Chinese Intelligence, Surveillance, and Reconnaissance Systems

Lt Col Thomas R. McCabe, USAFR, Retired

The best weapons in the world are useless unless aimed accurately, which requires a sophisticated intelligence, surveillance, and reconnaissance (ISR) system to detect and track targets, preferably in as close to real time as possible. Even more important, at the strategic level, the People's Republic of China (PRC) views war between modern states as a conflict between systems of systems,[1] which means weapons and targeting require an accurate and comprehensive view of those enemy systems to target them. China has been building a wide variety of ISR systems to provide its forces with such capabilities, including systems that we must expect will be available for military use even if nominally civilian. (China has said its policy of military-civil fusion will include the outer space and maritime domains; so, we must assume that all the surveillance resources PRC civilian agencies have will be integrated into crisis/wartime military ISR.[2]) These systems include the following:

Satellites. China has developed and deployed constellations of dual-use and military satellite reconnaissance systems, especially the Yaogan ("China remote-sensing satellite") systems, with both electro-optical imagery reconnaissance satellites and synthetic aperture radar satellites.[3] Many of the Yaogan satellites are also reported to be electronic intelligence satellites,[4] intended to track and locate foreign warships by their optical and electronic signatures, and these systems and constellations have grown steadily more sophisticated over time.[5] Further, China has deployed the Gaofen 4 imagery satellite, which boasts a very high resolution but low rate of imagery—72 images every 24 hours[6] reportedly intended to track American aircraft carriers,[7] in geosynchronous orbit,[8] and may be reinforcing this with the recently launched Gaofen 13.[9] In addition, the Chinese Academy of Sciences has started to deploy a series of nominally civilian satellites (reportedly called the Hainan satellite constellation system) to maintain a real-time watch on the South China Sea (SCS), a system that is supposed to include six optical satellites, two hyperspectral satellites, and two radar satellites.[10] China has also announced the intention to launch large constellations of optical microsatellites.[11]

Signals intelligence (SIGINT) sites, ships, and aircraft. China evidently has an extensive and sophisticated SIGINT capability (one estimate from 2018 was that Beijing was spending a tenth of China's military budget on SIGINT[12]) and is reportedly heavily dependent on these systems for tracking American ships. For

example, in December 2013, the USS *Cowpens*, operating under emission control—EmCon—conditions, with all its electronic transmitters turned off, sailed within 12 miles of the Chinese aircraft carrier *Liaoning* before being spotted visually. The Chinese reacted with near hysteria.[13]

Radars. China has deployed over-the-horizon (OTH) radars, which operate on radio frequencies that either reflect off the ionosphere (sky wave) or follow the surface of the earth (surface wave) and are not limited to line-of-sight like higher-frequency radars.[14] Observers report that China had at least five OTH radars in 2010 (four surface-wave OTH sites along the coast and one OTH-Backscatter site inland)[15] and has presumably added more since then. China also claims to be developing a ship-based version of these radars.[16] An additional major part of the Chinese sensor system are the radars China is deploying as part of their integrated air defense system. In addition to longer-range air search radars, this includes the radars for surface-to-air missile (SAM) systems deployed along the coast. These SAM systems likely include long-range Russian-made SAMs (including SA-20s and S-400s/SA-21s,[17] with the 40N6 missile, developed as part of the Russian S-400 system and tested to a range of up to 250 miles[18]) and the Chinese-built HQ-9 system (Chinese-built version of the Russian SA-10) with missiles having a range of up to 125 miles.[19] While radars have a variety of limitations (especially line-of-sight and reduced range at lower altitudes due to the curvature of the earth), we must assume that the radars of these system reach at least as far as the maximum ranges of their missiles.

