
**China Deploys World's First Long-Range, Land-Based 'Carrier Killer':
DF-21D Anti-Ship Ballistic Missile (ASBM)
Reaches "Initial Operational Capability" (IOC)**

"Deep Dive"—Special In-Depth Report I

Andrew Erickson and Gabe Collins

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As we enter the Year of the Hare, China has achieved a major military milestone far faster than many foreign observers thought possible.¹ In a December 2010 interview with veteran national security journalist Yoichi Kato of the *Asahi Shimbun*, Admiral Robert F. Willard, Commander, U.S. Pacific Command, offered significant new revelations:

Kato: *Let me go into China's anti-access area denial (A2AD) capabilities. What is the current status of China's anti-ship ballistic missile (ASBM) development, and how close is it to actual operational deployment?*

Willard: *The anti-ship ballistic missile system in China has undergone extensive testing. An analogy using a Western term would be "initial operational capability (IOC)," whereby it has—I think China would perceive that it has—an operational capability now, but they continue to develop it. It will continue to undergo testing, I would imagine, for several more years.*

Q: *China has IOC?*

A: *You would have to ask China that, but as we see the development of the system, their acknowledging the system in open press reporting and the continued testing of the system, I would gauge it as about the equivalent of a U.S. system that has achieved IOC.*

Q: *China has already perfected the technology to fly that missile and also the sensor systems for targeting. Has the entire system integration been completed?*

A: *Typically, to have something that would be regarded as in its early operational stage would require that that system be able to accomplish its flight pattern as designed, by and large.*

Q: *But they have not conducted the actual flight test or the test to attack moving ships yet, have they?*

A: *We have not seen an over-water test of the entire system.*

Q: *But do you believe they already have that capability?*

A: *I think that the component parts of the anti-ship ballistic missile have been developed and tested.*

Q: *Is it a bigger threat to the United States than submarines in terms of their anti-access area denial?*

A: *No, I don't think so. Anti-access area denial, which is a term that was relatively recently coined, is attempting to represent an entire range of capabilities that China has developed and that other countries have developed.*

It's not exclusively China that has what is now being referred to as A2/AD capability. But in China's case, it's a combination of integrated air defense systems, advanced naval systems such as the submarine, advanced ballistic missile systems such as the anti-ship ballistic missile, as well as power projection systems into the region.

The anti-access area denial systems, more or less, range countries, archipelagos such as Japan, the Philippines and Vietnam, so there are many countries in the region that are falling within the envelope of this, of an A2AD capability of China. That should be concerning—and we know is concerning—to those countries.

While it may be largely designed to assure China of its ability to affect military operations within its regional waters, it is an expanded capability that ranges beyond the first island chain and overlaps countries in the region. For that reason, it is concerning to Southeast Asia, (and) it remains concerning to the United States.

So now we know: China's DF-21D ASBM is no longer aspirational. Beijing has successfully developed, tested, and deployed the world's first weapons system capable of targeting a moving carrier strike group (CSG) from long-range, land-based mobile launchers. The Second Artillery, China's strategic missile force, already has a capability to attempt to use the DF-21D against U.S. CSGs in the event of conflict, and therefore likely expects to achieve a growing degree of deterrence with it. **Exhibit 1** shows two recent types of missiles in the DF-21 series.

Exhibit 1: Chinese DF-21 Missiles



Source: ONI

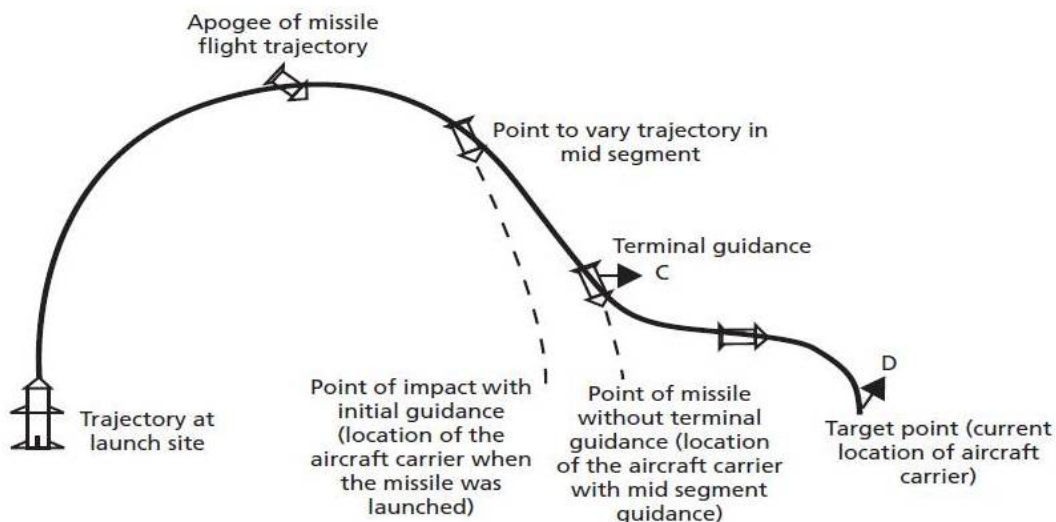
This photo shows two CSS-5/DF-21 variants on transporter-erector-launchers (TEs). The missile on the right appears to be a DF-21C. The Office of Naval Intelligence (ONI) termed the missile on the left a “new” variant in 2009. This suggests that it could conceivably be a DF-21D ASBM.

Since the 1920s, the U.S. Navy has built its carrier forces around the idea that the air group represents the first and best line of defense for the carrier. The ASBM potentially bypasses the air group and removes it from the defensive equation.

Only one other major system has ever offered the possibility of doing this. That is the submarine, and while China is developing a potent fleet, it cannot today effectively conduct advanced anti-submarine warfare (ASW), while the U.S. can—using carrier-based aircraft. Defense against missiles, by contrast, is potentially an extremely difficult problem for any military.

According to the U.S. Department of Defense (DoD)’s 2010 report on the People’s Liberation Army (PLA), China’s ASBM is based on the “D,” or “Delta,” variant of the *Dong Feng*-21 medium-range ballistic missile (MRBM), known in the West as the CSS-5 Mod 5. “The missile has a range in excess of 1,500 km, is armed with a maneuverable warhead, and when integrated with appropriate command and control systems, is intended to provide the PLA the capability to attack ships, including aircraft carriers, in the western Pacific Ocean.” **Exhibit 2** shows how China’s ASBM works; **Exhibit 3** displays the area within which it can currently threaten enemy vessels.

