21st Century Anti-Scouting for Carrier Strike Groups – Countering Detection in the Anti-Access/Area Denial Environment

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14. ABSTRACT

As peer/near-peer adversaries continue rapid growth in intelligence, surveillance, and reconnaissance (ISR) capabilities, long-range strike, and development of maritime platforms, the U.S. faces great challenges in maintaining maritime superiority. Operational commanders must perfect and employ creative techniques to prevent being detected, located, and targeted by the multiple threats posed by China's anti-access/area denial (A2/AD) capabilities. The author asserts that success for the U.S. Navy and the viability of a first strike capability from a carrier strike group (CSG) in the Western Pacific requires a significant paradigm shift in operational thinking. This paper considers the effectiveness of the current CSG and whether anti-scouting is a realistic concept today. Objective analysis will conclude that for a carrier strike group to attack effectively first in today's threat environment, it requires more than emissions control and dispersal; it must be able to counter-detect in multiple warfighting domains simultaneously.

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INTRODUCTION

> *All warfare is based on deception…when we are near, we must make the enemy believe we are far away; when far away, we must make him believe we are near. Attack him where he is unprepared, appear where you are not expected.*[1]
>
> —Sun Tzu, *Art of War*

In the age of rapid technological advances and near-peer adversaries, the United States Navy is facing a great power struggle for maritime dominance. The exponential growth of new technology in both the civilian and military sectors – in the areas of cyberspace, automation, communications, intelligence collection, and long-range vessels, aircraft, and weapons – has made it difficult for maritime commanders to follow Sun Tzu's edict. War today is no less based on deception, but in the information age, it is arguably more difficult to achieve the element of surprise that deception provides. For a carrier strike group to attack effectively first in today's threat environment, it requires more than emissions control and force dispersal; it must be able to counter-detect in multiple warfighting domains simultaneously.

One only needs to turn on the news, peruse social media feeds, or scan defense blogs to discover how the latest technology is being used to deny the U.S. the ability to achieve superiority in every domain. Information is readily available on everything from naval combat capabilities to deployment schedules, and social media adds another dimension to the problem making every user a potential intelligence source. Buzz words such as *communications denied*, *carrier-killer*, and *anti-access/area denial (A2/AD)* are thrown around freely in conversations by learned military leaders as if to say the U.S. is relegated to accept these circumstances.

Can a carrier strike group remain hidden in the era of modern technology? The situation may seem dismal, but the U.S. Navy has faced daunting challenges since its inception; the shift from sail to steam, battleships giving way to carrier air, and now the highly contested information age. U.S. commanders must recognize the operational necessity of shaping the

information available to the adversary and using it as a tool to balance time and space to maximize the effects of force from the sea. By doing so, carrier strike groups can continue to provide the effective first-strike capability they have enjoyed in years past.

The current maritime environment is laden with advanced technology designed to detect, identify, track, and target U.S. Navy carrier strike groups, long before they can achieve any level of surprise. Furthermore, current Navy and Joint doctrine do little to explore actions necessary to mitigate this threat. A synchronized multi-faceted solution is required, yet there is a glaring gap in doctrinal parity across the warfare domains. However, it is still possible for CSG commanders to achieve operational success if deliberate actions are taken now to prevent enemy scouting while maximizing friendly use of the information environment.

BACKGROUND

Over the past several decades, the U.S. Navy has freely operated uncontested across the maritime commons to project America's power globally from the sea.[2] Peer competitors now threaten this freedom of movement with superior technology, advanced weaponry, and better scouting. The challenges posed by technological advancement are nothing new to the Navy; the ability of the U.S. Navy to remain responsive by adapting to new technology has always been a strength and must continue to be the case.

