Understanding the Iraq Crisis

U.S. Forces in the Gulf

	Already Deployed	In Deployment	Projected Total (11-15-98)
Total Personnel (Joint & Support Staff)	23,500 1,000	18,729?	42,229? (27,500 formally announced)
Air Force			
Personnel	5,600	4,000(?)	9,600(?)
Total Combat Aircraft	173	129 (84 fixed wing combat) (14 helicopter combat) (27 fixed wing support) (4 helicopter support)	302
	70 on Eisenhower	12 B-52 with 96 ALCM to Diego Garcia	
	103 land-based 18 F-15CJ 8 F-16CJ 10 F-16CG 13 A-10A 3 E-3B AWACS 2 RC-135 ELINT 2 U-2	6 B-1B 12 F-16CG with laser targeting pods 16 F-16CJ with HARMs and jamming pods 12 F-15 12 F-117 12 F-18 (Marine Corps) 3 E-3B AWACS 1 Joint Stars 3 EC-130 2 EA-6B ECM aircraft	
Navy			
Personnel	14,400 Navy & Marines		
	12,000 Navy	10,000	22,000
Main Battle Ships	15 ships 97 aircraft		
Cruise Missiles			
Launch Ships	8	8	16

Missiles	250-275 CGC: 2 Cape St. George (122) Anzio (122)	75-100 2	350 4
	DDG: 5 Arleigh Bruke (90) Paul Hamilton (90) Hopper (90) Hayler (90) Fletcher (90)	4	9
	SSN: 1 Newoort News	2	3
Carrier Battle Forces	USS Eisenhower 1 Aircraft carrier 68 aircraft 10 F-14 36 F/A-18 4 EA-6B 4 E-2C 8 S-3A/B 2 Cruiser 5 Destroyers 1 Frigate 1 Attack Submarine 1 Mine Countermeasure Ship	USS Enterprise 1 Aircraft Carrier 70 aircraft 1/ F-14 3/F-18A/B 1/E-2C 1/EA-6B 2 Cruisers 4 Destroyers 2 Frigates 2 Submarines	 2 138 4 9 3 3 1
Marine Corps			
Personnel	14,300 Marines And Navy		
	3,300 Marines	1,729	5,029
Amphibious			
Ready Group	Essex 1 Assault Ship 5 AV-B Harriers 24 helicopters 1 Amphibious Transport Dock 1 Dock Landing Ship	Belleau Wood 1 Assault Ship 5 AV-8B Harriers 24 helicopters 2 Ampibious support ships	
Army			
Personnel	2,600? Cadre for Prepositioned Brigade in Kuwait	3,000 Full manning and support of Brigade in Kuwait	5,600? 1 Full heavy brigade
Patriot Units	6 Batteries (some under foreign command)	2 plus 500 support troops	

The Nature of the US Halt and Build-Down

- Secretary Cohen announces on November 16, that the US has halted its force build-up. "We will keep the forces that are already there for the time being. Those forces that did not yet arrive, will in all probability be recycled back in the next several days."
- The US holds back a total of 91 of the 105 aircraft the Air Force planned to send to the Gulf
- Several dozen F-16 and F-15 fighter planes, along with four F-117 Stealth fighters, halt in Europe instead of heading toward the Gulf as originally planned..

- The US deploys six F-117 stealth fighters to Kuwait from Holloman Air Force Base, N.M., instead of the planned 12.
- Seven of 12 B-52H model bombers arrived on the island of Diego Garcia in the Indian Ocean. The remaining five are now to stay in the U.S.
- Twenty-four F-16s and12 F-15C fighters were diverted to England.
- Four of six B-1B bombers arrive in the Gulf. Two will remain in the U.S.
- Similarly, a Joint Stars surveillance aircraft deployed to the Gulf is returning home.
- The Army stops deployment of 3,600 troops from Fort Stewart, Georgia, and six to nine batteries of Patriot missiles from Fort Bliss, Texas. Each battery contains about four launchers and 32 missiles.
- A total of about 4,000 Army troops stand down.
- Cohen says these forces will "be ready to go at a moment's notice." When a second aircraft carrier USS Enterprise arrives in the Gulf, the one there -- the USS Dwight D. Eisenhower -- is expected to return home on schedule.
- The number of aircraft now planned to be in the Gulf will be about half the 400 U.S. warplanes would be in the Gulf region the US had planned.
- More than 170 U.S. aircraft, one aircraft carrier and about two dozen other ships -- including eight vessels capable of launching Tomahawk cruise missiles -- were already in the region, and a total of six F-117s Stealth fighters, six B-52 bombers, four B-1 bombers and some support aircraft, including AWACS surveillance planes, were added during the crisis.

Source: Adapted from material provided by the Department of Defense, 11-17-98

The Cost of US Forces in the Gulf

- The US announces that its military operations in the Persian Gulf aimed at Iraq have cost almost $6.9 billion since 1991.
- These costs don't include the latest deployment of additional bombers, fighters, and troops.
- Costs in fiscal 1998, which ended Sept. 30, are estimated to be $2 billion --primarily because of the massive military buildup that started in January and lasted until May.
- The U.S. put two aircraft battle groups on station in January instead of one and increased troops, airmen, and sailors to 40,000 from about 20,000.
- The figures include costs for continual air patrols over Iraq to stop Iraqi military flights, Tomahawk cruise missile attacks launched twice in 1993 and once in 1996, and major military deployments of troops in October 1994 and this January.
- The annual costs include:
- $346 million in fiscal 1991;
- $106 million in fiscal 1992;
- $838.5 million in 1993; $421.8 million in 1994;
- $864.3 billion in 1995; $65.2 million in 1996; $739 million in 1997;
- $2 billion in fiscal 1998,
- and $849 million so far in fiscal 1999.

Source: Adapted from material provided by the Department of Defense, 11-17-98

F-15 Eagle

Mission

The F-15 Eagle is an all-weather, extremely maneuverable, tactical fighter designed to gain and maintain air superiority in aerial combat.

Features

The Eagle’s air superiority is achieved through a mixture of unprecedented maneuverability and acceleration, range, weapons and avionics. It can penetrate enemy defense and outperform and

outfight any current or projected enemy aircraft. The F-15 has electronic systems and weaponry to detect, acquire, track and attack enemy aircraft while operating in friendly or enemy-controlled airspace. Its weapons and flight control systems are designed so one person can safely and effectively perform air-to-air combat.

The F-15's superior maneuverability and acceleration are achieved through high engine thrust-to-weight ratio and low wing loading. Low wing-loading (the ratio of aircraft weight to its wing area) is a vital factor in maneuverability and, combined with the high thrust-to-weight ratio, enables the aircraft to turn tightly without losing airspeed. A multi-mission avionics system sets the F-15 apart from other fighter aircraft. It includes a head-up display, advanced radar, inertial navigation system, flight instruments, UHF communications, tactical navigation system and instrument landing system. It also has an internally mounted, tactical electronic-warfare system, "identification friend or foe" system, electronic countermeasures set and a central digital computer.

Through an on-going multistage improvement program the F-15 is receiving extensive upgrade involving the installation or modification of new and existing avionics equipment to enhance the tactical capabilities of the F-15.

The head-up display projects on the windscreen all essential flight information gathered by the integrated avionics system. This display, visible in any light condition, provides the pilot information necessary to track and destroy an enemy aircraft without having to look down at cockpit instruments.

The F-15's versatile pulse-Doppler radar system can look up at high-flying targets and down at low-flying targets without being confused by ground clutter. It can detect and track aircraft and small high-speed targets at distances beyond visual range down to close range, and at altitudes down to tree-top level. The radar feeds target information into the central computer for effective weapons delivery. For close-in dog fights, the radar automatically acquires enemy aircraft, and this information is projected on the head-up display. An inertial navigation system enables the Eagle to navigate anywhere in the world. It gives aircraft position at all times as well as pitch, roll, heading, acceleration and speed information.

The F-15's electronic warfare system provides both threat warning and automatic countermeasures against selected threats. The "identification friend or foe" system informs the pilot if an aircraft seen visually or on radar is friendly. It also informs US or allied ground stations and other suitably equipped aircraft that the F-15 is a friendly aircraft. A variety of air-to-air weaponry can be carried by the F-15. An automated weapon system enables the pilot to perform aerial combat safely and effectively, using the head-up display and the avionics and weapons controls located on the engine throttles or control stick. When the pilot changes from one weapon system to another, visual guidance for the required weapon automatically appears on the head-up display. The Eagle can be armed with combinations of four different air-to-air weapons: AIM-7F/M Sparrow missiles or AIM-120 Advanced Medium Range Air-to-Air Missiles on its lower fuselage corners, AIM-9L/M Sidewinder or AIM-120 missiles on two pylons under the wings, and an internal 20 mm Gatling gun (with 940 rounds of ammunition) in the right wing root. Low-drag, conformal fuel tanks were especially developed for the F-15C and D models. Conformal fuel tanks can be attached to the sides of the engine air intake trunks under each wing and are designed to the same load factors and airspeed limits as the basic aircraft. Each conformal fuel tank contains about 114 cubic feet of usable space. These tanks reduce the need for in-flight refueling on global missions and increase time in the combat area. All external stations for munitions remain available with the tanks in use. AIM-7F/M Sparrow and AIM-120 missiles, moreover, can be attached to the corners of the conformal fuel tanks.

Background

The first F-15A flight was made in July 1972, and the first flight of the two-seat F-15B (formerly TF-15A) trainer was made in July 1973. The first Eagle (F-15B) was delivered in November 1974

to the 58th Tactical Training Wing, Luke Air Force Base, Ariz., where pilot training was accomplished in both F-15A and B aircraft. In January 1976, the first Eagle destined for a combat squadron was delivered to the 1st Tactical Fighter Wing at Langley Air Force Base, Va.
Other units equipped with F-15s include the 36th Fighter Wing, Bitburg Air Base, Germany; 325th Fighter Wing at Tyndall Air Force Base, Fla.;

33d Fighter Wing, Eglin Air Force Base, Fla.; 32d Fighter Squadron, Soesterberg AB, Netherlands; and the 3d Fighter Wing, Elmendorf Air Force Base, Alaska. In January 1982, the 48th Fighter-Interceptor Squadron at Langley Air Force Base became the first Air Force air defense squadron to transition to the F-15.

The single-seat F-15C and two-seat F-15D models entered the Air Force inventory beginning in 1979. Kadena Air Base, Japan, received the first F-15C in September 1979. These new models have Production Eagle Package (PEP 2000) improvements, including 2,000 pounds (900 kilograms) of additional internal fuel, provision for carrying exterior conformal fuel tanks and increased maximum takeoff weight of up to 68,000 pounds (30,600 kilograms).
F-15C's, D's and E's were deployed to the Persian Gulf in 1991 in support of Operation Desert Storm where they proved their superior combat capability with a confirmed 26:0 kill ratio.

General Characteristics

- Primary Function: Tactical fighter.
- Contractor: McDonnell Douglas Corp.
- Power Plant: Two Pratt & Whitney F100-PW-100 turbofan engines with afterburners.
- Thrust: (C/D models) 25,000 pounds each engine (11,250 kilograms).
- Length: 63 feet, 9 inches (19.43 meters).
- Height: 18 feet, 8 inches (5.69 meters).
- Wingspan: 42 feet, 10 inches (13.06 meters)
- **Speed: 1,875 mph (Mach 2.5-plus at sea level).**
- Ceiling: 65,000 feet (19,697 meters).
- Maximum Takeoff Weight: (C/D models) 68,000 pounds (30,600 kilograms).
- **Range: 3,450 miles (3,000 nautical miles) ferry range with conformal fuel tanks and three external fuel tanks.**
- **Armament: One M-61A1 20 mm multibarrel gun mounted internally with 940 rounds of ammunition; four AIM-9L/M Sidewinder and four AIM-7F/M Sparrow missiles, or a combination of AIM-9L/M, AIM-7-F/M and AIM-120 missiles.**
- Crew: F-15A/C: one. F-15B/D: two.
- Unit cost: $15 million.
- Date Deployed: July 1972
- Inventory: Active force, 403; ANG, 126; Reserve, 0.

F-16 Fighting Falcon

Mission The F-16 Fighting Falcon is a compact, multirole fighter aircraft. It is highly maneuverable and has proven itself in air-to-air combat and air-to-surface attack. It provides a relatively low-cost, high-performance weapon system for the United States and allied nations. Uses AMRAAM, AIM-120, Mavrick, and laser guided bombs.
Block 40: night attack, all-weather version with LANTIRN low altitude attack and navigation infrared system, GPS, Maverick attack capability
Block 50: Anti-radiation missile and air defense suppression version using HARM and Shrike Anti-radiation missiles.
Features
In an air combat role, the F-16's maneuverability and combat radius (distance it can fly to enter air combat, stay, fight and return) exceed that of all potential threat fighter aircraft. It can locate

targets in all weather conditions and detect low flying aircraft in radar ground clutter. In an air-to-surface role, the F-16 can fly more than 500 miles (860 kilometers), deliver its weapons with superior accuracy, defend itself against enemy aircraft, and return to its starting point. An all-weather capability allows it to accurately deliver ordnance during non-visual bombing conditions. In designing the F-16, advanced aerospace science and proven reliable systems from other aircraft such as the F-15 and F-111 were selected. These were combined to simplify the airplane and reduce its size, purchase price, maintenance costs and weight. The light weight of the fuselage is achieved without reducing its strength. With a full load of internal fuel, the F-16 can withstand up to nine G's—nine times the force of gravity—which exceeds the capability of other current fighter aircraft.

The cockpit and its bubble canopy give the pilot unobstructed forward and upward vision, and greatly improved vision over the side and to the rear. The seat-back angle was expanded from the usual 13 degrees to 30 degrees, increasing pilot comfort and gravity force tolerance. The pilot has excellent flight control of the F-16 through its "fly-by-wire" system. Electrical wires relay commands, replacing the usual cables and linkage controls. For easy and accurate control of the aircraft during high G-force combat maneuvers, a side stick controller is used instead of the conventional center-mounted stick. Hand pressure on the side stick controller sends electrical signals to actuators of flight control surfaces such as ailerons and rudder.

Avionics systems include a highly accurate inertial navigation system in which a computer provides steering information to the pilot. The plane has UHF and VHF radios plus an instrument landing system. It also has a warning system and modular countermeasure pods to be used against airborne or surface electronic threats. The fuselage has space for additional avionics systems.

Background

The F-16A, a single-seat model, first flew in December 1976. The first operational F-16A was delivered in January 1979 to the 388th Tactical Fighter Wing at Hill Air Force Base, Utah.
The F-16B, a two-seat model, has tandem cockpits that are about the same size as the one in the A model. Its bubble canopy extends to cover the second cockpit. To make room for the second cockpit, the forward fuselage fuel tank and avionics growth space were reduced. During training, the forward cockpit is used by a student pilot with an instructor pilot in the rear cockpit.

All F-16s delivered since November 1981 have built-in structural and wiring provisions and systems architecture that permit expansion of the multirole flexibility to perform precision strike, night attack and beyond-visual-range interception missions. This improvement program led to the F-16C and F-16D aircraft, which are the single- and two-place counterparts to the F-16A/B, and incorporate the latest cockpit control and display technology. All active units and many Air National Guard and Air Force Reserve units have converted to the F-16C/D.

