China’s New YJ-18 Antiship Cruise Missile: Capabilities and Implications for U.S. Forces in the Western Pacific

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Introduction

In April 2015, the U.S. Office of Naval Intelligence confirmed that China has deployed the YJ-18 antiship cruise missile (ASCM) on some People’s Liberation Army (PLA) Navy submarines and surface ships. The YJ-18’s greater range and speed than previous Chinese ASCMs, along with its wide deployment across PLA platforms, would significantly increase China’s antiaccess/area denial capabilities against U.S. Navy surface ships operating in the Western Pacific during a potential conflict. The YJ-18 probably will be widely deployed on China’s indigenously built ASCM-capable submarines and newest surface ships by 2020, and China could develop a variant of the YJ-18 to replace older missiles in its shore-based ASCM arsenal. This paper assesses the capabilities of the YJ-18 and describes the implications of its wide deployment for U.S. forces operating in the Western Pacific. The author exclusively used open source information and considered the capabilities of similar missiles to assess the likely characteristics of the YJ-18.

Characteristics of the YJ-18

- **Speed**: The YJ-18 has a subsonic cruise speed, reportedly about 600 miles per hour (mph), or Mach 0.8. Media reports suggest that when the missile is about 20 nautical miles (nm) from its target, the warhead accelerates to supersonic speed, reportedly up to Mach 3.0. The more fuel-efficient subsonic stage of the YJ-18’s flight increases its overall range, and the supersonic terminal flight stage reduces the time adversary forces have to engage the missile.

- **Range**: According to the U.S. Department of Defense, the YJ-18 has a range of 290 nm. The YJ-18’s predecessor on many Chinese submarines, the YJ-82, has a range of about 20 nm.

- **Flight path**: The YJ-18 most likely follows a sea-skimming flight path as it approaches its target. By flying only a few meters above the sea, the missile attempts to evade detection by surface radar until it breaks the radar horizon 16 to 18 nm from its target.

- **Payload**: Authoritative open source information on the YJ-18’s physical dimensions, including the size of its conventional warhead, is scarce. Some sources, including an *IHS Jane’s* report, suggest the YJ-18’s warhead weighs 300 kilograms (kg), though other sources suggest it weighs only 140 kg.

- **Targeting**: China is focused on building a robust C4ISR system for detecting ships and aircraft over the horizon, which would provide targeting data to antiship missiles such as the YJ-18. This system

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1 According to the U.S. Department of Defense, “antiaccess” actions are intended to slow deployment of an adversary’s forces into a theater or cause them to operate at distances farther from the conflict than they would prefer. “Area denial” actions affect maneuvers within a theater, and are intended to impede an adversary’s operations within areas where friendly forces cannot or will not prevent access. China, however, uses the term “counterintervention,” reflecting its perception that such operations are reactive. U.S. Department of Defense, Military and Security Developments Involving the People’s Republic of China 2013, 2013, i, 32, 33; U.S. Department of Defense, Air Sea Battle: Service Collaboration to Address Anti-Access & Area Denial Challenges, May 2013, 2.


3 Sources disagree on the assessed range of the YJ-18. The U.S. Office of Naval Intelligence has not publicly reported the estimated range of the missile, but has said the YJ-18 “extends a similar capability” to China’s ASCM submarines as does the SS-N-27 ASCM, which has a range of 120 nm. Christopher Carlson, a former Defense Intelligence Agency intelligence officer, estimates the YJ-18’s range is similar to that of the SS-N-27. Reporting by *IHS Jane’s* also supports an estimate of the YJ-18’s range of about 120 nm. Christopher Carlson, former Defense Intelligence Agency intelligence officer, interview with Commission staff, October 1, 2015; *IHS Jane’s*, “Jane’s Strategic Weapon Systems: Yong Ji-18 (YJ-18),” June 5, 2015; and U.S. Office of Naval Intelligence, *The PLA Navy: New Capabilities and Missions for the 21st Century*, April 2015, 19.