One example of U.S. Navy responsiveness to technological change occurred following WWII when the Soviet Union quickly emerged as the new global maritime adversary. As with all great power struggles, each side worked tirelessly to create a military advantage, leading to developments such as nuclear-powered submarines and intercontinental ballistic missiles.[3] For the U.S. Navy to provide an offensive strike capability if called upon, it had to devise a way to get aircraft carriers close enough to Soviet territory without being detected. As a result of this

operational dilemma to remain undetected by Soviet scouting, the U.S. Navy conducted the HAYSTACK and UPTIDE experiments from the 1950s through the 1970s, which focused on deception by dispersal of forces and management of the electromagnetic spectrum through emissions control (EMCON) measures.[4]

While proven to be successful counter-detection methods, one could argue the techniques developed during HAYSTACK are insufficient in the information age due to the adversary's overlapping collection and offensive capabilities from the sea, land, air, space, and cyberspace. Countering today's threats requires an adaptive and agile force. Admiral Richardson spoke on the importance of "technological agility" at the Brookings Institute in February 2019, categorizing it as a critical capability in the dynamic security environment faced today, where information plays an increasingly important role in multi-domain military operations.[5]

Technology facilitates long-range scouting by improving intelligence, surveillance, and reconnaissance (ISR), allowing navies to fight from over-the-horizon and through cyberspace. Likewise, technological agility requires an effort to identify and exploit weaknesses in these new capabilities to provide an advantage over the adversary. Counter-detection is now more important than scouting in many regards. To attack effectively first commanders must understand the two-sided nature of naval combat described by Wayne Hughes in *Fleet Tactics*; "each side is simultaneously stalking the other."[6]

Today, the U.S. Navy faces a rapidly changing security environment across the globe, with the added challenge of competition for maritime dominance by China. China's deviation from the rules-based system and international historical norms in the South China Sea, coupled with over-the-horizon radar (OTH-R), long-range missiles, a rapid build-up of naval platforms, and aggressive intelligence-gathering tactics in both physical and cyberspace, creates a volatile

environment for the U.S. Navy.[7] A recent *New York Times* article notes that for China's People's Liberation Army Navy (PLAN) to counter the advantage that aircraft carriers provide the U.S. Navy, it has worked diligently to "develop 'anti-access' capabilities that use radar, satellites, and missiles to neutralize the decisive edge."[8] U.S. Navy leadership recognizes the urgency of the threat. In the 2018 CNO's "A Design for Maintaining Maritime Superiority Version 2.0," Admiral Richardson looks to shape the Navy's focus on maintaining control of the sea, becoming more technologically agile, and incorporating the best use of information and data into the commander's decision-making cycle at every level.[9] Even so, is it too late for the U.S. Navy refocus and win the contest with China for maritime dominance by truly taking full advantage of the information domain?

China has worked diligently to create an asymmetric advantage over the U.S. within the Pacific Theater by growing its military capabilities at an astounding rate over the past two decades. Implementation of multiple signals intelligence (SIGINT) ground stations in and around mainland China, plus a robust intelligence-gathering fleet of ships (both Navy and the paramilitary maritime militia), focus on detecting and tracking U.S. Navy platforms at distant ranges.[10] Additionally, the PLAN is poised to overtake the U.S. Navy in four ship classes by 2022, reaching numerical superiority by 2030 at current growth rates.[11] Considering this progress, China possesses a significant advantage over the U.S. in the ability to conduct ISR.

Adding teeth to China's extensive scouting capabilities are a series of ballistic missiles designed to target U.S. carrier fleets, aircraft, and ground stations in the Western Pacific Ocean. The two most serious threats to the U.S. are the Dong Feng-21D (DF-21D) anti-ship ballistic missile with a 1,500km range, and the newly fielded Dong Feng-26 (DF-26) mobile transporter-erector-launcher (TEL)-launched intermediate-range ballistic missile capable of striking targets

up to 4,000km away (see figure 1).[12] China's intentions are clearly to deter U.S. freedom of maneuver in the region and to possess a capable offensive strike option if deterrence should fail.