Exhibit 2: Schematic Diagram of ASBM Flight Trajectory with Midcourse and Terminal Guidance

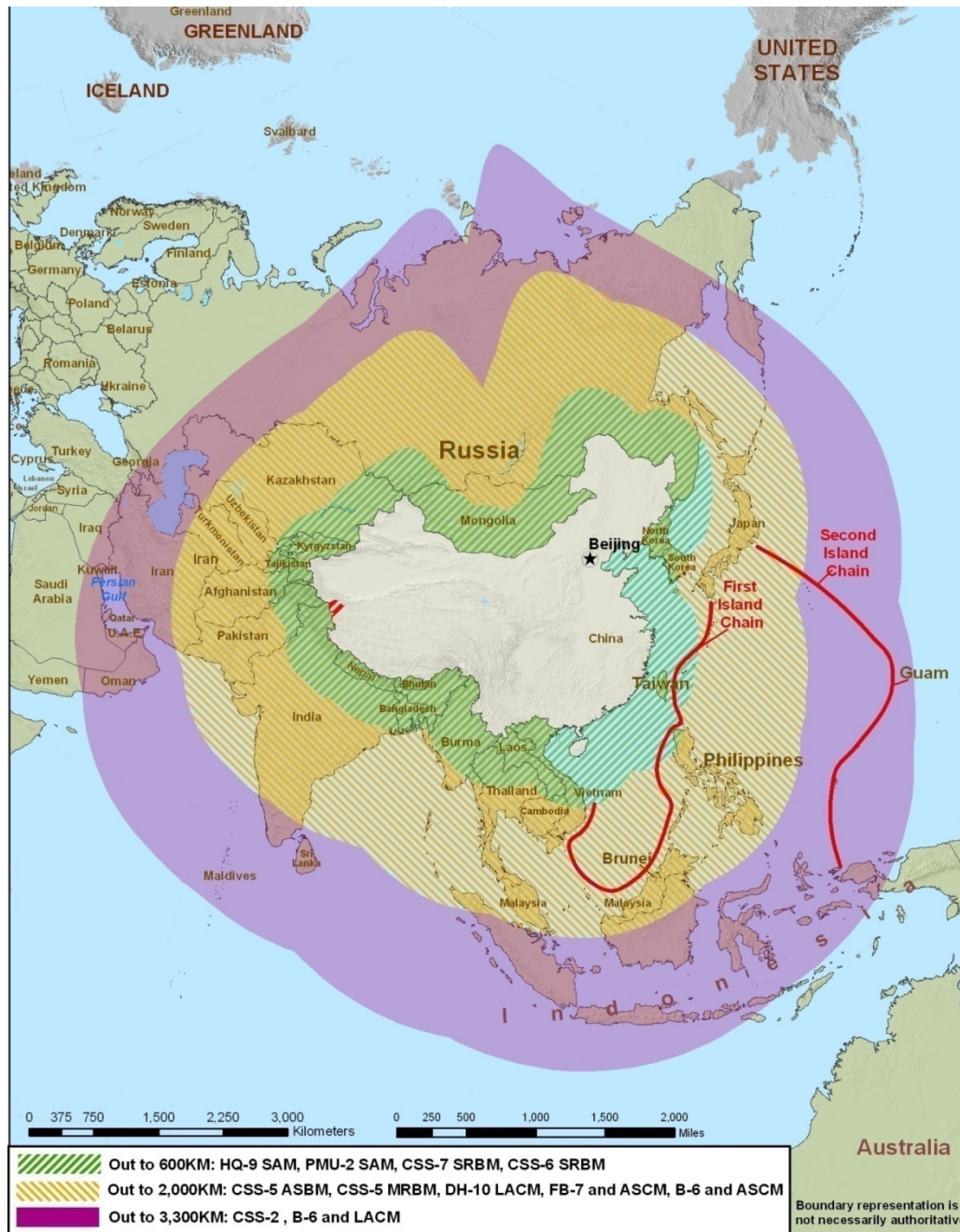


Source: DoD²

Note the depiction of control fins on the reentry vehicle, which would be critical to steering the ASBM through terminal maneuvers to evade countermeasures and home in on a moving target.

This makes an ASBM different from most ballistic missiles, which have a fixed trajectory during the terminal phase of flight.

Exhibit 3: Range Rings for Chinese ASBM and other Conventional Anti-Access Capabilities



Source: DoD³

This exhibit shows the maximum Range of DF-21/CSS-5 ASBM from launch locations in mainland China. Note the large area potentially covered, far beyond Taiwan and the First Island Chain into the Western Pacific.

THE MEANING OF “INITIAL OPERATIONAL CAPABILITY” (IOC)

What exactly does “Initial Operating Capability” mean? According to one authoritative U.S. open source, the *DOD Dictionary of Military and Associated Terms*, IOC is “The first attainment of the capability to employ effectively a weapon, item of equipment, or system of approved specific characteristics that is manned or operated by an adequately trained, equipped, and supported military unit or force.”⁴ The U.S. Defense Acquisition University website, the authoritative source perhaps most relevant in this case due to its specialized nature, states that IOC is “attained when some units and/or organizations in the force structure scheduled to receive a system 1) have received it and 2) have the ability to employ and maintain it.”⁵

This is still short of Full Operational Capability (FOC). The *DOD Dictionary* recognizes yet does not explain this term,⁶ but the U.S. Defense Acquisition University defines FOC as occurring “when all units and/or organizations in the force structure scheduled to receive a system 1) have received it and 2) have the ability to employ and maintain it.”⁷

Perhaps most importantly, IOC goes significantly beyond the nebulous status of Initial Threat Availability (ITA), a term sometimes used to describe a system that has been tested successfully but not deployed. When describing a different missile system in 2007, a DoD official explained: “the system is available and could be used if China’s leaders determine that they wanted to. The distinction between initial threat availability and initial operational capability is that right now we assess that DF-31 may not be fully integrated into the force structure, may not have all the requisite supporting personnel/equipment that we believe they would need to have to be considered fully operational. ...it’s a distinction that says that the system is ready or available now but it’s not necessarily fully operational.”⁸

All the aforementioned terms have very specific definitions and connotations within the U.S. defense community, making it challenging to draw exact parallels with foreign systems. This is a very problematic issue that can lead to misunderstanding if the nuances are not fully accounted for. Admiral Willard appears to be working hard to put the term “IOC” within a proper U.S. context while emphasizing that it is a U.S.-specific term.

Exhibit 4: China's Current ASBM Status

Initial Threat Availability (ITA)	Initial Operational Capability (IOC)	Full Operational Capability (FOC)
"the system is available and could be used if China's leaders determine that they wanted to. ...may not be fully integrated into the force structure, may not have all the requisite supporting personnel/equipment..."	"when some units and/or organizations in the force structure scheduled to receive a system 1) have received it and 2) have the ability to employ and maintain it."	"when all units and/or organizations in the force structure scheduled to receive a system 1) have received it and 2) have the ability to employ and maintain it."

Sources: DoD, Defense Acquisition University

It thus seems that China's DF-21D ASBM weapon system has probably been deployed to operational unit(s)—as opposed to test or training unit(s)—and that those unit(s) are capable/certified/qualified to employ the weapon system in combat. How effective the Second Artillery would be at employing the ASBM and related systems under realistic conditions, including against U.S. and allied countermeasures, remains difficult if not impossible to determine at this time.

