Journal of Strategic Studies
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/fjss20

China's Anti-Access Strategy in Historical and Theoretical Perspective

Thomas G. Mahnken [a]
[a] US Naval War College , Newport, Rhode Island, USA
Published online: 17 Jun 2011.

To cite this article: Thomas G. Mahnken (2011) China's Anti-Access Strategy in Historical and Theoretical Perspective, Journal of Strategic Studies, 34:3, 299-323, DOI: 10.1080/01402390.2011.574971

To link to this article: http://dx.doi.org/10.1080/01402390.2011.574971

The Journal of Strategic Studies
Vol. 34, No. 3, 299–323, June 2011

Routledge
Taylor & Francis Group

ARTICLES

China's Anti-Access Strategy in Historical and Theoretical Perspective

THOMAS G. MAHNKEN

US Naval War College, Newport, Rhode Island, USA

ABSTRACT This article views China's development of anti-access capabilities against the backdrop of the theory and history of military innovation. It begins with a discussion of the process of military innovation, as well as the indicators that may appear at different stages of that process. It then discusses the barriers to recognizing new ways of war and applies that framework to China's development of advanced ballistic missiles, to include precision-guided conventional ballistic missiles and anti-ship ballistic missiles (ASBMs). It concludes with several suggestions for how to improve the ability to recognize and understand foreign military innovation.

KEY WORDS: China, Anti-access, Innovation, Intelligence

Military innovation has historically been a source of both operational advantage and strategic surprise. In the mid-nineteenth century, Prussia's mastery of the railroad, rifle, and telegraph allowed it to defeat Denmark, Austria, and France and unify Germany under its control. At the beginning of World War II, Nazi Germany's development of armored warfare and tactical aviation delivered a string of unexpected lightning victories against Poland, Norway, Denmark, Belgium, Luxembourg, the Netherlands, and – most dramatically – France. Imperial Japan's use of carrier aviation, naval surface warfare tactics, and amphibious landings allowed it not only to cripple the US Pacific Fleet at Pearl Harbor, but also to seize American, British, and Dutch possessions in Asia in the span of five months.

ISSN 0140-2390 Print/ISSN 1743-937X Online/11/030299-25 © 2011 Taylor & Francis
DOI: 10.1080/01402390.2011.574971

During the 1973 Arab–Israeli War, Egypt's innovative use of surface-to-air missiles and anti-tank guided munitions inflicted on Israel its worst battlefield defeat. The use of stealth and precision-guided munitions by the United States in the 1991 Gulf War yielded a rapid victory that shocked both participant and observer alike.

Over at least the last two decades, scholars have argued that the growth and diffusion of information technology are radically altering the character and conduct of war. States across the globe are incorporating advanced information processing, precision-strike systems, and stealth technology into their armed forces. Although the United States has led the world in the adoption of these technologies, other states, including China, have expressed considerable interest in them as well.[1] As the number of states entering the information age expands, the possibility of strategic surprise may grow dramatically.

China's military modernization has received increasing attention in recent years. China's January 2007 test of a direct-ascent anti-satellite (ASAT) weapon, its fielding of an anti-ship ballistic missile (ASBM), and its development of the stealthy J-20 fifth-generation fighter aircraft have garnered international attention. It is increasingly apparent that the United States has underestimated the scope and pace of Chinese military modernization. Secretary of Defense Robert Gates admitted as much in January 2011 after the appearance of the J-20.[2] Gates' remarks mirrored those of Vice Admiral Jack Dorsett, the US Navy's senior intelligence officer, who has stated that the Defense Department 'certainly would not have expected [the Chinese] to be as far along as they are today' in technology and has argued that the Pentagon needs to refine its intelligence on military matters in China.[3] For his part, the Commander of US Pacific Command, Admiral Robert F. Willard, USN, told reporters in October 2009:

> 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

[1]Emily O. Goldman and Thomas G. Mahnken (eds), *The Information Revolution in Military Affairs in Asia* (New York: Palgrave Macmillan 2004); Jacqueline Newmyer, 'The Revolution in Military Affairs with Chinese Characteristics', *Journal of Strategic Studies* 33/4 (Aug. 2010), 481–504.

[2]John Pomfret, 'Defense Secretary Gates: US Underestimated Parts of China's Military Buildup', *Washington Post*, 9 Jan. 2011, <www.washingtonpost.com/wp-dyn/content/article/2011/01/09/AR2011010901068.html>.

[3]Anna Mulrine, 'We Underestimated China, US Official Says after Reports of J-20 Stealth Fighter,' *Christian Science Monitor*, 6 Jan. 2011.

> that are concerning to the region, some anti-access capabilities and so on.[4]

Much of Chinese military modernization involves a mixture of incremental innovation, creative innovation, and creative adaptation.[5] The People's Liberation Army (PLA) is, for example, fielding a new generation of armored fighting vehicles to replace those that are becoming obsolescent. It is also deploying more capable fixed-wing aircraft. Of greater concern is Beijing's development of qualitatively new capabilities, particularly so-called anti-access and area denial capabilities. As the Defense Department's 2010 *Quadrennial Defense Review* put it:

> Anti-access strategies seek to deny outside countries the ability to project power into a region, thereby allowing aggression or other destabilizing actions to be conducted by the anti-access power. Without dominant US capabilities to project power, the integrity of US alliances and security partnerships could be called into question, reducing US security and influence and increasing the possibility of conflict.[6]

By dramatically raising the cost of power projection, China's anti-access strategy holds the potential to become what Andrew Ross calls a disruptive revolutionary innovation.[7]

Given the stakes involved in China's rise, both in Asia and across the globe, understanding the scope and pace of Chinese military modernization is an important undertaking. This paper argues that one way to understand China's current innovation is to examine an analogous period in the past. Specifically, this paper draws lessons from the period that separated the two world wars. In particular, Japan's development of new ways of war during the 1920s and 1930s, including carrier aviation and amphibious warfare, can provide insight into the challenges that outside observers may face in trying to understand a rising power.

---

[4] <http://www.voanews.com/english/2009-10-21-voa8.cfm.>

[5] Tai Ming Cheung, 'The Chinese Defense Economy's Long March from Imitation to Innovation', *Journal of Strategic Studies* 34/3 (June 2011), 325–54. See also Tai Ming Cheung, 'Dragon on the Horizon: China's Defense Industrial Renaissance,' *Journal of Strategic Studies* 32/1 (Feb. 2009), 29–66.

[6] *Quadrennial Defense Review Report* (Washington DC: DOD Feb. 2010), 31.

[7] Andrew L. Ross, 'On Military Innovation: Toward an Analytical Framework', paper presented at the Conference on China's Defense and Dual-Use Science, Technology, and Industrial Base, University of California, San Diego, 1–2 July, 2010, 14.

