine additional drops, culminating in a full-weapon system demo on the B-2A in July 2020. The F-35A dropped an inert B61-12 for the first time in 2020 and completed the final full weapon system drops required toward certification on Sept. 21, 2021. Delivery of the first production example has been delayed two years to 2022 due to technical issues. Future integration is planned on the F-16 and F-35A.

**Contractors:** Los Alamos National Laboratory (weapon); Boeing (B61-12 tail kit).

**Delivered:** 1966.

**IOC:** 1968.

**Production:** N/A.

**Inventory:** Approx. 500.

**Operator:** AFMC, USAFE.

**Deployed locations:** Aviano AB, Italy; Büchel AB, Germany; Ghedi AB, Italy; Incirlik AB, Turkey; Kleine Brogel AB, Belgium; Volkel AB, Netherlands.

**Active Variant:**

•B61. Supersonic-droppable free-fall thermonuclear weapon.

**Dimensions:** Length 11 ft 8 in., diameter 1 ft 1 in.

**Weight:** 700 lb; 825 lb (B61-12).

**Performance:** N/A.

**Guidance:** None (B61 Mod 1 to 11); unk, likely INS (B61 Mod 12).

**Warhead:** One B61 -3, -4, -7, -10, or -11.

**Estimated Yield:** 0.3 kilotons, 1.5 kilotons, 10 kilotons, 50 kilotons (pre-selectable).

**Integration:** B-2A, F-15E, and F-16C/D; NATO: F-16A/B Mid-Life Upgrade (MLU), and Panavia Tornado IDS. Planned: B-21, F-35A.



Senior Airman Abbigayle Williams

## **LGM-30 MINUTEMAN III**

**Strategic surface-to-surface ballistic missile**

**Brief:** Minuteman is a three-stage, solid-propellant nuclear deterrent ICBM housed in a survivable underground silo. Minuteman III became operational in 1970, providing improved range, rapid retargeting, and the capability to place up to three reentry vehicles on three targets with high accuracy. It is the sole remaining U.S. land-based ICBM. AFGSC initially deployed 550 missiles, later reducing that number to 400 based at Malmstrom, Minot, and F.E. Warren. AFGSC reduced deployed ICBMs to a single-warhead configuration in 2014 under limits imposed by the New START agreement. Minuteman III is already more than 40 years beyond its initially planned service life and USAF expects the system will begin falling below readiness standards as early as 2026 if not replaced. USAF awarded Boeing and Northrop Grumman technology maturation and risk-reduction contracts to replace Minuteman with a future Ground-Based Strategic Deterrent (GBSD) in 2017. Boeing declined to bid on full development in 2019, leaving Northrop Grumman to develop GBSD. As such, current efforts are focused on sustaining the Minuteman III's operational capability through fielding of the GBSD. Upgrades to guidance and propulsion as well as modernized reentry vehicles extend key system to 2030 and flight-testing of a replacement fuse will culminate with the last of four test launches in 2024. FY22 funds support more the 20 sustainment efforts including Launch Control Center Block Upgrade (LCCBU), emergency comms, cryptography updates, and arm/disarm switch replacement. LCCBU replaces key hardware, software, comms, and environmental control systems in the crew capsule, as well as starting new missile site security and video situational awareness upgrades.



GBSD fielding is targeted for 2027 with full operational capability by 2036.

**Contractors:** Boeing; General Electric; Lockheed Martin; Northrop Grumman (formerly Orbital ATK).

**First Flight:** February 1961.

**Delivered:** 1962-1978.

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

**Production:** 1,800.

**Inventory:** 397 deployed; 261 non-deployed.

**Operator:** AFGSC.

**Unit Location:** F. E. Warren AFB, Wyo.; Malmstrom AFB, Mont.; Minot AFB, N.D.; Vandenberg SFB, Calif. (test location).

**Active Variant:**

•LGM-30G. Current Minuteman III variant.

**Dimensions:** Length 59.9 ft, diameter 5.5 ft.

**Weight:** 79,432 lb.

**Propulsion:** Stage 1: Orbital ATK refurbished M55 solid-propellant motor, 202,600 lb thrust; stage 2: Orbital ATK refurbished SR19 solid-propellant motor, 60,721 lb thrust; stage 3: Orbital ATK refurbished SR73 solid-propellant motor, 34,400 lb thrust.

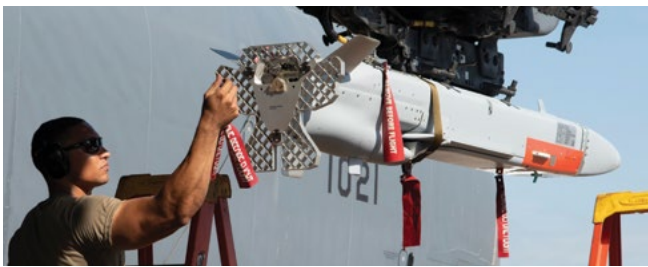
**Performance:** Speed at burnout approx 15,000 mph, range 6,000+ miles.

**Guidance:** Inertial guidance system.

**Re-entry Vehicle:** One Mk 21 RV; one to three Mk 12/12A MIRVs.

**Warhead:** One W87 or up to three W78 enriched uranium thermonuclear warheads.

## LONG-RANGE STANDOFF WEAPONS



Airmen 1st Class Celeste Zuniga

### ADM-160 MINIATURE AIR LAUNCHED DECOY (MALD)

Aircraft decoy; Close-in radar jammer

**Brief:** MALD is a programmable, low-cost, modular, autonomous flight vehicle that mimics U.S. or allied aircraft to confuse enemy Integrated Air Defense Systems (IADS). MALD-J adds radar jamming capability to the basic decoy platform and can operate alone or in concert with other EW platforms. The jammer version is designed as an expendable, close-in jammer to degrade and deny an early warning or acquisition radar's ability to establish a track on strike aircraft. It also maintains the ability to fulfill the basic decoy mission. F-16 or B-52 are lead employment aircraft for MALD. USAF capped procurement in FY12, converting Lot 4 to the MALD-J variant. Plans call for 3,000, of which 2,400 are the jammer version. USAF demonstrated in-flight retargeting capabilities and is integrating GPS-Aided Inertial Navigation System (GAINS II) to improve navigational accuracy in GPS-denied environments. An upgraded Jammer variant dubbed "MALD-X" successfully demonstrated future, low-level flight capabilities, improved EW payloads, and enhanced data links in 2018. MALD-X aims to establish USAF's future baseline and serves as the basis of the Navy's developmental MALD-N variant. USAF awarded a MALD-J contract option for Lot 10 production in 2016 and a follow-on Lot 11 contract for 250 weapons in 2018. A B-52 conducted a rare MALD live-launch in support of tactics development during a Combat Hammer assessment from Barksdale in 2021.

**Contractor:** Raytheon.

**First Flight:** 1999 (MALD); 2009 (MALD-J).

**Delivered:** Sept. 6, 2012 (MALD-J).

**IOC:** 2015 (MALD-J).

**Active Variants:**

•ADM-160B. MALD base decoy variant.

•ADM-160C. MALD-J jammer/decoy variant.

**Dimensions:** Span 5.6 ft (extended), length 9.3 ft. Weight: Less than 300 lb.

**Power Plant:** Hamilton Sundstrand TJ-150 turbojet, 337 lb thrust.

**Performance:** Range up to 575 miles, endurance 90 minutes (50 minutes on-station loiter).

**Guidance:** GPS/INS.

**Integration:** B-52H, F-16C. Planned: B-1B.



USAF

### AGM-154 JOINT STANDOFF WEAPON (JSOW)

Guided air-to-surface glide bomb

**Brief:** JSOW is a joint USAF-Navy family of medium-range, GPS/INS guided, standoff air-to-ground glide weapons. It is used to attack a variety of soft and armored area targets during day and night and adverse weather conditions. The baseline BLU-97 CEM variant is used against soft and area targets. The BLU-108 variant provides anti-armor capability. The AGM-154C incorporates an additional imaging IR seeker and is intended for use against hardened, stationary targets. The new AGM-154C-1 variant adds moving, maritime strike capability to the baseline C variant, which reached IOC with the Navy in 2016. The weapon completed operational flight-testing on the F-35C in 2019, clearing the way for ongoing internal integration and testing on the F-35A.

**Contractor:** Raytheon.

**First Flight:** December 1994.

**Delivered:** 2000-2005 (USAF).

**IOC:** 2000.

**Active Variants:**

•AGM-154A. Baseline BLU-97 CEM variant for soft/area targets.

•AGM-154B. The BLU-108 submunition variant for anti-armor.

•AGM-154C. Imaging IR-guided variant for hardened tactical targets.

**Dimensions:** Length 13.3 ft, diameter 13 in.

**Performance:** Range 13.8 miles low-altitude, 73 miles high-altitude.

**Guidance:** GPS/INS.

**Warhead:** See variants above.

**Integration:** B-1, B-2, B-52, F-15E, and F-16. Planned: F-35A.



USAF

### AGM-158 JOINT AIR-TO-SURFACE STANDOFF MISSILE (JASSM)

Air-to-surface cruise missile

**Brief:** JASSM is a joint USAF-Navy autonomous, precision cruise missile for use against heavily defended or high-value targets at standoff range. It can attack fixed, relocatable, and moderately hardened/buried targets. The base variant is a stealthy, low-cost airframe equipped with GPS/INS guidance and imaging IR terminal seeker. The JASSM-Extended Range (JASSM-ER) version uses the same baseline body but a new engine and fuel system that increases range to more than 500 miles. The ER was cleared for combat on the B-1B in 2015, reached full operational capability on the F-15E in 2018, and is planned for use on all fighter/bomber platforms. Full-rate production began in 2018 and production shifted to ER-only in FY16. Further development has resulted in the improved AGM-158B-2 and the "extreme range" JASSM-XR. Lockheed Martin is also developing the Long-Range Anti-Ship Missile (LRASM) which reached early operational capability on the B-1B in December 2018 and is planned for additional fielding on the B-52. USAF conducted a proof-of-concept employing palletized JASSM deployed from mobility aircraft in 2020 demonstrating

the potential for massed standoff attack. JASSM and LRASM are key to USAF's strategy to confront near-peer adversaries in highly contested environments and the service is upping total procurement of both weapons. FY22 funds support maximum-rate procurement 525 JASSM-ER including 210 improved AGM-158B-2s and 35 extreme-range variants. JASSM-ER is slated for integration on the B-2A by FY22. No LRASM were requested due to short-term supply chain limitations.

