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Chinese ASBM vs. U.S. Carrier Strike Group

The development of an anti-ship ballistic missile has been heralded as a "game changer" to the influence of power in the western pacific. This newly developed weapon system calls into question the ability of the United States Navy to keep China's military ambitions in check as well as come to the assistance of allies in the region should perceived infringement occur. In the past, hostilities from China, either through declaration or force build-up, were met with a deployment of the U.S. 7th Fleet. A carrier strike group (CSG) would advance and patrol the area and maintain the stable status quo. The 1996 Taiwan Strait confrontation demonstrated to China that they would be unable to maintain their interests without addressing a U.S. CSG. Since then, China has been pouring resources into the development of a system that would act as a deterrent, announcing in 2010 that such a system existed and would soon be operational. The ballistic missile system that was developed was the Dong Feng 21 Series, specifically the DF-21D. The DF-21D is a mobile platform that has a range of between 1,500 to 2,000 km, with a possibility of 3,000 km. There have been reports and confirmation that China has developed an intermediate ballistic missile system in 2016, the DF-26, with a supposed maximum range of 4,023 km.[1] However, due to the relative unknown open source information on this ballistic missile platform, and the similarities required to successfully launch both the DF-21D and the DF-26, the DF-21D will be the focus of this paper. The DF-21D mobile platform is just one aspect of the ASBM system. ASBM systems require near-real-time intelligence to successfully achieve their objectives; the entire kill-chain must be implemented with precision for a mobile vessel, like an aircraft carrier, to be struck and damaged to the point of disability or destruction.

[1] Kazianis, Harry J. "China's DF-26 Anti-Ship Ballistic Missile: What Does the Pentagon Really Think?." *The National Interest.*18 May 2016.

This paper will be researching the required support systems for the ASBM, what is necessary for successful ASBM deployment along the kill-chain, the doctrine for its use, and finally explore a scenario where an ASBM is deployed against a U.S. CSG and U.S. countermeasures in order to answer a focused question: is the ASBM an adequate deterrent to U.S. involvement in the East Asian region, and if not, can the Chinese deploy an ASBM successfully against a U.S. CSG to destroy an aircraft carrier?

Disposition of Opposing Forces

An ASBM system is a "system of systems" and requires complex C4ISR to find potential vessels of interest, then fix on their positions to track and target before engagement. This incorporates detection and identification to ensure the vessels found are the specified targets. This section will identify the specific aspects of C4ISR that China currently has as well as the countermeasures deployable by a CSG.

China

The ASBM system, specifically the DF-21D mobile platform, had originally been placed under and deployed with the Second Artillery Force.[2] The Second Artillery Force was renamed the PLA Rocket Force on December 31, 2015. While retaining all their previous responsibilities, the 2015 reorganization also made the PLARF its own military branch with increased roles over a wider range of missile maintenance and deployment.[3] The PLARF is believed to have two DF-21D launch brigades in service, and was the military branch that displayed the DF-26 IRBM

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[2] Erickson, Andrew S. and David D. Yang. "Using the Land to Control the Sea?: Chinese Analysts Consider the Antiship Ballistic Missile." *Naval War College Review.* Autumn 2009, Vol. 62, No. 4.
[3] Cordesman, Anthony H. "The PLA Rocket Force: Evolving Beyond the Second Artillery Corps (SAC) and Nuclear Dimension." *Center for Strategic & International Studies*. 13 October 2016.

