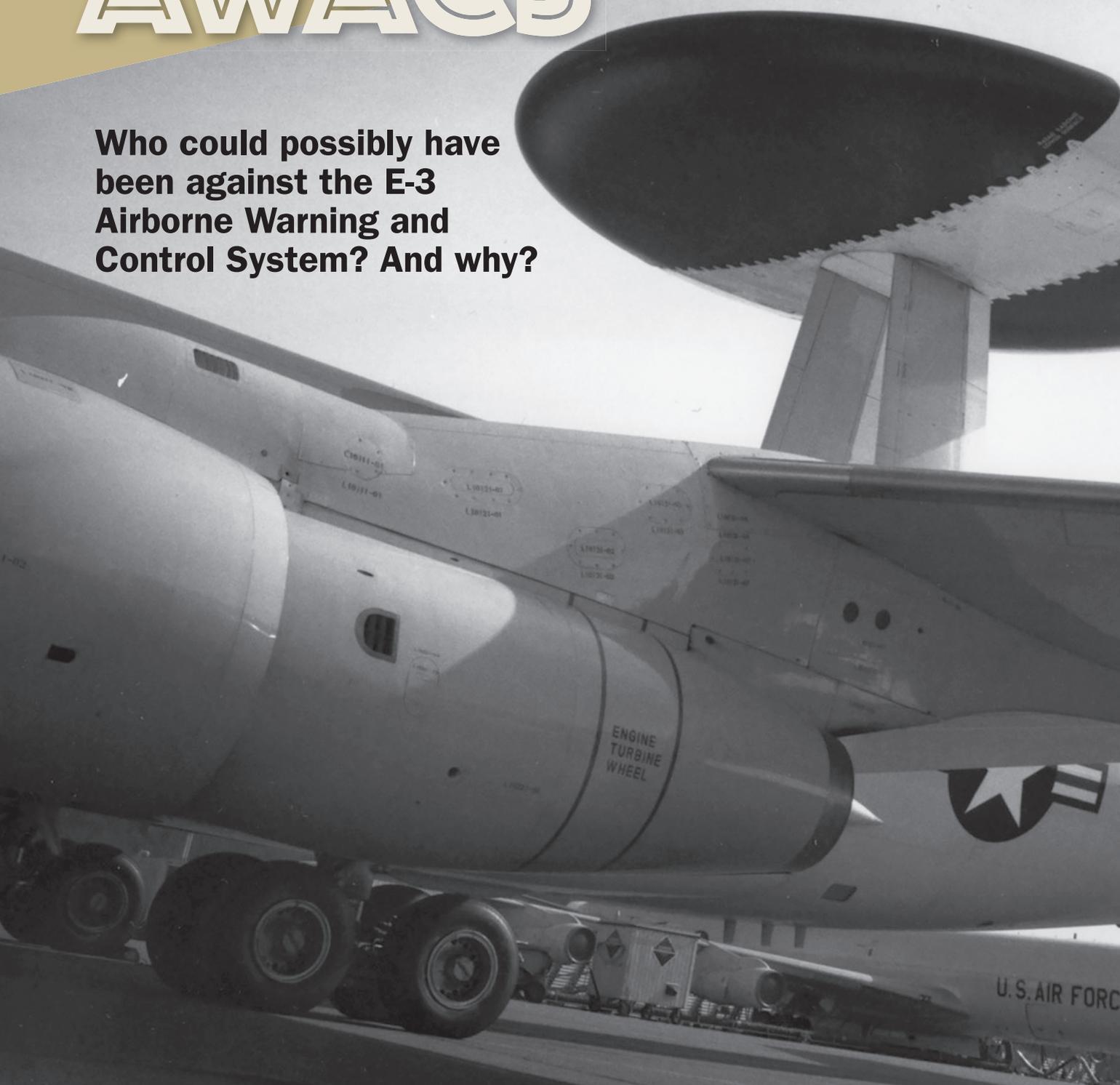


OPPOSING AWACS

By John T. Correll

Who could possibly have been against the E-3 Airborne Warning and Control System? And why?



In operational tests prior to entering service with Tactical Air Command, the E-3 overcame the best efforts of almost 300 aggressor aircraft to jam or attack it.

