The Chinese Missile Threat:

A Rising Tide in the Pacific

By Wes Rumbaugh & Kristin Horitski

As a rising power in the Asia-Pacific region, China has developed a diverse and sophisticated arsenal of ballistic and cruise missiles. These missiles are part of a broader military modernization to enhance Beijing's ability to assert itself in regional and territorial conflicts. To accomplish this, China knows it must be able to threaten U.S. assets forward deployed in the region. To this end, China has deployed a layered anti-access area denial strategy that also includes cyber and anti-satellite weapons. China is also an emerging nuclear power, though its program is shrouded in secrecy due to the lack of arms control regimes that would allow verification of its capabilities.

China's Anti-Access Challenge

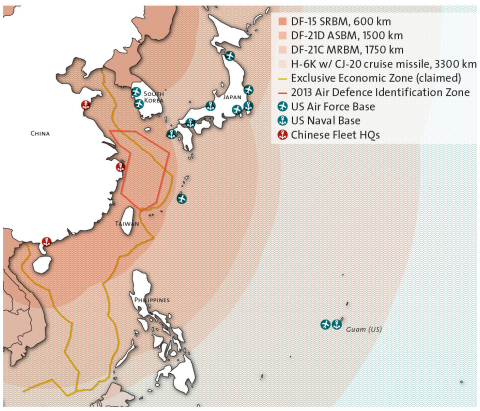
Chinese development of anti-access and area denial (A2/AD) capabilities fits within a broader military modernization program designed for the strategic environment it inhabits. The need to deny access to adversaries springs from the objectives of China's foreign policy and geographic realities. Beijing seeks to project power in the maritime domain and advance its territorial claims in the East and South China Seas. This mandates a naval force capable of protecting expansive naval claims while denying adversaries the ability to effectively do the same. Geography also explains the importance China places on maritime security and anti-access strategies. A majority of China's population and economic centers are in coastal areas; a reflection of its trading economy. This means China must project power into proximate naval areas to develop defense-in-depth.

The confluence of these factors was never clearer than in the Taiwan Strait Crisis of 1995-96. The United States responded to Chinese live-fire exercises that were universally understood to send a signal to the government of Taiwan by sending two aircraft carrier battle groups to the region in a display of resolve. Beijing's lack of ability to respond to the U.S. show of force illustrated the capabilities gap that existed at the time and highlighted the need for China to develop an A2/AD doctrine in order to exercise more influence in the surrounding region. These doctrines and capabilities would focus on strategies to defeat the carrier battle group; the foundation of American naval power.

Beijing's commitment to protecting what it sees as its territorial waters became clearer in 2010 during the Cheonan Incident. After a North Korean submarine torpedoed a South Korean corvette, Washington initiated joint exercises, as it had done previously to display resolve during crises in the region. This time however, China's confidence in its anti-access capabilities had grown and Beijing issued a strong condemnation of America's actions.

This growing confidence reflects the expansion of Chinese capabilities to project influence in what Beijing considers its territorial waters. Featured in this modernization is the expansion of Chinese ballistic and cruise missiles that can target American aircraft carriers and other surface ships. Chinese anti-ship ballistic missiles can be launched from both silo and road-mobile launchers. These missiles also feature penetration aids like maneuverable reentry vehicles and decoys to complicate the missile defense task for American naval assets. The Chinese have also worked on a hypersonic glide vehicle for anti-ship ballistic missiles, compounding the missile defense problem. Beijing also has built a substantial arsenal of anti-ship cruise missiles that it can launch from a variety of sea and air platforms. This creates another layer of missile defense complexity and makes it important that any assets in the region can conduct integrated air and missile defense operations.

China's anti-access footprint



Sources: Air Power Australia, Chinese Ministry of National Defence, Congressional Research Service

Recognizing that the United States military relies heavily on cyber and space capabilities, Chinese war planners have also developed capabilities to deny access to American forces in these domains. This threatens to undermine the effectiveness of missile defense assets that rely on space-based satellites for tracking and communications, and cyber assets for battle coordination and command and control. The ability to defend these capabilities will be an essential part of any American strategy to project power should a conflict with China arise.

