Ballistic trajectory

China develops new anti-ship missile

China appears to be approaching operational capability with its anti-ship ballistic missile programme. ***Andrew S Erickson*** *examines how that may complicate strategic relations with the United States.*

KEY POINTS

- China's anti-ship ballistic missile programme is showing signs of maturing.
- The missile could potentially deter or in wartime disable US carrier strike groups in the western Pacific.
- The development of the missile may motivate countermeasures from the US and other regional militaries.

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It seems a cliché to cite Sun Zi's maxim "in war, the way is to avoid what is strong and to strike at what is weak". Yet, this universally accepted approach does seem to correspond to Chinese military planning. Nowhere is this more true than in such ballistic missile developments as its anti-ship ballistic missile (ASBM) programme, one of several weapons designed to exploit relative Chinese military strengths against relative military weaknesses of the United States.

Through this approach, China is working to make it more difficult for the US to intervene militarily in China's maritime periphery. An ASBM, if developed and deployed successfully, would be the world's first weapons system capable of targeting a moving aircraft carrier strike group from long-range, land-based mobile launchers. This could make defences against it difficult and raise the prospect of potentially highly escalatory strikes against launchers or associated targets in China.

However, there are various obstacles that could limit China's ability to deploy ASBMs effectively, particularly the issues of joint service operations and information usage. Further, the missile deployment could act as a significant escalation in military rivalry and may only prompt US forces to deploy countermeasures rather than prevent carrier strike group employment.

ASBM programme

Beijing began ballistic missile research and development in the late 1950s, and has prioritised it ever since. The idea of striking ships with land-based missiles was articulated as far back as 1972 by a high-ranking official. The 1995-96 Taiwan Strait Crisis, in which the US deployed two aircraft carrier strike groups toward Taiwan in response to Chinese missile testing, appears to have catalysed ASBM-relevant programmes as a potent element of a larger anti-access approach.

Scott Bray, senior intelligence officer-China at the Office of Naval Intelligence, stated in November 2009: "ASBM development has progressed at a remarkable rate. In a little more than a decade, China has taken the ASBM programme from the conceptual phase to nearing an operational capability."

Current ASBM efforts appear to centre on the DF-21D (CSS-5) solid-propellant, medium-range ballistic missiles. A DF-21D ASBM would have two stages, and a re-entry vehicle with a seeker, control fins and a warhead (unitary, submunitions or conventional electro-magnetic pulse). In operation, some combination of land-, sea- and space-based sensors would first detect the relevant sea-surface target. The ASBM would be launched from a transporter-erector-launcher (TEL) on a ballistic trajectory aimed roughly at the target, most likely a aircraft carrier strike group. After jettisoning its stages, the re-entry vehicle would use its seeker (possibly radar-homing or infrared) to locate and attack the aircraft carrier strike group. This could be supplemented by targeting updates if necessary.

The Second Artillery, which published a 2003 feasibility study on ASBMs, would most likely control any Chinese ASBMs. Small, technologically focused and secretive, the Second Artillery has controlled China's conventional land-based missiles since 1993. Surface vessel- and submarine-based variants, which the People's Liberation Army Navy would presumably control, seem unlikely at this time as their more expensive, less numerous launch platforms would be much more easily detected than land-based, road-mobile missiles, with which the Second Artillery has extensive experience.

The service's authoritative 2004 doctrinal manual *Science of Second Artillery campaigns* envisages several uses of ASBMs against aircraft carrier strike groups, including direct strikes (on the carrier itself or the aircraft carrier strike group more generally); intimidation salvos (in front of a aircraft carrier strike group or to drive it away from Chinese vulnerabilities); and electro-magnetic pulse strikes on aircraft carrier strike group command and control. In the book *Intimidation warfare* published by the People's Liberation Army's National Defence University in 2005, a former Second Artillery deputy commander also suggests overflying and bracketing targets.