The F-16 is being built under an unusual agreement creating a consortium between the United States and four NATO countries: Belgium, Denmark, the Netherlands and Norway. These countries jointly produced with the United States an initial 348 F-16s for their air forces. Final airframe assembly lines were located in Belgium and the Netherlands. The consortium's F-16s are assembled from components manufactured in all five countries. Belgium also provides final assembly of the F100 engine used in the European F-16s. The long-term benefits of this program will be technology transfer among the nations producing the F-16, and a common-use aircraft for NATO nations. This program increases the supply and availability of repair parts in Europe and improves the F-16's comb at readiness.

USAF F-16 multi-mission fighters were deployed to the Persian Gulf in 1991 in support of Operation Desert Storm, where more sorties were flown than with any other aircraft. These fighters were used to attack airfields, military production facilities, Scud missiles sites and a variety of other targets.

General Characteristics

- Primary Function: Multirole fighter
- Builder: Lockheed Martin Corp.
- Power Plant: F-16C/D: one Pratt and Whitney F100-PW-200/220/229 or
- General Electric F110-GE-100/129
- Thrust: F-16C/D, 27,000 pounds(12,150 kilograms)
- Length: 49 feet, 5 inches (14.8 meters)
- Height: 16 feet (4.8 meters)
- Wingspan: 32 feet, 8 inches (9.8 meters)
- **Speed: 1,500 mph (Mach 2 at altitude)**
- Ceiling: Above 50,000 feet (15 kilometers)
- Maximum Takeoff Weight: 37,500 pounds (16,875 kilograms)
- **Range: More than 2,000 miles ferry range (1,740 nautical miles)**
- **Armament: One M-61A1 20 mm multibarrel cannon with 500 rounds; external stations can carry up to six air-to-air missiles, conventional air-to-air and air-to-surface munitions and electronic countermeasure pods.**
- Unit cost: F-16C/D, $20 million plus
- Crew: F-16C: one; F-16D: one or two
- Date Deployed: January 1979
- Inventory: Active force, 444; Air National Guard, 305; Reserve, 60.

B-1B Lancer

Mission

The B-1B is a multi-role, long-range bomber, capable of flying intercontinental missions without refueling, then penetrating present and predicted sophisticated enemy defenses. It can perform a variety of missions, including that of a conventional weapons carrier for theater operations.

Features

The B-1B's electronic jamming equipment, infrared countermeasures, radar location and warning systems complement its low-radar cross-section and form an integrated defense system for the aircraft.

The swing-wing design and turbofan engines not only provide greater range and high speed at low levels but they also enhance the bomber's survivability. Wing sweep at the full-forward position allows a short takeoff roll and a fast base-escape profile for airfields under attack. Once airborne, the wings are positioned for maximum cruise distance or high-speed penetration.
The B-1B uses radar and inertial navigation equipment enabling aircrews to globally navigate, update mission profiles and target coordinates in-flight, and precision bomb without the need for ground based navigation aids. Included in the B-1B offensive avionics are modular electronics that allow maintenance personnel to precisely identify technical difficulties and replace avionics components in a fast, efficient manner on the ground.

The aircraft's AN/ALQ 161A defensive avionics is a comprehensive electronic counter-measures package that detects and counters enemy radar threats. It also has the capability to detect and counter missiles attacking from the rear. It defends the aircraft by applying the appropriate counter-measures, such as electronic jamming or dispensing expendable chaff and flares. Similar to the offensive avionics, the defensive suite has a re-programmable design that allows in-flight changes to be made to counter new or changing threats.

The B-1B represents a major upgrade in US long-range capabilities over the aging B-52 -- the previous mainstay of the bomber fleet. Significant advantages include:

- Low radar cross-section to make detection considerably more difficult.

- Ability to fly lower and faster while carrying a larger payload.
- Advanced electronic countermeasures to enhance survivability.

Numerous sustainment and upgrade modifications are ongoing or under study for the B-1B aircraft. A large portion of these modifications which are designed to increase the combat capability are known as the conventional mission upgrade program. This three phase program will increase the lethality, survivability and supportabilty of the B-1B fleet. Phase I of the program, scheduled for completion by the end of FY 96, will add the capability to release cluster bomb unit weapons. Phases II and III will further upgrade the B-1B capability, to include the ability to deliver joint direct attack munitions and standoff weapons.

Background
The first B-1B was delivered to the Air Force at Dyess Air Force Base, Texas, in June 1985, with initial operational capability on Oct. 1, 1986. The final B-1B was delivered May 2, 1988.
The B-1B holds several world records for speed, payload and distance. The National Aeronautic Association recognized the B-1B for completing one of the 10 most memorable record flights for 1994.

General Characteristics

- Primary Function: Long-range, multi-role, heavy bomber
- Builder: Rockwell International, North American Aircraft
- Operations Air Frame and Integration: Offensive avionics, Boeing
- Military Airplane; defensive avionics, AIL Division
- Power Plant: Four General Electric F-101-GE-102 turbofan engine with afterburner
- Thrust: 30,000-plus pounds with afterburner, per engine
- Length: 146 feet (44.5 meters)
- Wingspan: 137 feet (41.8 meters) extended forward, 79 feet (24.1 meters)
- swept aft
- Height: 34 feet (10.4 meters)
- Weight: Empty, approximately 190,000 pounds (86,183 kilograms)
- Maximum Takeoff Weight: 477,000 pounds (214,650 kilograms)
- **Speed: 900-plus mph (Mach 1.2 at sea level)**
- **Range: Intercontinental, unrefueled**
- Ceiling: Over 30,000 feet (9,000 meters)
- Crew: Four (aircraft commander, pilot, offensive systems officer and
- defensive systems officer)
- Armament: Up to **84 Mark 82 conventional 500-pound bombs and 30**
- **CBU-87/89/97**. Also can be reconfigured to carry a wide range of nuclear weapons
- Date Deployed: June 1985
- Unit Cost: $200-plus million per aircraft
- Inventory: Active force, 50 (PAA) 84 (actual); ANG, 10 PAA (11 actual); Reserve , 0

B-52 Stratofortress

Mission
Air Combat Command's B-52 is a long-range, heavy bomber that can perform a variety of missions. The bomber is capable of flying at high subsonic speeds at altitudes up to 50,000 feet (15,166.6 meters). It can carry nuclear or conventional ordnance with worldwide precision navigation capability.

Features
In a conventional conflict, the B-52 can perform air interdiction, offensive counter-air and maritime operations. During Desert Storm, B-52s delivered 40 percent of all the weapons dropped by

coalition forces. It is highly effective when used for ocean surveillance, and can assist the US Navy in anti-ship and mine-laying operations. Two B-52s, in two hours, can monitor 140,000 square miles (364,000 square kilometers) of ocean surface.

All B-52s are equipped with an electro-optical viewing system that uses platinum silicide forward-looking infrared and high resolution low-light-level television sensors to augment the targeting, battle assessment, flight safety and terrain-avoidance system, thus further improving its combat ability and low-level flight capability.

Pilots wear night vision goggles (NVGs) to enhance their night visual, low-level terrain-following operations. Night vision goggles provide greater safety during night operations by increasing the pilot's ability to visually clear terrain and avoid enemy radar.

Starting in 1989, an on-going modification incorporates the global positioning system, heavy stores adaptor beams for carrying 2,000 pound munitions and additional smart weapons capability. All aircraft are being modified to carry the AGM-142 Raptor missile and AGM-84 Harpoon anti-ship missile.

The use of aerial refueling gives the B-52 a range limited only by crew endurance. It has an unrefueled combat range in excess of 8,800 miles (14,080 kilometers).

The aircraft's flexibility was evident during the Vietnam War and, again, in Operation Desert Storm. B-52s struck wide-area troop concentrations, fixed installations and bunkers, and decimated the morale of Iraq's Republican Guard. The Gulf War involved the longest strike mission in the history of aerial warfare when B-52s took off from Barksdale Air Force Base, La., launched conventional air launched cruise missiles and returned to Barksdale—a 35-hour, non-stop combat mission.

Background

For more than 35 years B-52 Stratofortresses have been the primary manned strategic bomber force for the United States. The B-52 is capable of dropping or launching a significant array of weapons in the US inventory. This includes gravity bombs, cluster bombs and precision guided missiles. Updated with modern technology, the B-52 will continue into the 21st century as an important element of our nation's defenses. Current engineering analysis show the B-52's life span to extend beyond the year 2045.

The B-52A first flew in 1954, and the B model entered service in 1955. A total of 744 B-52s were built with the last, a B-52H, delivered in October 1962. Only the H model is still in the Air Force inventory and all are assigned to Air Combat Command.

The first of 102 B-52H's was delivered to Strategic Air Command in May 1961. The H model can carry up to 20 air launched cruise missiles. In addition, it can carry the conventional cruise missile which was launched from B-52G models during Desert Storm.

The B-52's electronic countermeasures suite is capable of protecting itself against a full range of air defense threat systems by using a combination of electronic detection, jamming and infrared countermeasures. The B-52 can also detect and counter missiles engaging the aircraft from the rear. These systems are undergoing continuous improvement in order to enable them to continue to counter emerging threat systems.

General Characteristics

- Primary Function: Heavy bomber
- Contractor: Boeing Military Airplane Co.
- Power Plant: Eight Pratt & Whitney engines TF33-P-3/103 turbofan

- Thrust: Each engine up to 17,000 pounds
- Length: 159 feet, 4 inches (48.5 meters)
- Height: 40 feet, 8 inches (12.4 meters)
- Wingspan: 185 feet (56.4 meters)
- **Speed: 650 miles per hour (Mach 0.86)**
- Ceiling: 50,000 feet (15,151.5 meters)
- Weight: Approximately 185,000 pounds empty (83,250 kilograms)
- Maximum Takeoff Weight: 488,000 pounds (219,600 kilograms)
- **Range: Unrefueled 8,800 miles (7,652 nautical miles)**
- **Armament: Approximately 70,000 pounds (31,500 kilograms) mixed ordnance** -- bombs, mines and missiles. (Modified to carry air-launched cruise missiles, Harpoon anti-ship and Have Nap missiles.)
- Crew: Five (aircraft commander, pilot, radar navigator, navigator and
- electronic warfare officer)
- Accommodations: Six ejection seats
- Unit Cost: $30 million
- Date Deployed: February 1955
- Inventory: Active force, 85; ANG, 0; Reserve, 9

E-3 Sentry (AWACS)

Mission

The E-3 Sentry is an airborne warning and control system (AWACS) aircraft that provides all-weather surveillance, command, control and communications needed by commanders of US and NATO air defense forces. As proven in Desert Storm, it is the premier air battle command and control aircraft in the world today.

Features

The E-3 Sentry is a modified Boeing 707/320 commercial airframe with a rotating radar dome. The dome is 30 feet (9.1 meters) in diameter, six feet (1.8 meters) thick, and is held 11 feet (3.3 meters) above the fuselage by two struts. It contains a radar subsystem that permits surveillance from the Earth's surface up into the stratosphere, over land or water. The radar has a range of more than 200 miles (320 kilometers) for low-flying targets and farther for aerospace vehicles flying at medium to high altitudes. The radar combined with an identification friend or foe subsystem can look down to detect, identify and track enemy and friendly low-flying aircraft by eliminating ground clutter returns that confuse other radar systems.

Other major subsystems in the E-3 are navigation, communications and computers (data processing). Consoles display computer-processed data in graphic and tabular format on video screens. Console operators perform surveillance, identification, weapons control, battle management and communications functions.

The radar and computer subsystems on the E-3 Sentry can gather and present broad and detailed battlefield information. Data is collected as events occur. This includes position and tracking information on enemy aircraft and ships, and location and status of friendly aircraft and naval vessels. The information can be sent to major command and control centers in rear areas or aboard ships. In time of crisis, this data can be forwarded to the National Command Authorities in the United States.

In support of air-to-ground operations, the Sentry can provide direct information needed for interdiction, reconnaissance, airlift and close-air support for friendly ground forces. It can also provide information for commanders of air operations to gain and maintain control of the air battle.

As an air defense system, E-3s can detect, identify and track airborne enemy forces far from the boundaries of the United States or NATO countries. It can direct fighter-interceptor aircraft to these enemy targets.

Experience has proven that the E-3 Sentry can respond quickly and effectively to a crisis and support worldwide military deployment operations. It is a jam-resistant system that has performed missions while experiencing heavy electronic countermeasures.

With its mobility as an airborne warning and control system, the Sentry has an excellent chance of surviving in war. Among other things, the flight path can quickly be changed according to mission and survival requirements. The E-3 can fly a mission profile for more than 8 hours without refueling. Its range and on-station time can be increased through inflate refueling.

The aircraft can be used as a surveillance asset in support of other government agencies during counter drug operations. US Customs Service officers may fly aboard the E-3 Sentry on precoordinated missions to detect smuggling activities.

Background

Engineering, test and evaluation began on the first E-3 Sentry in October 1975. In March 1977 the 552nd Airborne Warning and Control Wing (now 552nd Air Control Wing, Tinker Air Force Base, Okla.), received the first E-3s where they are still assigned.

Pacific Air Forces has four E-3 Sentries assigned to the 961st Airborne Air Control Squadron (AACS), Kadena Air Base, Japan, and the 962nd AACS, Elmendorf AFB, Alaska.
NATO has acquired 18 of the aircraft and support equipment. The first E-3 was delivered to NATO in January 1982. The United Kingdom has seven E-3s and France has four.
E-3 Sentry aircraft were among the first to deploy during Operation Desert Shield where they immediately established an around-the-clock radar screen to defend against Iraqi aggression. During Desert Storm, E-3s flew more than 400 missions and logged more than 5,000 hours of on-station time. They provided radar surveillance and control to more than 120,000 coalition sorties. In addition to providing senior leadership with time-critical information on the actions of enemy forces, E-3 controllers assisted in 38 of the 40 air-to-air kills recorded during the conflict.
For the first time in the history of aerial warfare, an entire air war has been recorded. This was due to the data collection capability of the E-3 radar and computer subsystems.
In March 1996, the Air Force activated an AWACS Reserve Associate Program unit which will perform duties on active-duty aircraft. The unit is assigned to the 507th Operations Group at Tinker.

General Characteristics

- Primary Function: Airborne surveillance, command, control and
- communications
- Builder: Boeing Aerospace Co.
- Power Plant: Four Pratt and Whitney TF33-PW-100A turbofan engines
- Thrust: 21,000 pounds each engine
- Length: 145 feet, 6 inches (44 meters)
- Wingspan: 130 feet, 10 inches (39.7 meters)
- Height: 41 feet, 4 inches (12.5 meters)
- Rotodome: 30 feet in diameter (9.1 meters), 6 feet thick (1.8 meters),
- mounted 11 feet (3.33 meters) above fuselage
- Speed: Optimum cruise 360 mph (Mach 0.48)
- Ceiling: Above 29,000 feet (8,788 meters)
- Maximum Takeoff Weight: 347,000 pounds (156,150 kilograms)
- Endurance: More than 8 hours (unrefueled)
- Unit Cost: Approximately $270 million

- Crew: Flight crew of four plus mission crew of 13-19 specialists
- (mission crew size varies according to mission)
- Date Deployed: March 1977
- Inventory: Active force, 33; Reserve, 0; Guard, 0

F/A-18 Hornet

Description: All-weather fighter and attack aircraft. The single-seat F/A-18 Hornet is the nation's first strike-fighter. It was designed for traditional strike applications such as interdiction and close air support without compromising its fighter capabilities. With its excellent fighter and self-defense capabilities, the F/A-18 at the same time increases strike mission survivability and supplements the F-14 Tomcat in fleet air defense. F/A-18 Hornets are currently operating in 37 tactical squadrons from air stations world-wide, and from 10 aircraft carriers. It is proudly flown by the US Navy's Blue Angels Flight Demonstration Squadron.

