USAF & USSF ALMANAC 2024

WEAPONS & PLATFORMS

By Aaron M. U. Church

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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 program cancellation 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, but reducing speed 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 fleet completed its most comprehensive upgrade to date in September 2020. The three-part Integrated Battle Station (IBS) program added an all-digital glass cockpit, Fully Integrated Data Link (FIDL) to enhance targeting/LOS/BLOS C2, and a Central Integrated Test System (CITS) for real-time simplified troubleshooting. The fleet is also undergoing Multifunctional Information Distribution System/Joint Tactical Radio System (MIDS/JTRS) data link modernization to improve situational awareness and retargeting abilities, as well as BLOS cryptography updates to 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 hypersonic missiles 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. The Load Adaptable Modular (LAM) pylon system currently in testing would enable carriage of large stores such as the AGM-183 ARRW or future hypersonic weapons. AFGSC retired 17 of the least serviceable airframes in FY21 but is regenerating a previously stored aircraft to replace one damaged beyond repair in a ground fire at Dyess in 2022. Another B-1B was severely damaged in a landing accident at Ellsworth Jan. 4, 2023, though all four crew members safely ejected. Recent retirements increased the fleet's mission capable rate, and USAF plans to keep enough B-1Bs to maintain 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 (farther 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 low observability (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. Modernization is focused on safeguarding the B-2A's penetrating strike capability in high-end threat environments and integrating advanced weapons. Recent upgrades significantly enhance the B-2's ability to deliver precision nuclear and conventional weapons under GPS-denied or degraded conditions. The aircraft is now capable of using radar to supply targeting data, or by feeding coordinates to weapons pre-release to thwart jamming. A B-2A successfully employed the longer-range JASSM-ER cruise

Airman First Class Ivy Thomas/ANG

missile in a test launch last December, clearing the way for full integration. Ongoing efforts include Advanced Communications upgrades to provide Mobile User Objective System (MUOS) secure, jam-resistant SATCOM and NATO-interoperable SATURN UHF/VHF as well as Link 16-based in-flight retasking, replacing the primary cockpit displays, advanced IFF, and weapons integration. These upgrades collectively shift the B-2 to an easily upgradable open-system architecture to keep pace with emerging threats. USAF is also working to enhance the fleet's maintainability with LO signature improvements to coatings, materials, and radar-absorptive structures such as the radome and engine inlets/exhausts. The fleet returned to flight in May 2023 following a six-month fleetwide stand-down in the wake of a pair of landing accidents in 2021 and 2023, which severely damaged two aircraft. USAF plans to retire the fleet once the B-21 Raider enters service in sufficient numbers around 2032.

Contractors: Northrop Grumman; Boeing; Vought; Sierra Nevada (ACS).
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 (farther 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 JASSM/JASSM-ERs, or eight GBU-28 LGBs.
Accommodation: Two pilots on ACES II zero/zero ejection seats.

Edwards Air Force Base/Facebook

B-21 RAIDER

Long-range heavy bomber

Brief: The B-21 Raider is a developmental, penetrating strike bomber planned to deliver both conventional and nuclear munitions. The low-observable flying-wing design was christened "Raider" in honor of the WWII Doolittle Raiders, who mounted the surprise attack on Japan in April 1942. Though similar in shape to the B-2, the B-21 features more deeply recessed engine inlets, dual-wheel main-landing gear, unique trapezoidal windscreens, and more advanced low-observable designs. The Air Force awarded Northrop Grumman the Long-Range Strike Bomber contract in 2015, aimed at developing an affordable, next-generation stealth bomber utilizing modern systems and materials. The type is the Air Force's first new bomber design since the B-2 Spirit, introduced in 1988, and is planned to become the mainstay of the strategic fleet alongside the modernized B-52J. USAF is developing the B-21 as part of a "family of systems" encompassing complementary ISR, C2, and electronic warfare platforms and capabilities designed for survivability in high-end threat environments. Northrop Grumman is using digital design techniques to quickly incorporate changes and speed fielding, as well as an open-system architecture to easily enable future upgrades and modernization. Notional nuclear armament includes the planned Long-Range Standoff (LRSO) missile and B61-12 guided free-fall weapons, as well as a range of advanced conventional weapons. AFGSC plans to acquire a fleet of at least 100 B-21s would be delivered starting in the mid-2020s. Concurrent development and low-rate initial production aim to accelerate fielding, starting with the first LRIP contract awarded in late 2023. LRIP will notionally include 21 aircraft over five lots, followed by full-rate production as soon as FY25. At least six airframes are in production at Northrop Grumman's Palmdale, Calif., facility where the initial aircraft was unveiled to the public in December 2022. The first aircraft completed ground testing and taxi trials at Palmdale, before making the type's first flight on Nov. 10, 2023, en route to Edwards. The aircraft, dubbed "Cerberus," launched flight-testing there on Jan. 17, 2024, and will continue development and flight-testing. Initial operational aircraft will be delivered to AFGSC's formal training and operational units at Ellsworth, followed by Whiteman and Dyess.

Contractors: Northrop Grumman (aircraft); Pratt & Whitney (engines); Collins Aerospace; GKN Aerospace; BAE Systems; Spirit Aerosystems; Janicki Industries (advanced structures).
First Flight: Nov. 10, 2023.
Delivered: Nov. 10, 2023-present.
IOC: Unknown
Production: ≥100 (projected).
Inventory: One.
Operator: AFMC. Planned: AFGSC.
Aircraft Location: Edwards AFB, Calif. (test location); Planned: Ellsworth AFB, N.D.; Whiteman AFB, Mo.; Dyess AFB, Texas.
Active Variant:
▪B-21. Developmental Long-Range Strike Bomber.
Dimensions: Span 140 ft (estimated), length 55 ft (estimated), height 18 ft (estimated).
Weight: Max T-O unknown.
Power Plant: Undisclosed number of Pratt & Whitney engines.
Performance: Speed high-subsonic (estimated), range intercontinental.
Ceiling: Unknown.
Armament: Nuclear and conventional (planned).
Accommodation: Two pilots; autonomous control (planned).

Senior Airman Celeste Zuniga

B-52 STRATOFORTRESS

Long-range heavy bomber

Brief: The B-52H is a long-range nuclear/conventional bomber and USAF's primary standoff 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 (CONECT) recently replaced cockpit displays and comms and added integrated mission-management, including Link 16, and machine-to-machine tasking/ retargeting. It forms the digital backbone of the Internal Weapons Bay Upgrade transitioning the Conventional Rotary Launchers designed for CALCM to carry the modern AGM-158B JASSM-ER. This nearly doubles the B-52's payload of JASSM, JDAM, and MALD, while reducing drag and increasing range. CONECT also enables associated mods including Tactical Data Link to add low-latency, jam-resistant C2/comms, and GPS updates. USAF is pursuing both the Radar Modernization Program to replace the B-52's AN/APQ-166 with AESA and the Commercial Engine Replacement Program (CERP) to re-engine the fleet. CERP will replace the B-52's current engines with modern, efficient and reliable Rolls-Royce F130-200 turbofans in a modified pylon-mounted eight-engine arrangement. Re-engined aircraft will be redesignated B-52J and fleetwide retrofits are expected to be completed by 2038. AESA radar is planned for introduction in 2026, and future upgrades include VLF/LF receiver modernization, ATP color MFDs to enhance targeting and situational awareness, AEHF SATCOM installation, and crypto modernization. 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. B-52s have conducted at least nine successful LRSO test flights, culminating in a free-flight launch in October 2022.

Contractors: Boeing (airframe/CONECT); 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.
▪B-52J. Future modernized B-52H, retrofitted with more efficient Rolls-Royce F130-200 turbofans.
Dimensions: Span 185 ft, length 159.3 ft, height 40.7 ft.
Weight: Max T-O 488,000 lb.
Power Plant: 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. (Radar navigator position will be eliminated on the B-52J).

USAF

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 following current OFP Suite 11 the program will shift to more frequent rolling software upgrades. USAF did not request FY24 modernization funding, though FY23 supported replacing primary cockpit instruments with a high-resolution digital glass display, adding directional audio threat cueing, modernizing ARC-210 UHF/VHF comms, adding Ethernet, integrating Small Diameter Bomb I, and transition to Onboard Oxygen Generation Systems (OBOGS). Re-winging is key to the aircraft's longevity and extends airframe life to at least 10,000 hours. A total of 173 aircraft received new wingsets prior to modifications recommencing in 2022, and all remaining aircraft will be re-winged through FY26. Congress lifted its ban on A-10 divestitures in FY23, allowing the service to cut the Indiana ANG's 21 aircraft. The ANG announced Idaho's 124th Fighter Wing will follow suit in early 2027, and USAF plans to continue retirements in FY24. ACC plans to eliminate 42 A-10s from Davis-Monthan and Moody, eventually reducing the fleet to 218 upgraded aircraft which will fly through 2030 or beyond. USAF surged A-10 deployments to CENTCOM following Hamas terrorist attacks on Israel in October 2023, with units from Davis-Monthan augmenting aircraft deployed from Moody through the end of the year.

Contractors: Fairchild Republic (Lockheed Martin); Boeing/Korean Aerospace Industries (re-wing).
First Flight: Jan. 20, 2005 (A-10C).
Delivered: 2006-2012 (A-10C).
IOC: September 2007 (A-10C).
Production: 713.
Inventory: 261.
Operator: ACC, AFMC, PACAF, ANG, AFRC.
Aircraft Location: Boise Air Terminal, Idaho; Davis-Monthan AFB, Ariz.; Eglin AFB, Fla.; Martin State Arpt., Md.; Moody AFB, Ga.; Nellis AFB, Nev.; Osan AB, South Korea; Selfridge ANGB, 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 (farther 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.

Tyler Greenlees/USAF

F-15 EAGLE

Air superiority fighter

Brief: The F-15 Eagle was 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 in combat during 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 the Eagle Passive/ Active Warning Survivability System (EPAWSS) was cut after the decision to replace the fleet with new-build F-15EX. USAF also reduced the number of aircraft slated for MIDS/JTRS upgrades that add higher capacity, jam-resistant Link 16 and UHF SATCOM. Two-thirds of F-15C/D's 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 ending in FY24. USAF declared the Legion Pod initially operationally capable and fielded it on Kadena-based F-15s in 2022. Legion IRST gives the F-15 passive detection capability to enable long-range air-to-air engagement without exposing intent to adversary aircraft. USAF requested to cut 57 aircraft in FY24 ahead of replacement by the F-15EX. Kadena began F-15 drawdown in late 2022, and USAF is backfilling with rotational fighters until a final force-structure decision is made. An F-15D was severely damaged when it overran the runway at Klamath Falls on May 15, 2023.

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: 145 (F-15C); 12 (F-15D).
Operator: ACC, PACAF, ANG.
Aircraft Location: Barnes Arpt., Mass.; Fresno ANGB, Calif.; Jacksonville Arpt., Fla.; Kadena AB, Japan; Klamath Falls (Kingsley Field), Ore.; NAS JRB New Orleans, La.; Portland Arpt., Ore.
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; farther 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 ACESII zero/zero ejection seats.

USAF

F-15E STRIKE EAGLE

Multirole 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 a 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. The Strike Eagle is undergoing major avionics modernization centered on the new APG-82(V)1 AESA radar which will increase its lethality against more capable targets fleetwide in 2024. The Eagle Passive/Active Warning Survivability System (EPAWSS) is simultaneously replacing the Strike Eagle's obsolete self-defense suite to increase survivability in future high-threat environments. Supporting upgrades include color Large Area Digital (LAD) displays and processors to fully exploit AESA and EPAWSS' targeting and situational awareness improvements, and MIDS/JTRS to enable higher capacity, jam-resistant Link 16. F-15Es recently began transition to Mobile User Objective System (MUOS) secure, jam-resistant SATCOM and NATO-interoperable SATURN UHF. Boeing completed EPAWSS installation on the first two F-15Es in 2022 and launched operational testing in 2024 with the intent of fielding the capability as soon as 2025. Future enhancements include IRST to discreetly engage airborne targets, GPS hardening, and updated EW protection and warning. USAF recently announced plans to retire roughly half the F-15E fleet through 2028, retaining and upgrading only 99 late-model PW-229-engined aircraft to fund other priorities. Congress is likely to limit reductions to 68 airframes.

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, USAFE.
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 (farther 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.

Staff Sgt. Blake Wiles

F-15EX EAGLE II

Multirole 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, LAD glass-cockpit with touch-screen interface, and incorporate APG-82 AESA radar, Joint Helmet Mounted Cueing System (JHMCS), and EPAWSS self-defensive 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 29,500 lb payload (including two additional weapon stations), and lower operating costs than previous variants. The type also boasts the longest stand-off air-to-air engagement range of any fighter in the USAF inventory. 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. USAF awarded Boeing a $1.2 billion contract for the first eight new-build F-15EX on July 13, 2020. FY21 funded 12 aircraft and FY22 funded 12 airframes plus a congressional add of five aircraft. FY23 and FY24 fund 24 airframes to speed phase-out of the F-15C/D, though the Air Force now plans to purchase 104 aircraft rather than the originally planned 144. The first aircraft was delivered to Eglin on March 11, 2021, and aircraft EX3 and EX4 arrived at Eglin a year late due to supply chain issues on Dec. 20, 2023. A further two airframes will round out the six-strong test fleet. USAF must receive the first two operational aircraft slated for the ANG at Portland to meet its revised IOC target of July 2024, with the required 44-jet fleet for FOC planned for 2027. FY24 funds stand up depot maintenance, upgrade initial aircraft to operational standards, and buy initial conformal fuel tank sets. Capability development includes IR Search and Track integration for discrete targeting, Auto Ground Collision Avoidance (AGCAS), ejection seat improvements, advanced INS/GPS, and improved mission planning/debrief. The F-15EX completed combined developmental and operational testing in August 2023, participating in 19 Large Force Employment Exercises against fourth- and limited fifth-generation threats. Tests included AIM-9X and AIM-120 live fire as well as employment of SDB I, GBU-38 JDAM, and JASSM. Testers are currently evaluating the aircraft's self-defensive capabilities ahead of Full Operational Testing and Evaluation (FOT&E) which will evaluate the aircraft against more capable fifth-generation threats in complex scenarios. USAF announced plans to replace legacy F-15s at Fresno and New Orleans as well as backfilling Kadena with a permanent force of 36 F-15EX.

Contractors: Boeing; BAE Systems (EPAWSS); Raytheon (AESA).
First Flight: Feb. 2, 2021.
Delivered: March 11, 2021-present.
IOC: July 2023 (originally planned).
Production: 104 (planned).
Inventory: Two.
Operator: ACC, AFMC. Planned: ANG.
Aircraft Location: Eglin AFB, Fla. Planned: Fresno ANGB, Calif.; Kadena AB, Japan; Klamath Falls (Kingsley Field); NAS JRB New Orleans, La.; 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.