Preconceptions about the character and conduct of war, ethnocentrism, and incomplete information frequently conspire to prevent observers from understanding new ways of war. Specifically, observers are more inclined to monitor the development of established weapons than to search for new military systems. It is also easier for them to detect technology and doctrine that have been demonstrated in war than weapons and concepts that have not seen combat. As a result, they readily identify incremental changes to weapons whose value has been demonstrated in war. They experience greater difficulty identifying new or unique systems that have yet to be tested in combat. Finally, observers often pay greater attention to innovations in areas that their own services are exploring than to those that they have not examined, are not interested in, or have rejected. One would therefore expect them to monitor foreign developments that mirror those of their own armed forces more closely than those that differ substantially from them.

This article begins with a discussion of the process of military innovation, as well as the indicators that may appear at different stages of that process. It then discusses the barriers to recognizing new ways of war and applies that framework to China's development of advanced ballistic missiles, to include precision-guided conventional ballistic missiles and ASBMs. It concludes with several suggestions for how to improve the ability to recognize and understand foreign military innovation.

Understanding Military Innovation

There is a considerable body of literature on the phenomenon of military innovation.[8] Scholars have advanced four broad explanations for why and how militaries innovate. One approach, advanced by Barry Posen, holds that civil–military dynamics, and particularly the intervention of civilian policymakers, determine whether militaries innovate. A second argument, whose proponents include Harvey Sapolsky and Owen Coté, holds the relationship between military services within a state determines military innovation. A third line of

[8]See Matthew Evangelista, *Innovation and the Arms Race: How the United States and the Soviet Union Develop New Military Technologies* (Ithaca, NY: Cornell UP 1988); Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars* (Ithaca, NY: Cornell UP 1984); Stephen Peter Rosen, 'New Ways of War: Understanding Military Innovation', *International Security* 13/1 (Summer 1988); Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell UP 1991); Kimberly Marten Zisk, *Engaging the Enemy: Organizational Theory and Soviet Military Innovation, 1955–1991* (Princeton UP 1993).

reasoning, which includes work by Stephen P. Rosen, contends that competition between branches of the same military service drives innovation. A final school of thought, associated with Theo Farrell, Terry Terriff, and others, focuses on the culture of military organizations as the key determinant of military innovation.[9]

Many scholars have pointed to the period between the two world wars as the paradigmatic case of peacetime military innovation.[10] The 1920s and 1930s saw the development of a range of new ways of war – including combined-arms armored warfare, strategic bombing, carrier aviation, amphibious warfare, and strategic air defense – that shaped the course and outcome of World War II.

Such innovations did not spring forth overnight. Indeed, the process of developing novel ways of war may span several decades. Carrier aviation first saw combat in the closing phases of World War I, but only became the dominant arm of naval warfare in World War II. The first precision-guided munitions (PGMs) saw service in World War II and were widely employed during the Vietnam War, but it was not until after the 1991 Gulf War that their full effectiveness became manifest.[11]

Most major military innovations came about due to the recognition of a pressing strategic or operational problem that cannot be handled through improvements to the existing force, but rather requires a new approach. During the 1920s and 1930s, for example, the expectation of a two-front war helped prod the German Army into exploring the potential of combined-arms armored warfare and tactical aviation. During the same period, the possibility that the United States would have to cross the Pacific to defend or re-conquer the Philippines from Japan drove the US Navy to explore offensive carrier warfare and the US Marine Corps to develop amphibious landing doctrine.

Past cases of military innovation show that military services tend to develop new approaches to combat in three distinct but often overlapping phases: speculation, experimentation, and implementation (see Table 1). Each phase yields indicators that can give us an estimation of the pace and scope of innovation.

[9]Adam Grissom, 'The Future of Military Innovation Studies', *Journal of Strategic Studies* 29/5 (Oct. 2006), 905–34.

[10]See, for example, the cases in Williamson Murray and Allan R. Millett (eds), *Military Innovation in the Interwar Period* (New York: Cambridge UP 1996).

[11]Much of the argument that follows is drawn from Thomas G. Mahnken, *Uncovering Ways of War: US Military Intelligence and Foreign Military Innovation, 1918–1941* (Ithaca, NY: Cornell UP 2002) and Thomas G. Mahnken, 'Uncovering Foreign Military Innovation', *Journal of Strategic Studies* 22/4 (Dec. 1999), 26–54.

Table 1. Potential Indicators of Innovation

Phase	Potential Indicators of Innovation
I. Speculation	• Publication of concept papers, books, journal articles, speeches, and studies regarding new combat methods. • Formation of groups to study the lessons of recent wars. • Establishment of intelligence collection requirements focused upon foreign innovation activities.
II. Experimentation	• Existence of an organization charged with innovation and experimentation. • Establishment of experimental organizations and testing grounds. • Field training exercises to explore new warfare concepts. • Wargaming by war colleges, the defense industry, and think-tanks regarding new warfare areas.
III. Implementation	• Establishment of new units to exploit, counter innovative mission areas. • Revision of doctrine to include new missions. • Establishment of new branches, career paths. • Changes in the curriculum of professional military education institutions. • Field training exercises to practise, refine concepts.

Speculation

In the first stage of the process, which may be termed speculation, military innovators identify novel ways to solve existing operational problems or exploit the potential of emerging technology. The most visible indicators of innovation during this phase are often books, journal articles, speeches, and studies advocating new approaches to warfare. These sources may offer the first warning that a state is interested in acquiring new capabilities. In the years following the end of World War I, for example, a handful of European and American military officers speculated on how armored vehicles, aircraft carriers, and land- and sea-based aviation would change the shape of future wars. Debates over the proper composition and employment of tank formations raged on in the pages of the British journals such as the *Journal of the Royal United Service Institution*, *Army Quarterly*, *Journal of the Royal Artillery*, *Royal Engineers Journal*, and even the *Cavalry Journal*. During the same period, service journals contained numerous articles discussing the proper employment of air power and the relative merits of the battleship and aircraft carrier.

The primary challenge that observers face at this stage is detecting foreign interest in new approaches to combat. Predicting a service's

future actions based upon speculative writings in military journals is, however, a hazardous undertaking. It may be exceedingly difficult to determine which – if any – statements are authoritative. Rarely do military professionals agree over the effectiveness of unproven weapons and concepts. Without in-depth knowledge of both the formal and informal hierarchy of foreign military organizations, it is difficult to tell whether an author's opinions are merely his own, or whether they reflect a consensus within his service.

Nor will discussion of new forms of warfare necessarily take place in public. In 1920, for example, Germany's shadow general staff, the Troop Office (*Truppenamt*), established 57 secret committees to study the lessons of World War I. The Army subsequently used their conclusions to develop its doctrine.[12] Great Britain, for its part, developed its integrated air defense system in utmost secrecy. In these instances, early detection of innovation would have required precisely targeted clandestine collection of information.