Features: The F/A-18 Hornet, an all-weather aircraft, is used as an attack aircraft as well as a fighter. In its fighter mode, the F/A-18 is used primarily as a fighter escort and for fleet air defense; in its attack mode, it is used for force projection, interdiction and close and deep air support.

Background: The F/A-18 demonstrated its capabilities and versatility during Operation Desert Storm, shooting down enemy fighters and subsequently bombing enemy targets with the same aircraft on the same mission, and breaking all records for tactical aircraft in availability, reliability, and maintainability. The aircraft's survivability was proven by Hornets taking direct hits from surface-to-air missiles, recovering successfully, being repaired quickly, and flying again the next day. The F/A-18 is a twin engine, mid-wing, multi-mission tactical aircraft. The F/A-18A and C are single seat aircraft. The F/A-18B and D are dual-seaters. The B model is used primarily for training, while the D model is the current Navy aircraft for attack, tactical air control, forward air control and reconnaissance squadrons. The newest models, the E and F were rolled out at McDonnell Douglas on Sept. 17, 1995, and are currently undergoing further testing at the Patuxent Naval Air Station in Maryland. The E is a single seat while the F is a two-seater.
All F/A-18s can be configured quickly to perform either fighter or attack roles or both, through selected use of external equipment to accomplish specific missions. This "force multiplier" capability gives the operational commander more flexibility in employing tactical aircraft in a rapidly changing battle scenario. The fighter missions are primarily fighter escort and fleet air defense; while the attack missions are force projection, interdiction, and close and deep air support.

The F/A-18C and D models are the result of a block upgrade in 1987 incorporating provisions for employing updated missiles and jamming devices against enemy ordnance. C and D models delivered since 1989 also include an improved night attack capability.

General Characteristics, C and D models

- Primary Function: Multi-role attack and fighter aircraft
- Contractor: Prime: McDonnell Douglas; Major Subcontractor: Northrop
- Unit Cost: $ 24 million
- Propulsion: Two F404-GE-402 enhanced performance turbofan engines
- Thrust: 17,700 pounds (8,027 kg) static thrust per engine
- Length: 56 feet (16.8 meters)
- Height: 15 feet 4 inches (4.6 meters)
- Maximum Take Off Gross Weight: 51,900 pounds (23,537 kg)
- Wingspan: 40 feet 5 inches (13.5 meters)
- Range (w/external tanks):

- Fighter: 1,379 nautical miles (1585.9 miles/2,537 km);
- Attack: 1,333 nautical miles (1532.9 miles/2,453 km)
- Ceiling: 50,000+ feet
- Speed: Mach 1.7+
- Crew:
- A,C and E models: One
- B,D and F models: Two
- Armament: One 20 mm MK-61A1 Vulcan cannon;
- External payload: AIM 9 Sidewinder, AIM 7 Sparrow, AIM-120 AMRAAM,
- Harpoon, Harm, Shrike, SLAM, SLAM-ER, Walleye, Maverick missiles; Joint
- Stand-Off Weapon (JSOW); Joint Direct Attack Munition (JDAM); various general purpose bombs, mines and rockets.
- Date Deployed:
- First flight, November 1978
- Operational, October 1983 (A/B models); September 1987 (C/D models)

General Characteristics, E and F models

- Primary Function: Multi-role attack and fighter aircraft
- Contractor: McDonnell Douglas
- Unit Cost: $ 35 million
- Propulsion: Two F414-GE-400 turbofan engines
- Thrust: 22,000 pounds (9,977 kg) static thrust per engine
- Length: 60.3 feet (18.5 meters)
- Height: 16 feet (4.87 meters)
- Maximum Take Off Gross Weight: 66,000 pounds (29,932 kg)
- Wingspan: 44.9 feet (13.68 meters)
- Ceiling: 50,000+ feet
- Speed: Mach 1.8+
- Crew:
- A,C and E models: One
- B,D and F models: Two
- Armament: One 20 mm MK-61A1 Vulcan cannon;
- External payload: AIM 9 Sidewinder, AIM 7 Sparrow, AIM-120 AMRAAM,
- Harpoon, Harm, Shrike, SLAM, SLAM-ER, Walleye, Maverick missiles; Joint
- Stand-Off Weapon (JSOW); Joint Direct Attack Munition (JDAM); various general purpose bombs, mines and rockets.
- First Flight December 1995

F/A-18D Hornet

- Primary function: Attack and destroy surface targets, day or night, under all weather conditions; conduct multi-sensor imagery reconnaissance; provide supporting arms coordination; and intercept and destroy enemy aircraft under all weather conditions.

  Mission: Specific F/A-18D tasks include:

- Conduct day and night deep air support, in all weather. Deep air support consists of armed reconnaissance, radar search and attack, interdiction, and strikes against enemy installations, using all types of weapons compatible with assigned aircraft.

- Conduct multi-sensor imagery reconnaissance to include pre-strike and post-strike target damage assessment and visual reconnaissance.
- Conduct day and night supporting arms coordination to include forward air control, tactical air coordination and artillery/naval gunfire spotting.
- Intercept and destroy enemy aircraft in conjunction with ground and airborne fighter direction.
- Conduct battlefield illumination and target illumination.
- Conduct armed escort of friendly aircraft.
- Be able to operate from aircraft carriers, advanced bases, and expeditionary airfields.
- Be able to deploy or conduct extended range operations employing aerial refueling.

Features: Marine F/A-18D aircraft are unique within the Department of the Navy because the Marine Corps employs the F/A-18D as a tactical strike aircraft while the Navy uses it as a trainer. Marine F/A-18Ds may be land-based from prepared airfields, or they can operate from expeditionary airfields (EAF). They may also be sea-based, operating from the decks of Navy aircraft carriers.

Inventory: Currently 72 (6 active squadrons). Background: The Marine Corps F/A-18Ds have replaced 108 OA-4M, RF-4B, and the A6-E aircraft. The F/A-18D functions not only as a strike fighter, but also as a Forward Air Controller (Airborne)/Tactical Air Controller (Airborne) (FAC(A)/TAC(A)) and tactical reconnaissance aircraft. In addition, the night attack suite allows the F/A-18D to conduct operations below weather at low altitude using night vision goggles and Forward Looking Infrared Radar (FLIR) systems. Using a variety of precision guided weapons, the F/A-18D provides a precision strike capability.

Operation Desert Storm in 1991 was the operational proving ground for the F/A-18D. Twelve F/A-18D aircraft deployed to SWA to participate in combat operations. Used solely in a Tactical Air Coordinator (Airborne)/Forward Air Control (Airborne) or "Fast FAC" role, the F/A-18D proved to be a superior TAC(A)/FAC(A) platform. The F/A-18D's flew into target areas, ahead of strike aircraft, to locate and identify high value targets for USMC, USAF, USN, and Kuwait Air Force TACAIR missions. By providing target location and identification, threat updates, and the overall battlefield situation, the F/A-18D proved very effective in controlling as many as 20 strike fighters in a single 30-minute period.

Manufacturer: McDonnell Douglas
Propulsion: Two General Electric F404-GE-400 afterburning, low bypass turbofan engines
Thrust: 16,000 pounds per engine
Length: 56 feet (17.06 meters)
Wing span: 37.5 feet (11.43 meters)
Cruise speed: High subsonic to supersonic
Ferry range: Over 2,000 nautical miles (2300 miles)
Combat radius:
Fighter mission: 400 nautical miles (460 miles)
Attack mission: 575 nautical miles (661.25 miles)
Armament: Nine external wing stations, comprising two wingtip stations for AIM-9 Sidewinder air-to-air missiles; two outboard wing stations for an assortment of air-to-air and air-to-ground weapons, including AIM-7 Sparrows, AIM-9 Sidewinders, AMRAAMs, AGM-84 Harpoons and AGM-65 Maverick missiles; two inboard wing stations for external fuel tanks or air-to-ground stations; two nacelle fuselage stations for Sparrows or AN/AAS-38 Forward Looking Infrared Radar (FLIR) pods; and a center station for fuel tank or air-to-ground weapons such as GBU-10 and -12 laser guided bombs, Mk 80 series general purpose bombs, and CBU-59 cluster bombs. An M61 20 mm six-barrel gun is mounted in the nose and has a McDonnell Douglas director gunsight.

Crew: 2
Introduction date: October 1989
Unit Replacement Cost: $28,000,000

F/A-18A/C/CN Hornet

Mission: Specific F/A-18A/C/CN tasks include:

- Intercept and destroy enemy aircraft in conjunction with ground or airborne fighter control under all-weather conditions.
- Conduct day and night close air support under the weather.
- Conduct day and night deep air support, under the weather. Deep air support consists of radar search and attack, interdiction, and strikes against enemy installations using all types of weapons compatible with assigned aircraft.
- Conduct armed escort of friendly aircraft.
- Be able to operate from aircraft carriers, advanced bases, and expeditionary airfields.
- Be able to deploy or conduct extended range operations employing aerial refueling.

Features: The Marine Corps F/A-18A/C/CN strike fighter multi-mission aircraft was designed to replace the F-4 Phantom. The F/A-18A/C/CN Hornet is missionized for traditional fighter, attack, and close air support roles through selection of external pods/equipment to accomplish specific mission objectives. Any aircraft can quickly be configured to perform either fighter or attack missions, or both, thus providing the Marine Air Ground Task Force (MAGTF) commander more flexibility in employing his tactical aircraft in a rapidly changing scenario. Marine F/A18s may be land-based from prepared airfields, or they can operate from expeditionary airfields (EAF). They may also be sea-based, operating from the decks of Navy aircraft carriers.

Inventory: 10 active and 4 reserve squadrons with 12 planes each for a total of 168 planes.
Background: Operation Desert Storm in 1991 was the operational proving ground for the F/A-18A/C. Six single-seat F/A-18A/C squadrons deployed to SWA to participate in combat operations. These squadrons flew in excess of 4600 sorties for a total of 8864 hours while experiencing no combat losses.

- Primary function: Intercept and destroy enemy aircraft under all-weather conditions and attack and destroy surface targets.
- Manufacturer: McDonnell Douglas
- Propulsion: Two General Electric F404-GE-400 afterburning, low bypass turbofan engines
- Thrust: 16,000 pounds per engine
- Length: 56 feet (17.06 meters)
- Wing span: 37.5 feet (11.43 meters)
- Cruise speed: High subsonic to supersonic
- Ferry range: Over 2,000 nautical miles (2300 miles)
- Combat radius:
- Fighter mission: 400 nautical miles (460 miles)
- Attack mission: 575 nautical miles (661.25 miles)
- Armament: Nine external wing stations, comprising two wingtip stations for an assortment of air-to-air and air-to-ground weapons, including AIM-7 Sparrows, AIM-9 Sidewinders, AMRAAMs, AGM-84 Harpoons and AGM-65 Maverick missiles; two inboard wing stations for external fuel tanks or air-to-ground stations; two nacelle fuselage stations for Sparrows or AN/AAS-38 Forward Looking Infrared Radar (FLIR) pods; and a center station for fuel tank or air-to-ground weapons. Air-to-ground weapons include GBU-10 and -12 laser guided bombs, Mk 80 series general purpose bombs, and CBU-59 cluster bombs. AN M61 20mm six-barrel gun is mounted in the nose and has a McDonnell Douglas director gunsight.

Crew: 1
Introduction date: March 1983
Unit Replacement Cost: $28,100,000

EA-6B Prowler

Service: Navy and Marine Corps
Description: The EA-6B Prowler provides an umbrella of protection over strike aircraft and ships by jamming enemy radar, electronic data links and communications.

Features: The EA-6B Prowler is a twin-engine, mid-wing aircraft manufactured by Grumman Aerospace Corporation as a modification of the basic A-6 Intruder air frame. Designed for carrier and advanced base operations, the Prowler is a fully integrated electronic warfare system combining long-range, all-weather capabilities with advanced electronic countermeasures. A forward equipment bay, and pod-shaped faring on the vertical fin, house the additional avionics equipment. The side-by-side cockpit arrangement gives maximum efficiency, visibility and comfort.

Background: The primary mission of the aircraft is to support air strikes and ground troops by interrupting enemy electronic activity.

General Characteristics

- Primary Function: Electronic countermeasures Contractor: Grumman Aerospace Corporation Propulsion: Two Pratt & Whitney J52-P408 engines (11,200 pounds thrust each)
- Length: 59 feet 10 inches (17.7 meters)
- Wingspan: 53 feet (15.9 meters)
- Height: 16 feet 3 inches (4.9 meters)
- Weight: Max gross take-off: 61,000 pounds (27,450 kg)
- Speed: Over 500 knots (575 mph, 920 kmh)
- Range: Over 1,000 nautical miles (1,150 miles, 1,840 km)
- **Ceiling: 37,600 feet**
- Crew: Four: pilot and three electronic countermeasures officers
- Armament: AGM-88A HARM missile
- Date Deployed: First flight, May 25, 1968; Operational, July 1971

EA-6B Prowler

Primary function: Airborne Command and Control (C2W) support to Fleet Marine Forces to include electronic attack (EA), tactical electronic support (ES), electronic protection (EP) and high speed anti-radiation missile (HARM).

Features: Marine Prowlers may be land-based from prepared airfields, or they can operate from expeditionary airfields (EAF). They may also be sea-based, operating from aircraft carriers. Marine Prowlers are unique in their integration with the Tactical Electronic Processing and Evaluation System (TERPES). TERPES provides post-mission analysis of EA-6B ES data for reporting and updating orders of battle. It also provides post-mission analysis of jamming and HARM employment for reporting, assessing and storing mission data.

Background: Following the transition from the EA-6A aircraft to the EA-6B, Marine Tactical Electronic Warfare Squadron 2 (VMAQ-2) continued to provide detachments to Carrier Air Wing Five on board the USS Midway. In 1980 VMAQ-2 completed its assignment aboard the Midway and began shore-based rotations with the 1st Marine Aircraft Wing in Iwakuni, Japan. Detachments were subsequently sent back to sea duty aboard the USS Saratoga and USS America. Marine Prowlers supported joint operations against Libya in 1986 from the carrier.

During Operations Desert Storm and Desert Shield VMAQ-2 had one detachment (six aircraft) deployed in Japan and the remainder of the squadron (12 aircraft) deployed to the Persian Gulf. The Reserve squadron, VMAQ-4 (six aircraft), transitioned from the EA-6A to the EA-6B and subsequently relieved the detachment in Japan. During Desert Shield the squadron flew 936 sorties for over 2100 hours. Marine Prowlers flew 495 combat missions totaling 1622 hours, supporting the full spectrum of joint and combined missions. Effective Oct. 1, 1992, the Marine Prowler community reorganized its structure. VMAQS are now structured into four active force squadrons (VMAQ-1, 2, 3, 4). Each squadron now has at least five aircraft. This restructuring provides the flexibility necessary for continuing to support peacetime requirements, as well as the capacity to concurrently assign Marine EA-6B forces to commanders in different areas of operation. Current plans call for one squadron to be assigned to Carrier Airwing One in FY95, while the others continue to support the Unit Deployment Program and CINC contingency requirements.

Mission: The EA-6B's ALQ-99 OBS is used to collect tactical electronic order of battle (EOB) data which can be disseminated through the command and control system while airborne, and which can be recorded and processed after missions to provide updates to various orders of battle. The ALQ-00 TJS is used to provide active radar jamming support to assault support and attack aircrtaft, as well as ground units. Additional suppression of enemy air defenses (SEAD) capability is available with the employment of HARM.