during the Victory Day parade, they are reported to have 16 in testing.[4] The PLARF has launch brigades in six military bases: Shenyang, Beijing, Jinan, Nanjing, Guangzhou, and Lanzhou. The two DF-21D brigades could be stationed at any one of these bases at a given time. These brigades are in command of approximately 146 medium range ballistic missiles, but only the DF-21D has the capabilities required for ASBM usage; the PLARF has roughly 18 DF-21D missiles.[5] Based on the number of missiles compared to the number of brigades, it is safe to assume that there are 9 mobile platforms per brigade. The DF-21D is a theater-range ballistic missile equipped with a maneuverable reentry vehicle designed to hit moving ships at sea.[6] It is considered combat capable with top speeds of Mach 10 and a range of between 1,500 – 2,000 km, with a possibility of 3,000 km should a third "glide" phase be added[7] that would implement a wavelike trajectory accomplished through igniting its liquid-solid fuel booster several times during mid-course flight.[8] This wavelike propulsion is not confirmed to be in use, but is still in the investigation stages. The DF-21D has a missile kill radius between 25-40 km, the distance from its pre-launch target point to where it can still have 50% chance of engaging the target.[9] However, the DF-21D has never been tested on water, nor on a moving target so its effectiveness is still questionable. In order to increase the probability of a successful ASBM launch, the PLARF will have to either increase the salvo size, the number of missiles fired at a single time,

[4] "Chapter Six: Asia: The Military Balance." Routledge: Taylor and Francis Group. 9 February 2016. Pp. 211-306.
[5] "Chapter Six: Asia: The Military Balance."
[6] O'Rourke, Ronald. "China Naval Modernization: Implications for U.S. Navy Capabilities – Background and Issues for Congress." *Congressional Research Service.* 17 June 2016.
[7] Heginbotham, Eric. "The U.S. – China Military Scorecard: Forces, Geography, and the Evolving Balance of Power 1996-2017." *Rand Corporation.* Chapter 7. 2015.
[8] Hagt, Eric, and Matthew Durnin. "China's Antiship Ballistic Missile: Developments and Missing Links." *Naval War College Review*, Autumn 2009, Vol. 62, No. 4.
[9] Heginbotham, Eric. Ch. 7.

or increase the speed and reliability of detection, tracking, and identification prior to the launch.[10]

The DF-21D system relies on coordinates and information fed to it by radar systems and other sources of ISR. The first aspect of ISR for the ASBM is the Over-The-Horizon (OTH) radar system. This system is believed to be controlled by the PLAAF and has a complex near Xiangfan.[11] The PLAAF is believed to have at least four large phased array radars with detection and tracking capabilities.[12] The OTH radar and Naval Ocean Surveillance Systems (NOSS) are ground based and operate in a high frequency domain, between 3-40 MHz. These systems have a minimum range of 925 km and a maximum range of 3,330km, and can scan a 60-degree sector, roughly 5.3 million square miles, in 24 seconds. OTH radar systems reflect their signal off the ionosphere towards a target located over the horizon and reads the signature that is reflected back over the same path to determine the scope of the target and the distance to the target.[13] The physical attributes of the ionosphere make OTH reflections and readings highly dependent on solar activity. During the day, distinct layers of ionized particles are formed that give a more precise location of a returning signal, while at night, the ionized layers merge into a single region with decreased electron density which then reduces the accuracy of a target's location. OTH systems are also highly susceptible to electromagnetic irregularities, like an increase in solar flare activity, which can greatly alter the electron density and the physical

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[10] Dutta, Debasis. "Probabilistic Analysis of Anti-Ship Missile Defense Effectiveness." *Defense Science Journal.* Vol. 64, No. 2. March 2014. Pp. 123-129.

[11] Heginbotham, Eric. Ch. 7.

[12] "Chapter Six: Asia: The Military Balance."