Airman Raina Dale

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 takeoff 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 first 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 (OFP) continuously updates the F-16's software, most recently adding JASSM-ER and enhanced AMMRAM. USAF is retiring 49 of the older Block 30-32 aircraft through FY25 while simultaneously modernizing late-block aircraft as a low-cost "capacity" fleet to augment fifth-generation fighters. Modernization centers on the new AN/APG-83 AESA radar, specifically aimed at countering cruise missile threats to the homeland. An initial 72 AESA-equipped aircraft were fielded under an emergent operational need and a further 443 will be upgraded. A total of 450 airframes are also undergoing SLEP to stretch beyond 8,000 flying hours. USAF aims to expand digital RWR upgrades into a future, fully integrated, internal EW suite for active jamming as well as self-defense. The rapidly developed Integrated Viper Electronic Warfare Suite (IVEWS) will leverage AESA and will be rapidly upgradable against new threats with fleet mods potentially starting in FY25. Comm suite upgrades will integrate Mobile User Objective System (MUOS) secure, jam-resistant BLOS and NATO-interoperable LOS SATURN, while MIDS/JTRS will provide higher capacity, jam-resistant Link 16. Other efforts include modernizing mission computer and cockpit displays in conjunction with offensive/defensive upgrades, and Mode 5 IFF. USAF plans to continue upgrading the F-16 to keep pace with threats through 2040 or beyond. The Indiana ANG's 122nd FW reverted to F-16 operations in 2023, and Idaho's 124th FW will also transition in 2026 as the A-10 fleet is retired. Over the last year, three F-16s were lost in separate crashes in South Korea, while a fourth was severely damaged in a ground mishap at Misawa.

Contractors: Lockheed Martin (previously General Dynamics); Northrop Grumman (AESA/ IVEWS).
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 fo USAF (nearly 5,000 for global users).
Inventory: 726 (F-16C); 136 (F-16D).
Operator: ACC, AETC, AFMC, PACAF, USAFE, 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 Arizona, Colorado, District of Columbia (flying from Maryland), Indiana, Minnesota, New Jersey, Ohio, Oklahoma, South Carolina, South Dakota, and Texas. Planned: Gowen Field ANGB, Idaho.
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 ACESII zero/zero ejection seats.

Master Sgt. Morgan Whitehouse/ANG

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 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 debuted in combat striking Islamic State ground targets during Inherent Resolve in 2014, and achieved its first air-to-air kill downing a Chinese surveillance balloon off the coast of North Carolina on Feb. 3, 2023. It is the world's most advanced fighter and its mix of stealth, long-range supercruise, and multitarget engagement capability make it a key platform in USAF's Indo/Asia-Pacific strategy. F-22's advanced flight controls and high-performance thrust-vectoring engine enable extreme maneuverability. Features include six LCD color cockpit displays, APG-77 AESA radar, EW system with RWR and missile launch detection, and advanced comm/navigation and data links. USAF is aggressively testing enhancements to ensure the F-22's "first-shot, first-kill" advantage against advanced threats until replaced by the Next Generation Air Dominance (NGAD) fighter in the 2030s. Combat-coded aircraft recently completed Increment 3.2B software upgrades adding high-resolution ground mapping SAR, threat geolocation, EA capability, and integrated SDB I, AIM-120D, and AIM-9X. The program employs an "agile" strategy to continuously develop, test and rapidly field improvements, including rolling NGAD technologies back into the Raptor. Ongoing efforts include IRST to stealthily track and target airborne threats, stealthy external fuel tanks/pylons to extend unrefueled range, and AIM-260 Joint Advanced Tactical Missile testing. Other significant efforts include the Reliability, Availability, and Maintainability Program (RAMP), Link 16, IFF enhancement, and engine reliability and performance improvements. RAMP improves electrical power, replaces avionic-fiberoptics, adds more durable LO, and fixes structures and wiring. 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 fleetwide upgrade has been extended an additional year to FY26. USAF proposed retiring noncombat-coded Block 20 aircraft to fund NGAD development in FY23, retaining only modernized Block 30/35s. Congress blocked the move pending analysis of the costs to upgrade Block 20s to full combat capability. The F-22 severely damaged in a 2018 takeoff accident at NAS Fallon was restored to flight May 4, 2023, rejoining the fleet at Elmendorf.

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.; 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 (farther 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.

Ralph Branson/ANG

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 developed under 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 replacing the A-10 and some F-16s, 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. Air Force F-35s first saw combat on April 30, 2019, during Inherent Resolve. The current fleet-standard Block 3F software gives the F-35A full combat capability with an array of precision guided weapons across mission sets including interdiction, basic CAS, and limited SEAD. Continuous Capability Development and Delivery (C2D2) will provide ongoing development and modernization. The next Block 4 iteration will give the F-35A a new maritime strike role and add weapons including the nuclear B61-12, developmental Stand-in Attack Weapon (SiAW), and SDB II, as well as APG-85 radar and EW improvements. Block 4 also corrects deficiencies discovered in concurrent development/testing but is roughly three years behind schedule. The Lot 15 through 17 production deal agreed in December 2022 will include the first Tech Refresh 3 (TR-3) aircraft specifically equipped to support Block 4 retrofit. The F-35A requires increased engine performance to fully exploit Block 4. Both GE and Pratt & Whitney tested prototype engines that offered as much a 30 percent range increase, but USAF opted for an Engine Core Upgrade to the current power plant instead on cost and variant-interoperability grounds. The F-35A was approved for full rate production on March 12, 2024, following completion of initial operational and live-fire testing which will enable future cost-saving mutiyear block buys. Despite the decision, more the 30 undelivered USAF aircraft are in storage at Lockheed's facilities pending completion of TR-3 testing which is expected in mid-2024. FY24 funds procure 48 airframes as well as standing up engine depot-level maintenance. The fleet continues to struggle with low availability rates due to maintenance and supply system delays, particularly with engines. Tyndall received its first F-35s on Aug. 1, 2023, while the Alabama Air National Guard's 187th Fighter Wing received their first Lightning IIs on Dec. 5, 2023.

Contractors: Lockheed Martin; BAE Systems; Northrop Grumman; Pratt & Whitney (engine and Engine Core Upgrade).
First Flight: Dec. 15, 2006.
Delivered: April 2011-present.
IOC: Aug. 2, 2016.
Production: Planned: 1,763 (USAF F-35As).
Inventory: 408 (USAF).
Operator: ACC, AETC, AFMC, AFRC (associate), ANG, PACAF, USAFE.
Aircraft Location: Burlington ANGB, Vt.; Dannelly Field, Ala.; Edwards AFB, Calif.; Eglin AFB, Fla.; Eielson AFB, Alaska; Hill AFB, Utah; Luke AFB, Ariz.; Nellis AFB, Nev.; RAF Lakenheath, U.K.; Truax Field, Wis.; Tyndall AFB, Fla. Planned: Barnes ANGB, Mass.; Jacksonville ANGB, Fla.; Kingsley Field, Ore.; Moody AFB, Ga.; NAS JRB Fort Worth, Texas.
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.

Sheila deVera/USAF

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 manufacturing 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, 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. F-117s most recently flew dissimilar air combat training alongside ANG F-15s at Fresno in September 2021, and took part in ANG's large-force employment Exercise Sentry Savannah in May 2022. A combined 45 aircraft remain in flying (or regeneratable stored) condition with approximately three airframes undergoing demilitarization and disposal each year. USAF contracted to maintain the type for test and training support through at least 2034.

Contractor: Lockheed Martin.
First Flight: June 18, 1981.
Delivered: 1982-summer 1990.
IOC: October 1983.
Production: 59.
Inventory: 45 (Type 1000 storage).
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 non-afterburning 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, including laser- and GPS-guided 2,000 lb munitions.
Accommodation: Pilot on ACES II zero/zero ejection seat.

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 counterinsurgency scenarios. The A-29 was initially a contender for the Air Force's Light Attack/Armed Reconnaissance (LAAR) requirement for approximately 100 aircraft that 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 a Combat Aviation Advisor and SOF-support capability. The A-29 was not selected as one of the five aircraft USSOCOM evaluated to replace the AFSOC-operated U-28A fleet that was ultimately won by the AT-802U Sky Warden. AETC's 81st Fighter Squadron at Moody also operated the A-29, training Afghan and Nigerian Air Force pilots through September 2021. A total of 16 countries operate the type worldwide. Sierra Nevada delivered the aircraft to Hurlburt in early 2021, but the Air Force plans to divest the fleet in FY24, potentially supplying them to the Philippines, pending approval of the foreign military sale.

Contractor: Sierra Nevada Corp.
First Flight: June 2, 1999.
Delivered: Feb. 23, 2021-March 31, 2021.
IOC: N/A.
Production: Three.
Inventory: Three.
Operator: AFSOC.
Aircraft Location: Hurlburt Field, Fla.
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.

AC-130J GHOSTRIDER

Attack

Brief: The AC-130J is AFSOC's primary 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 retrofitted after delivery with the modular Precision Strike Package, wing-mounted weapons, and gunship-specific systems. The initial aircraft was overstressed beyond repair when it departed controlled flight during a test sortie on April 21, 2015. Ghostrider 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

Senior Airman Wyatt Stabler

to operational requirements. The aircraft's PSP weapons system, initially developed on the AC-130W, 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 a 105 mm gun, laser-guided SDB, side-facing pilot tactical HUD, and Large Aircraft Infrared Countermeasures (LAIRCM). Block 20+/30 improved gun accuracy, hardened GPS, and added Hellfire missile and Small Glide Munition as a result of lessons learned in operational testing. The first Block 30 was delivered for testing in 2019 and retrofit of the last five aircraft is slated for FY24. AFSOC recently reduced its planned buy from 37 to 30 aircraft, receiving the final aircraft at Cannon Nov. 2, 2022. The command scrapped plans to demonstrate an Airborne High Energy Laser (AHEL) weapon that could have added low probability of detection strike capability against electronics, and light vehicle targets this year. AFSOC is considering removing the 105 mm gun from equipped airframes to reduce aircrew as well as adding AESA radar to improve range, accuracy, and all-weather targeting. Ongoing upgrades include reengineering and modernizing of the 105 mm gun, radio frequency countermeasures (RFCM) to detect, locate, and respond to threats, defensive systems upgrades, and HF/VHF/UHF/SATCOM suite modernization. AFSOC plans to shift AC-130J formal training from Hurlburt to Kirtland, though implementation has been delayed.

Contractors: Lockheed Martin, Sierra Nevada Corp. (RFCM).
First Flight: Jan. 31, 2014.
Delivered: July 29, 2015-Nov. 2, 2022.
IOC: Sept. 30, 2017.
Production: 31.
Inventory: 30.
Operator: AFSOC; Planned: AETC.
Aircraft Location: Hurlburt Field, Fla.; Cannon AFB, N.M. Planned: Kirtland AFB, N.M.
Active Variants:
▪AC-130J Ghostrider Block 20+. Production standard gunship with additional 105 mm gun.
▪AC-130J Ghostrider 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 (farther 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; aft-firing GBU-69B Small Glide Munition or 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.

C-146 WOLFHOUND

Special operations mobility

Brief: The C-146 provides flexible, responsive airlift for special operations teams flying 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. 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. C-146s notably participated in tactical landing operation on an Alaskan highway during Exercise Arctic Edge in May 2023, proving austere extreme cold weather capabilities within the NORTHCOM area of operations.

Tech. Sgt. Victor Caputo

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. Pre-owned 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.

Senior Airman Wyatt Stablerr

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 antijam comms. The CV-22 can conduct shipboard and austere forward operations and is USAF's sole high-speed vertical lift asset. It is also fully 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. The Department of the Navy leads joint-service sustainment with USAF funds, while SOCOM foots special operations specific mods. The program is currently retrofitting CV-22s to Block 20 standard, in common with USMC's MV-22s. Mods include new cabin lighting, Color Helmet Mounted Displays, IR searchlight, lightweight ballistic armor, EW upgrades, avionics, self-defensive 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 and FY24 funds retrofit a second test aircraft to support full fielding. Priority modifications include improving the Osprey's rapid, long-distance self-deployment capabilities, modifying its nacelles to improve maintainability, improving engine IR suppression, and reducing dust/debris ingestion. Airborne Mission Networking (AbMN) will eventually give the aircrew a common air/ground picture and manage complex workloads (in common with the AC/MC-130 fleet), and TacNet will add lightweight Link-16. The Pentagon grounded all V-22 variants for three months following the crash off the coast of Japan which killed eight USAF personnel on Nov. 29, 2023. AFSOC previously grounded the fleet in 2022 due to engine-gearbox issues affecting controllability and cited material failure as the primary cause of the most recent crash. The joint service fleet returned to flight March 8, 2024, and AFSOC plans to take a phased approach to resuming full operations on top of previously implemented training and procedural changes. FY24 additionally funds gearbox, clutch, and proprotor safety improvements. USAF is considering using the CV-22 as an interim long-range CSAR platform to augment the HH-60W in the Pacific region.

Contractors: Boeing; Bell Helicopter Textron.
First Flight: February 2000 (CV-22).
Delivered: Sept. 19, 2005-May 22, 2021.
IOC: 2009.
Production: 54.
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.
Accommodation: Two pilots, two flight engineers.
Load: 24 troops seated, 32 troops on floor, or 10,000 lb cargo.

Tech. Sgt. Tony Harp/ANG

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 conducted psychological operations in almost every U.S. contingency since 1980 and the EC-130J debuted in combat during 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 Solos serve as a standard broadcasting station for psychological warfare operations while the four "Super J's" perform 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), giving both variants full MISO/EA capabilities. 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. The MC-130J Commando II is replacing both Commando Solo and Super-J as part of AFSOC's multimission fleet consolidation. Commando Solo flew its final broadcast sortie on Sept. 16, 2022, and will be de-converted to

standard C-130J configuration. The four Super-J's will also revert to C-130J configuration for transfer to the ANG schoolhouse at Little Rock in FY24 with the 193rd SOW's transition to the MC-130J.

Contractors: Lockheed Martin; Raytheon; Sierra Nevada Corp. (Link 16/AbMN).
First Flight: November 2003.
Delivered: Oct. 17, 1999-2006.
IOC: 2004.
Production: Seven.
Inventory: Five.
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.

Airman Erika Chapa/ANG

MC-12W LIBERTY

Tactical ISR

Brief: The MC-12W is a crewed, 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 crewed 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. Pooling aircraft within SOCOM initially hampered the 137th SOW's effort to reach full capability. Coordination between AFSOC and the ANG eventually freed 13 aircraft, enabling the aircrew qualifications and availability needed to reach full operational capability in 2022. 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. SOCOM is replacing both the MC-12W and U-28 with a fleet of 75 AT-802U Sky Warden light attack/armed reconnaissance aircraft. The MC-12 fleet will be reduced to nine aircraft in FY24 as the 137th SOW begins transition to the AT-802.

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, combat systems operator, tactical systems operator.

Senior Airman Natalie Fiorilli

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 airdrop resupply, rotary wing aerial refueling, psyops, and rubber raiding craft deployment for littoral ingress/egress. Specialized mission systems include advanced, integrated defensive systems including LAIRCM, EO/IR targeting sensor, and an added CSO flight-deck station to manage refueling, tactical navigation, and comms. MC-130Js are equipped with wing-mounted external tanks and drogue refueling pods to provision tilt-rotor and rotary-winged aircraft as well as a boom-style receptacle to receive fuel in flight. The MC-130J shares system commonality with both the HC-130J rescue and AC-130J gunship versions, sharing overlapping upgrades and modernization with both types. The MC-130J was pulled out of baseline C-130J Block 7/8.1 software upgrades, which were then merged with comm/nav modernization in 2022. "Block 8.X" now comprises critical software for HF/VHF/UHF SATCOM upgrades, including secure, jam-resistant Mobile User Objective System (MUOS) BLOS and antijam NATO-interoperable SATURN UHF. Link 16 mods were delayed for funding and a planned switch to high-capacity, jam-resistant MIDS-JTRS. AFSOC is significantly enhancing the MC-130J's ability survive an operate in future high-end-threat environments under Capability Release 2, which includes Terrain-Following/ Terrain Avoidance (TF/TA) radar, Radio Frequency Countermeasure (RFCM), and Airborne Mission Networking (AbMN). Upgraded aircraft are redesignated Combat Talon III and will pave the way toward future open-architecture, highly integrated, and automated mission and defensive systems. Silent Knight TF/TA is housed in a second radome below the cockpit and enables the MC-130J to fully replace the MC-130H in the low-level nighttime/adverse weather penetration role. RFCM modernizes EW, improves detection, location, and response to emerging threats, while AbMN gives the aircrew a common air/ground picture to manage complex workloads. Modernization also includes the radar warning receivers, chaff, and flare systems. AFSOC delayed demonstrating a float-equipped MC-130J for nonrunway operations to 2026 but is pushing forward with prototyping, testing, and evaluation. The final legacy MC-130H retired on April 10, 2023, and AFSOC is also divesting the EC-130J to consolidate its C-130-based special mission fleet.

