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Why AirSea Battle?

BY ANDREW F. KREPINEVICH

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2010

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About the Author

Dr. Krepinevich is an accomplished author and lecturer on US military strategy and policy. He is the author of two books: *7 Deadly Scenarios: A Military Futurist Explores War in the 21st Century* and *The Army and Vietnam*, which received the 1987 Furniss Award. Other recent works published by CSBA include: *US Nuclear Forces: Meeting the Challenge of a Proliferated World*, *An Army at the Crossroads*, and *Defense Investment Strategies in an Uncertain World*. "The Pentagon's Wasting Assets" was published in the Summer issue of Foreign Affairs. Dr. Krepinevich gained extensive strategic planning experience in national security and technology policy through his work in the Department of Defense's Office of Net Assessment, service on the personal staff of three secretaries of defense, and as a member of the National Defense Panel in 1997, the Defense Science Board Task Force on Joint Experimentation in 2002–2003, and Joint Forces Command's Transformation Advisory Board. He has recently joined the Secretary of Defense's Defense Policy Board. He has taught a wide variety of national security and defense policymaking courses while on the faculties of West Point, George Mason University, the Johns Hopkins University School of Advanced International Studies and Georgetown University. Following an Army career that spanned twenty-one years, Dr. Krepinevich retired to become the president of what is now the Center for Strategic and Budgetary Assessments.

Acknowledgments

The author would like to thank Jan van Tol for providing insightful comments on drafts of this paper. Thanks are extended as well to Chris Dougherty and Eric Lindsey for their assistance in researching Chinese and Iranian military developments, and to Charlotte Brock for her superb editing. That being said, the author assumes full responsibility for any shortcomings in this paper.

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For well over half a century, the United States has been a global power with global interests. These interests include (but are not limited to) extending and defending democratic rule, maintaining access to key trading partners and resources, and reassuring those allies and partners who cooperate with the United States in defending common interests. The United States' ability to project and sustain military power on a large scale has been, and remains, essential to this endeavor.

During much of the Cold War, the Soviet Union posed a serious military challenge to US power-projection capabilities. Fortunately, the two superpowers managed to avoid a major war. Nonetheless, the US military's unsurpassed ability to project and sustain large forces overseas was demonstrated in limited wars in Korea, Vietnam and the Persian Gulf, as well as in numerous other, smaller contingencies. In the decade or so following the Soviet Union's collapse the US military's power-projection capabilities in defense of the nation's interests were effectively unchallenged.

This state of affairs is almost certainly ending, with significant consequences for US security. With the spread of advanced military technologies and their exploitation by other militaries, especially China's People's Liberation Army and to a far lesser extent Iran's military and Islamic Revolutionary Guards Corps, the US military's ability to preserve military access to two key areas of vital interest, the Western Pacific and the Persian Gulf, is being increasingly challenged. While both countries profess benign intentions, it is an old military maxim that since intentions can change overnight—especially in authoritarian regimes—one must focus on the military capabilities of other states.

Unless Beijing and Tehran divert from their current course of action, or Washington undertakes actions to offset or counterbalance the effects of their military buildups, it is practically certain that the cost incurred by the US military to maintain access to two areas of vital interest will rise sharply, perhaps to

prohibitive levels, and perhaps much sooner than many expect. Currently there is little indication that China or Iran intend to alter their efforts to create "no-go zones" in the maritime areas off their coasts. The United States is thus confronted with a strategic choice: to risk a loss of military access to areas vital to its security or to explore options for preserving access.

Recently the United States Air Force and Navy agreed to address the issue. Both Service chiefs are committed to pursuing a new operational concept called AirSea Battle which appears designed to assess how US power-projection capabilities can be preserved in the face of the military challenges posed by China and Iran. Given the stakes involved, their efforts to adapt their power-projection forces should command the attention and support of senior national security officials and Congress, as well as the interest and support of America's allies.

INTRODUCTION

> *[W]hen considering the military-modernization programs of countries like China, we should be concerned less with their potential ability to challenge the U.S. symmetrically—fighter to fighter or ship to ship—and more with their ability to disrupt our freedom of movement and narrow our strategic options. Their investments in cyber and anti-satellite warfare, anti-air and anti-ship weaponry, and ballistic missiles could threaten America's primary way to project power and help allies in the Pacific—in particular our forward air bases and carrier strike groups. This would degrade the effectiveness of short-range fighters and put more of a premium on being able to strike from over the horizon—whatever form that capability might take.*[1]
>
> —Secretary of Defense Robert M. Gates

In September 2009 the US Air Force chief of staff, General Norton Schwartz, and the US Navy's chief of naval operations, Admiral Gary Roughead, signed a classified memorandum to initiate an effort by their Services to develop a new operational concept known as "AirSea Battle."[2] While the effort has to date only been described in the most general of terms, to be effective any new operational concept must be designed to address a particular type of challenge, which forms the object of its design. In this case, the effort should (and appears to) focus on the rising challenge to the US military's power-projection capabilities, which take full expression in China's rapidly developing anti-access/area-denial (A2/AD) capabilities and Iran's similar (albeit far more modest) capabilities, which are focused primarily on the Persian Gulf.

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1 Secretary of Defense Robert M. Gates, Speech to the Air Force Association Convention, National Harbor, MD, Wednesday, September 16, 2009, accessed at http://www.defenselink.mil/speeches/speech.aspx?speechid=1379, on November 2, 2009.

2 Christopher P. Cavas and Vago Muradian, "New Program Could Redefine AF-Navy Joint Ops," *Air Force Times*, November 16, 2009, accessed at http://www.airforcetimes.com/news/2009/11/airforce_navy_cooperation_111509w/, on November 8, 2009.

The US military's ability to project power in the Western Pacific and in the Persian Gulf enables the United States to access areas of vital political and economic interest. Until recently, this ability had been effectively unchallenged for decades. Thanks to the efforts of China's People's Liberation Army (PLA) and Iran's Islamic Revolutionary Guard Corps (IRGC), the United States is faced with a strategic choice: begin adapting the way it projects power into these two regions—along with corresponding changes in its military capabilities and force structure—or face the prospect of paying an ever-increasing and perhaps prohibitive price for sustaining military access.[3] As both regions are primarily aerospace and maritime domains, it makes sense for the Air Force and Navy to begin the process of exploring their power-projection options by developing an AirSea Battle concept.

Over time, in the course of developing and refining an AirSea Battle concept, it may make sense to bring the US Army and US Marine Corps into the effort. An argument might be made that all four Services should be present at the creation of this effort. Yet cooperation among military Services has always been a challenge in itself, as demonstrated by the experience of the Army and Air Force in the development of AirLand Battle doctrine in the 1980s.[4]

This paper argues that an Air Force-Navy AirSea Battle concept is needed, for the reasons stated above. It begins by noting the critical role that power-projection operations have played in providing for the United States' security since becoming an active global power nearly seventy years ago. The paper then goes on to describe how China and Iran are engaged in military modernization efforts whose principal purpose appears to be to deny the United States the ability

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[3] For an overview of this issue, see Andrew F. Krepinevich, "The Pentagon's Wasting Assets," *Foreign Affairs*, July–August 2009.

[4] AirLand Battle was the brainchild of General Donn A. Starry, who commanded the Army's Training and Doctrine Command (TRADOC) from 1977–81. Starry sought to develop a new Army doctrine to address the challenge posed to US and NATO forces in Central Europe from a potential attack by the Soviet Union's forces operating in multiple echelons ("waves"). Starry saw the need to engage Soviet second-echelon forces simultaneously with its first-echelon forces. For this approach to work, Starry knew the Army would need the Air Force's cooperation. To convey the sense of the doctrinal shift he envisioned, Starry announced the Army's new concept as "AirLand Battle." The "Air" part of AirLand Battle was intended to signal to the Air Force that the Army believed a strong partnership between the two services was essential. Thus while AirLand Battle became *Army* doctrine; it was *not* Air Force doctrine, nor was it joint doctrine. That being said, the AirLand Battle concept was incorporated in the Air Force's 1984 edition of *AFM 1-1*, now titled *Basic Aerospace Doctrine of the United States Air Force*. The two Services increased their cooperation further when, in 1983, the two respective Service chiefs signed a formal memo of understanding to enhance their joint conduct of the AirLand Battle doctrine. A second memo later that year committed the Services to explore thirty-one specific initiatives regarding air-ground operations associated with AirLand Battle. Despite their success in developing the AirLand Battle concept, and in their efforts to execute it, the effort was far from seamless, and serves as a reminder of just how difficult it can be for even two Services to integrate their efforts. This summary is drawn from Harold R. Winton, "Partnership and Tension: The Army and Air Force Between Vietnam and Desert Shield," *Parameters*, Spring 1996, pp. 100–119.

to sustain military forces in two areas of vital interest, the Western Pacific and the Persian Gulf, respectively. A short conclusion follows.

This paper is the first of two, with the second presenting a point-of-departure AirSea Battle operational concept.

CHAPTER 1 > THE UNITED STATES AND POWER PROJECTION

By virtue of its insular position and global interests, the United States has for over a century relied on its military's ability to project power abroad at distances far from its shores on a scale sufficient to execute a successful campaign against a major rival.[5]

This dependence on power-projection operations has grown over the years, for two fundamental reasons. First, following World War II the United States assumed from Great Britain the mantle of the world's leading democracy and principal guardian against attempts by imperial or totalitarian states to overturn the international order by subversion or force. A growing web of alliances in the middle of the last century found US security inextricably linked with the security of key allies around the globe, especially its English-speaking allies, as well as the members of NATO in Western Europe, and Japan. Second, the need for a power projection capability was accentuated with the United States' growing dependence on overseas commodities, particularly oil, to sustain its economic growth and the well-being of its citizens. The need became even more acute as economic globalization accelerated toward the end of the twentieth century, and, along with it, increased US reliance on global supply chains for a wide variety of goods and services.

During this period of roughly forty years, US military forces engaged in an often intense standoff with the forces of America's superpower rival, the Soviet Union, and its Warsaw Pact allies. The US military's ability to deploy large forces forward at bases around the world, and to reinforce them rapidly, enabled the

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[5] To be sure, the United States' ability to project power over great distances extends back over two centuries, and includes expeditions against the Barbary Pirates along North Africa's coast in the early 1800s and, prior to that, a "Quasi-War" against France on the high seas in the 1790s. However, this paper is concerned with US military power-projection capabilities on the scale of a major campaign at considerable distance from US shores. This capability was first demonstrated in the Spanish-American War in 1898.

strategy of containment of Soviet power. To be sure, US commanders worried that in the event of a war with the Soviet Union, the major American and allied bases would be at high risk of attack, as would US sea lines of communication. Fortunately, such a confrontation never occurred.

During the major Cold War-era conflicts, first in Korea, then in Southeast Asia, and finally in the Persian Gulf region, America's armed forces typically enjoyed access to bases that were effectively sanctuaries from enemy attack. Moreover, the flow of supplies and reinforcements to those bases, which overwhelmingly moved across the seas, went unhindered. America's long-range air power and carrier-based sea power—two unrivaled forms of US military power—buttressed the capabilities of its forward-based forces.

During the major Cold War-era conflicts, America's armed forces typically enjoyed access to bases that were effectively sanctuaries from enemy attack.