Based on standard U.S. military definitions of IOC, as well as connecting the numerous ASBM data point "dots" that have been emerging from China for some time, the following conclusions are in order:

1. Tests. China must have conducted a rigorous program of tests sufficient to demonstrate that the DF-21D ASBM is mature enough for initial production, deployment, and employment. This would have likely entailed a variety of flight tests, albeit none fully integrated over water thus far.
2. Production. Today's IOC status strongly suggests that the reported completion of a DF-21D rocket motor factory in autumn 2009, or some equivalent preparation, has already occurred.
3. Units. Chinese unit(s) must have already received the DF-21D. These unit(s) have been trained to deploy, employ, and maintain the ASBM, support infrastructure, and related systems. This might correlate with the reported July 2010 announcement of a new Second Artillery missile brigade in Shaoguan, Guangdong province.
4. C4ISR. While doubtless an area of continuous challenge and improvement, the DF-21D's C4ISR (command, control, communications, computers, information, surveillance, and reconnaissance) infrastructure must be sufficient to support basic CSG-targeting capabilities. China's rapid succession of advanced satellite launches over the past year suggests a concerted effort to accrue the space-based architecture to support this initial capability, however modest.
5. Deployment. Based on previous Second Artillery deployment patterns, we anticipate that ever-better-performing and -C4ISR-linked versions of the DF-21D will be deployed in "waves" to different units until the vast majority of ASBMs reach a level of capability the PLA deems sufficient to meet its present deterrence objectives.

6. Deterrence. On the basis of present capabilities, we anticipate that China already expects to achieve some level of (growing) deterrence benefits from its DF-21D ASBM.

Finally, one important caveat—Countermeasures. An IOC status for China's ASBM says nothing about the countermeasures that U.S. and allied forces may be able to employ to negate its effectiveness.

While IOC status is a significant revelation, numerous ASBM data point “dots” have been emerging from Chinese sources and U.S. official statements and reports for years now, available to anyone willing to connect them. They offer a case study useful not only to those involved with Sino-American strategic relations, but also to anyone conducting analysis under conditions of incomplete information. In what follows, we offer general context, address these seven issue areas in depth, trace the indicators that emerged in each, and examine broader implications.

Exhibit 5: ASBMs in the Family? America's Pershing II and China's DF-15/CSS-6 and DF-21/CSS-5 Missiles.



Source: China Defense Forum.

According to Chinese sources, China's DF-21 ASBM is based on the distantly-related U.S. Pershing II MRBM (left), as is China's DF-15 missile (center). Following their 1987 Intermediate-Range Nuclear Forces (INF) Treaty, Washington and Moscow eliminated all their 500-5,500 km-range

nuclear and conventional ground-launched ballistic and cruise missiles, including Pershing II; Beijing has filled this vacuum by developing the world's foremost sub-strategic missile force. The U.S. Pershing II (left) has adjustable reentry vehicle (RV) control fins for terminal maneuver. Positively identified photos of a CSS-5 outside its launch canister are not known to exist. But the DF-15 missile (center) has an RV virtually identical to the Pershing II's. Based on the strong visual resemblance, it is possible that the DF-15 employs terminal maneuvering technology similar to that of Pershing II. The RV that China obviously has here could easily have been mated with a variant of the DF-21/CSS-5 booster (right), which might then produce an effective ASBM.

STRATEGIC BACKGROUND

What is China Doing, and Why?

China's progress in this area is logical and long-term. Chinese development of ASBM systems and related capabilities has been documented publicly by previous U.S. government unclassified analyses as well as statements by senior officials. In November 2009, Scott Bray, Senior Intelligence Officer-China, ONI, stated that: "ASBM development has progressed at a remarkable rate.... In a little over a decade, China has taken the ASBM program from the conceptual phase to nearing an operational capability. ...China has elements of an [over-the-horizon] network already in place and is working to expand its horizon, timeliness and accuracy."

It's not hard to see why China is developing and testing an ASBM—it strongly desires the ability to both deter Taiwan independence advocates and prevent U.S. CSGs from intervening effectively in the event of a future Taiwan Strait crisis. Beijing has defined its immediate strategic concerns clearly in this regard.

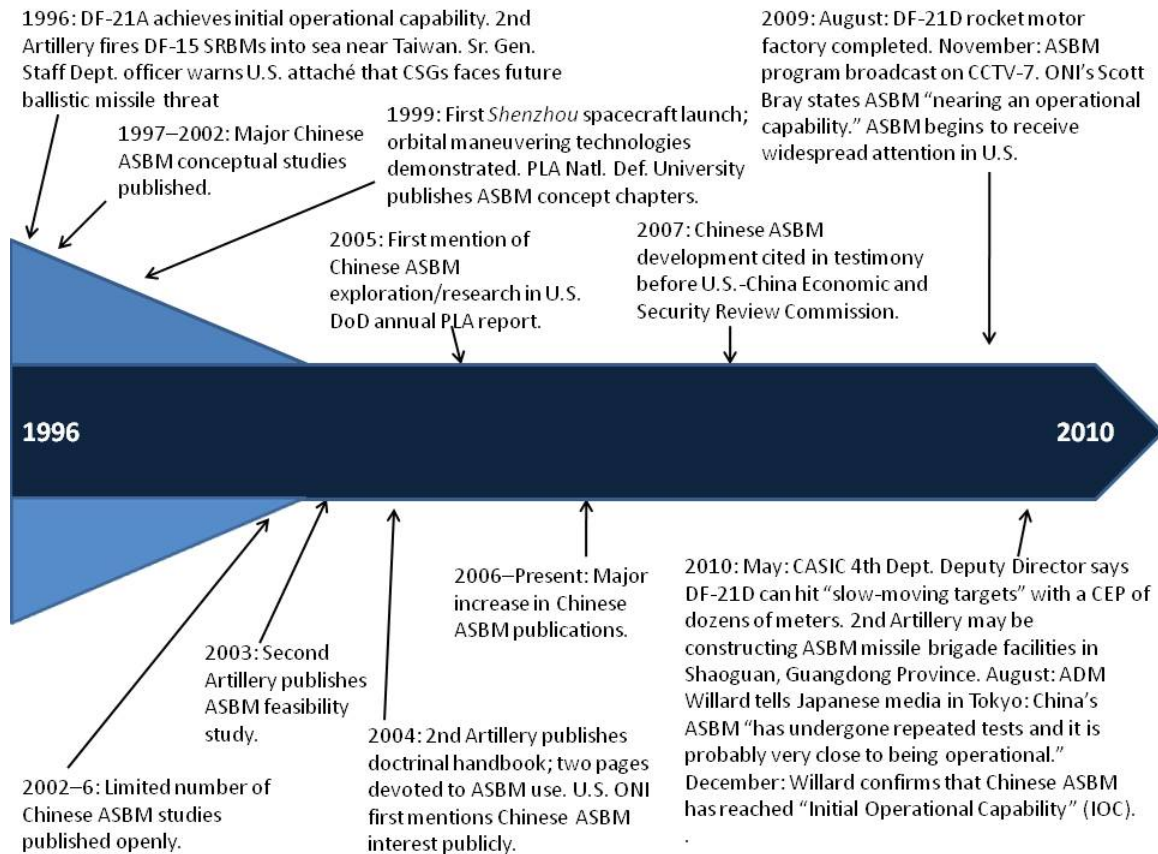
More broadly, China is interested in achieving an ASBM capability because it offers the prospect of limiting the ability of other nations, particularly the United States, to exert military influence on China's maritime periphery, which contains several disputed zones of core strategic importance to Beijing. ASBMs are regarded as a means by which technologically limited developing countries can overcome by asymmetric means their qualitative inferiority in conventional combat platforms, because the gap between offense and defense is the greatest here.

