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# The PLA-AF's new force multipliers

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China is in the midst of a large scale restructuring and modernisation of its air force and naval air arm, on the scale of the Warsaw Pact spending surge during the 1980s, which includes Airborne Early Warning & Control (AWE&C) and air-to-air refueling systems. Unlike the economically anaemic Warsaw Pact nations, China has a booming economy in double digit growth, which means it can sustain a spending spree on a range of programs.

Recent developments in China include initial orders for an air wing of 50 Sukhoi Su-33 Flanker D shipboard fighters for the former Russian 1143.5 class aircraft carrier Varyag, currently in refit; the public unveiling of the first operational Rafale class J-10 indigenous canard-delta fighters; ongoing progress with the KJ-2000/A-50 indigenous AWACS; an order for eight Ilyushin Il-78MK tankers; and the unveiling of the re-engined new build H-6K Badge cruise missile carrier.

## China's AEW&C Programs

The PLA has had a long-standing interest in acquiring an AEW&C/AWACS capability. Its earliest experiments involved the indigenous KJ-1 / Project 926 system carried in a rotodome by a turboprop powered Tu-4 Bull, itself a Soviet clone of the B-29 Superfortress (examples have survived in museums).

By the 1990s the PLA decided it had to have an AEW&C capability, after observing the rout of the Iraqi air force in Desert Storm and the Serbian air force in Allied Force. China sought to acquire the latest technology and contracted Israeli industry to rehost the Elta Phalcon L-band phased array radar, at the time also bid to the RAAF on an A-310 airframe on a Russian Ilyushin Il-76 Candid airframe, emulating the Soviet Beriev A-50 Mainstay AEW&C design. The L-band Phalcon was the basis of the Elta bid for the RAAF Wedgetail program and is a generation ahead of Japan's E-767 AEW&C and Taiwan's E-2T Hawkeye.

US pressure on Israel killed the A-50I deal in July 2000, and reports soon emerged that the Russian Beriev A-50U or A-50E variant, equipped with the Schmel series mechanically steered array, was to be purchased. India subsequently signed with Israel to pick up the A-50I instead of China.

The collapse of China's plan to acquire the Beriev A-50I AEW&C with the Israeli Elta Phalcon phased array radar was a significant setback for the PLA-AF, and was a loss of face globally to the US. The Chinese leadership vowed publicly they would get an AEW&C capability.

*Beriev A-50E AWACS (Beriev)*

*The PLA's new KJ-2000 AWACS prototype in the circuit at the Central Flight Test Establishment in Nanjing (via Internet).*

Unsupported claims of an impending buy of the Russian Beriev A-50U or A-50E continued, until photographs emerged on the Internet during the 2003 period showing what was clearly an A-50-like AEW&C being flown from the Central Flight Test Establishment at Nanjing.

A respectable number of amateur photographs of an A-50I aircraft being flown over Nanjing have since emerged on the Internet, some of remarkable quality. At least three prototypes were built, and flown in differing livery including a two-tone grey camouflage. Chinese source claim the aircraft is designated the KJ-2000.

Imagery clearly shows three-sided phased array dielectric radomes and wingtip ESM fairings on a rebuilt Il-76 Candid airframe. An APU has been installed in the left main undercarriage fairing. Aft fuselage strakes, absent on the A-50, have been installed. The ram air inlet in the root of the vertical stabiliser of the A-50 is absent, as are the fuselage dielectric blister radomes for the ESM. The KJ-2000 prototypes have been photographed with and without aerial refuelling probes installed.

There has been some speculation that the PRC may be attempting to clone the Israeli Phalcon system using indigenous technology. Given that L-band radio frequency power transistors of suitable ratings are available commercially, cloning is feasible and entirely consistent with the long running PLA policy of concurrently developing indigenous products while importing foreign equivalents. An L-band array Transmit-Receive module design of suitable performance and configuration could be used for both the A-50 system and the smaller Y-8 design, sharing most of the system hardware and software. A least one image exists of a ground-based antenna testing rig, built up as an AESA radome and mounted atop a mast on a larger building.