Following the Cold War there seemed no practical limit to the United States' ability to project power. The US military enjoyed commanding leads in stealth technology, both in air platforms and in undersea systems. As the First Gulf War demonstrated, it also led the way in fielding precision-guided munitions (PGMs), amassing during the course of the 1990s an impressive PGM arsenal. To leverage the full potential of these munitions, the military began constructing battle networks to facilitate the speedy and accurate movement of targeting information from "sensor-to-shooter," all the better to strike enemy forces and supporting elements with unprecedented speed and accuracy. Over time, these battle networks became increasingly reliant on access to space and cyberspace for their effective operation.[6]

Following the First Gulf War the US Navy, which trailed the US Air Force in exploiting the revolution in precision warfare, moved quickly to catch up. Carrier aircraft were modified to carry PGMs. Vertical launch systems (VLS) capable of carrying Tomahawk Land-Attack Cruise Missiles (TLAMs) proliferated aboard surface combatants and submarines alike, culminating in the conversion of several fleet ballistic missile submarines (SSBNs) to cruise missile submarines (SSGNs), each capable of carrying up to 154 VLS tubes.

This combination of US investment in its power-projection forces, combined with the collapse of the Soviet Union in 1991 and the corresponding relative decline in military investment on the part of America's major allies, produced a period of US military dominance, as demonstrated in operations during the 1999 Balkans conflict, and immediately following the radical Islamist attacks on New York and Washington in September 2001, which saw the United States topple

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[6] See Barry D. Watts, *Six Decades of Guided Munitions and Battle Networks: Progress and Prospects* (Washington, DC: Center for Strategic and Budgetary Assessments, 2007). With respect to PGMs, a battle network can be defined as the communications and data links that bring together the various elements of a military's intelligence, reconnaissance surveillance (ISR) and targeting systems along with its command and control elements to provide prompt, precise guidance to munitions that can exploit it (e.g., laser-guided munitions, GPS-guided munitions such as the Joint Direct Attack Munition, or JDAM, etc.).

hostile regimes in Afghanistan and Iraq in rapid succession. For a time, the US military found itself the object of comparisons to the militaries of the world's greatest empires at their apogee, including those of Rome and Great Britain. To some, even the term "superpower" seemed inadequate to describe the United States' military dominance, leading to the introduction of terms like "hyperpower" and "unipolar era." To some expert observers, it seemed that for those who viewed the United States with suspicion, if not hostility, the only plausible way of deflecting its military would be to pursue a nuclear weapons capability.[7]

However, for the United States and its allies and partners, the US military's unsurpassed ability to project and sustain large military forces over great distances is a source of comfort and assurance. It has dissuaded countries that otherwise might seek to resolve outstanding issues through aggression or coercion to seek alternative means to advance their aims. While generally unappreciated, the US military's role as the steward of the global commons—the world's oceans in particular—has enabled the free movement of goods around the world, facilitating both general peace and prosperity. In short, on balance, the nearly two decades of US military dominance represent a major positive development in the international system.

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THE EROSION OF US MILITARY DOMINANCE

This era of US military dominance is waning at an increasing and alarming rate. Nowhere is this more pronounced than in the United States' ability to project power. Specifically, several states, notably China and Iran, are strenuously working to raise precipitously over time—and perhaps prohibitively—the cost to the United States of projecting power into two areas of vital interest: the Western Pacific and the Persian Gulf. Their efforts present US leaders with a strategic choice of the first magnitude: either acquiesce in the advent of a new world order in which the United States can no longer freely access areas crucial to its economic well-being, or effectively assist key allies and partners in those areas in defending themselves from aggression or coercion.

In order to make an informed strategic choice, US leaders will need, at a minimum, to understand the character of the challenges being posed to the country's power-projection forces, and the options available to offset these challenges. This paper focuses on the first issue: the character of the challenges.[8] First, it describes

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[7] Following the First Gulf War, one Indian general officer summed up the feelings of many foreign military leaders when he declared, "Never fight the Americans without nuclear weapons." Jim Garamone, "Iraq and Its Quest for Nuclear Weapons," American Forces Press Service, February 5, 2003, accessed at http://www.defenselink.mil/news/newsarticle.aspx?id=29475, on November 3, 2009.

[8] A second CSBA paper, describing a point-of-departure AirSea Battle operational concept for offsetting rival A2/AD forces, is in development.

the growing challenge, in the form of anti-access/area-denial (A2/AD) capabilities, to the United States' ability to project power. This is followed by a discussion of Chinese and Iranian efforts to field A2/AD forces. The paper concludes with a brief assessment of the implications of these efforts for US security.

THE ANTI-ACCESS/AREA-DENIAL (A2/AD) CHALLENGE

Concerns regarding A2/AD threats are not new. As the Cold War drew to a close, the Pentagon's Office of Net Assessment began exploring how conflicts might change now that the Soviet Union no longer posed a threat to the United States and given precision-guided warfare's demonstrated effectiveness in the First Gulf War. In the early 1990s this paper's author drafted a series of three assessments examining the issue of whether a military revolution, or dramatic shift in the character of military competitions was underway. The assessments described what has become known as the anti-access/area-denial challenge.[9] The final assessment, completed in November 1993, noted the following:

> As peer competitors [i.e., states with military potential comparable to that of the United States] become increasingly proficient in exploiting advanced technologies…and as many Third World states acquire more destructive, extended-range weaponry, the conduct of forcible-entry operations will change dramatically. For peer competitor states operating against aggressor non-peer competitor states [i.e., states in the developing world], the threat environment could require that forcible entry operations be initiated at extended ranges (although they may be supported by infiltrated forces, like special operations forces) and by coalition partners or allies whose geographic location may place them, de facto, at close range with the aggressor. For peer competitors, the ever-increasing engagement envelopes of non-competitor states will likely alter dramatically traditional notions regarding the benefits of forward-deployed forces….
>
> Forward bases—those huge, sprawling complexes that bring to mind such places as Malta, Singapore, Subic Bay, Clark Air Base, and Dhahran—will become great liabilities, not precious assets. The reason is simple: [as] Third World states acquire significant numbers of ranged-fire systems (i.e., ballistic and cruise missiles, high performance aircraft) and enormously more effective munitions (i.e., smart bombs; nuclear, chemical, and biological weapons), these bases' "sudden" vulnerability will deter their owners from acting to deter or thwart aggression. Their occupants will find themselves in the uncomfortable (and certainly unintended) role of hostages to the growing military capabilities of Third World nations. Rather than acting as a source of assurance to friends and allies in the region, these bases will be a source of anxiety…. Rather than a source of stability in a crisis, the bases will likely encourage one side or both toward pre-emptive strikes: either against the base before its

[9] See Andrew Krepinevich, Barry Watts and Robert Work, *Meeting the Anti-Access and Area-Denial Challenge* (Washington, DC: Center for Strategic and Budgetary Assessments, 2003).

> assets can be dispersed or against the potential aggressor in an attempt to disarm it of its ranged-fire strike capability.
>
> Forward-deployed naval forces may be able to offset the future liabilities of forward bases, but only partially and probably not for very long, as currently configured. The traditional carrier task force or surface action group possesses neither the mobility nor the stealth to function as the spear tip of forcible entry operations.[10]

Starting in the mid-1990s, senior US military leaders began voicing similar concerns over the US military's ability to deal with such contingencies. General Ronald Fogleman, then Air Force chief of staff, observed in 1996 that

> Saturation ballistic missile attacks against littoral forces, ports, airfields, storage facilities, and staging areas could make it extremely costly to project US forces into a disputed theater, much less carry out operations to defeat a well-armed aggressor. Simply the threat of such enemy missile attacks might deter US and coalition partners from responding to aggression in the first instance.[11]

Admiral Jay Johnson, then chief of naval operations, expressed very similar concerns when he declared

> Over the past ten years, it has become evident that proliferating weapon and information technologies will enable our foes to attack the ports and airfields needed for the forward deployment of our land-based forces. [12]

Perhaps most revealing, however, are the comments of a retired Indian brigadier general, who observed immediately following the First Gulf War that future access to forward bases

> is, by far the trickiest part of the American operational problem. This is the proverbial "Achilles heel." India needs to study the vulnerabilities and create covert bodies to develop plans and execute operations to degrade these facilities in the run up to and after commencement of hostilities. Scope exists for low cost options to significantly reduce the combat potential of forces operating from these facilities.[13]

If, as General Fogleman and Admiral Johnson observed, anti-access (A2) strategies aim to prevent US forces from operating from fixed land bases in a

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[10] Andrew F. Krepinevich, Jr., "The Military Revolution," Unpublished Draft, November 1993, pp. 60–62. This paper is an extended version of the original paper, written in July 1992 for the Office of Net Assessment, Department of Defense. See CSBA's reprint: Andrew F. Krepinevich, Jr., *The Military-Technical Revolution: A Preliminary Assessment* (Washington, DC: CSBA, 2003). The 1992 version is considered by some to be the first discussion of the A2/AD concept. See Roger Cliff, et al, *Entering the Dragon's Lair* (Santa Monica, CA: RAND, 2007), p. 1.

[11] Bill Gertz, "The Air Force and Missile Defense," *Air Force Magazine*, February 1996, p. 72.

[12] Admiral Jay Johnson, "Anytime, Anywhere: A Navy for the 21st Century," *Proceedings*, November 1997, p. 49.

[13] Brigadier V. K. Nair, *War in the Gulf: Lessons for the Third World* (New Delhi, India: Lancer International, 1992), p. 230.

theater of operations, then area-denial (AD) operations aim to prevent the freedom of action of maritime forces operating in the theater. Admiral Johnson expressed these concerns when he declared

> I anticipate that the next century will see…[our] foes striving to target concentrations of troops and materiel ashore and attack our forces at sea and in the air. This is more than a sea-denial threat or a Navy problem. It is an area-denial threat whose defeat or negation will become the single most crucial element in projecting and sustaining US military power where it is needed.[14]

The concerns of military leaders were echoed by the National Defense Panel (NDP), formed by Congress in 1997 to review long-term US strategy. The NDP concluded that the threat to forward base access was real, and would almost certainly grow over time.[15] The NDP therefore concluded that the United States "must radically alter" the way in which its military projects power.[16]

Anti-access/area-denial operations can include coordinated operations by an enemy's air forces and integrated air defenses to maintain a degree of air parity or superiority over its territory and forces. Land-based A2/AD operations might include short- to medium-range artillery, rocket, or missiles strikes against US forward-based forces and forward-deploying forces (which can include forcible entry forces) at either their littoral penetration points or at air-landing points. These enemy forces can also be employed against friendly maritime forces, and may also include anti-ship cruise, or even ballistic, missiles and submarines armed with torpedoes or anti-ship cruise missiles (ASCMs). Closer to shore, sophisticated mines, coastal submarines, and small attack craft could be employed against US forces.[17]

What was debated in the 1990s as one aspect of the so-called revolution in military affairs has emerged as a reality some fifteen years after the Office of Net Assessment's original work. The contours of the emerging A2/AD challenge are strikingly similar to those described in the 1992–1993 assessments. As described at that time, the major challenge (from a "peer" competitor) is emanating from the People's Republic of China, while the second-order challenge (from a "non-peer" competitor) is most clearly represented in the military activities of

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[14] Johnson, "Anytime, Anywhere: A Navy for the 21st Century," p. 49.

[15] National Defense Panel, *Transforming Defense* (Washington, DC: US GPO, December 1997), pp. 12–13. The author served as a member of this panel.

[16] National Defense Panel, *Transforming Defense*, p. 33.

[17] For a discussion of the maritime AD threat, see VADM Arthur K. Cebrowski and Captain Wayne P. Hughes, US Navy (Ret.), "Rebalancing the Fleet," *Proceedings*, November 1999; and Captain Wayne P. Hughes, US Navy (Ret.), *Fleet Tactics and Coastal Combat* (Annapolis, MD: Naval Institute Press, 2000), pp. 145–68.