**Contractors:** Lockheed Martin; Raytheon; Honeywell.

**First Flight:** April 8, 1999.

**Delivered:** 2001-present.

**IOC:** September 2003; December 2014 (ER variant); 2018 (LRASM).

**Production:** 10,000 JASSM (planned); 400 LRASM (planned).

**Active Variants:**

•AGM-158A JASSM. Base-variant.

•AGM-158B JASSM-ER. Extended-Range variant.

•AGM-158C LRASM. Long-Range Anti-Ship Missile, based on JASSM.

•AGM-158D JASSM-XR. Future extreme-range variant of JASSM-ER.

**Dimensions:** Length 14 ft., diameter approx. 2 ft., wingspan 7.8 ft.

**Power Plant:** Teledyne Technologies J402 turbojet (JASSM); Williams Intl. F107-WR-105 turbofan (JASSM-ER).

**Performance:** Speed subsonic, range 200+ miles (baseline), 500+ miles (ER), approx. 1000 miles (XR).

**Guidance:** GPS/INS and imaging IR terminal seeker.

**Warhead:** 1,000-lb class penetrator (JASSM); 1,000-lb blast fragmentation (LRASM).

**Integration:** B-1B, B-2, B-52H, F-15E, and F-16 Block 40-52; planned: F-35A (JASSM), B-1B, B-2A, B-52H, F-15E F-16; planned: F-35A (JASSM-ER) B-2A. Planned: B-52 (LRASM).

## AIR-TO-AIR MISSILES



2nd Lt. Kayla Fitzgerald

### AIM-9 SIDEWINDER

Air-to-air missile

**Brief:** Sidewinder is an IR-guided short-range, supersonic air-to-air missile. It was developed by the Navy for fleet air defense and adapted for USAF fighters. Early versions were used extensively in the Vietnam War. The AIM-9M is a joint Navy-USAF, all-altitude, all-aspect intercept missile. It has improved defense against IR countermeasures, background discrimination, and reduced-smoke rocket motor. AIM-9X is the newest jointly funded variant. It employs passive IR tracking, jet-vane steering for increased maneuverability and Joint Helmet-Mounted Cueing System (JHMCS) compatibility for high-angle, off-boresight targeting. The enhanced AIM-9X Block II was cleared for full-rate production in September 2015 and adds improved lock-after-launch and maneuverability, new data link for beyond-visual range engagement, enhanced anti-countermeasures, a new fuse, and safer ground-handling characteristics. AIM-9X production includes 67 converted AIM-9Ms, 1,289 Block I, and planned joint-service procurement of 11,635 Block II/II-plus (nearly double the number originally planned). FY22 funds procure slightly fewer than FY21 for a combined 243 AIM-9X Block II/II+ missiles.

**Contractor:** Raytheon; Northrop Grumman (propulsion).

**First Flight:** September 1953; July 1999 (AIM-9X); 2016 (AIM-9X Block II).

**Delivered:** AIM-9M 1983; AIM-9X from 2002-2011 (Block I); 2011-present

(Block II); 2017-present (Block II+).

**IOC:** Circa 1983 (9M); November 2003 (9X); September 2016 (9X Block II).

**Production:** 1,289 (Block I); 11,635 (Block II/Block II+) (planned).

**Active Variants:**

•AIM-9M. Early variant.

•AIM-9M-9. Expanded anti-countermeasure capability variant.

•AIM-9X. Newest, highly maneuverable, JHMCS compatible variant.

**Dimensions:** Span 2.1 ft (M), 1.4 ft (X), length 9.4 ft (M); 9.9 ft (X); diameter 5 in.

**Propulsion:** Mk 36 Mod 11 (9M); Orbital ATK Mk 139 solid-propellant rocket motor (9X).

**Performance:** Speed Mach 2+, range 10+ miles.

**Guidance:** Passive IR homing guidance.

**Warhead:** HE annular blast fragmentation.

**Integration:** F-15C/D/E, F-16C/D, F-22A (AIM-9X). Planned: F-35A.



Samuel King Jr./USAF

### AIM-120 ADVANCED MEDIUM-RANGE AIR-TO-AIR MISSILE (AMRAAM)

Air-to-air guided missile

**Brief:** AMRAAM is an active, radar-guided, medium-range, supersonic air-to-air missile. It is a joint USAF-Navy follow-on to the AIM-7 Sparrow with launch-and-maneuver capability. The AIM-120B is an upgraded, reprogrammable variant of the original missile. The AIM-120C incorporates smaller control surfaces for internal carriage on F-22 and F-35 and a high-angle off-boresight (HOBS) launch capability. AIM-120D offers improved range, GPS-assisted guidance, updated data links, and jam resistance, in addition to greater lethality. Ongoing upgrades will further enhance weapon performance and electronic protection. The second phase of the AIM-120D System Improvement Program (SIP II) completed operational testing and was fielded in 2020. SIP III entered operational testing in 2021 and is planned for fielding in 2022 to keep pace with emerging threats. Ongoing development also includes Form, Fit, and Function (F3R) mods and replacing obsolete electronic elements. In 2019, USAF announced it is developing the AIM-260 Joint Air Tactical Missile (JATM) with the Navy to replace AMRAAM with a longer-range, more capable weapon to counter high-end threats. An AIM-120 successfully using passive infrared search and track (IRST) in-lieu of radar to hit an airborne target, Aug. 5, 2021. FY22 funds procure 168 AIM-120D missiles.

**Contractors:** Raytheon; Northrop Grumman; Nammo Group (propulsion).

**First Flight:** December 1984.

**Delivered:** 1988-present.

**IOC:** September 1991; July 2015 (120D).

**Active Variants:**

•AIM-120B. Upgraded, reprogrammable variant of AIM-120A.

•AIM-120C. Production variant optimized for the F-22/F-35.

•AIM-120D. Latest variant with GPS guidance, improved range, lethality, and jam-resistance.

**Dimensions:** Span 1.7 ft (A/B), 1.5 ft (C/D); length 12 ft; diameter 7 in.

**Propulsion:** Boost-sustain solid-propellant rocket motor.

**Performance:** Supersonic, range 20+ miles.

**Guidance:** Active radar terminal/inertial midcourse.

**Warhead:** HE blast-fragmentation.

**Integration:** F-15C/D/E, F-16C/D, F-22A, F-35A.

## AIR-TO-GROUND MISSILES/ ROCKETS

### AGR-20 ADVANCED PRECISION KILL WEAPON SYSTEM (APKWS)

Air-to-surface guided rocket

**Brief:** APKWS is a low-cost, semi-active laser-guidance system sized to fit the 2.75-in aerial rocket. It is optimized for precision, low-collateral-damage strike against moving or stationary light vehicle and personal



Samuel King/Courtesy illustration

targets. Illuminating and white phosphorous rounds are used for target marking by Forward Air Control aircraft. USAF acquired the system as an urgent operational requirement and an F-16 employed it in combat for the first time in June 2016. The weapon employs a mid-body guidance package to convert the standard rocket into a guided weapon. APKWS was already in service with the three other services and initial weapons were procured from Navy stocks. The rockets are launched from multi-round reusable pods. FY22 SOCOM funds procured 80 APKWS guidance kits. An F-16 successfully destroyed an airborne target using APKWS as part of an anti-cruise missile demo in 2019. BAE introduced a block upgrade capable of increasing APKWS' range up as much as 30 percent which is slated to begin production in 2021.

**Contractor:** BAE Systems.

**First Flight:** May 2013 (USAF).

**Delivered:** October 2012-present.

**IOC:** N/A.

**Active Variant:**

•AGR-20A. Semi-active, laser-guided 2.75-in rocket, adapted for fixed-wing use.

**Dimensions:** Span 9.5 in, length 6.25 ft, diameter 2.75 in.

**Propulsion:** Solid-propellant rocket motor.

**Performance:** Subsonic, range 1.2 to 6.8 miles.

**Guidance:** Semi-active laser.

**Warhead:** HE, white phosphorous, or illuminating round.

**Integration:** AT-6, A-10, A-29, F-16.



Tech. Sgt. Michael Ammons

## AGM-65 MAVERICK

Air-to-surface guided missile

**Brief:** Maverick is a TV, imaging IR, or laser-guided standoff air-to-surface missile employed by fighter/attack aircraft against tanks, vehicles, and air defenses. It was first employed during the Vietnam War and was used extensively in Desert Storm and Iraqi Freedom. AGM-65B is a launch-and-leave, EO/TV guided missile, equipped with "scene magnification" allowing acquisition of small/distant targets. Fielded in 1986, AGM-65D employs an imaging IR seeker for all-weather day/night use. The AGM-65E is laser guided with a heavyweight penetrator warhead. The AGM-65G fielded in 1989 combines an imaging IR seeker, software to track larger targets, with a heavyweight penetrator warhead, digital autopilot, and a pneumatic actuation system. The AGM-65H is an upgraded B variant that recently completed tracker upgrades. The AGM-65K is a modified G variant that replaces IR guidance with EO TV and is also undergoing a tracker upgrade. The AGM-65L is the newest EO TV/semiactive-laser

seeker equipped "Laser Maverick" designed to strike high-speed moving targets. USAF is gradually modifying legacy missiles to Laser Maverick standards but the FY22 budget does not include additional procurement.