Figure 1 – China's Missile Ranges[13]

The threat posed by China across all domains of warfare places the U.S. in a critical position. Outnumbered in platforms, out-reached in strike, the U.S. must strive to create advantages where it can while it works to grow an offensively-capable fleet for the future. China's A2/AD curtain of networked platforms with passive detection and active radar capabilities, space-based collection systems, and formidable anti-ship weaponry makes countering detection very difficult. That is why it is so critical for the U.S. Navy to refocus its efforts in areas that will improve anti-scouting, such as controlling the electromagnetic spectrum, using dispersal techniques, and focusing on counter-ISR plus active deception.

21st CENTURY ANTI-SCOUTING

For CSG commanders to have the option to initiate an effective first strike in a conflict with China, they must be able to locate and target the adversary (scouting) while preventing the same from happening to friendly units (anti-scouting). To fully appreciate the concepts of scouting and anti-scouting in the 21st Century is to understand the necessity of commanders to utilize command, control, communications, computers, and intelligence (C4I) effectively while disrupting the adversary's ability to scout.[14] Countering detection across all domains of warfare concurrently will be the key to successfully preventing the adversary from achieving mission kill on U.S. Navy CSGs.

Scouting has always played a significant role in naval warfare. In the 1896 edition of *The Naval Annual,* the author analyzes various scouting techniques used in relevant battles at sea. While each commander employed different scouting methods, the common thread for that era was the need for battleships to be able to see and communicate with their scouts to be effective.[15] However, advanced communications technology negates the need for scouts to remain in constant visual presence of the rest of the battle group, effectively extending the targeting range. A strike group commander who can employ scouting platforms at longer ranges than the adversary will have both the tactical and operational advantage in combat.

Successful commanders will employ counter-detection to erode the adversary's decision-making processes and create an advantage. Effective anti-scouting techniques, like military deception, jamming radars and communications, and even physical destruction of the scout, are complementary to the maxims of spectrum control and force dispersal.[16] Commanders rely on relevant, timely data to inform their decisions. Therefore, effective anti-scouting will thwart the enemy commander's decision-making cycle. Kline captures this well in "Distributed Lethality,"

by basing his doctrine on three main points: "Out think the enemy. Out scout the enemy. Out shoot the enemy."[17]

Anti-scouting is difficult in such a complex technological environment, but not impossible to achieve. It requires a significant divergence from the open and transparent way the U.S. Navy currently operates and must begin before ships leave the pier. The information age produces inherent vulnerabilities to military operations; social media, 24-hour news cycles, vulnerable networks, and lax OPSEC practices all play a part. Even a novice can ascertain the timing and makeup of a CSG deployment by merely observing readily available data: coverage by multiple news media outlets in advance, Facebook pages offering support and tailored events for dependents, and even naval station gate traffic or busses of Sailors arriving at the piers.

The ability of the U.S. Navy to project power globally relies on long logistics tails to ensure supplies and parts arrive when and where needed. A recent Department of Defense report noted both commercial and military logistics networks are vulnerable to exploitation and cyber-attacks, which can derail combat operations before they even start.[18] Adversaries can hack into vulnerable networks of contractors supporting military logistics to determine equipment status (based on ordered parts) and operating areas (based on what ports-of-call are projected for delivery). Effective anti-scouting requires resources to harden these networks to prevent adversaries from crippling military operations from across the globe.

The U.S. Navy must think creatively for effective 21st Century anti-scouting and these techniques must be applied routinely across all warfare domains. Considerations for active deception, such as publishing false deployment objectives, erroneous ports-of-call, and staggering underway dates for strike group assets, are viable options. Additionally, hardening critical infrastructure and requiring defense contractors to maintain secure networks will help

ensure operations security. Commanders must adhere to strict enforcement of the existing naval policy on OPSEC to preserve the element of surprise.[19] Ultimately, countering detection is the most critical step to achieving an effective first strike in a future maritime conflict, and commanders must strive to exploit the enemy's weaknesses while protecting their own.

ELECTROMAGNETIC SPECTRUM CONTROL

For decades, the main line of effort of the U.S. surface Navy in the electromagnetic spectrum (EMS) has been strictly passive electronic warfare (EW) and communications/signals intelligence and has lacked adequate investment to improve these capabilities afloat. While updates to software and hardware have occurred over the years, advances in technology have led adversaries to develop radars and missiles outside the collection ranges of the existing EW collection equipment, posing a significant threat to the U.S. fleet.[20] Warfighting in the EMS is more than traditional EW at sea, and passive collection is only a small fraction of what commanders require to have freedom of maneuver in this domain.