Iran.[18] As informed speculation yields to hard military reality, it becomes possible—indeed, necessary—to take stock of the challenge in its true form in order to assess how the United States might best respond. For this we turn to a discussion of the Chinese and Iranian efforts to field A2/AD forces sufficiently capable to exclude the US military from two areas of vital interest to national security.

[18] The original assessment includes a simple scenario describing how a "non-peer" competitor might wage an effective A2/AD campaign. The author of this paper, who also authored the three assessments, modeled the non-peer scenario on Iran.

CHAPTER 2 > **CHINA'S ANTI-ACCESS/AREA-DENIAL CAPABILITIES**

Since the Taiwan Strait crisis of 1996, when the United States responded to aggressive Chinese behavior toward Taiwan by sailing two aircraft carriers into the Strait, China has moved to shift the military balance in the Western Pacific in its favor by fielding systems capable of driving up the cost of US military access to the region to prohibitive levels. Beijing is emphasizing A2/AD capabilities that can hold at risk both key-point targets (such as the major US bases at Kadena Air Force Base in Japan and Andersen Air Force Base in Guam), and increasingly key mobile targets, such as aircraft carriers, out to the second island chain.[19] The PRC is also according high priority to creating capabilities that can hold at risk key elements of the US military's battle networks. Thus we find China developing anti-satellite (ASAT) capabilities and intensifying its fielding and use of cyber weapons. China's military buildup has consistently caught the US intelligence community flat-footed in its estimates, time and again fielding capabilities significantly sooner than expected.[20]

While China's People's Liberation Army (PLA) does not use the term "anti-access/area-denial," it does employ the term *shashoujian*, or "assassin's mace," that

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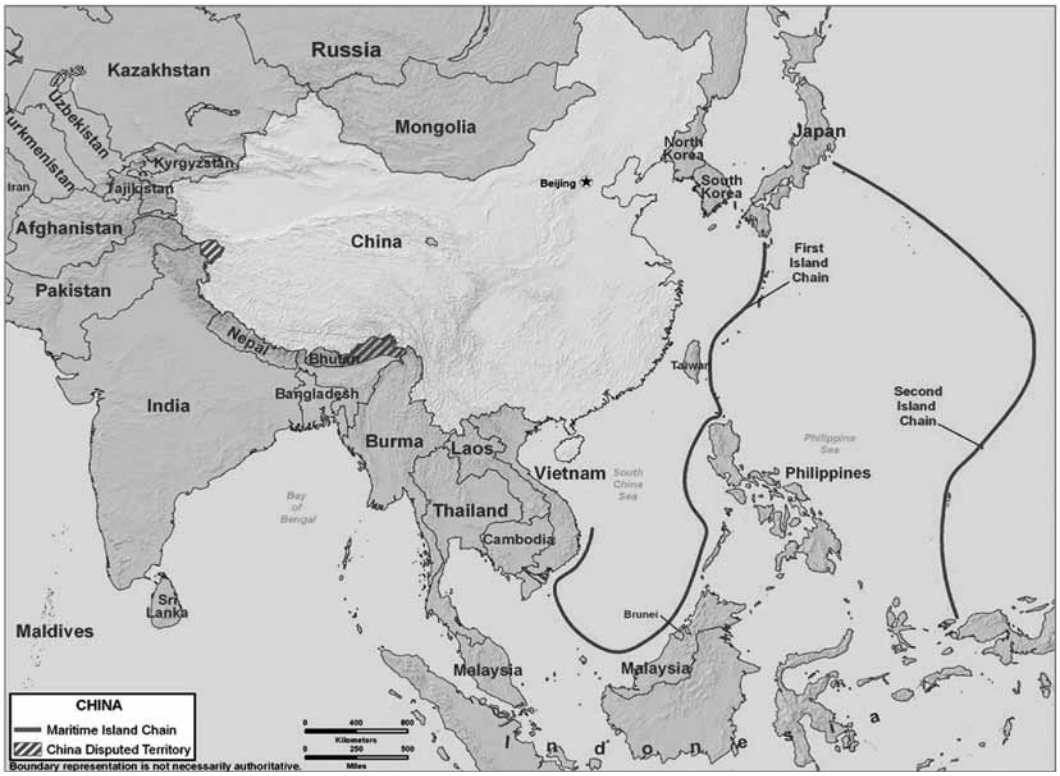
[19] The second island chain, in Chinese military writings, extends from the Japanese island of Honshu, through the Marianas, and down to the western tip of New Guinea.

[20] "Admiral Willard Discusses China, North Korea," accessed at http://www.eagleworldnews.com/2009/10/21/admiral-willard-discusses-china-north-korea/, on December 9, 2009. Admiral Willard, the incoming US commander in the Pacific, stated that "In the past decade or so, China has exceeded most of our intelligence estimates of their military capability and capacity, every year. They've grown at an unprecedented rate in those capabilities. And, they've developed some asymmetric capabilities that are concerning to the region, some anti-access capabilities and so on."

serves as a very rough surrogate.[21] *Shashoujian* were ancient hand maces that could be concealed in the wide sleeves characteristic of Chinese dress at the time. The *shashoujian* could be employed with little or no warning to break swords and crush human skulls, even those protected by helmets. They obviously would be an attractive weapon for someone attempting the assassination of an important figure. Today, *shashoujian* weapons and combat methods are essentially those potentially capable of deterring a superior adversary like the United States or of being employed to surprise and cripple US forces at the onset of a conflict.

[21] The three Chinese characters that make up the term *shashoujian* are literally translated to kill (*sha*), hand (*shou*), and sword, club, or mace (*jian*). The most common translation is "assassin's mace." See Jason E. Bruzdzinski, Chapter 10, "Demystifying *Shashoujian*: China's 'Assassin's Mace' Concept," p. 312, available online at http://www.mitre.org/work/best_papers/best_papers_04/bruzdzinski_demystify/ bruzdzinski_demystify.pdf, accessed on August 20, 2007.

FIGURE 1. CHINA AND THE TWO ISLAND CHAINS



Source: Department of Defense, Office of the Secretary of Defense, Annual Report to Congress on the Military Power of the People's Republic of China, 2009, p. 18, accessed at http://www.defenselink.mil/pubs/pdfs/China_Military_Power_Report_2009.pdf), on November 24, 2009.

Shashoujian combat methods likely include what US strategists refer to as A2/AD strategies—strategies designed to delay the assembly of US power-projection forces (to include their battle networks), to keep them beyond effective range of Chinese territory, or to defeat them once they come within range. These methods might include attacks on logistics, transportation, and support forces; attacks on sea, land, and ports; and attacks on air bases. In addition, *shashoujian* forces can be expected to engage in attacks to disrupt and/or destroy US battle networks, to include cyber attacks and the use of ASAT weapons. They might also include coercive measures designed to dissuade US allies from granting US forces operational access to their bases.[22]

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ANTI-SATELLITE AND CYBER WEAPONS

The PRC's determined pursuit of *shashoujian* capabilities is perhaps best illustrated by its quest for an effective ASAT weapon. In 2001, the Director of the Defense Intelligence Agency, Vice Admiral Thomas Wilson, testified to Congress that US military forces might confront Chinese anti-satellite capabilities by 2015.[23] One year later, he advanced that timeline to 2010.[24] Yet on January 11, 2007, after three failed attempts, PLA rocket forces destroyed an inoperative Chinese weather satellite.[25] The speed with which the Chinese were able to overcome the technological challenges of an ASAT weapon is clearly impressive, especially given US intelligence estimates that it would take the PLA considerably longer to overcome them.[26] Kinetic ASAT systems are only one element of an overall Chinese effort to hold at risk the United States' constellation of satellites. The PLA has also developed ground-based ASAT laser systems that have reportedly been employed to "dazzle" US satellites.[27] China's rapidly advancing space exploration program, while ostensibly for purely peaceful purposes, will inevitably provide it with the capability to develop ASAT weapons capable of targeting US systems in mid-Earth orbit, where America's GPS satellites are positioned.

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[22] See Cliff, et al., *Entering the Dragon's Lair: Chinese Anti-access Strategies and Their Implications for the United States*, pp. 60–80.

[23] Vice Admiral Thomas R. Wilson, "Global Threats and Challenges Through 2015," Statement for the Record, Senate Armed Services Committee, March 8, 2001, p. 14.

[24] Vice Admiral Thomas R. Wilson, "Global Threats and Challenges," Statement for the Record, Senate Armed Services Committee, March 19, 2002, p. 17.

[25] See Phillip C. Saunders and Charles D. Lutes, "China's ASAT Test: Motivations and Implications," *Joint Forces Quarterly*, Issue 46, 3rd Quarter 2007, pp. 39–45. Available online at: www.ndu.edu/inss/Press/jfq_pages/editions/i46/8.pdf.

[26] For an elaboration on this logic, see Dr. Thomas P. Ehrhard, testimony before the US-China Economic and Security Review Commission, February 2, 2007. This testimony can be accessed online at http://www.uscc.gov/hearings/2007hearings/written_testimonies/07_02_01_02wrts/07_02_1_2_ehrhard_tom_statement.pdf.

[27] Saunders and Lutes, "China's ASAT Test: Motivations and Implications," p. 39.

The details of Chinese cyber warfare capabilities are a well-guarded secret, and the US Government is understandably loath to reveal its intelligence regarding these capabilities. Nevertheless, China's cyber weapons are generally believed to be formidable, and the United States, as well as many other countries, has long been subjected to persistent cyber probes and attacks emanating from China. While these intrusions primarily involved efforts to extract information, China is believed to have the ability to conduct computer network attacks at a high level of sophistication.[28] For example, China has been publicly accused by the US Navy's Naval Network Warfare Command (NETWARCOM) of sponsoring hundreds of suspicious hacking incidents each day against military and private-sector computer systems to steal technology, gather intelligence, probe defenses and install "sleeper" software.[29]

China's ability to disrupt or destroy key elements of the US military's battle network could cripple US power-projection operations. The preponderance of US precision-guided weaponry, for instance, is dependent on GPS satellite systems for their targeting information. Some US unmanned aerial vehicles, such as the Predators, are incapable of operating in the absence of satellite data links to their remote controllers. The US military's Time-Phased Force and Deployment Data (TPFDD), essential to deploying forces in a timely and efficient manner, is highly dependent upon myriad data links bringing together information from a range of sources.[30]

THE THREAT TO FORWARD BASES

Chinese planners believe that if war were to break out with the United States over Taiwan or some other flashpoint in East Asia, the US military would, consistent with past practice, begin operations by conducting an air and missile strike campaign while it begins to build up a powerful regional battle network and associated forces. To defeat US forces, the Chinese military would conduct preemptive attacks (including cyber strikes) on US theater ports and airfields, aircraft carriers and large surface combatants operating in theater, as well as on logistics, transportation, and support forces, and US battle networks. The Chinese might

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[28] Department of Defense, Office of the Secretary of Defense, *Annual Report to Congress on the Military Power of the People's Republic of China, 2009*, pp. 52–53, accessed at http://www.defenselink.mil/pubs/pdfs/China_Military_Power_Report_2009.pdf), on November 24, 2009.

[29] "Greatest Hits," *The Economist*, May 24, 2007, accessed at http://www.economist.com/world/international/displaystory.cfm?story_id=9228757, on November 23, 2009.