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: 64 (planned).
Inventory: 57.
Operator: AETC, AFSOC, ANG.
Aircraft Location: Cannon AFB, N.M.; Harrisburg Arpt., Pa.; Kadena AB, Japan; Kirtland AFB, N.M.; RAF Mildenhall, U.K. Planned: Davis-Monthan AFB, Ariz.
Active Variant:
▪MC-130J. Commando II. SOF support and aerial refueling tanker based on the C-130J.

▪MC-130J. Combat Talon III. MC-130J upgraded with TF/TA radar, RFCM, and AbMN.
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 Ty Pilgrim

U-28A DRACO

Tactical ISR

Brief: The U-28A is a crewed, 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 coaligned laser designator. Recent upgrades include U-28 EQ+ mods that 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. Two aircraft were lost to fatal mishaps in Djibouti in 2012 and at Cannon in 2017, and FY21 funds were allocated 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. SOCOM announced it is procuring a fleet of 75 AT-802U (OA-1K) Sky Warden light attack/armed reconnaissance aircraft to replace the U-28A as well as the MC-12W. AFSOC plans to complete transition from the U-28 by 2029 & FY24 funds are limited to low-cost sensor, data link, electrical, and comms upgrades.

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).

William Lewis/USAF

COMMAND, CONTROL, COMMUNICATIONS/BATTLE MANAGEMENT/ISR AIRCRAFT

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 added a digital cockpit and next-generation CNS/GATM. The E-3 is increasingly unable to counter current and emerging threats and suffers less than a 60 percent mission capable rate due to obsolescence. USAF sharply curtailed E-3 modernization, retired 13 airframes in FY23, and awarded Boeing a $1.2 billion replacement contract to adapt the E-7A Wedgetail currently operated by Australia and several allies to meet USAF requirements. The service plans to procure up to 26 E-7As with two prototypes slated for testing starting in 2027. Future E-3 upgrades will be limited to sensors, comms, networking, and computing improvements to maintain capability until retirement. Development includes Communication Network Upgrade (CNU) to add high-speed jam-resistant Link 16, high-bandwidth internet to quickly prosecute time-sensitive targets, and AWACS Communications Integration Program (ACIP) which will include BLOS SATCOM/second-generation NATO UHF, and anti-jam GPS. USAF began retiring E-3s in FY23 and continued this year reducing the fleet to 15 aircraft to improve sustainment through phaseout targeted for FY29.

Contractors: Boeing, Northrop Grumman (radar); Lockheed Martin (computer); Collins Aerospace (DRAGON cockpit upgrade).
First Flight: Oct. 31, 1975 (full mission equipment).
Delivered: March 1977-1984.
IOC: 1977; July 28, 2014 (Block 40/45).
Production: 31.
Inventory: One (E-3B); 14 (E-3G).
Operator: ACC, 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.

Justin Oakes/USAF

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). The early E-4A first flew on June 13, 1973, reaching IOC in December 1974. The fleet was fully upgraded to E-4B standards in 1985. It is hardened against the effects of nuclear detonations, including electromagnetic pulse (EMP). Comms and data processing capabilities include EHF Milstar SATCOM, six-channel International Maritime Satellite, and a tri-band radome that 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 (SSHF), enabling uninterrupted, jam-resistant nuclear C2 fleetwide. 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 solicitations but the service aims to award an engineering development contract in early FY24, fielding an initial capability no later than 2032.

Contractors: Boeing; Raytheon (FAB-T); L3Harris (SSHF); Boeing/Collins Aerospace (Low-Frequency Transmit System).
First Flight: June 10, 1978 (E-4B).
Delivered: December 1974-1985.
IOC: 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 was a ground moving target indication (GMTI), airborne battlefield management/command and control platform. Its primary mission was 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' side-looking phased array radar could locate, classify, and track vehicles and ships at distances exceeding 124 miles, and more recent refinements added human-target tracking. Target data was transmitted via data link to ground stations or other aircraft. USAF dropped plans to replace JSTARS with a modern 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 plans to shift to a space-based approach to GMTI to overcome anti-access/area denial threats. Congress approved divestiture of JSTARS starting with four airframes in FY22. The final eight aircraft were retired in FY23 and JSTARS flew its final operational sortie in September 2023 supporting USAFE ahead of its final flight Nov. 4, 2023. E-8C serial number 00-2000 was transferred to the Museum of Aviation in Warner Robins, Ga., for preservation and display.

irman 1st Class Jared Lovett

Contractors: Northrop Grumman; Raytheon.
First Flight: April 1, 1988.
Delivered: March 22, 1996-March 23, 2005.
IOC: Dec. 18, 1997.
Production: 18.
Inventory: zero (E-8C); zero (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.

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

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.

Senior Airman Ashley Richards

E-11A BATTLEFIELD AIRBORNE COMMUNICATIONS NODE

Communications relay

Brief: The E-11 is a modified Bombardier Global 6000/BD-700-1A10 or Global 6500 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 near Kandahar Airfield 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 initially 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 to expand the E-11 fleet to nine aircraft. USAF has procured a single airframe each year from FY21 to complete the fleet by 2026. The first E-11 based on the newer Global 6500 was delivered to 430th Expeditionary Electronic Combat Squadron at Prince Sultan AB, Saudi Arabia, Dec. 16, 2022. The fifth and sixth airframes were delivered in FY23 with the seventh following in early FY24. FY24 funds will purchase and modify one E-11. 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. USAF plans to upgrade the E-11 with a High-Capacity Backbone (HCB) to support advanced battle management connectivity. Ongoing upgrades include adding military GPS to operate in higher-end threat environments, advanced navigation, along with flight safety, reliability, performance, and self-defensive improvements. ACC and the Georgia ANG at Robins transitioned from JSTARS to operating BACN in 2023. Robins received its first E-11A on April 24, 2023, and plans reach full operational capability by 2027.

Contractors: Bombardier; Northrop Grumman (integration and support).
First Flight: August 2007.
Delivered: December 2008-present.
IOC: Circa 2011.
Production: Five (nine planned).
Inventory: Five.
Operator: ACC, ANG (associate).
Aircraft Location: Al Dhafra AB, UAE; Prince Sultan AB, Saudi Arabia; Robins AFB, Ga.
Active Variant:
▪E-11A. Modified Bombardier Global 6000, BD-700, or Global 6500 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 (Global 6000/BD-700); two BR700-710D5-21 turbofans, each 15,125 lb thrust (Global 6500).
Performance: Speed Mach 0.88, range 6,900 miles (Global 6000); speed Mach 0.9, range, 7,595 miles (Global 6500).
Ceiling: 51,000 ft.
Accommodation: Two pilots.

L3Harris

EA-37B COMPASS CALL (PREVIOUSLY EC-37B)

Electronic warfare/electronic attack

Brief: The EA-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 transport its "Compass Call" systems to a more modern aircraft. The program, originally dubbed "EC-X" is "rehosting" upgraded EC-130H mission equipment directly to the EA-37 with nearly 70 percent remaining unchanged. Redesignated from EC-37B to EA-37B in November 2023, the aircraft is faster, more economical, capable of higher altitude operations, and is more survivable than the EC-130H. Upgrades will allow it to conduct standoff jamming/EA from greater distances 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 will receive the EC-130H's upgraded Baseline 3 package, including Advanced Radar Countermeasure System (ARCS) and other significant capability enhancements. The EA-37 will not receive comparable low-band capability until Baseline 4, which will debut on the sixth airframe. Baseline 4 will add System-Wide Open Reconfigurable Dynamic Architecture (SWORD-A) to enable rapid future upgrades. USAF postponed buying a seventh airframe in FY22 to focus on Baseline 4 development, installation of equipment on the sixth airframe, and implementing technical changes. Congress approved the service's FY23 unfunded request for four aircraft, restoring the planned fleet to 10. BAE Systems and L3 Harris delivered the first EA-37B to begin combined Baseline 3 development and operational testing Sept. 12, 2023, paving the way for initial crew training in 2024. The existing fleet will begin upgrade to Baseline 4 starting in 2026, coinciding with planned IOC.

Contractors: Gulfstream Aerospace (airframe); BAE Systems; L3 Harris (mission equipment).
First Flight: Aug. 25, 2021.
Delivered: Sept. 12, 2023-present.
IOC: 2026 (planned).
Production: 10 (planned).
Inventory: One.
Operator: ACC (planned).
Aircraft Location: Edwards AFB, Calif. Planned: Davis-Monthan AFB, Ariz.
Active Variant:
▪EA-37B. Military Electronic Attack special-mission variant of the Gulfstream G550.
Dimensions: Span 93.5 ft, length 96.4 ft, height 25.8 ft.
Weight: Max T-O 91,000 lb.
Power Plant: Two BR710C4-11 turbofans, each 15,385 lb thrust.
Performance: Speed 767 mph, range 5,074 miles.
Ceiling: 45,000 ft.
Accommodation: Two pilots; mission crew: two EWOs, mission crew supervisor (cryptologic), two cryptologic linguists, acquisition operator, and airborne maintenance technician.

Master Sgt. Wolfram Stumpf

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 air 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. EC-130H airframes have reached the limit of their planned service life and the first aircraft retired to the boneyard at Davis-Monthan on Aug. 31, 2021. ACC plans to divest two airframes in FY24, reducing the fleet to five and freeing mission equipment for use on the EA-37B.

Contractors: Lockheed Martin; BAE Systems (mission equipment); L3Harris (integration and sustainment).
First Flight: 1981.
Delivered: March 19, 1982-unknown.
IOC: 1983; Block 35 from 2011.
Production: (Converted).
Inventory: Six (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-hour 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.

P-9A PALE ALE

Maritime patrol, detection, and monitoring

Brief: The P-9A is a heavily modified Bombardier Q202 (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 and Eastern Pacific. 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).

Tomas Acevedos/Vlimages

First Flight: N/A.
Delivered: N/A.
IOC: 2013.
Production: Four.
Inventory: Four (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 37,300 lb.
Power Plant: Two Pratt & Whitney PW-123C/D turboprop engines, each 2,380 shp.
Performance: Speed 333 mph, range 2,300 miles.
Ceiling: 25,000 ft.
Accommodation: Two pilots, two sensor operators.

Senior 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. An 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 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. Baseline 14 is finishing development and will include SIGINT direction finding and steerable K-

band collection antennas, digital search and recording, improved signal identification, SATCOM target identification, and Rivet Joint Baseline 14 COMINT suite integration.

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, antiradiation 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. FY24 focuses on sustaining and completing enhancements to Baseline 6 (similar to Rivet Joint Baseline 12). Baseline 6 includes wideband SATCOM reachback, integrating Rivet Joint's Baseline 13 COMINT suite, improving operator interface, enhancing antennas and processors, and providing 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 299,000 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, one navigator, two airborne systems engineers; mission crew: 10 EW officers, six or more electronic, technical, mission-area specialists.

Josh Plueger/USAF

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-crewed by USAF/RAF personnel under an agreement through at least 2035. 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 current Baseline 11/12 modernized cockpit and operator interface, added new direction finding COMINT, precision ELINT/SIGINT, improved collection in dense-signal environments, enhanced near-real-time data dissemination, and integrated RC-135 with the Distributed Common Ground Station (DCGS). USAF is currently upgrading the recently fielded Baseline 13 aircraft and launching future Baseline 14 integration. Baseline 13 included signal search and geolocation improvements, wideband signal recording, jam-resistant search, moving emitter target location and tracking, and wideband datalink improvement. Baseline 14 will incorporate signal recording and spectral receiver enhancements, modernized navigation, surveillance, and air traffic management (CNS/ATM), advanced Mode 5 IFF, and upgraded autopilot. Development includes Baseline 15, automated search and detection, employment of artificial intelligence, and collaboration to speed collection, analysis, and distribution. USAF recently tested an Electromagnetic Warfare Integrated Reprogramming (EWIR) concept to enable the RC-135 to quickly respond to evolving adversary tactics in a high-threat environment. Rivet Joint conducted multiple Agile Combat Employment exercises in 2023 to rapidly operate from dispersed locations and stood up a new forward operating location at Elmendorf to meet increased Pacific taskings. AFMC retired the fleet's sole legacy-engined NC-135W systems test bed Sept. 5, 2023, backfilling the aircraft's role with a single TC-135W.

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).
Operator: ACC, AFMC.
Aircraft Location: Offutt AFB, Neb.; forward operating locations: Elmendorf AFB, Alaska; 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.
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).

Nicholas Harnack/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 feature glass cockpits, digital autopilot, modernized EW systems, and updated data links. Its major sensors are the ASARS-2A SAR, modernized SYERS-2C multispectral EO/IR imagery system, and enhanced Airborne Signals Intelligence Payload (ASIP). The aircraft is also capable of mounting the legacy optical bar camera for broad-area synoptic imagery, though operations from Beale concluded in 2022. Modification and upgrades are focused on sustaining U-2 capability through its currently planned retirement, 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 continue flight-testing through expected IOC with two sensors in 2024. The 2B/C will replace the current 2A and its open architecture makes it transferable to future platforms. A U-2 upgraded to Avionics Technical Refresh (ATR) standards flew for the first time in September 2023, adding open-architecture systems, enhanced C2 networking, and pilot workload management features. Development and modification efforts include ATR Phase 2, SIGINT and IR sensor technical refresh, stellar navigation for GPS-denied operations, SIGINT modernization, quick-change modular mission systems, unmanned-system interoperability, and a helmet and pressure suit refresh. The program continues to prioritize experimental sensors, systems, and software to meet emerging threats, and development of networked, next-generation BM/C2. Two U-2s notably intercepted and photographed a Chinese ISR balloon over the central U.S. on Feb. 3, 2023. ACC retired the first TU-2S and two U-2S in early 2024, and plans to retire the entire fleet by 2026.

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.; forward operating locations: Al Dhafra AB, U.A.E; Osan AB, South Korea; RAF Akrotiri, Cyprus; RAF Fairford, U.K.
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.

USAF

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, 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. AFRC is returning the fleet to the more weather-resistant and durable gloss-gray paint scheme worn by WC-130s prior to 2007. WC-130Js flew more than 990 flight hours collecting data on 10 named storms in the Atlantic and Caribbean and six in the Pacific during the 2023 storm season, making it the unit's fourth busiest.

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.

Tech. Sgt. Anthony Hetlage

WC-135 CONSTANT PHOENIX

Air sampling and collection

Brief: : WC-135's mission is nuclear test monitoring, airborne radiological sampling, and arms control treaty verification. The KC-135R-based aircraft is equipped with air sampling and collection equipment and 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 original fleet of modified C-135Bs was delivered between 1965 and 1996 and was fully retired in 2022 with delivery of the first modernized WC-135R. The WC-135R features modernized glass cockpits and uprated CFM-56 turbofans (common with the KC-135 fleet) which significantly improves the aircraft's range, service ceiling, performance, and maintainability. Constant Phoenix' 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. L3 Technologies completed retrofit and redelivery of the first modernized WC-135R Constant Phoenix on July 11, 2022, followed by a second aircraft on May 11, 2023. The third and final aircraft was delivered to Offutt on Dec. 4, 2023.