THE E-3 Airborne Warning and Control System would surely make any short list of the most valuable military aircraft of all time. When it entered service in 1977, AWACS instantly changed the whole regime of air combat. The pulse Doppler radar in its rotating dome could reach out for hundreds of miles in all directions to find and track every airplane moving within the airspace.

AWACS could direct the battle so adeptly that it multiplied the effectiveness of the forces it controlled. The commander of Tactical Air Command pronounced

it “the most significant single tactical improvement since the advent of radar.” The program was also well-managed. The first production airplane was delivered within four months of target date and within four percent of target cost.

Since then, AWACS has seen action in every conflict from Grenada and the Gulf War to Iraq and Afghanistan. It was the first aircraft ever acquired by NATO to be operated as an alliance asset and flown by international crews. After the terrorist attacks on New York and Washington in 2001, the US relied not only on its own AWACS fleet but also on reinforcement by NATO E-3s to maintain a patrol against further attacks.

Today, after almost 40 years of service, AWACS is still going strong and is universally well-regarded—but it was not always so. In its early days, AWACS was confronted constantly by those who wanted to curtail it or kill it outright.

One of the first critics was Sen. William Proxmire (D-Wis.), who had gained fame for exposing waste and fraud in govern-

ment. Proxmire accused the Pentagon of waste in the AWACS program in 1971 and later called it “a plane in search of a mission.”

Sen. Thomas F. Eagleton (D-Mo.)—described by *The New York Times* as “waging a one-man war against the AWACS program”—said AWACS was an “apparently irresistible gadget which has no real combat utility,” a “sham” and a “disastrous failure” that “contributes nothing and has a zero chance of surviving attack.”

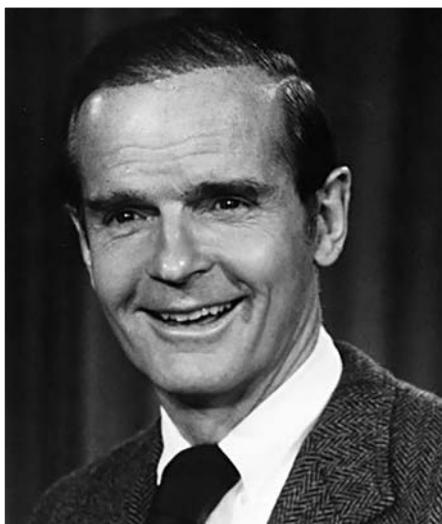
The news media and the General Accounting Office chimed in, apparently unimpressed by test exercises where some 300 aggressor aircraft could not defeat AWACS. In 1976, Rep. Patricia S. Schroeder (D-Colo.) nominated AWACS as the “Turkey of the Year” and attempted to delete all funding for it.

Opposition surged when the Ford, Carter, and Reagan administrations proposed foreign military sales of AWACS to allies. In 1980, critics objected to offering AWACS to Saudi Arabia, arguing concurrently the E-3A was a flop operationally and that it would be a mortal threat to Israel.





The first flight of the AWACS testbed on Feb. 9, 1972.



Condemnation of the program in general continued. Pundit Alexander C. Cockburn, writing in *The Wall Street Journal* in 1981, said that AWACS was an “airborne disaster” and “an ocean of gravy” for the contractors. The real secret of AWACS, he said, was that “it does not work.”

AWACS was an unlikely candidate for such invective, and there was no indication of the trouble to come when the program requirement was laid down in the 1960s.

A NEW KIND OF RADAR

The military value of radar was demonstrated in the Battle of Britain in 1940 and was clearly understood. However, attackers soon learned to avoid detection by flying low. The beam of traditional ground radar went out in a straight line and could see only what was above the horizon. Anything behind the curvature of the Earth was hidden.

An airplane flying at an altitude of 100 feet, for example, could penetrate unseen to within about 13 miles of the average ground radar. Even with airborne radar systems, low fliers were

Above, l-r: Sen William Proxmire (D-Wis.), one of the first critics of the AWACS. He called it “a plane in search of a mission.” Sen. Thomas Eagleton (D-Mo.) waged what The New York Times called a “one-man war against the AWACS program.” Rep. Patricia Schroeder (D-Colo.) called the E-3 the “Turkey of the Year.”

lost in the “ground clutter,” a hodgepodge of signals reflected up from the Earth’s surface.