[30] Bryan Krekel, "Capability of the People's Republic of China to Conduct Cyber Warfare and Computer Network Exploitation," Prepared for The US-China Economic and Security Review Commission, Oct. 9, 2009, accessed at www.uscc.gov/.../NorthropGrumman_PRC_Cyber_Paper_FINAL_Approved%20Report_16Oct2009.pdf; and James Mulvenon, "Chinese Information Operations Strategies in a Taiwan Contingency," *Testimony Before the U.S.-China Economic and Security Review Commission Hearing*, Sept. 15, 2005, on December 7, 2009.

also employ coercive measures designed to convince US allies to deny American forces access to their bases.[31]

To threaten US access to forward land bases, the PLA has equipped its 2nd Artillery units opposite Taiwan with roughly 1,100 mobile, short-range ballistic missiles (SRBMs), and has been increasing their numbers at the rate of one hundred per year.[32] More recent generations boast greater range, enhanced accuracy, and the ability to carry a variety of conventional payloads, including unitary warheads and submunitions.[33] China is also increasing its medium-range ballistic missiles (MRBMs) (those with a range of 1,000–3,000 km, or roughly 600–2,000 miles) forces, and improving their guidance systems, with an eye toward holding at risk bases out to the second island chain, where the United States is currently engaged in converting Andersen Air Force base and naval facilities at Guam into a major forward operating base. These missiles are capable of delivering a range of conventional munitions as well as weapons of mass destruction. They may also prove useful in conducting counter-network attacks, for example by using nuclear weapons to generate an electromagnetic pulse.

China is also modernizing its long-range aviation forces. The PLA Air Force's (PLAAF's) modernized FB-7A fighter-bomber will augment the PLAAF's F-10 and Su-30MKK multirole strike aircraft. The PLAAF is also upgrading its H-6 bomber fleet to carry a new long-range cruise missile.[34]

THE THREAT TO MARITIME SURFACE COMBATANTS

Throughout the Cold War, the United States Navy remained confident in its ability to operate carriers forward in defense of US interests, even in the face of the Soviet Union's efforts to make such operations prohibitively costly, principally through the threat of its submarine force and its long-range bombers. Following the Soviet Union's collapse, US surface warships operated with near-impunity, in the Persian Gulf during the two wars with Iraq, in the Aegean Sea during the 1999 Balkans conflict, and off the coast of Pakistan in support of strike operations in Afghanistan following the 9/11 attacks. But since the 1996 Taiwan crisis the

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[31] See Cliff, et al., *Entering the Dragon's Lair: Chinese Anti-access Strategies and Their Implications for the United States*, pp. 60–80. See also Mark Stokes, *China's Strategic Modernization: Implications for the United States* (Carlisle, PA: Strategic Studies Institute, September 1999), pp. 8–9.

[32] Department of Defense, Office of the Secretary of Defense, *Annual Report to Congress on the Military Power of the People's Republic of China*, 2009, pp. VIII, accessed at http://www.defenselink.mil/pubs/pdfs/China_Military_Power_Report_2009.pdf), on November 22, 2009.

[33] Ibid., pp. 22, 66. The PLA is believed to have roughly 400 CSS-6 missiles with a 600 km range, and about 700 CSS-7 missiles with a range of 300 km.

[34] Ibid., p. 50.

Chinese have devoted great effort to hold any US fleet at high risk of destruction should it enter the waters within the second island chain.[35]

The most worrisome *shashoujian* weapons and methods are those intended to destroy the US carriers. China's efforts here have benefited greatly from the Soviet Cold War anti-carrier efforts, to include access to updated Russian anti-carrier weapons.[36] Given their focus on preemption, the PLA's objective is to attack and disable US carriers before they deploy close enough to the scene of the crisis to get their aircraft into effective strike range. Of course, the PLAN would likely accept a condition in which, owing to the prohibitive risk of operating within the PLA's A2/AD zone, US carriers are forced to operate from such extended ranges that the effectiveness of their air wings is fatally degraded.[37]

Given their focus on preemption, the PLA's objective is to attack and disable US carriers before they deploy close enough to the scene of the crisis to get their aircraft into effective strike range.

The *shashoujian* capabilities that most likely attract PRC and PLAN strategists are those capable of striking US aircraft carriers between 1,000 and 1,600 nm miles from the Chinese mainland.[38] This involves drawing upon capabilities employed by the Soviets during the Cold War, such as submarines, anti-ship cruise missiles, and strike aircraft, while also exploiting advances in military capabilities that have occurred over the two decades since the fall of the Berlin Wall. Perhaps the most notable Chinese addition is the anti-ship *ballistic* missile (ASBM).[39]

As reported in a 2004 Office of Naval Intelligence report, China's ASBM capability centers on a variant of the DF-21 medium-range ballistic missile. The DF-21 is a modified version of one of the new generation of road-mobile, solid-fuel Chinese missiles designed to execute rapid launches, enabling "shoot-and-scoot" operations to enhance the system's survivability.[40] The DF-21 has a nominal combat range exceeding 1,100 nm, and carries maneuverable reentry vehicle (MaRVs)

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35 For a recent overview of the Chinese Navy's modernization efforts, see Ronald O'Rourke, "China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress," *Congressional Research Service*, October 21, 2009.

36 Cliff, et al., *Entering the Dragon's Lair: Chinese Anti-access Strategies and Their Implications for the United States*, p. 74.

37 Ibid., p. 71.

38 At this time, it is unclear whether or not the PRC intends to build anti-access/area-denial systems and capabilities more akin to Soviet automated reconnaissance-strike complexes or more dynamic US battle networks. Therefore, when referring to new PRC systems, this report uses the Soviet term "complex" interchangeably with the US term "battle network" or "network."

39 See, for example, Michael S. Chase, Andrew S. Erickson and Christopher Yeaw, "Chinese Theater and Strategic Missile Force Modernization and its Implications for the United States," *The Journal of Strategic Studies*, February 2009, pp. 67–114; Andrew S. Erickson and David D. Yang, "On the Verge of a Game-Changer," *US Naval Institute Proceedings*, May 2009, pp. 26–32; Andrew S. Erickson and David D. Yang, "Using the Land to Control the Sea? Chinese Analysts Consider the Anti-ship Ballistic Missile," *Naval War College Review*, Autumn 2009, pp. 53–86; and Eric Hagt and Matthew Durnin, "China's Anti-ship Ballistic Missile, Developments and Missing Links," *Naval War College Review*, Autumn 2009, pp. 87–115.

40 See Robert Hewson, "Dragon's Teeth—Chinese Missiles Raise Their Game," *Jane's Navy International*, February 2007, p. 21. See also Ted Parsons, "China Develops Anti-Ship Missile," *Jane's Defense Weekly*, January 18, 2006.

equipped with both active and passive radar seekers.[41] Although the technical hurdles in developing such a system are significant, some experts believe that the Chinese have already completed operational tests of the DF-21 ASBM. Other reports suggest the Chinese are now developing a special submunition warhead for the missile with clusters of non-explosive flechette penetrators designed to damage a carrier by kinetic impact, and a high-power microwave warhead designed to disable naval radars with electromagnetic pulses. Such warheads would allow the PRC to "mission-kill"[42] a carrier.[43]

China's anti-ship ballistic missile program, as well as its surface-to-surface ballistic missile force, represents an important and growing source of asymmetric advantage over the United States and its allies. This stems from two factors. First, the 1987 Intermediate Range Nuclear Forces (INF) Treaty prohibits its signatories, the United States and Russia (formerly the Soviet Union) from producing or deploying ballistic missiles with ranges between 500–5,500 kilometers (approximately 300–3,500 miles).[44] China, not being a party to the treaty, suffers from no such constraints. Second, no US ally in the region has fielded or currently has plans to field missiles of this type. Thus thanks to a treaty that might be termed a "Cold War relic," China has an effective monopoly in this key area of the military balance, and is exploiting it to good effect.

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TARGETING MARITIME FORCES

To be sure, even if the PRC has a capable ASBM, a targeting system is still required to enable the reentry vehicle to hone in on its target. Fielding the ISR component for its ASBM force represents a challenging task for the PLA.

China is reportedly developing or deploying maritime surveillance and targeting systems that can detect US warships at extended ranges and provide targeting information. Among the systems being developed and deployed are over-the-horizon backscatter (OTH-B) radars, land-based over-the-horizon surface wave (OTH-SW) radars, electro-optical satellites and radar satellites.[45]

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41 Richard Fisher, Jr., "Growing Asymmetries in the China-Japan Naval Balance," International Assessment and Strategy Center, November 22, 2005, accessed online at http://www.strategycenter.net/research/pubID.83/pub_detail.asp, on November 15, 2009.

42 A "mission kill" results in a condition in which the platform (e.g., tank, aircraft, ship) subjected to attack is not destroyed, but is no longer capable of executing its mission. Thus a carrier with a severely damaged flight deck may still be afloat and underway and normal speed, but cannot execute its assigned strike missions owing to an inability to launch and recover its aircraft.

43 Hewson, "Dragon's Teeth—Chinese Missiles Raise Their Game," p. 22.

44 *Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Elimination of their Intermediate-Range and Shorter-Range Missiles*, accessed at http://www.state.gov/www/global/arms/treaties/inf1.html, on December 8, 2009.

45 *Military Power of the People's Republic of China 2009*, p. 49.

Chinese engineers are reportedly working on as many as fifteen different types of satellites for imagery reconnaissance, electronic and signal intelligence collection, navigation, communications, and weather forecasting.[46] China is deploying advanced imagery and reconnaissance satellites, to include the Yaogan-1, -2, -3, -4, and -5, the Haiyang-1B, and the CBERS-2 and -2B satellites. China is also planning eight satellites in the Huanjing program capable of visible, infrared, multi-spectral, and synthetic aperture radar imaging.[47]

In addition to satellite-based carrier detection systems, the PRC is also developing new terrestrial long-wave radar systems, with emphasis on OTH-B high-frequency (HF) radars. Modern technology and data processing capabilities may enable such a radar network to provide targeting-quality information to Chinese ASBM units and other carrier strike systems. Consider, for example, that Australia's Jindalee Skywave OTH-B radar system can, under ideal conditions, discriminate carrier-like targets moving at moderate speeds out to 1,600 nm or more. Moreover, the Jindalee is much less susceptible to jamming than earlier OTH-B radars.[48] This combination of space-based systems and OTH-B HF radars will make it increasingly risky for aircraft carriers to operate within the second island chain.

Given the PLA's adaptation of the Soviet approach to anti-carrier operations, the PLAN also seems sure to use both maritime patrol aircraft and submarines to "shadow" US carrier strike groups and task forces in international waters.

CHINESE MARITIME AVIATION STRIKE FORCES

In addition to strikes from land-based ASBMs and submarine-launched anti-ship cruise missiles (ASCM), major US surface combatants can anticipate barrages of cruise missiles launched from PLAN Air Force (PLANAF) and PLAAF aircraft. The primary PLANAF maritime strike platform is the H-6K naval aircraft. With a combat radius of 1,600 nm, the H-6K is capable of carrying up to six ASCMs.[49] The H-6K can reportedly carry the Russian Kh-31A Mod 2 anti-ship cruise missile, a fast (Mach 2+), ramjet-powered, sea-skimming active radar missile with an attack

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[46] Timothy Hu, "China Marching Forward," *Jane's Defense Weekly*, April 25, 2007.

[47] DoD, *Military Power of the People's Republic of China 2009*, p. 26.

[48] Jindalee's antenna extends to almost three kilometers in length. See D.H. Sinnot, *The Development of Over-the-Horizon Radar in Australia*, p. 32, accessed at http://www.dsto.defence.gov.au/attachments/The_development_of_over-the-horizon_radar.pdf, on November 23, 2009; and Mark A. Stokes, *China's Strategic Modernization: Implications for the United States* (Carlisle, PA: US Army War College Strategic Studies Institute, September 1999), p. 41, accessed at http://www.fas.org/nuke/guide/china/doctrine/chinamod.pdf, on November 23, 2009.