- Manufacturer: Grumman Aircraft Corporation
- Power plant: Two Pratt & Whitney J52-P408 turbofan engines Thrust: 11,200 pounds (4,767 kilograms) per engine Length: 59 feet (17.98 meters)
- Height: 15 feet (4.57 meters)
- Wing span: 53 feet (16.15 meters)
- Speed: Maximum .99 mach; cruise .72 mach
- Ceiling: 40,000 feet (12,186 meters)
- Maximum takeoff weight: 61,500 pounds (27,921 kilograms)
- Range:
    - Unrefueled in combat configuration: 850 nautical miles (977.5 miles)
    - Refueled: unlimited (crew fatigue factor - approximately 8 hours) Armament: ALQ-99 Tactical Jamming System (TJS); High Speed Anti-Radiation Missile (HARM)
- Sensors: ALQ-99 On-board System (OBS)
- Inventory: Currently 20 (4 active squadrons).
- Crew: 4
- Introduction date: ICAP configuration, 1977; current ICAP II
- configuration, 1984
- Unit Replacement Cost: $52,000,000

F-14 Tomcat

Description: The F-14 Tomcat is a supersonic, twin-engine, variable sweep wing, two-place fighter designed to attack and destroy enemy aircraft at night and in all weather conditions. Features: The F-14 can track up to 24 targets simultaneously with its advanced weapons control system and attack six with Phoenix AIM-54A missiles while continuing to scan the airspace. Armament also includes a mix of other air intercept missiles, rockets and bombs.

Background: The Grumman F-14 was designed to replace the F-4 Phantom II fighter (phased out in 1986). F-14s provided air cover for the joint strike on Libyan terrorist targets in 1986. The F-14A was introduced in the mid-1970s. The upgraded F-14A+ version, with new General Electric F-110 engines, now widespread throughout the fleet, is more than a match for enemy fighters in close-in, air combat.

General Characteristics

- Function: Carrier-based multi-role strike fighter Contractor: Grumman Aerospace Corporation Unit Cost: $38 million Propulsion:
- F-14: two Pratt & Whitney TF-30P-414A turbofan engines with afterburners;
- F-14B and F-14D: two General Electric F-110-GE-400 augmented turbofan engines with afterburners Thrust:
- F-14A: 20,900 pounds (9,405 kg) static thrust per engine;
- F-14B and F-14D: 27,000 pounds (12,150 kg) per engine Length: 61 feet 9 inches (18.6 meters)
- Height: 16 feet (4.8 meters)
- Maximum Takeoff Weight: 72,900 pounds (32,805 kg)
- Wingspan: 64 feet (19 meters) unswept, 38 feet (11.4 meters) swept
- Ceiling: Above 50,000 feet
- Speed: Mach 2+
- Crew: Two: pilot and radar intercept officer
- Armament: Up to 13,000 pounds of AIM-54 Phoenix missile, AIM-7 Sparrow missile, AIM-9 Sidewinder missile, air-to-ground ordnance, and one MK-61A1 Vulcan 20mm cannon
- Date Deployed: First flight: December 1970

KC-135 Stratotanker

Mission

The KC-135 Stratotanker's primary mission is to refuel long-range bombers. It also provides aerial refueling support to Air Force, Navy, Marine Corps and allied aircraft.

Features

Four turbojets, mounted under wings swept 35 degrees, power the KC-135. Nearly all internal fuel can be pumped through the tanker's flying boom, the KC-135's primary fuel transfer method. A special shuttlecock-shaped drogue, attached to and trailed behind the flying boom, is used to refuel aircraft fitted with probes. An operator stationed in the rear of the plane controls the boom. A cargo deck above the refueling system holds passengers or cargo. Depending on fuel storage configuration, the KC-135 can carry up to 83,000 pounds (37,350 kilograms) of cargo.

Background

The Boeing Military Airplane Company's model 367-80 was the basic design for the commercial 707 passenger plane as well as the KC-135A Stratotanker. In 1954 the Air Force purchased the first 29 of its future fleet of 732. The first aircraft flew in August 1956 and the initial-production Stratotanker was delivered to Castle Air Force Base, Calif., in June 1957. The last KC-135A was delivered to the Air Force in 1965.

In Southeast Asia, KC-135 Stratotankers made the air war different from all previous aerial conflicts. Mid-air refueling brought far-flung bombing targets within reach. Combat aircraft, no longer limited by fuel supplies, were able to spend more time in target areas.

The KC-135A's are being modified with new CFM-56 engines produced by CFM-International. The re-engined tanker, designated the KC-135R, can offload 50 percent more fuel, is 25 percent cheaper to operate and is 96 percent quieter than the KC-135A.

Under another modification program, all Air Force Reserve and Air National Guard tankers were re-engined with TF-33-PW-102 engines. The re-engined tanker, designated the KC-135E, is 14 percent more fuel efficient than the KC-135A and can carry 20 percent more fuel.

With projected modifications, the KC-135 will fly and refuel into the next century. A new aluminum-alloy skin grafted to the underside of the wings will add 27,000 flying hours to the aircraft.

The KC-135 tanker fleet made an invaluable contribution to the success of Operation Desert Storm in the Persian Gulf, flying around-the-clock missions to maintain operability of allied warplanes. The KC-135s form the backbone of the Air Force tanker fleet, meeting the aerial refueling requirements of bomber, fighter, cargo and reconnaissance forces, as well as the needs of the Navy, Marines and allied nations.

General Characteristics (KC-135R)

- Primary Function: Aerial refueling
- Contractor: Boeing Military Airplanes
- Power Plant: Four CFM-International F108-CF-100 turbofans
- Thrust: 22,224 pounds (10,000.8 kilograms) each engine
- Length: 136 feet, 3 inches (40.8 meters)
- Height: 38 feet, 4 inches (11.5 meters)
- Wingspan: 130 feet, 10 inches (39.2 meters)
- Speed: Maximum speed at 30,000 feet (9,100 meters) 610 mph (Mach 0.93)
- Ceiling: 50,000 feet (15,152 meters)
- Weight: 119,231 pounds (53,654 kilograms) empty
- Maximum Takeoff Weight: 322,500 pounds (145,125 kilograms)
- Range: 11,192 miles (9,732 nautical miles) with 120,000 pounds (54,000 kilograms) of transfer fuel.
- Crew: Four or five; up to 80 passengers.
- Date Deployed: August 1965.
- Unit Cost: KC-135R, $53 million; KC-135E, $30.6 million; KC-135A, $26.1 million.
- Inventory: Active force, 457; Reserve, 30; ANG, 158.

KC-10A Extender

Mission

Although the KC-10A's primary mission is aerial refueling, it can combine the tasks of tanker and cargo aircraft by refueling fighters while carrying the fighters' support people and equipment during overseas deployments. The KC-10A can transport up to 75 people and about 170,000 pounds (76,560 kilograms) of cargo a distance of about 4,400 miles (7,040 kilometers). Without cargo, the KC-10A's unrefueled range is more than 11,500 miles.

Features

In addition to DC-10 wing fuel tanks, the KC-10A has two large fuel tanks under the cargo floor, one under the forward lower cargo compartment and one under the rear compartment. Combined, the six tanks carry more than 356,000 pounds (160,200 kilograms) of fuel—almost twice as much as the KC-135 Stratotanker.

Using either an advanced aerial refueling boom, or a hose and drogue refueling system, the KC-10A can refuel a wide variety of U.S. and allied military aircraft. It is equipped with special lighting for night operations.

The KC-10A's boom operator controls refueling operations through a digital fly-by-wire system. Sitting in the rear of the aircraft, the operator can see the receiver aircraft through a wide window. During boom refueling operations, fuel is transferred to the receiver at a maximum rate of 1,100 gallons (4,180 liters) per minute; the hose and drogue refueling maximum rate is 470 gallons

(1,786 liters) per minute. The KC-10A can be air-refueled by a KC-135 or another KC-10A to increase its delivery range.

The large cargo-loading door can accept most tactical air forces' fighter unit support equipment moving heavy loads. The cargo compartment can accommodate loads ranging from 27 pallets to a mix of 17 pallets and 75 passengers.
The sophisticated avionics of the aircraft improve crew efficiency and reduce crew workload. On certain missions, additional seats and bunks can be rearranged to accommodate extra crew members.

Background A modified McDonnell Douglas DC-10, the KC-10A entered service in 1981. Although 88 percent of its systems are common with the DC-10, it has additional systems and equipment necessary for its Air Force mission. Additions include military avionics; an aerial refueling boom, an aerial refueling hose and drogue, a seated aerial refueling operator station and an aerial refueling receptacle. The KC-10A fleet is being modified to add wing-mounted pods to further enhance aerial refueling capabilities.

During Operations Desert Shield and Desert Storm, the KC-10 fleet provided in-flight refueling to aircraft from all branches of the U.S. armed forces as well as those of other coalition forces. In-flight refueling extended the range and capability of all U.S. and other coalition fighter aircraft. Air operations continued without costly and time-consuming ground refueling. In-flight refueling was key to the rapid airlift of material and forces. In addition to refueling airlift aircraft, the KC-10A, along with the smaller KC-135, moved thousands of tons of cargo and thousands of troops in support of the massive Persian Gulf build-up.

The KC-10A and the KC-135 conducted about 51,700 separate refueling operations and delivered 125 million gallons (475 million liters) of fuel without missing a single scheduled rendezvous.

General Characteristics

- Primary Function: Aerial refueling/transport.
- Contractor: Douglas Aircraft Co.
- Power Plant: Three General Electric CF-6-50C2 turbofans
- Thrust: 52,500 pounds (23,625 kilograms), each engine
- Length: 181 feet, 7 inches (54.4 meters)
- Height: 58 feet, 1 inch (17.4 meters)
- Wingspan: 165 feet, 4 1/2 inches (50 meters)
- Speed: 619 mph (Mach 0.825)
- Ceiling: 42,000 feet (12,727 meters)
- Maximum Takeoff Weight: 590,000 pounds (265,500 kilograms)
- Range: 4,400 miles (3,800 nautical miles) with cargo; 11,500 miles
- (10,000 nautical miles) without cargo
- Unit Cost: $86.3 million (1992 dollars)
- Crew: Four (aircraft commander, pilot, flight engineer and boom operator)
- Date Deployed: March 1981
- Inventory: Active force, 59; ANG, 0; Reserve, 0

E-4B

Mission The E-4B serves as the National Airborne Operations Center for the National Command Authorities. In case of national emergency or destruction of ground command control centers, the aircraft provides a modern, highly survivable, command, control and communications center to direct U.S. forces, execute emergency war orders and coordinate actions by civil authorities.

Features Air Combat Command (ACC) is the Air Force single-resource manager for the E-4B, and provides aircrew, maintenance, security and communications support. The Joint Chiefs of Staff actually control E-4B operations and provide personnel for the airborne operations center. The E-4B, a militarized version of the Boeing 747-200, is a four-engine, swept-wing, long-range, high-altitude airplane capable of being refueled in flight. Its larger size provides approximately triple the floor space of the earlier EC-135 command post.

The main deck is divided into six functional areas: a National Command Authorities' work area, conference room, briefing room, an operations team work area, and communications and rest areas. An E-4B crew may include up to 114 people, including a joint-service operations team, an ACC flight crew, a maintenance and security component, a communications team and selected augmentees.

The E-4B has electromagnetic pulse protection, an electrical system designed to support advanced electronics and a wide variety of new communications equipment. Other improvements include nuclear and thermal effects shielding, acoustic control, an improved technical control facility and an upgraded air-conditioning system for cooling electrical components. An advanced satellite communications system improves worldwide communications among strategic and tactical satellite systems and the airborne operations center.

To provide direct support to the National Command Authorities, at least one E-4B is always on alert at one of many selected bases throughout the world.

Background The E-4B evolved from the E-4A, which had been in service since late 1974. The first B model was delivered to the Air Force in January 1980, and by 1985 all aircraft were converted to B models. All E-4B are assigned to the 55th Wing, Offutt Air Force Base, Neb.
In August 1994, the E-4B assumed an additional role. With the approval of JCS chairman, the E-4B will support the Federal Emergency Management Agency's request for assistance when a natural disaster, such as hurricane, typhoon or earthquake occurs. The E-4B would be tasked to fly the FEMA Emergency Response to the disaster site, and become the FEMA command and control center until the emergency team's own equipment and facilities can be set up. With E-4B support the emergency team's response is a matter of hours as opposed to days.

General Characteristics

- Primary Function: Airborne operations center
- Builder: Boeing Aerospace Co.
- Power Plant: Four General Electric CF6-50E2 turbofan engines
- Thrust: 52,500 pounds each engine
- Length: 231 feet, 4 inches (70.5 meters)
- Wingspan: 195 feet, 8 inches (59.7 meters)
- Height: 63 feet, 5 inches (19.3 meters)
- Maximum Takeoff Weight: 800,000 pounds (360,000 kilograms)
- Endurance: 12 hours (unrefueled)
- Ceiling: Above 30,000 feet (9,091 meters)
- Unit Cost: $258 million
- Crew: Up to 114
- Date Deployed: January 1980
- Inventory: Active force, 4; ANG, 0; Reserve, 0

HC-130P (KING)

- Primary Function:Aerial refueling of combat search and rescue

- helicopters and deployment of pararescuemen.
- Builder: Lockheed Aircraft Corp.
- Power Plant: Four Allison T56-A-15 turboprop engines
- Thrust: 4,910 shaft horsepower each engine
- Length: 99 feet, 4 inches (30.09 meters)
- Height: 38 feet, 6 inches (11.7 meters)
- Wingspan: 132 feet, 7 inches (40.4 meters)
- Speed: 289 knots (at sea level)
- Ceiling: 33,000 feet
- Maximum Takeoff Weight: 175,000 pounds
- Range: Beyond 4,000 miles
- Crew: Three officers (pilot, co-pilot and navigator), and three enlisted (flight engineer, communications systems operator and loadmaster) Air Force

Mission:The HC-130P King deploys worldwide to provide combat search and rescue coverage for U.S. and allied forces. Combat search and rescue missions include flying low-level, preferably at night aided with night vision goggles, to an objective area where aerial refueling of a rescue helicopter is performed or pararescuemen are deployed.

The secondary mission of the HC-130P is peacetime search and rescue.
HC-130P aircraft and crews are uniquely trained and equipped for search and rescue in all types of terrain including artic, mountain, and maritime. Peacetime search and rescue missions may include searching for downed or missing aircraft, sinking or missing water vessels, or missing persons. The HC-130P can deploy parascuemen to a survivor, escort helicopter to a survivor, or airdrop survival equipment to a survivor.

Air Force Features:Combat-oriented improvements are being made to the HC-130P to provide improved navigation, enhanced communications, better threat detection, and more effective countermeasures systems. when fully modified, the HC-130P will have a self-contained navigation system including an inertial system and global positioning system. It will also have a missle warning system, radar warning receiver, and associated chaff and flare dispenser systems.

The HC-130P can fly in day against a reduced threat. Crews are also trained to fly night low-level and air refueling using night vision goggles.

Air Force Inventory:Active 9, Guard and Reserve 25.
Air Force Background:HC-130s were deployed to Saudi Arabia in support of Desert Storm. They operated from main bases and remote locations. Thier missions included air refueling of Air Force helicopters over friendly territory and alert CSAR coverage for coalition forces in the AOR. Originally ordered in 1963 and first flown in 1964, the HC-130 has served in many roles and missions. In Southeast Asia they were used to refuel H-3 Jolly Green Giant and H-53 Super Jolly Green Giant helicopters and act as an airborne command and control platform to direct rescue efforts.