**Contractors:** Raytheon (missile body); Northrop Grumman (propulsion).

**First Flight:** August 1969.

**Delivered:** August 1972.

**IOC:** February 1973.

**Active Variants:**

•AGM-65B. A launch-and-leave EO TV seeker variant.

•AGM-65D. Adverse weather B variant.

•AGM-65E. Laser guided version heavyweight penetrator variant.

•AGM-65G. Imaging IR seeker heavyweight penetrator variant.

•AGM-65H. Upgraded B variant.

•AGM-65K. Modified EO TV seeker G variant.

•AGM-65L. Laser guided EO TV seeker variant for fast moving targets.

**Dimensions:** Span 2.3 ft, length 8.2 ft, diameter 12 in.

**Propulsion:** Two-stage, solid-propellant rocket motor.

**Performance:** Supersonic, range 20 miles.

**Guidance:** EO TV guidance system (B/H/K); Imaging IR seeker (D/G); laser seeker (E).

**Warhead:** 125-lb cone-shaped (B/D/H); 300-lb delayed-fuse penetrator (E/G/K).

**Integration:** A-10C, F-15E, F-16C/D.



Senior Master Sgt. Edward Snyder

## AGM-88 HIGH-SPEED ANTI-RADIATION MISSILE (HARM)

Air-to-surface anti-radiation missile

**Brief:** HARM is an anti-radiation, air-to-surface missile highly effective against enemy ground radar. AGM-88 is a joint USAF-Navy weapon carried by SEAD-dedicated F-16CJs. AGM-88B is equipped with erasable and electronically programmable read-only memory, permitting in-field changes to missile memory. The AGM-88C is the current production model with a more lethal warhead. Raytheon began a HARM Control Section Mod (HCSM) in 2013 to convert current models to more precise AGM-88Fs with improved GPS/INS guidance, anti-countermeasure performance, and reduced risk of collateral damage. The Navy is further retrofitting its missiles with advanced networking, digital homing, and terminal millimeter-wave radar seeker resulting in the AGM-88E Advanced Anti-Radiation Guided Missile (AARGM). USAF dropped sole-source plans to pursue the extended-range AGM-88G AARGM-ER as the basis for its next-generation Stand-in Attack Weapon (SiAW) issuing a request to industry in March 2021 for proposals instead. SiAW aims to enable the F-35 to strike advanced threats including theater ballistic missile and land attack/anti-ship missile sites, GPS jammers, and anti-satellite systems. USAF will continue Navy-led AARGM-ER integration to give the F-35A an interim SEAD capability until SiAW enters service. A Navy F-18F successfully test-fired the first AARGM-ER over the Point Mugu test range on July 19, 2021.

**Contractors:** Raytheon (HARM); Northrop Grumman (AARGM).

**First Flight:** April 1979 (HARM); July 19, 2021 (AARGM-ER).

**Delivered:** 1982-98.

**IOC:** Circa 1984.

#### Active Variants:

- AGM-88B. Early production variant.
- AGM-88C. Current production variant.
- AGM-88E. Next-generation Advanced Anti-Radiation Guided Missile.
- AGM-88F. Upgraded variant with greater accuracy and precision.
- AGM-88G. Next-generation Advanced Anti-Radiation Guided Missile Extended-Range variant.

**Dimensions:** Span 3.7 ft, length 13.7 ft, diameter 10 in.

**Propulsion:** Thiokol dual-thrust, solid-propellant rocket motor.

**Performance:** Mach 2+, range 30+ miles.

**Guidance:** Proportional passive RF broadband via fixed antenna and seeker head in missile nose.

**Warhead:** HE fragmentation.

**Integration:** F-16CJ (Block 50); planned: B-21, F-35A (SiAW).



Staff Sgt. Brian Ferguson

### AGM-114 HELLFIRE

Air-to-surface guided missile

**Brief:** Hellfire is a low-collateral damage, precision air-to-ground missile with semi-active laser guidance for use against light armor and personnel. Missiles are used on the MQ-9 Reaper. AFSOC dropped previous plans to integrate the weapons onto its AC-130W gunships in favor of the Small Glide Munition. Hellfire is procured through the Army and numerous variants are utilized based on overseas contingency demands. An MQ-1 Predator employed Hellfire in combat for the first time in Afghanistan on Oct. 7, 2001. The latest AGM-114R replaces several types with a single, multitarget weapon and USAF is also buying variable Height-of-Burst (HOB) kits to enhance lethality. The next-generation Joint Air-to-Ground Missile (JAGM) is also procured via the Army and adds a new multimode guidance section to the AGM-114R. JAGM is used against high-value moving or stationary targets in all weather. FY22 funds 1,176 Hellfire/JAGM via a common production contract despite prioritizing weapons to confront higher-end future threats. Recent AC-130J block upgrades integrated wing-pylon mounted Hellfire to the next generation gunship's arsenal.

**Contractors:** Lockheed Martin (missile body); Northrop Grumman (propulsion).

**First Flight:** Feb. 16, 2000 (USAF).

**Delivered:** March 2016-present.

**IOC:** N/A.

#### Active Variants:

- AGM-114. Numerous subvariants, depending on target and mission requirements.
- AGM-169. JAGM, incorporating a multimode seeker on the advanced AGM-114R.

**Dimensions:** Span 28 in, length 5.33 ft, diameter 17 in.

**Propulsion:** Solid-propellant rocket motor.

**Performance:** Subsonic, range 5+ miles.

**Guidance:** EO TV guidance system (B/H/K); IIR seeker (D/G); laser seeker (E).

**Warhead:** Shaped charge and blast fragmentation.

**Integration:** AC-130J, MQ-9.

### AGM-176 GRIFFIN

Air-to-surface guided missile

**Brief:** Griffin is a light, low-cost, multiservice air-launched weapon with GPS-aided inertial guidance and semi-active laser seeker. The weapon is used for high-precision, low-collateral damage attack against light surface targets. The AGM-176A forms part of the PSP employed on AFSOC's AC-130W Stinger II and AC-130J Ghosthunter gunships. Both aircraft employ the aft-firing weapon from ramp-mounted common-launch tubes. The forward-firing AGB-176B is employable on RPAs. USAF issued Raytheon



Raytheon

a \$105.2 million contract modification to supply additional Griffin missiles in 2018. FY21 SOCOM-wide funds supported production of 226 AGM-176, including data links. FY22 does not fund additional procurement as USSOCM shifts funds to confront future threats by developing small, Stand-Off Precision Guided Munitions (SOPGM) for use in contested environments.

**Contractor:** Raytheon.

**First Flight:** Feb. 16, 2000 (USAF).

**Delivered:** September 2001.

**IOC:** N/A.

#### Active Variants:

•AGM-176A. Aft-ejecting missile employed as part of the PSP.

•AGM-176B. Forward-firing variant optimized for light aircraft/RPAs.

**Dimensions:** Length 43 in, diameter 5.5 in.

**Propulsion:** Solid-propellant rocket motor.

**Performance:** Subsonic, range 12 + miles.

**Guidance:** GPS/INS/semi-active laser.

**Warhead:** Blast fragmentation.

**Integration:** AC-130J (A), AC-130W (A); MQ-9 (B).



Textron Systems

## AREA WEAPONS

### CBU-105 SENSOR FUZED WEAPON (SFW)

Wide-area munition

**Brief:** SFW is a tactical area weapon for use against massed stationary or moving armor and ground vehicles. The munitions dispenser contains a payload of 10 BLU-108 submunitions each containing four skeet-shaped copper disks totaling 40 lethal, target-seeking projectiles. The skeet's active laser and passive IR sensors can detect a vehicle's shape and IR signature. If no target is detected, the warhead instead detonates at a preset time. Primary targets are massed tanks, armored personnel carriers, and other self-propelled targets. SFW can be delivered from high-altitude and in adverse weather. It debuted in combat in Iraq in 2003. DOD ceased cluster munition procurement in 2007 and has only employed the weapons in combat once since 2003. CBU-105 was the only standard USAF cluster munition that met the less-than-one-percent failure rate previously mandated by DOD for use beyond 2018. DOD has since reversed course, retaining existing weapons for deterrence on the Korean Peninsula. USAF is now testing the 2,000 lb-class Next Generation Area

Attack Weapons (NGAAW) which replaces explosive submunitions with a high-fragmentation warhead reducing the risk of unexploded munitions injuring noncombatants.

**Contractor:** Textron Systems.

**First Flight:** Circa 1990.

**IOC:** 1997.

**Active Variants:**

•CBU-105. CBU-97 casing with Wind-Corrected Munitions Dispenser (WCMD) tail kit.

**Dimensions:** Length 7.7 ft, diameter 15 in.

**Performance:** Delivers 40 lethal projectiles over an area of about 500 ft x 1,200 ft.

**Guidance:** IR targeting in each warhead; INS (via WCMD tail kit pre-dispersal) and GPS-data (via aircraft, prerelease).

**Warhead:** Shaped charge and blast fragmentation.

**Integration:** A-10C, B-1B, B-52H, F-15E; F-16C/D, (tested on MQ-9).



Tech Sgt. Marvin Lynchard

## CBU-107 PASSIVE ATTACK WEAPON

Wide-area munition

**Brief:** Passive Attack Weapon is a nonexplosive, kinetic penetrating area weapon for use against sensitive targets. The CBU-107's penetrator rods limit collateral damage and do not scatter potentially contaminating debris when used against enemy WMD stockpiles. The weapon glides toward its target after release. Before impact, its inner chamber begins to rotate, and projectiles are ejected in rapid succession by centrifugal force, penetrating targets within a 200-ft radius. The weapon contains various-sized penetrating projectiles, but no explosive. Full production was completed in six months. The weapon was used during Iraqi Freedom.

**Contractors:** General Dynamics (kinetic energy penetrator payload and canister); Lockheed Martin (WCMD); Textron (tactical munition dispenser kit).

