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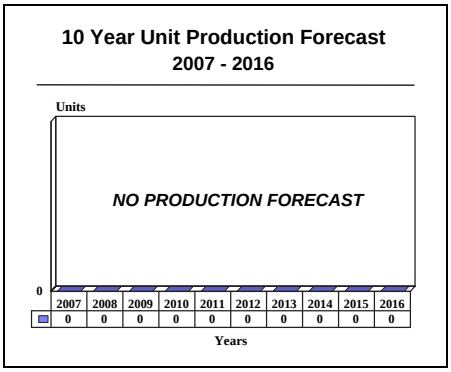
Boeing E-3/E-6 Series - Archived 01/2008

Outlook

- The final E-8C JSTARS aircraft was delivered in 2005
- USAF and NATO E-3 AWACS aircraft are undergoing modification



Orientation

Description. Multimission, special-purpose military aircraft (E-3A/B/C/D/F, KE-3A, E-6A, E-8A/C, EC-18B, VC-137A/B/C) based on Boeing 707 airframe.

Sponsor. U.S. Air Force Aeronautical Systems Center, Wright-Patterson AFB, Ohio, USA.

U.S. Naval Air Systems Command, Washington, DC, USA.

Status. E-3 production was completed in 1991.

Total Produced. Through 1991, Boeing produced 68 E-3 and eight KE-3A aircraft.

Application. E-3A/B/C/D/F - Airborne Warning and Control System (AWACS) aircraft.

KE-3A - Tanker aircraft for Saudi Arabia.

E-6A - Airborne Very Low Frequency communications aircraft for U.S. Navy.

E-8 - Joint Surveillance Target Attack Radar System (JSTARS) platform for USAF.

Price Range. E-3A for USAF, $111.9 million (FY83 unit cost). E-6A for USN, $67.1 million (FY89 unit cost). E-8C for USAF, $306.5 million (FY03 unit cost).

Boeing E-3/E-6 Series

BOEING E-6B
Source: U.S. Navy

Contractors

Prime

Boeing Integrated Defense Systems	http://www.boeing.com, PO Box 516, St Louis, MO 63166 United States, Tel: + 1 (314) 232-0232, Fax: + 1 (314) 777-1096, Prime

Subcontractor

CFM International Inc	http://www.cfm56.com, Mail Drop Y7, PO Box 15514, Cincinnati, OH 45215 United States, Tel: + 1 (513) 552-3272, Fax: + 1 (513) 552-3329, Email: geae.csc@ae.ge.com (CFM56-2 Turbofan)
Pratt & Whitney	http://www.pratt-whitney.com, 400 Main St, East Hartford, CT 06108 United States, Tel: + 1 (860) 565-4321, Email: info@pw.utc.com (TF33 Turbofan)
NOTE(S): The above contractors are for the E-3. The TF33 engine applies to the E-3A, the E-3B, and the E-3C. The CFM56-2 engine applies to the E-3A, the E-3D, and the E-3F.	

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Technical Data

(E-3A)

Design Features. Airframe is based on Boeing's Model 707.

	Metric	U.S.
Dimensions		
Length	44.15 m	144.83 ft
Height overall	12.73 m	41.75 ft
Wingspan	44.42 m	145.75 ft

		Metric	U.S.
Weight			
Maximum TOW		151,955 kg	335,000 lb
Performance			
Maximum speed		800+ kmph	434+ kt
Aircraft ceiling		10,670+ m	35,000+ ft
Range		9,250+ km	5,000+ nm
Propulsion			
E-3A/B/C	(4)	Pratt & Whitney TF33-PW-100/100A two-spool turbofans rated 93.4 kN (21,000 lbst) each. The -100A is the more recent production variant. (**Note:** TF33 powers aircraft for USAF and NATO.)	
E-3A/D/F; KE-3A	(4)	CFM International CFM56-2 twin-shaft high-bypass turbofans rated 106.8 kN (24,000 lbst) each. (**Note:** CFM56 powers aircraft for Saudi Arabia, France, and the U.K.)	
E-6A	(4)	CFM International F108-CF-100 (CFM56-2A-2) turbofans rated 106.8 kN (24,000 lbst) each.	
Armament			
None			