[49] Dr. Carlo Kopp, "XAC (Xian) H-6 Badger," *Air Power Australia*, accessed at http://www.ausairpower.net/APA-Badger.html, on November 20, 2009; and Richard Fisher, Jr., "China's 'New' Bomber," International Assessment and Strategy Center, February 7, 2007, accessed at http://www.strategycenter.net/research/pubID.146/pub_detail.asp, on November 25, 2009.

range just over 50 nm, modeled after the SS-N-22 Sunburn ASCM. The H-6K can also be armed with the Kh-31PM/PMK missile, a 100-nm range anti-radiation missile with a multi-band passive seeker designed specifically to attack US radar systems like the US Navy's SPY-1 radar, the E-2 Hawkeye carrier AEW radar, the Air Force's AWACS, and the Army's Patriot fire control radar. In short, the H-6K is an ideal system to support the PLA's second island chain A2/AD strategy.

Augmenting the H-6Ks in the maritime strike role are land-based strike-fighters, the most impressive of which is the Russian-built Su-30MKK2, a variant of the highly maneuverable Russian Su-27 Flanker air superiority fighter. The aircraft is roughly comparable to the US F-15E Strike Eagle. With a normal combat load, the aircraft has an impressive unrefueled combat radius of about 860 nm. Consequently, as with the H-6K, the Su-30MKK2 *outranges all of the manned strike aircraft in the US Navy's program of record carrier air wing*. Moreover, its strike range can be extended out to 1,400 nm with one refueling, meaning the aircraft could escort H-6Ks over nearly their entire unrefueled strike range. This raises the specter of combined fighter and bomber attacks against US aircraft carriers—a threat not encountered since World War II.[50]

It appears Chinese air and naval air forces will soon field some five hundred modern, fourth-generation fighters and strike-fighters, or about twelve CVW-equivalents of strike aircraft. With support from China's A-50 AWACS and H-6U and II-78MKK tankers, these aircraft will be able to contest US forces for control of the air in the Western Pacific and to strike targets at ranges beyond 850 nm.[51]

THE PLAN SUBMARINE FLEET

China's submarine force is a key component of the PLA's A2/AD force. Chinese strategy documents declare that "stealth warships and new-style submarines represent the modern sea battle platforms."[52] To date, however, most PLAN submarines are diesel-electric boats with relatively poor underwater endurance when operating at high speeds. Moreover, even their maximum speeds are far below those of a carrier strike group. Consequently, at least for the time being, the PLAN submarine fleet seems best suited to conduct barrier operations designed to ambush US Carrier Strike Groups (CSGs) advancing within the second island chain.

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[50] Fisher, "Growing Asymmetries in the China-Japan Naval Balance," and "Su-30MKK Multirole Fighter Aircraft," accessed at http://www.sinodefence.com/airforce/fighter/su30.asp on August 15, 2007; and John Stillion and Scott Perdue, "Air Combat Past, Present and Future," *RAND*, Aug. 2008, p. 7.

[51] Carlo Copp and Peter A. Goon, "Inquiry into Australian Defence Force Regional Air Superiority," *Air Power Australia*, February 17, 2006, pp. 55–56; and Stillion and Perdue, "Air Combat Past, Present and Future," pp. 29–41.

[52] Andrew S. Erickson and Lyle J. Goldstein, "China's Future Nuclear Submarine Force," *Naval War College Review*, Winter 2007, p. 59.

As PRC submarines and crews improve in quality, deploying quickly to the scene of a crisis in the Western Pacific region will prove highly challenging for any CSG.

That being said, the evidence of the past fifteen years clearly indicates the PLA is according high priority to improving its capabilities for submarine-based anti-surface (ASuW) warfare. In 1994, the PLAN bought two Russian Kilo-class submarines, which were among the quietest, most effective diesel-electric boats in the world. The Chinese ordered two more improved versions in 1996, and in 2002, the PLAN acquired an additional eight improved Kilos. The Kilos are armed with advanced wake-homing and wire-guided torpedoes of Russian design.[53] These guided weapons, optimized for use against surface ships, are vastly superior to (and more deadly than) the torpedoes on the earlier PLAN Romeo and Ming classes. Moreover, PLAN Kilos and improved Song-class submarines are guided missile submarines (SSGs) capable of firing ASCMs while submerged. The eight newer Kilo SSK are armed with the highly capable Russian-designed Klub ASCM, also known as the SS-N-27B Sizzler.[54] The Sizzler's attack profile is specifically designed to defeat the US Aegis anti-air warfare system, penetrate a task force's defenses, and strike high-value surface warships, to include carriers.

The evidence of the past fifteen years clearly indicates the PLA is according high priority to improving its capabilities for submarine-based anti-surface (ASuW) warfare.

As in other areas of the military competition, Chinese progress in submarine development has often advanced more quickly than US intelligence estimates predicted. In 2004, for example, the Chinese introduced the new Yuan-class SSG, which may be the first Chinese diesel-electric submarine equipped with an auxiliary air-independent propulsion (AIP) plant.[55] Such ASCM-armed AIP boats would be ideally suited for anti-carrier barrier patrols.[56]

The importance that PRC and PLAN strategists put on the PLAN submarine fleet is reflected in their submarine modernization effort. Between 1995 and 2007, China placed into service a total of thirty-eight submarines. This rate, if

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53 DoD, *Military Power of the People's Republic of China 2009*, p. VII; and Bill Gertz, "The Chinese Buildup Rolls On," *Air Force Magazine Online*, September 1997, accessed at http://www.afa.org/magazine/Sept1997/0997china.asp, on January 22, 2008.

54 DoD, *Military Power of the People's Republic of China 2009*, p. 48; and Ronald O'Rourke, "China Naval Modernization: Implications for US Navy Capabilities—Background and Issues for Congress," *Congressional Research Service*, October 21, 2009, p. 5.

55 The AIP enables a submarine to operate quietly in a patrol area for weeks at slow speeds without the need to "snorkel" to recharge its batteries. Snorkeling is a noisy operation that leaves the submarine highly vulnerable to location identification and attack. See *Military Power of the People's Republic of China 2009*, p. 49; and Edward C. Whitman, "Air-Independent Propulsion: AIP Technology Creates a New Undersea Threat, *Undersea Warfare*, Fall 2001, accessed at http://www.navy.mil/navydata/cno/n87/usw/issue_13/propulsion.htm, on December 6, 2009.

56 Stephan Nitschke, "Air-, Surface-, and Subsurface-Launched Naval Cruise Missiles," *Naval Forces*, No. VI/2006, Vol. XXVII, pp. 32–41. See also "Russia to Deliver SS-N-27 to China," *Chinese Defense Today*, April 29, 2005, accessed online at http://www.sinodefence.com/news/2005/news29-04-05.asp, on May 25, 2005; Robert Hewson, "Novator Wields its Klub," *Jane's Defense Weekly*, September 5, 2007, p. 18; and Tony Capaccio, "Navy Lacks Plan to Defend Against 'Sizzler' Missile," Bloomberg.com, March 23, 2007, accessed at http://www.bloomberg.com/apps/news?pid=20601087&sid=akO7Y_ORw538&refer=home, on March 29, 2007.

sustained over the next three decades, would produce a PLAN submarine force near ninety boats, assuming an average submarine life of thirty years.[57] All boats will be capable of firing ASCMs and long-range, wake-homing torpedoes.[58]

To summarize, those American carrier strike groups that survive ASBM attacks in the outer layer of the PRC's maritime A2/AD network and succeed in penetrating into the western Philippine Sea near Taiwan risk confronting barrages of anti-ship cruise missile salvos launched from PLAN submarines, as well as multiple torpedo attacks. As such, future US naval commanders seem likely to confront the prospect of either proceeding rapidly to pierce Chinese A2/AD defenses, but at a terrible (and perhaps prohibitive) price, or defaulting to a protracted campaign in which the PLAN submarine force is gradually eliminated as a significant threat. It is far from clear that either course of action would yield victory.

CHINESE AIR DEFENSES

In addition to fielding ever-larger ballistic missile forces capable of rendering forward US airbases ineffective, Chinese military planners are pursuing other means by which to deny the US Air Force the use of land-based aircraft in any conflict in the Western Pacific. The PRC's objective appears to be to deny US air forces access to the airspace over Taiwan and the Taiwan Strait by employing a combination of surface to air missiles (SAMs) and land-based interceptor aircraft. By combining this effort with coordinated air, missile and special operations strikes against airfields in the region, the PLA hopes to effectively eliminate US air power as a major factor in any regional conflict.

The PRC's objective appears to be to deny US air forces access to the airspace over Taiwan and the Taiwan Strait by employing a combination of surface to air missiles (SAMs) and land-based interceptor aircraft.

The PRC's investment in surface-to-air missile defenses is impressive. The eastern coast of China, and especially the area along the Taiwan Strait, is blanketed by a dense network of SAM launch sites and radars. The Chinese are upgrading this network, most recently with advanced Russian SAM systems such as the S-300PMU2, whose range approaches 200 km.[59] The density and sophistication of this network threatens the ability of even low-observable aircraft to

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[57] This number includes twelve Kilo-class submarines purchased from Russia. If only indigenous production is considered, the PLAN long-term steady-state submarine force level would top out at roughly sixty boats. Ronald O'Rourke, "China Naval Modernization: Implications for US Navy Capabilities—Background and Issues for Congress," *Congressional Research Service*, October 21, 2009, p. 6.

[58] The overall force level of Chinese submarines is highly speculative at this point. Keith Jacobs believes that the final fleet tally will be twelve Kilos, twelve Songs, twenty Yuans, and six to eight Shangs. This corresponds roughly to the projection found in *Jane's Fighting Ships*, which expects an overall force level of forty to fifty boats of all types. See Keith Jacobs, "PLA-Navy Update: The People's Liberation Army-Navy Military-Technical Developments," and Saunders, ed., *Jane's Fighting Ships 2007–2008*, 110th edition, p. 31.

[59] See Cliff, et al., *Entering the Dragon's Lair: Chinese Anti-access Strategies and Their Implications for the United States*, p. 85.

operate effectively in Chinese airspace. When this network is combined with Chinese efforts to harden SAM sites and associated radars, and the command and control networks linking them together into an integrated air defense network, it presents a daunting challenge to any efforts intended to suppress or defeat them. Further increasing the difficulty of countering these systems, to reduce the threat from cyber attacks, China has created dedicated fiber-optic command and control networks that are unconnected to outside networks.[60] Gaining access to such a system would seemingly require physical proximity.[61]

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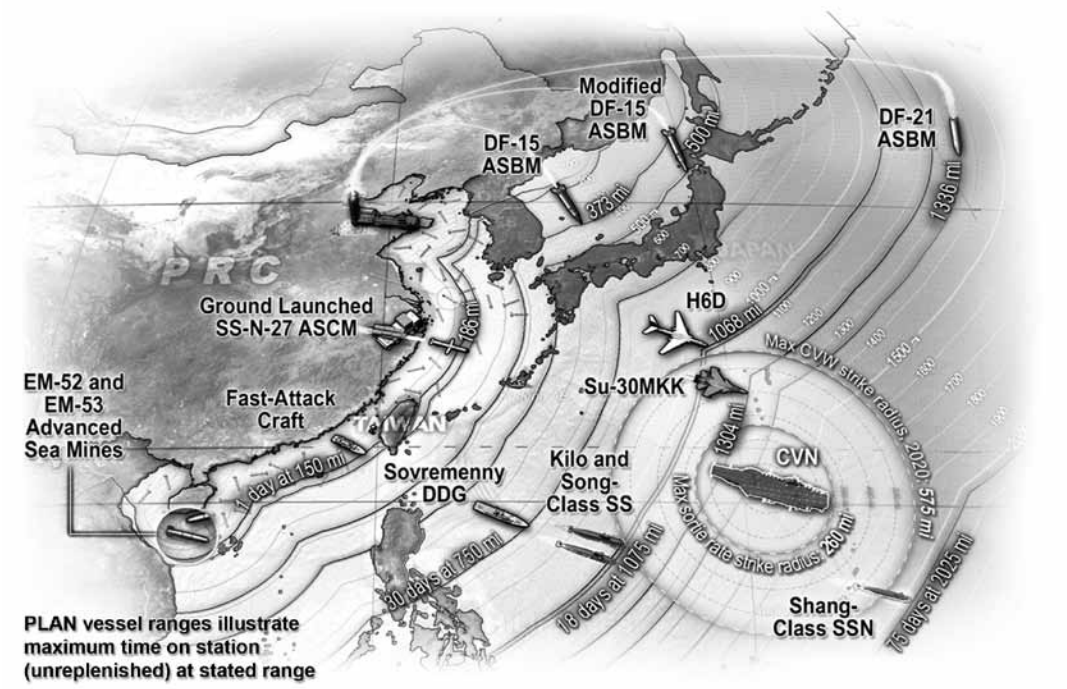
[60] I am indebted to my colleague, Jan van Tol, for bringing this to my attention.