**First Flight:** 2002.

**IOC:** December 2002.

**Active Variant:**

•CBU-107A. Centrifugally dispersed, armor-penetrating weapon with Wind-Corrected Munitions Dispenser (WCMD) tail kit.

**Dimensions:** Length 7.7 ft, diameter 15 in.

**Performance:** Delivers a high-speed volley of nearly 4,000 metal projectiles in three sizes from a single canister; projectiles: 15-inch rods (350), 7-inch rods (1,000), and small-nail size (2,400).

**Guidance:** INS (via WCMD tail kit) and GPS-data (via aircraft) pre-release.

**Warhead:** Non-explosive projectiles.

**Integration:** B-52, F-15E, F-16C/D.

## NEXT GENERATION AREA ATTACK WEAPON (NGAAW)

Wide-area munition

**Brief:** Next Generation Area Attack Weapon (NGAAW) is a blast-fragmentation area weapon designed as an alternative to cluster bomb munitions banned by DOD mandate beyond 2018. DOD ceased cluster munition procurement in 2007 and implemented a less-than-one-percent failure rate mandate on area weapons to prevent civilian casualties from unexploded

ordnance. USAF awarded the \$60 million NGAAW procurement contract for a compliant family of weapons in 2019. NGAAW is being developed in two increments, the 500-lb Improved Lethality Warhead (ILW) anti-personnel/materiel weapon based on the BLU-134B, followed by the more potent 2,000-lb high-fragmentation warhead. An F-16 conducted initial live-developmental test drops of the 2,000-lb class BLU-136 at the Nellis range in July 2020. The 10-weapon series proved the effectiveness of the weapon against light vehicles, structures, and personnel in excess of a 225 ft radius. The 2,000-lb weapon is externally similar to the standard JDAM when fitted with the precision-guided tail kit requiring little adaptation to existing platforms for operational use. The NGAAW family of weapons will primarily be aimed at replacing the remaining CBU-105/107 stockpile, with potential to replace additional area weapons.

**Contractors:** Major Tool & Machine; Faxon Machining.

**First Flight:** 2020.

**IOC:** N/A.

**Active Variant:**

•NGAAW Increment I. Optionally GPS/INS-guided Improved Lethality Warhead area weapon based on the 500-lb class BLU-134/B.

•NGAAW Increment II. Optionally GPS/INS-guided 2,000-lb area weapon, based on the BLU-136/B.

**Dimensions:** Length approx. 12 ft (2,000-lb class with tail kit), diameter approx. 14.5 in.; length approx. 7.8 ft, diameter approx. 10.7 in. (500-lb class with tail kit).

**Performance:** Range up to 15 miles (based on JDAM guidance/ BLU-136 mass and form factor), 225+ ft effective radius (based on initial testing).

**Guidance:** GPS/INS.

**Warhead:** 2,000 lb high-fragmentation area-attack warhead with height-of-burst sensor (BLU-136/B); 500-lb fragmentation area-attack warhead (BLU-134/B).

**Integration:** N/A.

## PRECISION GUIDED WEAPONS



Airman 1st Class Jessi Monte

## GBU-10/12/49 PAVEWAY II

Air-to-surface guided munition

**Brief:** Paveway II is a laser-guided, free-fall bomb for use against surface targets at short to standoff range. The kit is a folding-wing version of the earlier fixed-wing Paveway I with seeker and reliability improvements. The recent Paveway II Plus adds a modernized, more precise guidance package. GBU-10 is the Paveway II seeker and tail kit mounted on a 2,000-lb general-purpose bomb and primarily used against nonhardened targets. It is, however, capable of penetration. The GBU-12 uses a 500-lb bomb body

and is primarily used against stationary armored targets. GBU-49 is also a 500-lb body but adds GPS guidance for all-weather precision delivery from 2,500 ft up to 40,000 ft. GBU-49 currently provides the F-35A an interim moving target capability until its Block 3F software is fully fielded. An F-35 dropped the weapon for the first time in a test at Eglin on Nov. 7, 2018, and operational testing was conducted at Nellis.

**Contractors:** Lockheed Martin; Raytheon.

**First Flight:** Early 1970s.

**IOC:** 1976.

**Active Variants:**

- GBU-10. Laser/GPS guided 2,000-lb bomb.
- GBU-12. Laser guided 500-lb bomb.
- GBU-16. Laser guided 1,000-lb bomb.
- GBU-49. Laser/GPS guided 500-lb bomb.

**Dimensions:** Span 5.5 ft, length approx. 14.8 ft, diameter 18 in (GBU-10); span 4.4 ft, length 10.8 ft, diameter 11-18 in (GBU-12/49).

**Performance:** CEP 29.7 ft, range 9.2 miles (GBU-10); CEP 29.7 ft, range about six miles (GBU-12/49).

**Guidance:** Semi-active laser.

**Warhead:** Mk 84 bomb 2,000 lb (GBU-10); Mk 82 500-lb blast/fragmentation bomb (GBU-12/49).

**Integration:** A-10, B-1B, B-52, F-15E, F-16C/D, F-35 (GBU-49), MQ-9.



Master Sgt. Carl Clegg

### GBU-24/28 PAVEWAY III

**Air-to-surface penetrating glide bomb**

**Brief:** Paveway III is a laser guided free-fall bomb for use against surface targets from medium standoff range. The third-generation laser guided seeker/tail kit package enables greater precision over Paveway II, and its high-lift airframe enables longer glide slopes for greater standoff employment. It can be dropped from low, medium, or high altitude and is effective against a broad range of high-value targets. GBU-24 is fitted to a 2,000-lb bomb body with a BLU-109 penetrating warhead. GBU-28 variants are large 5,000-lb class air-to-ground penetrators initially developed for use against Iraq's deeply buried, hardened C2 facilities. The GBU-28B adds GPS/INS guidance to the existing laser seeker for all-weather targeting. It entered production in 1999. The GBU-28C adds a more powerful penetrating BLU-122 warhead in addition to the enhanced guidance package. It entered production in 2005 and quantities are purchased as needed to replenish and maintain stockpiles. GBU-28 will eventually be replaced by the JDAM-based GBU-72 "A5K" penetrator currently under development.

**Contractor:** Raytheon.

**First Flight:** Early-1980s (GBU-24); Feb. 24, 1991 (GBU-28).

**IOC:** 1986 (GBU-24); 1991 (GBU-28).

**Active Variants:**

- GBU-24. Laser guided 2,000-lb penetrating bomb.
- GBU-28B/B. Laser/GPS/INS guided 5,000-lb penetrating bomb.
- GBU-28C/B. Laser/GPS/INS guided 5,000-lb improved penetrating bomb.

**Dimensions:** Span 6.7 ft, length 14.4 ft, diameter 18 in (GBU-24); length approx. 20 ft, diameter 15 in (GBU-28).

**Performance:** Range more than 11 miles (GBU-24); range more than 5.75 miles (GBU-28).

**Guidance:** Semi-active laser.

**Warhead:** BLU-109 2,000-lb bomb (GBU-24); BLU-113 or BLU-122 5,000-lb bombs (GBU-28).

**Integration:** B-52, F-15E, F-16C/D (GBU-24); B-2A, B-52, F-15E (GBU-28).



Airman Colleen Coulthard

### GBU-31/32/38 JOINT DIRECT ATTACK MUNITION (JDAM)

**Air-to-surface guided bomb**

**Brief:** JDAM is a GPS/INS-guided, autonomous, all-weather surface attack weapon. The joint USAF-Navy program upgrades the existing inventory of general-purpose bombs by adding a GPS/INS guidance kit for accurate all-weather attack from medium/high altitudes. The weapons acquire targeting information from the aircraft's avionics. After release, an inertial guidance kit directs the weapon aided by periodic GPS updates. JDAM seeker/tail kits can be mounted on general-purpose or penetrating warheads in each weight class. JDAM can also utilize the 500-lb carbon fiber-cased Very Low Collateral Damage Weapon (VLCDW) for sensitive targets. A JDAM kit is under development for the 5,000-lb BLU-113 penetrating weapon slated for integration and flight-testing on the F-15E. The Advanced 2,000-lb (A2K) BLU-137/B weapon is also being developed for integration onto the F-15E and B-2A. A2K will improve both precision and penetration to strike a wider variety of targets, eventually replacing the BLU-109 bunker buster. JDAM-class weapons are the most frequent air-to-ground munition expended in combat. USAF is procuring an upgraded tail kit with anti-jam receiver for use in GPS degraded conditions under an Urgent Operational Requirement. The service is also seeking to develop a lighter-weight successor class of weapons incorporating IR/GPS guidance, maneuvering wings, stealth, and EW capabilities. Testers are currently working to integrate the GBU-38 for operational use on the F-35. USAF tapered combat stockpile replenishment effort from 16,800 JDAMs enacted in FY21 to 1,919 weapons in FY22 reflecting a shift to advanced weapon procurement to confront future threats.

**Contractors:** Boeing; Textron; Honeywell.

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

**IOC:** 1998.

**Active Variants:**

- GBU-31. GPS/INS guided 2,000-lb GP, or BLU-109 penetrating weapon.
- GBU-32. GPS/INS guided 1,000-lb GP, or BLU-110 penetrating weapon.
- GBU-38. GPS/INS guided 500-lb GP, or BLU-111 penetrating weapon.

**Dimensions:** Span 25 in (GBU-31), 19.6 in (GBU-32), 14 in (GBU-38); length (with JDAM and warhead) approx 12 ft (GBU-31), 10 ft (GBU-32), 7.8 ft (GBU-38).