Tomahawk Cruise Missile

Description: Long range, subsonic cruise missile used for land attack warfare.
Background: Tomahawk is an all-weather submarine or ship-launched land-attack cruise missile. After launch, a solid propellant propels the missile until a small turbofan engine takes over for the cruise portion of flight. Tomahawk is a highly survivable weapon. Radar detection is difficult because of the missile's small cross-section, low altitude flight. Similarly, infrared detection is difficult because the turbofan engine emits little heat. Systems include Global Positioning System (GPS) receiver; an upgrade of the Digital Scene Matching Area Correlation (DSMAC) system; Time of Arrival (TOA) control, and improved 402 turbo engines.

Features: The land attack version of Tomahawk has inertial and terrain contour matching (TERCOM) guidance. TERCOM uses a stored map reference to compare with the actual terrain to determine the missile's position. If necessary, a course correction is then made to place the missile on course to the target.

General Characteristics

- Primary Function: Long-range subsonic cruise missile for attacking land targets.
- Contractor: Hughes Missile Systems Co., Tucson, Ariz.
- Unit Cost:about $750,000 (over the last four years) Power Plant: Williams International F107-WR-402 cruise turbo-fan engine; solid-fuel booster Length: 18 feet 3 inches (5.56 meters); with booster: 20 feet 6 inches (6.25 meters)
- Weight: 2,650 pounds (1192.5 kg); 3,200 pounds (1440 kg) with booster Diameter: 20.4 inches (51.81 cm)
- Wing Span: 8 feet 9 inches (2.67 meters)
- Range: Land attack, conventional warhead: 870 nautical miles (1000 statute miles, 1609 km)
- Speed: Subsonic - about 550 mph (880 km/h)
- Guidance System: Inertial and TERCOM, digital scene matching, GPS (Block III)
- Warheads: Conventional: 1,000 pounds or conventional submunitions dispenser with combined effect bomblets.
- Date Deployed: 1986; Block III: 1995

AGM-88 HARM Missile System

Services: Navy and Air Force
Description: The AGM-88 High-Speed Anti-radiation Missile (HARM) is an air-to-surface tactical missile designed to seek out and destroy enemy radar-equipped air defense systems.

Features: The AGM-88 can detect, attack and destroy a target with minimum aircrew input. The proportional guidance system that homes in on enemy radar emissions has a fixed antenna and seeker head in the missile's nose. A smokeless, solid-propellant, dual-thrust rocket motor propels the missile.

Background: The HARM missile was approved for full production in March 1983. It proved effective against Libyan targets in the Gulf of Sidra in 1986, and was used extensively by the Navy and the Air Force in Operation Desert Storm in 1991.

General Characteristics:

- Primary Function: Air-to-surface anti-radiation missile; attack and destroy hostile radar installations.
- Contractor: Raytheon
- Power Plant: Thiokol dual-thrust, solid propellent, rocket motor Length: 13 feet, 8 inches (4.1 meters)
- Launch Weight: 800 pounds (360 kilograms)
- Diameter: 10 inches (25.4 centimeters)
- Wing Span: 3 feet, 8 inches (1.1 meters)
- Range: 80+ miles (57+ nautical miles/91+ km)
- Speed: 760+ mph (1,216 kmph)
- Guidance: radar homing
- Warhead: Blast fragmentation; warhead weight 150 pounds (68 kg)
- Unit Cost: $284,000
- Date Deployed: 1985

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AGM-86 ALCM

- The AGM-86B and C air-launched cruise missiles (ALCMs) were developed to increase the effectiveness of B-52 bombers. In combination, they dilute an enemy's forces and complicate defense of its territory. AGM-86B missiles can be air-launched in large numbers by the bomber force. B-52G and B-52H bombers carry six AGM-86B missiles on each of two externally mounted pylons. B-52H aircraft have been modified with a bomb bay rotary launcher for eight additional air-launched cruise missiles. The AGM-86C differs from the B model in that it is a conventional air-launched cruise missile.

- The foundation of the U.S. nuclear deterrent force is the strategic Triad -- intercontinental ballistic missiles, submarine-launched ballistic missiles and manned bombers. In February 1974, the Air Force entered into contract to develop and flight-test the prototype AGM-86A air-launched cruise missile, which was slightly smaller than the later B and C models. The 86A model did not go into production. Instead, in January 1977, the Air Force began full-scale development of the AGM-86B. Production of the AGM-86B began in 1980 with a total 1,715 missiles completed in October 1986.

- In June 1986 a limited number of AGM-86B missiles were converted to carry a high-explosive blast/fragmentation warhead. This modification included a Global Positioning System capability with the existing inertial navigation computer system. The C model

became operational in January 1991 at the onset of Operation Desert Storm.

- The small, winged AGM-86B is powered by a turbofan jet engine that propels it at sustained subsonic speeds. After launch, the missile's folded wings, tail surfaces and engine inlet deploy. It then is able to fly complicated routes to a target through use of a terrain contour-matching guidance system. During flight, this system compares surface characteristics with maps of the planned flight route stored in on-board computers to determine the missile's location. As the missile nears its target, comparisons become more specific, guiding the missile to target with pinpoint accuracy. The missiles' small size and low-altitude flight capability makes them difficult to detect on radar.Specifications
- Primary Function: Air-to-surface missile
- Contractor: Boeing Aerospace Co
- Power Plant: Williams Research Corp. F-107-WR-10 turbofan engine
- Thrust: 600 pounds
- Length: 20 feet, 9 inches
- Weight: 3,150 pounds
- Diameter: 24.5 inches
- Wingspan: 12 feet
- Range: AGM-86B: 1,500-plus miles
- Speed: About 550 mph (Mach 0.73)
- Warheads: Nuclear capable
- Unit Cost: $1 million
- Date Deployed: December 1982
- Inventory: Active force, 1,628

AGM-65 Maverick

- The AGM-65 Maverick is a tactical, air-to-surface guided missile designed for close air support, interdiction and defense suppression mission. It provides stand-off capability and high probability of strike against a wide range of tactical targets, including armor, air defenses, ships, transportationequipment and fuel storage facilities. A-10, F-4, F-15E, F-16 and F-111 aircraft carry Mavericks.

- The Air Force accepted the first AGM-65A Maverick in August 1972. A total of 25,750 A and B Mavericks have been purchased by the Air Force. The Air Force took delivery of the first AGM-65D in October 1983, with initial operational capability in February 1986. Delivery of operational AGM-65G missiles took place in 1989. AGM-65 missiles were employed by F-16s and A-10s in 1991 to attack armored targets in the Persian Gulf during Operation Desert Storm. Mavericks played a large part in the destruction of Iraq's significant military force.

- The Maverick has a cylindrical body, with a warhead in the center section. A cone-shaped warhead, one of two types carried by the Maverick missile, is fired by a contact fuse in the nose. The other warhead type is a delayed-fuse penetrator. This heavyweight warhead penetrates the target with its kinetic energy before firing. It is very effective against large, hard targets. The propulsion system for both types is a solid-rocket motor behind the warhead. The missile also has launch-and-leave capability, enabling a pilot to take evasive action or attack another target as the missile guides itself to the target.

- Maverick A/B models have an electro-optical television guidance system. The pilot selects the target much like a video game, centers cross hairs on it, locks on, then launches the missile. Although the Maverick B is similar to the A model, the television guidance system has a screen magnification capability that enables the pilot to identify

and lock on smaller and more distant targets.

- The Maverick D has an imaging infrared guidance system with infrared video that overcomes the daylight-only, non-adverse weather limitations of the other systems. The IIR Maverick D can track heat generated by a target, and provide the pilot a pictorial display of the target during darkness and hazy or inclement weather.

- The G model has the same guidance system as the D, with some software modifications that track larger targets. The G model's major difference is its heavyweight penetrator warhead, while Maverick A, B and D models employ the shaped-charge warhead.

- Specifications
    - Primary Function: Air-to-ground guided missile
    - Contractors: Hughes Aircraft Co., Raytheon Co
    - Power Plant: Thiokol TX-481 solid-propellant rocket motor
    - Launch Weight: AGM-65A/B, 462 LBS; AGM-65D, 485 LBS; AGM-65G, 670LBS
    - Diameter: 1 foot
    - Wingspan: 2 feet, 4 inches
    - Aircraft: A-10, F-4, F-15E, F-16 and F-111
    - Guidance System: AGM-65A/B, electro-optical TV; AGM-65D/G, Imaging IR
    - Warheads: AGM-65A/B/D, 125 pounds, cone shaped; AGM-65G, 300 pounds
    - delayed-fuse penetrator, heavyweight
    - Unit Cost: $22,387

AGM-65E Maverick

- The tactical AGM-65E Maverick missile is a laser-guided, rocket propelled, air-to-ground missile, designed for use against fortified ground installations, armored vehicles, and surface combatants.
- The Maverick missile is compatible with the A-4M, A-6E, AV-8B and F/A-18 aircraft.
- The AGM-65E missile consists of two major sections-the guidance and control section and the center/aft section. Four fixed wings are an integral part of the center/aft section and four movable control surfaces (fins) are located at the aft section. These fins can be installed or removed to aid in handling.
- The missile is issued to the fleet as an all-up-round. Installation of the fins is the only assembly required at the organizational maintenance level.

- The AGM-65E missile system provides all laser missile features, including automatic terminal homing on laser energy reflected from he target illuminated by a laser designator.
- The laser designator can be a ground device, either hand held or tripod mounted. It can also be a stabilized airborne device, mounted either on a separate aircraft or on the launching aircraft.
- In addition, the warhead provides kinetic penetration into earth barricaded or concrete fortifications and ships.
- The fuzing system provides for a selectable detonation delay to optimize kill capability.

AGM-130A Missile

Mission The AGM-130A is a powered air-to-surface missile designed for high- and low-altitude strikes at standoff ranges against a variety of targets.

Features Carrying forward the modular concept of the GBU-15 guided weapon system, the AGM-130A employs a rocket motor for extended range and an altimeter for altitude control. The AGM-130A will provide a significantly increased standoff range beyond that of the GBU-15.
The AGM-130A is equipped with either a television or an imaging infrared seeker and data link. The seeker provides the launch aircraft a visual presentation of the target as seen from the weapon. During free flight this presentation is transmitted by the AXQ-14 data-link system to the aircraft cockpit monitor.

The seeker can be either locked onto the target before or after launch for automatic weapon guidance, or it can be manually steered by the weapon systems officer. Manual steering is performed through the two-way data link.

The AGM-130A is designed to be used with F-15E aircraft. Development of the AGM-130A began in 1984 as a product improvement of the GBU-15 guided glide bomb.

Background For the primary mode of operation, the aircraft flies to a pre-briefed launch position. Survivability of aircraft and crew is enhanced by launching the weapon at low altitude and significant standoff range, thus avoiding detection by enemy air defenses. After launch, the weapon flies through glide-powered-glide phases toward the target area with midcourse guidance updates provided by global positioning system (GPS) navigational information or through the data link.

Upon termination of the powered flight phase the rocket motor is ejected. As the target comes into view, the weapon systems officer has dual flexibility in guiding the weapon via the data link. For automatic terminal homing, the guidance tracker is locked on target but can be manually updated for precision bombing. When total manual guidance is used, the operator manually guides the weapon to the target aimpoint. For those aircraft not equipped with a data-link pod, the weapon may be launched in the direct attack mode.
The first unit was operational in 1994.

General Characteristics
Primary Function: Air-to-surface guided and powered bomb

- Contractor: Rockwell International Corp.
- Thrust: Classified
- Length: 12 feet, 10.5 inches (3.90 meters)
- Launch Weight: 2,917 pounds (1,312.65 kilograms)
- Diameter: 18 inches (45.72 centimeters)
- Wingspan: 59 inches (149.86 centimeters)
- Range: Classified
- Ceiling: 30,000-plus feet (9,091 meters)
- Speed: Classified
- Guidance System: television or imaging infrared seeker
- Date Deployed: 1994
- Unit Cost: Less than $300,000 per missile
- Inventory: The missile is in production. When in the inventory the number will be classified. Current total projected weapon procurement is approximately 600 weapons.

AGM-130 standoff weapon.

- Carrying forward the modular concept of the GBU-15 guided weapon system, the AGM-130A employs a rocket motor for extended range and an altimeter for altitude control.

The AGM-130A will provide a significantly increased standoff range beyond that of the GBU-15.

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- **It is made by Boeing**
- Its range is 15-40 miles, depending on launch altitutde and speed. Release altitutdes can be 200-20,000 feet.
- It uses INS/GPS mid-course correction to guide to the target and the TV/IR (with Imaging Inrared Focal Plane Seeker in the last two-three miles to allow the weapons officer to direct it precisely against a target.
- It offers a man in the loop option.
- It directs a Mark 84 2,000 pound bomb, but can carry the BLU-109/B hard target or bunker buster weapon.
- It weighs 2,917 pounds, is 13 feet long and has a 59" wing span.
- The AGM-130A carries a 2,000 lb Mark 84 fragmentation bomb
- The AGM-130C carries the BLU-109B 2,000 lb bunker buster and dives on to the target from a steep angle of attack.
- It uses Imaging IR, TV (CCD) to guide in on the target. It can attack at night.
- It has an INS/GPS data link.

Standoff Land attack Missile (SLAM)

The Standoff Land Attack Missile is derri9ved from the Harpoon missile and is design to provide an intermediate range day/night/adverse weather air-to-surface weapon for use against land targets and surface ships in port. the Navy plans to improve performance by retrofitting SLAMs with a suite of improvements.

- The SLAM combines an imaging infrared seeker, inertial GPS-aided guidance, and data link control to provide standoff precision strike against land targets and selective ship attack. The pilot can fine tunethe aim point while the missile is in flight, providing targeting accuracy, rela time bomb damage asessment, and minimum collateral damage.
- Service: Navy
- Program Status: Production
- Mission: Anti-surface warfare, strike
- Targets: Fixed hard, fixed soft, maritime soft
- Platforms: F/A-18C/D, F/A-18E/F. A-6E
- First capability: 1991
- Guidance method: Imaging infrared seeker, intertial GPS-aided guidance, and data link control.
- Range: Greater than 60 miles.

- Quantity: 767
- Development cost: $81.9 million
- Production Cost: $1,056.9 million
- Total Acquisition Cost: $1,138.8 million
- Acquisition Unit Cost: $1.49 million
- Production unit cost: $1.38 million

Standoff Land Attack Missile - Extended Respond (SLAM-ER)

The Standoff Land Attack Missile - Extended Response is an upgrade and retorfit to the baseline SLAM. It maintains baseline capability while improving performance in the areas of launch and control, aircraft survivability, immunity to countermeasures, and probability of kill against hardened targets. SLAM-ER is also expeacted to provide improved range, hard target penetration, and user interfaces for both mission planning and aircraft integration.

