Airborne Early Warning and Control (AEW&C)

An Airborne Early Warning and Control (AEW&C) is an airborne radar system which is used to detect aircraft, ships, vehicles and incoming projectiles at long range.

It also has the task of performing command and control operations of the warzone in an air engagement by directing fighter aircraft attacks.

The first known aerial engagement with both opposing sides using Airborne Early Warning and Control aircraft was in the Indian Subcontinent, during the February 2019 aerial engagements between India and Pakistan, with India using A-50I Phalcon and DRDO Netra and Pakistan using the Saab 2000.

This article will give details about AEW&C within the context of the IAS Exam.

Overview and General Characteristics of AEW&C

The AEW&C units are also capable of carrying out surveillance of ground and air targets. At high altitude, the onboard radars are able to track and detect aircrafts at a great distance similar to ground-based radar. It is also able to distinguish between hostile and friendly targets. Like ground based radars it can be detected by the enemy as well, but due to its mobility, AEW&C aircrafts are less vulnerable to counter-attacks.

AEW&C aircrafts are used for defensive and offensive operations. For NATO and US-trained air forces it is an equivalent of a combat information centre along with being a highly mobile and powerful radar platform.

The development of the AEW&C first took place in the 1930s through the development of the Chain Home - a ground-based early warning radar that could be fitted into an aircraft. When World-War II broke out, it was used to cower the North West approaches of the Brtish Isles from long range germain bombers and fighter crafts.

The Lockheed WV and EC-121 Warning Star, which first flew in 1949, served widely with the US Air Force and US Navy. It provided the main AEW coverage for US forces during the Vietnam war.

During the Cold war, the United Kingdom deployed a substantial AEW capability, initially with American Douglas AD-4W Skyraiders, designated Skyraider AEW.1, which in turn were replaced by the Fairey Gannet AEW.3, using the same AN/APS-20 radar.

Types of AEW&C Systems

The types of Airborne Early Warning and Control systems are as follows:

1. Airborne Warning and Control System (AWACS):

Boeing produces a specific system with a "rotodome" rotating radome that incorporates Westinghouse (now Northrop Grumman) radar. It is mounted on either the E-3 Sentry aircraft (Boeing 707) or more recently the Boeing E-767 (Boeing 767), the latter only being used by the Japan Air Self-Defense Force.

When AWACS first entered service it represented a major advance in capability, being the first AEW to use a pulse-Doppler radar, which allowed it to track targets normally lost in ground clutter.

2. E-2 Hawkeye

The E-2 Hawkeye was a specially designed AEW aircraft. Upon its entry to service in 1965, it was initially plagued by technical issues, causing a (later reversed) cancellation.

Procurement resumed after efforts to improve reliability, such as replacement of the original rotary drum computer used for processing radar information by a Litton L-304 digital computer.

The latest E-2 version is the E-2D Advanced Hawkeye, which features the new AN/APY-9 radar.

The APY-9 radar has been speculated to be capable of detecting fighter-sized stealth aircraft, which are typically optimized against high frequencies like Ka, Ku, X, C and parts of the S-bands. Historically, UHF radars had resolution and detection issues that made them ineffective for accurate targeting and fire control;

3. Beriev A-50

The Russian Air Force is currently using approximately 15–20 Beriev A-50 and A-50U "Shmel" in the AEW role. The "Mainstay" is based on the Ilyushin Il-76 airframe, with a large non-rotating disk radome on the rear fuselage. These replaced the 12 Tupolev Tu-126 that filled the role previously.

AEW&C for the Indian Air Force

In 2003, the Indian Air Force and Defence Research and Development Organisation (DRDO) began a study of requirements for developing an Airborne Early Warning and Control (AWAC) system.

In 2015, DRDO delivered 3 AWACs, called Netra, to the IAF with an advanced Indian AESA radar system fitted on the Brazilian Embraer EMB-145 air frame. Netra gives a 240-degree coverage of airspace.

The Emb-145 also has air-to-air refuelling capability for longer surveillance time. The IAF also operates three Israeli EL/W-2090 systems, mounted on Ilyushin Il-76 airframes, the first of which first arrived on 25 May 2009. The DRDO proposed a more advanced AWACS with a longer range and with a 360-degree coverage akin to the Phalcon system, based on the Airbus A330 airframe.