**Performance:** Range up to 15 miles, CEP with GPS 16.4 ft, CEP with INS only 98 ft.

**Guidance:** GPS/INS.

**Warhead:** 2,000-lb Mk 84/BLU-109 (GBU-31); 1,000-lb Mk 83/BLU-110 (GBU-32); 500-lb Mk 82/BLU-111 (GBU-38).

**Integration:** A-10C, B-52H, B-2A, B-1B, F-15E, F-16, F-22A, F-35A (GBU-31/32), and MQ-9.

### GBU-39 SMALL DIAMETER BOMB I

**Guided air-to-surface glide bomb**

**Brief:** SDB is a low-yield, all-weather precision guided munition designed to limit collateral damage and strike targets from up to 46 miles away. Experimentation began in 2001 in response to an ACC requirement for a miniaturized precision weapon. Boeing was selected to fully develop and produce the weapon in 2003 and low-rate initial production began in 2005. Its size allows it to be carried in fighter or bomber internal weapons bays or to increase overall loadout for more independent strikes per sortie. SDB I employs advanced anti-jam GPS/INS, and target coordinates are loaded on the ground or received from the aircraft before release. Several SDBs can be simultaneously released against multiple targets. The



Staff Sgt. Jordan Martin

weapon was first employed by an F-15E over Iraq in 2006. The Focused Lethality Munition (FLM) is a low collateral version employing a carbon fiber case to limit damage to structures. Laser SDB is capable of self-targeting as well as GPS-only modes and is equipped with a selectable height-of-burst fuse to tailor kinetic effects. Current production versions incorporate Strategic Anti-Jam Beam-forming Receiver (SABR-Y) for use in GPS-denied/degraded environments. USAF tapered combat stockpile replenishment from over 2,000 weapons in FY21 to a total of 988 weapons in FY22 reflecting a shift to advanced stand-off weapons to confront future threats.

**Contractor:** Boeing.  
**First Flight:** May 23, 2003.  
**IOC:** Oct. 2, 2006.  
**Production:** 24,000 (planned).  
**Active Variant:**

- GBU-39/B SDB I. GPS/INS guided 250-lb low-yield bomb.
- GBU-39A/B SDB I. GPS/INS guided Lethality Munition.
- GBU-39B/B SDB I. Semiactive laser/GPS guided 250-lb low-yield bomb.

**Dimensions:** Length 6 ft, width 7.5 in; BRU-61/A carriage (four bombs) length 12 ft, width 16 in, height 16 in.  
**Performance:** Near-precision capability at standoff range up to 46 miles.  
**Guidance:** GPS/INS.  
**Warhead:** 250-lb class penetrating and blast fragmentation munition.  
**Integration:** AC-130J, AC-130W, F-15E, F-16, F-22, F-35A. Planned: A-10, B-1, B-52, B-21, MQ-9.



Raytheon Missile and Defense

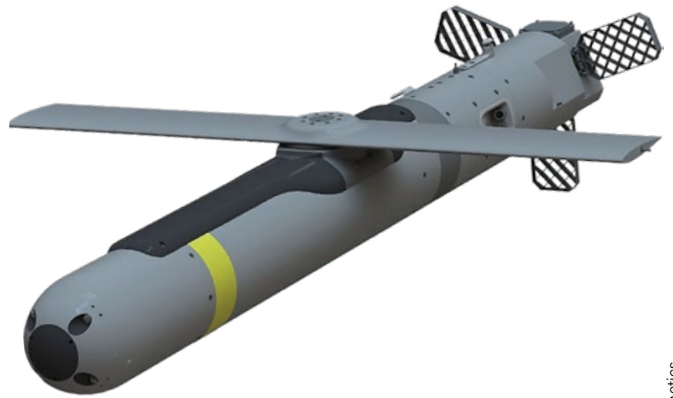
### GBU-53 STORMBREAKER (SMALL DIAMETER BOMB II)

Guided air-to-surface glide bomb

**Brief:** StormBreaker (formerly SDB II) is a joint USAF-Navy program to develop as a low-yield, precision guided munition capable of striking moving targets in all-weather from up to 46 miles away. Its size allows it to be carried in fighter or bomber internal weapons bays or to increase overall loadout to enable more independent strikes per sortie. Several StormBreakers can be simultaneously released against multiple targets. SDB II adds a millimeter-wave radar, imaging IR, and semi-active laser packaged into a tri-mode seeker. The bomb is retargetable after release. Improvements over SDB-I include reduced susceptibility to countermeasures and network-enablement through Link 16/UHF data links. LRIP production began in 2015 and USAF awarded the current production Lot 7 on 30 April 2021. SDB II began operational testing in June 2018 and achieved initial fielding on the F-15E Sept. 23, 2020. The fielding decision paves the way for IOC and testing is underway for follow-on fielding on

the F-35 and Navy F-18E/F Super Hornet. FY22 funding supports production of up to 985 SDB IIs.

**Contractor:** Raytheon.  
**First Flight:** 2012.  
**IOC:** 2019 (planned).  
**Production:** 12,000 (planned).  
**Active Variant:**  
 •GBU-53/B SDB II. Tri-mode guided 250-lb low-yield bomb.  
**Dimensions:** Bomb: length 5.75 ft, wingspan 5.6 ft, diameter 7 in.  
**Performance:** Near-precision capability at standoff range up to 46 miles.  
**Guidance:** Tri-mode seeker millimeter-wave radar, uncooled IIR, and digital semi-active laser.  
**Warhead:** 250-lb class penetrating blast fragmentation munition.  
**Integration:** F-15E. Planned: A-10, AC-130W/J, B-1, B-2, B-52, F-16, F-22, F-35, MQ-9.



Dynetics

### GBU-69 SMALL GLIDE MUNITION

Guided air-to-surface glide bomb

**Brief:** Small Glide Munition is a standoff precision guided munition specifically tailored to SOF mission requirements. Internally carried GBU-69/B were integrated onto the next-generation AC-103J gunship as part of Block 20+ upgrades following initial operational testing. USSOCOM is currently working to integrate the weapon onto RPA platforms including the MQ-9. The weapon is deployable from the AC-130J's ramp-mounted Common Launch Tubes or dropped conventionally. It is capable of quietly reaching targets from standoff range using its deployable wings to minimize risk to delivery platforms. The weapon utilizes semi-active laser and lattice-type control fins (similar to the GBU-57) for guidance and terminal stability, and is capable of receiving in-flight targeting updates via two-way data link. The weapon was jointly developed between Dynetics and USSOCOM. The company was awarded two contracts in FY18 totaling \$104 million for delivery of approximately 1,000 weapons through 2022. Procurement beyond FY21 decreased to align with future priorities such as Stand-Off Precision Guided Munitions (SOPGM) for use in contested environments.

**Contractors:** Dynetics.  
**First Flight:** Feb. 16, 2000 (USAF).  
**Delivered:** 2020-present.  
**IOC:** N/A.

**Active Variants:**  
 •GBU-69. Semi-active laser guided 36-lb low-yield bomb.  
**Dimensions:** Span 28 in, length 3.5 ft, diameter 4.5 in.  
**Propulsion:** None.  
**Performance:** Near-precision capability at standoff range of 20+ miles.  
**Guidance:** Semi-active laser.  
**Warhead:** 36-lb blast fragmentation.  
**Integration:** AC-130J; planned: MQ-9.

### GBU-72 ADVANCED 5,000-POUND PENETRATOR

Massive PGM

**Brief:** A5K is a GPS/INS-guided next-generation penetrating weapon for striking high-priority hardened and deeply buried targets. The GBU-72 comprises the BLU-138 5,000 lb-class weapon paired with a modified JDAM tail kit. The weapon is being developed as a more survivable, lethal,



Samuel King Jr./USAF

and affordable replacement to the current Paveway-III-based GBU-38. A5K's successful ground detonation test was the largest open-air "Arena" test ever conducted at Eglin and an F-15E successfully completed the first weapon release over the Eglin range July 23, 2021. The drop was the first of a three-flight test series and demonstrated both safe-separation from the aircraft and the JDAM tail kit's ability to guide the weapon. The developmental weapon will continue JDAM integration test flights and proceed to operational testing in 2022.

**Contractor:** Air Force Armament Directorate.

**First Flight:** Jul. 23, 2021.

**Delivered:** N/A.

**IOC:** N/A.

**Active Variants:**

•GBU-72. GPS/INS guided 5,000-lb BLU-138 penetrating weapon.

**Dimensions:** N/A.

**Propulsion:** None.

**Performance:** N/A.

**Guidance:** Semi-active laser.

**Warhead:** N/A.

**Integration:** Planned: F-15E.



USAF

## GBU-43 MASSIVE ORDNANCE AIR BLAST (MOAB) BOMB

Massive guided bomb

**Brief:** MOAB is the largest satellite-guided, air-delivered weapon ever employed. It is designed for use against large area targets, deeply buried targets, or targets in tunnels or caves. The conventional HE bomb is GPS guided, with fins and inertial gyro for pitch and roll. It was developed by the Air Force Research Laboratory Munitions Directorate at Eglin in only nine weeks to be available for the 2003 Iraq campaign. The weapon was designated Massive Ordnance Air Blast (MOAB) but is unofficially known as "Mother of All Bombs." The weapon is designed for deployment from the ramp of an MC-130 without a parachute. A total of 18,700 lb of the weapon's 21,000-lb weight is attributed to BLU-120/B warhead. It was used operationally for the first time in April 2017 against an ISIS-occupied cave complex in Afghanistan.

**Contractors:** AFRL; Dynetics.

**First Flight:** March 11, 2003.

**IOC:** April 2003.

**Active Variant:**

•GBU-43/B. GPS guided 21,000-lb bomb.

**Guidance:** GPS/INS.

**Warhead:** BLU-120/B 18,700-lb HE.

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

**Integration:** MC-130H.



Senior Airman Krista Rose

## GBU-54 LASER JOINT DIRECT ATTACK MUNITION (LJDAM)

Air-to-surface guided bomb

**Brief:** LJDAM is a GPS/INS guided, autonomous, all-weather attack weapon for use against fixed as well as moving ground and maritime targets. It is a joint USAF-Navy development that combines a laser guidance kit with the GPS/INS-based navigation of the existing GBU-38 JDAM. Laser JDAM made its combat debut in Iraq in August 2008. The current LJDAM is a dual-mode, 500-lb guided weapon capable of attacking moving targets with precision. It was developed as an urgent operational need, and testing was completed in less than 17 months. It was first delivered in May 2008 and deployed in combat in Iraq three months later. Boeing has also nearly completed development of the GBU-56 (2,000-lb) variant. The F-35 is currently undergoing tri-service testing to integrate the GBU-38/54 for operational use.