China's ASBM is part of a much larger pattern in which the development and proliferation of various weapons systems—such as ballistic and cruise missiles, submarines, and naval mines—threatens to hold U.S. platforms at risk in vital areas of the global maritime commons. Today U.S. operations in the Western Pacific appear most threatened in this regard, but similar challenges are emerging in the Persian Gulf, and might eventually materialize elsewhere.

Chinese open source publications provide strong indications that Beijing has been developing an ASBM ever since the 1995-96 Taiwan Strait Crisis. The deployment of the USS *Nimitz* and *Independence* CSGs in response to China's missile tests and military exercises in the Taiwan Strait then was a move that China could not counter. Whether seen by China's leaders as a largely successful use of coercive diplomacy (albeit one that produced some unintended consequences), or as a strategic debacle, it likely convinced them to never again allow U.S. CSGs

to intervene in what they consider to be a matter of absolute sovereignty. **Exhibit 6** (below) offers a timeline of known ASBM development.

Exhibit 6: Chinese ASBM Development Timeline



Source: China SignPost™

What is China Saying About its ASBM development?

Quite a lot, actually, albeit with no direct official statements thus far. A wide range of doctrinal, technical, and generalist literature has proliferated over the past decade, with the majority published in the past five years. Even China's military, in an apparent attempt to deter the U.S. from intervening vis-à-vis Taiwan and other claimed areas on China's disputed maritime periphery, has provided significant hints of its own ASBM progress, as well as some thought-provoking mysteries. In an unexplained cartoon animation at the end of a lengthy 29 November 2009 program on ASBMs broadcast on China Central Television Channel 7 (China's official military channel), a sailor falsely assumes that his carrier's Aegis defense systems can destroy an incoming ASBM as effectively as a cruise missile, with disastrous results.⁹

Exhibit 7: China Central Television ASBM Program Footage





Source: CCTV

Still, Chinese officials have yet to address their nation's ASBM development directly in an open public forum. On 26 October 2009 General Xu Caihou, Central Military Commission Vice Chairman, delivered an address and entertained questions at the Center for Strategic and International Studies, Washington, D.C. When asked why China was developing ASBMs, Gen. Xu did not respond directly, instead stating more broadly that ballistic and cruise missile development was necessary for mainland China to safeguard its interests vis-à-vis Taiwan.

IN-DEPTH ANALYSIS

Tests

China must have conducted a rigorous program of tests sufficient to demonstrate that the DF-21D ASBM is mature enough for initial production, deployment, and employment. This likely would have entailed a variety of flight tests, albeit not yet fully integrated over water—perhaps because of a desire to avoid embarrassing failures in view of worried citizens of East Asia and a U.S. military increasingly refocused on the region. Indeed, China appeared to place particular emphasis on ballistic missile testing this year. In an October 2010 post on his well-regarded *Information Dissemination* blog, Galrahn emphasized that it appears that “China has conducted on average [of] two tests of major ballistic missiles [per month] over the last 4 months. That is a lot of ballistic missile testing in a short time.”

Several unverifiable media reports, including at least two from China, suggested that ASBM tests were being conducted during summer 2010. A 16 August 2010 article in South Korea's *Chosen Ilbo* stated:

“China will test its new the [sic] Dong Feng 21D anti-ship ballistic missile, the country's state media said Friday [August 13]. There is speculation that Beijing is responding to the U.S. deployment of the nuclear-powered aircraft carrier George Washington to the West Sea [i.e., the Yellow Sea] and the South China Sea to join naval exercises with Korea and Vietnam, which China considers too close for comfort. Internet China National Radio said the China Aerospace Science and Industry Corporation will soon test-fire ‘a weapon under an important state weapons project.’ Although it did not specify what this project was, it carried a photo of a Dong Feng 21C medium-range ballistic missile, the same series as the Dong Feng 21D, and an artist's drawing of such missiles attacking an American aircraft carrier.”¹⁰

Yet there have been no direct confirmations to date of ASBM-specific flight tests, at least in the unclassified realm. The best open source analysis in this area was done by subject matter experts who extrapolated from other data points. Mark Stokes of the Project 2049 Institute stated on 4 June 2010 that “odds are what you're seeing now in terms of testing is... flight tests of the [DF-21D] motor itself and the airframe... the final step would be most likely going against a target at sea in a realistic environment.” While system components may be tested separately, and on the ground in many cases, fully integrated flight test(s) would be almost certainly necessary to give the PLA confidence in approving full-scale production and deploying ASBMs in a full operational state.

This disparity suggests the need for humility on the part of open source analysts, some of whom have misconstrued the absence of *publicly documented* flight tests as conclusive proof that *no*

flight tests have occurred. It is always risky to stake one's analytical reputation on the claim that one has proven a negative.

As China's ASBM moves toward FOC, we are likely to witness even more sophisticated flight tests—including fully integrated tests over water against increasingly challenging targets—that are ever more difficult to conceal. And, aside from specific information about potential vulnerabilities, perhaps Beijing not want to conceal further testing—further successful tests would only strengthen deterrence.

Exhibit 8: ASBM Joint Technical Research

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子母弹对航空母舰舰载机群毁伤计算的像素仿真法

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摘 要: 对于采用子母弹攻击航空母舰舰载机群的毁伤效果分析问题, 存在相当大的难度, 为对子母弹攻击舰载机群毁伤评估提供一个快速、初步的结果, 在对舰载机群进行易损性分析的基础上, 采用像素仿真的模拟方法, 实现了多弹攻击下舰载机群毁伤效果的计算机模拟计算。仿真计算结果表明, 自寻的弹道导弹携带子母式战斗部能够对航空母舰舰载机群实现一定的毁伤。

关键词: 子母弹; 舰载机群; 像素仿真法; 毁伤效果

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Pixel-simulation Study on Damage Efficiency of Carrier Plane Groups under Attacking of Submunition

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Abstract: Evaluating the damage efficiency of the carrier plane groups under the attacking of multiple-submunition is a complicated problem. A rapid method was provided to evaluate the damage efficiency issue based on vulnerability analysis of the carrier plane group and using the pixel-simulation method, and a computation simulation model of the carrier plane groups under the attacking of submunition was established. The simulation results indicate that the homing missile with multiple submunitions can cause some damage when attaching the carrier plane groups.