What remains unclear at this time is the IOC for an operational system, and specific performance parameters for the AESA, such as module count and peak power rating. It is reasonable to speculate that these parameters would be very similar to the Israeli Elta design, to which the PLA had considerable exposure.

*The Y-8 AEW&C prototype using a conventional radar and rotodome (via Internet)*

*The KJ-200 or 'Y-8 Balanced Beam' AEW&C prototype (Via Internet)*

The PLA has two other AEW&C development programs under way at this time, with multiple photographs now circulating on the Internet.

The first is a conventional radar using a rotodome, with the installation mounted on a Shaanxi Y-8 (An-12 Cub) transport. The resulting AEW&C system is in the class of the C-130H and P-3B AEW&C systems built by Lockheed-Martin using the APS-145 UHF radar from the E-2C. As no images are available showing the exposed main antenna, it is impossible to draw conclusions about radar operating wavelength and antenna gain and sidelobe performance. The airframe is a 'classic' Y-8 Cub, with additional vertical stabilisers on the tips of the horizontal tails.

The second smaller AEW&C program has been labelled the KJ-200 or 'Y-8 Balanced Beam' system. Installed on a late model Y-8F-600 airframe with Pratt & Whitney Canada PW150B turboprops and Honeywell avionics. The KJ-200 has been observed in the Nanjing area flying with a dorsal structure resembling the Ericsson Erieye AESA system, as well as ventral radomes. With a similar payload/volume to the C-130A, a Y-8 with an Erieye clone AEW&C system would be equivalent in performance and endurance to the C-130/Erieye proposals marketed during the late 1990s.

Imagery shows that the KJ-200 antenna assembly is much like the Swedish Ericsson PS-890, including the ram air-cooling system for the transmit-receive modules. Like the Erieye, the KJ-200 cannot provide coverage over the nose, but due to large aperture size will have excellent broadside power-aperture ratings and angular resolution.

Given the similar size and platforms used for the two smaller AEW&C systems, it is a reasonable assessment that the rotodome system was developed as a risk hedge in the event that the KJ-200 AESA was too difficult to develop.

Press reports from Pakistan and India indicate that China recently signed a deal with Pakistan to supply an unspecified number of AEW&C aircraft. Given reports that Pakistan was to acquire the SAAB/Ericsson Erieye system, it is not entirely clear what Pakistan intends, or which of the three Chinese systems was sought. India's acquisition of the A-50I would be a strong incentive for Pakistan to acquire the KJ-2000 to match capability.

It remains to be seen, longer term, which of the three PLA AEW&C systems become operational, and which of these will proliferate in the global export market. Clients who do not want the political strings attached to US or EU products, or the cost of a Russian or Israeli product, may well find a Chinese AEW&C offering attractive.

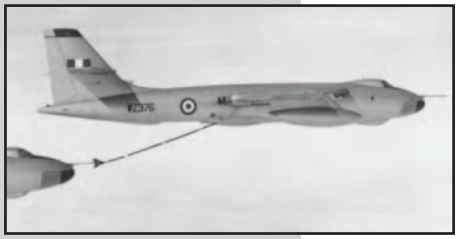
## China's Aerial Refuelling Tanker Programs

By the end of this decade China will be operating a mixed tanker fleet, comprising at least two tanker variants of the indigenous H-6 Badger, and imported Russian Ilyushin Il-78MK Midas tankers based on the Il-76 Candid airframe.

China, like Australia, was a late entrant in the air refuelling game. At this time the PLA operates two distinct tanker variants of the Badger.