China's Diverse Missile Arsenal

China has a long history of research and development in nuclear weapons and ballistic missile technologies, including Multiple Independently-targeted Reentry Vehicles (MIRV) and Maneuverable Reentry Vehicles (MaRV) technology. MIRV allows for ballistic missiles to carry multiple warheads that can be aimed at different targets within the same area. China acquired the technology and capability to develop and deploy MIRVs several decades ago, but Chinese leaders chose not to deploy missiles with this capability until recently. Over the last several years, China has developed, tested, and deployed several ballistic missiles capable of carrying MIRVs including the DF-5A and the DF-41.

China's development and deployment of MIRVs on some of its ICBMs calls into question its commitment to its no-first-use policy. MIRVs can be a destabilizing force, particularly on silo-based ICBMs, because they provide a lucrative target for an adversary and create an incentive to launch early in a crisis to counter such a strategy. Countries also use MIRVs as a means of evading missile defense systems. Missiles carrying MIRVs are more difficult for missile defense systems to intercept once the MIRVs are deployed in the midcourse because there are more targets, increasing the likelihood that a warhead could penetrate the missile defense shield. China may consider the development and deployment of MIRV technology as a means of asserting itself as a more dominant nuclear power in the region and globally. Given the context of China's larger military modernization program, MIRVs could be seen as a natural progression in nuclear weapons technology, and the result of China having the resources and being more technologically capable of testing and deploying this technology.

China has also developed a sea-based missile arsenal. Its first nuclear powered ballistic missile submarine (SSBN) the Type 092/ Xia-class, was launched in 1981, commissioned in 1987 and test-fired its first SLBM in 1988. The Xia-class SSBN is able to carry up to 12 JL-1 medium-range ballistic missiles that are capable of carrying nuclear warheads, giving China the third leg of its nuclear triad. It is not believed that the Xia-class submarine has ever left Chinese coastal waters due to vulnerabilities related to slow speed and a noisy engine. The Xia-class underwent a refit from 1995-2000, but it remained vulnerable to anti-submarine warfare platforms. The Xia-class was replaced by Jin-class submarines launched in the 2004-2012 timeframe.

China currently has four Type 094/ Jin-class ballistic missiles submarines that carry up to 12 JL-2 SLBMs. The Jin-class submarine is seen as a China's first chance at a credible sea-based nuclear deterrent. The JL-2 SLBM is an intercontinental-range, three-stage ballistic missile that is similar to China's DF-31 ICBM. The JL-2 has a range of more than 7,200 km and is equipped with either a single MT nuclear warhead or three to eight smaller MIRV'd warheads. The JL-2 uses both inertial guidance and GPS systems and may also carry penetration aids and decoys.

A Chinese Jin-class submarine with the SLBM launch tubes open

The Jin-class submarines may be almost ready to, or in the process of, conducting deterrence and combat patrols in the Pacific. However, questions remain whether the PLAN has overcome past problems including establishing a continuous command and control structure for submarines at sea. A secure and reliable communications network is essential for Chinese leaders to communicate with their deployed submarines in order to issue orders and exercise control of the nuclear weapons onboard. Communication becomes particularly important in times of crisis, when loss of contact with deployed forces could cause leaders to believe a submarine has been lost to the enemy. If communications are not considered reliable, leaders may pre-delegate launch authority to submarine commanders, increasing the probability of an accidental nuclear missile launch.

China is also active in developing and testing anti-satellite weapons. Anti-satellite weapons are those designed to disable an adversary's satellites or degrade its C4ISR capabilities and include lasers, satellite jammers and anti-satellite missiles. Since 2005, China has conducted a number of missile tests including those of its SC-19 and the Dong Ning-2 (DN-2) missiles. The DN-2 is a ground-based, high earth-orbit attack missile that China tested in 2013, claiming it was an experiment rather than a missile test. China's continued development and testing of anti-satellite missiles poses a serious threat to U.S. satellites and the ability of the U.S. military to communicate effectively and share information in a future conflict.

While China has criticized U.S. missile defense systems, it is investing in advanced technologies that could have missile defense applications. China has developed and tested kinetic energy interceptors, using missiles or satellites as targets. In 2007, China launched one of its interceptors to destroy an old weather satellite, and tested exo-atmospheric hit-to-kill technology in 2014. China claimed to conduct these tests as part of its ballistic missile defense program, but other countries have suggested they are actually a means of testing anti-satellite missiles. In April 2015, China announced it had reached a deal with Russia for the purchase of four to six Russian S-400 Triumph long-range anti-aircraft missile systems. The systems are set to be delivered in the next 12-18 months and will give China an immediate missile defense capability.