To remain a global maritime power in the 21st Century, the U.S. Navy must rapidly adapt to the ever-changing information environment and shift from operating in the EMS to fighting in it. Strike group commanders must treat the EMS as a warfighting domain like any other, whereby operators can apply the decades-old joint doctrine to find, fix, track, target, engage, and assess (F2T2EA) the adversary.[21] Viewing the EMS as merely another domain of warfare, strike group commanders can then think through how to maneuver their forces in a manner that enables freedom of action (effective use of the spectrum) while preventing the enemy from doing the same (counter-detection).

As the EMS is a "global commons" similar to the sea, it stands to reason that Mahan's principles of controlling the sea, or characteristics of sea control as described by Dr. Milan Vego,

would likewise apply in this environment.[22] Like the sea, the need to achieve EMS control is driven by the commander's intent and stated objectives. Adapting Vego's concept of sea control, figure 2 identifies considerations to achieve the desired effects of EMS control.[23]

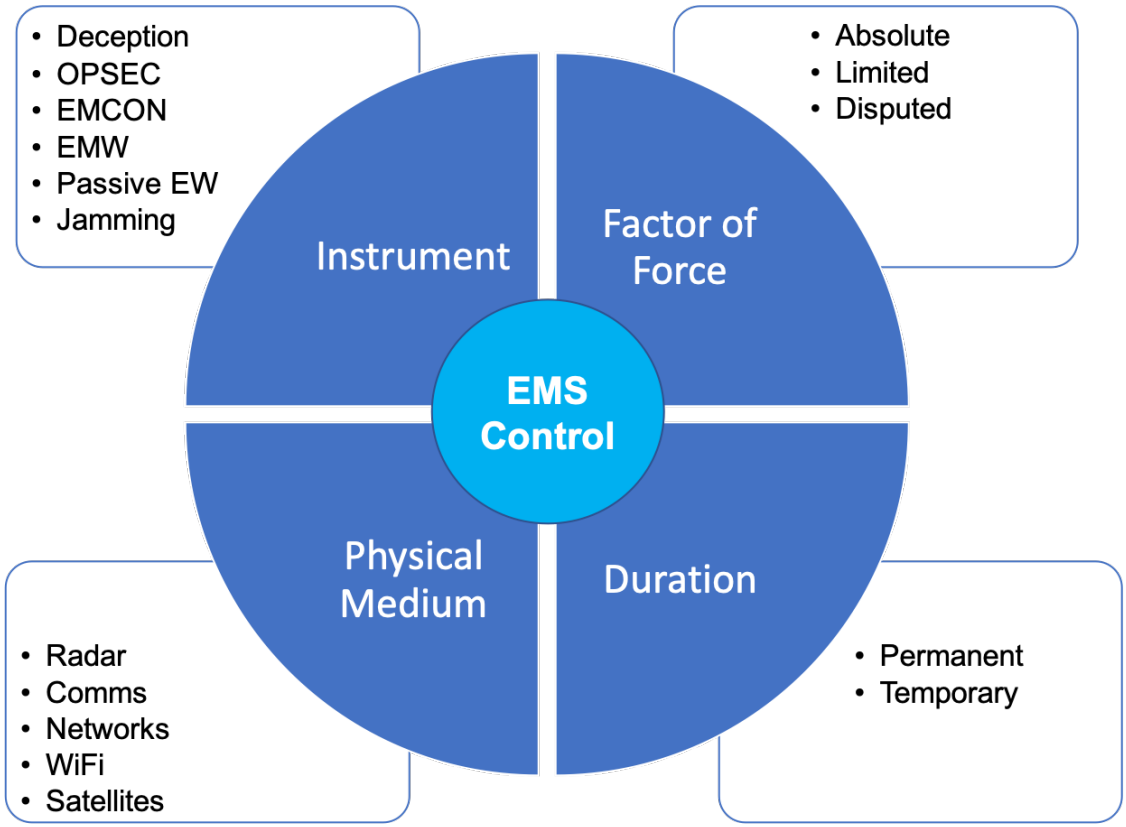

Figure 2 – EMS Control

Achieving EMS control requires active measures to attain EMS superiority – dominating the spectrum to support operations across all other domains is a critical enabler to operational success.[24] This involves a significant paradigm shift in the way commanders employ their systems; it requires maneuver in the EMS. Coined as *electromagnetic maneuver warfare* (EMW), this active measure is "the Navy's warfighting approach to gain freedom of action in the EMS while denying the same to our enemies."[25]