Key words: warhead with submunition; carrier plane groups; pixel-simulation; damage efficiency

Source: *Journal of System Simulation*

This is one of many Chinese technical articles on using ASBM-deployed submunitions to render carrier-based aircraft inoperable. Note authors' affiliations with both Second Artillery and PLA Navy.

Production

"Augmented by direct acquisition of foreign weapons and technology, [defense industry] reforms have enabled China to develop and produce advanced weapon systems that incorporate mid-1990s technology in many areas, and some systems—particularly ballistic missiles—that rival any in the world today," DoD explains in its 2010 report. "Production trends and resource allocation appear to favor missile and space systems.... China has the most active

land-based ballistic and cruise missile program in the world. It is developing and testing several new classes.”

The DF-21D’s IOC status strongly suggests that the reported completion of a DF-21D rocket motor facility, or some equivalent preparation, has already occurred. According to a Hohhot, Inner Mongolia 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.

As for the DF-21D’s current rate of production, no authority from any nation has offered details, let alone a parallel to U.S. status terms. U.S. Defense Acquisition University defines “low rate initial production (LRIP)” as “The first effort of the Production and Deployment (P&D) phase. This effort is intended to result in completion of manufacturing development in order to ensure adequate and efficient manufacturing capability and to produce the minimum quantity necessary to provide production or production-representative articles for IOT&E [independent initial operational test & evaluation]; establish an initial production base for the system; and permit an orderly increase in the production rate for the system, sufficient to lead to full-rate production upon successful completion of operational (and live-fire, where applicable) testing.”¹¹ Based on Admiral Willard’s estimate that China will continue ASBM testing for “several more years,” it might seem too early to witness a Chinese equivalent to the next step in the U.S. production lexicon, or Full Rate Production (FRP), in which a “system is produced at rate production and deployed to the field or fleet. This phase overlaps the Operations and Support (O&S) phase since fielded systems are operated and supported (sustained) while Full Rate Production (FRP) is ongoing.”¹² Again, however, China may instead display unique “Chinese characteristics” in its approach. It has had a history of building small numbers of weapons systems, deploying them; developing improved follow-on variants and deploying them in successive “waves”; and replacing older systems with newer systems as capabilities and numbers permit. Some PLA sources refer to this pattern as “rolling deployment.”

Units

Chinese unit(s) must have already received the DF-21D. These unit(s) have been trained to deploy, employ, and maintain the ASBM, support infrastructure, and related systems. This might correlate with the reported late July 2010 announcement of a new Second Artillery missile brigade. Based on sophisticated organizational analysis, Mark Stokes and his colleague Tiffany Ma suggested on 3 August 2010 that the Second Artillery might be constructing ASBM missile brigade facilities in the northern Guangdong Province municipality of Shaoguan:

“Last week, China’s state-run media quietly announced the construction of facilities for a new Second Artillery missile brigade – the 96166 Unit – in... Shaoguan... [Guangdong] province is already home to a Second Artillery short-range ballistic missile (SRBM) brigade (the 96169 unit in Meizhou)....”

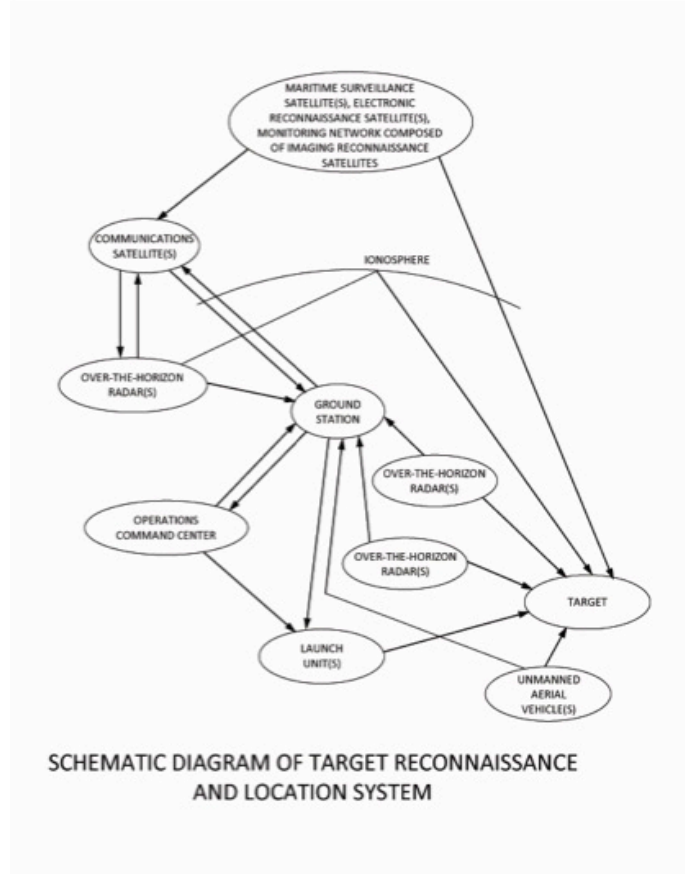
“Although the introduction of the 1,700km range solid fuelled, terminally guided DF-21C ballistic missile into Guangdong is possible, the brigade is also a candidate to be the first unit equipped with the DF-21D anti-ship ballistic missile (ASBM). The DF-21C, first introduced into the active inventory in 2005, is designed to attack fixed targets on land. If an ASBM is successful in passing

the necessary design reviews and a sufficient sensor network is in place, the Shaoguan brigade could become the first in the PLA to field a lethal capability against moving targets at sea out to a range of 1,500-2,000km or more from launch sites.”

Shaoguan’s location near Hunan Province, with the inter-provincial Nanling Mountains and tunnels through them (under construction since at least 2008) that complicate foreign satellite surveillance, offers significant advantages:

“Whether the unit is equipped with the DF-21C or the more advanced DF-21D maritime variant, the establishment of a conventionally-capable medium range ballistic missile brigade in Guangdong would decisively expand the Second Artillery’s striking radius. More specifically, it would enable the Second Artillery to support the Central Military Commission to enforce territorial claims in the South China Sea, or strike targets in a Taiwan-related contingency without having to overfly Japanese territory.”

Exhibit 9: Chinese Conception of ASBM Target Detection and Tracking, ca. 200



Source: *Missiles & Space Vehicles*¹³

C4ISR

While doubtless an area of continuous challenge and improvement, the DF-21D’s C4ISR infrastructure must be sufficient to support basic CSG-targeting capabilities. China’s rapid

succession of advanced satellite launches over the past year suggests a concerted effort to achieve the space-based architecture to achieve this initial capability, however modest. In a series of events little noticed by most China watchers, let alone the general public, China has been orbiting the *Yaogan* series of advanced electro-optical and synthetic aperture radar (SAR) remote sensing satellites. *Yaogan* 1, launched on 27 April 2006, has since completed its mission. *Yaogan* 2 through 11 were launched between 25 May 2007 and 22 September 2010, for a total of 12 satellites currently operational in orbit.

