



## CHINA'S AWACS : HISTORY AND DEVELOPMENT

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*"All the business of war, and indeed all the business of life, is to endeavour to find out what you don't know by what you do; that's what I call guessing what was at the other side of the hill"*

*Arthur Wellesley, 1st Duke of Wellington*

**China** last week announced that it was setting up an "air defence identification zone" (ADIZ) in the East China Sea over an area that includes Senkaku/ Diaoyu islands controlled by Japan but claimed by China. These islands are about 400 km east of Fujian on China's east coast. China will have to carry out air surveillance with its AWACS (airborne warning and control system) to enforce the ADIZ rules set by them. To understand the air surveillance capabilities of China's AWACS, it will be pertinent to briefly trace the history and development of China's indigenous AWACS project.

In today's battle environment monitoring real time enemy air activity is surely on top of the commander's mind. AWACS provides the air force commander the ability to see enemy air activity from low level to high level, deep inside his territory. It is like having an ADDC (Air Defence Direction Centre) in the air with a clear view of what is happening up to long distances. Thus, meeting the age old requirement of commanders to know what is happening on the "other side of the hill". The early warning from an AWACS gives a definite advantage to the commander in air battle management and guiding friendly fighters to intercept enemy aircraft well in time before the weapon release line. AWACS has changed the way war is conducted. As a force multiplier AWACS aircraft have become so critical in modern warfare that the side which does not have them will suffer from a huge asymmetry

right from the start of the shooting war. The Chinese realized the importance of these platforms 44 years ago and now after long years of effort have their own fleet of AWACS/AEW aircraft with four Kong Jing-2000 (KJ-2000) and four of the smaller KJ-200.

China's first attempt to make an indigenous AWACS dates back to 1969. This project, called the Kong Jing-1 (KJ-1), was undertaken on a 1950s designed Soviet TU-4 Bull aircraft. The project was not successful since China did not have the technology to overcome ground clutter problems. In an 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 Chinese were unable to do this and the project was abandoned.



Here is the KJ-1, China's first attempt to make an AWACS, on the Soviet TU-4 Bull platform, in 1969. Photo from <http://forum.keypublishing.com/showthread.php?23523-Chinese-AWACS/page6>

Since then China had been trying to purchase or develop an airborne warning and control capability. In the 1970s relations between China and USA improved with the express intention of

jointly opposing the then Soviet Union as their common enemy. Taking advantage of this situation China began exploring the purchase of E-3A Sentry AWACS from USA. This subject was taken up by the Chinese during President Reagan's visit to China in 1984 but nothing seems to have come off it<sup>i</sup>. The Chinese having failed in their attempts to get E-3A from USA now looked for AWACS from Russia, UK and Israel. The Russian product on IL-76 airframe was rejected as its radar performance did not meet their requirements.

The Chinese also negotiated with a number of Western firms to produce jointly an indigenous AWACS. These firms were: Westinghouse (USA); Marconi (UK); Thorn-EMI (UK); and Dornier GmbH (then FRG) but there was no fruitful outcome. The only success China had was with the development of a maritime AEW by China's Harbin Aircraft Corporation. Harbin developed an AEW prototype by installing the Thorn-EMI Skymaster radar on the Y-12 Turbo Panda. A small number of these aircraft were used for maritime surveillance. But they still did not have an AWACS. The Chinese wanted to purchase the Nimrod from UK but this project was cancelled by the British. Thus, having been left with no choice the Chinese decided to develop an AWACS in collaboration with Israel.