[61] See James C. Mulvenon and Thomas J. Bickford, "The PLA and the Telecommunications Industry in China," *The People's Liberation Army in the Information Age*, James C. Mulvenon and Richard H. Yang, editors, pp. 246–255. Available online at: www.rand.org/pubs/conf_proceedings/CF145/CF145.chap12.pdf.

FIGURE 2. EMERGING CHINESE ANTI-ACCESS/AREA-DENIAL CAPABILITIES



SUMMARY

To sum up, early in any conflict the PLA would likely seek to deny the United States the ability to launch strikes from its bases in the region, such as Kadena Air Base on Okinawa, and (eventually) Andersen Air Base on Guam. The PLA's 2nd Artillery would launch massed salvos of ballistic missiles at these bases, followed by waves of PLAAF strike aircraft. These strikes would target aircraft on the ground as well as runways, taxiways, fuel and munitions storage facilities and maintenance facilities.[62] Similar strikes against major US surface combatants operating in the Western Pacific would be undertaken by Chinese ASBMs, ASCMs and strike aircraft. These would be supplemented by PLAN submarine torpedo attacks. At the same time, Chinese air defense SAM batteries and fighter-interceptor aircraft would seek to establish air superiority over the target of its military campaign. Any forward-deployed US forces surviving such an attack, or reinforcements moving into the theater of operations might also have to operate with degraded or non-functional battle networks, the result of Chinese ASAT and cyber attacks.

As the great Chinese military theoretician, Sun Tzu, observed, the acme of generalship is being able to win without fighting. It appears the PLA is incorporating this philosophy in its efforts to create an A2/AD network, whose ultimate goal appears to be to raise the US cost of power-projection operations in the Western Pacific to prohibitive levels, thereby deterring any American effort to meet its defense obligations to allies in the region while setting the conditions for a potential latter-day Chinese Greater East Asia Co-Prosperity Sphere of influence.[63]

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[62] See Cliff, et al., *Entering the Dragon's Lair: Chinese Anti-access Strategies and Their Implications for the United States*, pp. 81–83; and Stillion and Perdue, "Air Combat Past, Present and Future," pp. 6–15.

[63] Sun Tzu: "For to win one hundred victories in one hundred battles is not the acme of skill. To subdue the enemy without fighting is the acme of skill."

CHAPTER 3 > IRAN'S ANTI-ACCESS/AREA-DENIAL CAPABILITIES

The Western Pacific is not the only area of vital interest to US security. Nor is it the only such area where a prospective rival state is assiduously working to create its own A2/AD network. This can also be seen in the activities of Iran in the Persian Gulf, through which flows a substantial portion of the world's oil, transiting the Strait of Hormuz on its way to the open seas just beyond. Iran, with military-technical support from China, North Korea, and Russia, seems intent on developing and fielding a range of A2/AD capabilities, to include ballistic and cruise missiles (possibly equipped with WMD warheads), mobile ASCMs (both shore-based and sea-based), submarines, small high-speed coastal combatants, and advanced anti-ship mines. While the situation may be manageable for US maritime forces over the near term, Iran seems determined to continue developing more formidable A2/AD capabilities, which could be used not only to target Persian Gulf shipping, but also to hold at risk the oil and natural gas production facilities (to include over land pipelines) of other Gulf states.[64]

While Iran cannot hope to match China when it comes to developing an advanced A2/AD network, it has advantages that China does not. One is geography. China seeks to project its A2/AD capabilities out to the second island chain, over a thousand miles from its shores. Iran, on the other hand, is primarily interested in creating circumstances under which it becomes too costly for the United States to project power into a far smaller geographic area: the Persian Gulf, which is barely 600 miles long and between 40 and 210 miles wide. The Gulf also has a geographic bottle neck, the Strait of Hormuz, which is only 33 miles at its narrowest point.[65]

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[64] A US military major joint field exercise, Millennium Challenge 2002, conducted seven years ago revealed that even a small country's A2/AD forces could severely limit US maritime forces' ability to control key narrow waters. See Andrew Krepinevich, *Seven Deadly Scenarios* (New York: Bantam Books, 2009), pp. 5–8.

[65] Fariboz Haghshenass, "Iran's Asymmetric Naval Warfare," Washington Institute for Near East Policy (WINEP), Policy Focus #87, September 2008, p. 7.

Iran's coastline runs practically the entire length of the Gulf's northern edge. Along that coastline there are over ten large and sixty small ports and harbors, as well as many scattered fishing and sailing villages which offer excellent hiding places for small warships. Much of Iran's shoreline is overlooked by a mountain ridge that rises as high as 6,500 feet in some places. The Iranian Navy has bases all along the coast, including a large naval air station and operational headquarters at Bandar Abbas directly north of the strait. The Islamic Revolutionary Guard Corps Navy (IRGCN) has constructed outposts on several islands close to the strait, including Abu Musa, Larak, and Sirri. The IRGC has also built an extensive network of tunnels and underground missile bunkers on these islands, creating what it calls "static warships."[66]

Iran hopes to progressively raise the cost to any power—the United States in particular—that desires to maintain a military presence in the Persian Gulf.

From this base of operations, Iran hopes to progressively raise the cost to any power—the United States in particular—that desires to maintain a military presence in the Persian Gulf. Their approach has multiple dimensions. By deploying anti-ship mines the Iranians intend to slow and disrupt the movement of maritime forces operating in the Gulf's relatively restricted waters, making ships easier to target. With attack warning dramatically reduced owing to the Gulf's proximity to land, slow-moving ships are more vulnerable to the array of Iranian strike forces, which include torpedoes, anti-ship cruise missiles, and swarming craft, some of which may be used for suicide attacks. Were that not enough, Iran's growing arsenal of ballistic missiles may pose a threat to US forward bases in the region in a manner similar to, although far less formidable than, the PLA's missile forces. Over time, of course, there is also the prospect of Iranian nuclear weapons becoming part of the military balance equation. We now turn to a brief discussion of these Iranian capabilities.

ANTI-SHIP MINES

The relatively confined waters of the Gulf significantly limit naval units' freedom of maneuver, which can be further restricted by seeding the waters with anti-ship mines.[67] Iran's mine-laying capability is significant, especially when one considers the relatively small area under consideration. Moreover, both the Iranian Navy and the naval branch of the IRGC are looking to expand their mine warfare capabilities. While Iran has only a limited number of specialized mine vessels, it can also use small craft, helicopters, submarines and even commercial vessels to

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[66] Ibid., p. 18.

[67] Generally speaking, the ratio of mines to sea area is *not* advantageous to the minelayer. However, the balance shifts toward the minelayer if he places the mines in areas where ships are very likely to go, i.e., harbor approaches, defined shipping lanes, and narrow waters; and if he employs smart mines.

accomplish this mission.[68] Estimates of Iran's mine inventory range from 2,000–3,000.[69] Still, the payloads of most Iranian minelayers are rather modest. This may constitute a key vulnerability in Iran's mine warfare force, especially if the minelayers can be attacked before they can emplace large numbers of mines.

COASTAL COMBATANTS AND SMALL BOATS

The small Iranian surface fleet's only hope of success against the US Navy lies in striking first. Once identified as a hostile combatant, any Iranian surface vessel's prospects for survival decline precipitously.

The small Iranian surface fleet's only hope of success against the US Navy lies in striking first.

However, the combination of the Gulf's relatively constricted waters, relatively large numbers of basing points, a ready supply of highly motivated IRGCN fighters, and Iran's large number of well-armed coastal combatants and small boats represents a significant threat even to modern fleet operations—especially if Iran can get in the first blow.

Of particular concern are small craft with missiles aboard. There are reports that the IRGC operates Iran's entire maritime missile craft, including ten 68-ton Chinese-built *Thondor* (Hudong)-class fast attack craft equipped with I-band search and navigation radars and armed with the C-801 and C-802 anti-ship cruise missiles. Far less formidable are the clusters of small patrol boats equipped with heavy machine guns, grenade launchers, anti-tank-guided weapons, man-portable surface-to-air missiles, and 106-mm recoilless rifles. The IRGC also employs small high-speed craft armed with a mix of small arms. These vessels are difficult to detect by radar in anything but the calmest seas, making them

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[68] Anthony Cordesman and Martin Kleiber, *Iran's Military Forces and Warfighting Capabilities: The Threat in the Northern Gulf* (Washington, DC: CSIS Press, 2007), pp. 119–120. Among Iran's mine warfare craft are three frigates, two corvettes, and ten fast missile boats. Tehran may also have a small number of old US-made RH-53D Sea Stallion mine-laying helicopters. Iran possesses more than two hundred smaller patrol and coastal combatants suitable for mine laying; indeed, Iran used this type of craft to lay mines during the 1980s tanker wars. The Iranian Navy boasts three relatively modern Russian-made type-877 Kilo-class diesel electric submarines, each capable of carrying eighteen torpedoes or twenty-four mines. See Caitlin Talmadge, "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz," *International Security*, Vol. 33, No. 1 (Summer 2008), p. 89.

[69] Stephen Saunders, ed., *Jane's Fighting Ships, 2007–2008* (Surrey: Jane's Information Group, 2007), p. 353. Anthony Cordesman and Martin Kleiber, *Iran's Military Forces and Warfighting Capabilities: The Threat in the Northern Gulf* (Washington, DC: CSIS Press, 2007), p. 120. The Iranians have a variety of anti-ship mines. One is the Russian-designed M-08 moored contact mine, manufactured in North Korea. This mine was responsible for damage to the USS *Samuel Roberts* in 1988. Another is the Russian designed and produced MDM-6, and possibly the MDM-1 as well. Perhaps the most sophisticated mine in the Iranian inventory is the Chinese-built EM-52 (or MN-52) rocket-propelled rising mine. Talmadge, "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz," pp. 91–92. Combined with modern submarine-laid mines and anti-ship missile systems like the CS-801/802 and the SS-N-22, the EM-52 would give Iran considerable capability to harass Gulf shipping and even the potential capability to close the Gulf.

prospectively dangerous in that they can strike quickly and with limited warning.[70] The prospect of suicide attacks against the fleet cannot be discounted, as the IRGC leadership believes that Iran's more fearsome weapon is its martyrdom culture.[71]

ANTI-SHIP CRUISE MISSILES

Iran possesses a hodge-podge inventory of anti-ship cruise missiles, which vary greatly in terms of their manufacturing source and capabilities. Its ASCM inventory comprises old Western models, as well as Chinese- and Russian-made weapons. The Iranians have also made their own modified copies of these weapons. All told, it is likely that the Iranian military counts at least several hundred ASCMs in its arsenal.[72]

One Iranian ASCM is the Chinese-made CSS-N-2 Silkworm, which has two variants (i.e., the Chinese HY-2, and the HY-2G, also referred to as the CSS-C-3 Seersucker). At least one source contends that Iran has deployed at least twelve batteries and three hundred missiles of this type in and around Bandar Abbas, directly across from the Strait of Hormuz.[73] These missiles have a range of roughly 60 miles.