The rapid pace of recent launches (7 since 9 December 2009) suggests high prioritization. Of particular interest with respect to potential for ASBM cueing is the 5 March 2010 launch of *Yaogan* 9A, B, and C. These satellites fly in formation in similar orbits, apparently as a type of Naval Ocean Surveillance System (NOSS). The U.S. Navy reportedly deployed such a system beginning in the early 1970s, apparently to detect surface vessels by sensing their electronic emissions and locating the using time distance of arrival. *Yaogan*-11 was launched with two picosatellites that will co-orbit with it for three months.¹⁴ Ian Easton at the Project 2049 Institute tells us: “My guess is that it is a test-bed for something like a RORSAT [Radar Ocean Reconnaissance SATellite]-style carrier-hunting platform or something similar that combines ELINT [electronic intercept] and SAR.”

Another possible indication of relevant C4ISR progress is a news release published on 20 May 2010 attributed to China Aerospace Science & Industry Corporation (CASIC) citing Wang Genbin, Deputy Director of its 4th Department, as stating that the DF-21D can hit “slow-moving targets” with a CEP (circular error probable, meaning half of missiles fired will strike within) of dozens of meters.

“The PLA Navy is improving its over-the-horizon (OTH) targeting capability with Sky Wave and Surface Wave OTH radars. OTH radars could be used in conjunction with imagery satellites to assist in locating targets at great distances from PRC shores to support long range precision strikes, including by anti-ship ballistic missiles,” states DoD’s 2010 report. “Over the long term, improvements in China’s C4ISR, including space-based and over-the-horizon sensors, could enable Beijing to identify, track, and target military activities deep into the western Pacific Ocean.”

A 16 August 2010 background briefing by a senior DoD official suggested that China still needed to successfully integrate its ASBM with C4ISR in order to operationalize it: “the primary area... where we see them still facing roadblocks is in integrating the missile system with the C4-ISR. And they still have a ways to go before they manage to get that integrated so that they have an operational and effective system.”

Various obstacles could limit China’s ability to employ ASBMs effectively, particularly in the areas of detection, targeting, data fusion, joint service operations, and bureaucratic coordination. The exact status of this progress remains unclear at this point, but to achieve IOC, it would seem that the DF-21D and its supporting systems would have had to address at least some of the most basic problems.

Deployment

Based on previous Second Artillery deployment patterns, we can anticipate that ever-better-performing and -C4ISR-linked versions of the DF-21D will be deployed in “waves” to different units until the majority of ASBMs reach a level of capability the PLA deems sufficient to meet its present deterrence objectives. This has been the pattern with previous Second Artillery missile systems.

Exhibit 10: Second Artillery Vision for ASBM Employment

Science of Second Artillery Campaigns (2004)

ASBM—a “silver bullet” (杀手锏) against carriers:

- “Harassment strikes” (火力袭扰)
- “Frontal firepower deterrence” (前方火力慑阻)
- “Flank firepower expulsion” (翼侧火力驱赶)
- “Concentrated fire assault” (集火突击)
- “Information Assault” (信息攻击)

The authoritative high-level handbook *Science of Second Artillery Campaigns* details how China’s strategic rocket force conceives of the use of ASBMs against carriers. “Harassment strikes” involve hitting CSGs; “frontal firepower deterrence” involves firing intimidation salvos in front of a CSG “to serve as a warning”; “flank firepower expulsion” combines interception of a CSG by Chinese naval forces with intimidation salvos designed to direct it away from the areas where China feels most threatened; “concentrated fire assault” involves striking the carrier’s control tower and aircraft; and “information assault” entails attacking the CSG’s command and control system electromagnetically to disable it.

Deterrence

On the basis of present capabilities, we can anticipate that China already expects to achieve some level of (growing) deterrence benefits from its DF-21D ASBM. The purpose of the ASBM is straightforward. First it is a potent system for deterrence purposes, especially in conjunction with all of China’s other A2/AD capabilities. If deterrence is successful, China’s adversary decides to stay outside the range ring in a crisis or a conflict, thus diminishing the adversary’s

operational effectiveness and making it easier for China to achieve its operational and strategic objectives. If deterrence fails, then China can use it to achieve a mission kill or possibly disable or even sink an enemy ship (assuming the enemy is willing to run the risk of escalation), or complicate defense in a way that could allow another weapon to do the same.

As Ronald O'Rourke, Congressional Research Service, explains: "Observers have expressed strong concern about the DF-21D, because such missiles, in combination with broad-area maritime surveillance and targeting systems, would permit China to attack aircraft carriers, other U.S. Navy ships, or ships of allied or partner navies operating in the Western Pacific. The U.S. Navy has not previously faced a threat from highly accurate ballistic missiles capable of hitting moving ships at sea. Due to their ability to change course, the MaRVs on an ASBM would be more difficult to intercept than non-maneuvering ballistic missile reentry vehicles." PLA sources reveal extreme confidence in China's ability to control escalation in the process.

The ASBM is envisioned primarily as a deterrent weapon by Chinese analysts; to many, this makes it inherently "defensive" in nature. Wu Riqiang, a former CASIC missile designer with six years' work experience, believes that ASBMs and related weapons are "essentially 'political chips,' the mere mention of which ha[ve] already achieved the goal of making U.S. warships think twice about operating near China's shores. ... 'It's an open question how these missiles will do in a conflict situation. But the threat—that's what's most important about them.'"¹⁵

A 6 September 2010 editorial in the English-language edition of the nationalistic Chinese newspaper *Global Times* declared that "China needs powerful" ASBMs and other "carrier-destroying measures." Apparently written for a foreign audience, the editorial elaborated:

"Since US aircraft carrier battle groups in the Pacific constitute deterrence against China's strategic interests, China has to possess the capacity to counterbalance." To end "speculation" by Western intelligence agencies: "China ought to convince the international community of its reliable carrier-killing capacity as soon as possible...."

"While developing its anti-ship missile capacity, China should also let Westerners know under what circumstances will such weaponry be used."

"An external anxiety over China's development of its military is somewhat understandable. The greater strategic deterrence China possesses, the more cautious it should be in using force. China should carefully explore how to present its deterrence. This is a new subject for China."

Global Times is not an official newspaper but is sponsored by and produced under the auspices of *People's Daily*, the official daily newspaper of the Communist Party of China Central Committee. In any case, these are extremely pointed statements on a strategically important—and previously sensitive—subject.