EMW enables commanders to manipulate how and what equipment operates in the spectrum, instead of the old 'on/off' mentality of EMCON. Moreover, as described by Rear

Admiral Mathias Winter, Office of Naval Research, during a 2016 address to the National Defense Industrial Association, the U.S. Navy has been operating "loud and proud for 20 years."[26] Winter went on to say, "EMW is going to be a game changer in our ability to operate in the denied [environment]."[27]

A successful counter-detection plan for the future CSG includes both passive and active measures and must consider the adversary's capabilities to exploit U.S. vulnerabilities. This is especially important when one studies China's effort to ensure near-complete overhead collection of much of the Pacific. Since September 2017, China has launched a series of SIGINT/electro-optical satellites in the Yaogan Constellation, which were creatively positioned in varying degrees of orbit to enable high-revisit rates over vital geographic areas.[28] Essentially, one of these collection satellites can pass over the same area 54 times in a 24-hour period, with only 22 minutes lapse in coverage.[29] Figure 3 shows the projected footprint and coverage areas.

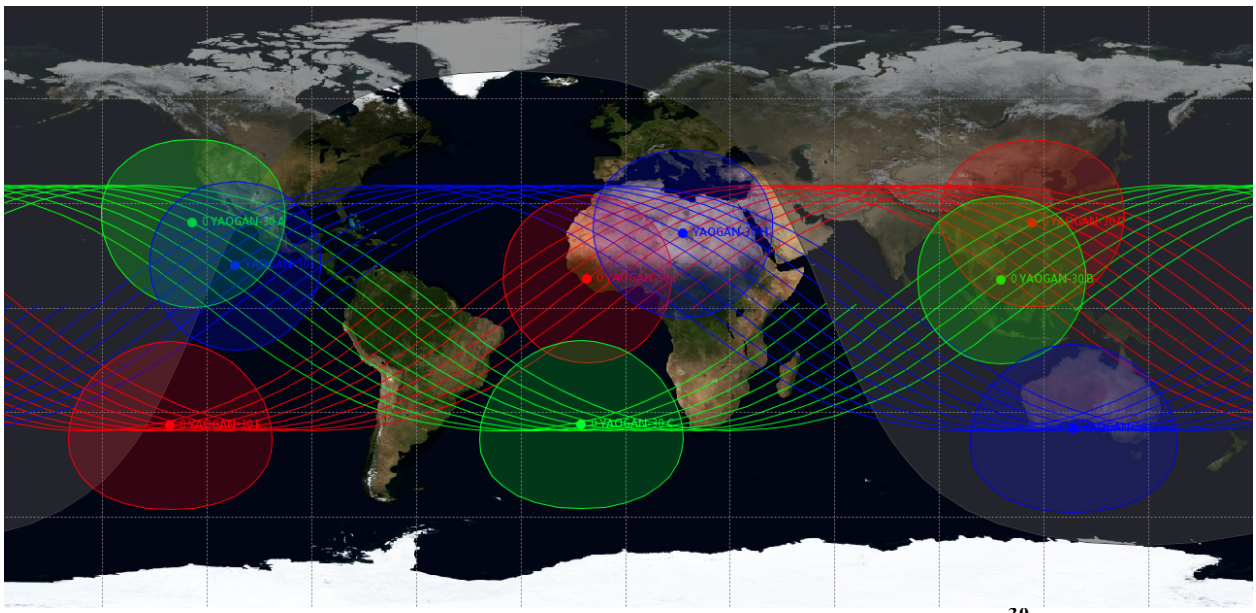

Figure 3 – Chinese Yaogan-30 High-Revisit Constellation[30]

With China aggressively employing A2/AD capabilities across the South China Sea, CSGs will need to apply the fundamentals of counter-detection across all facets of the EMS.