Unmanned Air Systems. China is making an extensive effort in ISR unmanned aerial systems (UAS). Military systems include at least two reported analogs to the American high-altitude, long-endurance (HALE) Global Hawk—the Divine Eagle, which entered production before 2018,[20] and the Xianglong/Soaring Dragon, which first deployed in 2018[21]—and several systems for the medium-altitude, long-endurance (MALE) UAS role. The most widely reported MALE systems are the Yilong/Wing-loong and the BZK-005, roughly similar to (or larger than) the American Predator,[22] and the CH-5, roughly equivalent to the American Reaper.[23] The People's Liberation Army Air Force (PLAAF) has also recently revealed the DR-8, a supposedly supersonic UAS reportedly intended to be used for searching for aircraft carriers.[24] In addition, the Chinese are deploying nominally civilian drone fleets, such as the one being deployed by the Ministry of Natural Resources for surveillance of oceanic areas, especially the SCS,[25] that we must expect to be at the disposal of the Chinese military if and when needed. Finally, China has tested a large, unmanned airship[26] and has been at least testing aerostats,[27] both of which can be used as sensor platforms.

ISR aircraft. While China has historically deployed a modest force of ISR aircraft,[28] it has recently started to mass produce the KJ-500 airborne early warning and control (AEW&C) aircraft for the People's Liberation Army Navy Air Force (PLANAF) and PLAAF, with 14 deployed as of 2019.[29] In addition, China has about 24 earlier KJ-200 AEW&C aircraft.[30] China is also reported to be developing a new AEW&C aircraft, the KJ-3000.[31]

Ships. We should expect the PRC to use its maritime militia (84 full-time large vessels in 2019),[32] coast guard (225 vessels larger than 500 tons in early 2019),[33] fishing fleet (187,200 "marine fishing vessels" in 2018),[34] and sea traffic as potential surveillance assets to detect and track movements of hostile surface warships. In addition, we should expect the PLAN to deploy "tattletales," ships trailing American and allied warships and task groups.

Antisubmarine warfare sensors. China is working on a variety of sensors that can be used to track and detect hostile submarines and ships. These include military passive sound-detection arrays on adjacent sea bottoms,[35] nominally civilian acoustic listening systems on the deep-sea bottom near Guam and Yap Islands in the Philippine Sea,[36] and hundreds of anchored buoys throughout the western Pacific. Additionally, in 2017, Beijing announced plans for a massive dual-use military-civilian sensor system for adjacent seas (the "Underwater Great Wall"),[37] projected for completion in 2022.[38] Further, by October 2018, China had deployed nine surface-towed array sonar systems (SURTASS) ships.[39] In addition, China is reportedly working on other potential submarine detection methods, including lasers from satellites and wake detection.[40]

External—especially Russian—assistance. Russia considers China to be a strategic ally against the United States[41] and is helping China deploy a missile attack warning system, which evidently includes missile warning radars and satellites.[42] Russia could potentially also provide other intelligence support to China. Of particular significance would be data from Russian systems supposedly capable of tracking American aircraft carriers.[43]

Data is, of course, useless by itself; it must be processed into usable intelligence. After doing this China then faces the formidable and most likely enormous challenge of integrating the intelligence from the various platforms, systems, and undoubtedly different military and civilian organizational stovepipes into a coherent and comprehensive picture of the Chinese mainland, the lands and seas bordering it, and whatever other areas Beijing considers necessary. China will then need to extract military or security-relevant intelligence from undoubtedly enormous amounts of what must be considered background clutter. This is likely to be an early priority for application of artificial intelligence. This task will be made even more complicated by the fact that it is a dynamic and constantly

changing picture. Then this picture must be provided to the command, control, communications, computer, cyber, ISR (C5ISR) system for the Chinese command structure to use for making decisions. And all this in a dictatorship obsessed with information control and a dual military-political command system (commander and Communist Party political commissar)[44] in their units. Finally, China faces the daunting challenge of making this structure survivable in wartime. The United States has wrestled with these problems for decades, with mixed success. China clearly has its work cut out for it.✪

Lt Col Thomas R. McCabe, USAFR, Retired

Colonel McCabe (BA, West Chester State College; MA, Georgetown University; MS in Strategic Intelligence, Defense Intelligence College), is a retired lieutenant colonel from the US Air Force Reserve, a retired career military analyst for the US Department of Defense, and a lifelong student of China. His writings on China have appeared in *Air & Space Power Journal,* the *Air Force Journal of Indo-Pacific Affairs*, the *Mitchell Papers*, the *Mitchell Institute Forum,* and Air University's *Wild Blue Yonder*. This article reuses some information previously published in those sources. Reused with permission. This article represents only his work and should not be regarded as reflecting the position of any agency of the United States government.

Notes

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