Experimentation

If the seeds of innovation fall on fertile soil, then speculation regarding emerging warfare areas may grow into experimentation with organizations and doctrine to carry them out. In some cases, this may involve imitating foreign technology, doctrine, and organization; in other cases, it may lead to innovation. Military services may establish experimental units. Between 1926 and 1928, for example, the British Army formed an Experimental Mechanized Force (EMF) to explore armored operations. The US Army created its own experimental forces in 1928 and 1930.[13]

Services may also conduct exercises to examine new concepts. During the 1920s and 1930s, the British, French, German, Soviet, and American armies all held maneuvers to explore the effectiveness of armored formations.[14] In several cases, they sought to determine the value of new organizations by pitting them against standard formations. During the

[12]James S. Corum, *The Roots of Blitzkrieg: Hans von Seeckt and German Military Reform* (Lawrence: Univ. of Kansas Press 1992), 37–8.

[13]John T. Hendrix, 'The Interwar Army and Mechanization: The American Approach,' *Journal of Strategic Studies* 16/1 (March 1993), 78–82; Timothy K. Nenninger, 'The Experimental Mechanized Forces,' *Armor* 78/3 (May–June 1969), 33–9.

[14]On the development of armored warfare during the interwar period, see Capt. Jonathan M. House, US Army, *Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organization*, Combat Studies Institute Research Survey No. 2 (Fort Leavenworth, KS: US Army Command and General Staff College 1984); Richard M. Ogorkiewicz, *Armor: A History of Mechanized Forces* (New York: Frederick A. Praeger 1960).

same period, the US Navy used its fleet exercises to examine concepts for the offensive use of carrier aviation.

Wargaming represents another form of experimentation. During the interwar period, for example, wargames at the US Naval War College explored the role of carrier aviation in future conflicts. One exercise held in the fall of 1923 depicted an engagement between a US naval force with five aircraft carriers – more than any navy possessed at the time – against an opponent with four. During the game, the US force launched 200 aircraft armed with bombs and torpedoes in one strike at the enemy fleet, and succeeded in crippling its carriers and a battleship.[15]

Such experimental activities offer clear indicators of interest in new warfare areas. Yet without a clear understanding of the objectives of foreign maneuvers, it is easy to misinterpret their results. The US Marine Corps, for example, began conducting amphibious exercises in the early 1920s, only to halt them in 1926. It would have been easy for an observer to conclude that the corps had abandoned the idea of amphibious landings as infeasible. Indeed, a Marine after-action report describing these early exercises found them 'woefully theoretical'.[16] In fact, the Marine Corps remained committed to the seizure of advanced bases, but had been forced to suspend exercises due to commitments in Asia and Latin America. Conversely, it is not certain that military organizations will adopt experimental concepts, however promising. Indeed, both the British and American armies chose to disband their experimental mechanized forces, even though they had enjoyed considerable success. It is therefore important to understand the level of bureaucratic support for experimentation within a foreign military organization.

Implementation

Successful experimentation with new approaches to combat may lead military services to adopt concepts and organizations tailored to carry them out. Following the British Experimental Mechanized Force's maneuvers, for example, Colonel C.N.F. Broad wrote *Armoured and Mechanized Formations*, the British Army's first doctrinal publication to discuss armored warfare. In 1931, he assumed command of the 1st Brigade of the Royal Tank Corps to test methods for conducting deep penetrations of an adversary's lines.[17] In November

[15]Rosen, *Winning the Next War,* 69.

[16]Allan R. Millett and Peter Maslowski, *For the Common Defense: A Military History of the United States of America* (New York: The Free Press 1984), 376.

[17]Capt. B.H. Liddell Hart, *The Tanks: The History of the Royal Tank Regiment and its Predecessors Heavy Branch Machine-Gun Corps, Tanks Corps, and Royal Tank Corps, 1914–1945*, Vol. I, *1914–1939* (London: Cassell 1959), 292–4.

1933, the Army authorized the permanent formation of the 1st Tank Brigade and appointed Brigadier Percy Hobart as its commander. Hobart, an advocate of independent tank operations, used the opportunity to test and refine concepts of armored warfare. Mechanized infantry and artillery brigades and supporting units joined the tank brigade to form what was in essence an armored division.

Several indicators may appear at this stage. The establishment of new military formations and the promulgation of doctrine to govern their employment demonstrate a service's commitment to pursuing novel combat methods. In some cases, services may establish new branches, specialties, and career paths to support them. They may also hold exercises and conduct training in these areas. The curriculum of professional military education institutions may change to reflect new doctrine as well.

In some cases, the processes of experimentation and doctrinal development overlapped. In 1934, for example, the US Marine Corps issued the first draft of its *Tentative Manual for Landing Operations*. Beginning in 1936, it began holding fleet landing exercises to examine a range of new amphibious tactics, techniques, and technology. The corps used the results of these exercises to refine the *Tentative Manual*.[18]

The key challenge at this stage is not only detecting or recognizing innovation, but also evaluating the merit of practices whose potential is purely theoretical. Predicting the battlefield impact of new weapons and concepts during peacetime is extremely difficult. Information is often fragmentary, ambiguous, and thus unlikely to challenge prevailing assumptions about warfare. Instead, it sometimes reinforces the tendency to ignore new combat methods.

Of course, not all innovations unfold over decades. The Imperial Japanese Navy, for example, developed the concept of launching concentrated carrier air strikes only months before the attack on Pearl Harbor.[19] Similarly, the Imperial Japanese Army began to study jungle warfare less than a year before its attack upon Southeast Asia.[20] These developments proved much more difficult to detect.

[18]Allan R. Millett, 'Assault from the Sea: The Development of Amphibious Warfare Between the Wars – the American, British, and Japanese Experiences', in Murray and Millett, *Military Innovation in the Interwar Period* (Cambridge: Cambridge UP 1996), 76–7.

[19]David C. Evans and Mark R. Peattie, *Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887–1941* (Annapolis, MD: Naval Institute Press 1997), 347–52.

[20]Col. Masanobu Tsuji, *Japan's Greatest Victory, Britain's Worst Defeat*, ed. H.V. Howe, trans. Margaret E. Lake (New York: Sarpedon Books 1993), 1–18.

Barriers to Understanding Innovation

Understanding new ways and means of warfare before they undergo the test of battle is difficult. As the performance of American and British intelligence between the two world wars demonstrates, it is easy to ignore, overlook, dismiss, or misinterpret evidence of foreign innovation. In particular, preconceptions about the character and conduct of war, ethnocentrism, and incomplete information frequently conspire to prevent observers from understanding new ways of war in peacetime.