4 C4ISR stands for command, control, communications, computers, intelligence, surveillance, and reconnaissance.
incorporates an array of ship-borne and land-based radar (including over-the-horizon radar); a constellation of imaging satellites; and a variety of intelligence, surveillance, and reconnaissance aircraft. However, China’s C4ISR infrastructure might be insufficient to generate and fuse the targeting information necessary to take advantage of the YJ-18’s assessed range.13 According to the Department of Defense, “It is … unclear whether China has the capability to collect accurate targeting information and pass it to launch platforms in time for successful [antiship missile] strikes in sea areas beyond the first island chain.”14 Moreover, some systems in China’s C4ISR infrastructure may be vulnerable to countermeasures, such as electromagnetic warfare operations, that could degrade the ability of the PLA to detect, identify, and track enemy ships and employ antiship missiles against them in a contingency.15

- Navigation: The YJ-18 most likely is capable of using waypoint navigation and onboard radar-seeking technology to navigate to its target.16

**Deployment of the YJ-18**

China’s SHANG II-class nuclear attack submarines are widely reported to have been outfitted with vertical missile launchers, which may indicate these submarines already carry the YJ-18.17 Ultimately, China will deploy the YJ-18 on its YUAN-class air-independent diesel attack submarines (currently numbering 12), SONG-class diesel attack submarines (currently numbering 13), and SHANG I- and SHANG II-class nuclear attack submarines (currently numbering two each).18 Previously, all of these submarines—possibly excluding the SHANG II-class—carried the subsonic YJ-82.19 China most likely will also deploy the YJ-18 on its Type 095 nuclear attack submarine, which is still under development.20 China’s ASCM-capable submarine fleet also includes eight Russian-built KILO-class diesel attack submarines carrying the Russian SS-N-27 ASCM, which has supersonic sprint capabilities similar to the YJ-18 and a range of 120 nm.21 China also operates three aging HAN-class nuclear submarines capable of firing the YJ-82, but these boats are unlikely to be upgraded to carry the YJ-18.22

The YJ-18’s wide deployment would reduce missile production costs, streamline missile maintenance, and increase the range and firepower of many platforms and missile units. China could deploy YJ-18 variants to replace diverse ASCMs across the PLA. China already has deployed a surface-launched YJ-18 variant on some of its LUYANG III-class guided missile destroyers (DDGs), and may deploy the YJ-18 on its future Type 055 DDG.23 The YJ-18 improves the range and lethality of the LUYANG III, which was already equipped with advanced missile and mine defense capabilities, including what some Chinese media call the “Chinese Aegis.”24 In addition, China could develop a ground-launched variant of the YJ-18 to replace the subsonic YJ-62 ASCM (range of 150 nm) in shore-based missile units.

**Implications for U.S. Military Operations in the Western Pacific**

The YJ-18’s supersonic speed and long range, as well as its wide deployment on PLA Navy platforms, could have serious implications for the ability of U.S. Navy surface ships to operate freely in the Western Pacific in a contingency.

- The YJ-18’s assessed 290 nm range creates a threat ring covering approximately 264,200 square nautical miles (sq nm), compared to the YJ-82’s threat ring of about 1,250 sq nm. These larger threat rings will greatly expand the area U.S. forces must monitor for PLA Navy submarine activity (see Figure 1). Although many submarines that will carry the YJ-18 are relatively noisy, the process of detecting and engaging these submarines will complicate the task of defending U.S. Navy surface ships from cruise missile attacks.25

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1 The first island chain refers to a line of islands running through the Kurile Islands, Japan and the Ryukyu Islands, Taiwan, the Philippines, Borneo, and Natuna Besar. The second island chain is farther east, running through the Kurile Islands, Japan, the Bonin Islands, the Mariana Islands, and the Caroline Islands. PLA strategists and academics have long asserted the United States relies primarily on the first island chain and the second island chain to strategically “encircle” or “contain” China and prevent the PLA Navy from operating freely in the Western Pacific. Open Source Center, “PRC Article Surveys China’s Naval Rivals, Challenges,” January 6, 2012. ID: CPP20120109671003; Bernard D. Cole, *The Great Wall at Sea* (Second Edition), Naval Institute Press, 2010, 174–176.
Note: The locations of the submarines in this image are hypothetical, and the ranges depicted are approximate. Three YJ-82-equipped submarines are depicted near the Chinese mainland for clarity, rather than to suggest these submarines would necessarily operate in these waters in a contingency. In a Taiwan contingency, PLA Navy ASCM-equipped submarines likely would attempt to challenge points of ingress for U.S. Navy surface ships entering the theater. The threat rings of the YJ-18-equipped submarines reflect the maximum assessed range of the YJ-18. In a contingency, technical limitations, such as a lack of accurate targeting data, could significantly shorten the effective range of the YJ-18.