With cross-Strait relations relatively stable at present, perhaps Beijing's statements in summer 2010 that the U.S. should not deploy a CSG in the Yellow Sea represented early efforts to see how such enhanced deterrence might be exploited in peacetime.

Exhibit 11: Chinese Internet Coverage of Previous Statement by Admiral Willard

军事频道 军事情报 评论精选 军事图库 史海烟云 论坛精华 军事视频 军事专题 军事新闻

当前位置: 军事 > 军事情报 > 台海情报站 > 正文

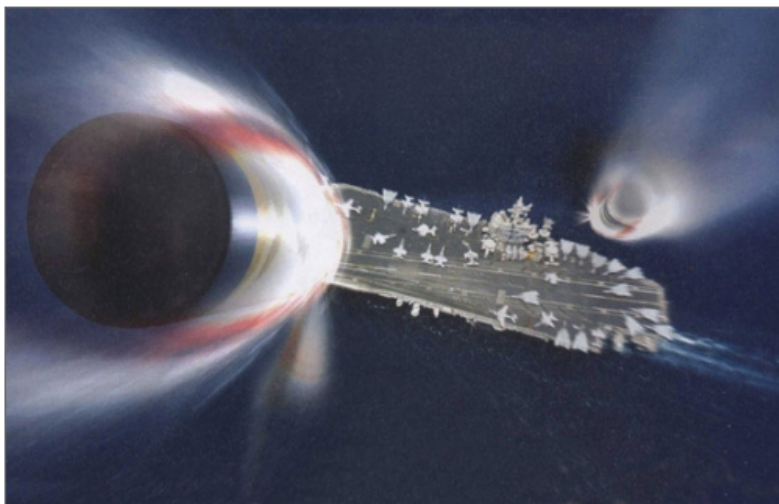
美军太平洋司令披露中国在测试反航母弹道导弹

2010-03-28 10:18:40 春风 东方网 【大 中 小】 发表评论

- 6国联合治-高血糖
- 男人补肾让女人满足
- 阳痿-早泄-国药精品
- 阳痿-早泄-最新国药
- 湿疣-疱疹-特供新药
- 阳痿早泄--认准国药
- 皮肤癣鱼鳞病抗复发
- 颈椎腰椎一“贴”就灵



二炮新型中程导弹



美称中国反航母导弹进展快可轻易突破反导系统

据美国华盛顿时报26日报道，美军太平洋司令罗伯特·威拉德周四在美国众议院军

This graphic comes from an article posted on the website of Dongfang Ribao (Oriental Daily), a Shanghai newspaper, covering Admiral Willard's 25-26 March 2010 testimony in writing before the U.S. congressional Armed Services committees that "China is... developing and testing a conventional anti-ship ballistic missile...."

Countermeasures

An IOC status for China's ASBM says nothing about the countermeasures that U.S. and allied forces may use to negate its capabilities. A Chinese ASBM system of systems could be difficult and/or highly escalatory to defend against. But related efforts appear to be well underway. On 29 September 2010, Secretary of Defense Robert Gates emphasized the need to factor ASBM development into future carrier operations.

"What I've been trying to do is get people to think about... adaptability. If the Chinese or somebody else has a highly accurate anti-ship cruise or ballistic missile that can take out a carrier at hundreds of miles of ranges and therefore in Asia puts us back behind the second island chain, how then do you use carriers differently in the future than we've used them in the past?"

"I'm trying to get people to think about how do we use [carriers] in a world environment where other countries will have the capability, between their missile capabilities and their satellite capabilities, to knock out a carrier if you get to a certain point... within range."

In a slightly earlier interview, Undersecretary of the U.S. Navy Robert O. Work addressed a broader but closely-related issue: that of increasing A2/AD challenges to U.S. forces. Having been asked, "What issues regarding the department keep you awake at night?" Work replied in part: "Secretary Gates has just asked the Navy and the Marine Corps to say how we're going to operate in what he terms an anti-access area denial environment where the enemy has a battle network that is as capable as our own and has the ability to fire lots of guided weapons. We've never faced an enemy like that before. We have essentially had a monopoly on guided weapons warfare since the early '90s."

The following, as reported in the December 2010 issue of *Popular Mechanics*, suggests a measured but proactive U.S. response: "Adm. Patrick Walsh, the current commander of the U.S. Navy's Pacific Fleet, sees preparation as a way to avoid a future fight. 'When we look at these sorts of developments, such as the ASBM, they are technological developments that we respect, but do not necessarily fear,' Walsh says. 'The key element in any sort of deterrent strategy is to make it clear to those who would use a given piece of technology that we have the means to counter it, and to maintain a technological edge.'"

U.S. ships will not offer a fixed target for such "asymmetric" weapons, including Chinese ASBMs. U.S. military planning documents, including the March 2010 *Joint Operating Environment* and February 2010 *Quadrennial Defense Review* (QDR)—the Pentagon's guiding strategy document—clearly recognize China's growing A2/AD challenge; the QDR charges the U.S. military with multiple initiatives to address it. For example, the Air Force and Navy are pursuing AirSea Battle, a new operational concept designed to preserve U.S. power-projection

capabilities in an era of aerospace-maritime battlespace fusion, increasing jointness, tightening budgets, and Chinese and Iranian A2/AD capabilities.

In a world where U.S. naval assets will often be safest underwater and in more dispersed networks, President Obama's defense budget supports building two submarines a year and investing in a new ballistic-missile submarine, as well as a variety of missile defense systems. As Ronald O'Rourke outlines, ASBM-relevant measures more broadly include:

"The U.S. Navy and (for sea-based ballistic missile defense programs) the Missile Defense Agency (MDA) have taken a number of steps in recent years that appear intended, at least in part, at improving the U.S. Navy's ability to counter Chinese maritime anti-access capabilities, including but not limited to the following:

- increasing antisubmarine warfare (ASW) training for Pacific Fleet forces;
- shifting three Pacific Fleet Los Angeles (SSN-688) class SSNs to Guam;
- basing all three Seawolf (SSN-21) class submarines—the Navy's largest and most heavily armed SSNs—in the Pacific Fleet (at Kitsap-Bremerton, WA);
- basing two of the Navy's four converted Trident cruise missile/special operations forces submarines (SSGNs) in the Pacific (at Bangor, WA);
- assigning most of the Navy's ballistic missile defense (BMD)-capable Aegis cruisers and destroyers to the Pacific—and homeporting some of those ships at Yokosuka, Japan, and Pearl Harbor, HI;
- expanding the planned number of BMD-capable ships from three Aegis cruisers and 15 Aegis destroyers to 10 Aegis cruisers and *all* Aegis destroyers; and
- increasing the planned procurement quantity of SM-3 BMD interceptor missiles."