China has also voiced concerns over the deployment of U.S. ballistic missile defense systems in the Pacific. These criticisms generally revolve around the radar associated with the missile defense system, rather than the limited numbers of interceptors. The U.S. THAAD system, which has been considered for deployment in South Korea, relies on an X-band radar with a range of up to 1,300 km. China is concerned that deployment of THAAD in South Korea would allow the U.S. to track and observe deployments and testing of Chinese missiles. Chinese officials also cite concerns over regional security saying, "[b]uilding a missile defense system in the Asia-Pacific region will have negative effects on global and regional strategic stability, and go against the security needs of the countries in the Asia-Pacific region."

Hypersonic Weapons: An Overview

In recent years Russia, China, and the United States have renewed efforts to develop hypersonic weapons as part of their conventional and nuclear arsenals. Hypersonic weapons are ultra-high speed weapons that fly along the edge of space and accelerate to between Mach 5 and Mach 10. Given their rate of speed and non-ballistic trajectory, hypersonic weapons are difficult for current ballistic missile defense systems to intercept.

Since 2014, China has carried out several tests of its hypersonic glide vehicle (HGV). The HGV or WU-14 is launched during the last stage of a missile and can reach nearly 7,500 mph (Mach10), as well as maneuver to avoid missile defenses and zero-in on targets. This weapon can be configured to carry a nuclear or conventional warhead and China claims it is precise enough to attack ships at sea. Hypersonic weapons could also compress the amount of time leaders have to make decisions in times of crisis, because they can strike much faster than other weapons.

The United States has also invested in research and development of hypersonic weapons, but has focused on hypersonic boost glide technology. Hypersonic boost glide technology uses a different type of propulsion known as Supersonic Combustion Ramjet or "scramjet." Scramjet engines take in the oxygen needed for the engine to combust from the air passing through the vehicle, rather than an onboard tank. This allows the vehicle to achieve hypersonic speeds by reducing the weight the missile must carry.

CHINESE NUCLEAR PROGRAM AND DOCTRINE

China became a nuclear weapon state when it exploded its first nuclear device in 1964. Since then, China has slowly developed and modernized its nuclear weapons program using a mixture of foreign and indigenous weapons designs and technology. China's current nuclear arsenal contains approximately 200-300 nuclear weapons including silo-based and road-mobile intercontinental ballistic missiles, short and medium range ballistic missiles, and submarine-launched ballistic missiles. Predictions about the size, status, and capabilities of China's nuclear forces are often difficult given the secrecy surrounding China's nuclear program and China's extensive use of underground tunnels to store military hardware and possibly nuclear weapons. China also has refused to engage in strategic arms control dialogues that would require transparency about its nuclear forces. Generally, China views secrecy as an essential part of ensuring the survivability of its relatively small nuclear force and an integral part of its no-first-use policy.

Historically, China has maintained a nuclear doctrine based on the concept of 'no-first-use' (NFU), viewing its nuclear arsenal as a means of self-defense and deterrence. China's military modernization program and upgrades to its nuclear weapons arsenal, along with its 2013 defense white paper that did not comment on China's NFU pledge, has led some to question China's commitment to its NFU policy. However, in its May 2015 defense white paper, Beijing reaffirmed its NFU policy stating that its nuclear weapons are for "strategic deterrence and nuclear counterattack."

Hypersonic Glide Vehicle

DF-5a launch

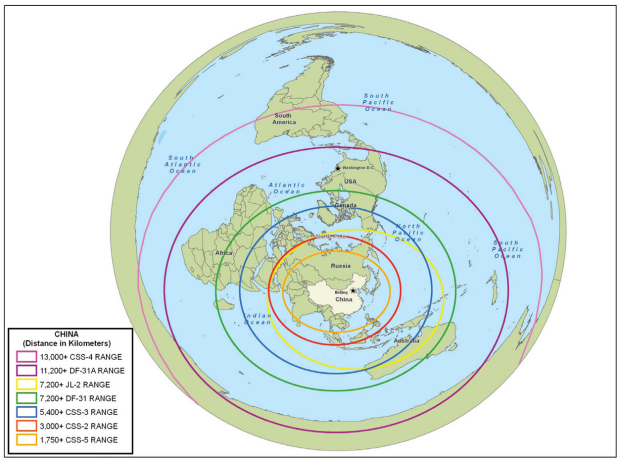


Figure 4. Medium and Intercontinental Range Ballistic Missiles. *China currently is capable of targeting its nuclear forces throughout the region and most of the world, including the continental United States. Newer systems, such as the DF-31, DF-31A, and JL-2, will give China a more survivable nuclear force.*