Source: GmapGIS; Google Earth.

- The YJ-18’s wide deployment and long range would increase China’s ability to launch standoff\(^*\) multi-axis, multi-missile attacks against U.S. Navy surface ships. Such attacks are formidable challenges for shipboard defenses, and the YJ-18’s supersonic sprint capabilities will further increase the likelihood some missiles would penetrate a U.S. ship’s missile defenses.\(^{26}\) The YJ-18 is one of a variety of antiship missiles that provide China a multilayered antiaccess/area denial capability in its near seas\(^{†}\) and beyond (see Figure 2). In a 2014 volume on China’s cruise missiles, China military experts Dennis Gormley, Andrew Erickson, and Jingdong Yuan assessed, “It appears that China’s increasing ASCM inventory has increasing potential to saturate U.S. Navy defenses.”\(^{27}\)

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\(^*\) Standoff capability refers to a platform’s ability to fire from a range that increases its chance of surviving an exchange of fire.

\(^{†}\) China typically defines its “near seas” as waters within the Yellow Sea, East China Sea, and South China Sea.
Figure 2: Selected Chinese Antiship Missiles

<table>
<thead>
<tr>
<th>Designator and Missile Type</th>
<th>Platform</th>
<th>Top Speed</th>
<th>Approximate Range (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YJ-83 ASCM</td>
<td>Air and surface variants</td>
<td>Subsonic</td>
<td>100+</td>
</tr>
<tr>
<td>YJ-82 ASCM</td>
<td>Subsurface</td>
<td>Subsonic</td>
<td>20</td>
</tr>
<tr>
<td>YJ-81 ASCM</td>
<td>Air</td>
<td>Subsonic</td>
<td>27</td>
</tr>
<tr>
<td>YJ-8A ASCM</td>
<td>Surface</td>
<td>Subsonic</td>
<td>23</td>
</tr>
<tr>
<td>YJ-62 ASCM</td>
<td>Ground and surface variants</td>
<td>Subsonic</td>
<td>150</td>
</tr>
<tr>
<td>YJ-18 ASCM</td>
<td>Subsurface and surface variants</td>
<td>Supersonic</td>
<td>290</td>
</tr>
<tr>
<td>YJ-12 ASCM</td>
<td>Air</td>
<td>Supersonic</td>
<td>216</td>
</tr>
<tr>
<td>SS-N-27 ASCM</td>
<td>Subsurface</td>
<td>Supersonic</td>
<td>120</td>
</tr>
<tr>
<td>SS-N-22 ASCM</td>
<td>Surface</td>
<td>Supersonic</td>
<td>65</td>
</tr>
<tr>
<td>DF-21D ASBM</td>
<td>Ground</td>
<td>Supersonic</td>
<td>810+</td>
</tr>
<tr>
<td>DF-26 ASBM</td>
<td>Ground</td>
<td>Supersonic</td>
<td>1,620+</td>
</tr>
</tbody>
</table>

Note: The DF-21D and DF-26 are antiship ballistic missiles (ASBMs).

- The U.S. Navy is exploring advanced ship defense technologies—such as electromagnetic railguns and directed energy weapons—that could mitigate the vulnerability of U.S. Navy surface ships to long-range, supersonic missile strikes. The U.S. Navy currently lacks a supersonic ASCM, but has acquired seaskimming supersonic target vehicles to simulate attacks by supersonic ASCMs and to develop defenses against similar missiles.

- China’s long-distance submarine deployments in recent years, including deployments of SHANG- and YUAN-class submarines to the Indian Ocean, suggest Chinese submarines carrying the YJ-18 could impede the progress of a carrier strike group in the Western Pacific and in the Indian Ocean, and could hold at risk a carrier strike group in the Western Pacific.
Endnotes


22 *IHS Jane’s*, “Jane’s Fighting Ships: Han Class (Type 091/091G),” February 13, 2015.