Contractors: Boeing; L3 Technologies (WC-135R conversion).
First Flight: June 2022 (WC-135R).
Delivered: July 11, 2022-Dec. 4, 2023 (WC-135R).
IOC: 2022 (WC-135R).
Production: Two (WC-135C/W); three (WC-135R).
Inventory: Three (WC-135R).
Operator: ACC.
Aircraft Location: Offutt AFB, Neb.
Active Variants:
▪WC-135R. Modified KC-135R tankers, replacing the aging WC-135C/W fleet.
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 turbofans, each 21,634 lb thrust.
Performance: Speed 530 mph, range approx. 3,900 miles (farther with air refueling).
Ceiling: 50,000 ft.
Accommodation: Two pilots, navigator, up to 31 special equipment operators/observers as required.

TANKER AIRCRAFT

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. Avionics Block 8.1 development (in common with the C-130J fleet) was completed in FY23 and large-scale retrofits are planned starting in FY26. This year launches Comm Modernization Phase I including Mobile User Objective System (MUOS) and crypto updates as well as Link 16 certification, Star mission computer refresh, and EO/IR sensor life-extension. Future Comm Modernization Phase II will add NATO-interoperable LOS SATURN and updated UHF/VHF radios. ACC completed fleetwide recapitalization of its fixed-wing rescue capability with delivery of the 39th HC-130J in 2022. New York ANG HC-130Js notably assisted efforts to locate the submersible that imploded during a dive to the RMS Titanic, conducting three long-range sorties in June 2023. The ANG recently evaluated an aft-door mounted Litening targeting pod to potentially enhance the aircraft's search and rescue capabilities.

Tech. Sgt. Dhruv Gopinath

Contractor: Lockheed Martin.
First Flight: July 29, 2010.
Delivered: Sept. 24, 2010-2022.
IOC: April 25, 2013.
Production: 39.
Inventory: 39.
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.

Senior Airman Sergio Avalos

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 boom-equipped tankers. 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 in 2021 citing capacity concerns with

delays to the KC-46 program but removed limitations starting in FY22. AMC has steadily retired KC-10s as KC-46s are delivered, maintaining a required floor of no fewer than 446 overall tankers. McGuire ended KC-10 operations with a final departure on June 22, 2023, leaving Travis as the type's final main operating location. USAF cut 15 aircraft in FY23 and plans to retire the final aircraft by the end of FY24.

Contractors: McDonnell Douglas (now Boeing); Collins Aerospace (CNS/ ATM).
First Flight: April 1980.
Delivered: March 1981-April 1990.
IOC: August 1982.
Production: 60.
Inventory: 21.
Operator: AMC, AFRC (associate).
Aircraft Location: 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.

Bryce Bennett/USAF

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 on Jan. 10, 2019. The service awarded the first LRIP contract for 19 aircraft in 2016, and most recently awarded Lot 10 in November 2023, raising the quantity on contract to 143 airframes. Full-rate production was initially planned for Lot 3 but a decision is now expected in late FY24 or beyond, while current year funds purchase 15 tankers. The KC-46 completed developmental testing and entered operational testing in 2019. Planned IOC and full-rate production have slipped to FY24 or later due to remaining deficiencies with the boom and remote vision system (RVS). USAF accepted Boeing's revised 3D RVS design comprised of six color/IR cameras in April 2022, and now aims to field the system on the KC-46 in 2026. The Wing Aerial Refueling Pods (WARP) have also faced certification delays. KC-46 is cleared to refuel receivers in combat (except for the A-10) while awaiting resolution of the final six critical deficiencies. The KC-46 will begin testing a C2 pod which is the first element of the Advanced Battle Management System (ABMS) to network fifth-generation aircraft in high-threat environments this year. The service is considering an upgraded KC-46 as one option for a 75-aircraft "bridge" fleet to a next-generation, possibly stealthy, tanker. Selfridge was selected as the next preferred base to host KC-46s as soon as 2029, and Travis took delivery of its first aircraft on July 28, 2023, following a five-month delivery pause due to subcontractor deficiencies.

Contractor: Boeing.
First Flight: Sept. 25, 2015 (KC-46A).
Delivered: December 2018-present.
IOC: FY24 (planned).
Production: 179 (planned).
Inventory: 72 (KC-46A).
Operator: AETC, AFMC, AFRC, 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.; Travis AFB, Calif. Planned: MacDill AFB, Fla.; March ARB, Calif.; Selfridge ANGB, Mich.; 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.

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

Staff Sgt. Ryan Gomez

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 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. Block 45 cockpit upgrades were initially planned to stretch through 2027 but fleet reductions will speed completion to FY24 at 207 total aircraft. 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. Other upgrades include replacing Aero-I long-distance oceanic satellite tracking/C2 replacement with Iridium, Mobile User Objective System (MUOS) secure, jam-resistant BLOS, NATO-interoperable LOS SATURN, and crypto modernization. Real Time in the Cockpit (RTIC) began adding battlefield threat awareness to Active-duty aircraft through FY26, and addition of rudder instrumentation aims to prevent accidents like the fatal 2013 Kyrgyzstan crash. The service plans to test prototype winglets to increase fuel efficiency over the next two years. USAF will retain the fleet until at least 2050, but issued a request for information to partially recapitalize KC-135 pending the notional Next-Generation Air-refueling System (NGAS) emergence. USAF aims to retire 15 KC-135s per year through the late 2030s, maintaining a minimum force of 466 tankers.

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: 325 (KC-135R); 51 (KC-135T).
Operator: AETC, AFMC, AMC, PACAF, USAFE, 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 (active associate), Arizona, Hawaii, Illinois, Iowa, Kansas, Maine, Michigan, Mississippi, Nebraska, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Utah, Washington, Wisconsin.
Active Variants:
▪KC-135R. Reengined 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

Roland Balik/USAF

C-5 GALAXY

Strategic airlift

Brief: The C-5 is USAF's largest airlifter and one of the world's largest aircraft, capable of carrying unusually large/heavy cargo over intercontinental ranges. It can also 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) were 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 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 a 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 modifications 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. Development to replace the aircraft's flight deck displays and support future upgrades and modernization began in FY23. A C-5M reverse-flow refueled a KC-10 for the first time as part of a capability demo in 2023, to augment and extend tanker capacity in a high-end Pacific conflict. C-5s also demonstrated 35-hour long endurance sorties and capacity to download fuel to sustain dispersed, austere operations.

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.

Adam Bowles/USAF

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).
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).

Airman 1st Class Adriana Jordan-Alcañiz

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. The C-17 fleet was heavily tasked evacuating U.S. and allied personnel from Afghanistan during Operation Allies Refuge, including carrying a record-breaking 823 passengers on a single flight on Aug. 15, 2021. Major Block 20 upgrades included some 60 programs to bring early production aircraft to a common configuration, and the most recent Block 21 including Mode 5 IFF and airspace compliance were completed fleetwide in 2020. FY24 continues fleetwide HUD replacement through FY28, and begins install of enhanced high-bandwidth BLOS voice/data SATCOMS. Ongoing upgrades also include next-generation Large Aircraft Infrared Counter-measures (LAIRCM) to combat man-portable air defenses, as well as safety and sustainment mods. The Roll-on/Roll-off Conference Capsule to replace the "Silver Bullet" for in-flight conferencing is currently finishing testing and integration. This year launches Flight Deck Replacement development which will introduce an easily upgradable modular cockpit infrastructure. The C-17 fleet is currently the largest consumer of jet fuel in the inventory. USAF awarded Pratt & Whitney a $55 billion contract add in 2023, to upgrade the fleet's F117 engines to improve fuel efficiency and increase maintenance intervals by 2027.

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.
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.

C-21

Light airlift

Brief: The C-21 "Cougar" 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 upgrades 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. C-21s ended 32 years of detached aeromedical and DV support to USCENTCOM with a final flight from Al Udeid AB, Qatar, on June 30, 2023. Ongoing aircraft modifications are limited to required low-cost airworthiness and safety upgrades.

Airman 1st Class De'Quan Simmons

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-B2 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).

Tech. Sgt. Benjamin Mota

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 JB 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 stateroom, 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. The C-32A fleet is undergoing significant comm-suite modernization including a Senior Leader Communication System (SLC C3), next-generation Presidential

and National Voice Conferencing (PNVC), and replacement of obsolescent UHF SATCOM with Mobile User Objective System (MUOS) compatible BLOS. SLC is installing Wideband SATCOM, secure air-to-air/ground comms, commercial WiFi, in-flight information, and enhanced airborne executive phones across USAF's executive fleets. A single C-32A will undergo installation in FY24 with modification fleetwide planned for by 2027. Two aircraft received PNVC and FY24 funds a third install, as well as launching MUOS-compatible crypto modernization for install through FY26. DOD scraped plans to replace the C-32A, opting to retain the fleet through 2038 or beyond. The Pentagon is now assessing options to augment the C-32 fleet with up to 10 modified commercial aircraft.

Contractors: Boeing; L3 Harris (Senior Leader Communications Modernization).
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.

Senior Airman Shelimar Rivera Rosado

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 leaders' access to secure data and voice networks, and FAA-required CNS/ATM updates. FY24 continues comm suite upgrades as part of the Senior Leader Communication Modernization effort across USAF's executive fleets. A total of 16 aircraft will be modified, including six in FY24, to ensure redundant, survivable and secure/top-secret voice, data, and videoconferencing for uninterrupted worldwide C2. Existing aircraft will receive modernized en route air traffic SATCOMS, which will be standard on future airframes. USAF aims to acquire as many as 40 additional aircraft to backfill the now-retired C-20 and two aircraft were added to the fleet in 2019 and 2020, followed by two delivered under a fleet expansion contract through 2022. FY24 funds MUOS-compatible crypto to support secure, jam-resistant BLOS UHF SATCOM upgrades by FY26.

Contractors: Gulfstream Aerospace; Honeywell (commercial SATCOM replacement); L3 Harris (Senior Leader Communications Modernization).
First Flight: October 1998 (C-37A).
Delivered: Oct. 14, 1998-February 2022.
IOC: Dec. 9, 1998.
Production: 16 (planned).
Inventory: Nine (C-37A); seven (C-37B).
Operator: AMC, PACAF, USAFE.
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).

Airman 1st Class Luis Rios Calderon

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. Both variants are receiving updated Large Aircraft Infrared Countermeasures (LAIRCM) through FY27 to sustain self-defensive capabilities. FY24 continues 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. Two C-40Bs will be upgraded in FY24 to ensure redundant, survivable and secure/top-secret voice, data, and video conferencing for uninterrupted worldwide C2. C-40Bs are also receiving MUOS-compatible crypto to support upgraded secure, jam-resistant BLOS UHF SATCOM.

Contractors: Boeing; L3Harris (Wideband SATCOM/Senior Leader Communication Modernization).
First Flight: April 14, 1999 (C-40A).
Delivered: 2002-2007.
IOC: Feb. 28, 2003.
Production: 11.
Inventory: Four (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).

Staff Sgt. Janae Masoner

C-130H HERCULES

Tactical airlift

Brief: The C-130H is an all-purpose theater transport that performs diverse roles, including tactical and intertheater 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 uprated engines, redesigned outer wing, improved pneumatic systems, new avionics, improved radar, and NVG lighting. USAF intends to recapitalize the C-130H fleet with the C-130J while modernizing the remaining fleet with new avionics, safety, and performance improvements in the interim. Ongoing upgrades include critical center wing box replacement, C-130H Avionics Modernization Program (previously Viability and Airspace Access Program), and NP2000 propeller retrofits. AMP Increment 1 was completed fleetwide in 2021, adding new CNS/ATM and bringing legacy C-130s into compliance with international airspace rules. L3Harris completed the first Increment 2-upgraded aircraft in 2022. A decreased total of 77 ANG and AFRC aircraft will now receive Increment 2 mods to add terrain awareness and warning, new flight management, and modern glass cockpit displays through 2028. UHF SATCOM modernization was added to Increment 2 in FY23, rolling in Mobile User Objective System (MUOS) secure, jam-resistant BLOS, and NATO-interoperable LOS SATURN. The fleet also began eight-bladed NP2000 propellor retrofits, which enhance performance up to 20 percent. USAF currently has 83 aircraft on contract for NP2000 and will likely accelerate retrofits following a fleetwide grounding in 2022 due to cracks in the four-bladed units. Georgia ANG's 165th AW transferred its final C-130H to the Delaware ANG on Aug. 18, 2023, upgrading to the C-130J. ANG units in Connecticut, Illinois, Minnesota, and Montana will also upgrade to the C-130J in the coming years. USAF will cut two C-130Hs in FY24, replacing aircraft with C-130Js on a one-for-one basis to maintain the congressionally mandated minimum 271-airframe tactical fleet.

Contractors: Lockheed Martin (airframe); L3Harris (AMP Increment 2); Collins Aerospace (NP2000).
First Flight: 1965 (C-130H).
Delivered: April 1975-96 (current C-130H2/H3).
IOC: Circa 1974.
Production: 1,202 (C-130H).
Inventory: 126.
Operator: ANG, AFRC.
Aircraft Location: Dobbins ARB, Ga.; Little Rock AFB, Ark.; Minneapolis-St. Paul Arpt./ARS, Minn.; Peterson SFB, Colo. (MAFFS); Youngstown ARS (Electronic Modular Aerial Spray System (EMASS), and ANG in Arkansas, Connecticut, Delaware, Illinois, Minnesota, Missouri, Montana, Nevada (MAFFS), Texas, 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 (approx. 20 percent increased thrust with NP2000 propellers).
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.

Yasuo Osakabe/USAF

C-130J/C-130-J-30 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 intertheater airlift, airdrop, AE, and 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 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, replace UHF comms with SATCOMS, and update mission planning systems. Block 8.1's Mode 5 IFF and air traffic management upgrades were successfully fielded ahead of cycle to meet airspace requirements and the first full 7/8.1 aircraft was redelivered in late 2020 with 15 slated for upgrade in FY24. Airframes delivered since 2009 incorporate enhanced service-life center wings, and three early production airframes will be retrofitted in 2024. Major development focuses on modernized secure, jam-resistant HF/UHF/SATCOM voice and data (MUOS and NATO Saturn) as well as data links to keep pace with newer satellites and networking. Congress added funds beyond the current multiyear C-130J contract, including 16 C-130Js for the ANG units and four for AFRC, bringing planned C-130J procurement to 202 aircraft. Four former EC-130J Super-Js are undergoing deconversion to standard C-130Js and will be redelivered to Little Rock by late 2027. AFRC successfully flight-tested the Electronic Modular Aerial Spray System (EMASS) on a C-130J at Youngstown in March 2024, paving the way for the J-model to take over the aerial spray mission from the C-130H. The Georgia ANG transitioned from the C-130H to the C-130J in 2023 and USAF announced plans to transition units in Connecticut, Montana, Minnesota, and Illinois to the Super Hercules.

Contractor: Lockheed Martin.
First Flight: April 5, 1996.
Delivered: February 1999-present.
IOC: October 2006.
Production: 2,600+ worldwide, 202 (USAF).
Inventory: 151.
Operator: AETC, AMC, PACAF, USAFE, ANG, AFRC.
Aircraft Location: Dyess AFB, Texas; Keesler AFB, Miss.; Little Rock AFB, Ark.; Ramstein AB, Germany; Yokota AB, Japan; and ANG in California, Georgia, Kentucky, Rhode Island, Kentucky, Texas, and West Virginia. Planned: Youngstown ARS; ANG in Arkansas, Connecticut, Montana, Minnesota, and Illinois.
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).