[13] Saverino, Anna L., Amerigo Capria, Fabrizio Berizzi, Marco Martorella, and Enzo D. Mese. "Frequency Management in HF-OTH Skywave Radar: Ionospheric Propagation Channel Representation." *Progress in Electromagnetics Research* 50 (2013): 97-111.

attributes of the ionized layer.[14] An increase in ionospheric irregularities could possibly reduce the usable frequencies of an OTH system and therefore limit the ability to detect a potential target.[15] Another limitation is the large range resolutions of OTH systems. They are incapable of discriminating between targets that are several kilometers apart, which makes it difficult to target the carrier in a CSG.[16] They could get a rough estimate of the carrier location due to the large radar cross section, and the ability of these radar systems to detect aircraft in flight, as long as the U.S. does not mitigate OTH effectiveness. A final limiting factor of the OTH is their Circular Error Probable (CEP). The CEP is the difference between the actual target location and the expected location, or the 50% probability that the location of the true target is located within the radius of the radar return.[17] China's OTH is estimated to have a CEP of between 22-105 km at a detection distance of 2,000 km and a CEP of 36-178 km at a detection distance of 3,300 km.[18] A more accurate launching of a ASBM would require a smaller CEP. As the OTH CEP increases in relation to the kill radius of the DF-21D, so too does the required number of missiles in the salvo to achieve the desired probable level of damage. Since the Chinese have a limited number of DF-21D missiles at their disposal, they cannot rely strictly on OTH and NOSS systems for coordinates of potential targets given the large probability for failure. OTH and NOSS systems are therefore a cueing device for more precise targeting data.

Space-based imaging assets can be cued to offer more useable data. China has approximately 77 satellites in orbit: 5 for communication, 18 for GPS and timing, 39 designated

[14] Hunt, Stephen M., Frederick J. Rich, and Gregory P. Ginet. "Ionospheric Science at the Reagan Test Site." *Lincoln Laboratory Journal* 19, no. 2 (2012): 89-101.
[15] Saverino, Anna L., Amerigo Capria, Fabrizio Berizzi, Marco Martorella, and Enzo D. Mese.
[16] Heginbotham, Eric. Ch. 7.
[17] Nelson, William. "Use of Circular Error Probability in Target Detection." *The MITRE Corporation.* Bedford, Mass. May 1988.
[18] Heginbotham, Eric. Ch. 7.

for ISR, and 15 ELINT/SIGINT.[19] The satellites that are most likely to be cued for the use of an ASBM launch are their Synthetic Aperture Radar imaging satellites and their Electro-Optical imaging satellites from the Yaogan series. The SAR satellites are numbered 1,3, and 6. Yaogan 1 and 3 have resolutions of 5-20 meters while Yaogan 6 has a resolution of 1.5.[20] The SAR satellites have a swath ranging from 40-100 km. The EO satellites are numbered 2,4,5, and 7, and have a resolution ranging from 1 to 1.5 meters. A typical constellation will include SAR, EO, and possibly SIGINT satellites designed to collect optical and radio signatures to locate and track among other things, possible target vessels.[21] A possible problem with the space-based ISR for ASBM usage is the revisit time of these constellations. In a normal orbit, a constellation has a revisit time of between 6.9 – 13.8 days, but if cued by OTH, this revisit time falls drastically to between 4-8 hours.[22] Despite the relative drop in revisit time, satellite imaging and tracking still leaves open hours of blackouts when information is not being detected. One of the most optimistic scenarios of Chinese satellite usage is the possibility that there are periods in which roughly 8 satellites are cued to a location within an hour and a half.[23] Given the unlikelihood of this perfect scenario, space-based imaging and detection satellites can offer more precise location targeting but still do not offer the real-time intelligence desired for ASBM launches despite their ability to increase revisit times from cueing. The Chinese satellite system command is under PLA jurisdiction, more specifically, the Strategic Support Force (SSF) under direction of Lieutenant General Gao Jin.[24] The SSF is categorized as having responsibility over information

[19] "Chapter Six: Asia: The Military Balance."
[20] Heginbotham, Eric. Ch. 7.
[21] Erickson, Andrew S. Chinese Anti-Ship Ballistic Missile (ASBM) Development: Drivers, Trajectories, and Strategies. Jamestown Foundation. Washington, D.C. 2013.
[22] Heginbotham, Eric. Ch. 7.
[23] Hagt, Eric, and Matthew Durnin.
[24] Chen, Gang. "New Roles Played by Different PLA Departments after China's Military Reform." *IPP Review.* 22 April 2016.