Air Defense Command began operating the EC-121 Warning Star in 1953. It was a radar-picket version of the Lockheed Constellation airliner, with radomes mounted above and below the fuselage. Two variants of the EC-121 later saw extensive service in Vietnam. The radar did well enough in tracking aircraft at medium and high altitudes, but could not separate air traffic below from the ground clutter.

The Navy introduced the E-2 Hawkeye warning and control aircraft, a twin-turboprop considerably smaller than the EC-121, in 1961. Early models of the Hawkeye had serious reliability problems. When it worked, the Hawkeye

was successful in surveillance over water, but like the Air Force's EC-121, it was unable to detect and track targets amid ground clutter over land.

Around 1960, the Air Force came to believe that technology, especially the miniaturization of electronics, had reached the point that the ground clutter issue could be solved. The key was a phenomenon known as the Doppler shift.

If a radar beam bounces off a moving object, the electronic signal returns at a different frequency from the one at which it was sent out. Radar operating in pulse Doppler mode can track a flying object based on its speed relative to the radar, not just its position. If the object is approaching the radar, the wavelength is compressed; if it is going away, the wavelength is stretched out. Computers, processing the raw radar returns, could filter fast-moving airplanes out from slow-moving or stationary objects on the ground.

In 1962, Tactical Air Command and ADC issued a joint Specific Operational Requirement for an airborne warning and control system to detect and track large numbers of targets at long range. ADC wanted the system for continental air defense against bombers. TAC wanted to see the enemy fighters and a capability to manage the air battle.

Three aircraft entered the competition to be the airframe for AWACS: the Boeing Co. 707, the Douglas Aircraft Co. DC-8, and the Lockheed Georgia Co. C-141. Lockheed dropped out in 1966. A system program office was established at the Electronic Systems Division at Hanscom AFB, Mass., in 1967.

Exploratory research and development proved the technological feasibility of AWACS, and in July 1970, the Air

Force announced the selection of Boeing as the prime contractor. In 1972, after a lengthy competition, Westinghouse was chosen to provide the radar. AWACS, now designated the E-3A, entered full-scale development in 1973.

AS THE DOME TURNS

The original plan was for 64 AWACS aircraft, but the procurement was cut to 42 in 1970 and then to the final total of 34 in 1973. This was partly for cost reduction reasons but also because the emphasis on defense against enemy bombers had diminished with the advancement of ICBMs. In 1974, TAC was named as the single manager of AWACS when it went into operational service.

Critics at the time said the AWACS air defense mission was gone, but it is still around 40 years later. For example, after the September 2001 terror attacks, every AWACS available was called in to guard the approaches to the United States.

The E-3A's most obvious feature was the huge rotating dome, 30 feet wide and six feet thick, jutting up from the fuselage on two struts. Half of this "rotodome" contained an IFF (identification, friend or foe) system, and the other half a powerful radar antenna.

AWACS was more than a flying radar. It was a complete command and control center with computers to process the raw data and nine mission consoles for surveillance, weapons direction, and battle management. Every 10 seconds, the E-3A's rotating radar furnished a new position of the aircraft it was tracking, each of them glowing cleanly as a blip on the console screens.

In the pulse Doppler mode, the radar could reach out for more than 250 miles and sort out low-flying aircraft from the

Every 10 seconds, the E-3A radar provided the command and control crew with a new position for every aircraft it was tracking.





Maj. Gen. Lawrence Skantze said AWACS was “survivable,” not “immortal.” It could be defeated if an enemy was willing to allocate enough resources and take enough losses.

trees and hills. As a side benefit, the radar was not bothered by chaff, which drifted through the air too slowly to register as a flying object. It could also be used in a plain non-Doppler pulse mode, which extended the range to about 350 miles but without the ground clutter filtering.

Most of the criticism of AWACS focused on its supposed vulnerability to jamming and attack by enemy fighters. In fact, the E-3A could be jammed or shot down—if an enemy was ready to devote enough resources and take enough losses to do it.