Jaclyn Lyons/USAF

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 with 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 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 takeoff 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, and the Avionics Modernization Program that launched Increment 2 in 2022. Required upgrades include NVG-compatible flight deck, secure BLOS data link, increased reliability commercial SATCOM, and self-defensive/missile warning capability. The ANG test-flew an LC-130 with upgraded T56 3.5 engine enhancements for the first time in October 2022. Paired with the NP2000 propellers, the upgrade improves payload, range, high-altitude performance, and reliability. The ANG planned to retrofit all 10 aircraft by early 2024. LC-130s flew a total of 114 Operation Deep Freeze missions supporting NSF research during the 2023-2024 season. Aircraft carried a total of 1,500 passengers and 1,100 tons of cargo, logging 52 long-range flights between Christchurch, New Zealand, and Antarctica, as well as on the continent. LC-130s also flew 2.4 million pounds of cargo and 1,300 passengers supporting NSF research on the Greenland Ice Cap from April to August 2023, and airlifted U.S. and Canadian ground forces to the high Arctic during Exercise Guerrier Nordique. Congress has pushed USAF to recapitalize the LC-130 (likely with C-130J) fleets citing increased Russian and Chinese activity in the Arctic.

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 6 ft wide, main gear skis 12 ft by 6 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 have 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 aim to maintain fleet viability until the VC-25B (based on Boeing's modernized 747-8 Intercontinental) enters service. Future upgrades encompass mission comms, notably the Senior Leader Communication Modernization effort across the executive fleets, low-latency satellite teleconferencing and higher-capacity tactical data links. USAF issued Boeing a $3.9 billion presidential aircraft replacement contract to modify two undelivered commercial 747-8s to VC-25B standards in 2018. Boeing began modifications in 2020, to add mission comms, DV interior, self-defensive systems, integral airstairs/ground-level boarding, autonomous baggage handling, a second auxiliary power unit, and uprated electrical systems. Specifications exclude aerial refueling capability to reduce program cost. Delivery of the first aircraft has slipped three years to 2027 due to manufacturing delays, jeopardizing the VC-25A's planned out-of-service date. Delivery of the second and final aircraft is now planned for 2028. The White House announced VC-25B will retain a modernized version of its traditional livery, reversing previous administration plans to radically change the scheme.

Contractor: Boeing.
First Flight: Sept. 6, 1990 (VC-25A).
Delivered: August-December 1990.
IOC: Dec. 8, 1990; planned 2027 (VC-25B).
Production: Two VC-25A; two VC-25B (undergoing modification).
Inventory: Two (VC-25A).
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).

Staff Sgt. Jessi Roth

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 Black Hawk. 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/antijam 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, ultimately modifying Army surplus UH-60Ls instead. The first of 21 UH-60L combat loss replacements was delivered in 2016 with the final aircraft entering service in 2022. Ongoing mods include color cockpit displays, Mode 5 IFF, loss-replacement mission systems, and defensive system support. USAF plans to fully replace the Pave Hawk fleet with new-build HH-60W by 2026 and began retirements in 2022, with plans to cut 37 airframes in 2024. ACC inactivated the 66th Rescue Squadron at Nellis with the retirement of its HH-60Gs on June 1, 2023, and Kadena's 33 Rescue Squadron began transition to the HH-60W in February 2024.

Contractor: Lockheed Martin Sikorsky.
First Flight: October 1974.
Delivered: 1982-1998 (HH-60G).
IOC: 1982.
Production: 112 (HH-60G); three (HH-60U).
Inventory: 61 (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.; 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 nonambulatory patients.

HH-60 JOLLY GREEN II

Personnel recovery/medium lift

Brief: The HH-60W is an armed, all-weather day/night CSAR helicopter meant 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

Senior Airman Zachary Rufus

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 to buy a total of 75 HH-60Ws over five lots (decreased from a planned 113 aircraft). A total of 55 LRIP helicopters would be procured in four lots from FY19 to FY22, with the final two lots procured through 2024. USAF accepted the first production aircraft from Sikorsky on May 18, 2021, and requested funds to procure 10 aircraft completing its planned buy in FY23. Congress, however, doubled the FY23 request—boosting the overall program to 85 airframes. Planned capability improvements include adding Distributed Aperture IR 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. The HH-60W completed developmental testing and established the helicopter's baseline configuration in April 2022. USAF approved full-rate production in April 2023 and shifted to full operational testing at Nellis, evaluating deficiency corrections, integrating an additional weapon, and verifying low-visibility hover instrumentation. Kadena began transition from the HH-60G with the arrival of the first HH-60Ws on Jan. 26, 2024.

Contractor: Lockheed Martin Sikorsky.
First Flight: May 17, 2019.
Delivered: 2019-present.
IOC: Sept. 7, 2022.
Production: 85 (planned).
Inventory: 32 (HH-60W).
Operator: ACC, AETC, PACAF. Planned: USAFE, ANG, AFRC.
Aircraft Location: Davis-Monthan AFB, Ariz.; Duke Field, Fla.; Kadena AB, Japan; Kirtland AFB, N.M.; Moody AFB, Ga. Planned: Aviano AB, Italy; Francis S. Gabreski Arpt., N.Y.; JB Elmendorf-Richardson, Alaska; 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: two pilots, flight engineer, gunner, two PJs.
Load: TBD.

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 targeted to eventually replace UH-1Ns in the DV lift and aircrew survival training roles as well. Since the commercial AW139 is a mature system,

Senior Airman Breanna Christopher Volkmar

USAF streamlined developmental testing to focus on mission requirements. IOC was initially pegged for 2021 but developmental flight-testing uncovered performance-limiting deficiencies in crosswinds, degraded visual conditions, and austere operating conditions which delayed FAA and subsequent military certification to August 2022. Six helicopters are supporting 15-months of USAF-led developmental testing to expand the flight envelope, validate mission suitability, and develop tactics and procedures ahead of operational testing in mid-2024. Development is focused on fixing intercom, machine-gun ammunition feed system, mission-planning, and cabin layout problems. USAF is also working to solve engine debris ingestion issues that have restricted operations from unimproved surfaces, evaluate heavy-weight, hot/high-density altitude performance, and validate the effectiveness of the IR self-defense systems. USAF approved low-rate initial production in March 2023, and FY24 funds procure seven aircraft. A decision to ramp up to full rate production of 15 helicopters per year is expected in FY25, though the service wanted to reduce the planned 84-helicopter fleet to 42 aircraft due to budgetary constraints. AFGSC's three missile bases and the schoolhouse at Maxwell are unaffected by the change, though Andrews, Fairchild, and Yokota will continue to operate the UH-1N. Malmstrom took delivery of the first operational MH-139 on March 9, 2024.

Contractors: Boeing (prime contractor); Leonardo (formerly Agusta-Westland) (airframe); Honeywell (avionics).
First Flight: 2019.
Delivered: August 2022-present; (USAF/contractor-operated test aircraft delivered Dec. 19, 2019).
IOC: 2023 (planned).
Production: 80 (planned).
Inventory: Five.
Operator: AFGSC. Planned: AETC, AFRC.
Aircraft Location: Duke Field, Fla.; Malmstrom AFB, Mont. Planned: F. E. Warren AFB, Wyo.; 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.

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 Novosel (formerly 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 UH-1N is the only DOD aircraft fleet to consistently achieve its target mission capable rate over the past decade. The ongoing SLEP of up to 63 airframes aims to bridge the gap until the MH-139A is fielded. USAF planned to begin retiring

2nd Lt. Rebecca Abordo

the fleet in 2022 with full retirement by 2032, though no airframes have yet been divested and budget cuts to the MH-139 mean Andrews, Fairchild, and Yokota will continue flying the UH-1N for the foreseeable future.

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 Novosel, 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

Airman 1st Class Keira Rossman

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. Militarization includes 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 synthetic aperture radar (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 73 aircraft (including all CSO-training aircraft) were upgraded through completion of the curtailed program in March 2023. USAF began divesting the majority of the fleet in FY23 cutting a total of 50 airframes due to cost-prohibitive obsolescence issues. Congress

barred AETC from retiring an additional 52 aircraft in FY24 until the command fully implements its revamped Undergraduate Pilot Training. AETC plans to retain only the 21 CSO-configured trainers at Pensacola, relying instead on simulators to conduct mobility pilot qualifications.

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: 127.
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 turbofans, 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).

Airman 1st Class Keira Rossman

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-designed 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 hypoxia-like incidents. Improved maintenance and inspections have resulted in an 82 percent reduction in hypoxic incidents and will continue until fleetwide retrofit is completed in mid-2024. FY23 launched the Avionics Replacement Program (ARP) to replace the T-6A's aging HUD cockpit displays and interface, integrate simulated air-to-air/air-to-ground weapons and EW, and modernize debriefing aids. Future development includes controlled flight-into-terrain-avoidance systems.

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.

Joshua McClanahan/USAF

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 its $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 fewer than three years using digital design techniques to quickly field new, low-cost designs. The aircraft 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 life-cycle 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 flew from Boeing's facility at St. Louis on Dec. 21, 2016, launching initial flight-testing with the manufacturer. Boeing delivered the first of five production-representative aircraft to Edwards on Nov. 9, 2023, launching USAF and Boeing developmental flight-testing. Two aircraft are conducting flight-envelope expansion at Edwards and a third is in extreme weather-testing at Eglin prior to supporting systems testing. Instability at high angles of attack discovered in early trials as well as concerns with ejection seat performance and supply chain issues have delayed testing. A decision to begin low-rate production was likewise delayed a year to 2025 and initial operational capability was postponed from 2024 to 2028 or later. USAF recently reduced its planned procurement from 351 aircraft to an initial 346 with the first production T-7A slated for delivery to Randolph.

Contractors: Boeing-SAAB; General Electric (engine); Collins Aerospace (cockpit/ejection seats).
First Flight: Dec. 20, 2016 (T-X).
Delivered: 2023 onward (planned).
IOC: 2028 (planned).
Production: 351 (planned).
Inventory: One (contractor-owned test airframe).
Operator: AETC; Planned: AFMC.
Aircraft Location: Edwards AFB, Calif.; Eglin AFB, Fla. Planned: Columbus AFB, Miss.; Laughlin AFB, JBSA-Randolph, and Sheppard AFB, Texas; Vance AFB, Okla.
Active Variants:
▪T-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.

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

Jet Fabara/USAF

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 gunsight 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 18 aircraft will undergo rework in FY24. USAF increased the number of T-38s receiving selected structural improvements by 21 aircraft in FY24 and now plans to upgrade a total of 182 under the Talon Repair Inspection and Maintenance (TRIM) program through 2028. Other key efforts also include digital cockpit display replacement, HUD and flight data-transfer refresh, and navigation system fixes to prevent spatial disorientation. USAF is working to resolve a shortage of overhauled engines due to parts obsolescence which has limited fleet availability and delayed pilot training over the last few years.

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: 52 (T-38A); six (AT-38B); 437 (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; Eglin AFB (temporarily relocated from 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 US16T zero/zero ejection seats.

EXPERIMENTAL AND TEST VEHICLES

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 began 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

USAF

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 craft has an internal payload bay similar to the space shuttle orbiter's and can deploy satellites or conduct on-orbit experimentation. The vehicle autonomously reenters the atmosphere upon command from a ground control station (GCS), and it lands conventionally on the runway. 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 six 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 record of 780 days on orbit, returning to Earth on Oct. 27, 2019. USSF launched its inaugural X-37B mission, OTV-6 (USSF-7), on May 17, 2020, which surpassed all previous flights, logging 908 days on orbit before landing at Kennedy Space Center on Nov. 12, 2022. OTV-6 was equipped with an aft-mounted service module enabling it to carry a larger research payload. The craft successfully deployed the U.S. Air Force Academy's experimental FalconSAT-8 as well as conducted a demonstration converting solar to RF microwave energy and transmitting it back to Earth. OTV-7 was carried aloft by a Falcon Heavy rocket for the first time Dec. 28, 2023, from Cape Canaveral, potentially targeting higher geosynchronous orbit. The launch closely followed deployment of a Chinese space plane dubbed "Shenlong" on Dec. 14, 2023.

Contractor: Boeing.
Operator: USSF SPoC, Delta 9 Detachment 1, (DEL 9 Det 1).
First Launch: April 22, 2010.
IOC: N/A.
Launch Vehicle: Atlas V, Falcon 9, Falcon Heavy.
Production: Two.
Inventory: Two.
Operational Location: Cape Canaveral SFS, Fla. (launch/landing); Vandenberg SFB, Calif., Kennedy Space Center, Fla. (landing).
Active Variant:
▪X-37B. DARPA/USAF-developed Orbital Test Vehicles.
Dimensions: Span 14 ft, length 29.25 ft (without service module), height 9.5 ft.
Weight: 11,000 lb at launch.
Propulsion: Single liquid-propellant rocket motor.
Endurance: 908+ days on orbit.
Orbit Altitude: Low-Earth orbit (LEO) at 110-500 miles.
Power: Gallium arsenide solar cells with lithium-ion batteries.

Kyle Brasier/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 that tested the combat potential of high-angle-of-attack maneuvers 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, 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 was equipped with the VISTA Simulation System (VSS) which could generate differing flight dynamics for the pilot, linked to a second control stick in the cockpit. VISTA incorporates an enlarged dorsal spine for additional equipment as well as a drag chute in common with some export variants of the F-16. It was redesignated X-62 in 2021 as part of a radical modernization effort that included upgrading VSS and integrating the new System for Autonomous Control of Simulation (SACS) and Model Following Algorithm (MFA). SACS permits the aircraft to be remotely controlled from the ground or operated via reprogramable synthetic artificial intelligence (AI), though with a safety pilot onboard. Open-architecture upgrades permit rapid reprogramming of various AI or control dynamics to replicate a broader variety of aircraft including uncrewed platforms. X-62 became the first supersonic aircraft to fly under AI control in December 2022 and Air Force Research Laboratory is employing X-62 as a surrogate to test software for the Skyborg paired, autonomous aircraft program. Algorithms flown on the X-62 enabled an unmanned XQ-58A Valkyrie to successfully fly via synthetic AI control. USAF is also modifying six F-16s with autonomous flight controls under the separate Viper Experimentation and Next-gen Operations Model-Autonomy Flying Testbed program (VENOM-AFT), which is likewise developing Collaborative Combat Aircraft (CCA) concepts. The X-62 is operated in partnership with Calspan Aviation and continues to support the Air Force Test Pilot School syllabus in addition to test work.

Contractors: Lockheed Martin; Calspan Aviation (VISTA VSS).
First Flight: April 1992 (NF-16D VISTA).
Delivered: January 1995.
IOC: 1992.
Production: One.
Inventory: One.
Operator: AFMC (AFRL, AFTPS).
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 42,300 lb.
Power Plant: F100-PW-229 augmented turbofan, 29,000 lb thrust.
Performance: Speed Mach 2+, range 3,200 miles.
Ceiling: 50,000 ft.
Accommodation: Two pilots on ACES II zero/zero ejection seats; remote or AI algorithm control (with safety pilot).

UNCREWED AIRCRAFT SYSTEMS

Sara Vidoni/USAF

BQMS-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 that 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. FY24 funds support production of 20 subscale targets.

Contractor: 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 unknown.
Ceiling: 50,000 ft.
Defensive Systems: Chaff/flares, EA pods, IR/RF wing pods (augmentation).
Accommodation: Preprogramed, unmanned.