warfare, specific jurisdictions include cyber and space capabilities, the electromagnetic spectrum, ISR, and UAVs.[25]

The ability of the Chinese PLARF to launch ASBMs depends greatly on the amount of information that they have prior to the launch as well as coordination and communication between the PLARF, the PLAAF, and the PLA, not to mention the CCP and higher authorization to either proceed with or abort the mission. The 2015 reorganization was an attempt to enhance control over military capabilities within the PLA and to ensure this level of coordination would be achieved by the Joint General Staff Department under General Fang Fenghui.[26] The new organization of the Chinese military ultimately created more independent branches and departments that must cooperate in an ASBM strike; these branches and departments now all report directly to the CMC. During a ASBM launch, the CMC will have to coordinate operational and tactical information from the PLARF, PLAAF, SSF, and JGSD. Additionally, without additional sources of information, like submarines or UAVs, ASBMs will be forced to rely primarily on OTH, NOSS, and satellite based intelligence to increase the probability for a successful attack. The factors that determine the success rate of a ASBM launch are the ability of the OTH to limit their CEP and cue additional satellites for more precise prelaunch target locations for the DF-21D. This is highly reliant on the ionosphere (favorable conditions for radar occur during the day, baring a solar irregularity, for both Chinese OTH systems and U.S. detection equipment), sensor and radar manipulation of the U.S., and CSG anti-ballistic defense capabilities. While the ASBM system is in initial combat capability, the ability of an ASBM

[25] Cordesman, Anthony H. "China Military Organization and Reform." *Center for Strategic & International Studies.* 1 August 2016. Pg. 26.
[26] Chen, Gang.

destroying an aircraft carrier in a CSG is a complicated and coordinated undertaking, and that is without the U.S. being on high alert.

The United States CSG

According to the U.S. Navy, there is no real definition of a Carrier Strike Group, but rather they are deployed based on the requirements of the mission on an "as-needed" basis.[27] The vessels that will be used for this simulation come from the forward deployment vessels of the U.S. 7th Fleet that are stationed in Japan. It will constitute a Nimitz-class carrier with a carrier wing of 70 aircraft, three Arleigh Burke-class destroyers, and two Ticonderoga-class cruisers. Normally, additional Los Angeles-class attack submarines, medical vessels, and transport logistical support ships would also be deployed, but for the parameters of this simulation they will be left out.

The Nimitz-class aircraft carrier has a displacement of 102,000 tons and has a length of 317 meters. Carriers can reach maximum speeds of over 30 knots. Standard carriers are fitted with Raytheon Rolling Airframe Missile systems that are intended to provide short-range defense against ASM, additional defensive measures include four six barreled mk36 Sippican Super Rapid Bloom Off-board Chaff decoy launchers.[28] The SRBOC fires flares and chaff. These countermeasures are used to avoid detection and counter against incoming air attacks by dispensing a large amount of aluminum fibers that reflect radar signals and increase clutter. More modern radar systems are capable of deciphering these measures as decoys.[29] A carrier can detect incoming radar emissions using the Raytheon AN/SLQ-32 electronic warfare system. The

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[27] U.S. Navy. "The Carrier Strike Group." Accessed at: http://www.navy.mil/navydata/ships/carriers/powerhouse/cvbg.asp.
[28] "Nimitz Class Aircraft Carrier, United States of America." *Kable Intelligence Limited.* 2016.
[29] Pike, John. "Chaff-Radar Countermeasures." *GlobalSecurity.org.* 7 July 2011.