Observers face several challenges in trying to identify and characterize foreign military innovation. Perhaps the most pervasive is the tendency to extrapolate, whether consciously or unconsciously. We tend to draw a straight line from past experience to a prediction of the future. In dealing with evolutionary change, such extrapolation often provides a rough approximation of future capabilities. However, in periods marked by discontinuous change, such as that brought on by large-scale innovation, extrapolation can yield inaccurate predictions of military performance. For example, military experts have done a generally poor job of predicting the course or outcome of conflicts over the past two decades. As the military historian Sir John Keegan forthrightly admitted in 2001, 'Warfare is undergoing some strange transformations. Outcomes are becoming increasingly difficult to predict.' He noted that 'In the last 20 years, I have been required professionally to comment upon, to analyze, and to predict outcomes in five wars: The Falklands, the Gulf, the civil war in the former Yugoslavia, Kosovo, and now Afghanistan. The task has become progressively more difficult.'[21]

A focus upon existing warfare areas at the expense of potentially revolutionary technology and doctrine abets the tendency to overlook innovation. In 1935, for example, the US military attaché in Berlin learned that the German Air Force was interested in airborne operations from his assistant, who had gleaned the information from a student at the German General Staff School, the *Kriegsakademie*. However, because Germany possessed no parachute units at the time, the attaché considered the idea to be of purely theoretical interest and instructed his assistant not to accord the issue a high priority. Instead, the officer was to concentrate his efforts upon German infantry, artillery, cavalry, armor, and combat engineer units. It was not until the fall of France and the Low Countries in mid-1940 that the US Army tasked its intelligence assets with collecting information on German airborne operations and forces.

[21]John Keegan, 'The Changing Face of War,' *Wall Street Journal Europe*, 26 Nov. 2001.

The paucity of available data regarding the effectiveness of new technology and doctrine abets the tendency to perceive continuity with the past.[22] Information on new technology and concepts is often fragmentary and thus unlikely to challenge prevailing assumptions about warfare. Indicators of innovation may be similarly ambiguous. The emergence of new combat methods is likely to be accompanied by a substantial degree of organization turmoil and doctrinal ferment.[23] The ambiguity of such information may reinforce the tendency to discount innovation.

In other cases, preconceived notions of technological superiority can blind observers to foreign developments. Information indicating that an adversary has achieved a technological breakthrough may contradict the deeply held beliefs of experts. As R.V. Jones, the father of scientific and technical intelligence, wrote, 'In my own experience, while there have been times when the experts alone were right, there have been important occasions when the other forms of intelligence have been right and the experts wrong.' British intelligence, for example, long discounted the possibility that Germany might be pursuing radar, despite the fact that Britain had already done so. In fact, Berlin's radar research and development program had begun in 1934; by the outbreak of World War II, Germany had deployed navigation radar on several surface ships, was deploying an early warning radar system, and was in the late stages of developing an anti-aircraft fire control radar. Until intelligence conclusively proved the existence of the German 'Freya' air defense radar in early 1941, however, there was widespread disbelief within the British armed forces that Germany had deployed radar systems.

The result of this process is a growing gap between perception and reality. Past experience serves as a cognitive anchor that limits the ability of observers to comprehend the magnitude of change that is underway and constrains the ability of intelligence organizations to understand foreign military developments.[24] The magnitude of this divergence depends upon the amount of time that passes between wars

[22]Thomas G. Mahnken, 'Gazing at the Sun: The Office of Naval Intelligence and Japanese Naval Innovation, 1918–1941', *Intelligence and National Security* 11/3 (July 1996), 424–41.

[23]Rosen, *Winning the Next War*, Ch. 3.

[24]Anchoring occurs when the mind uses a natural starting point as a first approximation to a judgment. It modifies this starting point as it receives additional information. Typically, however, the starting point serves as an anchor that reduces the amount of adjustment, so that the final estimate remains closer to the starting point than it ought to be. Amos Tversky and Daniel Kahneman, 'Anchoring and Calibration in the Assessment of Uncertain Quantities', *Oregon Research Institute Research Bulletin*, No. 12 (1972).

and the amount of technological and doctrinal dynamism in the interwar period. During periods of frequent interaction and conflict, one would expect military organizations to resemble one another. In periods of less interplay, they may display considerable variety.[25]

Not all failures to detect innovation are the result of the lack of information. In some cases, observers gathered accurate information regarding foreign technological and doctrinal innovation but failed to recognize its significance. The pathology of mirror imaging frequently skews assessments of foreign technology and doctrine. During the mid-1930s, the Japanese Navy deployed the Type 93 ('Long Lance') oxygen-propelled torpedo, a 24in (61cm) weapon with a range, speed, and payload much greater than that of contemporary American and British models. Despite the extreme secrecy under which the Japanese developed the weapon, in early 1940 the US naval attaché in Tokyo acquired reasonably accurate information on the torpedo from a Japanese agent. He submitted a report describing the weapon to the Office of Naval Intelligence (ONI), but the Navy's technical experts declared that such a design was impossible – largely because the United States had itself been unable to master oxygen propulsion. Allied naval forces paid the price of this failure when the Japanese used the Long Lance to deadly effect during the 1942 Battles of the Java Sea, Savo Island, and Tassafaronga. It was not until April 1943, three years after ONI had first learned of the existence of the Long Lance, which the office finally concluded – based upon the interrogation of Japanese prisoners – that enemy cruisers and destroyers were armed with oxygen-propelled torpedoes.

Received wisdom about the character and conduct of war can also warp analysis. The US Navy's concept of war at sea, for example, influenced ONI's perceptions of Japanese naval tactics. ONI collected information indicating that the Japanese Navy's training emphasized night operations as a way of negating the material superiority of the American fleet. The office nonetheless failed to recognize the full implications of this approach. Rather, too often American officers projected US naval concepts on their Japanese counterparts. Wargames at the Naval War College assumed that Japanese naval tactics were identical to those of the US Navy. The United States paid for this mistake during the Guadalcanal campaign (1942–43), during which the Japanese Navy repeatedly bested the US Navy in night engagements, despite the fact that the Americans possessed radar.

To the extent that past performance creates expectations about future capabilities, estimates of a state's military power will become

[25]John A. Lynn, 'The Evolution of Army Style in the Modern West, 800–2000', *International History Review* 13/3 (Aug. 1996), 509–10.

more inaccurate over time. Specifically, one would expect observers to underestimate the capabilities of rising powers and overestimate those of declining ones.[26] The failure of the US intelligence community and the vast majority of academics to comprehend the decline of the Soviet economy and the collapse of the Soviet Union is but one of the more recent and dramatic examples of a perennial problem.[27]

American and British estimates of Japan between the two world wars illustrate the difficulties associated with assessing a rising power.[28] Japan possessed an economy one-ninth the size of that of the United States.[29] Whereas the United States enjoyed a diverse and robust industrial infrastructure, Japan's was much more limited. In 1940, for example, the United States produced 61e million metric tons of ingot steel, compared to 7.5 million tons for Japan.[30] The United States was largely self-sufficient in key resources, but Japan depended heavily upon foreign sources of raw materials. Tokyo imported 55 percent of its steel, 45 percent of its iron, and all of its rubber and nickel.[31]

At the beginning of the interwar period, Japanese technology lagged behind that of the other major states. Military observers correctly viewed Japanese training and combat skills as inferior to that of European and American militaries. Within the next two decades, however, Japan grew into a first-class military power. By 1937, for example, Japanese dockyards built more than 20 percent of the world's ships, second only to Great Britain.[32] Tokyo also developed a substantial aircraft industry, first through licensed production of foreign engines and airframes, and then by manufacturing a number

[26]See, for example, Aaron L. Friedberg, *The Weary Titan: Britain and the Experience of Relative Decline, 1895–1905* (Princeton UP 1988), *passim*.