Variants/Upgrades

E-3A Sentry. A military 707-320B variant selected to carry Airborne Warning and Control System (AWACS) airborne early warning equipment. While the E-3 aircraft itself is often referred to as the AWACS, this is a misnomer since the E-3 is only the airborne platform for the electronic equipment. In a strategic defense role, the aircraft provides the means to detect, identify, track, and intercept airborne threats. In a tactical role, the E-3 provides quick-reaction surveillance and command, control and communications (C3) necessary to manage both tactical and defensive fighter forces. It can also detect and track hostile aircraft operating at low altitudes over all terrain, and can identify and control friendly aircraft in the same airspace.

In the late 1960s, Boeing and McDonnell Douglas submitted proposals to the U.S. Air Force for the AWACS platform. Boeing proposed a modified 707-320B and teamed with Hazeltine, IBM Federal Systems, and Airborne Instrument Labs, while McDonnell Douglas proposed a DC-8 and joined Rockwell Collins, Litton, Sylvania, and Systems Development Corp. In July 1970, Boeing was selected as the winner of the AWACS platform contract, and began work on two prototype airframes under the designation EC-137D.

The rotodome, 9.144 meters (30 ft) in diameter and 1.829 meters (6.0 ft) thick, contains a rotating turntable designed by Keystone Engineering of Los Angeles. Contained within the rotodome are the Westinghouse APY-1/2 surveillance radar and the IFF/TADIL C array. For surveillance operations, the rotodome is hydraulically driven at six rpm. The Westinghouse surveillance radar is an S-band type using pulse Doppler technology, with a high pulse repetition frequency. Other systems include the IBM Data Processing Functional Group, which includes an IBM 4 Pi CC-1 or CC-2 computer; the Hazeltine Data Display and Control subsystem; the Northrop ARN-120 Omega navigation/ guidance system; the Teledyne Ryan APN-213 Doppler velocity sensor; Delco ASN-119 Carousel IV inertial navigation systems; the Eaton AIL APX-103 interrogator set; and communications subsystems supplied by Rockwell Collins.

The initial production version was the E-3A. The first 24 E-3s for the U.S. Air Force were built in the "core" E-3A configuration. The remaining 10 USAF aircraft and all NATO E-3s were built to the U.S./NATO "standard" E-3A configuration that features a maritime surveillance radar mode, the CC-2 computer, and additional HF radios.

E-3B. The first 24 USAF E-3As were modified under Block 20 to the E-3B configuration. (See below for details.)

E-3C. The final 10 USAF E-3As were modified under Block 25 to the E-3C configuration. (See below for details.)

E-3 Upgrades. The first major upgrade (Block 20) to the E-3 was started in the early 1980s, taking 24 USAF E-3A aircraft to the E-3B configuration. The changes

included an ECM-resistant voice communications system, an additional HF radio and five additional UHF radios, a new IBM CC-2 computer, five more situation display consoles, aircraft self-defense hardpoints, and an austere maritime surveillance capability for the Westinghouse radar system. The first E-3B was redelivered in July 1984.

Block 25 upgrades began in 1984, taking 10 USAF E-3As to the E-3C configuration. Five more situation display stations and five additional UHF radios were added. The program was completed during the summer of 1990.

In 1987, the Air Force began a major upgrade program for its E-3B/C Sentry aircraft. This upgrade, known as Block 30/35, was approved for production by the Assistant Secretary of the Air Force for Acquisition in 1992. The program covered an Electronic Support Measures (ESM) system, NAVSTAR Global Positioning System (GPS) equipment, a modification of the IBM CC-2 computer to an improved CC-2E version, and a Joint Tactical Information Distribution System (JTIDS) Class 2H terminal. Boeing manufactured production shipsets. The Air Force itself performed kit installation. Block 30/35 upgrades to the service's 32 E-3s were completed in late 2001.