EMCON alone will not be enough to remain undetected inside the second island chain. Commanders must be educated and empowered to freely execute a combination of passive EW, active EMW, and deception techniques simultaneously, to remain undetected.

FORCE DISPERSAL: HAYSTACK 2.0

A real change in thought and action must occur for CSGs to remain initially undetected in a maritime conflict against China. Similar to the goal of the HAYSTACK experiments, to enable an effective first strike from a CSG in the 21st Century, commanders must look at feasible options to extend the survivability of their assets.[31] The strike capabilities that carriers bring to bear are irrelevant if the platforms are located and targeted before they can be employed. From ground-based OTH-R and overlapping satellite coverage dedicated to SIGINT and imagery to long-range anti-ship and ballistic missiles, China has targeted how the U.S. Navy currently operates its CSGs. In a potential future conflict, the U.S. must strive to overcome the burdens of China's extensive layered A2/AD capability, and it is imperative for commanders to operate in ways that maximize the amount of time they remain unlocated.

According to the research thinktank *GlobalSecurity.org*, the implementation of China's combined sky and ground wave OTH-R system in 2017 enables complete coverage of the South China Sea, with ability to detect carrier strike groups and aircraft at ranges of over 1,600 nautical miles.[32] This extended view gives China the ability to locate, track, and target U.S. Navy platforms, and is a significant component of the A2/AD architecture. Figure 4 is a graphical depiction of China's OTH-R systems and assessed viewpoints; note the projected range extends well into the second island chain.

