Protecting the dragon's den: PLA grows air-defence capabilities to meet future airborne threats

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China is rapidly enhancing its air-defence capabilities with an eye on addressing the proliferation of Western-made fifth-generation combat aircraft in the Asia-Pacific region. *Wasif Naqi* and *Kelvin Wong* examine the mix of indigenous and imported surface-to-air missiles and radar systems that have been fielded by the People's Liberation Army

Initially dependent on foreign weapon and sensor systems for its emergent requirements, the People's Liberation Army's (PLA's) ground-based air defence (GBAD) and surveillance capabilities have more recently benefitted from a diverse range of modern technologies under a rapid modernisation effort across the entire service since the 1990s.

The HQ-16A SAM TEL is equipped with a six-cell cold-launch system. (IHS Markit/Kelvin Wong)

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The PLA has lately demonstrated a specific interest in developing countermeasures to the growing threat of stealthy fifth-generation Western aircraft now coming into service with Japan and South Korea, countries that are aligned with its strategic rival, the United States.

China's GBAD network was already extensive by the time the Soviet Union collapsed, but it had been largely comprised of legacy radars, surface-to-air missile (SAM) systems, and tactical aircraft acquired from the 1960s through the end of the Soviet Union. As such it was widely acknowledged to provide little utility against the stealthy aircraft and stand-off precision munitions then being developed by the US.

Legacy systems

The primary SAM system in the PLA's legacy GBAD network is the medium-range Hong Qi 2 (Red Flag 2 or HQ-2), a reverse-engineered derivative of the Soviet S-75 Dvina/SA-2 'Guideline' missile featuring indigenous enhancements that enable it to engage high-speed threats, including a modified missile body with increased fuel capacity, enlarged wing control surfaces, an improved 200 kg high-explosive warhead, and electronic counter-countermeasures (ECCM) and semi-active radar homing (SARH) capabilities.

Introduced from the mid-1960s, the HQ-2 remains in limited service. It is understood to measure 10.7 m long and 0.71 m in diameter, with a 2,300 kg launch weight. The solid-fuelled missile has a stated maximum speed of Mach 3.5 and a slant range and altitude of 45 km and 82,020 ft (25,000 m), respectively. The missile is believed to be supported by reverse-engineered variants of the Soviet P-12 Spoon Rest early warning radar and the SJ-202 fire-control radar (FCR), the latter being based on the Soviet SNR-75 design.

Lower altitude air defence is also supported by the short-to-medium range HQ-6A and HQ-7A SAM systems. The HQ-6A is a 300 kg second-generation indigenous weapon developed in the early 1980s. It has a 4 m long and 0.28 m wide body that resembles the Italian Selenia Aspide missile. Powered by a single-stage solid fuel rocket motor, the HQ-6A can travel at speeds of up to Mach 3 and is believed to be capable of engaging low-flying threats out to a range of 10 km and at an altitude of 26,246 ft.

A typical HQ-6A battery comprises an early warning radar with a detection range of up to 50 km, and up to three FCRs and six launcher vehicles. Each launcher vehicle is based on a Hanyang 6×6 truck chassis and is equipped with four ready-to-fire missiles.

The battery can also include the Ludun-2000 (LD-2000) mobile gun system, which is essentially a ground-based variant of the naval 30 mm Type-730 seven-barrelled close-in weapon system mounted on a Taian TA5450 truck chassis with an integrated Type-347G gunfire control radar, ammunition magazines, and power supply. The vehicle's mast-mounted low-altitude search radar can also be used to augment the battery's early warning radar.

In contrast, the HQ-7A is believed to be a reverse-engineered version of the Thales Crotale EDIR (Ecartométrie Différentielle InfraRouge) system that was fielded from the late 1980s to engage high-speed, deep penetration-type threats, adopting infrared, TV, and SARH guidance techniques to guide the 84.5 kg, 3 m-long and 0.15 m-wide missile – armed with a blast fragmentation warhead – at speeds of up to Mach 2.2 out to distances of 12 km and altitudes between 100 to 19,985 ft. Each 4×4 armoured launcher vehicle is equipped with

an elevating four-cell missile canister featuring a Ku-band monopulse command to line-of-sight radar, with a typical unit comprising a command vehicle and between two to three launch vehicles.

Russian boost

Although updated variants of the HQ-2 as well as the HQ-6A and HQ-7A systems remain in PLA service, they are progressively being replaced by imported Russian mobile S-300P/PMU-1/PMU-2 and S-400 systems, as well as with indigenously manufactured fourth-generation mobile SAM systems such as the HQ-9A, HQ-16A, and HQ-22.

China is the largest export customer of the Almaz-Antey S-300 SAM system, having acquired several variants from around 1991 to 2008 as part of a wider transition to contemporary fourth-generation SAM technologies. By 1993, the PLA had received its initial order of eight export model S-300PMU batteries with a total of 32 four-missile transporter erector launchers (TELs). The service subsequently obtained another 16 batteries of S-300PMU-1/SA-20A 'Gargoyle' SAM systems with 64 TELs in 1998, which can be armed with the 48N6E missile featuring a track-via-missile (TVM) guidance system and a maximum range of 150 km.

Russia also supplied the S-300PMU-2/SA-20B system in a 2004 order worth approximately USD980 million, comprising a 83M6E2 mobile command post, and eight 90Zh6E2 (SA-20B 'Gargoyle') batteries with 32 TELs. This version introduced the TVM-guided 48N6E2 SAM, which can engage aircraft at a maximum stated range of 200 km or short-range ballistic missiles out to 40 km.

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