



China's Carrier Killer: Threat and Theatrics

By Otto Kreisher

In the history of warfare, there have been numerous weapons described as “game changers” that promised to nullify the dominant weapons of the day. Stone castles fell prey to gunpowder. Integrated air defenses were overcome by stealth.

Sometimes new weapons brought tremendous advantages, but they have often proved short-lived, as countermeasures—in the form of defensive weapons or tactics—have always arisen to blunt the effect of the new technology.

Today, some are predicting the demise of the aircraft carrier—a potent tool of American power projection for more than 90 years—at the hands of China’s DF-21D anti-ship ballistic missile (ASBM), widely labeled the “carrier killer.” This medium-range, high-speed missile with a terminal homing warhead is touted by many analysts as reducing nuclear-powered carriers, with their complement of 70-odd aircraft each, to sitting ducks.

Longtime critics of the Navy’s multibillion-dollar carriers have cited the DF-21D as justification to sharply reduce the flattop fleet, declaring them hopelessly obsolete.

Naturally, not all see it that way. Senior defense officials—including top Navy and Air Force officers—suggest reports of

The DF-21D missile is a legitimate threat to carrier-based airpower, but at times the concern has bordered on hysteria.

the carrier’s demise, to paraphrase Mark Twain, are premature.

The DF-21D—NATO designation CSS-5 Mod 4—is part of the family of Dong Feng (“East Wind”) ballistic missiles. China has hundreds, in a number of variants.

Based on Chinese defense documents, what sets the -21D apart from the others is that it has a maneuverable re-entry vehicle with synthetic aperture radar (SAR) and optical sensors, which could enable it to hit a moving target.

The two-stage, solid-fuel missile has an operational range variously estimated at 1,035 to 1,726 miles and a conventional warhead considered powerful enough to inflict at least a “mission kill”—meaning that a direct hit could cause enough damage to



Photo via Chinese website

China's A2/AD defense includes hundreds of short- to long-range ballistic missiles that would attempt to neutralize Air Force, Navy, and Marine Corps strike aircraft based on mainland Japan, Okinawa, South Korea, and as far away as Guam.

It is the reported capabilities of the DF-21D, however, that seem to have stirred the most excitement among defense analysts.

Patrick M. Cronin, senior director of the Asia-Pacific Security Program at the Center for a New American Security, wrote in 2010, "The emerging Chinese anti-ship missile capability, and in particular the DF-21D, represents the first post-Cold War capability that is both potentially capable of stopping our naval power projection and deliberately designed for that purpose."

Toshi Yoshihara, a professor at the Naval War College, in 2010 wrote, "China can reach out and hit the US well before the US can get close enough to the mainland to hit back. ... It underscores more broadly that the US Navy no longer rules the waves as it has since the end of World War II."

Even then-Defense Secretary Robert M. Gates, speaking at the Air Force Association's 2010 Air & Space Conference, said China's investments in cyber and anti-satellite warfare and anti-air and anti-ship weaponry, including ballistic missiles, "could threaten America's pri-

make a US carrier unable to conduct flight operations. Chinese defense literature describes a salvo of DF-21Ds first crippling the carrier and then sinking it with later hits.

Such a range could threaten a carrier well outside the combat radius of carrier aircraft without in-flight refueling. That makes the DF-21 a key element in China's strategy of developing an anti-access, area-denial (A2/AD) capability. The missile could potentially prevent the Navy from intervening in a conflict with Taiwan or with one of its neighbors over disputed islands in the South and East China seas.

China's apparent fixation with keeping US carriers at bay may stem from a 1996 incident, in which two American carrier strike groups moved into the Taiwan Strait while China was saber-rattling in the area in an attempt to sway Taiwan elections. The presence of the carriers compelled China to stop missile shots and military maneuvers aimed at coercing what it considers its "breakaway province."

Above: A computer-generated image found on a Chinese website of DF-21D missiles hitting a US Navy carrier group. **Right:** Artist Tom Freeman's concept of carrier-killer missiles hitting USS Enterprise made the cover of the US Naval Institute's publication Proceedings in May 2009.



mary way to project power” through its forward air bases and carrier strike groups.

And in May 2009, the US Naval Institute’s *Proceedings* magazine featured a cover story with art of an American carrier exploding and in flames beneath the headline, “Chinese Carrier Killer?”

Threat or Hyperbole?

Is the actual threat posed by the DF-21 as bad as all that?

Top US commanders seem to believe the DF-21 is deployed. Chinese publications say deployment of the DF-21D began in 2010, and Adm. Robert F. Willard, then chief of US Pacific Command, told reporters that same year that the missile apparently had reached initial operational capability (IOC).