Usage and doctrine

An ASBM holds various advantages for China. At a practical level, it is affordable. Two Chinese observers, Qiu Zhenwei and Long Haiyan, in the 2006 article *A discussion of China's development of an anti-ship ballistic missile*, estimated the cost of an ASBM and its launcher at USD5 million to USD10.5 million. This cost would be far outweighed by the amount that a potential adversary would have to spend on countermeasures. A network of sensors, while expensive to develop, is likely to be needed for other purposes as well, and therefore to be funded separately.

If deployed successfully, an ASBM would offer a relatively accurate, over-the-horizon strike capability from ashore, without having to risk surface vessels or submarines in engagements. While data are currently insufficient to predict precise accuracy, such radar-homing atmospheric weapons as Russia's Kh-31 (AS-17 Krypton) anti-radar missile and Kh-41 (3M80 Moskit) ship-launched, surface-to-surface missile are considered capable of hitting even smaller ships than a carrier. China has acquired both these missiles since 2000 and Beijing has probably achieved a technological level sufficient to indigenise such technology or even perhaps to develop it independently.

Moreover, ASBM strikes match China's 'active defence' military doctrine, which is based partially

on non-linear, non-contact and asymmetric operations. Active defence is a concept under which China's strategic goals are viewed as inherently defensive (such as defending China's maritime periphery), but limited offensive measures may be employed as necessary to safeguard China's core strategic interests (for instance, by using an ASBM to target a US carrier strike group dispatched to preclude China from coercing Taiwan). Non-linear operations involve launching attacks from multiple platforms in unpredictable fashion that range across an opponent's operational and strategic depth; here an ASBM could play a valuable role, perhaps in concert with cruise missile stream raids.

Non-contact operations entail targeting enemy platforms and weapons systems with precision attacks from a distance sufficient to potentially preclude the enemy from striking back directly. Therefore, the DF-21D ASBM's 1500+ km range could prove invaluable as it greatly exceeds the unrefuelled combat radius of US carrier aircraft. Additionally, ASBMs could be launched from highly mobile TELs from deep in China's interior; even if they could be detected, which might be difficult, launching pre-emptive strikes to disable them would be extremely escalatory.

Asymmetric operations involve exploiting inherent physics-based limitations to match Chinese strengths against an opponent's weaknesses. Despite rapid progress, particularly over the last decade, the People's Liberation Army (PLA) remains in a position of overall weakness compared to the US military. It therefore seeks new technologies that can threaten the core of what the US military holds valuable and thereby deter intervention of key platforms into strategically relevant areas. Previous manifestations of that approach include the development and testing of anti-satellite weapons, computer network operations, and long-range ballistic and cruise missiles. There is probably no better symbol of US power projection than an aircraft carrier, creating a potent incentive to add an ASBM to this asymmetric arsenal.

Potential pitfalls

However, the ASBM programme and deployment also face various challenges that may limit the missile's tactical and strategic utility. For example, China will need to develop an ASBM firing doctrine, including deciding on objectives of target destruction; what to shoot at, and when; whether to fire one ASBM, several, or a large salvo; which warheads to use; and whether to co-ordinate with other munitions and services.

The launching of an ASBM would essentially be a joint service operation, which also raises the messy bureaucratic questions of which services should control which sensors (such as over-the-horizon radar) and how they should be used. With ASBM operations requiring 'data fusion' from multiple sources across multiple commands or services, problems with institutional 'stovepipes' are likely, particularly during general wartime crisis management. Particularly revealing, both in terms of Chinese bureaucratic practices and signalling to the outside world about escalation control, would be which command level would have the ultimate authority for release of an ASBM. Beyond difficulties in harmonising the services involved in ASBM operations, there is also the concern that use of such missiles would actually be counter-productive to China's operational goals.