Airman 1st Class Victoria Nuzzi

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), upgraded 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 and dismounted target tracking. A Reaper system comprises three aircraft, upgraded Block 30 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. The fleet is split between earlier Block 1 and later Block 5 aircraft that are retrofitted to meet operational needs. Extended Range (ER) mods adding external fuel tanks, a four-bladed propeller, engine alcohol/water injection, heavyweight landing gear, longer wings and tail surfaces, and other enhancements were completed fleetwide in 2023. The future Multi-Domain Operations (M2DO) configuration flew for the first time in 2022, and will add enhanced data link and control robustness, plug-and-play system integration, and double the power to integrate future advanced sensors, systems, and algorithms. M2DO enhancements will include antijam GPS, Link 16, internet-protocol and modular mission system architecture, enhanced C2 resiliency, and greater flight autonomy/automation. Ongoing mods include DAS-4 high-definition EO/IR sensor and capability enhancements. The service is transitioning the fleet from counterinsurgency to future roles in or near contested airspace and Reapers have recently demonstrated maritime support, C2, and ISR roles flying from forward operating locations in the Pacific. Developmental Automatic Take-Off and Land Capability (ATLC) is enabling MQ-9 to operate from airfields worldwide without a line-of-sight ground station, vastly increasing flexibility. An AFSOC crew also demonstrated flying three MQ-9s simultaneously and using the aircraft as a mothership to launch smaller, networked UAS in 2023. USAF plans to retire all Block 1s in 2024 followed by the highest-time Block 5 airframes through 2027. Plans call for retaining 140 Reapers through 2035, until a more survivable, flexible, and advanced platform can be fielded. An MQ-9 was lost in a high-profile midair collision with a Russian Su-27 following a botched intercept over the Black Sea on March 14, 2023, and two were damaged by Russian fighters in incidents over Syria that July. Two more MQ-9s were shot down by Houthi rebels in

November 2023 and February 2024.

Contractors: General Atomics Aeronautical Systems; L3Harris; Raytheon (sensors).
First Flight: February 2001.
Delivered: November 2003-present.
IOC: October 2007; 2015 (ER).
Production: 338.
Inventory: 244.
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.
GCS 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 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 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 converted airframes in six production lots through April 2025. 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., in 2020, which delivered approximately 75 conversions before closing in July 2022. Conversions will continue at Davis-Monthan through the life of the program. USAF is seeking a follow-on supersonic Next Generation Aerial Target (NGAT) to better replicate advanced adversary platforms' performance, radar, IR, and system signatures. The service is transitioning funds from QF-16 procurement to sustainment starting in FY24.

Contractors: Lockheed Martin; Boeing (drone conversion).
First Flight: May 4, 2012.
Delivered: February 2015-present.
IOC: Sept. 23, 2016.
Production: 126 (planned).
Inventory: 11 (QF-16A); 62 (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.

Bryce Bennett/USAF

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. 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 eventually converted as EQ-4B Battlefield Airborne Communications Node (BACN) relays before being retired in 2021. Block 30 was a multi-intelligence fleet equipped with EO/IR, SAR, and SIGINT sensors. ACC's final Block 30 departed Beale on July 7, 2022, destined for conversion by Northrop Grumman as a telemetry platform to support hypersonic weapons testing. Block 40 is a ground-moving target surveillance platform equipped with the Multiplatform Radar Technology Insertion Program (MP-RTIP) and the last USAF variant remaining in service. Its AESA and SAR simultaneously conduct moving target and cruise missile tracking, as well as stationary imagery collection. NATO operates a pooled fleet of RQ-4Ds based on the Block 40, which declared initial operating capability with the Allied Ground Surveillance fleet in 2021. FY24 funds support Block 40 and Ground Station sustainment through planned retirement in 2027. The Ground Station Modernization Program is currently fielding a completely redesigned "cockpit" that incorporates aircraft control, system and ISR sensor monitoring, data dissemination, and adds automated sensor operations and mission planning. USAF concluded Edwards-based RQ-4 operations in June 2023, transitioning all-variant development and sustainment testing to Palmdale.

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: Nine (Block 40).
Operator: ACC, AFMC.
Aircraft Location: Grand Forks AFB, N.D. (Block 40); forward operating locations: Andersen AFB, Guam; NAS Sigonella, Italy; Yokota AB, Japan.
Active Variants:
▪RQ-4B Block 30. Multi-intelligence platform equipped with EO/IR, SAR and SIGINT sensors.
▪RQ-4B Block 40. AESA and SAR equipped ground moving target indica-

tion (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) and/or maintainer at four work-stations (in GSMP-upgraded ground segments).

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 testing, 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 MISSLE (ALCM)

Strategic air-to-surface cruise missle

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 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 and were 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 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 nonpowered glide vehicle that maneuvers a warhead 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 Sea 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. USAF conducted a series of six ground detonations quantifying the characteristics of the weapon's warhead in early FY22. ARRW achieved safe separation and booster ignition for the first time on May 14, 2022, attaining Mach 5 after release from a B-52. A second successful launch on July 12 concluded booster testing, paving the way for operational testing. An AGM-183 completed the first live-fire test of a full-up weapon on Dec. 9, 2022, successfully flying its planned route before impacting the predetermined target. USAF conducted three all-up round tests in 2023 including a March 19 test in which the shroud failed to separate from the glide vehicle, invalidating terminal performance data. An additional shot Aug. 19, achieved proper release, boost, and ascent as well as "nominal" glide vehicle and warhead detonation, followed by a similarly successful over-water shot Oct. 12. Assessments indicate ARRW is survivable against advanced defenses, though early failures may limit the program's ability to fully prove its lethality against intended targets. USAF conducted the second to last all-up round tests, aimed at proving the weapons against land-targets on March 17, 2024. The service plans to finish the test program this year. An acquisition decision and previ-

ously planned fielding on the B-1, B-52, and possibly F-15E/EX are now uncertain pending the results of testing.

Contractor: Lockheed Martin.
First Flight: May 14, 2022.
Delivered: TBD.
IOC: 2022 (planned).
Production: TBD.
Inventory: N/A.
Operator: AFMC, Planned: AFGSC.
Unit Location: Edwards AFB, Calif.
Active Variants:
▪AGM-183A. Developmental prototype hypersonic boost-glide weapon.
Dimensions: Unknown.
Weight: Unknown.
Propulsion: Solid fuel rocket.
Performance: Mach 5+, range approx. 1,000 miles.
Guidance: Unk.
Warhead: Boost-glide vehicle with explosive warhead.

Airman 1st Class Devan Halstead

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. The B61 Mod 12 Life Extension Program (LEP) begun in 2016 is consolidating 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 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 on June 8, 2020, as the first aircraft capable of delivering the B61-12. The Department of Energy conducted nine additional drops, culminating in a full weapon system demo on the B-2A in July 2020. The B-2A conducted a test drop using the Radar Aided Targeting System (RATS) in July 2022, which was a major milestone for full integration on the aircraft. 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. Full integration is planned as part of ongoing Block 4 development. The first production B61-12 emerged in November 2021 ahead of full-rate production ramp-up in October 2022. The entire B61 inventory is slated for upgrade to B61-12 through FY26, though DoD announced plans to develop a B61-13 variant using -12 enhancement to modernize the higher yield -7, Oct. 27, 2023. If funded, B61-13 would modernize existing weapons for use against "harder and large area military targets," replacing the 1.2 megaton B83-1 and approximately 360 kiloton-yield B61-7 without increasing the existing stockpile.

Contractors: Los Alamos National Laboratory, Sandia National Laboratory (weapon); Boeing (B61-12 tail kit).
Delivered: 1979-1998 (legacy stockpile); 2022-present (B61-12 mod).
IOC: 1968.
Production: Approx. 1,840 (current active variants).
Inventory: Approx. 725 (including stockpiled and deployed).
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:
▪B61-3. Free-fall thermonuclear weapon with 0.3-170kt selectable yield.
▪B61-4. Free-fall thermonuclear weapon with 0.3-50kt selectable yield.
▪B61-7. Free-fall thermonuclear weapon with 10-360kt selectable yield.
▪B61-11. Ground-penetrating free-fall thermonuclear weapon with 400kt fixed yield.
▪B61-12. Modernized free-fall thermonuclear weapon with 0.3-50kt selectable yield and precision-guidance tail kit.
Dimensions: Length 11 ft 8 in., diameter 1 ft 1 in.
Weight: 700 lb; 825 lb (B61-12).
Performance: 0.3-400 kiloton thermonuclear yield air-droppable at speeds in excess of Mach 1.
Guidance: None (B61 Mod 1 to 11); unknown, likely INS (B61 Mod 12).
Warhead: One B61 -3, -4, -7, or -11.
Estimated Yield: 0.3 kilotons, 1.5 kilotons, 10 kilotons, 50 kilotons, (pre-selectable); 360 kilotons (B61-7), 400 kilotons (B61-11) (fixed yield).
Integration: B-2A, F-15E, and F-16C/D; NATO: F-16A/B Mid-Life Upgrade (MLU), and Panavia Tornado IDS.

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 currently the sole operational U.S. land-based ICBM. AFGSC initially deployed 550 missiles, later reducing that number to 400 based at Malmstrom, Minot, and F.E. Warren. Deployed ICBMs were also reduced 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 Northrop Grumman the Ground Based Strategic Deterrent (GBSD) development contract in 2019, resulting in the future LGM-35A Sentinel. AFGSC plans to begin replacing Minuteman III in 2027, with Sentinel fully replacing legacy ICBMs by 2036. Current Minuteman III efforts are focused on sustaining the ICBM's critical deterrent capability through the full fielding of Sentinel. Upgrades to guidance and propulsion will extend key systems to 2030, while modernized reentry vehicles and fuzes will serve both Minuteman and Sentinel. Flight-testing of the replacement fuse will culminate with the last of four test launches in 2024. USAF paused launches following Russian noncompliance with New START in 2022, but resumed testing with a shot on April 19, 2023. The service conducted four launches last year including one which was terminated in midflight due to an anomaly on Nov. 1, 2023. FY24 additionally funds Minuteman Essential Emergency Communication Network (MEECN) mods, generator reliability improvement, and access denial system life extension.

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: Approx. 400 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.
Reentry Vehicle: One Mk 21 RV; one to three Mk 12/12A MIRVs.
Warhead: One W87 or up to three W78 enriched uranium thermonuclear weapons.

USAF illustration

LGM-35 SENTINEL

Strategic surface-to-surface ballistic missile

Brief: The LGM-35A Sentinel is a developmental three-stage, solid-propellant, silo-based nuclear ICBM designed to replace the Minuteman III as the land-based element of USSTRATCOM's nuclear triad. Nuclear deterrent modernization is the Defense Department's top priority and USAF exhaustively studied further extending the 50-year-old Minuteman III before determining full replacement would be the most cost-effective investment. USAF awarded Boeing and Northrop Grumman technology maturation and risk-reduction contracts for a future Ground-Based Strategic Deterrent (GBSD) in 2017. Boeing declined to bid on full development in 2019, leaving Northrop Grumman to develop GBSD, which was officially designated LGM-35A Sentinel in April 2022. AFGSC plans to modernize and/or replace existing Minuteman III launch control, alert, and C2 facilities at Malmstrom, Minot, and F.E. Warren to accommodate Sentinel, which is targeted to reach IOC with nine alert missiles by 2029. The overall program will replace the 400 deployed Minuteman IIIs and 450 silos on a one-for-one basis, with the addition of 242 missiles to support developmental testing as well as reliability validation over the life of the program. Sentinel will incorporate modular design and open system architecture to ease both maintenance and future modernization. The service plans to initially deploy Sentinel with a single thermonuclear warhead aligning it to New START treaty limits, though the ICBM's increased performance could permit a multiple-warhead configuration. Sentinel will utilize both the Mk21 reentry vehicle and ICBM fuse, which are already undergoing modernization and replacement for the Minuteman III. AFGSC projects the LGM-35A will reach full operational capability by 2036, providing land-based strategic deterrence capability through at least 2075. FY24 procurement primarily funds converting Minuteman launch control centers and test facilities, as well as procuring guidance, electronics, propulsion, and test equipment. Northrop Grumman conducted the first test firing of the LGM-35A's first stage solid rocket motor at its static-test facility at Promontory, Utah, in 2023 followed by a test of the second stage in a vacuum chamber at Arnold Engineering Development Complex, Tenn., in early 2024. The successful engine tests along with wind-tunnel testing completed last year pave the way for a planned test flight in 2024. The technical complexity of the project has likely delayed planned IOC by at least a year to early 2030.

Contractors: Northrop Grumman (prime contractor); Aerojet Rocketdyne (third-stage solid fuel rocket); Bechtel, Clark Construction (launch infrastructure); CAE (training system); Collins Aerospace (training system/ C2); General Dynamics (C2, digital engineering, aerospace equipment); Honeywell (guidance and control); Textron (reentry system); Lockheed Martin (payload support); Kratos, HDT Global (transport systems).

First Flight: 2024 (planned).
Delivered: N/A.
IOC: 2029 (planned).
Production: 642 (planned).
Inventory: Zero.
Operator: Planned: AFGSC.
Unit Location: Planned: F. E. Warren AFB, Wyo.; Malmstrom AFB, Mont.; Minot AFB, N.D.; Vandenberg SFB, Calif. (test location).
Variant:
▪LGM-35A. Developmental Minuteman III replacement.
Dimensions: Unknown.
Weight: Unknown.
Propulsion: Stage 1: Northrop Grumman solid-propellant motor, thrust TBD; Stage 2: Northrop Grumman solid-propellant motor, thrust TBD; Stage 3: Aerojet Rocketdyne solid-propellant motor, thrust TBD.
Performance: Speed hypersonic, range 6,000+ miles.
Guidance: Unknown.
Reentry Vehicle: Mk 21 or Mk 21A RV.
Warhead: W87-0 or W87-1 enriched uranium thermonuclear weapons.

LONG-RANGE STANDOFF WEAPONS

Airman 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. The 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-10s demonstrated a MALD standoff support capability, escorting B-1s during Exercise Iron Thunder near the Philippines in 2022.

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: A-10, 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 targeted for 2023.

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: A-10, B-1, B-2, B-52, F-15E, and F-16. Planned: F-35A.

Senior Airman Jonathan Ramos

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 increase 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 extended range AGM-158B and "extreme range" AGM-158D, which is re-targetable via data link after launch. JASSM-ER production is shifting to AGM-158B-2 and production of the jam-resistant B-3 is projected for 2026. Prior production JASSM will not be upgraded though USAF aims to modify existing contract lots to procure B-2/B-3 instead. The AGM-158D is also currently in development and planned for delivery starting in 2027. Lockheed Martin is further developing the Long-Range Anti-Ship Missile (LRASM), which reached early operational capability on the B-1B in December 2018 and is planned for fielding on the B-52. USAF conducted a proof-of-concept employing palletized JASSM from mobility aircraft in 2020 in a massed standoff attack. JASSM and LRASM are USAF's premiere weapons for use in a high-end threat scenario. Notable efforts include Weapon Data Link (WDL) development to enable post-launch retargeting and precision guidance for GPS-denied environments. The service increased its JASSM stockpile objective by 47 percent, and FY24 funds continue maximum-rate procurement of 550 JASSM-ER as well as continuing LRASM purchases of 27 weapons. The manufacturer is opening a second production facility to double JASSM/LRASM production, and USAF plans to increase purchases to 810 missile a year due to threats in Europe and the Pacific. A B-2A successfully launched JASSM-ER for the first time during an integration test flight in 2022, and an F-15EX conducted its first shot as part of integrated testing in August 2023.

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 (including B-2 and B-3).
▪AGM-158C LRASM. Long-Range Anti-Ship Missile, based on JASSM.
▪AGM-158D JASSM-ER. Developmental extreme-range variant of JASSM- ER (previously XR).
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 Block 40-52; planned: F-15EX, F-35A, (JASSM-ER). Planned: B-52 (LRASM).