Map of Chinese missile ranges

Chinese missile ship firing cruise missiles

CHINA'S ADVANCED MISSILE ARSENAL

China's missile program, like many elements of its military modernization, is shrouded in secrecy. The lack of an arms control regime akin to the one the United States has with Russia leaves Washington without any meaningful way to compel China to declare its weapons capabilities or seek verification. This leaves analysts to look at only the information that Beijing publicly displays at events, such as its VJ Day Parade, where it shows off its most advanced capabilities. The following panels detail some of these systems.

DF-5A

The DF-5A is a silo-based, liquid-propelled ICBM and an upgraded version of the DF-F (CSS-4) ballistic missile with an accuracy of approximately 500 m CEP. The DF-5A has a range of 13,000 km (able to hit most of the continental U.S.) and is generally equipped with three MIRVs, each with a warhead carrying a yield of 150-350 kT. Reports indicate that the DF-5A also possesses decoys and penetration aids to increase its effectiveness against missile defense systems.

DF-41 ICBM

China is also currently testing the DF-41 ICBM, which is nearing operational status. The DF-41 has an intercontinental range of 12,000-15,000 km (able to target half to all of the continental U.S.), can carry multiple warheads, and is road-mobile.

DF-21D

The DF-21D is a medium-range ballistic missile designed for use against naval targets, and has an accuracy of 20 m CEP. Its sophisticated guidance system allows it to maneuver to hit a moving ship at sea. China deploys the DF-21D as a silo-based and road-mobile ballistic missile along its coast and has nicknamed the missile the "carrier killer."

DF-26

The DF-26 is an intermediate range ballistic missile with the ability to target medium and large surface ships including aircraft carriers. The DF-26 can also threaten Guam with a conventional payload, threatening Andersen AFB, earning the missile the nickname "Guam killer."

YJ-12

The YJ-12 is an air-launched anti-ship cruise missile (ASCM) that China deploys on its H-6K medium-range bomber. It has a range of 400 km, can reach speeds of up to Mach 3, and is capable of performing air-borne evasive maneuvers before hitting its target.

YJ-18

The YJ-18 is another ASCM the PLAN deploys on its Luyang III DDG and Type 055 CG surface combatant ships and its attack submarines. The YJ-18 is vertically-launched and can travel at supersonic speeds to a range of 290 nautical miles per hour. The YJ-18 missile carries a 300 kg high explosive (HE) warhead that can take out a destroyer-sized ship. Given the supersonic speed the YJ-18 achieves shortly before impact with its target, it is difficult for ships to destroy with on-board guns.

FUTURE U.S. BMD RESPONSES

The extent and sophistication of the Chinese missile threat makes it clear that continued United States power projection into the Asia-Pacific region will require the development of additional missile defense capabilities. These enhancements will be a vital element in supporting the Obama Administration's announced rebalance to Asia, as they are necessary to protect American and allied forces and interests in this strategically important region.

To project power in the maritime domain and overcome the missile portions of the A2/AD challenge, the United States will need to invest in additional Aegis BMD capabilities. The simultaneous threat from cruise and ballistic missiles to American naval assets highlights the need for ships deployed in the Asia-Pacific to be upgraded to the Baseline 9 software configuration to allow them to engage in both air and missile defense at the same time. Integration of air and missile defense assets will also be important to counter ASCM capabilities that China deploys on bombers. Significant radar and discrimination capability will be required to deal with the decoys and maneuvering missiles in China's arsenal.

Countering other elements of China's missile arsenal will require additional investment in future missile defense technologies. To deal with the sheer number of missiles and salvo attacks likely to be used in an A2/AD engagement, the United States will need to develop interceptors that are less expensive to produce than current models. This will require additional investment in emerging technologies such as railguns and directed energy weapons. Countering maneuverable and hypersonic missiles will also require additional investments in capabilities like the Extended Range THAAD and other systems with high divert rates to counter the late maneuvering of these platforms.

About MDAA

MDAA's mission is to make the world safer by advocating for the development and deployment of missile defense systems to defend the United States, its armed forces and its allies against missile threats.

We are a non-partisan membership-based and membership-funded organization that does not advocate on behalf of any specific system, technology, architecture or entity.