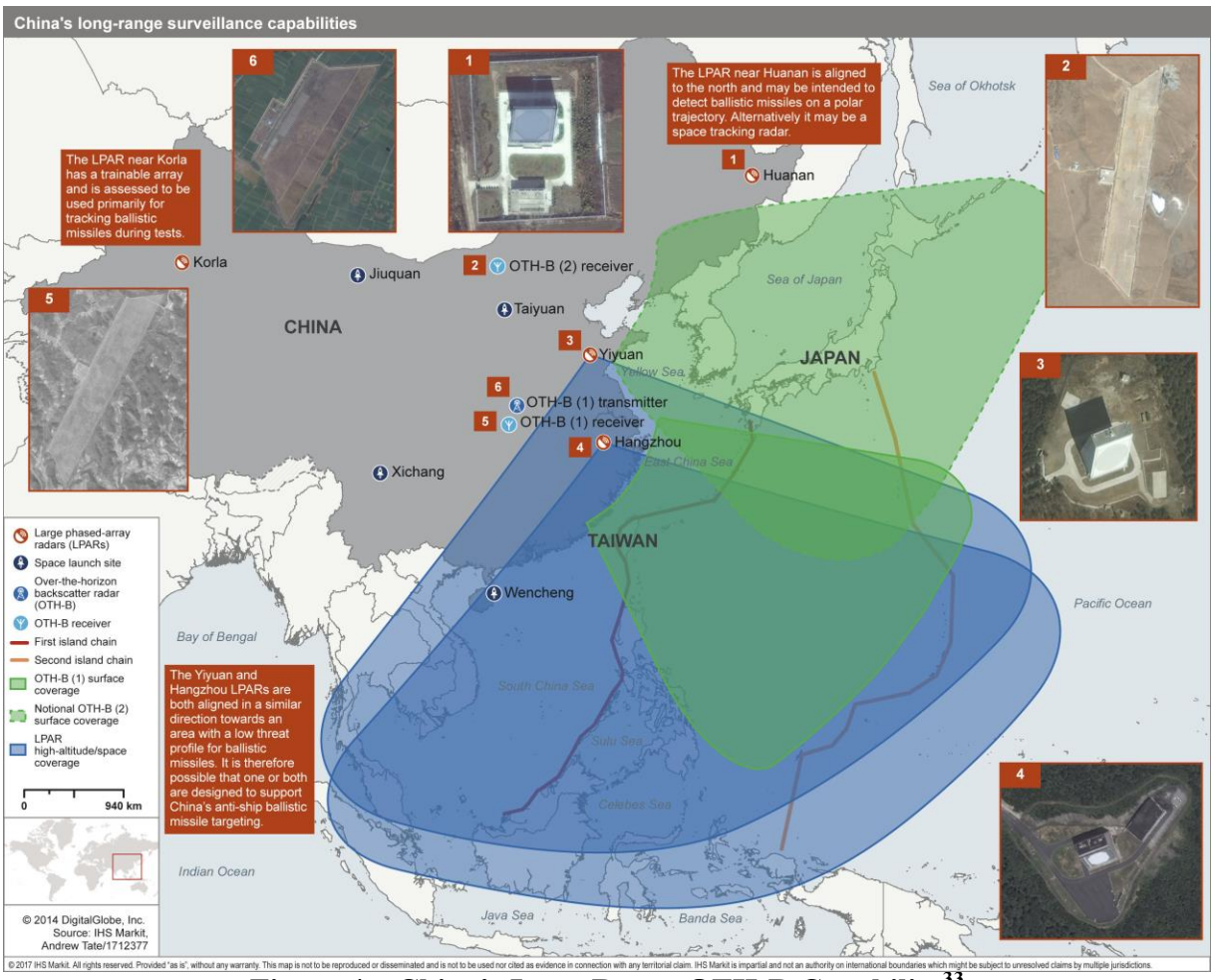

Figure 4 – China's Long-Range OTH-R Capability[33]

The U.S. Navy is not at a complete disadvantage, though. Advanced technology, such as measures to reduce radar cross-section (RCS), can be coupled with creative force dispersal techniques to counter detection by long-range radar. Additionally, employment of deception plans, blending in with merchant shipping, and minimizing operations that are easily attributable to military platforms (flight operations), can be used simultaneously.

To remain undetected long enough to attack effectively first, all the facets of EMS control and anti-scouting mentioned previously must be applied across a dispersed fleet. It is time to dust off the lessons learned in both HAYSTACK and UPTIDE and modify them to meet the challenges faced in the 21st Century. VADM Charles Brown, Commander of U.S. SIXTH

Fleet during the time of the testing, lauded the experiments as successful by effectively extending the "critical survival time" of the carriers to enable strike/counter-strike against the enemy.[34] The need is not to remain undetected indefinitely, only to survive long enough to attack effectively first. CSG commanders will be required to employ active deception tactics as daily routine; disaggregating forces to prevent location while exercising strict EMCON can enable a successful first strike.

In 2015, the leadership of the Naval Surface Forces began to address a solution to mitigate China's A2/AD capabilities with the introduction of the *Distributed Lethality* concept. In a January 2015 article in *Proceedings*, Vice Admiral Rowden (Naval Surface Forces), Rear Admiral Gumataotao (Surface Force Atlantic), and Rear Admiral Fanta (OPNAV N96, Surface Warfare), addressed the Navy's need for a drastic shift to an offensive and dispersed force model.[35] Moreover, the fleet bosses' writing focused on a few key elements: the employment of smaller surface action groups (SAGs) with a variety of offensive weaponry, attaining sea control when and where needed to achieve the objectives, and "spread the playing field" out to force the enemy to shift its focus to overcoming a more robust targeting problem.[36]

The U.S. Navy will continue to have a requirement to deploy and defend its carriers, even under the design put forth by Rowden and his team. However, the use of smaller, dispersed SAGs across a wider geographic area will afford operational commanders a variety of options in a maritime conflict. Considerations must also be made to incorporate both manned and unmanned platforms to maximize capability and minimize risk to life. Regardless of platform, to achieve an effective first strike, the U.S. must invest more into a reliable passive C2 architecture afloat and empower commanders to act. Dispersed forces operating under EMCON or other counter- detection tactics must be able to target and strike the adversary from a completely

passive or semi-passive posture. National, theater-level, and even other tactical unit sensor systems must be able to broadcast targeting quality data to a silent dispersed force, and weapons systems and C2 datalinks must be more capable than today.