Another Chinese ASCM that has found its way into the Iranian inventory is the C-801A, known as the Sardine. This Sardine is roughly equivalent to the French Exocet ASCM. Iran is estimated to have well over one hundred Sardine ASCMs.[74] An upgrade to the Sardine is the Saccade (CS-802), which has a range of 70 to 75 miles and a 363-pound semi-armor-piercing warhead. During the 2006 Israeli invasion of Lebanon, Hezbollah used copies of the Saccade, reportedly with Iranian aid, to attack the Israeli Sa'ar 5-class *Hanit* ten miles off the coast.[75] (The Noor is Iran's indigenously produced version of the C-802, and is purported

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[70] Anthony Cordesman and Martin Kleiber, *Iran's Military Forces and Warfighting Capabilities: The Threat in the Northern Gulf* (Washington, DC: CSIS Press, 2007), p. 123.

[71] Fariboz Haghshenass, "Iran's Asymmetric Naval Warfare," *Washington Institute for Near East Policy* (WINEP), Policy Focus #87, September 2008, pp. 10–11.

[72] Talmadge, "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz," p. 100.

[73] Ibid., p. 101. Iran has produced an extended-range version of the HY-2, the SS-N-4, which goes by the name of Rad (Thunder). The Rad, which was first tested in military maneuvers in early 2007, is designed to fly lower than the HY-2G Seersucker, and perform evasive maneuvers during its terminal flight phase. The Rad also is equipped with active and passive guidance, electronic counter-countermeasures (ECCMs) and a one thousand-pound warhead. See Fariboz Haghshenass, "Iran's Asymmetric Naval Warfare," Washington Institute for Near East Policy (WINEP), Policy Focus #87, September 2008, p. 15.

[74] "Strait of Hormuz: Assessing Threats to Energy Security in the Persian Gulf," Robert S. Strauss Center for International Security and Law, accessed at http://hormuz.robertstrausscenter.org/missiles#_edn13, on November 6, 2009.

[75] Alon Ben-David, "Hizbullah Hits Israeli Corvette," *Jane's Defense Weekly*, July 26, 2006, p. 18.

to have a range exceeding 100 miles.)[76] The Sardine and Saccade are capable of being launched from surface vessels, aircraft, and trucks. According to one source, Iran has mounted some one hundred Saccades and eighty Seersuckers on trucks.[77] Another source states that Iran has stationed at least sixty of its seventy-five Saccade missiles on the island of Qeshm.[78]

Iran's primary naval platforms for delivering ASCMs are its ten French-made Kaman fast missile boats and its ten Chinese-made Houdong fast missile boats. At least half of the Kaman boasts are believed to carry the C-801, and the Houdong vessels are thought to carry the C-802. The Iranian Navy also has three 1970s-era British guided missile frigates that carry the C-802 and have improved fire-control radars. Additionally, Iran has an air-launched version of the C-801, the C-801K, believed to be installed on up to six old US-built F-4E aircraft—probably located at Bandar Abbas.

Iran continues to improve its ASCM weaponry. There have been reports for several years that Iran has the Russian-made SS-N-22 ASCM, known as the Sunburn. There are indications that the PRC (or perhaps Ukraine) provided Iran with variants of this missile after purchasing Russian copies, and that the Iranians tested the missile in 2006. The missile has a range of over 150 miles and moves at three times the speed of sound, making it a potentially fearsome weapon against any ship operating anywhere near the Strait of Hormuz.[79]

SUBMARINES

In recent years Tehran has begun to focus attention on its submarine flotilla in an attempt to improve the effectiveness of its maritime forces, and to enhance the odds of their survival. To this end, Iran has purchased three Soviet-era Kilo submarines (Type 877 EKM) from Russia.[80] Iran has attempted to offset the weakness of its major surface forces by obtaining three Type 877 EKM

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[76] "Strait of Hormuz: Assessing Threats to Energy Security in the Persian Gulf," Robert S. Strauss Center for International Security and Law, accessed at http://hormuz.robertstrausscenter.org/missiles#_edn13, on November 6, 2009; and Haghshenass, "Iran's Asymmetric Naval Warfare," p. 15.

[77] Saunders, *Jane's Fighting Ships, 2007–2008*, p. 353.

[78] Talmadge, "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz," p. 101. Qeshm Island is just off the southern coast of Iran, opposite the port cities of Bandar Abbas and Bandar Khamir. The island is just over 80 miles long and quite narrow—only about 25 miles wide at most. Of great importance is Qeshm's location along the northern portion of the Strait of Hormuz.

[79] "Iran Tests Upgraded Surface to Sea Missile," India-Defence.com, August 28, 2006. Accessed at http://www.india-defence.com/reports/2408, on November 6, 2009; and Talmadge, "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz," pp. 101–102.

[80] Export versions of the Kilo class are roughly 30 feet longer than the original Kilos and are equipped with advanced command and control systems.

Kilo-class submarines. Each Kilo can remain at sea for up to six weeks, while carrying up to eighteen torpedoes[81] or twenty-four mines. The Iranians keep two Kilos operational at any given time. These submarines have been known to deploy outside the Persian Gulf, in the eastern mouth of the Strait of Hormuz, the Gulf of Oman, and the Arabian Sea.[82]

The noisy waters of the Gulf make detecting submarines like the Kilo more difficult, the underwater geography at the Strait of Hormuz also neutralizes many of the submarine's advantages. The Iranians have at times deployed their submarines beyond the Strait. Once out in the open seas the Kilos can operate in an environment more to their advantage, posing a threat to both commercial shipping and warships emerging from the Gulf into the open seas.[83] There is precedent for this. In 1987 the Iranians laid minefields in the Gulf of Oman, a mission the Kilos may be called upon to perform to establish Iran's A2/AD perimeter defenses.[84] According to at least one source, Iran plans to base its Kilos at Chah Bahar (Bandar Beheshti) on the northern shore of the Gulf of Oman.[85]

Complementing their trio of Kilos, the Iranians also operate *Yono*-class midget submarines and *Nahang*-class coastal submarines. Little is known about the former class of submarines, which have been labeled as the Qadir 1, 2, and 3. They are likely to be employed in the shallow waters at the Strait of Hormuz.[86] As for the latter, their best use would also seem to be in shallow waters. They may be able to deploy and recover swimmer delivery vehicles.

AIR DEFENSES

As with much of its military equipment, Iran's air defense network is a mix of older Western and newer, generally Russian-designed, systems. Among the vintage air defense systems in the Iranian inventory is the domestically produced Shahab

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[81] Armaments carried by the Kilos may include the *Hoot* supercavitating torpedo, which the Iranians reportedly test-fired in April 2006 and July 2008. These torpedoes, like the submarines, are based on a Russian design, in this case the VA-111 Shkval. The Hoot is far from an advanced weapon, being extremely noisy, and a "straight-runner" (i.e., it cannot maneuver).

[82] Fariboz Haghshenass, "Iran's Asymmetric Naval Warfare," Washington Institute for Near East Policy (WINEP), Policy Focus #87, September 2008, p. 13.

[83] Talmadge, "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz," p. 90.

[84] Steven Ward, *Immortal: A Military History of Iran and its Armed Forces* (Washington: Georgetown University Press, 2009), p. 316.

[85] Saunders, *Jane's Fighting Ships, 2007–2008*, p. 354.

[86] Ibid., p. 355. Swimmer delivery vehicles can accommodate a two-man crew and has up to three additional divers. It is well suited to coastal reconnaissance, Special Forces insertion/extraction and mining missions. (They each can carry 14 limpet mines) However, their operations are generally limited to coastal waters.

Taqeb, which resembles French Crotale R440.[87] Another aging Iranian air defense system is the US-built Improved HAWK, which dates back to the time of the Shah. Iran also has significant numbers of Soviet-era SA-2 (Chinese HQ-2) and SA-5 systems, comprising perhaps over fifty launchers in all. During the 1990s Russia reportedly transferred six SA-6 Gainful (Russian 2K12 Kub) systems to Iran, but there is no clear evidence that these Iranian systems are operational.

Among the newer systems purportedly fielded by Tehran are the Russian-designed SA-15 Gauntlet (Russian Tor-M1), and perhaps the SA-10 Grumble (Russian S-300P) and SA-20A/B Gargoyle (Russian S-300PMU-1/2). Yet there has been no concrete evidence that Iranian SA-6 systems are operational.[88] However, in 2007 Iran accepted delivery of 29 SA-15 Gauntlet (Russian Tor-M1) all-weather low to medium altitude, short-range air defense systems.[89] These systems came into service in the Soviet armed forces in the mid-1980s.

Of perhaps greatest concern are reports that Iran has reached an agreement with Russia to purchase the SA-10 Grumble (Russian S-300P) and SA-20 A/B Gargoyle (an advanced version of the S-300) systems. Russian officials confirmed in March 2009 that a contract had been signed in 2007. Various sources within the Israeli defense establishment have told reporters that Iranian S-300s would become operational sometime during 2009.[90] Recently, however, the Russian Government has stated that deliveries of the system have not yet been made to Iran.[91]

Iran's air defense forces are too few to provide more than limited air defense for key population centers, military bases, and facilities (e.g., oil facilities, nuclear facilities). Iran also lacks sufficient low-altitude radar coverage, command-and-control assets, advanced sensors, and electronic counter-counter measure (ECCM) capabilities to field a highly capable integrated air defense against fourth- and fifth-generation aircraft and air-breathing missiles. Moreover, Iran lacks the ability to link together its hodge-podge of air defense systems whose origins range from China and Russia to the United States.[92]

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[87] Anthony Cordesman and Khalid Al-Rodhan, "The Gulf Military Forces in an Era of Asymmetric War: Iran," Working draft, revised June 28, 2006, p. 24. Iran appears to have purchased a number of FM-80 (HQ-7) Crotale (Rattlesnake) short-range SAM systems from China, and more recently succeeded in reverse engineering the system under the Ya-zahra project. There is speculation that Iran also captured Crotale units from the Iraqis during their war in the 1980s, or received some from Libya.

[88] Talmadge, "Closing Time: Assessing the Iranian Threat to the Strait of Hormuz," p. 113. The SA-6 system originally came into service in the Soviet armed forces in the late 1960s.

[89] "Russia Completes Air Defense System Deliveries to Iran—Ivanov," *RIA Novosti*, January 16, 2007, accessed at http://en.rian.ru/russia/20070116/59156706.html, on November 7, 2009.

[90] Dan Williams, "Iran to get new Russian air defences by '09–Israel," Reuters, July 23, 2008, accessed at http://www.reuters.com/article/latestCrisis/idUSL21512727, on November 7, 2009.

[91] "Russia is not currently supplying S-300 SAM systems to Iran," RIA Novosti, October 28, 2009, accessed at http://en.rian.ru/russia/20091028/156624538.html, on November 7, 2009.

[92] Anthony Cordesman and Khalid Al-Rodhan, "The Gulf Military Forces in an Era of Asymmetric War: Iran," Working draft, revised June 28, 2006, p. 25.