AIR-TO-AIR MISSILES

Tom Demerly/ANG

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, a 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) through 2035. FY24 funds decreased from FY23, procuring a combined 192 AIM-9X Block II/II+ missiles. An F-22 scored its first kill on Feb. 4, 2023, using an AIM-9X to down a Chinese ISR balloon flying at 60,000 feet off the South Carolina coast.

Contractors: 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-15EX, F-35A.

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-leave capability. The AIM-120B is an upgraded, re-programmable 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 completed operational testing in 2022 and is planned for timely fielding to keep pace with emerging threats. Ongoing development also includes Form, Fit, and Function (F3R) mods and replacing obsolete electronic elements. An F-15E conducted the first of five live-fire tests of the resulting AIM-120D3 on June 30, 2022, paving the way for production and fielding. 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. USAF successfully demonstrated an AIM-120 using passive infrared search and track (IRST) in lieu of radar against an airborne target in 2021, and an F-15E fired the first updated F3R AIM-120D3 in a live-shot against a QF-16 on June 30, 2022. The F-15EX fired an AIM-120D for the first time as part of integrated testing at Eglin Jan. 25, 2022. FY24 begins a multiyear/large lot procurement boosting USAF production from 320 to 457 AIM-120Ds.

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. Planned: F-15EX.

AIR-TO-GROUND MISSILES/ROCKETS

Courtesy illustration

WGU-59 ADVANCED PRECISION KILL WEAPON SYSTEM (APKWS) II

Air-to-surface guided rocket

Brief: APKWS II 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 personnel targets. APKWS can be fitted with HE or penetrating warheads as well as visual and IR illuminating, or white phosphorous rounds 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 midbody 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 multiround reusable pods. An F-16 successfully destroyed an airborne target using APKWS as part of an anti-cruise missile demo in 2019 and an A-10 tested it against vehicles with advanced reactive armor in 2022. BAE introduced a block upgrade capable of increasing APKWS' range as much as 30 percent in 2021. USAF had nearly fulfilled its required inventory, however FY24 funds 2,059 HE warheads and 91 guidance kits in addition to motors and launch tubes. The AT-802U was tested with APKWS during evaluation prior to its selection as SOCOM's future light attack/armed overwatch platform.

Contractor: BAE Systems.
First Flight: May 2013 (USAF).
Delivered: October 2012-present.
IOC: Circa 2016.
Active Variant:
- WGU-59B. 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, armor-penetrating, white phosphorous, or illuminating round.
Integration: AT-6, A-10, A-29, F-16. Planned: AT-802U.

Tom Demerly/ANG

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 FY24 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, approx. 714 mph, 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.

Jim Haseltine/courtesy photo via PACAF

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 will give the F-35 the ability to strike advanced threats including theater ballistic missile and land attack/anti-ship missile sites, GPS jammers, and anti-satellite systems. USAF is pursuing Navy-led fielding of AARGM-ER as an interim SEAD capability for the F-35A, procuring 42 missiles in FY23 and 14 in FY24 as a bridge to SiAW. AARGM-ER differs significantly from the legacy AGM-88, incorporating a new motor, larger diameter, and blended conformal strakes in place of forward stabilizing fins. A Navy F-18F successfully test-fired the first AARGM-ER over the Point Mugu test range on July 19, 2021, and the sea service's plan to reach IOC last year slipped to 2024 or later due to testing and certification delays.

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 (AARGM-ER).

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 employed on the MQ-9 Reaper and the AC-130J gunship. 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. Recent AC-130J block upgrades added a wing-pylon-mounted Hellfire to the 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-130J Ghostrider gunship, which employs the aft-firing weapon from ramp-mounted common-launch tubes. The forward-firing AGB-176B is employable on RPAs. USAF issued Raytheon a $105.2 million contract

Raytheon

modification to supply additional Griffin missiles in 2018. FY21 SOCOM-wide funds supported production of 226 AGM-176, including data links. FY22 ended additional procurement as USSOCOM shifts funds to confront future threats by developing small, Standoff Precision Guided Munitions (SOPGM) for use in contested environments. SOCOM plans to include AGM-176 in the future AT-802U armed overwatch platform's arsenal.

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), MQ-9 (B). Planned: AT-802U.

AREA WEAPONS

Senior Airman Jonathan Ramos

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. SFWs 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 standard USAF cluster munition that met the less-than-1-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 500-lb class and 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).

Ilka Cole/USAF

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 working to field 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, maneuver wings, stealth, and EW capabilities. USAF drastically reduced combat stockpile replenishment in FY22 before slightly increasing procurement to 4,200 tail kits in FY23. FY24 funds procure 1,772 tail kits.

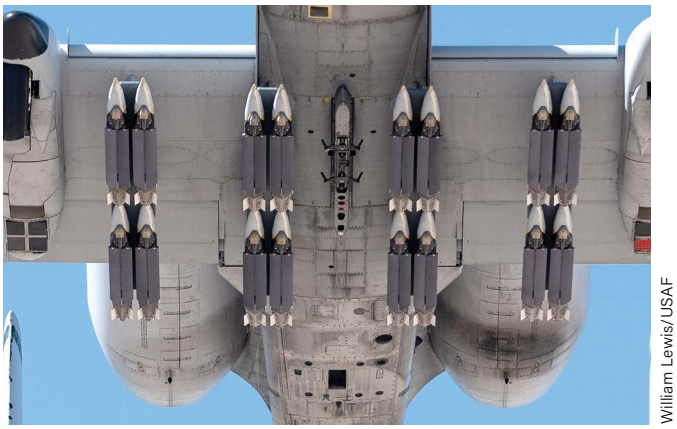
Contractors: Boeing; Textron; Honeywell.
First Flight: Oct. 22, 1996.
IOC: 1998.
Active Variants:
- GBU-31. GPS/INS-guided 2,000-lb GP, or BLU-109 penetrating weapon.
- GBU-32. GPS/INS-guided 1,000-lb GP, or BLU-110 penetrating weapon.
- GBU-38. GPS/INS-guided 500-lb GP, or BLU-140 (prev. BLU-111) penetrating 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 only INS 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 (SDB 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 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 HOB fuse to tailor kinetic effects. Current production versions incorporate Strategic Anti-Jam Beamforming Receiver Y-Code (SABR-Y) for use in GPS-denied/degraded environments. USAF reduced combat stockpile replenishment from over 2,000 weapons in FY21 to an actual total of 545 weapons in FY23, reflecting a shift to advanced standoff weapons to confront more advanced future threats. Procurement in FY24 increased to 874 and Ground-Launched SDB propelled by a 227 mm rocket are a significant part of U.S. military aid currently supplied to Ukraine. A-10C integration testing culminated a live-load of 23 SDB 1s in a flight test at Davis Monthan on Aug. 22, 2023.



William Lewis/USAF

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 Focused 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: A-10, AC-130J, F-15E, F-16, F-22, F-35A. Planned: B-1, B-52, B-21, MQ-9.

Raytheon Missile and Defense

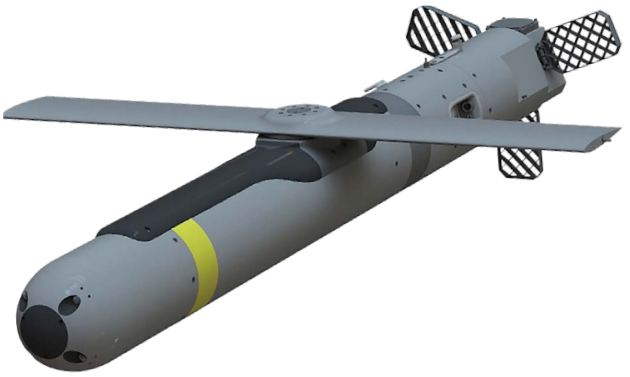
GBU-53 STORMBREAKER (SMALL DIAMETER BOMB II)

Guided air-to-surface glide bomb

Brief: StormBreaker (formerly SDB II) is a joint USAF-Navy program to develop 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 began in 2015, and USAF awarded the current production Lot 7 on April 30, 2021. Development includes integrating anti-jam GPS receiver, crypto and cyber security improvements, as well as guidance and lethality enhancements. SDB II began operational testing in June 2018 and achieved initial field-

ing on the F-15E on Sept. 23, 2020, followed by IOC in September 2022. Navy testing is underway with the F-35B/C and the service declared early operational capability on the F-18E/F in October 2023 with IOC targeted for 2024. FY24 funding supports production of up to 920 SDB IIs.

Contractor: Raytheon.
First Flight: 2012.
IOC: September 2022.
Production: 21,610 (planned).
Active Variant:
▪GBU-53/B SDB II. Tri-mode guided 250-lb low-yield bomb.
Dimensions: 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-130J, 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.

Contractor: Dynetics.
First Flight: Feb. 16, 2000 (USAF).
Delivered: 2020-present.
IOC: 2017 (USSOCOM).
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, and affordable replacement to the current Paveway III-based GBU-28. 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

Samuel King Jr./USAF

weapon release over the Eglin Range on 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 weapon is undergoing integration test flights which are supposed to be completed by the end of FY24. Procurement of 125 weapons began FY22, and FY23 and FY24 fund 80 BLU-138/A5K weapons.

Contractor: Air Force Armament Directorate.
First Flight: July 23, 2021.
Delivered: 2022-present.
IOC: N/A.
Active Variants:
▪GBU-72. GPS/INS guided 5,000-lb BLU-138 penetrating weapon.
Guidance: Semi-active laser.
Warhead: 5,000-lb (BLU-138/GBU-72) penetrating warhead.
Dimensions: 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-130H without a parachute. A total of 18,700 lb of the weapon's 21,000-lb weight is attributed to the 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.

Tech. Sgt. Alex Fox Echols III

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 initial LJDAM was a dual-mode, 500-lb guided weapon capable of attacking moving targets with precision using a semi-active laser guidance set. It was developed as an urgent operational need, and testing was completed in less than 17 months. The 500-lb variant was delivered in May 2008 and deployed in combat in Iraq three months later. Boeing more recently developed the GBU-56 (2,000-lb) variant, which uses a similar semi-active laser guidance set.

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 semi-active 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).

GBU-57 MASSIVE ORDNANCE PENETRATOR (MOP)

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 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 test targets have pushed potential fielding of the upgrade to FY25 or beyond. A B-2 employed

509th Bomb Wing

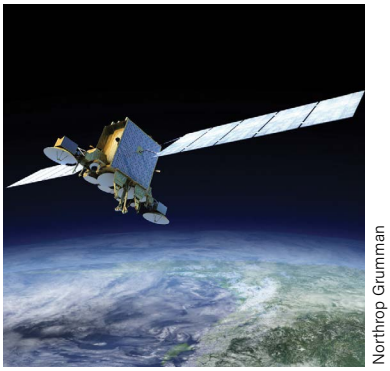
an LPSF-equipped weapon against a tunnel test target in 2020 to validate the design, followed by a series of three performance test drops between August 2021 and May 2022. No significant testing was conducted in 2023 but the program aims to formalize a test plan in FY24. Recent work includes adding jam-resistant GPS for operations against advanced A2/AD targets as well as procuring warheads, guidance kits, and fuses.

Contractor: Boeing.
First Flight: 2008.
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).

COMMUNICATIONS SATELLITES

ADVANCED EXTREMELY HIGH FREQUENCY (AEHF) SATELLITE SYSTEM

Communications



Northrop Grumman

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 to be declared when the vehicle joined the constellation on May 3, 2019. SV-5 launched Aug. 8, 2019, 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 was planned for late 2022. USSF plans to begin replacing AEHF with the next-generation Evolved Strategic SATCOM (ESS) for nuclear C2 starting in the early 2030s, while developing Protected Tactical SATCOM (PTS) to relive AEHF of providing contested battlefield comms. Both Boeing and Northrop Grumman received ESS prototype contracts ahead of a competitive selection. USSF is developing the Protected Tactical Enterprise Service (PTES) to enable global anti-jam, low-probability of intercept comms. PTES waveforms will initially be fielded on WGS, later expanding to commercial satellites and eventually to PTS. USSF plans to complete prototype PTS payloads in FY25 for hosted launch on WGS-11 as well as a second stand-alone satellite.

Contractors: Lockheed Martin; Northrop Grumman.
Operator/Location: USSF SpOC, Delta 8 (DEL 8), 4th Space Operations Squadron (4 SOPS), Schriever SFB, Colo.
First Launch: Aug. 14, 2010.
IOC: 2015.
Design Life: 14 yrs.
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: 14,500 lbs at launch, 9,000 lbs on-orbit.
Performance: 24-hr low, medium, and extended data rate connectivity from 75 bps to approximately 8 Mbps, from 65 north to 65 south latitude worldwide.
Orbit Altitude: Geosynchronous at 22,500 miles.
Power: Solar arrays generating 20,000 watts.

USAF

MILSTAR SATELLITE COMMUNICATIONS SYSTEM (MILSTAR)

Communications

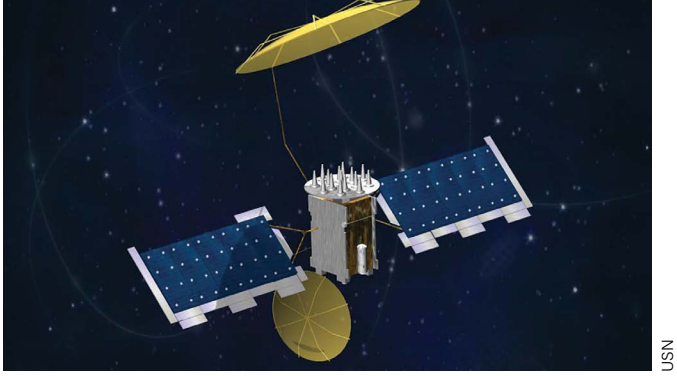
Brief: Milstar is the legacy joint-service backbone of strategic/tactical DOD communications. It provides encrypted, secure, anti-jam communications around the world and uses cross-linked satellites, eliminating the need for ground relay stations. Block I satellites incorporate a low-data-rate payload 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. Milstar surpassed 30 years of operations Feb. 7, 2024, exceeding its on-orbit design life by three times.

Contractors: Lockheed Martin; Boeing; Northrop Grumman (formerly TRW).
Operator/Location: USSF SpOC, Delta 8 (DEL 8), 4th Space Operations Squadron (4 SOPS), Schriever SFB, Colo.
First Launch: Feb. 7, 1994.
IOC: July 1997 (Milstar I).
Design Life: 10 yr.
Launch Vehicle: Titan IV/Centaur.
Constellation: 5: 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.

MOBILE USER OBJECTIVE SYSTEM (MUOS)

Communications

Brief: MUOS provides next-generation global UHF narrowband and BLOS military SATCOMS. The constellation was originally developed by Lockheed Martin for the Navy and is designed to replace the legacy UHF Follow-On (UFO) system, enabling a 10-fold increase in capacity as well as interoperability with legacy terminals. Each satellite is equipped with an advanced SATCOM payload that converts 3G cellular-like service to military UHF as well as a UHF payload compatible with UFO terminals. MUOS provides tactical air, land, and sea platforms reliable SATCOMS even in challenging terrain and weather conditions and also extends SATCOMS to the high Arctic. The system utilizes both geosynchronous satellites and ground-station relays to provide mobile phone-type, voice, text, and data to users in the field. MUOS can interface with the Defense Switched Network and DOD's Global Information Grid offering clear voice and videoconferencing



USN

over existing networks. The system comprises four operational satellites, an on-orbit spare, and four ground relay stations in addition to networking and satellite control. USSF aims to procure two additional MUOS satellites targeted for launch by 2030, coinciding with the projected end-of-life of the initial vehicles. Service life extension efforts initiated by the Navy would procure two additional satellites, equipped only with the advanced Wideband Code Division Multiple Access (WCDMA) payload to replace the oldest satellites in orbit by 2030. Full exploitation of MUOS' capabilities has been hampered by the slow modernization of user platforms to date, and many USAF platforms are in the process of transition. The Naval Satellite Operations Center transferred its remaining UHF satellites, including five legacy UHF Follow-Ons, a single remaining UHF FLTSAT, and two range-extending nanosats to the USSF along with control of MUOS on June 6, 2022. FY24 funds focus on modernizing software and correcting cyber vulnerabilities to the network's six Ground Segment sites. Canada is set to become the first allied MUOS user starting in early 2024 with FOC for Canadian Forces planned in 2026.