NATO has modified its fleet of E-3As to the Modification Block 1 standard. This configuration includes Hazeltine color displays, HAVE QUICK anti-jam radios, and a Link 16 capable JTIDS. In January 1993, Boeing received a NATO contract worth over $290 million for procurement of the equipment. Boeing later received a follow-on award worth $35.5 million to retrofit the equipment to NATO E-3s. Actual installation began in 1994. Boeing modified the first aircraft, and Daimler-Benz Aerospace (DASA) upgraded the remaining 17.

In 1993, Boeing received a NATO award worth $127 million covering production and installation of ESM kits for 17 NATO E-3 aircraft. The ESM system was the same as that used in the USAF Block 30/35 upgrade effort. DASA installed the ESM kits at the same time that it installed the Modification Block 1 equipment.

Another modification program for USAF E-3s was the Radar System Improvement Program (RSIP) upgrade to the Westinghouse APY-1 and APY-2 radar systems on the aircraft. RSIP was intended to improve the ability of the E-3's radar to track smaller targets, such as cruise missiles, and increase the distance at which the E-3 will be able to detect and track bombers and fighters. The USAF RSIP upgrades were completed in April 2005.

NATO also opted to upgrade its fleet of 17 E-3As with the RSIP improvements. All 17 were retrofitted with RSIP kits by February 2000. DASA, under subcontract to Boeing, installed the kits on the NATO E-3As at its facility in Manching, Germany.

In a program completed in late 2000, BAE Systems installed RSIP kits on the seven British E-3Ds.

In early 2002, Boeing was awarded a $133 million contract for RSIP modifications for the four French E-3Fs. Boeing, as prime contractor and systems integrator, shipped modification kits to Air France Industries (AFI). AFI, under subcontract to Boeing, performed the installation and checkout at its facility in Le Bourget, France. Installation was completed in 2006. The RSIP kits were built principally by Northrop Grumman under subcontract to Boeing.

KE-3A. Six tanker versions of the basic E-3 airframe were ordered by Saudi Arabia in 1981, along with five E-3 AWACS aircraft. In 1984, Saudi Arabia increased its order to eight tankers. Saudi E-3 deliveries began in June 1986, with all E-3 and KE-3 aircraft in service by September 1987. Two of the Saudi KE-3As were later converted to the RE-3A configuration.

E-3D (Sentry AEW1). Designation for U.K. AWACS. Six were ordered in February 1987, and an order for a seventh was placed in October 1987. Aircraft roll-out occurred in July 1989. The initial aircraft was delivered to the U.K. MoD in 1991. The seventh E-3D was delivered in May 1992. Boeing's European suppliers included British Aerospace (U.K. installation and checkout), Air Log (ground support equipment for U.K. and France), Rediffusion (U.K. dynamic simulator), Computing Devices (mission digital recorder), Racal (color monitors), Page Aerospace (low-voltage power supplies), AMSS (radome maintenance platform), GEC (engine monitoring system), and Ferranti (mission simulator). French suppliers on the E-3D and E-3F included Snecma (CFM56 engines), UTA (French installation and checkout and mission simulator), and Sogerma (refueling probe). German companies and their responsibilities were Siemens (data display terminals) and AEG (equipment racks, bases, and consoles).

E-3F. Designation for three French AWACS ordered in February 1987. A fourth was ordered in August 1987. Initial roll-out occurred in early 1990. Delivery began in 1991.

E-6A TACAMO II. U.S. Navy designation for airborne communications system platform. In 1983, the U.S. Navy began the program to acquire modified Boeing 707s fitted with 24,000-lbst CFM56-2A-2 (F108-CF-100) engines to replace its EC-130Q TACAMO aircraft. The E-6A served as a communications link between command authorities and the

ballistic missile submarine force. A prototype first flew in 1987. The first two production aircraft were funded in FY86. Three were funded in each of FY87 and FY88, with seven approved in FY89. The service ordered an additional airframe, a variation of the E-6 airframe, in 1990. Major equipment aboard the E-6 includes triple Collins ARC-182 transceivers, five Collins ARC-190 HF radios, a Hughes AIC-32 intercom, triplex Litton LTN-90 ring laser gyro IRS with LTN-211 VLF/Omega, a duplex Smiths Industries SFM 102 digital/analog flight management computer system, a Bendix APS-133 color radar with short-range terrain mapping capability, a Honeywell APN-222 radio altimeter, a Collins low-range altimeter with ILS and GPWS, and a General Instruments ALR-66(V)4 ESM in each wingtip pod.