AN/SLQ-32 has the capability of identifying and directing capabilities to multiple threats, and is used on carriers, destroyers and some cruisers. Raytheon states that the AN/SLQ-32 system can achieve its goals with 100% probability and will ensure jamming protection and response will be enabled before a ship can be fired upon by long-range targeting systems.[30] The detection and countermeasure systems are integrated through the mk2 Ship Self Defense System (SSDS) developed by Raytheon. A potential problem with Raytheon's SSDS is that it was upgraded to have a decreased time delay between the detect and engage sequences against ASCMs traveling at Mach 9, there is little information on whether or not it would be able to counter the DF-21D traveling at Mach 10.[31] The strength of the aircraft carrier lies in its ability to detect incoming radar and hide its approach from enemy systems. This greatly increases the CEP of Chinese OTH and decreases the probability of a successful ASBM attack should China launch without satellite imagery.

The Arleigh Burke-class guided missile destroyer was built with defense in mind. These destroyers are approximately 155 meters long, displace roughly 10,000 tons, and can travel at speeds up to 30 knots.[32] Its main components are the AEGIS weapons system, AN/SLQ-32 system, and the Tomahawk weapons system. The AEGIS system's greatest asset is the AN/SPY-1 multi-function phased-array radar.[33] This allows the AEGIS to simultaneously search and track more than 100 targets and conduct anti-air, anti-surface, and anti-submarine operations. The limitations of the AEGIS system are being addressed in the upgrades that are currently being modified. Since the Arleigh Burke-class was deployed in 1991, they have had to constantly upgrade their software and defensive capabilities. The current effort is to incorporate

[30] Raytheon. "AN/SLQ-32(V) Shipboard EW System." *Raytheon Company.* 2015.
[31] Raytheon. "Ship Self-Defense System (SSDS)." *Raytheon Company.* 2016.
[32] U.S. Navy. "Destroyers – DG." *U.S. Navy.* 13 January 2016.
[33] "AEGIS Weapon System." *U.S. Navy Naval Sea Systems Command.* 5 January 2016.

modernization of ballistic missile defense. The current limitations of the AEGIS system are remedied with the AN/SLQ-32 system already in place. While an offensive weapon, the Tomahawk system manufactured by Raytheon is a missile that could prove instrumental in an exchange between China and the U.S. should China launch a ASBM attack. The Tomahawk missile has an operational range of roughly 1,600 km and can be re-directed in flight.[34] Should the CSG advance as far as Okinawa, Japan, a Tomahawk missile could potentially reach Xiangfan, China, a distance of 1,640 km, and destroy their OTH radar complex as well as potential DF-21D platforms given coordination with other American ISR capabilities.

The Ticonderoga-class cruiser displaces approximately 9,600 tons, is 173 meters long, and travels at high speeds of 32.5 knots. Cruisers serve primarily in a battle force role, but in this scenario they will serve as support for CSGs. Cruisers are equipped with Tomahawk weapons systems, the AEGIS system, and many have been outfitted with Ballistic Missile Defense capabilities.[35] The radar capabilities of cruisers are less than the carriers and battleships, but they are in the process of being over-hulled with improved electro-optical systems.[36] In this simulation it is assumed that the cruisers will not have the improved electro-optical radar capabilities, and will rely on the AEGIS system linked with the newly outfitted ballistic missile countermeasure capabilities for defense.

The CSG has the ability to detect incoming radar systems, and then proceed to track their origin while masking their own signatures. It then has the armaments to launch countermeasures at incoming cruise and ballistic missiles traveling at speeds of Mach 9. The CSG can also maneuver to decrease strike probability while remaining close enough to throw off the OTH

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[34] Raytheon. "Tomahawk Cruise Missile: Modern, Mature, Powerful." *Raytheon Company*. 2016.
[35] U.S. Navy. "Cruisers – CG." *U.S. Navy.* 13 January 2016.
[36] U.S. Navy. "Cruisers – CG."

radar that has difficulty identifying vessels that are traveling in groups. The CSG is a formidable force that has been built to protect the carrier and counter any force that would challenge it.