The ASBM would be a deterrence weapon, envisioned ideally to achieve its objective without being used in an actual conflict. Authoritative PLA sources reveal overconfidence in China's ability to control escalation, which is itself an extraordinary danger. Perhaps the Second Artillery is overconfident because Chinese strategists have never had the sobering experience of a Cuban missile crisis to impress on them the realities of the 'fog of war' and the potential for misperceptions and unintended, potentially disastrous consequences, including pre-emptive strikes against precious Chinese assets, or retaliatory strategic strikes.

PLA doctrinal publications mention firing 'warning shots' in front of carriers, but it is unclear whether US naval operators or decision-makers would consider this a warning shot or simply a miss or failure. The difference in US perception between an intentional deterrent and an unintentional failed strike could have significant repercussions and incite Washington to retaliate and even launch operations against Chinese targets more directly.

Strategically, the ASBM may also fail to achieve the broader goal of preventing US intervention. Just the development of the ASBM itself could concern the US that a successful attack on one or more aircraft carrier strike groups was possible, and hence encourage Washington to pre-emptively destroy or disable missiles or supporting assets in the case of conflict.

Regionally, Chinese ASBM development may have negative repercussions. The US developed a distantly related capability, the Pershing II, but voluntarily retired the missiles following ratification of the US-Soviet Intermediate-Range Nuclear Forces (INF) Treaty in May 1988. The INF Treaty prevents both states from possessing conventional and nuclear ground-launched ballistic (and cruise) missiles with ranges of 500-5,500 km.

In a demonstration of significant strategic restraint, the world's two military superpowers voluntarily refrained from developing sub-strategic missiles within these parameters. For more than two decades, Washington and Moscow have maintained their self-discipline, even as China has moved rapidly to develop the world's most formidable sub-strategic missile force. Chinese demonstration of the strategic value of missiles with precisely such characteristics might well motivate other states to develop ASBMs or related capabilities of their own.

Recently, various Russian officials and analysts have expressed frustrations and doubts about the INF Treaty, in part because of rapid Chinese missile development. Beijing's ASBM development may also concern historical rivals such as Japan, adding further fuel to domestic calls for remilitarisation. The resulting strategic tension would fuel additional military procurement and energise long-term investment to counter or balance Chinese ASBM capabilities, an arms race that would leave all parties worse off than before.

Future development

China probably has the technological capacity to develop an ASBM and has made great progress regarding hardware. Mastering detection, targeting and bureaucratic co-ordination is likely to represent an ongoing challenge. When it comes to targeting an aircraft carrier strike group, there will not be a sharp red line between no capability and full capability. Some Chinese analysts believe that even the significant likelihood of a capability might have a large deterrent effect. A Chinese ASBM may therefore appear relatively soon and could have significant implications for US-China strategic relations.

This makes it all the more important to seek potential benchmarks of ASBM progress. While system components may be tested separately, a fully integrated flight test is likely to be necessary to give the PLA confidence in approving full-scale production and deploying ASBMs in a full operational state. China may already be producing DF-21D rocket motors. According to a Hohhot city government website, the 6th academy of China Aerospace and Industry Corporation in August 2009 completed the construction of the 359 factory (also known as Honggang), whose role is to produce motors for the DF-21D.

A photograph released by the Office of Naval Intelligence in its July 2009 report on China's navy (although it circulated on the internet for months before that) depicts what appear to be two different TEL-mounted DF-21 variants. One has a pointed nose cone, common on DF-21C MRBMs. The other has a rounded nose cone; the ONI describes it as a "new DF-21 variant with nosecap". While this missile has not been positively identified as a DF-21D, its presence suggests that the Second Artillery is actively developing new DF-21 variants. ■

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DF-21C ballistic missile preparing for 1 October 2009 parade in Beijing. An anti-ship ballistic missile would be based on a variant of the DF-21 ballistic missile. The transporter-erector-launcher (above) allows for mobility and makes targeting by enemy forces harder.

This photo shows two CSS-5/DF-21 variants on TELs. The missile on the right appears to be a DF-21C. The Office of Naval Intelligence terms the missile on the left a 'new' variant. This suggests that it could conceivably be a DF-21D ASBM.