Adm. Samuel J. Locklear III, current PACOM chief, referred in congressional testimony this spring to the “initial deployment of a new anti-ship missile that we believe is designed to target US aircraft carriers.”

That was echoed in another hearing when Army Lt. Gen. Michael T. Flynn, Defense Intelligence Agency director, said in the unclassified annual Chinese threat assessment that China’s array of 1,200 ballistic missiles includes “a limited but growing number of conventionally armed, medium-range ballistic missiles, including the DF-21D.”

Several defense analysts point out, however, that deployment doesn’t necessarily equate to a combat-ready weapon. After that, the next question would involve actual effectiveness.

For a ballistic missile to hit a target at 1,000 miles or more, it has to know where that target is located, with a high degree of accuracy. That’s complicated when the target—such as a carrier strike group—is moving at up to 34 miles per hour. For the weapon to be effective, such a geographic fix must be updated constantly.

To locate a carrier initially, China could use its over-the-horizon radars, which can search out more than a thousand miles. But the geographic accuracy of OTH radars at long range can be off by scores of miles.

China is known to have at least three reconnaissance satellites in orbit over the Pacific—with SAR or optical sensors—that could be used to more accurately fix a carrier’s position.

Long-range Chinese reconnaissance aircraft or attack submarines could also pinpoint a carrier, if they were operating in the right area. But in a time of conflict, a patrol airplane or submarine attempting to get close to a carrier—shielded by its E-2C early warning airplanes, F/A-18 interceptors, and an anti-submarine screen of subs and destroyers—might not succeed.

If the Chinese could get an accurate fix on the carrier, the data would have to be processed, and the missile prepared, programmed, and launched—a complicated command and control procedure that has to be routinely tested and practiced to ensure it works. The missile, its homing sensors, and guidance system would also have to function properly to reach and hit the moving carrier.

Those integrated steps—to find, fix, target, and hit—are crucial links in what the military calls the “kill chain” of a successful weapons system.

The complexity of that kill chain led Jan van Tol, a retired Navy captain and senior fellow on strategic planning at the Center for Strategic and Budgetary Assessment, to wonder, “Has it really reached IOC as that term is normally understood?”

Acknowledging that he can use only unclassified information, van Tol said in an interview, “I have seen no stories of any kind

that China has successfully tested the system, first, against any mobile targets; ... secondly, mobile targets at sea; and thirdly, mobile targets at sea amid clutter,” meaning the various support ships in a carrier battle group.

Such a demonstration “is what’s really important to show that the weapon had actually reached operational capability,” and these are “very difficult things.” Van Tol was the principal author of a 2010 CSBA study on China’s A2/AD threats.

The only indication that the DF-21D has been tested at all was a report in the Taiwan-based *Want China Times*. That article said satellite photos showed a 650-foot-long white form painted in the Gobi Desert with two large craters, possibly created by unarmed warheads from the missile. Even if this did represent a DF-21 test, however, van Tol notes that this was not a mobile target.

DOD’s annual report on China states: “It is not clear whether China has the capability to collect accurate targeting information and pass it to launch platforms in time for successful strikes in sea areas beyond the first island chain,” the imaginary line, prominent in Chinese defense literature, that runs from Japan to the Philippines.

This conclusion was echoed by another CSBA analyst, Barry D. Watts, a former Air Force fighter pilot and planner, in a study released in August titled, “The Evolution of Precision Strike.”

Discussing the DF-21D, Watts wrote, “Perhaps the most salient observation regarding this system is that the Chinese have yet to conduct an end-to-end test of it against a moving target at sea.” He cited a July 2011 article from China’s Xinhua News Agency in which Gen. Chen Bingde of the People’s Liberation Army General Staff said the DF-21D was “still in the research stage” and had not yet achieved operational status.

Disrupting the Kill Chain

The DF-21D is likely a developing component of China’s larger anti-access strategies, and “it seems reasonable to assume that the US Navy is already working on countermeasures to further complicate the already difficult task of hitting a maneuvering warship at sea at long ranges,” Watts wrote.

Moreover, the US military as a whole, and not just the Navy, is working on ways to counter the DF-21D and China’s other A2/AD efforts under the evolving AirSea Battle concept.

Adm. Jonathan W. Greenert, the Chief of Naval Operations, and other military leaders shy away from even mentioning China or the DF-21, to avoid an admission that the US considers China an adversary.

A Greenert spokesman said the CNO would not sit for an interview specifically on the DF-21D. But he made available a number of documents in which the Navy leader described, in generic terms, how the military could counter such weapons.

One of those was a May 16 article in *Foreign Policy* co-authored by Greenert and Air Force Chief of Staff Gen. Mark A. Welsh III. In it, they discussed joint efforts within the AirSea Battle concept to counter A2/AD capabilities, again without naming China or the DF-21D.