Doctrine of Confrontation

China has declared on multiple occasions that the use of ASBM will only be done so under extreme circumstances. Senior Captain Duan Xiaoxian of the PLAN stated in 2010, that "These ground-based weapons are solely defensive in nature. Its defensive scope is limited. It would only be used do deal with Taiwan independence forces and those who sought to support them…"[37] PLA Chief of General Staff General Chen Bingde reiterated these sentiments in 2011when he recalled a conversation that he had with Admiral Mullen, Chairman of the Joint Chiefs of Staff.[38] The Taiwan issue is at the forefront of reasons for the use of ASBMs based on the time frame of the early developments of the ASBM system and the declarations of Duan and Chen. China does not want to wage an actual war using ASBMs, the escalation from an effective attack on a CSG would have a more negative affect on their objectives than it would benefit them. China seeks to make the U.S. pause and consider their actions when deciding to use a CSG in the vicinity of Chinese interests. The ASBM system is the ultimate deterrent against an aircraft carrier, and it also sends a message to the American allies in the region that they can no longer rely on the U.S. Navy to press their cases against China, they will have to deal with China directly and on China's terms. The United States disagrees with their definition of defense and views the development of an ASBM as a form of aggression. According to China, intent is much more meaningful than capability, to which the U.S. would disagree.[39] The U.S. believes that capability is far more important than intent, and that this development will open up

[37] Erickson, Andrew S.
[38] Erickson, Andrew S.
[39] Hagt, Eric, and Matthew Durnin.

China to pursuing interests more aggressively that they would normally have. ASBM systems are a security concern for the U.S., and they are viewed as a means for China to establish a hegemon in Asia that denies U.S. access to areas of core interest to the nation and threatens the sovereignty and international rights of our allies. The U.S. will continue to develop countermeasures and capabilities to ensure area denial is not reached.

Scenario Parameters

Taiwan has declared itself the independent Republic of Taiwan on April 29, and has severed communications from the People's Republic of China and has begun building up defensive capabilities for the prospect of an invasion by the PLA. On May 1, the ROT has issued a plea for the U.S. to intervene on their behalf. The United States has agreed to send a CSG to dissuade the PRC from conducting an all-out invasion of the island after negotiations failed to persuade them otherwise. A CSG consisting of an aircraft carrier, three destroyers, and two cruisers set out from Yokosuka, Japan, at 0300 on May 2 to attempt to stave off PLA forces and assist the ROT. The weather for the week looks to be mostly clear, with sporadic cloud coverage. Due to favorable conditions and inability to achieve their objectives through diplomatic channels, Chinese leadership has decided to launch a ASBM attack against the CSG in route towards Taiwan, and immediately began preparations for the mission. The U.S. CSG is aware of a possible ASBM attack and is implementing standard countermeasure capabilities.

Scenario Confrontation

OTH radar complex in Xiangfan, China begins scanning for the U.S. CSG, which has left Yokosuka, Japan at 0300 on May 2, and is traveling at 25 knots, or 46.3 kph. The PLARF DF-21D Brigades are prepped and on standby for coordinates in anticipation of a ASBM launch from PLA bases in Jinan and Nanjing, both roughly 780 km from the Xiangfan OTH complex.

The Chinese OTH radar system detects the CSG at 1700 on May 2, 650 km straight south of Osaka, Japan, 2,180 km away from the Xiangfan facilities. The OTH has a CEP of between 22-105 km, and immediately sends data to space-based imaging assets to identify and more accurately locate CSG elements. However, CSG detects OTH radar from Xiangfan and implements jamming and other systems to hide their signals. The CSG also spreads the formation spacing to 30 km and increases speed to 30 knots, or 55.56 kph. A Chinese satellite constellation consisting of SAR, EO, and SIGINT satellites are cued and redirected to provide more precise imaging, it takes 2 hours for constellation direction. Since the CSG is over the maximum range of the DF-21D and additional imaging is required for accurate targeting, the Chinese decide to allow another constellation two more visits for more precise imaging, it takes 4 hours for the constellations to make another pass, total of 8 hours. In this time period, the Chinese are able to get additional NOSS readings. 10 hours after the redirection of the constellations the CSG is 555 km farther than they were when they were first detected by the OTH system, and 1,200 km from the Nanjing DF-21D Mobile platforms and 1,600 km from the Jinan facilities. The CSG is also now less than 1,000 km from Taipei, the capital of the ROT at approximately 0300 May 3.