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In 1992 China and Israel got into an initial agreement for joint development of the AWACS. After four years, in 1996 both sides signed an official contract which defined cooperation in development of an AWACS based on the IL-76 platform. Initially Israel provided a modified Phalcon radar with antennas mounted on the aircraft fuselage and nose dome. This configuration could provide only 260° coverage which was not acceptable to the Chinese. The Chinese wanted full 360° coverage and suggested stationary radome on top of the fuselage with phased array planar antenna technology. But the Israeli plan to sell AWACS technology ran into rough weather in 2000 when the Americans forced the Israelis to cancel the deal. The Americans did not want AWACS technology to fall in the hands of the Chinese. They saw this deal as a threat to Taiwan and of US interests in the region. The Chinese were obviously not pleased with this development but they were determined to have an AWACS. The cancellation of the deal speeded up China's indigenous efforts. Although the Israelis had removed all the Phalcon radar components the Chinese managed to get some of the technology from them.<sup>ii</sup>

In November 2003 China produced their first AWACS on the IL-76 platform. This aircraft was labelled the KONG JING -2000 (KJ-2000) and it entered service with the PLAAF in 2007. The Chinese AWACS uses active electronically scanned array (AESA) technology which is more advanced than USA's and Russia's AWACS. The radar in the American E-3C and Russian Beriev A-50U uses older technology mechanical rotation of the antenna for 360° azimuth coverage. In the KJ-2000 there is no rotating antenna. The scanning in azimuth and elevation is done electronically. Three flat antennas are mounted in the radome on top of the fuselage in a triangle. Each antenna scans 120 degrees, thus covering full 360 degrees in azimuth. Elevation scanning is also similarly done by the array source.



PLAAF AWACS on IL-76 platform. Note the triangle drawn on the lower side of the rotodome indicating the three sided planar array antenna inside. (Photo: Chinamil.com.cn/Ben Daochun)

The other AEW aircraft which the Chinese developed was the KJ-200 which had its first flight in 2005. The KJ-200 with its balance beam-like radar on the back of its Yun-8 (Y-8 is a Chinese copy of Russian AN-12) airframe is a smaller AEW system which supplements the larger AWACS cover. The planar antenna on the fuselage is a dual side linear-shape active electronically steered array (AESA) radar similar to the Swedish Ericsson PS-890 Erieye<sup>iii</sup>. 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 Erieye also. The Chinese have installed two radomes at the nose tip and tail cone. It is not clear for what purpose these have been installed but probably they house additional antennas to provide full 360° coverage.



China's KJ-200 AEW on the Y-8 platform. Photo from <http://www.airforceworld.com/pla/english/kj200-awacs-radar-y8-china-1.html>

Since the Y-8 is a turbo prop aircraft its cruising altitude is lower than the jet engine KJ-2000. Consequently the KJ-200 detection range is also less than the KJ-2000. The KJ-200 project received major a setback in 2006 when it crashed in Guangde county, in Anhui province of China, killing all 40 people on board. It was one of the worst disasters in the history of the PLAAF but it did not deter the Chinese from continuing their development work in this field. The KJ-200 finally made its debut in 2009. It is being inducted in the PLAAF and PLANAF.

On October 1, 2009, the People's Republic of China held the largest parade in its history to celebrate the 60th anniversary of the founding of the Communist state. Taking pride of place in the flypast, for the first time, were China's indigenously developed AWACS/AEW aircraft the KJ-2000 and the KJ-200. China thus trumpeted its entry into the club of countries which can design and manufacture their own AWACS radar. The other countries in this club are USA, Russia, Sweden and Israel.

*(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)*

<sup>i</sup> U.S. DIA report “China’s Early Warning Capability” <http://www.dia.mil/public-affairs/foia/pdf/CHINA/CHINA'S%20EARLY%20WARNING%20CAPABILITY.pdf> accessed on September 10, 2013.

<sup>ii</sup> Mr. Wang Xiaomo, a leading Chinese radar expert in an interview explained the details of how China developed its AWACS KJ-2000 and KJ-200, available on Asian defence website <http://theasiandefence.blogspot.in/2009/10/development-of-chinese-kj-2000-awacs.html> accessed on September 10, 2013.

<sup>iii</sup> Sinodefence.com “KongJing-200 Airborne Early Warning & Control Aircraft”, accessed on September 16, 2013.