AirSea Battle “is not focused on one specific adversary, since the anti-access capabilities it is intended to defeat are proliferating and, with automation, becoming easier to use,” the two leaders wrote. “US forces need a credible means to assure access when needed to help deter aggression by a range of potential adversaries, to assure allies, and to provide escalation control and crisis stability.”



A DF-21 missile is launched. The midrange missile is a key element in China's developing anti-access, area-denial capability.

A key part of the counter-A2/AD approach, Greenert and Welsh said, is to disrupt the enemy's kill chain.

"AirSea Battle defeats threats to access by, first, disrupting an adversary's command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) systems; second, destroying adversary weapons launchers (including aircraft, ships, and missile sites); and finally, defeating the weapons an adversary launches," they wrote.

They further noted that to succeed in attacking US forces, an enemy "must complete a sequence of actions, commonly referred to as a 'kill chain.'" The enemy's surveillance systems must locate US forces, its communications networks must relay targeting information to weapons launchers, weapons must be launched, and then they must home in on US forces.

"Each of these steps is vulnerable to interdiction or disruption, and because each step must work, our forces can focus on the weakest links in the chain, not each and every one," the two service Chiefs pointed out.

A Sept. 30, 2011, press report quoted then-Lt. Gen. Herbert J. Carlisle, who was the Air Force deputy chief of staff for operations, plans, and requirements, as saying the Air Force has "taken [China's] kill chains apart to the nth degree." Carlisle is now commander of Pacific Air Forces.

Welsh and Greenert said they would not need to use "strikes against installations deep inland," an apparent reference to attacking long-range missiles at the launch site.

This view may recognize that most of China's ballistic missiles are either on mobile launchers—like the DF-21D is—or are hidden in tunnels or reinforced bunkers.

US forces were not successful in finding the Iraqi mobile launchers firing Scud missiles at Israel and at American forces in Saudi Arabia during 1991's Operation Desert Storm, despite the use of large numbers of strike and recon aircraft and special

operations forces. More than two decades have passed since this frustration, however, and electronic warfare and ISR capabilities have come a long way.

Instead, Greenert and Welsh said they could defeat missiles with EW and disrupt surveillance systems with electromagnetic or cyber attacks.

Greenert elaborated on that point in his CNO's blog on April 23, when he said a good example of breaking the adversary's kill chain at a vulnerable point is "using electronic warfare and jamming to prevent an adversary's radar from seeing us. That disrupts the first link in the enemy's kill chain: Find the target. Once that link is broken, the enemy has trouble completing the rest of the chain and attacking us."

Airborne or surface-based jammers could prevent over-the-horizon radars from finding a carrier strike group. Electronics, lasers, cyber, or kinetic weapons could be employed to blind the satellites China would need to pinpoint a moving target.

Failing that, the Navy could employ its EA-18G Growler electronic warfare jets or its shipboard EW systems to defeat the DF-21D's radar. In addition to the active jammers, destroyers escorting the carrier could deploy off-board radar-reflective decoys that could deceive the missile into aiming at a balloon floating over empty ocean.

The missile could also be defeated with a kinetic kill.

In a 2012 meeting with reporters, Greenert noted that US forces could attempt to shoot down a DF-21D at various spots along its trajectory. For example, Army Terminal High-Altitude Area Defense missile systems on Okinawa—or US and Japanese destroyers with the Aegis combat systems and SM-3 ballistic missile interceptors sailing in the East China Sea—could try for an early kill.

In the terminal stage, Navy destroyers could employ the Aegis-SM-3 ballistic missile defense system to protect the carrier. As of Sept. 18, the Navy BMD system had scored kills in 27 of 33 test shots against short- and medium-range ballistic missiles, including four straight hits with the latest anti-missile software. Even better software and more capable missiles are in development.

The Navy also is deploying to the Persian Gulf for operational trials on a solid-state laser weapon that in tests has shot down cruise missiles. If proven, it would be a speed-of-light weapon against threatening missiles.

The chances of successfully intercepting an in-bound ballistic missile are enhanced by the Cooperative Engagement Capability system that allows surface ships and the E-2C early warning airplanes to instantly share targeting data to create the most accurate shot.

As a last resort, the carrier could use its own self-defense weapon, the Evolved Seasparrow Missile, to kill a DF-21D close-in.

"Although China's projected ASBM, as a new type of weapon, might be considered a 'game changer,' that does not mean it cannot be countered," concluded Ronald O'Rourke, naval analyst at the Congressional Research Service in a July report. "There are several potential approaches for countering an ASBM that can be imagined, and these approaches could be used in combination." ■

Otto Kreisher is a Washington, D.C.-based military affairs reporter and a regular contributor to Air Force Magazine. His most recent article, "Strike Eagle Rescue," appeared in the March issue.