It should come as no surprise that the Badger was the basis of China's first operational tanker aircraft. China initiated production of cloned Tupolev Tu-16K Badgers during the late 1960s, and conducted an extended series production-build until the late 1980s to supply Badgers to the PLA-AF, the PLA-N and export clients. XAC (Xian) built around 120 airframes for the PLA. Initially, these were direct clones of the Tu-16K with the Soviet search radar, armed with dumb bombs or nuclear bombs, later anti-shipping strike H-6D/B-6D with a larger Chinese Type 245 radar, adapted from the Soviet 'Square Tie' missile boat engagement radar and armed with a pair of large YJ-6/C-601 Kraken ASMs, cloned from the Soviet P-15 Styx ASCM (basically transplanted from a Soviet fast missile boat into the Badger design). Four B-6Ds were exported to Saddam's Iraq, and XAC spare parts sustained the Egyptian Tu-16K fleet until its recent retirement.

In terms of performance and history, the Badger is a contemporary of the British V-bombers and compares best to the Vickers Valiant B.1 in size, weight, installed thrust and basic performance. Until recently, all Badgers were powered by variants of the Mikulin RD-3M, cloned in China as the Wopen WP-8, rated in the 20,000 lb class. The PLA Badger saga continues, with a tanker conversion engineered during the late 1980s and production restarted post-2001. The first new production Badgers were the H-6H, armed with a Styx derivative KD-63 TV/datalink guided cruise missile. The H-6H was soon followed by the H-6M, with four outboard wing pylons and built to carry four YJ-83/YJ-62 class anti-ship cruise missiles and possibly land attack derivatives. This year, photos emerged of a third new build variant in test, the H-6K cruise missile carrier with six wing pylons and a new technology turbofan engine.



*The Badger is a very close equivalent to the long retired RAF Vickers Valiant B(K).1*

China's tanker conversion was the result of an MoU signed with FRL Ltd in the UK in 1986. The result of this effort was an adaptation of the H-6 design, with two indigenous pylon mounted RDC-1 hose/ drogue pods resembling older FRL Mk.32 pods, these pods were designed by the China Research Institute of Aero Accessories.

*PLA-AF H-6U Badger, note the revised nose.*

With around 167,300 lb (75,800 kg) MTOW, 82,000 lb (37,150 kg) BEW and an internal fuel payload of about 85,000 lb (38600 kg) using a bomb-bay tank to supplant a 20,000 lb (9,000 kg) internal bomb payload, the Badger makes for a reasonable tanker in the size and offload class of the British V-bomber tanker conversions. With a total fuel uplift at MTOW about one half of a KC-135E/R, each Badger in practical terms can adequately support only two fighters.

The PLA has never disclosed the exact number of H-6 Badgers converted to tankers , nor proper technical detail on the configuration of the tanker. The aircraft is claimed to have dual INS and dual RSBN TACAN beacons.

At least two variants exist, the PLA-AF H-6U and PLA-N H-6DU (HU-6D). Both appear to be conversions of existing variants, using a pair of wing mounted hose/drogue pods.

Available photographs indicate the PLA-N H-6DU retaining the ventral Type 245 search radar radome, and the PLA-AF H-6U where the glazed navigator's station in the nose has been painted over or reskinned with sheetmetal, and a weather radar fitted. The remote control gun barbettes and tail turret are deleted to save weight.

The Badger refuellers have been used extensively to support the PLA-AF and PLA-N indigenous J-8-II/J-8C/D Finback fighter fleet, and have also been filmed refuelling the new J-10 canard fighter.

There is no evidence to date of strike variant Badgers being fitted with refuelling probes – the new turbofan powered H-6K is apt to have a striking radius in excess of 2,000 nautical miles which covers the needs arising from the recently adopted 'second island chain' strategy. The natural candidate for a refuelling probe retrofit is the Tu-95/142 Bear probe, fitted either to the H-6 lower starboard gun port, or above the nose. With a single refuelling an ALCM armed Badger could reach northern Australia from mainland China comfortably.

As the PLA does not openly disclose planning decisions, other than as propaganda stunts where this is seen to be useful, there are no indications of how many Badgers will eventually be converted into tankers.

