# Backgrounder

**Integrated Defense Systems**
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## Boeing E-3 Airborne Warning and Control System (AWACS)

**Description & Purpose:**
E-3 707 AWACS represents the world's standard for airborne early warning and control systems. E-3 fills the needs of both command and control (C2) functions for tactical and air defense forces. The E-3 offers superior surveillance capabilities. Equipped with a "look-down" radar. The AWACS can separate airborne targets from ground and sea clutter returns. It also can detect and track both air and sea targets simultaneously. AWACS has earned the reputation as an international keeper of the peace.

**Customers:**
The first E-3 entered U.S Air Force service in 1977, preceded by more than 10 years of competitive fly-offs, prototype design and development. The last of the 34 U.S. AWACS aircraft was delivered in 1984. E-3s are also in service with NATO (17), the United Kingdom (7), France (4) and Saudi Arabia (5).

**Miscellaneous:**
In its tactical role, the E-3 provides quick-reaction surveillance and C2 necessary to manage both tactical and defensive fighter forces. The E-3 can detect and track hostile aircraft operating at low altitudes over all terrain, and can identify and control friendly aircraft in the same airspace. The AWACS' mobility allows rapid deployment in any military action, regardless of intensity.

In its strategic defense role, the E-3 provides the means to detect, identify, track and intercept airborne threats.

Throughout its history AWACS has undergone extensive enhancements. Fleets from the U-S, NATO, United Kingdom and France have upgraded their communications, computers and navigation.

One of the most extensive programs involved the radar system. The Radar System Improvement Program (RSIP) improves E-3's radar by increasing the sensitivity of the pulse Doppler radar so the aircraft can detect and track smaller targets over a long range. It also improves the radar's counter-countermeasures capability (making it harder to jam the system), upgrades the radar operator's console, replaces the radar's existing

computer with a new high-reliability multiprocessor and rewrites the radar software to make it easier to maintain and enhance in the future. The U-S, NATO, the United Kingdom and France have installed RSIP into their fleets.

In November 1997, Boeing received a contract to develop and test a mission systems upgrade for the NATO E-3 fleet. Under the engineering, manufacturing and development (EMD) contract, Boeing—supported by subcontractors from participating NATO nations—integrated major system-related enhancements to computers, displays, communications, navigation and target identification.

Major mission system enhancements were installed on the first of 17 NATO AWACS aircraft as part of the $1.32 billion Mid-Term Modernization program. EADS, as subcontractor to Boeing, performed the work in Manching, Germany. The work was completed in Nov. 2006.

The entire fleet was upgraded in Nov. 2008. Additionally, Boeing also upgraded two AWACS mission simulators into the Mid-Term configuration.

The enhancements provide an improved picture of the battlespace with the integration of data from various sensors on board the AWACS, as well as from other sources, and an increased capacity in the number of targets it can track.

The capability means increased interoperability with more assets including other AWACS or Airborne Early Warning and Control fleets, ground stations, fighter aircraft, UAVs, ships and satellites and is combined with an updated Identification Friend or Foe system.

The largest block upgrade in the history of the U.S. Air Force's AWACS fleet being validated during a four year System Design and Demonstration (SDD) contract.

Under Block 40/45, mission computing upgrades were tested in the avionics development laboratory while integrated modeling and simulation testing was accomplished at Boeing's Virtual Warfare Center in St. Louis. Also, Test System 3 (TS-3), an AWACS test aircraft, was retrofitted with the new mission computing hardware and software, mission consoles, and upgraded electronic support measures equipment for the flight test portion of the program.

As part of the SDD contract, AWACS Block 40/45 Mission Systems flight testing on TS-3 began in April of 2007 and was completed in July 2008. Test data collected indicated the Block 40/45 system met or exceeded all its Key Performance Parameters and Technical Performance Measures. A pre-production contract has been awarded and the program is now writing the final proposal leading to a production contract later in 2009.

The enhancements are designed to increase AWACS mission execution capability, effectiveness, and reliability while lowering life –cycle costs. 40/45 will give the warfighter capabilities required to more efficiently provide airborne surveillance and air battle management well into the 21st century.

These upgrades dramatically enhance the capability of the US AWACS fleet making it a prime catalyst for network-enabled capability and an extraordinary force multiplier across the entire operational theatre. Block 40/45 will give the warfighter capabilities required to provide airborne surveillance and battle management well in the 21st century.

Another upgrade to the U.S. fleet is scheduled to be completed in 2009. Boeing is installing satellite communications and air traffic management upgrades. Enhanced satellite communications will boost the fleet's capability by providing crews with multiple channels for voice and data. This improves the AWACS system's ability to communicate with other AWACS aircraft, platforms and ground stations.

The Global Air Traffic Management upgrade permits AWACS to efficiently operate in congested airspace worldwide, especially in Europe and the East coast corridor of the U.S., by allowing the AWACS to fly in closer proximity to other aircraft. Additional enhancements include a traffic collision avoidance system, which sounds an alert and provides a message – climb or descend – to the AWACS flight crew in order to prevent a collision.

The Saudi AWACS fleet also is undergoing a major upgrade to its communications. The $49.2 million contract, including options, provides for Link 16 capability, a secure, jam-resistant, digital data link that allows military aircraft, ships and ground units to exchange their tactical pictures din real-time. Link 16 also supports the exchange of text messages and imagery data and provides additional channels for digital voice. The modification is scheduled to be completed in Dec. 2009.

**General Characteristics:**

**E-3 Specifications (707 Platform)**

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| Primary function: | Airborne surveillance, and command, control and communications. |
| Powerplant: | Four CFM-56-2 turbofan engines -- 24,000 lb. thrust (foreign-military-sale aircraft); four TF-33-PW-100 A turbofan engines -- 21,000 lb. thrust (U.S./NATO aircraft). |
| Dimensions: | Airframe -- span 44.43 meters/145 feet, 9 inches; length 46.62 meters/152 feet, 11 inches; radome height: 12.5 meters/41 feet, 9 inches. |
| Radome: | Diameter 9.1 meters/30 feet; thickness 1.8 meters/6 feet; above fuselage 3.35 meters/11 feet. |
| Speed: | More than 800 kilometers per hour/500 miles per hour. |
| Aircraft ceiling: | More than 10,670 meters/35,000 feet. |
| Endurance: | More than 11 hours (unrefueled). |

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| Armament: | None. |
| Range: | More than 9,250 kilometers/5,000 nautical miles. |
| Crew: | E-3A 17 (four flight crew, 13 AWACS specialists).<br>E-3B&C 21 (four flight crew, 17 AWACS specialists). |
| Max. takeoff weight: | 151,955 kilograms/335,000 pounds. |

**Worldwide E-3 Fleet**

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|---|---|---|---|
| United States | 33* | Saudi Arabia | 5 |
| NATO | 17** | France | 4 |
| United Kingdom | 7 | | |

* An E-3 crashed Sept. 22, 1995 in Alaska, reducing the U.S. fleet by one.
** A NATO E-3 crashed after an aborted takeoff on July 14, 1996 in Greece. 737-700 increased gross weight (IGW) airframe (Boeing Business Jet 1 configuration)

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