Under congressional direction, U.S. Navy E-6s have assumed the mission of strategic communications relay previously performed by USAF EC-135 command post and relay aircraft.

EC-18B. Designed as replacements for four of the seven Boeing EC-135s in the USAF Advanced Range Instrumentation Aircraft fleet, the four EC-18Bs augmented the ARIA mission capabilities. Dedicated to support missile and space testing, the aircraft were intended to serve as airborne tracking stations over land where a ground tracking station is limited by geographical constraints, and over ocean where no tracking stations exist.

The conversion program began in 1982 and involved external and internal modifications. Externally, there was a bulbous, 2.74-meter (9.0-ft) radome housing a steerable antenna and a 2.13-meter (7.0-ft) dish used for telemetry reception. The radome also housed a small weather antenna. Other additions included a smaller radome on top of the aircraft for communications capabilities, plus wingtip probe antennas for high-frequency radio transmission and reception.

Internally, the aircraft were outfitted with a navigation station, mission-critical cockpit avionics, a modified electrical system, and an improved environmental control system for cooling purposes. The conversion process involved transfer of the radomes, antennas, and onboard mission electronic equipment – receivers, data processors, and recorders – from the retiring EC-135s to the EC-18Bs.

E-8 JSTARS Platform. The U.S. Army/Air Force Joint Surveillance Target Attack Radar System (JSTARS) was developed by Northrop Grumman. The Boeing airborne platform is designated E-8.

Boeing converted two ex-airline 707s between 1986 and 1988 and delivered them to Grumman for systems integration and installation. These two aircraft were designated E-8A. First flight in full JSTARS configuration occurred in December 1988. Eighteen used 707s have been converted to an E-8C configuration for use as JSTARS platforms. One of the E-8Cs is utilized by Northrop Grumman as a permanent testbed.

JSTARS is designed to provide information to delay, disrupt, and/or destroy mobile targets in the enemy second echelon.

Program Review

Background. Boeing's E-3/E-6 special-purpose military aircraft extended the production line life of the venerable 707 transport by more than 10 years. More than 100 military 707s were produced. The E-3 is expected to be in service well into this century.

AWACS Program History. In July 1970, Boeing was selected for the U.S. Air Force AWACS program and immediately began work on two modified 707 airframes, designated EC-137D. Boeing subsequently awarded contracts to Hughes and Westinghouse to demonstrate an airborne surveillance radar. In October 1972, Westinghouse was declared the winner. USAF announced approval of full-scale E-3A development in January 1973, and authorized production in early 1975. Phase I of the contract to Boeing specified delivery of two EC-137Ds with standard JT3D-7 turbofans and fitted with rotodomes mounted on the aft fuselage. Production aircraft, however, were originally to be powered by eight GE TF34 engines. This plan was terminated due to budget limitations. All USAF E-3A aircraft were then specified with four P&W TF33-PW-100/A engines, the military equivalents of the JT3D-7/7A. At the same time, the EC-137 designation was changed to E-3A.

Deliveries of NATO's E-3s began in 1982. Seventeen are in operation, and are registered to the government of Luxembourg. The U.K. and France each selected the E-3 AWACS in 1986.

NATO AWACS. The NATO Alliance originally planned to deploy 27 E-3As. They were to be powered by CFM56 engines if France participated in the NATO effort. The U.K. and France decided against joining the program: the U.K. instead launched its Nimrod AEW project, and France delayed its AWACS procurement decision for seven years because of other, more pressing priorities. Toward the end of 1986, however, the U.K. selected the E-3A over the indigenous Nimrod and

ordered six in February of the following year. A seventh was ordered later that year, and an eighth option was subsequently canceled. The French and British E-3s have all been delivered.