The age of most of the 'first generation' H-6/B-6 fleet varies roughly between 12 and 30 years, and the design is a very sturdy Russian derivative of 1940s Boeing technology. Publicly available data suggests that Badger crews often average less than 100 hours annual flying time, which if true indicates that the fatigue life in the Badgers could last for decades yet, corrosion permitting. It is known that some of the oldest Badgers have been scrapped in recent years.

The bigger issue for the Badger are the fifties technology Wopen WP-8 (Mikulin AM/RD-3M-500) 21,000 lb class turbojet powerplants, which are thirsty and maintenance intensive by current standards, and the antiquated avionics. Earlier attempts to re-engine the Badgers were abandoned.

The appearance of new-build turbofan powered H-6K changes everything. A newer technology 21+ klb class turbofan would have a major impact on the achievable fuel offload performance and the operational economics of the H-6U/DU Badger fleet. Re-engining existing H-6U/H-6DU tankers, or building new production tankers derivatives of the H-6K, are now both feasible options for the PLA.

The current inventory is operated by the PLAAF 8th Air Division, Leiyang, in Hunan Province, and the PLA-N air arm 9th Division, from Lingshui on Hainan-Do.

China had an ongoing interest since the 1990s in acquiring four-engine Ilyushin Il-78 Midas tankers. In 2003, reports of negotiations with Rosoboronexport and Tashkent based TAPO to acquire six Il-78MKKs and thirty Il-76MDs emerged in the Russian media. India took delivery of Il-78MKI tankers in 2004, and this resulted in a tit-for-tat order for 8 Il-78MK tankers for the PLA.

The Il-78 Midas was the second generation of dedicated tanker to be introduced by the Soviets, replacing the very old Myasishchev M-4 tanker conversions operationally in 1987.

*A PLA Navy H-6DU gassing a J-8C Finback.*

*New production PLA-AF H-6M cruise missile carrier. The follow-on H-6K has a turbofan engine.*

The Il-78 is a conversion of the Il-76 Candid airlifter airframe, conceptually not unlike the USMC KC-130 tankers. Around 80,000 lb of auxiliary fuel is carried in two large fuselage tanks, mounted on fixed pallets carried on the main freight deck. While the earliest Midas tankers were reported to be dual role 'convertibles', indications are that more recently built aircraft are dedicated tankers, with a single large fuselage tank for auxiliary fuel.

The Il-78 uses the Sakhalin/Severin UPAZ-1/1A aerial refuelling pod, which is compatible with standard Russian probes used on the Tu-95 Bear, Su-24 Fencer, and Su-27SKM/Su-33/Su-30 Flankers. It is credited with a fuel transfer rate of up to 3,900 lb/minute.

The Midas is equipped with three pylons to carry UPAZ-1 series pods, one under each outboard wing, and one on the port aft fuselage. The Russians are known to fly the aircraft with one, two or three pods fitted.

The Midas is a tanker in the class of the KC-135 series, with a takeoff fuel payload of around 220,000 lb. Older variants of the Il-76 and Il-78 are powered by four Aviadvigatel' D-30KP turbofans, newer aircraft are now being built with the much more fuel efficient turbofan, with Russia planning to re-engine older aircraft with PS-90 over time.

The recent order of the PLA-AF indicates that the aircraft will be delivered in the Il-78MK configuration, powered by PS-90A76 fans.

In the long term, significant expansion of the PLA tanker fleet can be expected, as all of the late build Su-27SMK/J-11 Flankers and Su-30MKK/MK2 Flankers have refuelling probes, as does the new J-10 canard fighter. The PLA's options will be: conversion of the existing Badger fleet, production of a H-6K derivative tanker, or the purchase of further Midas tankers from Russia.

*Indian Il-78MKI gassing two Su-30MKIs (IAF)*

*Russian Il-78 Midas gassing an Su-35.*

*Sakhalin UPAZ-1A refuelling pod.*