Contractor: Lockheed Martin.
Operator/Location: USSF SpOC, Space Delta 8 (DEL 8), 10th Space Operations Squadron (10 SOPS), Naval Base Ventura County, Calif.; Schriever SFB, Colo.
First Launch: Feb. 24, 2012.
IOC: N/A; October 2019 (FOC).
Design Life: 14 yrs. Launch Vehicle: Atlas V.
Launch Vehicle: Atlas V.
Constellation: Four (plus one on-orbit spare).
Active Satellites:
▪MUOS-1. Launched in 2012, on orbit and operational (CONUS/Americas).
▪MUOS-2. Launched in 2013, on orbit and operational (Pacific).
▪MUOS-3. Launched in 2015, on orbit and operational (Atlantic).
▪MUOS-4. Launched in 2015, on orbit and operational (Indo-Asia).
▪MUOS-5. Launched in 2016, on-orbit spare.
Dimensions: Length 21.9 ft, height 12 ft, width 6 ft (with full solar array stowed), 90 ft (with solar arrays deployed); two deployable reflector arrays 17.7 ft (legacy UHF), and 45.9 ft (MUOS).
Weight: 8,405 lb (including 6,450 lb of fuel).
Performance: UHF narrowband/BLOS 3G-equivalent voice, chat, and data 89.5 north to 65 south latitude worldwide.
Orbit Altitude: Geosynchronous at 22,236 miles.
Power: Two deployable solar arrays.

Boeing

WIDEBAND GLOBAL SATCOM (WGS) SATELLITE

Communications

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 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. Congress again added FY23 funds to procure WGS-12 to ensure depth of coverage, augmenting the future Protected Tactical SATCOM (PTS), which will provide battlefield coverage in contested spectrum environments. USSF conducted a demonstration and is working to field an IOC PTS capability using a WGS satellite in 2024 specifically to address needs in the Indo-Asia Pacific theater. This capability could be extended to the full constellation, permitting an advanced anti-jam/low probability of interception bridge to PTS, and eventually augmenting the future constellation. WGS-11 slated for launch in 2024 will host a dedicated PTS payload in addition to being the first WGS satellite carried into orbit by a ULA Vulcan Centaur.

Contractor: Boeing.
Operator/Location: USSF SpOC, Delta 8 (DEL 8), 4th Space Operations Squadron (4 SOPS), Schriever SFB, Colo.
First Launch: October 2007.
IOC: April 16, 2008.
Design Life: 14 yr.
Launch Vehicle: Atlas V, Delta IV; planned: Vulcan Centaur (WGS-11).
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.

METEOROLOGICAL SATELLITES

USAF

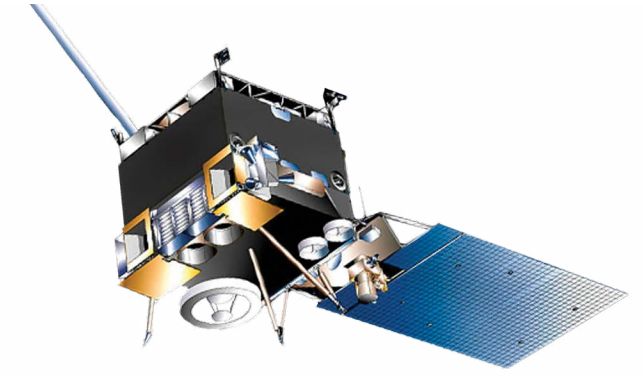
DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP)

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 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 remain 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. 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. WSF-M will measure oceanic winds and precipitation and space weather, augmented by the future Electro-Optical/Infrared Weather System (EWS), monitoring cloud cover and other conditions. USSF awarded General Atomics Electromagnetic Systems and Orion Space Solutions demonstrator contracts. Orion launched its experimental cubesat on Jan. 3, 2023, and General Atomics is expected to launch its demo in 2024. USSF estimates the DMSP constellation will reach the end of its useful life by 2026.

Contractors: Lockheed Martin; Northrop Grumman.
Operator/Location: National Oceanic and Atmospheric Administration; NOAA Operations Facility, Suitland, Md.; Schriever SFB, Colo. (backup).
First Launch: May 23, 1962.
IOC: 1965.
Design Life: Five yr (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.



Space Operations Command

ELECTRO-OPTICAL/INFRARED WEATHER SYSTEM-GEOSTATIONARY (EWS-G)

Strategic and tactical launch detection

Brief: EWS-G is an environmental data collection constellation for military weather forecasting over the Indian Ocean region. The system uses EO/IR sensors to image cloud layers and analyze environmental conditions in support of military operations and planning. EWS-G uses a Solar X-ray Imager (SXI) to map cloud cover in tandem with a sounding sensor that measures vertical temperature, humidity, and ozone layers. The satellites are also equipped with radiation and energetic particle sensors to monitor solar activity and electromagnetic "space weather," as well as a search and rescue transponder to extend aircraft, vessel, and personnel distress beacons. Data is transmitted to a Remote Ground Station (RGS) in Dongara, Australia, and relayed to DOD weather centers for analysis, forecasting, and dissemination to tactical users. The first satellite, EWS-G1 was launched as the National Oceanic and Atmospheric Administration (NOAA) Geostationary Operational Environmental Satellite (GOES)-13 in 2006. It was replaced on orbit in 2017 and subsequently transferred to the USSF to fill a gap in meteorological coverage in September 2020. EWS-G1 reached the end of its planned service life in February 2024, and USSF secured transfer of a second satellite (former GOES-15) redesignated EWS-2, which was maneuvered to a new geostationary orbit over the Indian Ocean in 2023. EWS-2 will provide coverage through 2030 or beyond. USSF awarded General Atomics Electromagnetic Systems a contract to develop a purpose-built EWS platform, issuing a follow-on option to build a prototype satellite in March 2023. The prototype is planned for launch in 2024 and EWS is intended to bridge the gap between anticipated DSMP retirement and USSF's next-generation small weather satellites.

Contractors: Boeing.
Operator/Location: USSF SpOC, Delta 2 (DEL 2), 19th Space Defense

Squadron (19 SDS), NAF Dahlgren, Va.; National Oceanic and Atmospheric Administration Wallops Command and Data Acquisition Station (WCDAS), Va.; NOAA Operations Facility, Suitland, Md. (backup).
First Launch: May 24, 2006.
IOC: 2020 (with USSF).
Design Life: 14 yrs.
Launch Vehicle: Delta IV.
Constellation: Four low-Earth orbit (LEO).
Active Satellites:
▪EWS-G1. Formerly NOAA GEOS-13, launched in 2006; active.
▪EWS-G2. Formerly NOAA GEOS-15, launched in 2010; active.
Dimensions: 13.7 x 6.16 ft x 9.5 ft with 27.5 ft solar array (deployed).
Weight: 7,075 lb at launch.
Performance: Geostationary orbit; provides constant near-real-time coverage of the Indian Ocean region.
Orbit Altitude: 22,236 miles.
Power: Solar array generating 2,300 watts.

MISSILE WARNING SATELLITES

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. The constellation hosts X-ray, optical, and radiation sensors that form a key part of the Radiation Detection Capability (RADEC) supporting the U.S. Nuclear Detonation Detection System (USNDS). USNDS is capable of near-real-time atmospheric and near-space detection and location of nuclear blasts supporting tactical warning, nuclear forces, space control, treaty monitoring, and classified missions. 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, reducing casualties. FY24 funds support DSP and SBIRS fixed and mobile ground station comms, crypto, cybersecurity, and processing modernization. The Army transferred the combined constellations' four Joint Tactical Ground Stations (JTAGS) located in Japan, Italy, South Korea, and Qatar to USSF as part of overall consolidation efforts on Oct. 1, 2023. USSF announced retirement of DSP-17, launched in 1994, on March 22, 2023.

Contractors: Northrop Grumman (formerly TRW); Aerojet.
Operator/Location: USSF SpOC, Space Delta 4 (DEL 4); 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 nonoperational.
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.

SPACE-BASED INFRARED SYSTEM (SBIRS)

USSF

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. GEO-5 and -6 are based on a modernized spacecraft that will begin migration to the next-generation Enterprise Ground Service (EGS), consolidating control of multiple systems. USSF also awarded Raytheon a contract in 2020 to modernize ground data processing. The Future Operationally Resilient Ground Evolution (FORGE) system will serve both SBIRS and the future Next-Generation Overhead Persistent Infrared (OPIR) system. OPIR will comprise three GEO satellites built by Lockheed Martin and two polar HEO sensors from Northrop Grumman. Delivery of the first OPIR GEO satellite is slated for FY25 followed by the first HEO sensor in FY28. The final SBIRS GEO satellite (GEO-6) successfully blasted off from Cape Canaveral on Aug. 4, 2022, and was operationally accepted March 24, 2023. GEO-5 and GEO-6 will replace the oldest satellites on orbit. FY24 funds support SBIRS and DSP fixed and mobile ground station comms, crypto, cyber security, and processing modernization. The Army transferred the combined constellations' four Joint Tactical Ground Stations (JTAGS) located in Japan, Italy, South Korea, and Qatar to USSF as part of overall consolidation efforts on Oct. 1, 2023.

Contractors: Lockheed Martin (prime contractor); Northrop Grumman (payload); Raytheon (data processing modernization).
Operator/Location: USSF SpOC, Space Delta 4 (DEL 4); 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).
Constellation: Six 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.
▪SBIRS GEO-6. Launched in 2022; 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); 530 lb (HEO sensor).
Orbit Altitude: Geosynchronous (GEO satellites) and highly elliptical (HEO sensors).
Power: Solar array, 2,435 watts (GEO), batteries.

PRECISION TIMING AND NAVIGATION SATELLITES

Courtesy

NAVSTAR 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, a second civil signal, and electromagnetic pulse sensors that form part of the U.S. Nuclear Detonation Detection System (NDS). 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, and integrity, and incorporates a steerable, high-power, anti-jam capability. Lockheed Martin completed Block IIIA production at SV-10 in 2022. The company was awarded a follow-on contract for Block IIIF SV-11 and SV-12 as well as up to 22 additional vehicles in 2018. USSF executed options for SV-13 and SV-14 in October 2020, SV-15 to -17 in November 2021, and SV-18 through SV-20 in November 2022. Block IIIF will add a hosted search and rescue payload, as well as geographically targetable high-power military signal. USSF is working to field the delayed Next-Generation Operational Control Segment (OCX), which will enable advanced GPS III features. The launch and on-orbit check segment of OCX went operational in 2017, but concurrent Blocks 1 and 2 to enable use of modernized civil, aviation, military signals, and advanced cyber defenses have been further delayed and are now not expected until mid-2024 or beyond. OCX is currently one of the last key elements to GPS Block III reaching IOC. USSF most recently launched GPS III SV-6 on Jan. 18, 2023, and vehicles 7 and 8 are awaiting launches planned for June 2024 and an undetermined launch date in 2025, respectively. 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, Delta 8 (DEL 8), 2nd Space Operations Squadron (2 SOPS), 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: 31 spacecraft (not including decommissioned or on-orbit spares).
Active Satellites:
▪GPS Block IIR. Launched 1997 to 2004; six active.
▪GPS Block IIR-M. Launched 2005 to 2009; seven active.
▪GPS Block IIF. Launched 2010 to 2016; 12 active.
▪GPS Block IIIA/IIIF. New generation launched in 2018; six 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: Medium-Earth Orbit (MEO) at between 10,988 and 12,550 miles.
Power: Solar panels generating 1,136 watts (IIR/IIR-M); up to 2,900 watts (IIF).

SPACE DOMAIN AWARENESS SATELLITES

GEOSYNCHRONOUS SPACE SITUATIONAL AWARENESS PROGRAM (GSSAP)

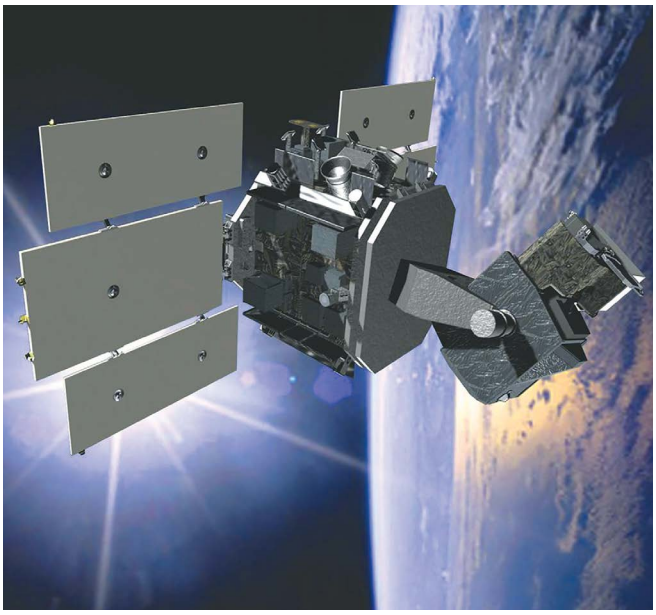
Situational awareness/orbital tracking

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 carry EO/IR sensors and are able to maneuver to observe objects at close range or conduct rendezvous. 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

USAF

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, and were declared operational several months later. USSF announced the on-orbit decommissioning of GSSAP 2, Aug. 2, 2023. The space service plans to launch two additional GSSAP satellites into orbit in 2024 and 2027.

Contractor: Northrop Grumman Space Systems (formerly Orbital ATK).
Operator/Location: USSF SpOC, Delta 9 (DEL 9), 1st Space Operations Squadron (1 SOPS), Schriever SFB, Colo.
First Launch: July 28, 2014.
IOC: Sept. 29, 2015.
Launch Vehicle: Delta IV, Atlas V (USSF-8).
Constellation: Six spacecraft.
Active Satellites:
▪GSSAP 1. Launched in 2014; on orbit, active.
▪GSSAP 2. Launched in 2014, non-operational orbit, decommissioned in 2023.
▪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: Near-geosynchronous at 22,300 miles.
Power: Solar panels.



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. 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 were 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. USSF and the National Reconnaissance Office (NRO) launched the first three of a series of satellites intended to replace SBSS, dubbed "Silent Barker," from Cape Canaveral Sept 10, 2023. The next-generation system is slated to become fully operational in 2026.

Contractors: Boeing (system integration, ground segment, operations and sustainment); Ball Aerospace (satellite); Orbital ATK (ORS-5).
Operator/Location: USSF SpOC, Delta 9 (DEL 9), 1st Space Operations Squadron (1 SOPS), 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; 22 ft 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).

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United Launch Alliance

The final United Launch Alliance Delta IV Heavy rocket carrying the NROL-70 mission for the National Reconnaissance Office lifts off from Space Launch Complex-37 at Cape Canaveral Space Force Station, Fla., on April 9, 2024.