The Chinese images from the limited OTH and NOSS, what could be salvaged from jamming, coupled with the satellite precision has created a CEP of 70 km; 50% of the ASBMs launched will successfully land within the 70 km radius of the CSG targeted location. The 1,200 - 1,600 km distance of the DF-21D platforms to the expected target creates a kill radius of 35 km. A DF-21D must be within 35 km of the vessels of the CSG for it to re-maneuver into a position where it will be able to strike otherwise it will detonate in the ocean and be ineffective. Since the ratio of kill radius to CEP is 35 to 70, a single DF-21D has a lower probability of first being able to reach the area of the CSG and then being able to maneuver to the location of the target when the warhead arrives in the vicinity. A more successful attack would incorporate a low CEP, for example 35 km, in relation to a higher kill radius, like 40 km, this occurs when ISR delivers more accurate real time data and the target is closer to the launch platforms. In this example, a DF-21D is already in range of the target should it land within the CEP. A CEP of 70 km with a kill radius of 35 km requires a larger salvo to achieve a higher probable hit rate. A CEP of 70 km covers an area of 15,386 km, an area able to be covered by four kill radii of 3,846.5 km. This means that China will have to launch eight DF-21Ds to have four land within the CEP of the CSG. This does not take into consideration missile overlapping nor the deployment of countermeasures. Once this is accounted for, all 18 DF-21Ds will need to be fired in order to achieve the highest probable rates of return for the Chinese. Should all 18 DF-21Ds be fired immediately at 0300, 9 would fall within the 70 km CEP radius. Of these 9, the likelihood of the aircraft carrier being within the kill radius of two DF-21D missiles is a little higher than 25%. This represents the greatest opportunity for maximum fire capability, however, it is highly unlikely that the DF-21Ds will be launched immediately, there is an expected additional hour lag for communications and the human error factor from the time the missiles have been decided to be fired and when they actually are. The ASBM launches will occur between 0400 and 0500 on May 4, and the DF-21D will be expected to travel approximately 1,100 to 1,500 km from their launch platforms to their designated targets, and will arrive between 5-10 minutes after being launched. Given the low probability of success based on the CEP ratio to the kill radius, the travel speed of the CSG, the number of DF-21Ds able to be fired, and the nature of the defense systems and ballistic missile defense of the Cruisers, the most damage to be expected from an ASBM strike would be minimal. The Chinese now have no more DF-21D missiles, and will have to resort to other measures to try and halt the forward progress of the CSG.

Conclusion

The ASBM is a system that is highly reliant on C4ISR and real time information feed. While China has developed a capable platform and effective OTH and satellite systems, their capabilities are mitigated by U.S. countermeasures. Currently, the ASBM is not a "one shot one kill" weapon nor a "carrier killer," but it is a capable weapon that will make the U.S. consider their actions in the maritime environments surrounding China's interests. In this sense, the ASBM is already acting as a deterrent. However, if the U.S. would want to intervene in the region, there is little that China could do to fully stop a CSG. This is a problem that they will continue to address for the foreseeable future as they continue testing IRBMs, improvements to ISR systems, and continue to better coordinate the C4 structure. China is improving and has demonstrated a commitment to the development of a more capable ballistic missile system. The ASBM is a weapons system that could potentially pull the U.S. into a very deadly confrontation depending on the level of damage done to a CSG and the possibility of a nuclear payload as demonstrated in their DF-26 development. It is in the best interest of both nations to keep an open dialogue on further IRBM development and means to deter their potential use.

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