NATO contracted for a total of 18 E-3As. The initial NATO aircraft was delivered to West Germany in March 1981 for installation of electronics under Dornier's supervision. This aircraft was delivered to NATO in early 1982. The final aircraft was delivered to NATO in April 1985.

International Orders. Delivery of the 18-unit NATO order was completed in April 1985 and, while these aircraft will undergo upgrades and modifications in the coming years, no further procurements are planned. In 1981, Saudi Arabia placed an order for five E-3A and eight KE-3A tanker variants, all of which were delivered by the end of 1987.

The U.K. and France ordered seven and four E-3s, respectively. In 1991, Boeing closed its 707 production line, ending the availability of new 707 airframes for use as AWACS platforms. Boeing currently markets the 767 as an AWACS platform, an option that Japan selected.

TACAMO II. The U.S. Navy conducted an early 1980s evaluation of several aircraft to fill its EC-130Q TACAMO replacement requirement known as ECX. Lockheed considered modified C-130s powered by four GE TF34s or twin GE/Snecma CFM56s in upper surface blowing configuration. However, neither Lockheed derivative could beat the Boeing 707 derivative in range, time on station, altitude, or future electronic systems growth and upgrade capability. Indeed, Lockheed never submitted a final proposal, saying the requirement was defined to favor only one or two commercial aircraft types. In April 1983, Boeing's entry was selected as the ECX aircraft.

Six E-6As had been delivered to the Navy by September 1990. The service then ordered 10 additional E-6s plus one E-6 variant airframe, thus taking the total E-6 buy to 17. One of the Navy's E-6As was subsequently purchased by the U.S. Air Force, which intended to convert it for use as a JSTARS platform. However, USAF eventually worked an exchange with Omega Air, swapping the ex-U.S. Navy E-6 for five used 707-320CHs plus $600,000. The 707 airframes were used as a reserve for the JSTARS production program.

JSTARS. The U.S. Air Force employs used 707s as airborne platforms for the JSTARS program. When equipped with the Northrop Grumman-designed and -integrated mission equipment package, the aircraft is designated E-8. Two development aircraft (known as E-8As) underwent flight testing, and production aircraft (called E-8Cs) were modified by Northrop Grumman. Eighteen used 707s were converted to the E-8C configuration.

Northrop Grumman's 1996 acquisition of the defense electronics business of Westinghouse Electric Corp, including Westinghouse Norden, brought much of the work on the JSTARS program under one corporate roof. Westinghouse Norden was the supplier of the E-8C's APY-3 multimode, side-looking, phased-array, I-band radar.

In addition to Northrop Grumman, other E-8C JSTARS contractors included General Dynamics (signal processors), Cubic Defense Systems (surveillance and control datalink), Greenwich Air Services (engine modification and refurbishment), Interstate Electronics Corp (graphic displays), DataMetrics (printers), Orbit International Corp (workstation keyboards), Raytheon (computers), RF Products (VHF collocation filters), Rockwell Collins (flight management system), Telephonics Corp (intercommunications systems), and World Auxiliary Power Company (auxiliary power unit).

JSTARS is designed to provide information to delay, disrupt, and/or destroy mobile targets in the enemy second echelon.

Although 18 E-8Cs were built, only 17 were delivered to the Air Force. One was retained by Northrop Grumman for use as a testbed.

The Air Force's final seven E-8Cs were produced in a configuration known as Block 20. This configuration includes an integrated, commercial off-the-shelf computing and signal processing architecture that can be easily upgraded with new technology. In a program completed in August 2005, the initial 10 USAF E-8Cs were retrofitted to the Block 20 standard.