[27]These charges, together with rebuttals, are contained in Bruce D. Berkowitz and Jeffrey T. Richelson, 'The CIA Vindicated: The Soviet Collapse *Was* Predicted,' *The National Interest* no. 41 (Fall 1995); Douglas MacEachin, *CIA Assessments of the Soviet Union: The Record Versus the Charges*, Central Intelligence Agency, Center for the Study of Intelligence Monograph 96-001 (May 1996).

[28]On intelligence on Japanese air power in particular, see Greg Kennedy, 'Anglo-American Strategic Relations and Intelligence Assessments of Japanese Air Power, 1934–1941', *Journal of Military History* 74/3 (July 2010), 737–73.

[29]David Kahn, 'The United States Views Germany and Japan in 1941' in Ernest R. May (ed.), *Knowing One's Enemies: Intelligence Assessment Before the Two World Wars* (Princeton UP 1984), 476

[30]Evans and Peattie, *Kaigun*, 18.

[31]Carl Boyd, 'Japanese Military Effectiveness: The Interwar Period', in Allan R. Millett and Williamson Murray (eds), *Military Effectiveness*, Vol. II, *The Interwar Years* (Boston: Unwin Hyman 1988), 143.

[32]Richard J. Samuels, '*Rich Nation, Strong Army': National Security and the Technological Transformation of Japan* (Ithaca, NY: Cornell UP 1994), 97.

of increasingly capable indigenous designs.[33] By the outbreak of the Pacific War, Japan was producing military aircraft as good as, or better than, its Western counterparts. The Japanese Army and Navy also devised operational concepts designed to offset the advantages of their technically sophisticated adversaries.

Although the United States devoted considerable resources to monitoring Japan, too often Japanese secrecy and preconceptions about the character and conduct of war skewed US assessments. The cultural distance that separated the two states further complicated intelligence collection and analysis. In some cases, the Japanese managed to conceal the development of new ways of war from American observers. In others, American intelligence discounted what turned out to be accurate information due to ingrained assumptions about war. It proved particularly difficult to detect weapons and doctrine that differed considerably from that which the US armed forces employed.

Three patterns emerge from the study of peacetime innovation.[34] First, observers are more inclined to monitor the development of established weapons than search for new military systems. During the period separating the two world wars, intelligence agencies spent a great deal of effort trying to understand weapons that had demonstrated their value on the battlefield in World War I, including the tank, the airplane, and the aircraft carrier. By contrast, they paid little attention to truly new weapons, such as missiles and radar. The low priority they attached to collecting intelligence regarding new technology made it all the easier to ignore the small amount of information that they did receive.

Second, observers pay more attention to technology and doctrine that have been demonstrated in war than those that have not seen combat. In other words, one should expect observers readily to identify incremental changes to weapons whose value has been demonstrated in war. They should experience more difficulty detecting new or unique systems that have yet to be tested in combat.

Finally, it is easier to identify innovation in areas that one's own services are exploring than those that they have not examined, are not interested in, or have rejected. As a result, observers should more frequently detect foreign developments that mirror those of their own armed forces than those that differ substantially from them.

An understanding of past cases of military innovation can, in turn, help us make more perceptive predictions about China. It can, for example, help us anticipate areas of innovation on the basis of likely

[33]See Robert C. Mikesh and Shorzoe Abe, *Japanese Aircraft: 1910–1941* (Annapolis: US Naval Institute Press 1990).
[34]Mahnken, *Uncovering Ways of War*, 4.

operational problems, such as the mission to coerce or invade Taiwan. Awareness of the pattern of military innovation can also help us interpret evidence of the development of new ways of war. Finally, attentiveness to the barriers to understanding innovation can point to ways to overcome them.

Assessing Chinese Military Innovation

As noted above, the existence of a clearly defined strategic or operational problem that defies a conventional solution is frequently a precondition for innovation. In the case of China, the need to coerce, or if necessary defeat, Taiwan to ensure its unification with the mainland serves as a powerful driver of Chinese military capabilities. Key to success in such a scenario would be ensuring that the United States was unwilling or unable to project its maritime and airpower in support of Taiwan. One would thus expect China to seek innovative approaches to achieve that aim.

China has for some time been acquiring the means necessary to pursue unification with Taiwan. As part of its planning for a Taiwan contingency, China is emphasizing measures to deter or counter US intervention in a future cross-Strait crisis. According to the Defense Department's annual report to Congress on Chinese military power, these include the ability to interdict or attack, at long ranges, air and maritime forces that might deploy or operate in the Western Pacific. It is seeking to build the capability to hold at risk regional bases and aircraft carriers. It has also developed a variety of weapons and jammers to degrade or deny an adversary's ability to use space-based platforms.[35]

Some of these capabilities represent evolutionary improvements to existing capabilities. China is, for example, fielding growing numbers of fourth-generation fighters and is developing fifth-generation aircraft. It is also deploying more sophisticated surface-to-air missiles. At sea, China is modernizing its surface navy and submarine force.[36] It is also fielding innovative systems as part of its anti-access strategy, including precision-guided conventional ballistic missiles and ASBMs.

Precision-Guided Conventional Ballistic Missiles

China, which possesses the most active ballistic missile program in the world, has devoted considerable effort to fielding a large number of highly accurate short-range ballistic missiles (SRBMs), marrying

[35] *Annual Report to Congress: Military Power of the People's Republic of China* (Washington DC: Department of Defense 2008), 21–3.
[36] Ibid., 22–3.

China's robust ballistic missile infrastructure with precision guidance. Whereas the popular image of conventionally armed ballistic missiles is the inaccurate and ineffective Scud B and its derivatives, China has fielded a family of SRBMs that could prove devastatingly effective in a future conflict. The PLA has deployed more than 1,000 CSS-6 and CSS-7 short-range ballistic missiles to garrisons opposite Taiwan and is increasing the size of this force at a rate of more than 100 missiles per year. These deployments include variants of these missiles with improved ranges, accuracies, and payloads.[37]

Analysts argue that China's large modern missile force and air forces will pose a considerable challenge to Taiwanese and American efforts to command the air over the Taiwan Strait. They predict that massive ballistic missile salvos launched against Taiwan's air bases would hamper Taipei's ability to generate enough fighter sorties to contest air superiority. As one 2009 RAND monograph puts it, 'As China's ability to deliver accurate fire across the strait grows, it is becoming increasingly difficult and soon may be impossible for the United States and Taiwan to protect the island's military and civilian infrastructures from serious damage.' As a result, the authors observe, 'China's ability to suppress Taiwan and local US air bases with ballistic and cruise missiles seriously threatens the defense's ability to maintain control of the air over the strait.' They further assert, 'The United States can no longer be confident of winning the battle for the air in the air. This represents a dramatic change from the first five-plus decades of the China–Taiwan confrontation.'[38]

Anti-Ship Ballistic Missiles

Perhaps the most innovative system that China seeks is the ability to attack moving ships at sea far from China's shores. According to the Defense Department's annual China military power report,

> China is seeking the capacity to hold surface ships at risk through a layered capability reaching out to the 'second island chain' (i.e., the islands extending south and east from Japan, to and beyond Guam in the western Pacific Ocean). One area of investment involves combining conventionally-armed ASBMs based on the CSS-5 (DF-21) airframe, Command, Control, Computers, Communications Intelligence, Surveillance and Reconnaissance (C4ISR) for geo-location and tracking of targets, and onboard

[37]Ibid., 2.