**Contractor:** Boeing.

**First Flight:** 2005.

**IOC:** 2008.

**Active Variant:**

•GBU-54 Laser JDAM. Laser/GPS/INS guided 500-lb GP, or BLU-111 penetrating weapon.

•GBU-56 Laser JDAM. Laser/GPS/INS guided 2,000-lb GP, or BLU-109 penetrating weapon.

**Dimensions:** Length 7.7 ft, diameter 17 in. (GBU-54); length 12.6 ft, diameter 25.3 in (GBU-56).

**Performance:** Range up to 15 miles (40 + miles with JDAM ER wing set).

**Guidance:** GPS/INS with laser.

**Warhead:** Mk 82/BLU-111/BLU-126/BLU-129 500-lb munition (GBU-54); Mk 84/BLU-117/BLU-109/BLU-116 2,000-lb munition (GBU-56).

**Integration:** F-15E, F-16. Planned: F-35, B-1B (GBU-56).

## GBU-57 MASSIVE ORDNANCE PENETRATOR

Massive PGM

**Brief:** MOP is a GPS-guided, earth-penetrating strike weapon for use against hardened and deeply buried targets. It was developed and tested through a USAF and Defense Threat Reduction Agency partnership in 2004 and is now managed by AFGSC. Flight-testing was conducted from 2008 to 2010 when the program transitioned to USAF. A B-2 successfully test-dropped the GBU-57 in 2014, 2015, and 2016. Several B-2s completed a total of four test drops at White Sands Missile Range, N.M., in 2017 validating the effectiveness of mods made under the Enhanced Threat Response IV upgrade. MOP proved effective, clearing the way for potential early fielding, though the Air Force's recommendation was classified. The service is currently testing the Large Penetrator Smart Fuse (LPSF) to increase precision and lethality, though delays constructing representative





59th Bomb Wing

test targets have pushed potential fielding of the upgrade to FY25 or beyond. A B-2 employed an LPSF-equipped weapon against a tunnel test target in 2020 to validate the design, followed by a performance test drop in August 2021. FY22 funds

jam-resistant GPS for operations against advanced A2/AD targets as well as an undisclosed number of additional MOP.

**Contractor:** Boeing.

**First Flight:** Classified.

**IOC:** 2011.

**Operator:** AFGSC.

**Active Variant:**

•GBU-57B. GPS-guided 30,000-lb penetrating weapon.

**Guidance:** GPS.

**Warhead:** 5,740-lb HE.

**Dimensions:** Length 20.5 ft, diameter 31.5 in.

**Integration:** B-2A (tests also conducted on the B-52).

## SATELLITE SYSTEMS



USAF

### ADVANCED EXTREMELY HIGH FREQUENCY (AEHF) SATELLITE SYSTEM

#### Communications

**Brief:** AEHF provides global, secure, protected, and jam-resistant military communications. It enhances the previous Milstar satellites and operates at a much higher capacity and data rate. It offers secure, anti-jam tactical and strategic communications around the world. AEHF uses cross-linked satellites, eliminating the need for ground relay stations. The program is a collaboration with Australia, Canada, the Netherlands, and the United Kingdom. Launch of SV-4 was originally slated for Oct. 17, 2017, but an issue with the system's power regulator prompted USAF to delay launch a year to enable a hardware fix. SV-4 launched on Oct. 17, 2018, paving the way for full operational capability declared when the vehicle joined the constellation operationally on May 3, 2019. SV-5 launched Aug. 8, 2019, after a several-month delay due to its launch vehicle, and SV-6 launched from Cape Canaveral on March 26, 2020, marking the newly formed USSF's first launch. SV-6 became operational after completing on-orbit checks on Aug. 22, 2020, completing the constellation. USSF completed the fourth of five planned incremental software upgrades to the mission planning element in May 2021. The final increment is planned for late 2022. USSF plans to begin replacing AEHF with the next-generation Evolved Strategic SATCOM (ESS) starting in the early 2030s.

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

**Operator/Location:** USSF SpOC; Schriever SFB, Colo.

**First Launch:** August 2010.

**IOC:** 2015.

**Design Life:** 14 yrs. Launch Vehicle: Atlas V.

**Launch Vehicle:** Atlas V.

**Constellation:** Six.

**Active Satellites:**

•AEHF SV-1. Launched in 2010, on orbit and operational.

•AEHF SV-2. Launched in 2012, on orbit and operational.

•AEHF SV-3. Launched in 2013, on orbit and operational.

•AEHF SV-4. Launched in 2018, on orbit and operational.

•AEHF SV-5. Launched in 2019, on orbit and operational.

•AEHF SV-6. Launched in 2020, on orbit and operational.

**Dimensions:** Length 31 ft, width 98 ft (with full solar array extension).

**Weight:** 13,400 lb.

**Performance:** 24-hr low, medium, and extended data rate connectivity from 65 north to 65 south-latitude worldwide.

**Orbit Altitude:** Geosynchronous at 22,000+ miles.

**Power:** Solar arrays generating 20,000 watts.



USAF

### DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP)

#### Space and Earth environmental data collection

**Brief:** DMSP is tasked with environmental data collection for worldwide, military weather forecasting. It provides timely and high-quality weather information to strategic and tactical combat units worldwide. DMSP uses an operational line scan sensor to image cloud cover in visible and thermal IR and analyze cloud patterns. It is equipped with microwave imagers and sounders and a suite of space environment sensors that provide critical land, sea, and space environment data. Block 5D-3 improved spacecraft bus and sensors for longer and more capable missions. Six operational DMSP satellites now survey the entire Earth four times a day. The oldest operational satellite, DMSP-13, suffered an apparent electrical short and exploded, creating a cloud of debris in space in 2015. DMSP-19 most recently launched in 2014. The vehicle subsequently suffered a power failure in early 2016, rendering it uncontrollable. Data from the craft remains usable until its orbit decays. Congress canceled the DMSP program before the final spacecraft (DMSP-20) could be launched. DMSP-20 was stored, awaiting a launch decision to replace DMSP-19. DMSP-17 ultimately assumed the failed satellite's coverage, and DMSP-20 went on permanent display at Los Angeles AFB, Calif. DMSP-14, the last operational Block 5D-2 satellite, was decommissioned Feb. 11, 2020, after 22 years of service. USAF awarded Ball Aerospace a \$255.4 million development contract for the Weather System Follow-On-Microwave (WSF-M) in November 2018, to partially replace DMSP starting in FY24. WSM-M will measure oceanic winds and precipitation and space weather, while a notional second constellation with optical/IR sensors would augment to monitor cloud cover and other conditions. USSF estimates the constellation will reach the end of its useful life between 2023 and 2026.

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

**Operator/Location:** National Oceanic and Atmospheric Administration; NOAA Operations Facility, Suitland, Md.

**First Launch:** May 23, 1962.

**IOC:** 1965.

**Design Life:** Five yrs (Block 5D-3).

**Launch Vehicle:** Delta IV; Atlas V.

**Constellation:** Four low-Earth orbit (LEO).

**Active Satellites:**

•Block 5D-3. Improved spacecraft bus and sensors for longer, more capable missions.

**Dimensions:** Length 25 ft (with array deployed), width 4 ft.

**Weight:** 2,545 lb, incl 772-lb sensor; 2,270 lb with 592-lb sensor payload.

**Performance:** Polar orbits; covers Earth in about 6 hr; primary sensor scans 1,800-mile-wide area.

**Orbit Altitude:** Approx 527 miles.

**Power:** Solar arrays generating 1,200-1,300 watts.

### DEFENSE SATELLITE COMMUNICATIONS SYSTEM (DSCS)

#### Communications

**Brief:** DSCS provides high-priority wartime and strategic SHF communications between high-level leadership and deployed forces and ships worldwide. Satellites enable high-data rate, secure, nuclear-hardened, jam-resistant military comms. In addition to joint service command and control, interagency users include the National Command Authority, White



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House Communications Agency, and Diplomatic Telecommunications Service. The last of 14 DSCS IIIs launched in 2003. AFSPC inactivated its two oldest DSCS satellites, B-12 in July 2014 and DSCS-10 in June 2015, B-12 having exceeded its designed life span by 12 years. The final four DSCS satellites received SLEP before launch, providing higher-power amplifiers, more sensitive receivers, and increased antenna connection options. The satellites also carry a single channel transponder to disseminate emergency action and force direction messages to nuclear-capable forces. WGS began augmenting DSCS in 2007 and will gradually replace the constellation.

**Contractor:** Lockheed Martin.  
**Operator/Location:** USSF SpOC; Schriever SFB, Colo.  
**First Launch:** DSCS II 1971; DSCS III 1982; DSCS III/SLEP 2000.  
**IOC:** Dec. 13, 1978 (DSCS II).  
**Design Life:** 10 yr (III).  
**Launch Vehicle:** Atlas II, NSSL, Space Shuttle Atlantis (two satellites, 1985).  
**Constellation:** Six (III); 14 deployed/six operational.  
**Active Satellites:**  
 •DSCS III. Current base on-orbit variant.  
 •DSCS III. SLEP. Upgrade configuration of last four satellites launched.  
**Dimensions:** Rectangular body 6 x 6 x 7 ft, 38-ft span with solar arrays deployed.  
**Weight:** 2,580 lb; 2,716 lb (SLEP).  
**Performance:** Employs six independent SHF transponder channels for secure voice and high-rate data communications.  
**Orbit Altitude:** 22,000+ miles in geosynchronous orbit.  
**Power:** Solar arrays generating 1,269 watts, decreasing to 980 watts after 10 yr; 1,500 watts (SLEP).