- Service: Navy
- Program Status: Development/Production
- Mission: Anti-surface warfare, strike
- Targets: Fixed hard, fixed soft, maritime soft
- Platforms: F/A-18C/D, F/A-18E/F. A-6E. Potentially B-1B, B-52, B-2, F-16, F-15E, F-117, F-14, AV-8B, P-3, S-3, V-22
- First capability: 1997
- Guidance method: Imaging infrared seeker, intertial GPS-aided guidance, and man in the loop data link control.
- Range: Greater than 60 miles.
- Quantity: 700
- Development cost: $192.3 million
- Production Cost: $358.0 million
- Total Acquisition Cost: $550.3 million
- Acquisition Unit Cost: $786,143
- Production unit cost: $511,428

AGM-154A Joint Stand-off Weapon (JSOW)

- The AGM-154A Joint Standoff Weapon or JSOW is currently under development by Texas Instruments for the Air Force and the Navy. The AGM-154A is purported to be a low cost, highly lethal glide weapon with an outstanding standoff capability. The JSOW uses inertial and global positioning system for midcourse navigation and imaging infra-red and datalink for terminal homing. The JSOW is just over 13 feet in length and weighs between 1000-1500 pounds. Extra flexibility has been engineered into the AGM-154A by its modular design. This allows several different submunitions, unitary warheads, or non-lethal payloads to be carried.
- The JSOW will have a number of propulsion methods, dependent upon the expected launch conditions and payloads. It will have both low and high-altitude launch capability, further enhancing its versatility. Once developmental testing is complete, the JSOW will be carried by nearly all bomb dropping platforms in the USAF inventory, and a variety of Naval assets as well.
- Carrying forward the modular concept of the GBU-15 guided weapon system, the AGM-154 is a glide bomb with INS/GPS Guidance.
- It is made by Texas Instruments
- It has no propulsion. Its range is determined by the altitutde and sp-eed of the launch aircraft, and uses INS/GPS to guide to the target.

- It uses a BLU-87 or BLU-108 culster munitions, or unitary explosive.
- It weighs 1,407 pounds (less the bomb), is 160" long and is 16X22" in diameter.
- It costs $250,000 to $450,000, depending on payload.
- It has an INS/GPS data link.

GBU-31 Joint Direct Attack Munition (JDAM).

- The Joint Direct Attack Munition (JDAM) is under development to meet both USAF and Navy needs. The program will produce a weapon with high accuracy, all-weather, autonomous, conventional bombing capability. The JDAM has an inertial navigation system/global positioning system guidance kit added to MK-84 general purpose 2,000 pound bomb, or Mk-83 1,000 pound bomb.
- The JDAM will be continuously updated by aircraft avionics systems prior to release. Once released, the bomb's INS/GPS will take over and guide the bomb to its target regardless of weather.
- The JDAM is being developed by Lockheed Martin and McDonald Douglas and will be operational by 1998. It will be carried by many aircraft, to include the B-1, B-2, B-52, F-15E, F-16, F-22, F-117, AND F/A-18.
- It uses INS/GPS guidance to control the tail fins.
- It guides either a Mark 84 or BLU-109 bomb.
- It has 535 to 945 pounds of explosive.
- The B-1B can carry 24, the B-2 can carry 16, the B-52H can carry 12, and the F-15E can carry 5, the F-14, F-16, F-18, and F-117 can carry 2.
- Range is dependent on speed or altitude, but is unlikely to exceed 12-22 miles.

GBU-24A/B laser-guided 2,000-pound **Paveway Laser Guided Bomb**

- The Guided Bomb Unit-24 (GBU-24) Low Level Laser Guided Bomb [LLLGB] consists of either a 2,000-pound MK-84 general purpose or BLU-109 penetrator bomb modified with a Paveway III low-level laser-guided bomb kit to add the proportional guidance in place of the bang-bang type used in the Paveway II.
- The LLLGB was developed in response to Sophisticated enemy air defenses, poor visibility, and to counter limitations in low ceilings. The weapon is designed for low altitude delivery and with a capability for improved standoff ranges to reduce exposure. The GBU-24 LLLGB/Paveway III has low-level, standoff capability of more than 10 nautical miles. Performance envelopes for all modes of delivery are improved because the larger wings of the GBU-24 increases maneuverability. Paveway III also has increased seeker sensitivity and a larger field of regard.
- The operator illuminates a target with a laser designator and then the munition guides to a spot of laser energy reflected from the target. One way to deliver LGBs from low altitude is a loft attack. In this maneuver, the aircraft pulls up sharply at a predetermined point some miles from the target and the LGB is lofted upward and toward the target. However, if the LGB guidance system detects reflected laser energy from the target designator too soon after release, it tends to pull the LGW down below its required trajectory and the bomb will impact well short of the target.
- This bomb is not nearly as delivery parameter sensitive as is the Paveway II LGB, nor is it affected by early laser designation. After a proper low altitude delivery, the LLLGB will maintain level flight while looking for reflected laser energy. If it does not detect reflected laser energy, it will maintain level flight to continue beyond the designated target, overflying friendly positions, to impact long, rather than short of the target.
- Unlike the Paveway II LGB, the LLLGB can correct for relatively large deviations from planned release parameters in the primary delivery mode (low-altitude level delivery). It

also has a larger delivery envelope for the dive, glide and loft modes than does the earlier LGB. The wide field of view and midcourse guidance modes programmed in the LLLGB allow for a "Point Shoot" delivery capability. This capability allows the pilot to attack the target by pointing the aircraft at the target and releasing the weapon after obtaining appropriate sight indications. The primary advantage of this capability is that accurate dive/tracking is not required to solve wind drift problems.

- In the Gulf War all of the 1,181 GBU-24s were released by F-lllFs.

The GBU-24B/B "bunker buster'' and "Colt 45" Bunker Buster Incendiary

- The Advanced Unitary Penetrator [AUP]: Hard target penetrator features an elongated narrow diameter case made of a tough nickel-cobalt steel alloy called Air Force 1410. The AUP bomb, designated the GBU-24 C/B (USAF) and GBU-24 D/B (Navy) is being developed by the USAF Wright Laboratory, and is designed to provide at least twice the penetration capability of existing BLU-109 2000-pound bombs.
- Penetration capability is directly proportional to the warhead's sectional density--its weight divided by its cross section. The AUP maximizes sectional density by reducing the explosive payload and using heavy metals in the warhead case. Lower explosive payload will diminish dispersion of NBC agents to help reduce collateral effects.
- The AUP will retain the carriage and flight characteristics of the BLU-109, and it will be compatible with the GBU-24, GBU-27, and GBU-15/AGM-130 series of precision-guided bombs. Thus, the AUP will be capable of delivery from a wider inventory of aircraft, including stealth platforms, than the BLU-113/GBU-28.
- During July 1996 rocket-sled tests by the Air Force's Wright Laboratory Armaments Directorate the AUP successfully penetrated 11 feet of reinforced concrete, equivalent to over 100 feet of soil. It achieves its performance by increasing the area density (warhead weight divided by cross-sectional area) of the weapon. The AUP objective is twice the penetration capability of the BLU-109 class in order to provide a more reliable kill for hard buried targets containing WMD facilities.
- In 1996 the Navy conducted tests of the F-14A Tomcat with the GBU-24B/B Hard Target Penetrator Laser-Guided Bomb at Naval Air Station Patuxent River, Md., as part of an air-to-ground development program to support clearance for use of the weapon in the fleet by F-14 Tomcats.
- Key accomplishments in 1996 included demonstration of controlled weapon penetration and detonation depth using the Hard-Target Smart Fuse [HTSF] and successful integration of the GBU- 24/ HTSF with F-15E and F/A- 18 aircraft. The Hard-Target Smart Fuse, developed at the Wright lab, features an accelerometer that can be programmed to detonate the bomb at a precisely specified depth significantly enhancing munition lethality.
- Mission: Close air support, interdiction, offensive counter air, naval anti- surface warfare Targets Mobile hard, fixed soft, fixed hard
- Service: Air Force, Navy Program status Operational First capability 1983
- Guidance method: Laser (man-in-the-loop) Range Greater than 10 nautical miles
- Development cost: Not available - Air Force officials stated that development cost was not available because they do not have records covering the development period. Production cost $729.138 million. Total acquisition cost: Not available Acquisition unit cost: Not available Production unit cost: $55,600 Quantity 13,114
- Platforms A-10, F-111, F-15, F-16, F/A-18, F-14, A-6
- Improved 2,000-pound (2,268 kg) "bunker buster'" bombs that ride a laser beam of bright light to blast their way through more than 12 feet (3.7 meters) of concrete and destroy underground military command centers.
- The Colt 45 is an experimental version has an incendiary agent to burn any chemical or biological agents in a sealed area.

Hard-Target Smart Fuse

- The Advanced Unitary Penetrator (AUP) would be used in conjunction with the Hard-Target Smart Fuse developed at the Wright lab.
- HTSF is a microcontroller-based, in line fuze designed to be physically and electrically compatible with GBU-10, GBU-15, GBU-24, GBU-27, GBU-28, AGM-130, and general purpose MK-80 series weapons.
- The HTSF was designed for current and future penetrator weapons to define the fuze function point as either a desired distance within a desired void or a depth of burial beneath a hard layer. It operates in one of three modes: hard-layer detection, void detection, and path-length integration.
- It also has an adjustable backup time delay that is set in 1-msec increments with a maximum delay of 250 msec.
- The HTSF uses a void sensing technique to count layers within a structure to initiate fuze function, a depth of burial mode that causes the fuze to function a preset distance after it senses a hard layer, and an integral time delay backup.
- Initial tests of the fuse in 1995 and 1996 at New Mexico's White Sands Missile Range were failures, though modifications are under development.

GBU-28A/B laser-guided 5,000-pound (2,268 kg) "bunker buster"

- **Bombs** that ride a laser beam of bright light to blast their way through more than 12 feet (3.7 meters) of concrete and destroy underground military command centers. The GBU-28 "bunker buster'' is dropped from Air Force F-15E attack jets, but the service will not say whether the bombs are already in the Gulf.
- Each weapon costs about $95,000, and is made by Texas Instruments.
- It weighs 4,676 pounds, is 229" long.
- Wings fold out and guide the weapon.
- It uses a BLU-113/B or BLU-113A/B warhead with 600 lbs of Tritonal high explosive.

AGM-142 HAVE NAP

- The Have Nap is an Israeli-built Popeye missile being acquired by the USAF.
- The AGM-142 is a medium range conventional stand off missile to be used by long range bombers for a precision strike capability.
- The Have Nap has an inertial guidance system with data link, TV, or imaging infra-red homing.
- The missile is in the 750 pound class explosive range with blast/fragmentation or penetrator options available.
- The contractor for this 15ft, 3,000 pound missile is the Rafael Armament Development Authority.
- It has a 50 mile range once fired and is powered by a solid propellant rocket motor.

AIM-120 AMRAAM

- The AIM-120 Advanced Medium Range Air to Air Missile (AMRAAM) is a new generation air-to-air missile. It has an all-weather, beyond-visual-range capability and is scheduled to be operational beyond 2000. The AMRAAM is being procured for the Air Force, Navy and

America's allies. The AMRAAM program improves the aerial combat capabilities of U.S. and allied aircraft to meet the future threat of enemy air-to-air weapons.

- The AMRAAM program completed its conceptual phase in February 1979. The demonstration phase concluded in December 1981 after flight-test missiles satisfied Air Force and Navy requirements. The Air Force competitively selected Hughes Aircraft Company's Missile System Group as the full-scale developer. During the full-scale development phase, Hughes Aircraft Co. completed missile development and went into production.
- More than 200 of the test missiles were launched during flight tests at Eglin AFB, Fla., White Sands Missile Range, N.M. and Point Mugu, Calif. AMRAAM is combat tested, having scored two kills during Operation Southern Watch. The missile is operational on U.S. Air Force F-15 and F-16 aircraft.
- AMRAAM is a follow-on to the AIM-7 Sparrow missile series. The missile is faster, smaller and lighter, and has improved capabilities against low-altitude targets. It incorporates an active radar with an inertial reference unit and micro-computer system, which makes the missile less dependent upon the fire-control system of the aircraft. Once the missile closes on a target, its active radar guides it to intercept. This enables the pilot to aim and fire several missiles simultaneously at multiple targets. The pilot may then perform evasive maneuvers while the missiles guide themselves to their targets.

- Specifications

•Primary Function: Air-to-air radar-guided tactical missile
•Contractor: Hughes Aircraft Co., Raytheon Co
•Length: 143.9 inches
•Launch Weight: 335 pounds
•Diameter: 7 inches
•Wingspan: 20.7 inches
•Range: 20+ miles (17+ nautical miles)
•Speed: Supersonic
•Guidance System: Active radar terminal; inertial midcourse
•Warhead: Blast fragmentation
•Unit Cost: $386,000
•Date Deployed: September 1991

Phoenix Guided Missile (AIM-54)

- The tactical AIM-54C Phoenix missile is an air-launched, air-to-air guided missile that employs active, semi-active, and passive homing capabilities. The AIM-54C is designed to be used primarily as a long-range air-intercept missile launched form the F-14 aircraft, which is equipped with the AWG-9 Airborne Missile Control System (AMCS). The missile can be launched in multiple missile attacks, as required, against hostile forces. A maximum of six AIM-54C Phoenix missiles can be launched from a single aircraft with simultaneous guidance against widely separated targets. In addition, the missile has dogfight, electronic counter-countermeasures (ECCM), and anti-cruise missile capabilities.
- The overall length of the missile is 13 feet with a diameter of 15 inches. It weighs approximately 1,020 pounds. The missile consists of the guidance section, the armament section, the propulsion section, and the control section. The missile is designed to be handled as an all-up-round. The wings and fins can be mounted or removed to facilitate handling.
- GENERAL CHARACTERISTICS:

- Primary Function: Long-range air-launched air intercept missile
- Contractor: Hughes Aircraft Co. and Raytheon Co.
- Unit Cost: $477,131
- Power Plant: Solid propellant rocket motor built by Hercules
- Length: 13 feet (3.9 meters)
- Weight: 1,024 pounds (460.8 kg)
- Diameter: 15 inches (38.1 cm)
- Wing Span: 3 feet (.9 meters)
- Range: In excess of 100 nautical miles (115 statute miles, 184 km)
- Speed: In excess of 3,000 mph (4,800 km/h)
- Guidance System: Semi-active and active radar homing
- Warheads: Proximity fuse, high explosive
- Warhead Weight: 135 pounds (60.75 kg)
- Date Deployed: 1974

Aircraft Carriers - CV, CVN

Description: Aircraft carriers provide a wide range of possible response for the National Command Authority.

The Carrier Mission

- To provide a credible, sustainable, independent forward presence and conventional deterrence in peacetime
- To operate as the cornerstone of joint/allied maritime expeditionary forces in times of crisis, and
- To operate and support aircraft attacks on enemies, protect friendly forces and engage in sustained independent operations in war.

Features: The aircraft carrier continues to be the centerpiece of the forces necessary for forward presence. Whenever there has been a crisis, the first question has been: "Where are the carriers?" Carriers support and operate aircraft that engage in attacks on airborne, afloat, and ashore targets that threaten free use of the sea; and engage in sustained operations in support of other forces.

Aircraft carriers are deployed worldwide in support of U.S. interests and commitments. They can respond to global crises in ways ranging from peacetime presence to full-scale war. Together with their on-board air wings, the carriers have vital roles across the full spectrum of conflict.
The Nimitz-class carriers, seven operational and two under construction, are the largest warships in the world. USS Nimitz (CVN 68) will undergo its first refueling during a three-year Refueling Complex Overhaul at Newport News Shipbuilding in Newport News, Va., in 1998.