"In addition, the Navy's July 2008 proposal to stop procurement of Zumwalt (DDG-1000) class destroyers and resume procurement of Arleigh Burke (DDG-51) class Aegis destroyers can be viewed as having been prompted in large part by Navy concerns over its ability to counter China's maritime anti-access capabilities. The Navy stated that this proposal was driven by a change over the last two years in the Navy's assessment of threats that U.S. Navy forces will face in coming years from ASCMs, ballistic missiles, and submarines operating in blue waters. Although the Navy in making this proposal did not highlight China by name, the Navy's references to ballistic missiles and to submarines operating in blue waters can be viewed, at least in part, as a reference to Chinese ballistic missiles (including ASBMs) and Chinese submarines."

How best to develop and implement ASBM countermeasures is a topic of vigorous discussion in U.S. Navy circles. In addition to those in the U.S., civilian and military leaders in other nations are following Chinese ASBM development closely and considering relevant countermeasures. "As far as a weapon like ASBM is concerned, if it is operationally fielded, certainly it is a matter of concern," Indian Navy Chief Admiral Nirmal Verma stated on 2 December 2010. "The areas in which it (ASBM) will be deployed in our area of operation is something we need to look at. And certainly we need to have something in place with respect to ASBM-type of weapon and we will put it in place."

While taking steps to prevent China's ASBM from changing the rules of the game in the Western Pacific, the U.S. is working to reduce the possibility of conflict in the first place by improving strategic communications with China. Admiral Willard has suggested that Chinese ASBM development should be raised in sustained discussions with China's military to help reduce misunderstanding and miscommunication, which could produce disastrous and unintended results: "trying to understand what the ... anti-ship ballistic missile system is designed for and against, and its relation with other anti-access capabilities – what that strategy entails is very much an issue that we would like to discuss mil-to-mil with the Chinese. I think this raises the importance of a continuous military-to-military dialogue...."

Exhibit 12: USS *George Washington*



Source: DoD

For the past several decades, the U.S. Navy has used aircraft carriers to project power around the world, including in and around the Taiwan Strait. Pictured here is USS George Washington, currently based in Yokosuka, Japan.

CONCLUSION

The significance of a top U.S. military authority likening the DF-21D's status to IOC is that it must now be taken seriously by foreign observers. Previously, a few naysayers stated that an ASBM was technologically impossible; more said that there was no evidence that China could achieve such a capability. But physics allows for an ASBM, and physics is the same for the Chinese as it is for everyone else. Now that the Commander of the U.S. Pacific Command, with his information access and operational judgment, has weighed in definitively, those positions have become untenable. Admiral Willard now views China's ASBM system as viable and one that must be taken into account. This system is not science fiction. It is not a "smoke and mirrors" bluff. It is not an aspirational capability that the U.S. can ignore until some point in the future.

The question is rather: what level of operations can China achieve, and how soon? More broadly, from a strategic perspective, how will this influence regional deterrence dynamics and what will it mean for U.S. strategy, operational concepts, and force development plans? Even China's Second Artillery itself cannot know exactly how the DF-21D would function under actual combat conditions. Nobody will know for certain if this ASBM actually works as intended unless it is actually used.

It is well established, by contrast, that the basic concept of the anti-ship cruise missile (ASCM) works. Whether Chinese ASCMs work as well as advertised or at their advertised ranges may be unclear, but the essentials have been battle-tested (as the Royal Navy learned in the Falklands War of 1982). The same is true for torpedoes, laser guided bombs, and GPS-guided bombs.

At the same time, the ASBM is not a stand-alone system. It is part of a system of systems that includes submarines, strike aircraft, and even surface vessels. Thus, even if the weapons system has flaws that can be countered, it represents one more problem that U.S. forces would have to deal with in a crisis scenario in the Western Pacific. The 4-7 June 1942 Battle of Midway—one of the World War II Pacific Campaign's, and of that war's, most decisive naval engagements—is instructive in this regard. It concluded with Japanese defeat when three squadrons of U.S. carrier-based dive bombers took Japanese carriers *Soryu*, *Akagi*, and *Kaga* out of action, forcing their eventual abandonment and scuttling. Prior to that, however, the Japanese carrier force was subjected to attacks from two groups of U.S. land-based dive bombers, two groups of land-based torpedo bombers, one group of land-based high-altitude bombers, three squadrons of carrier-based torpedo bombers, and one submarine. None one of these alone succeeded in causing significant damage to the Japanese carrier force and they took heavy casualties in general, but in aggregate they succeeded in preoccupying the Japanese air defenses and in confusing Japanese commanders regarding how prosecute the battle. This ultimately helped the dive bomber squadrons break through. Therein lies the larger point—even if U.S. forces could counter China's ASBM, would doing so divert attention away from another threat (i.e., a submarine) that can sneak in and fire a shot? While that question is unanswerable at present, the ASBM should not be viewed in isolation from other capabilities.

What's the Chinese for, "Go ahead, make my day"?

The core implication of the DF-21D's IOC status is that certain possibilities now have to be taken into account as never before. With the ASBM, the uncertainty arguably works in China's favor with regard to deterrence. In a crisis or combat situation, U.S. operators would have to draw a range ring for the DF-21D and then decide whether or not to risk sending CSGs into that range ring. This operational uncertainty evokes the 1971 crime thriller *Dirty Harry*, in which San Francisco Police Department Inspector Harry Callahan (Clint Eastwood) challenges a bank robber:

"I know what you're thinking: 'Did he fire six shots, or only five?' Well, to tell you the truth, in all this excitement, I've kinda lost track myself. But being this is a .44 Magnum, the most powerful handgun in the world, and would blow your head clean off, you've got to ask yourself one question: 'Do I feel lucky?' Well do ya, punk?"

In that particular case, it later turns out that the gun was empty, but the robber surrendered because he was unwilling to risk being killed. In the film's climactic scene, faced with a similar choice, the serial killer "Scorpio" (Andy Robinson) makes the opposite decision and ends up dead from a chest wound. In an actual combat situation, the relevant U.S. commander would have to make a decision as to how much risk s/he was willing to tolerate, and then act accordingly.

Today, an increasingly assertive China is determined to defend what it defines as its own sovereignty and jurisdictional order. Regardless of the DF-21D ASBM's actual combat capabilities, a new dynamic has entered Sino-American strategic relations. As we enter a new year, let us hope that Beijing and Washington can find better, more peaceful means of settling their differences.

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¹ Citations and links not provided in this document may be found at Andrew S. Erickson, “China Testing Anti-Ship Ballistic Missile (ASBM); U.S. Preparing Accordingly—Updated With Latest Analysis & Sources,” 22 December 2010, <http://www.andrewerickson.com/2010/12/china-testing-anti-ship-ballistic-missile-asbm/>; “Selected ASBM-Related Content from Ronald O'Rourke's 1 December 2010 Congressional Research Service Report ‘China Naval Modernization,’” 22 December 2010, <http://www.andrewerickson.com/2010/12/selected-asbm-related-content-from-ronald-o%E2%80%99rourke%E2%80%99s-1-december-2010-congressional-research-service-report-%E2%80%9Cchina-naval-modernization%E2%80%9D/>.

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