Funding

Recent and planned U.S. Air Force JSTARS and E-3 AWACS funding is as follows:

U.S. FUNDING

FY04	FY04	FY05	FY05	FY06	FY06	FY07 (Req)	FY07 (Req)

	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
E-8 Mods	-	41.4	-	61.0	-	15.3	-	138.2
JSTARS RDT&E (PE#0207581F)	-	59.9	-	98.4	-	104.3	-	152.7
E-3 Mods	-	54.9	-	46.5	-	49.6	-	64.5
AWACS RDT&E (PE#0207417F)	-	250.1	-	274.0	-	119.7	-	165.8

All $ are in millions.

Recent and planned U.S. Navy E-6 funding is as follows:

U.S. FUNDING

	FY04 QTY	FY04 AMT	FY05 QTY	FY05 AMT	FY06 QTY	FY06 AMT	FY07 (Req) QTY	FY07 (Req) AMT
E-6 Mods	-	48.0	-	19.5	-	11.1	-	99.2

All $ are in millions.

Contracts/Orders & Options

Contractor	Award ($ millions)	Date/Description
Rockwell Collins	$79.5	Mar 2004 – Contract from the U.S. Navy for system development and demonstration of the Block I modification to the E-6B aircraft to correct follow-on operational test and evaluation deficiencies, readiness degraders, and obsolescence issues. This effort includes design, development, installation, and testing of the fully integrated system modifications in a systems integration laboratory and a production-representative aircraft.
Boeing	$524.0	Apr 2004 – Modification to USAF contract for the production and retrofit phase of the global solution for the NATO AWACS mid-term modernization program.
Northrop Grumman	$103.0	Feb 2005 – Contract from USAF to begin an upgrade to E-8C air traffic management systems.
Rockwell Collins	$49.6	Mar 2005 – Contract from Northrop Grumman for the engineering, manufacturing and development phase of an avionics upgrade program for 18 E-8C JSTARS aircraft, including design, development, integration, and testing of a communication, navigation, surveillance/air traffic management suite for the E-8C aircraft.
Northrop Grumman	$7.8	Sep 2005 – Modification to USAF contract to definitize the change order for qualification, test, documentation, and installation related to the replacement of Antenna Servo Electronics (ASE) shop-replaceable units on the JSTARS fleet; preparation of a Time Compliance Technical Order (TCTO); procurement and fabrication of an ASE level TCTO kit; installation and kit proof of the TCTO kit; and integration of the modernized Antenna Servo Electronics into the APY-3 radar Sensor configuration. This effort also redesigns and qualifies key circuit card assemblies in the ASE. Finally, it also includes redesign of the phase shifters to resolve current design and material issues, as well as purchase of 19 phase shifters and two spares for evaluation in the GFE antenna.
Northrop Grumman	$532.0	Nov 2005 – Contract from USAF to procure improvements that will increase the performance capability, reliability, and maintainability of the JSTARS fleet. Projected efforts would be focused on communications, navigation, surveillance, air traffic management, mobile target tracking, joint tactical

Boeing E-3/E-6 Series

Contractor	Award ($ millions)	Date/Description
		radio systems, advanced radar systems, and airborne networking capability.

Timetable

Month	Year	Major Development
	1967	Initial studies begun
Jul	1970	Boeing selected as prime contractor
Feb	1972	First E-3/AWACS airframe test flight
Jan	1973	Full-scale development authorized
Early	1975	Production authorized
Late	1976	Airworthiness testing completed
Mar	1977	First production aircraft delivered to USAF
Dec	1978	NATO members agreed to procure 18 E-3As
Jan	1982	First of 18 NATO aircraft delivered
Early	1983	E-6A selected as TACAMO platform
Jan	1985	First EC-18B rolled out
Apr	1985	NATO order completed
	1986-87	Saudi E/KE-3A deliveries
	1987	First flight of U.S. Navy E-6A prototype
Jul	1989	Roll-out of first U.K. E-3D Sentry
	1991	Boeing closes 707 line
	1991	USN E-6A order completed
	1992	E-3 deliveries to U.K. and France completed
Aug	1995	First flight of initial production E-8C
Mar	1996	Delivery to USAF of initial production E-8C
Sep	1996	Pentagon approves full-rate production of E-8C

Worldwide Distribution/Inventories

(November 2006)

	E-3/E-6	
USAF	32	(E-3B/C)
USN	16	(E-6B)
NATO	17	(E-3A)
Saudi Arabia	5	(E-3A)
	6	(KE-3A)
	2	(RE-3A)
U.K.	6	(E-3D)
France	4	(E-3F)
	E-8	
USAF	1	(E-8A)
	17	(E-8C)
Northrop Grumman	1	(E-8C)(a)

(a)Test aircraft.