“It is scientifically impossible to come up with a radar that is totally jam-proof,” said Maj. Gen. Lawrence A. Skantze, E-3A program director from 1973 to 1977. “But the AWACS radar is beyond any comparable system ever built, and it exploits the latest state of the art to the fullest.”

A radar system’s primary vulnerability to jamming stems from the so-called antenna side lobes—energy radiated not along the system’s main beam but off to the sides. An enemy could try to jam the E-3A radar by aiming a strong electronic signal at its beam to cause interference. The E-3A transmitted a highly directional, very narrow radar main beam. When the radar main beam swept by a jamming source, targets within the beam were obscured. The jammed signal was displayed as a line or strobe on the E-3A screen. Targets outside the strobe could be tracked in the usual way.

Because of the long range of its radar, the aircraft could orbit too far away for most enemy fighters to locate or to attack even if they could locate it. Since the E-3A could see an enemy coming, it could summon and direct friendly fighters in its own defense. If necessary, it had enough speed to evade.

One test determined that an enemy would have to sacrifice between 60 and 100 of its own airplanes to bring down a single AWACS. “I said the E-3A is survivable,” Skantze pointed out. “I didn’t say it was immortal.”

THE CRITICS PILE ON

AWACS was barely out of the starting gate when the critics opened fire. In April 1971, Proxmire cited waste in AWACS and

other programs in a broad-ranging call to cut defense spending. He made several speeches about it in Congress, including one in 1975 when he said the E-3A was “known in some Pentagon circles as the BBO, which is the Boeing Bailout.”

Others also depicted AWACS as a pork barrel project. A *New York Times* article said it “was conceived several years ago when the Boeing Company was in serious financial difficulty on its transport program,” neglecting to mention that two other aircraft companies were in the competition for several years.

Eagleton attacked the program again and again, charging that AWACS could be “jammed from 200 miles away by cheap and simple electronics, making it useless for its primary mission.” He depicted it as “a technical marvel in search of a mission,” and “a marvel that we can no longer afford.” Both Proxmire and Eagleton trumpeted several GAO reports critical of the E-3A for high cost and limited utility.

A group of officials from the Kennedy and Johnson administrations, led by former Assistant Secretary of Defense for International Security Affairs Paul Warnke, recommended scrapping AWACS altogether.

Peter J. Ognibene, a former member of the political science faculty at the Air Force Academy, writing in *The New Republic* in 1974, chastised the Defense Department for keeping the program alive after the continental air defense mission had diminished and called AWACS “the plane that would not die.”

Ognibene said that AWACS would require “an airborne armada to protect it from Soviet fighters such as the trisonic Foxbat” and that long-distance jammers would leave it “blind and incapable of directing the strike aircraft under its control.” The defense budget, he said, contained “pouches of flab. AWACS is one.”

The efforts by Eagleton and like-minded colleagues to kill AWACS failed, but they persuaded the Senate to require the Secretary of Defense to certify the performance of the airplane based on additional testing. In one such test, AWACS defeated two EB-57 jamming aircraft that attempted to mask a simulated attack by an F-4 fighter. In another test, AWACS successfully controlled 134 friendly aircraft against 274 aggressor aircraft.

Accordingly, DOD certified to Congress that AWACS could indeed perform its mission in a hostile environment. TAC took delivery of the first E-3A in March 1977. In the introductory



NATO E-3A Component photo by Wouter Langen

four jet engines, flew at 530 mph compared to 375 mph for the twin-turboprop Hawkeye.

NATO, with strong support from defense ministers of member nations, agreed in December 1978 to buy 18 AWACS aircraft. But a new round of opposition erupted in 1980 when the Carter Administration proposed selling AWACS to Saudi Arabia. Carter's main concern was protecting Saudi oil production, six million barrels a day to the world market. Iran had already made an air attack on a Kuwaiti oil installation in the course of the Iran-Iraq war and Carter worried that Iran might try to close the Strait of Hormuz and oil shipments from the Persian Gulf.

The Reagan Administration picked up the plan and proposed offering Saudi Arabia five AWACS aircraft. Critics protested that this would create a danger of technology compromise and pose an unacceptable risk to Israel. Cockburn, sneering in his *Wall Street Journal* article, declared in any case Saudi Arabia would only be getting "five costly pieces of junk."