General Characteristics, Nimitz Class

- Builder: Newport News Shipbuilding Co., Newport News, Va.
- Power Plant: Two nuclear reactors, four shafts
- Length: 1040 feet (317 meters)
- Flight Deck Width: 252 feet (76.8 meters)
- Beam: 134 feet (40.84 meters)
- Displacement: Approx. 97,000 tons (87,300 metric tons) full load Speed: 30+ knots (34.5+ miles per hour)
- Aircraft: 85 Ships:
- USS Nimitz (CVN-68), Bremerton, Wash.
- USS Dwight D. Eisenhower (CVN-69), Norfolk, Va.

- USS Carl Vinson (CVN 70), Bremerton, Wash.
- USS Theodore Roosevelt (CVN-71), Norfolk, Va.
- USS Abraham Lincoln (CVN 72), Everett, Wash.
- USS George Washington (CVN 73), Norfolk, Va.
- USS John C. Stennis (CVN-74), Norfolk, Va.
- Harry S. Truman (CVN-75) (under construction-TBD)
- Ronald Reagan (CVN-76) (under construction-TBD)
- Crew: Ship's Company: 3,200 - Air Wing: 2,480
- Armament: Four NATO Sea Sparrow launchers, 20mm Phalanx CIWS mounts: (3 on Eisenhower and Nimitz, 4 on Vinson and later ships of the class.) Date Deployed: May 3, 1975 (USS Nimitz)

General Characteristics, Enterprise Class

- Builders: Newport News Shipbuilding Co., Newport News, Va.
- Power Plant: Eight nuclear reactors, four shafts
- Length: 1,040 feet (317 meters)
- Flight Deck Width: 252 feet (75.6 meters)
- Beam: 133 feet (39.9 meters)
- Displacement: 89,600 tons (80,640 metric tons) full load Speed: 30+ knots (34.5 miles per hour)
- Aircraft: 85
- Ship:USS Enterprise (CVN 65), Norfolk, Va.
- Crew: Ship's Company: 3,350 - Air Wing 2,480
- Armament: Sea Sparrow Missile launchers, Three Phalanx 20 MM CIWS mounts Date Deployed: November 25, 1961 (USS Enterprise)

General Characteristics, John F. Kennedy Class

- Builders: Newport News Shipbuilding, Newport News, Va. Power Plant: Eight boilers, four shafts, 280,000 total shaft horsepower Length: 1052 feet (315.6 meters)
- Flight Deck Width: 252 feet (76.8 meters)
- Beam: 130 feet (39.6 meters)
- Displacement: 82,000 tons (full load)
- Speed: 30+ knots (34.5 miles per hour)
- Aircraft: Approximately 85.
- Ship: USS John F. Kennedy (CV-67); Mayport, Fla.
- Crew: Ship's Company: 3,117 - Air Wing 2,480
- Armament: Sea Sparrow missiles with box launchers, Three 20mm Phalanx
- CIWS
- Date Deployed: September 7, 1968

General Characteristics, Kitty Hawk Class

- Builders:
- CV 63 - New York Ship Building Corp., Camden, N.J.
- CV 64 - New York Naval Shipyard, Brooklyn, N.Y. Power Plant: Eight boilers, four geared steam turbines, four shafts, 280,000 shaft horsepower.
- Length: 1062.5 feet (323.8 meters)
- Flight Deck Width: 252 feet (76.8 meters)
- Beam: 130 feet (39 meters)

- Displacement: Approx. 80,800 tons (72,720 metric tons) full load Speed: 30+ knots (34.5+ miles per hour)
- Aircraft: 85 Ships:
- USS Kitty Hawk (CV-63), San Diego, Ca.
- USS Constellation (CV-64), San Diego, Ca.
- Crew: Ship's Company: 3,150 - Air Wing: 2,480
- Armament: Sea Sparrow launchers, 3 20mm Phalanx CIWS mounts Date Deployed: April 29, 1961 (USS Kitty Hawk)
- General Characteristics, Forrestal Class
- Builders: New York Naval Shipyard, Brooklyn, N.Y.
- Power Plant: Eight boilers, four geared steam turbines, four shafts,
- 280,000 shaft horsepower
- Length: 1086 feet (317 meters)
- Flight Deck Width: 252 feet (76.8 meters)
- Beam: 129 feet (39.3 meters)
- Displacement: Approx. 79,300 tons
- Speed: 30+ knots (34.5+ miles per hour)
- Aircraft: Approximately 75
- Ships: USS Independence (CV 62), Yokosuka, Japan Crew: Ship's Company: 3,019 - Air Wing: 2,480 Armament: Four NATO Sea Sparrow launchers, 3 20mm Phalanx CIWS mounts Date Deployed: Oct. 1, 1955 (USS Forrestal)

Cruisers - CG, CGN

Description: Large combat vessel with multiple target response capability.

Features: Modern U. S. Navy guided missile cruisers perform primarily in a Battle Force role. These ships are multi-mission (AAW, ASW, ASUW) surface combatants capable of supporting carrier battle groups, amphibious forces, or of operating independently and as flagships of surface action groups. Due to their extensive combat capability, these ships have been designated as Battle Force Capable (BFC) units. The cruisers are equipped with Tomahawk ASM/LAM giving them additional long range strike mission capability.

Background: Technological advances in the Standard Missile coupled with the AEGIS combat system in Ticonderoga class cruisers and the upgrading of older cruisers have increased the AAW capability of surface combatants to pinpoint accuracy from wave-top to zenith. The addition of Tomahawk ASM/LAM in the CG-47, CGN-36 and CGN-38 classes, has vastly complicated unit target planning for any potential enemy and returned an offensive strike role to the surface forces that seemed to have been lost to air power at Pearl Harbor.

General Characteristics, Ticonderoga Class

- Builders:
- Ingalls Shipbuilding: CG-47-50, CG 52-57, 59,62, 65-66, 68-69, 71-73 Bath Iron Works: CG-51,58,60-61,63-64,67,70. Power Plant:4 General Electric LM 2500 gas turbine engines; 2 shafts, 80,000 shaft horsepower total.
- Length: 567 feet
- Beam: 55 feet
- Displacement: 9,600 tons (full load)
- Speed: 30 plus knots
- Aircraft: Two SH-2 Seasprite (LAMPS) in CG 47-48; Two SH-60 Sea Hawk (LAMPS III)
- Ships:
- USS Ticonderoga (CG 47), Pascagoula, Miss.
- USS Yorktown (CG 48), Pascagoula, Miss.

- USS Vincennes (CG 49), San Diego, Calif.
- USS Valley Forge (CG 50), San Diego, Calif.
- USS Thomas S. Gates (CG 51), Norfolk, Va.
- USS Bunker Hill (CG 52), Yokosuka, Japan
- USS Mobile Bay (CG 53), Yokosuka, Japan
- USS Antietam (CG 54), San Diego, Calif.
- USS Leyte Gulf (CG 55), Mayport, Fla.
- USS San Jacinto (CG 56), Norfolk, Va.
- USS Lake Champlain (CG 57), San Diego, Calif.
- USS Philippine Sea (CG 58), Mayport, Fla.
- USS Princeton (CG 59), San Diego, Calif.
- USS Normandy (CG 60), Norfolk, Va.
- USS Monterey (CG 61), Norfolk, Va.
- USS Chancellorsville (CG 62), San Diego, Calif.
- USS Cowpens (CG 63), San Diego, Calif.
- USS Gettysburg (CG 64), Mayport, Fla.
- USS Chosin (CG 65), Pearl Harbor, HI
- USS Hue City (CG 66), Mayport, Fla.
- USS Shiloh (CG 67), San Diego, Calif.
- USS Anzio (CG 68), Norfolk, Va.
- USS Vicksburg (CG 69), Mayport, Fla.
- USS Lake Erie (CG 70), Pearl Harbor, HI
- USS Cape St. George (CG 71), Norfolk, Va.
- USS Vella Gulf (CG 72), Norfolk, Va.
- USS Port Royal (CG 73), Pearl Harbor, HI
- Crew: 24 Officers, 340 Enlisted
- Armament: MK26 missile launcher (CG 47 thru CG 51) or MK41 vertical launching system (CG 52 thru CG 73)Standard Missile (MR); Anti-Submarine Rocket (ASROC); Tomahawk ASM/LAM; Six MK-46 torpedoes (from two triple mounts); Two MK 45 5-inch/54 caliberlightweight guns; Two Phalanx close-in-weapons systems Date Deployed: 22 January 1983 (USS Ticonderoga)

General Characteristics, Virginia Class

- Builders: Newport News Shipbuilding and Drydock Company, Newport News, Va.
- Power Plant: Two General Electric nuclear reactors, two shafts.
- Length: 585 feet
- Beam: 63 feet
- Displacement: 11,000 tons (full load)
- Speed: 30 plus knots
- Aircraft: None
- Helicopter Landing Capability: None
- Ship: USS Arkansas (CGN 41) to be decommissioned Fall 1997.
- Crew: 39 Officers, 539 Enlisted
- Armament: Standard Missile (MR); Eight Harpoon (From 2 quad launchers);
- Eight Tomahawk ASM/LAM (From two Armored Box Launchers); ASROC; Six MK-46 torpedoes (from two triple mounts); Two MK 45 5-inch/54 caliber lightweight guns; Two Phalanx close-in-weapons systems Date Deployed: September 11, 1976 (USS Virginia)
- General Characteristics, California Class
- Builders: Newport News Shipbuilding and Drydock Company, Newport News, Va.
- Power Plant: Two General Electric nuclear reactors, two shafts.
- Length: 596 feet
- Beam: 61 feet

- Displacement: 10,450 tons (full load)
- Speed: 30 plus knots
- Aircraft: None
- Helicopter Landing Capability: Landing area only, no support facilities Ships:
- USS California (CGN 36), Bremerton, WA
- USS South Carolina (CGN 37), Norfolk, Va.
- Crew: 40 Officers, 544 Enlisted
- Armament: Standard Missile (MR); Eight Harpoon (From 2 quad launchers);
- ASROC (From MK 16 box launcher); Four MK-46 torpedoes (from single fixed tubes); Two MK 45 5-inch/54 caliber lightweight guns; Two Phalanx close-in-weapons systems CIWS Date Deployed: February 16, 1974 (USS California)

Destroyers - DD, DDG

Description: These fast warships help safeguard larger ships in a fleet or battle group. Features: Destroyers and guided missile destroyers operate in support of carrier battle groups, surface action groups, amphibious groups and replenishment groups. Destroyers primarily perform anti-submarine warfare duty while guided missile destroyers are multi-mission (ASW, anti-air and anti-surface warfare) surface combatants. The addition of the Mk-41 Vertical Launch System or Tomahawk Armored Box Launchers (ABLs) to many Spruance-class destroyers has greatly expanded the role of the destroyer in strike warfare.

Background: Technological advances have improved the capability of modern destroyers culminating in the Arleigh Burke (DDG 51) class. Named for the Navy's most famous destroyer squadron combat commander and three-time Chief of Naval Operations, the Arleigh Burke was commissioned July 4, 1991 and was the most powerful surface combatant ever put to sea. Like the larger Ticonderoga class cruisers, DDG-51's combat systems center around the Aegis combat system and the SPY-lD, multi-function phased array radar. The combination of Aegis, the Vertical Launching System, an advanced anti-submarine warfare system, advanced anti-aircraft missiles and Tomahawk ASM/LAM, the Burke class continues the revolution at sea. Designed for survivability, DDG-51 incorporates all-steel construction and many damage control features resulting from lessons learned during the Falkland Islands War and from the accidental attack on USS Stark. Like most modern U.S. surface combatants, DDG-51 utilizes gas turbine propulsion. These ships replaced the older Charles F. Adams and Farragut -class guided missile destroyers.

The four Kidd-class suited missile destroyers are similar to the Spruance class, but have greater displacement and improved combat systems. These ships were built originally for use by Iran (when the Shah was in power) and the contract was canceled by the succeeding Iranian government. The U.S. Navy acquired them in 1981 and 1982. Like the older guided missile cruisers, these ships have been upgraded to improve their anti-air warfare performance against the technologically advanced threat expected into the 2lst Century.

The Spruance class destroyers, the first large U.S. Navy warships to employ gas turbine engines as their main propulsion system, are undergoing extensive modernizing. The upgrade program includes addition of vertical launchers for advanced missiles on 24 ships of this class, in addition to an advanced ASW system and upgrading of its helicopter capability. Like the Kidd class, Spruance class destroyers are expected to remain a major part of the Navy's surface combatant force into the 21st century.

General Characteristics, Arleigh Burke class

- Builders: Bath Iron Works, Ingalls Shipbuilding

- Power Plant: Four General Electric LM 2500-30 gas turbines; two shafts, 100,000 total shaft horsepower.
- Length: 466 feet (142 meters)
- Beam: 59 feet (18 meters)
- Displacement: 8,300 tons (7,470 metric tons) full load Speed: 31 knots (35.7 mph, 57.1 kph)
- Aircraft: None. LAMPS III electronics installed on landing deck for coordinated DDG 51/helo ASW operations Ships:
- USS Arleigh Burke (DDG 51), Norfolk, Va.
- USS Barry (DDG 52), Norfolk, Va.
- USS John Paul Jones (DDG 53), San Diego, Calif. USS Curtis Wilbur (DDG 54), Yokosuka, Japan USS Stout (DDG 55), Norfolk, Va.
- USS John S. McCain (DDG 56), Yokosuka, Japan USS Mitscher (DDG 57), Norfolk, Va.
- USS Laboon (DDG 58), Norfolk, Va.
- USS Russell (DDG 59), Pearl Harbor, HI USS Paul Hamilton (DDG 60), Pearl Harbor, HI USS Ramage (DDG 61), Norfolk, Va.
- USS Fitzgerald (DDG 62), San Diego, Calif.
- USS Stethem (DDG 63), San Diego, Calif.
- USS Carney (DDG 64), Mayport, Fla.
- USS Benfold (DDG 65), San Diego, Calif.
- USS Gonzalez (DDG 66), Bath, ME
- USS Cole (DDG 67), Norfolk, Va.
- USS The Sullivans (DDG 68), Mayport, Fla.
- USS Milius (DDG 69), San Diego, Calif.
- USS Hopper (DDG 70)Pearl Harbor, HI
- USS Ross (DDG 71), Norfolk, Va.
- Mahan (DDG 72), under construction
- Decatur (DDG 73), under construction
- McFaul (DDG 74), under construction
- Donald Cook (DDG 75) , under construction
- Higgins (DDG 76), under construction
- O'Kane (DDG 77) , under construction
- Porter (DDG 78), under construction
- Oscar Austin (DDG 79), under construction
- Roosevelt (DDG 80), under construction
- Winston Churchill (DDG 81), under construction
- (DDG 82), authorized
- (DDG 83), authorized
- (DDG 84), authorized
- (DDG 85), authorized
- Crew: 23 officers, 300 enlisted
- Armament: Standard missile; Harpoon; Tomahawk ASM/LAM; six Mk-46 torpedoes(from two triple tube mounts); one 5"/54 caliber Mk-45 (lightweight gun); two 20mm Phalanx CIWS Date Deployed: July 4, 1991 (USS Arleigh Burke)
- General Characteristics, Kidd and Spruance classes
- Builder: Ingalls Shipbuilding
- Power plant: Four General Electric LM 2500 gas turbines, two shafts,
- 80,000 shaft horsepower
- Length: 563 feet (171.6 meters)
- Beam: 55 feet (16.8 meters)
- Displacement: Kidd - 9,900 tons (8,910 metric tons) full load; Spruance - 9,100 tons (8,190 metric tons) full load Speed: 33 knots (38 mph, 60.8 kph)
- Aircraft:

- Kidd - One SH-2F Seasprite LAMPS helicopter Spruance - Two SH-60 Seahawk LAMPS III helicopters Ships (Kidd class):
- USS Kidd (DDG 993), Norfolk, Va.
- USS Callaghan (DDG 994), Everett, Wash.
- USS Scott (DDG 995), Mayport, Fla.
- USS Chandler (DDG 996), Everett, Wash.
- Ships (Spruance class):
- USS Spruance (DD 963), Mayport, Fla.
- USS Paul F. Foster (DD 964), Everett, Wash.
- USS Kinkaid (DD 965), San Diego, Calif.
- USS Hewitt (DD 966), Yokosuka, Japan
- USS Elliot (DD 967), San Diego, Calif.
- USS Arthur W. Radford (DD 968), Norfolk, Va.
- USS Peterson (DD 969), Norfolk, Va.
- USS Caron (DD 970), Norfolk, Va.
- USS David R. Ray (DD 971), Everett, Wash.
- USS Oldendorf (DD 972), San Diego, Calif.
- USS John Young (DD 973), San Diego, Calif.
- USS Comte De Grasse (DD 974), Norfolk, Va.
- USS O'Brien (DD 975), Yokosuka, Japan
- USS Merrill (DD 976), San Diego, Calif.
- USS Briscoe (DD 977), Norfolk, Va.
- USS Stump (DD 978), Norfolk, Va.
- USS Connolly (DD 979), Mayport, Fla.
- USS Moosbrugger (DD 980), Mayport, Fla.
- USS John Hancock (DD 981), Mayport, Va.
- USS Nicholson (DD 982), Mayport, Fla.
- USS John Rodgers (DD 983), Mayport, Fla.
- USS Leftwich (DD 984), Pearl Harbor, HI
- USS Cushing (DD 985), Pearl Harbor, HI
- USS Harry W. Hill (DD 986), San Diego, Calif.
- USS O'Bannon (DD 987), Mayport, Fla.
- USS Thorn (DD 988), Norfolk, Va.
- USS Deyo (DD 989), Norfolk, Va.
- USS Ingersoll (DD 990), Pearl Harbor, HI
- USS Fife (DD 991), Yokosuka, Japan
- USS Fletcher (DD 992), Pearl Harbor, HI
- USS Hayler (DD 997), Norfolk, Va.
- Crew:
- Kidd class: 31 officers, 332 enlisted
- Spruance class: 30 officers, 352 enlisted
- Armament: 8 Harpoon (from 2 quad launchers), Tomahawk ASM/LAM, VLS or ABL in Spruance; ASROC; six Mk-46 torpedoes (from 2 triple tube mounts); two 5"/54 caliber Mk-45 (lightweight gun); two 20mm Phalanx CIWS Kidd only: Standard missiles Spruance only: NATO Sea Sparrow point defense AAW missiles Date Deployed:
- June 27, 1981 (USS Kidd)
- Sept. 20, 1975 (USS Spruance)

Attack Submarines - SSN

Description: Attack submarine, designed to seek and destroy enemy submarines and surface ships.

Background: The concept of technical superiority over numerical superiority was and still is the driving force in American submarine development. A number of Third World countries are acquiring modern state-of-the-art non-nuclear submarines. Countering this threat is the primary mission of U.S. nuclear attack submarines. Their other missions range from intelligence collection and special forces delivery to anti-ship and strike warfare. The Navy began construction of Seawolf class submarines in 1989. Seawolf is designed to be exceptionally quiet, fast well-armed with advanced sensors. It is a multi-mission vessel, capable of deploying to forward ocean areas to search out and destroy enemy submarines and surface ships and to fire missiles in support of other forces. The first of the class, Seawolf (SSN 21), completed its initial sea trials in July 1996. Attack submarines also carry the Tomahawk cruise missile. Tomahawk launches from attack submarines were successfully conducted during Operation Desert Storm. The Benjamin Franklin class were converted from Fleet Ballistic Missile submarines and carry drydock shelters. They are equipped for special operations and support SEALs. The former missile spaces have been converted to accomodations, storage, and recreation spaces.

General Characteristics, Seawolf class

- Builders: General Dynamics Electric Boat Division.
- Power Plant: One nuclear reactor, one shaft
- Length: 353 feet (107.6 meters)
- Draft: 35 feet (10.67 meters)
- Beam: 40 feet (12.2 meters)
- Displacement: Approx. 9,150 tons (10,086 metric tons) submerged Speed: 25+ knots (28+ miles per hour, 46.3+ kph)
- Ships:
- USS Seawolf (SSN-21), Groton, Ct.
- Connecticut (SSN-22), (under construction)
- (SSN-23), (funded)
- Crew: 12 Officers; 121 Enlisted
- Armament: Harpoon and Tomahawk missiles, VLS tubes, MK-48 torpedoes, four torpedo tubes.

General Characteristics, Los Angeles class

- Builders: Newport News Shipbuilding Co.; General Dynamics Electric Boat Division.
- Power Plant: One nuclear reactor, one shaft
- Length: 360 feet (109.73 meters)
- Beam: 33 feet (10.06 meters)
- Displacement: Approx. 6,900 tons (6210 metric tons) submerged Speed: 20+ knots (23+ miles per hour, 36.8 +kph)
- Ships:
- USS Los Angeles (SSN-688), Pearl Harbor, Hawaii USS Philadelphia (SSN-690), Groton, Conn.
- USS Memphis (SSN-691), Groton, Conn.
- USS Indianapolis (SSN-697), Pearl Harbor, Hawaii USS Bremerton (SSN-698), Pearl Harbor, Hawaii USS Jacksonville (SSN-699), Norfolk, Va.
- USS Dallas (SSN-700), Groton, Conn.
- USS La Jolla (SSN-701), San Diego, Calif.
- USS Phoenix (SSN-702), Norfolk, Va.
- USS Boston (SSN-703), Groton, Conn.
- USS Baltimore (SSN-704), Norfolk, Va.
- USS City of Corpus Christi (SSN-705), Groton, Conn.
- USS Albuquerque (SSN-706), Groton, Conn.
- USS Portsmouth (SSN-707), San Diego, Calif.

- USS Minneapolis-St. Paul (SSN-708), Norfolk, Va.
- USS Hyman G. Rickover (SSN-709), Norfolk, Va.
- USS Augusta (SSN 710), Groton, Conn.
- USS San Francisco (SSN-711), Pearl Harbor, Hawaii USS Atlanta (SSN-712), Norfolk, Va.
- USS Houston (SSN-713), San Diego, Calif.
- USS Norfolk (SSN-714), Norfolk, Va.
- USS Buffalo (SSN-715), Pearl Harbor, Hawaii USS Salt Lake City (SSN-716), San Diego, Calif. USS Olympia (SSN-717), Pearl Harbor, Hawaii USS Honolulu (SSN-718), Pearl Harbor, Hawaii USS Providence (SSN-719), Groton, Conn.
- USS Pittsburgh (SSN-720), Groton, Conn.
- USS Chicago (SSN-721), San Diego, Calif.
- USS Key West (SSN-722), Pearl Harbor, Hawaii USS Oklahoma City (SSN-723), Norfolk, Va.
- USS Louisville (SSN-724), Pearl Harbor, Hawaii
- USS Helena (SSN-725), Pearl Harbor, Hawaii
- USS Newport News (SSN-750), Norfolk, Va.
- USS San Juan (SSN 751), Groton, Conn.
- USS Pasadena (SSN-752), San Diego, Calif.
- USS Albany (SSN-753), Norfolk, Va.
- USS Topeka (SSN-754), San Diego, Calif.
- USS Miami (SSN-755), Groton, Conn.
- USS Scranton (SSN-756), Norfolk, Va.
- USS Alexandria (SSN-757), Groton, Conn.
- USS Asheville (SSN-758), San Diego, Calif.
- USS Jefferson City (SSN-759), San Diego, Calif.
- USS Annapolis (SSN-760), Groton, Conn.
- USS Springfield (SSN-761), Groton, Conn.
- USS Columbus (SSN-762), Pearl Harbor, Hawaii USS Santa Fe (SSN-763), Groton, Conn.
- USS Boise (SSN-764), Norfolk, Va.
- USS Monpelier (SSN-765), Norfolk, Va.
- USS Charlotte (SSN-766), Pearl Harbor, Hawaii.
- USS Hampton (SSN-767), Norfolk, Va.
- USS Hartford (SSN-768), Groton, Conn.
- USS Toledo (SSN-769), Groton, Conn.
- USS Tucson (SSN-770), Pearl Harbor, Hawaii USS Columbia (SSN-771), Pearl Harbor, Hawaii USS Greeneville (SSN-772), Norfolk, Va.
- USS Cheyenne (SSN-773), Norfolk, Va. Crew: 13 Officers, 116 Enlisted Armament: Harpoon and Tomahawk missiles, VLS tubes, MK-48 torpedoes, four torpedo tubes (Seawolf has 8).
- Date deployed: November 13, 1976 (USS Los Angeles)

General Characteristics, Narwhal Class

- Builders: General Dynamics' Electric Boat Division
- Power Plant: One nuclear reactor, one shaft
- Length: 314 feet (95.71 meters)
- Beam: 38 feet (11.58 meters)
- Displacement: Approx. 5,350 tons (4815 metric tons) submerged Speed: 20+ knots (23+ miles per hour, 36.8 +kph) Ships: USS Narwhal (SSN 671), Norfolk, Va.
- Crew: 13 Officers, 116 Enlisted
- Armament: Harpoon and Tomahawk missiles, Mk 48 torpedoes; four torpedo tubes.

- Date Deployed: July 12, 1969 (USS Narwhal)

General Characteristics, Sturgeon Class

- Builders: General Dynamics Electric Boat Division; General Dynamics,
- Quincy Shipbuilding Division; Ingalls Shipbuilding; Portsmouth Naval
- Shipyard; San Francisco Naval Shipyard; and
- Newport News Shipbuilding.
- Power Plant: One nuclear reactor, one shaft
- Length: 292 feet (89 meters), (SSN 687-677); 300 feet (91.44 meters) SSN (678-687)
- Beam: 32 feet (9.75 meters)
- Displacement: Approx. 4,640 tons (4176 metric tons) submerged Speed: 20+ knots (23+ miles per hour, 36.8 +kph)
- Ships:
- USS Grayling (SSN-646), Groton, Conn.
- USS Pogy (SSN-647), San Diego, Calif.
- USS Sand Lance (SSN-660), Groton, Conn.
- USS Hawkbill (SSN-666), Pearl Harbor, HI
- USS Trepang (SSN-674), Groton, Conn.
- USS Billfish (SSN-676), Groton, Conn.
- USS Archerfish (SSN-678), Groton, Conn.
- USS William H. Bates (SSN-680), Pearl Harbor, HI USS Batfish (SSN-681), Groton, Conn.
- USS Tunny (SSN-682), Pearl Harbor, HI
- USS Parche (SSN-683), Bangor, Wa.
- USS Cavalla (SSN-684), Pearl Harbor, HI
- USS L. Mendel Rivers (SSN-686), Norfolk, Va.
- Crew: 12 Officers, 95 Enlisted
- Armament: Harpoon, MK-48 torpedoes, four torpedo tubes; **Tomahawk**.
- Date Deployed: March 3, 1967 (USS Sturgeon)

General Characteristics, Benjamin Franklin Class

- Builders: Mare Island Naval Shipyard; General Dynamics Electric Boat
- Division
- Power Plant: One nuclear reactor, one shaft
- Length: 425 feet (129.5 meters)
- Beam: 33 feet (10.1 meters)
- Displacement: Approx. 8,250 tons (7425 metric tons) submerged Speed: 20+ knots (23+ miles per hour, 36.8 +kph)
- Ships:
- USS Kamehameha (SSN 642) (ex-SSBN 642), Pearl Harbor, Hi.
- USS James K. Polk (SSN 645)(ex-SSBN 645), Norfolk, Va.
- Crew: 13 Officers, 107 Enlisted
- Armament: MK-48 torpedoes, four torpedo tubes Date Deployed: Oct. 22, 1965 (USS Benjamin Franklin)

Tomahawk Land-Attack Cruise Missile (TLAM) Block II (1986) and Block III (1993)

- Description: Long range, subsonic cruise missile used for land attack warfare.

- Background: Tomahawk is an all-weather submarine or ship-launched land-attack cruise missile. After launch, a solid propellant propels the missile until a small turbofan engine takes over for the cruise portion of flight. Tomahawk is a highly survivable weapon. Radar detection is difficult because of the missile's small cross-section, low altitude flight. Similarly, infrared detection is difficult because the turbofan engine emits little heat. Systems include Global Positioning System (GPS) receiver; an upgrade of the Digital Scene Matching Area Correlation (DSMAC) system; Time of Arrival (TOA) control, and improved 402 turbo engines.
- Features: The land attack version of Tomahawk has inertial and terrain contour matching (TERCOM) guidance. TERCOM uses a stored digital scene matching area correlator and map reference to compare with the actual terrain to determine the missile's position. If necessary, a course correction is then made to place the missile on course to the target.

General Characteristics

- Primary Function: Long-range subsonic cruise missile for attacking land targets.
- Contractor: Hughes Missile Systems Co., Tucson, Ariz.
- Production quantity: 2,729 TLAM C/D, 676 TLAM D
- Acquisition cost: $8,426.8 million: $1,224,9 million development cost and $7,201.9 million production cost.
- Acquisition unit cost for total program is $2.475 million, and production cost is $2.115 million.
- Unit Cost: now about $750,000 (over the last four years) Power Plant: Williams International F107-WR-402 cruise turbo-fan engine; solid-fuel booster Length: 18 feet 3 inches (5.56 meters); with booster: 20 feet 6 inches (6.25 meters)
- Weight: 2,650 pounds (1192.5 kg); 3,200 pounds (1440 kg) with booster Diameter: 20.4 inches (51.81 cm)
- Wing Span: 8 feet 9 inches (2.67 meters)
- Missions: Close air support, interdiction, offensive counter air, suppression of enemy air defense, naval anti-surface warfare.
- Targets: Fixed soft, fixed hard, mobile soft
- Range: Land attack, conventional warhead: 870 nautical miles (1000 statute miles, 1609 km)
- Speed: Subsonic - about 550 mph (880 km/h) Guidance System: Inertial and TERCOM, digital scene matching, GPS (Block III)
- Warheads: Conventional: 1,000 pounds or conventional submunitions dispenser with combined effect bomblets.
- First capability: 1984. Date Deployed: 1986; Block III: 1995

Tomahawk Baseline Improvement Program (TBIP)

- TBIP represents a major upgrade to the Tomahawk. TBIP uses a jam resistant GPS receiver and an INS to guide the missile throughout the mission and a forward-looking terminal sensor to autonomously attack the target. The Navy plans to upgrade or remanufacture the TASM and TLAM-C inventory to the TBIP
- Service: Navy
- Program Status: Development/Production
- Mission: Amphibious strike, Anti-surface warfare, naval warfare support, naval warfare
- Targets: Fixed hard, fixed soft, maritime surface
- Platforms: Ships, submarines
- First capability: 2000?
- Guidance method: GPS/INS

- Range: Land attack, conventional warhead: 870 nautical miles (1000 statute miles, 1609 km)
- Quantity: 1,181
- Development cost: $745.7 million
- Production Cost: $1,832.9 million
- Total Acquisition Cost: $2,578.6 million
- Acquisition Unit Cost: $2.18 million
- Production unit cost: $1.55 million