BALLISTIC MISSILES

Perhaps the weapons in Iran's arsenal that concern US military planners most are its ballistic missiles. These concerns take several forms. One is that, should Iran develop nuclear weapons, they could be delivered by ballistic missiles. Another is that a highly reliable defense against ballistic missiles has yet to be developed, posing a serious predicament in the event of a nuclear attack. Yet another concern is the threat such missiles could pose to US air and naval bases within the region, even if armed only with conventional warheads, as noted in the discussion of China's A2/AD forces above. As the foregoing narrative suggests, the danger from Iran's ballistic missile forces is more potential than real. Tehran has yet to develop either nuclear weapons (let alone warheads small enough to be delivered by ballistic missiles) or sufficiently accurate ballistic missiles to make saturation attacks by conventionally armed warheads effective against forward bases.

Tehran has yet to develop either nuclear weapons or sufficiently accurate ballistic missiles to make saturation attacks by conventionally armed warheads effective against forward bases.

Iran's family of ballistic missiles is derived from Soviet technology which, in some cases, has passed through the hands of the Chinese and North Korean militaries. A good case in point is the Shahab series of missiles.

The Shahab-1 (better known as the export version of the Soviet Scud-B) is reported to have a nominal range of approximately 185 miles with a conventional warhead payload of about 175 pounds. The missile is inaccurate by current standards, with a nominal circular error probable (CEP)[93] of roughly 1,000 meters. The Shahab-2 (a derivative of the Scud-C) represents a major improvement over the Shahab-1. According to some sources, the Shahab-2 boasts a range of 700 miles and a CEP of only 50 meters.[94] Considering the capabilities of the Russian technology from which the Shahab-2 is derived, however, these figures seem inflated. It is more plausible that the missile's CEP is closer to that of the original Scud-C (700 meters) and that its range is closer to 310 miles, a figure cited in Air Force intelligence estimates.[95] In any case, the missile's range and payload (1,650–2,200 pounds) pose a serious threat to targets along the Gulf's southern littoral.

Recent estimates place Iran's inventory of Shahab-1s at 150–700, and the number of Shahab-2s at between 50 and 600."[96] According to the US Air Force's

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93 The circular error probable is, as its name suggests, a circle representing the distance from a target in which half the weapons fired at it are projected to fall. Thus if a missile has a circular error probable of 100 meters, then one would expect 50 percent of the missiles fired at a given target to land within 100 meters of the target.

94 Anthony H. Cordesman and Adam C. Seitz, *Iranian Weapons of Mass Destruction: The Birth of a Regional Nuclear Arms Race?* (Washington: CSIS, 2009), p. 108.

95 National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat* (Wright-Patterson AFB, NASIC, 2009), p. 11.

96 Anthony H. Cordesman and Adam C. Seitz, *Iranian Weapons of Mass Destruction: The Birth of a Regional Nuclear Arms Race?* (Washington: CSIS, 2009), pp. 103, 108.

National Air and Space Intelligence Center (NASIC), Iran possesses "fewer than 100" total SRBM launchers as of April, 2009.[97]

The Shahab-3 (a.k.a. the Zelzal-3) may, according to many experts, be a derivative of the North Korean No-Dong 1 ballistic missile. Its range is estimated at between 600–1,000 miles.[98] Estimates vary over Iran's Shahab-3 inventory. Some analysts believe the missile may only be deployed with "showpiece" or "test-bed" units. As of April 2009, Iran possesses "fewer than 50" launchers for all variants of the Shahab-3, according to NASIC.[99] The Shahab-4 is a longer-range version of the Shahab-3. Its range is estimated at between 1,200 and 1,700 miles.[100]

Iran is reportedly working on advanced ballistic missile designs. One, the Ghadr-110, is reported to incorporate solid-fuel propulsion and appears similar to China's M-9 ballistic missile.[101] There are also reports that Iran is working on advanced versions of the Shahab missile (i.e., the Shahab-5 and Shahab-6), which would also employ solid fuel and whose range would extend out as far as 3,000 miles, bringing all of Europe and the easternmost parts of the United States within Tehran's targeting envelope.[102] Finally, in late 2007 Tehran announced that it was developing a new missile, called the Ashura, a two-stage solid propellant MRBM with an estimated range of 1,250–1,500 miles.[103]

The regime in Tehran continues to vigorously pursue a military buildup designed to make Iran the dominant military power in the Persian Gulf region.

SUMMARY

To sum up, despite formidable economic challenges and growing concerns over its declining legitimacy in the eyes of a growing number of Iranians, the regime in Tehran continues to vigorously pursue a military buildup designed to make Iran the dominant military power in the Persian Gulf region, if not the Middle East. Fielding an enhanced A2/AD capability that can be employed to credibly threaten the global economy's access to Gulf oil seems to be the regime's objective.

Absent offsetting action by the United States, as Iran's A2/AD capabilities improve over time it will become progressively more difficult for the US military to deploy forces to major bases in the region without incurring a high risk of potentially costly attack from salvoes or Iranian ballistic missiles. Any US naval forces seeking to transit the Strait of Hormuz will confront a hornet's nest of Iranian

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97 National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat* (Wright-Patterson AFB, NASIC, 2009), p. 13.

98 Steven A. Hildreth, "Iran's Ballistic Missile Programs: An Overview," *Congressional Research Service*, February 4, 2009, p. 3.

99 National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, p. 13.

100 Steven A. Hildreth, "Iran's Ballistic Missile Programs: An Overview," *Congressional Research Service*, February 4, 2009, p. 3.

101 Cordesman and Seitz, *Iranian Weapons of Mass Destruction: The Birth of a Regional Nuclear Arms Race?*, p. 121.

102 Ibid., p. 123.

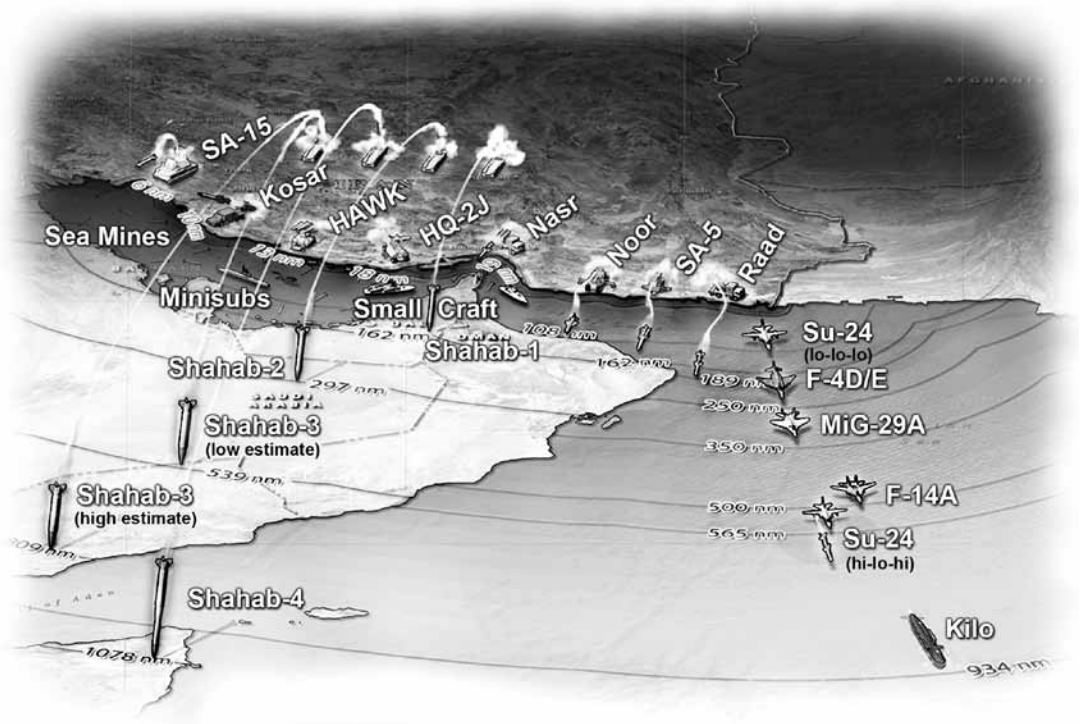
103 Alon Ben-David, "Iran Adds Ashura to Missile Line-Up," *Jane's Defence Weekly*, December 5, 2007.

mines, submarines, torpedoes, anti-ship cruise missiles, and suicide swarm boats, supplemented by land-based strike aircraft and Special Forces. Assuming Iranian ballistic missile accuracy improves over time, US forward-deployed forces will also have to contend with the problem of defending the region's oil and gas fields, along with their transportation and distribution facilities, all of which could be held at high risk of destruction by Iranian forces. Should Iran acquire nuclear weapons, the challenge will be all the more formidable.

As with the case of China, it seems likely that Iran is more interested in creating a military capability that will enable it to coerce its neighbors and exhort concessions from major powers outside the region, rather than preparing for an actual war. However, the latter cannot be discounted, no matter how illogical it may seem to Western political leaders. Sadly, the history of the last century offers many examples of countries that plunged themselves into self-destructive wars.[104]

[104] The list might arguably include Austria-Hungary and Russia (1914), Japan (1941), Germany and Italy (1941, against both the Soviet Union and the United States), Egypt (1967), and Iraq (1980 and 1991).

FIGURE 3. EMERGING IRANIAN ANTI-ACCESS/AREA-DENIAL CAPABILITIES



CONCLUSION

The above discussion strongly suggests that before long the United States will be confronted with a strategic choice concerning its military's ability to preserve access to two key regions of vital interest—the Western Pacific and the Persian Gulf. Given the long timelines needed by the US military to effect significant changes in capabilities and operations, the implications of this choice are profound. It may be that the United States will have to accept the loss of access to these regions. But if this is the case, it should be the result of a careful consideration of alternatives, including alternative methods and capabilities for sustaining the US military's ability to project power in the face of the efforts of other states—China and Iran, in particular—to alter fundamentally the military balance by fielding increasingly threatening anti-access/area-denial forces.

The Air Force and Navy, recognizing their central role in conducting power-projection operations in these two theaters of operations, have accepted the challenge, motivated by the prospective consequences for US security if it fails to go unanswered. Given the stakes involved, their efforts to adapt their power-projection forces accordingly should command the attention and support of senior national security officials and Congress, as well as the interest and support of America's allies.

GLOSSARY

A2/AD	Anti-access/area-denial
AIP	Air-independent propulsion
ASAT	Anti-satellite [capabilities]
ASBM	Anti-ship ballistic missile
ASCM	Anti-ship cruise missile
ASuW	Anti-surface warfare
CSG	Carrier strike group
ECCM	Electronic counter-counter measure
IRGC	Islamic Revolutionary Guard Corps
IRGCN	Islamic Revolutionary Guard Corps Navy
INF	Intermediate Range Nuclear Forces
MaRV	Maneuverable reentry vehicle
MRBM	Medium-range ballistic missile
NETWARCOM	Network Warfare Command
NDP	National Defense Panel
ONA	Office of Net Assessment
OSD	Office of the Secretary of Defense
OTH-B	Over-the-horizon backscatter
OTH-SW	Over-the-horizon surface wave
PLA	People's Liberation Army
PLAAF	PLA Air Force
PLAN	PLA Navy
PLANAF	PLAN Air Force
PGM	Precision-guided munitions
PRC	People's Republic of China
SAM	Surface to air missile
SRBM	Short-range ballistic missile

SSBN	Ballistic missile submarine
SSG	Guided missile submarine
SSGN	Cruise missile submarine
TLAM	Tomahawk Land-Attack Missile
TPFDD	Time-Phased Deployment Data
VLS	Vertical launch systems

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