One could argue that unit commanders today are not afforded the opportunity to exercise mission command, which is critical to the success of operating in a dispersed manner. The U.S. Navy has freely operated in large strike group formations with unrestricted C2 for decades. Addressed by Jeffrey Kline's article, "A Tactical Doctrine for Distributed Lethality," the author believes that commanding officers must be technically and doctrinally enabled to act independently to achieve the operational commander's intent "under China's A2/AD umbrella."[37] The concept of mission command requires accepting a certain level of risk to be employed effectively, and the U.S. Navy has become risk-averse over decades of peacetime operations.

While the points on distributed lethality are salient and consist of a much-needed major organizational shift from defense to offense, it requires empowering commanders to act autonomously to be successful. Coupled with EMS control and counter-detection techniques, a dispersed force will be most effective. The mindset must change now; otherwise, the first occasion commanders operate 'alone and unafraid' will be in a communications-denied environment with limited/no C2 capability. Since most experts agree the U.S. would face loss or severe degradation of the use of the spectrum in a war with China, it is necessary to maintain EMS control before conflict arises to support counter-detection, while ensuring superiority across the other domains to attack effectively first.[38]

CONCLUSION & RECOMMENDATIONS

> *Although the U.S. Navy has not had a peer competitor for decades, that time is over; that window is closing. Enabled in large part by advances in technology . . . the U.S. Navy now faces significant blue-water competition. It is no longer possible to ignore fleet-to-fleet engagements as naval forces seek to influence events ashore; navies will have to fight their way in from far out at sea.*[39]
>
> —ADM John M. Richardson, 2018

Further complicating the great power struggle for maritime dominance is the rapid technological advances of near-peer adversaries. While there is no single solution to achieve victory in a future maritime conflict within reach of China's A2/AD capability, investigation shows the U.S. Navy has a variety of options which will help facilitate an advantage. While some of the suggestions made in this paper could be considered drastic, one must conclude that the threat necessitates a commensurate response; the crisis is now, and inaction is not an option.

Considering Admiral Richardson's, *A Design for Maintaining Maritime Superiority 2.0*, "the future of the United States depends on the Navy's ability to rise to this challenge."[40] The ability of the Navy to ensure American security and prosperity through the projection of power across multiple domains requires CSGs to master advanced methods of operation to maintain a capable strike option. Although the struggle for dominance poses a real threat, the ability of commanders to maximize friendly use of the spectrum and employment of strike group assets, while conducting anti-scouting, will be the difference between success and failure. For a carrier strike group to attack effectively first in today's threat environment, it requires more than emissions control and force dispersal; it must be able to counter-detect in multiple warfighting domains simultaneously.

Recommendation 1: Conduct a thorough and comprehensive review of Naval doctrine on operating in the EMS, including the addition of EMW. This review must include Military Sealift Command logistics forces to be effective. Commanders should clearly understand the combined use of active and passive measures with the intent of obtaining/maintaining control of the spectrum to the extent required to achieve operational and tactical objectives.

Recommendation 2: Continuous training and enforcement of existing policies on OPSEC, EMCON, and deception tactics. Employment of own-force monitoring on every platform with real repercussions for failing to adhere to the policies. Commanders must be aware of these tools and be able to use them to ensure readiness. The process should be simple and user-friendly.

Recommendation 3: Further address concept of distributed lethality and train CSGs to operate in a dispersed manner with limited C2. Focus on mastering mission command concepts starting with initial pipeline training, and continuing up through command and leadership school. This is necessary to prepare for operations in an A2/AD, communications denied environment. Treat every platform as an offensive weapon and sensor to achieve operational success.

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