The Senate approved the Saudi sale in October 1981 with the proviso that some features of greatest concern to Israel be eliminated from the aircraft.

AWACS GOES ON AND ON

The NATO AWACS reached initial operational capability in 1983. By then, the United States was regularly dispatching its E-3As in instances of crisis or trouble in various parts of the world.

Opposition receded as the E-3A demonstrated its capability and worth, but there was one final spurt. The British had been interested in AWACS since the middle 1970s but held off because of protectionist pressure to buy a home-grown command and control aircraft, the Mark 3 Nimrod, instead. Nimrod was a modification of the de Havilland Comet airliner and primarily designed for maritime patrol. After lengthy debate, the Conservative Margaret Thatcher government chose AWACS in 1986, pointing out that Nimrod did not work nearly as well. The Labor Party complained it was "a bad decision because a country can only defend itself on the strength of its own industrial and technological base" and the procurement "handed Boeing a worldwide monopoly in early warning systems."

AWACS was one of the first aircraft to deploy to Operation Desert Shield in 1990 when US forces in the Persian Gulf were still thin in the region. It kept constant watch on the activities of the Iraqi Air Force during the buildup and subsequently flew more than 7,000 combat hours in Operation Desert Storm in 1991.

The E-3 AWACS based on the original Boeing 707 airframe is currently in service with France, NATO, Saudi Arabia, the United Kingdom, and the United States. Japan operates four AWACS hosted on the Boeing 767-200ER.

Of the 34 AWACS produced for the US Air Force, 31 still remain in the inventory. They have been upgraded several times with enhanced computers and electronics and improvements to the airframe. The E-3B upgrade in 1994 added five more mission consoles in the aircraft's command center. The 552nd Air Control Wing at Tinker AFB, Okla., is presently receiving the latest upgrades to the E-3G model, with more improvements to the fleet projected through 2020.

Back when AWACS was new, Skantze predicted that it might continue in service for 20 or even 30 years. The ultimate rebuttal to the critics is that AWACS is in its 38th year of operation with the end nowhere in sight. ✦

John T. Correll was editor in chief of Air Force Magazine for 18 years and is now a contributor. His most recent article, "The Year of the Kamikaze," appeared in the August issue.

The E-3A was the first airplane ever acquired by NATO as an alliance asset to be operated by international crews.

shakedown period with TAC, the AWACS aircraft, radar, and computers consistently exceeded the standards set by the Air Force. The system achieved initial operational capability in May 1978.

SALES PROPOSED AND PROTESTED

The Ford Administration generated new uproar about the E-3A when it proposed in December 1975 to sell 10 of the aircraft to Iran—then regarded as a stalwart US ally in an unstable Middle East. Among other considerations, the government hoped to recoup some of the research and development costs.

The Carter Administration also wanted to provide AWACS to Iran, and Congress approved a reduced sale of seven aircraft in October 1977, with some of the more advanced features stripped out. None of them were ever delivered. The AWACS offer was canceled, along with a pending sale of F-16 fighters, when the Shah of Iran was overthrown by the Islamic revolution in February 1979.

The New York Times reported in April 1975 that NATO was considering a "mammoth order" for AWACS. If it happened, it would be the first time the alliance acquired an aircraft that it would operate as an international asset. Protests ranged from the usual shots about performance and vulnerability to complaints that the offer price of \$68.7 million per airplane was too low. Eagleton tried to block the deal, accusing the Pentagon of "a patent subterfuge to obtain backdoor funding" by selling AWACS at an artificially low price that amounted to "a theft on the US taxpayers."

David Marash, writing in *New York Magazine* in May 1977, introduced a novel objection. He said that Grumman, located on Long Island, had been forbidden by the Pentagon to bid against AWACS for the NATO contract. Marash argued that NATO should have considered Grumman's E-2C Hawkeye, "one of the most advanced electronic systems in existence," established "through years of successful use in the Navy as an early warning plane with effective battlefield command and control capabilities."

The E-2C, which did not enter fleet service until 1973, corrected some of the problems of the previous Hawkeye models, but it still could not see through the ground clutter over littoral regions and land. Marash said the "slow-moving" AWACS would be easy to "knock down," oblivious to the fact that the E-3A, with