DOD

## DEFENSE SUPPORT PROGRAM (DSP)

Strategic and tactical launch detection

**Brief:** DSP provides ballistic missile early warning and is a key part of North American and theater early warning systems. It is capable of detecting missile launches and nuclear detonations and was initially meant to watch the Soviet military. It was used extensively in the 1991 Gulf War to detect Iraqi theater missile launches against coalition forces and allies in the region. The 23rd and final DSP satellite launched in December 2007 but malfunctioned and began drifting outside its intended orbit in 2008. Block 5 is the latest variant and is more survivable than predecessors. It includes a medium wavelength IR sensor for more mission utility and accommodates 6,000 detectors. Nine Block 5 satellites were deployed between 1989 and 2007. Control of the constellation was consolidated to the new Block 10 Mission Control Station at Buckley in early 2016. SBIRS is integrated with DSP, augments its role, and is designed to eventually

replace the constellation on orbit. The constellations jointly enabled early detection of ballistic missiles launched by Iran against U.S. forces at Al Asad AB, Iraq, on Jan. 7, 2020, minimizing casualties.

**Contractors:** Northrop Grumman (formerly TRW); Aerojet.  
**Operator/Location:** USSF SpOC; Buckley SFB, Colo.  
**First Launch:** November 1970.  
**IOC:** Circa 1972.  
**Design Life:** Three-year requirement and five-year goal.  
**Launch Vehicle:** Titan IV with inertial upper stage; Delta IV Heavy NSSL.  
**Constellation:** 23 deployed/five operational.  
**Active Satellites:**  
 •DSP-18. Launched in 1997, on orbit and operational.  
 •DSP-19. Launched in 1999, on orbit and operational.  
 •DSP-20. Launched in 2000, on orbit and operational.  
 •DSP-21. Launched in 2001, on orbit and operational.  
 •DSP-22. Launched in 2004, on orbit and operational.  
 •DSP-23. Launched in 2007, on orbit and non-operational.  
**Dimensions:** Diameter 22 ft, height 32.8 ft, with paddles deployed.  
**Weight:** Approx 5,200 lb.  
**Performance:** Uses IR sensors to sense heat from missile and booster plumes against Earth's background.  
**Orbit Altitude:** Geosynchronous at 22,000+ miles.  
**Power:** Solar arrays generating 1,485 watts.



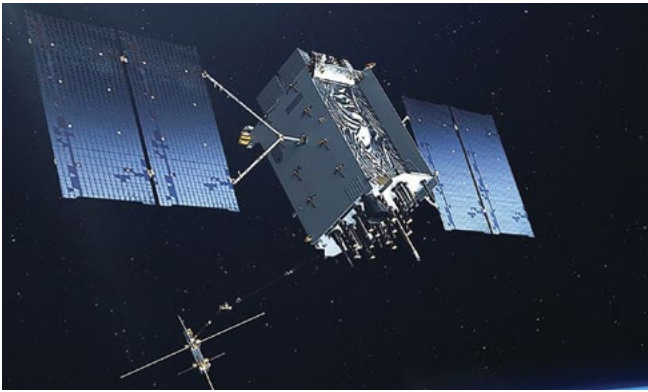
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## GEOSYNCHRONOUS SPACE SITUATIONAL AWARENESS PROGRAM (GSSAP)

Situational awareness/orbital tracking

**Brief:** GSSAP supplies space-based tracking and characterization of manmade objects in geosynchronous orbit, aiding safety and enabling avoidance. They are the "neighborhood watch" satellites augmenting the legacy Space Based Space Surveillance (SBSS) system. SBSS tracks and classifies manmade objects in low-Earth orbit and GSSAP extends this coverage to geosynchronous orbit. The satellites themselves operate in near-geosynchronous orbit to effectively monitor objects and aid in preventing collisions in space. GSSAP carries EO/IR sensors and are able to maneuver to observe objects at close range. They can track objects without the weather and atmospheric disruptions that affect ground-based systems. Two GSSAP satellites were launched in 2014 and attained IOC in 2015. Two more replenishment satellites launched Aug. 19, 2016, and became operational Sept. 12, 2017. USSF completed a significant overhaul and upgrade of the GSSAP ground system software to enhance the reliability, speed, and security of the system in February 2020. The upgrades also pave the way for future expansion of the constellation. The fifth and sixth sensors successfully launched aboard the USSF-8 mission from Cape Canaveral on Jan. 21, 2022.

**Contractor:** Northrop Grumman Space Systems (formerly Orbital ATK).  
**Operator/Location:** USSF SpOC; Schriever SFB, Colo.  
**First Launch:** July 28, 2014.  
**IOC:** Sept. 29, 2015.  
**Launch Vehicle:** Delta IV, Atlas V (USSF-8).  
**Constellation:** Four spacecraft.  
**Active Satellites:**  
 •GSSAP 1. Launched in 2014; on orbit, active.  
 •GSSAP 2. Launched in 2014, on orbit, active.  
 •GSSAP 3. Launched in 2016, on orbit, active.  
 •GSSAP 4. Launched in 2016, on orbit, active.  
 •GSSAP 5. Launched in 2022, on orbit, active.  
 •GSSAP 6. Launched in 2022, on orbit, active.  
**Orbit Altitude:** 22,300 miles, above geosynchronous.  
**Power:** Solar panels.



Courtesy



USAF

## GLOBAL POSITIONING SYSTEM (GPS)

Worldwide navigation, timing, and velocity data

**Brief:** GPS supplies space-based military and civil radio-positioning for geolocation, navigation, and timing. It is a fundamental enabler of precision bombing, CSAR, mapping, and rendezvous. It provides accurate and uninterrupted 3D (latitude, longitude, and altitude) position, velocity, and time data. The last of the GPS Block IIA satellites, launched between 1990 and 1997 was decommissioned in 2020. GPS Block IIR and IIR-M (modernized) included 21 vehicles launched between 2005 and 2009. Modernization upgrades included two new signals, enhanced encryption, anti-jamming capabilities, and a second civil signal. GPS Block IIF is a follow-on to IIR-M. Upgrades include extended design life, faster processors, and improved anti-jam and accuracy, a new military signal, and a second and third dedicated civil signal. The GPS Block IIIA, first launched on Dec. 23, 2018, has improved accuracy, availability, integrity, and incorporates a steerable, high-power, anti-jam capability. Lockheed Martin is under contract to build the final Block IIIA vehicles (nine and 10) for launch in 2022 and was awarded a follow-on for two Block IIIF vehicles (11 and 12) as well as up to 22 additional vehicles in 2018. Block IIIF adds a hosted search and rescue payload, as well as geographically targetable high-power military signal. FY22 funds procurement of two IIIF vehicles. The third IIIA launched in 2020, was the first boosted by a SpaceX Falcon 9, and a fifth launched June 17, 2021, was the first National Security Space Launch to recycle a previously used booster. GPS III vehicles six through eight are awaiting launch, and the first IIIF is slated to be launch-ready by 2026.

**Contractors:** Boeing (IIF); Lockheed Martin (IIR, IIR-M, III/IIIF).

**Operator/Location:** USSF SpOC; Schriever SFB, Colo.

**First Launch:** Feb. 22, 1978.

**IOC:** Dec. 9, 1993.

**Design Life:** 7.5 yr (IIR/IIR-M); 12 yr (IIF); 15 yr (IIIA).

**Launch Vehicle:** Delta II, Delta IV, Falcon 9.

**Constellation:** 30 spacecraft (not including decommissioned or on-orbit spares).

**Active Satellites:**

- GPS Block IIR. Launched 1997 to 2004; seven active.
- GPS Block IIR-M. Launched in 2005 to 2009; seven active.
- GPS Block IIF. Launched in 2010 to 2016; 12 active.
- GPS Block IIIA/IIIF. New generation launched in 2018; four active.

**Dimensions:** (IIR/IIR-M) 5 x 6.3 x 6.25 ft, span incl solar panels 38 ft; (IIF) 9.6 x 6.5 x 12.9 ft, span incl solar panels 43.1 ft.

**Weight:** On orbit, 2,370 lb (IIR/IIR-M); 3,439 lb (IIF).

**Performance:** Orbits the Earth every 12 hr, emitting continuous signals, providing time to within one-millionth of a second, velocity within a fraction of a mile per hour, and location to within a few feet.

**Orbit Altitude:** 10,988 miles.

**Power:** Solar panels generating 1,136 watts (IIR/IIR-M); up to 2,900 watts (IIF).

## MILSTAR SATELLITE COMMUNICATIONS SYSTEM (MILSTAR)

Communications

**Brief:** Milstar is the joint-service backbone of strategic/tactical DOD communications. It provides encrypted, secure, anti-jam communications around the world and uses cross-linked satellites, eliminating the need for ground relay stations. Block I satellites incorporate a low data rate payload capable of transmitting 75 to 2,400 bps over 192 EHF channels. Block II satellites carry both the low data rate payload and a medium data rate payload capable of transmitting 4,800 bps to 1.5 Mbps over 32

channels, allowing larger data to be passed more quickly. Interoperable terminals allow third-party land/sea-based units to upload data in real time to cruise missiles or other compatible weapons. Milstar provides continuous coverage between 65 degrees north and 65 degrees south latitude. The systems utilize multiple-redundant command and control for high survivability. The last of six satellites launched in 2003 and was augmented by the sixth and final AEHF satellite in 2020. AEHF now supplants Milstar as DOD's primary system in the combined, fully back-compatible AEHF-Milstar constellation.

**Contractors:** Lockheed Martin; Boeing; Northrop Grumman (formerly TRW).

**Operator/Location:** USSF SpOC; Schriever SFB, Colo.

**First Launch:** Feb. 7, 1994.

**IOC:** July 1997 (Milstar I).

**Design Life:** 10 yr.

**Launch Vehicle:** Titan IV/Centaur.

**Constellation:** Five: two Milstar I; three Milstar II.

**Active Satellites:**

•Block I. Milstar I satellites launched 1994-95.