[38]David A. Shlapak *et al.*, *A Question of Balance: Political Context and Military Aspects of the China-Taiwan Dispute* (Santa Monica, CA: RAND 2009), 126, 139, 131.

guidance systems for terminal homing to strike surface ships on the high seas or their onshore support infrastructure.[39]

According to an unclassified assessment by the US Office of Naval Intelligence, 'China is equipping theater ballistic missiles with maneuvering reentry vehicles (MaRVs) with radar or IR [infrared] seekers to provide the accuracy necessary to attack a ship at sea.'[40] If viable, such missiles, with 'high-reentry speed (Mach 10–12) [and] radical maneuvers', would be extraordinarily difficult to defend against, whatever ballistic missile defense the United States might deploy.[41] This capability would have particular significance, as it would provide China with preemptive and coercive options in a regional crisis. If not countered effectively, the very impression of such a risk might deter carrier strike groups from entering the region in the first place.

Achieving the ability to detect and launch a land-based ballistic missile at a moving target thousands of kilometers away is a daunting challenge. It requires not only a missile capable of finding its target, maneuvering, and avoiding defenses, but also the ability to detect, identify, and track the target in real time using a variety of surveillance platforms, as well as the ability to command and control the system rapidly and flexibly. As a result, a fully operational ASBM capability along with the necessary C4ISR support would be a key indicator of China's greater military modernization effort and potentially an important element in shifting perceptions of the long-term maritime balance in the Western Pacific and beyond.[42]

Given the potential impact of China's anti-access strategy on security in the Asia-Pacific region, it is important to understand the scope and pace of Chinese developments. There is, on the one hand, the danger of overestimating the extent of Chinese military modernization, of crediting China with capabilities that it does not possess. Overestimation would threaten to increase the pressure for competitive arms dynamics in the region. There is also, however, the danger of underestimating Chinese military modernization. Doing so would open up the United States, Taiwan, and other regional actors to surprises in the event of a future crisis or conflict. As noted above, history shows that there is a strong tendency to underestimate the military capabilities

[39] *Military Power of the People's Republic of China*, 23.
[40] *Seapower Questions on the Chinese Submarine Force* (Suitland, MD: Office of Naval Intelligence 2006).
[41] *The People's Liberation Army Navy: A Modern Navy with Chinese Characteristics* (Suitland, MD: Office of Naval Intelligence 2009), 26.
[42] Eric Hagt and Matthew Durnin, 'China's Antiship Ballistic Missile: Developments and Missing Links', *Naval War College Review* 62/4 (Autumn 2009), 87–8.

of rising powers. Moreover, it appears that China's ASBM program has proceeded faster than expected. As Scott Bray, the Office of Naval Intelligence's senior intelligence officer responsible for China, stated in November 2009, 'ASBM development has progressed at a remarkable rate. In a little more than a decade, China has taken the ASBM program from the conceptual phase to nearing an operational capability.'[43]

In assessing the pace and extent of Chinese military modernization, analysts are handicapped by the limits of publicly available information. The Chinese government values secrecy. Indeed, Chinese writings on warfare at least since Sun Tzu have valued secrecy and deception in military affairs. More recently, Chinese writers have emphasized the value of so-called 'assassin's mace' weapons – systems that could be unveiled at a propitious time in a way that would give China an asymmetric advantage against an adversary.[44] Years of US effort to achieve greater transparency in Chinese national security have yielded only modest results. If experience is a guide, the limited information available on Chinese military modernization should abet the tendency to perceive continuity with the past – in this case, a track record marked by limited Chinese military competence.

Openly available evidence suggests that China has moved beyond the speculation and experimentation and has begun the implementation of an anti-access strategy.

At the speculation stage, one would expect to see the formation of groups to explore these new approaches to combat, as well as to collect information on foreign activities of interest. There is robust evidence that China has been doing this for some time regarding both precision-guided ballistic missiles and ASBM.

Andrew S. Erickson and David D. Yang have argued that Chinese leaders and strategists have been thinking of using land-based missiles to hit targets at sea for nearly 30 years. In April 1972, for example, Vice Premier Zhang Chunqiao declared 'We are continentalists. Now guided missiles are well developed. Installed on shore, they can hit any target, and there is no need to build a big navy.'[45]

As would be expected, the Chinese also paid close attention to the development of precision-guided conventional ballistic missiles, first

[43]Quoted in Andrew S. Erickson, 'Ballistic Trajectory: China Develops New Anti-Ship Missile', *Jane's Intelligence Review* (Feb. 2010), 2.

[44]See, for example, Jason E. Bruzdzinski, 'Demystifying Shashoujian: China's 'Assassin's Mace' Concept,' in Andrew Scobell and Larry Wortzel (eds), *Civil-Military Change in China: Elites, Institutes, and Ideas after the 16th Party Congress* (Carlisle, PA: Strategic Studies Institute 2004).

[45]Andrew S. Erickson and David D. Yang, 'Using the Land to Control the Sea: Chinese Analysts Consider the Antiship Ballistic Missile', *Naval War College Review* 62/4 (Autumn 2009), 55.

and foremost the American Pershing II, which featured a MaRV. Erickson and Yang, for example, have catalogued over 50 related commentaries on the subject, even though the missile was withdrawn from service more than two decades ago as a result of the Intermediate-Range Nuclear Forces (INF) Treaty between the United States and the Soviet Union. According to Chinese authors, the missile had an influence on China's development of precision-guided ballistic missiles.[46]

Although it is difficult to determine the transition from speculation to experimentation from open sources, it appears that the 1995–96 Taiwan Strait crisis accelerated China's interest in advanced missiles. The deployment of the USS *Nimitz* and *Independence* carrier battle groups in response to Chinese missile tests and military exercises demonstrated China's inability to counter American sea power. As Colonel Larry Wortzel (ret.), US Army attaché in Beijing from 1995 to 1997, recently testified:

> The first time a senior Chinese military officer of the General Staff Department mentioned ballistic missiles attacking carriers was after our two carriers showed up, and he put his arm around my shoulder and said we're going to sink your carriers with ballistic missiles, and we had a long conversation about it. I don't know if they were doing research before that, but … the first time it got thrown in my face was 1996.[47]

Precision-guided conventional ballistic missiles and anti-ship ballistic missiles began to appear in PLA doctrinal manuals and technical publications in the late 1990s. Over time, discussion of these systems has increased and has moved from being theoretical and conceptual to increasingly systematic and detailed, as one would expect to see as an innovation moved from speculation to experimentation and implementation.[48]

