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Replacing the E-3 Airborne Warning and Control System (AWACS)

The U.S. Air Force recently expressed its interest to replace the E-3 Airborne Warning and Control System (AWACS) fleet. Over the summer and fall of 2021, several senior Air Force officials, including Air Force Secretary Frank Kendall and Commander of Pacific Air Forces General Kenneth Wilsbach, discussed plans to replace the E-3 AWACS. The officials stated that the Air Force needs to replace its fleet of E-3 AWACS aircraft due to their age, low mission capable rates, and the inability to procure parts to maintain 40-year-old aircraft. The Air Force released a request for information on February 8, 2022, seeking to replace the AWACS beginning in FY2023.

What Is the E-3 AWACS?

Since the 1970s, the United States has operated E-3 AWACS aircraft, with air movement tracking indicator (AMTI) technologies that give commanders the ability to see vast areas of airspace, including both friendly and hostile aircraft, and manage the battle in that space. The E-3 is a modified Boeing 707 aircraft with a 30-foot radar dome held above the aircraft's fuselage (**Figure 1**). AWACS have been sold to the North Atlantic Treaty Organization (NATO), France, the United Kingdom, and Saudi Arabia.

Figure 1. E-3 AWACS



Source: U.S. Department of Defense, at <https://media.defense.gov/2021/Sep/29/2002864360/-1/-1/0/200204-F-XO631-9049.JPG>.

Over the years, the E-3 AWACS fleet has received a number of upgrades to its radars and AMTI module in order to improve its command and control capabilities. From 1987 through 2001, the Air Force upgraded these systems through the Block 30/35 program, which included increased computer processing power, improved datalinks to communicate with more aircraft, defensive electronic countermeasures, and integration of Global Positioning System (GPS) navigation devices. Starting in 2003, through

the Block 40/45 program, the Air Force upgraded the systems again, to include improvements to electronic support measures and datalink/spectrum management, new battle management computer systems, and enhanced satellite-based internet chat capabilities. These upgrades are anticipated to reach full operational capability in May 2024.

Previous Replacement Initiatives

In 2003, the Department of Defense awarded Northrop Grumman a contract to develop the E-10 Multi-sensor Command and Control Aircraft (MC2A). The intent of this program, as originally stated by the Air Force, was to combine the E-3 AWACS with the E-8 Joint Surveillance Target Attack Radar System (JSTARS), equipped with ground movement tracking indicator (GMTI) capabilities, and the RC-135 Rivet Joint, a signals intelligence aircraft. Due to technical challenges, however, the Air Force decided to remove the GMTI requirement from the program in 2006. The E-10 program was completely cancelled in 2010.

In 2017, the Air Force again proposed replacing the E-3 AWACS with a new program called the Advanced Battle Management System (ABMS). Following release of the 2018 National Defense Strategy, the Air Force reevaluated its requirements for ABMS. According to a 2020 Government Accountability Office report, the Air Force “concluded that no single platform, such as an aircraft, would be the right solution to providing command and control capabilities across multiple domains.” Air Force officials testified in April 2019 regarding a new vision for ABMS, which aims to provide a family of command and control systems in air, space, and cyberspace.

The U.S. Space Force has disclosed that it intends to develop a low earth orbit satellite constellation to provide GMTI and AMTI capabilities in the future. The Air Force has also stated it intends to eventually transition airborne battle management aircraft to a space-based capability. It remains unclear when this space-based radar constellation would be operational.

Potential Replacement Options

Several airborne solutions might be able to replace the E-3 AWACS in the short term to mitigate potential capability shortfalls. An option specifically identified by senior Air Force officials is the E-7, also known as Wedgetail. The E-7, developed by the Royal Australian Air Force and produced by Boeing in Renton and Tukwila, WA, is based on a 737 airliner airframe (**Figure 2**). Australia contracted with Boeing to develop six Wedgetail aircraft in 2002, with initial delivery completed in 2009 and full operational capability achieved in 2015. The United Kingdom

subsequently contracted Boeing to produce five Wedgetails in 2019, with delivery of the final aircraft expected in 2023. Turkey and South Korea also operate the aircraft. The Wedgetail utilizes a multirole electronically scanned area radar that provides 360 degrees of surveillance coverage, with a reported radar range in excess of 174 nautical miles (200 miles, or 322 kilometers). Boeing currently projects E-7 Wedgetail operating costs to be 66% lower with higher mission capable rates (i.e., more aircraft available for use) when compared to E-3 AWACS.

Figure 2. E-7 Wedgetail



Source: Breaking Defense, at <https://breakingdefense.com/2021/09/brown-air-force-serious-about-e-7-wedgetail/>.

In November 2021, Saab CEO Micael Johansson proposed the Saab GlobalEye (**Figure 3**), made in Canada and Sweden, as an AWACS replacement. The GlobalEye is designed around a Bombardier 6000/6500 aircraft. Saab has stated that GlobalEye utilizes an active electronically scanned array (AESA) radar with a reported range of 300 miles, endurance of 11 hours, and a service ceiling of 60,000 feet. The United Arab Emirates is currently the only user of GlobalEye, first delivered in 2020, and planned full operational capability in 2025. South Korea, Finland, and Sweden have expressed interest in the aircraft.

Figure 3. Saab GlobalEye



Source: Saab, at <https://www.saab.com/products/globaleye>.

While Israel Aircraft Industries (IAI) has not publicly discussed selling its ELW-2085 to the United States, it remains a potential option (**Figure 4**). This aircraft, based on a G550 airframe from Gulfstream in Savannah, GA, also features an AESA radar providing 360-degree coverage,

and has an airframe similar to that used by the United States in the EC-37 Compass Call. Using the same airframe could potentially provide efficiencies by streamlining training and maintenance, and improve parts availability. IAI has indicated that the ELW-2085 can operate at 41,000 feet, with approximately nine hours of endurance. The aircraft was developed in 2003 and was first used operationally in 2007. Israel, Singapore, and Italy currently operate the ELW-2085.

Figure 4. ELW-2085



Source: <https://customer.janes.com/Janes/Display/JAEMI041-JC4IA>.

Potential Questions for Congress

- What are the tradeoffs of pursuing a space-based command and control architecture compared with a traditional air-based system? When does the Space Force anticipate having a space-based GMTI and AMTI capability ready to replace aircraft?
- Assuming a capability shortfall until space-based GMTI and AMTI are achieved, what are the tradeoffs should the Air Force choose to procure a mature aircraft like the E-7 Wedgetail, versus procuring an aircraft with potentially more capability but requiring time and funding for additional research and development?
- How effective would these short-term solutions be in the presence of advanced air defense and adversary fighter aircraft? Do improved sensor capabilities and ranges address increased risks posed by adversaries?
- Each of the potential options for AWACS replacement listed above is a crewed aircraft. Could uncrewed systems perform similar command and control missions? How much additional development would an uncrewed solution require, and would it offer operational advantages?
- With ABMS linking sensors together across the service, the Air Force considers every aircraft to be a sensor platform. Does a potential E-3 replacement bring enough unique capability to warrant deploying a dedicated fleet of aircraft?

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