•Block II. Milstar II satellites launched 1999-2003.

**Dimensions:** Length 51 ft, width 116 ft with full solar array extension.

**Weight:** 10,000 lb.

**Performance:** Milstar I low data rate (LDR) payload transmitting 75 to 2,500 bps of data over 192 channels of EHF; Milstar II LDR and medium data rate (MDR) payloads, transmitting 4,800 bps to 1.5 Mbps over 32 channels.

**Orbit Altitude:** Geosynchronous at 22,000+ miles.

**Power:** Solar arrays generating 8,000 watts.



Lockheed Martin

## SPACE BASED INFRARED SYSTEM (SBIRS)

Space-based surveillance/missile warning

**Brief:** SBIRS provides advanced space surveillance and missile warning, battlespace characterization, and technical intelligence gathering. It is the follow-on to the Defense Support Program satellite. The system includes IR sensor payloads on host satellites in highly elliptical orbit (HEO), two IR sensors each on dedicated satellites in geosynchronous Earth orbit (GEO), and ground assets. The HEO sensor detects launch of submarine-launched ballistic missiles (SLBMs) from the North Pole region and can be tasked for other IR detection missions. GEO scanning IR sensor performs the strategic missile warning mission, global technical intelligence, and initial phase for the strategic missile defense mission, providing two times the revisit rate and three times the sensitivity of DSP. USAF announced plans to allow civil use of SBIRS data to aid weather prediction, Arctic ice monitoring, and wildfire tracking. GEO-3 launched into orbit Jan. 20, 2017, after delays to validate the performance of its liquid apogee engine. GEO-4 launched on Jan. 19, 2018. GEO-5 and GEO-6 are based on a modernized spacecraft and will replace the oldest two on orbit. They will also begin migrating ground control to the next-generation Enterprise Ground

Service (EGS) aimed at consolidating control of multiple satellite systems. USSF also awarded Raytheon a \$197 million contract in 2020 to modernize ground data processing. USAF canceled the final two GEO satellites and shifted funds to develop the Next-Generation Overhead Persistent Infrared (OPIR) system. USAF awarded Lockheed Martin an initial design contract in 2018, and the constellation will comprise three GEO satellites and two polar HEO sensors. The company was awarded a \$4.8 billion follow-on contract for the GEO satellites on Jan. 4, 2021. Delivery of the first OPIR GEO satellite is slated for FY25 followed by the first HEO sensor in FY28. The fifth SBIRS GEO satellite (GEO-5) successfully blasted off from Cape Canaveral on May 18, 2021, and GEO-6 is awaiting launch targeted for the first half of 2022.

**Contractors:** Lockheed Martin (prime contractor); Northrop Grumman (payload); Raytheon (data processing modernization).

**Operator/Location:** USSF SpOC; Buckley SFB, Colo.

**First Launch:** GEO 1, May 2011.

**IOC:** HEO 1, Dec. 5, 2008. (Increment 1, Dec. 8, 2001).

**Launch Vehicle:** Atlas V (GEO). Planned: Delta, Falcon 9.

**Constellation:** Five GEO sats, two HEO sensors and two HEO on-orbit reserve (hosted).

**Active Satellites/Payloads:**

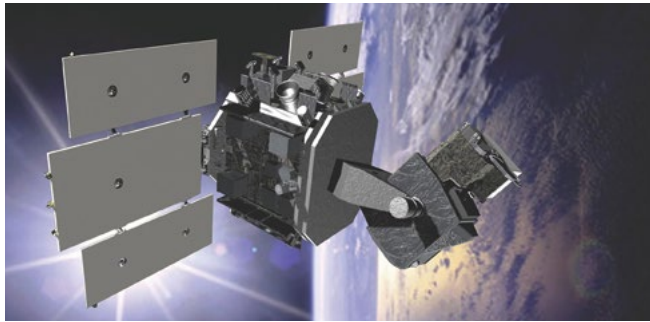
- SBIRS HEO-1. Payload operational in 2008; on-orbit reserve.
- SBIRS HEO-2. Payload operational in 2009; on-orbit reserve.
- SBIRS HEO-3. Payload operational in 2015; active.
- SBIRS HEO-4. Payload operational in 2017; active.
- SBIRS GEO-1. Launched in 2011; active.
- SBIRS GEO-2. Launched in 2013; active.
- SBIRS GEO-3. Launched in 2017; active.
- SBIRS GEO-4. Launched in 2018; active.
- SBIRS GEO-5. Launched in 2021; active.

**Dimensions:** 49 x 22 x 20 ft (GEO on orbit); 7 x 4 x 3 ft (HEO sensor).

**Weight:** 5,525 lb (GEO on orbit).

**Orbit Altitude:** Geosynchronous (GEO satellites) and highly elliptical (HEO sensors).

**Power:** Solar array, 2,435 watts (GEO), batteries.



Boeing

**SPACE BASED SPACE SURVEILLANCE (SBSS)**

**Orbital surveillance and object identification**

**Brief:** SBSS is designed to track, characterize, measure, and collect optical signatures of Earth-orbiting objects, including space vehicles and debris. The Missile Defense Agency originally launched SBSS as a technology demonstrator to classify and track ballistic missiles in mid-course flight, before handing it over to AFSPC in 2011. SBSS primarily uses a trainable, ground-controlled Space-Based Visible Sensor to track targets without repositioning. Potential high-end and even kinetic space threats from China and Russia have pushed orbital domain awareness to the top of AFSPC's priority list. AFSPC worked to extend SBSS service life and tasked one of its experimental Operationally Responsive Space satellites to cover a four-year gap in coverage until the newly established Space Force can launch a follow-on spacecraft now targeted for 2022. ORS-5 launched Aug. 26, 2017, and is equipped with an optical sensor to provide rapid, continuous scanning to detect movement in geosynchronous orbit. The Space Force is seeking funds for a follow-on satellite to ORS-5 to enhance surveillance. SBSS works in concert with an array of networked, ground-based sensors including the Space Fence wide-area search and surveillance system recently commissioned on Kwajalein Atoll in the Marshall Islands. SBSS collision-warning data was made openly available to the public in 2020 to improve domain awareness and orbital safety, and USSF is considering handing-off operations to a contracted service provider.

**Contractors:** Boeing (system integration, ground segment, operations,

and sustainment); Ball Aerospace (satellite); Orbital ATK (ORS-5).

**Operator/Location:** USSF SpOC; Schriever SFB, Colo.

**First Launch:** Sept. 25, 2010.

**IOC:** Aug. 17, 2012 (SBSS); May 31, 2018 (ORS-5).

**Design Life:** Seven yr.

**Launch Vehicle:** Minotaur IV.

**Constellation:** One LEO satellite; one LEO augmentation satellite.

**Active Satellites:**

- SBSS Block 10. Launched in 2010; active.
- ORS-5. Experimental satellite launched in 2017 to augment SBSS; active.

**Dimensions:** Height approx 49 ft; 22ft x 20 ft (SBSS on-orbit); 5 ft x 2.5 ft (ORS-5).

**Weight:** Approx 5,525 lb (SBSS on orbit); approx 250 lbs (ORS-5).

**Orbit Altitude:** 390 miles, sun-synchronous orbit (SBSS); 372 miles, geosynchronous orbit (ORS-5).

**Power:** Solar arrays and batteries generating 750 watts (SBSS); solar array and batteries (ORS-5).

**WIDEBAND GLOBAL SATCOM (WGS) SATELLITE**

**Communications**



Courtesy

**Brief:** WGS provides worldwide, high-capacity communications for deployed air, land, and sea forces. The system is designed to augment and then replace DSCS X-band frequency service. It also augments the one-way Global Broadcast Service Joint Program Ka-band frequency capabilities and provides a new high-capacity, two-way Ka-band frequency service. Block I includes: SV-1 (Pacific region), SV-2 (Middle East), and SV-3 (Europe and Africa). Block II satellites are modified to better support the airborne ISR mission and include: SV-4 (Indian Ocean) and SV-5 and SV-6, purchased by Australia in 2013. The U.S. is partnering with Canada, Denmark, Luxembourg, the Netherlands, and New Zealand on Block II follow-on satellites SV-7 to SV-10. The Space and Missile Systems

center recently conducted tests to field anti-jamming capability for SV-1 through SV-10 starting in 2022. Congress added funds beyond USAF's FY18 request to procure the 11th and 12th satellites, but USSF opted for the single, modernized WGS-11+ platform. USSF issued Boeing a \$20.6 million contract modification for the design and launch of WGS-11+ on June 21, 2021. The satellite will offer roughly twice the capability, in addition to stronger, more reliable coverage and is tentatively slated for completion in 2024. USSF is seeking to develop and field a WGS follow-on system and potentially lease commercial SATCOM in the interim.

**Contractor:** Boeing.

**Operator/Location:** USSF SpOC; Schriever SFB, Colo.

**First Launch:** October 2007.

**IOC:** April 16, 2008.

**Design Life:** 14 yr.

**Launch Vehicle:** Atlas V, Delta IV.

**Constellation:** 10 satellites.

**Active Satellites:**

- SV-1. Block I, launched in 2007; active.
- SV-2. Block I, launched in 2009; active.
- SV-3. Block I, launched in 2009; active.
- SV-4. Block II, launched in 2009; active.
- SV-5. Block II, launched in 2013; active.
- SV-6. Block II, launched in 2013; active.
- SV-7. Block II follow-on, launched in 2015; active.
- SV-8. Block II follow-on, launched in 2016; active.
- SV-9. Block II follow-on, launched in 2017; active.
- SV-10. Block II follow-on, launched in 2019; active.

**Dimensions:** Based on Boeing 702 Bus.

**Weight:** 13,000 lb at launch.

**Performance:** Approx 10 times the capability of a DSCS satellite.

**Orbit Altitude:** Geosynchronous at 22,000+ miles.

**Power:** Solar arrays generating 9,934 watts.

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