Forecast Rationale

The U.S. Air Force took delivery of its 17th and final E-8C JSTARS aircraft in March 2005. All of the aircraft were remanufactured from existing Boeing 707s, and retained the Pratt & Whitney JT3D engines of the 707s. The Air Force is planning to install new

engines on its JSTARS fleet and, in June 2006, kicked off a competition to select an engine supplier.

South Korea has shown interest in acquiring the E-8C, and has held preliminary discussions with Northrop Grumman about a potential buy of the aircraft.

Boeing terminated production of the 707-based E-3 in 1991. The company currently markets the 767 as an AWACS platform.

The U.S. Air Force has begun an upgrade effort for its fleet of 32 E-3s, called the Block 40/45 program. Under this program, Boeing will upgrade the fleet with new mission computing hardware and software, improved operator console displays and controls, and upgraded radar equipment. The fleet will also receive upgraded communications and navigation systems and enhanced electronic support measures.

The initial test flight of an AWACS aircraft upgraded under the Block 40/45 program occurred in July 2006.

NATO's 17 E-3As are undergoing modification under a $1.32 billion effort dubbed the Mid-Term Modernization Program. The program includes enhancements to the E-3A's computers, displays, and communications, navigation, and target identification systems. Installation work is being performed in Germany by EADS, under subcontract to Boeing. Retrofit of the NATO fleet is scheduled to be completed in 2008.

In a program completed in late 2003, the U.S. Navy's 16 E-6As were modified by L-3 Communications Integrated Systems to the E-6B configuration. The E-6B conversion included installation of a MILSTAR satellite communications terminal, GPS equipment, a Lockheed Martin mission computer system, a Honeywell vapor cooling system, and secure telephone and fax equipment. Other equipment was transferred from retired USAF EC-135s.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level				Good Confidence Level			Speculative			
Aircraft	**(Engine)**	**thru 06**	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**Total 07-16**
BOEING													
E-3A(a)	TF33-PW-100	52	0	0	0	0	0	0	0	0	0	0	0
E-3A (S. ARABIA)	F108-CF-400 (CFM56-2A3)	5	0	0	0	0	0	0	0	0	0	0	0
E-3D (U.K.)	F108-CF-400 (CFM56-2A3)	7	0	0	0	0	0	0	0	0	0	0	0
E-3F (FRANCE)	F108-CF-400 (CFM56-2A3)	4	0	0	0	0	0	0	0	0	0	0	0
E-6A	F108-CF-102 (CFM56-2A2)	17	0	0	0	0	0	0	0	0	0	0	0
KE-3A	F108-CF-400 (CFM56-2A3)	8	0	0	0	0	0	0	0	0	0	0	0
Subtotal - BOEING		93	0	0	0	0	0	0	0	0	0	0	0
GRUMMAN													
E-8A (MOD)(b)	TF33	2	0	0	0	0	0	0	0	0	0	0	0
Subtotal - GRUMMAN		2	0	0	0	0	0	0	0	0	0	0	0
NORTHROP GRUMMAN													
E-8C (MOD)(b)	TF33	18	0	0	0	0	0	0	0	0	0	0	0
Subtotal - NORTHROP GRUMMAN		18	0	0	0	0	0	0	0	0	0	0	0
Total Production		113	0	0	0	0	0	0	0	0	0	0	0

(a)34 for USAF, 18 for NATO alliance.
(b)Modification program - not new production aircraft.