



Centre for Air Power Studies

EMBRAER AIRBORNE EARLY WARNING AND CONTROL: INDIA'S EAGLE EYES

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Embraer EMB-145 AEW&C in IAF colours.

Photo source: http://en.wikipedia.org/wiki/DRDO_AEW&CS

"The ultimate milestone – the delivery of the fleet of AEW&C System to the Indian Air Force is not only our goal but a dream for DRDO."

Dr VK Saraswat,
Former Scientific Adviser to Raksha Mantri,
Secretary Defence R&D and DG DRDO.

Introduction

Brazilian aircraft manufacturer Embraer recently announced that they are in discussions with India's Centre for Airborne Systems (CABS), a Defence Research and Development Organisation (DRDO) research centre, for joint development and export to

South American countries, of AEW&C (Airborne Early Warning & Control) system¹. India had ordered for three EMB-145 aircraft from Embraer in 2008, as a platform for mounting DRDO's indigenously developed AEW&C radar for the Indian Air Force. The aircraft is likely to be handed over to the IAF in 2015. The Indian cabinet committee on security (CCS) had approved the program in 2004 at a project cost of \$396 million to develop two operational systems and one engineering prototype.² DRDO has in principle approval to develop five more systems on the EMB-145 platform³. The original date for completion of the project was October 2011⁴. This was revised to March 2014, but it now seems to have been delayed further and will probably be inducted in the IAF in 2015.

System Capabilities

The system mainly consists of primary surveillance radar, an identification friend or foe (IFF) radar, electronic support measures (ESM) equipment and communication systems. The aircraft radar warning receiver is integrated with the ESM system and in addition has a missile approach warning system (MAWS) and counter measures dispensing system (CMDS) as part of the self protection suite. Embraer has made many modifications in its aircraft which was originally a regional jet. The airframe has been structurally strengthened to take on the load of the radar and modified to house the mission systems, air to air refueling, SATCOM antenna and improved cooling system. Embraer handed over the first fully modified aircraft to CABS in August 2012. DRDO has developed the flat planar antenna which is installed on the fuselage. It is a dual side linear-shape active electronically steered array (AESA) radar similar to the Chinese KJ-200 and Swedish Ericsson Erieye⁵. This shape of the antenna cannot provide coverage in front over the nose, but it will provide broadside 120° coverage on each side. The limitation of 120° coverage is because the highest value, which can be achieved for the Field of View (FOV) of a planar phased array antenna, is 120°. This limitation is there in the KJ-200 and Erieye also. The Pakistan Air Force has also procured the Swedish Erieye and in addition has also purchased the Chinese ZDK-03 which is on the Y-8 turboprop platform (Y-8 is a Chinese copy of Russian AN-12) but has a radome antenna for 360 degree coverage.

The EMB-145 cabin has been modified to install five operator work stations, additional fuselage fuel tanks and five crew rest areas. The communication links comprise of C band data link, Ku band SATCOM and five V/UHF frequencies. The V/UHF frequencies enable the onboard fighter controllers to transmit voice and data to aircraft under control. The aircraft communication system is networked to the air defence command and control radar stations on the ground through direct digital data link and through satellite as back up. Another modification is the additional auxiliary power unit to meet power requirements of the radar and mission systems. The AEW system has a maximum crew of 12 and Indian officials have claimed that it can fly nonstop for 10-12 hours with mid air refueling. It has not yet been revealed what is the time on station likely to be but considering that this a regional jet derivative, the time on station at a distance of about one hour flying time from the home base, will be approximately four hours. Thus, to maintain the EMB-145 on station for longer duration will require adequate tanker support. The EMB-145 with a range of 300 km on fighter aircraft, will supplement the cover of the full size longer range AWACS and will also be useful as gap filler radar.

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The induction of this system in the IAF will be a big achievement for DRDO. The real test for the DRDO radar will be to overcome ground clutter problems. In airborne radar the signal return from ground echoes is stronger than the target signal and the radar system must be designed to overcome this limitation. The Americans overcame these problems in their first AWACS the Boeing E-3A, in the 1970s, by developing Pulse Doppler radar technology. Since this technology is quite old DRDO should not have any problem in this field. The major technological breakthrough DRDO has achieved is the indigenously developed AESA technology for the radar. AESA technology is the current state of the art benchmark for radars and DRDO's success in this field is certainly a quantum jump from the PESA (Passive Electronically Scanned Array) technology used in DRDO's Rajendra radar for Akash missile system. DRDO has been trying to develop AESA technology since the 1990s but the breakthrough was achieved when they applied for a patent for the home grown T/R modules (Transmit/Receive modules) a few years ago.

Conclusion

The EMB-145 AEW will certainly supplement IAF's full size AWACS radar cover. DRDO seems to have mastered the technology for airborne radar; it must now concentrate on delivery schedules to meet customer requirements. Project delays have been a major drawback of DRDO projects. DRDO needs to be held accountable for their failure in meeting schedules. Another point to note is the requirement of transport aircraft platforms for which huge amounts have to be paid to foreign vendors. India has a big requirement of transport aircraft in the civil and military sector. Instead of paying large sums abroad we need to consider 100% FDI in this field to produce them in India. In this way at least the nation will receive some benefits of the money spent and platforms for AWACS/AEW and other roles can be made in India.

(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS])

End Notes

¹ Anantha Krishnan M “Brazilian Embraer, DRDO Explore Export Potential of Prying Plane”, in *The New Indian Express*, July 16, 2014, <http://www.newindianexpress.com/states/karnataka/Brazilian-Embraer-DRDO-Explore-Export-Potential-of-Prying-Plane/2014/07/16/article2332090.ece> , accessed on September 4, 2014.

² “Embraer To Roll Out Indian AEW&C On Feb. 21”, <http://aviationweek.com/awin/embraer-roll-out-indian-aewc-feb-21-0> , January 7,2011, accessed on September 16,2014.

³ “India To Augment Awacs Fleet”, March 31, 2014, <http://aviationweek.com/military-government/india-augment-awacs-fleet> , accessed on Septmeber 20, 2014.

⁴ Press Information Bureau, Government of India, pib.nic.in/newsite/erelease.aspx?relid=93863 , March 18, 2013 , accessed on September 25, 2014.

⁵ Sinodefence.com “KongJing-200 Airborne Early Warning & Control Aircraft”, accessed on September 16, 2014.