Official military doctrinal publications are written by leading professional military education institutions under the editorial guidance of high-ranking active duty officers. Several doctrinal publications of the PLA as a whole and of the Second Artillery Corps discuss a variety of ways in which to use conventional ballistic missiles to strike air bases and deter or strike carrier strike groups (CSGs). *The Science of Campaigns* and *The Science of Second Artillery Campaigns* deserve special attention as the most authoritative statements available in PLA

[46]Ibid.
[47]Cited in Erickson and Yang, 'Using the Land to Control the Sea', 56.
[48]Hagt and Durnin, 'China's Antiship Ballistic Missile: Developments and Missing Links', 93.

doctrine concerning the operational and tactical use of ballistic missiles. Each has been 'printed and distributed to all military forces, colleges, and universities as a training and learning reference'.[49]

The Science of Campaigns, written by researchers at China's National Defense University, includes an overview of the use of conventional ballistic missiles to 'implement sea blockades' and 'capture localized campaign sea dominance' by 'implementing missile firepower assault or firepower harassment attacks against important targets that the enemy depends on for … sea-based maneuvering'. This is envisioned to be part of a joint campaign with such organizations as the PLA Navy and the PLA Air Force, with which there is supposed to be 'extremely close coordination', although in unspecified contingencies the Second Artillery might operate independently.[50]

The Science of Second Artillery Campaigns, published by the PLA Press in March 2004, provides an even more detailed discussion of advanced ballistic missiles. The book, which serves as a handbook for command personnel in the Second Artillery and PLA in general, is believed to represent the institutional position of the PLA as a whole and has thus been accepted by China's civilian leadership.[51] The 406-page volume contains astonishingly vivid details of the conditions under which China might seek to launch conventional missile strikes against outside intervention. It discusses, for example, 'firepower harassment' as a potentially effective tactic against US military bases on foreign soil.[52] The document also describes the use of ASBMs against carriers in detail and without suggesting that the capability is theoretical or aspirational. Indeed, the section describing their potential employment states that 'conventional missile strike groups' should be used as an 'assassin's mace' (or silver bullet) – a term commonly used in both PLA and less authoritative documents to describe weapons that match Chinese strengths with an enemy's weaknesses.[53] The volume describes five methods of using ASBMs against CSGs, the central pillar of 'military intervention by a powerful enemy' and thus the proper 'focal point for attacks'. Such tactics as firing intimidation salvos, destroying shipborne aircraft with submunitions, or disabling with electromagnetic pulses the sensor systems of Aegis destroyers are designed to make CSGs retreat or render them inoperable.[54]

[49]Cited in Erickson and Yang, 'Using the Land to Control the Sea', 60.
[50]Ibid.
[51]Ibid.
[52]Toshi Yoshihara, 'Chinese Missile Strategy and the US Naval Presence in Japan: The Operational View from Beijing', *Naval War College Review* 63/3 (Summer 2010), 49.
[53]Erickson and Yang, 'Using the Land to Control the Sea', 60–1.
[54]Ibid., 61–2.

The second category of written sources consists of technical analyses by military and civilian specialists of specific systems and operations relevant to advanced ballistic missiles, such as calculations of the maneuvering range of reentry vehicles.[55] These sources offer additional strong indications that China is pursuing advanced ballistic missiles seriously.

There is robust evidence that China has moved from speculating about advanced missiles to at least experimentation, if not deployment and implementation. China has conducted numerous tests of its precision-guided conventional munitions. Moreover, the Asian giant has moved beyond talking about ASBMs to testing them. According to Congressional testimony by Admiral Willard in March 2010, China has tested an ASBM version of the DF-21/CSS-5.[56] He did not reveal, however, how many tests China had conducted, the purpose of those tests, or their success.

Beyond experimentation, there is at least some openly available evidence suggesting that China has progressed to deploying advanced ballistic missiles. At this stage, one would expect to see the establishment of units to exploit new ways of war, the revision of doctrine to include new missions, the establishment of new branches and career paths within the military, changes to the curriculum of professional military education institutions, and field training exercises to practice and refine concepts.

As noted above, both precision-guided ballistic missiles and ASBMs already appear to be integrated into PLA doctrine. Moreover, it appears that the issue of which service will control these weapons has been decided. The PLA's Second Artillery, which controls China's nuclear ballistic missiles, also controls the country's conventional missiles. It also appears that the Second Artillery will control any Chinese ASBMs. Analysts have noted that individuals associated with the Second Artillery Engineering College in Xi'an are responsible for the vast majority of available technical articles devoted to ASBM issues, further suggesting that the institution may be playing a major role in ASBM development. They have also noted many articles from the Second Artillery Equipment Department in Beijing and the Second Artillery Equipment Research Institute, suggesting that some procurement, or at least consideration of procurement, is underway.[57]

[55]Ibid., 58.

[56]Statement of Adm. Robert F. Willard, USN, Commander, US Pacific Command, before the House Armed Services Committee on US Pacific Command Posture, 23 March 2010, 14, <http://armedservices.house.gov/pdfs/FC032510/Willard_Testimony032510.pdf>.

[57]Erickson and Yang, 'Using the Land to Control the Sea', 63–4.

At the same time, analysts note that deploying an effective ASBM system would likely require close cooperation between different Chinese services, raising speculation that bureaucratic friction could impede the deployment of a truly effective system.[58]

Improving the Ability to Detect Innovation

This paper has offered a preliminary assessment of China's development of anti-access capabilities by drawing upon the insights of past cases of military innovation. There are, however, several additional ways that the United States can improve its ability to detect and recognize Chinese innovation. One way to do so would be to make a systematic effort to analyze open sources such as military newspapers, professional journals, and books, as well as semi-open sources such as doctrinal publications, to improve its knowledge of foreign doctrinal debates. In many cases, they may offer the first indication that a foreign service is studying new warfare areas. The limited efforts cited in this paper demonstrate the value of the approach. It would be worthwhile, for example, to translate into English and publish key Chinese doctrinal handbooks, such as *Science of Campaigns* and *Science of Second Artillery Campaigns*. Such an effort would give the non-Mandarin-speaking expert community needed insight into Chinese thinking on defense matters.[59]

A complementary approach would be to establish multi-disciplinary research centers to examine Chinese military affairs. During the Cold War, for example, several think-tanks studied Soviet military concepts and doctrine. Similar efforts could help the US government understand potential future competitors. What lessons, for example, are they drawing from contemporary conflicts? How do they view US forces? Are they attempting to emulate or counter US technology and doctrine?

An effort to identify and track innovators may further illuminate the scope, pace, and emphasis of foreign efforts. During the 1930s, for example, US attachés in Germany followed General Heinz Guderian's writings, mining them for clues to German armored doctrine. A dedicated effort to identify and track foreign individuals and institutions associated with innovation efforts could prove similarly useful. How do they portray future conflicts? Who, if anyone, within their armed forces pays attention to their ideas? Are their ideas used in war-games and exercises? Are they incorporated in doctrine?

[58]Hagt and Durnin, 'China's Antiship Ballistic Missile: Developments and Missing Links', 105.

[59]To date, the only such document to appear in English is Peng Guangqian and Yao Youzhi (eds), *The Science of Military Strategy* (Beijing: Military Science Publishing House 2005).

It may also be worthwhile to develop relationships with foreign professional military education institutions. During the 1920s and 1930s, for example, the Marine Corps Schools at Quantico, Virginia, were responsible for writing amphibious doctrine, while the Naval War College was the hub of that service's thinking regarding carrier aviation. It would be worthwhile to determine whether foreign armed forces are founding new doctrinal and educational institutions. Who is being assigned to their professional military education institutions? Where are they going after these assignments?

Finally, some states considering innovative approaches to warfare may move beyond speculation to begin experimenting with new operational concepts and organizations. An examination of foreign exercises may offer important clues regarding new technology and doctrine. Attempts to explore innovative weapons and concepts should, for example, lead to a change in the observable pattern of exercises. An in-depth study of foreign exercise activity may reveal attempts to develop new approaches to combat.

The growth of Chinese military power has ramifications that go beyond the Asia-Pacific region. Similarly, the topic of Chinese military studies is far greater than the Asia specialist community. Rather, what is needed is a truly multidisciplinary approach – one that draws on the unique strengths not only of regional specialists, but also students of strategy, history, geography, culture, economics and technology.

Note on Contributor

Thomas G. Mahnken is currently Jerome E. Levy Chair of Economic Geography and National Security at the US Naval War College and a visiting scholar at the Philip Merrill Center for Strategic Studies at the Johns Hopkins University's Paul H. Nitze School of Advanced International Studies (SAIS). Dr Mahnken served as the Deputy Assistant Secretary of Defense for Policy Planning from 2006 to 2009. He is the author of *Technology and the American Way of War Since 1945* (Columbia UP 2008), *Uncovering Ways of War: US Intelligence and Foreign Military Innovation, 1918–1941* (Cornell UP 2002), and is editor (with Joseph A. Maiolo) of *Strategic Studies: A Reader* (Routledge 2007). He is an editor of *The Journal of Strategic Studies*.

Bibliography

Annual Report to Congress: Military Power of the People's Republic of China (Washington DC: Department of Defense 2008).

Berkowitz, Bruce D. and Jeffrey T. Richelson, 'The CIA Vindicated: The Soviet Collapse *Was* Predicted', *The National Interest* No. 41 (Fall 1995).

Cheung, Tai Ming, 'Dragon on the Horizon: China's Defense Industrial Renaissance,' *Journal of Strategic Studies* 32/1 (Feb. 2009), 29–66.
Cheung, Tai Ming, 'The Chinese Defense Economy's Long March from Imitation to Innovation,' *The Journal of Strategic Studies* 34/3 (June 2011), 325–54.
Corum, James S., *The Roots of Blitzkrieg: Hans von Seeckt and German Military Reform* (Lawrence: Univ. of Kansas Press 1992).
Erickson, Andrew S. 'Ballistic Trajectory: China Develops New Anti-Ship Missile', *Jane's Intelligence Review* (Feb. 2010).
Erickson, Andrew S. and David D. Yang, 'Using the Land to Control the Sea: Chinese Analysts Consider the Antiship Ballistic Missile', *Naval War College Review* 62/4 (Autumn 2009), 55.
Evangelista, Matthew, *Innovation and the Arms Race: How the United States and the Soviet Union Develop New Military Technologies* (Ithaca, NY: Cornell UP 1988).
Evans, David C. and Mark R. Peattie, *Kaigun: Strategy, Tactics, and Technology in the Imperial Japanese Navy, 1887–1941* (Annapolis, MD: Naval Institute Press 1997).
Friedberg, Aaron L., *The Weary Titan: Britain and the Experience of Relative Decline, 1895–1905* (Princeton UP 1988).
Goldman, Emily O. and Thomas G. Mahnken (eds), *The Information Revolution in Military Affairs in Asia* (New York: Palgrave Macmillan 2004).
Grissom, Adam, 'The Future of Military Innovation Studies', *Journal of Strategic Studies* 29/5 (Oct. 2006), 905–34.
Hagt, Eric and Matthew Durnin, 'China's Antiship Ballistic Missile: Developments and Missing Links', *Naval War College Review* 62/4 (Autumn 2009), 87–8.
Hendrix, John T. 'The Interwar Army and Mechanization: The American Approach', *Journal of Strategic Studies* 16/1 (March 1993), 78–82.
House, Capt. Jonathan M., US Army, *Toward Combined Arms Warfare: A Survey of 20th-Century Tactics, Doctrine, and Organization.* Combat Studies Institute Research Survey No. 2 (Ft Leavenworth, KS: US Army Command and General Staff College 1984).
Kennedy, Greg, 'Anglo-American Strategic Relations and Intelligence Assessments of Japanese Air Power, 1934–1941', *Journal of Military History* 74/3 (July 2010), 737–73.
Liddell Hart, Capt. B.H., *The Tanks: The History of the Royal Tank Regiment and its Predecessors Heavy Branch Machine-Gun Corps, Tanks Corps, and Royal Tank Corps, 1914–1945,* Vol. I, *1914–1939* (London: Cassell 1959).
Lynn, John A. 'The Evolution of Army Style in the Modern West, 800–2000,' *International History Review* 13/3 (Aug. 1996), 509–10.
MacEachin, Douglas, *CIA Assessments of the Soviet Union: The Record Versus the Charges,* Central Intelligence Agency, Center for the Study of Intelligence Monograph 96-001 (May 1996).
Mahnken, Thomas G., 'Gazing at the Sun: The Office of Naval Intelligence and Japanese Naval Innovation, 1918–1941,' *Intelligence and National Security* 11/3 (July 1996).
Mahnken, Thomas G., 'Uncovering Foreign Military Innovation,' *Journal of Strategic Studies* 22/4 (Dec. 1999), 26–54.
Mahnken, Thomas G., *Uncovering Ways of War: US Military Intelligence and Foreign Military Innovation, 1918–1941* (Ithaca, NY: Cornell UP 2002)
May, Ernest R. (ed.), *Knowing One's Enemies: Intelligence Assessment Before the Two World Wars* (Princeton UP 1984).
Mikesh, Robert C. and Shorzoe Abe, *Japanese Aircraft: 1910–1941* (Annapolis: US Naval Institute Press 1990).
Millett, Allan R. and Peter Maslowski, *For the Common Defense: A Military History of the United States of America* (New York: The Free Press 1984).
Millett, Allan R. and Williamson Murray (eds), *Military Effectiveness,* Vol. II, *The Interwar Years* (Boston: Unwin Hyman 1988).
Murray, Williamson and Allan R. Millett (eds), *Military Innovation in the Interwar Period* (New York: Cambridge UP 1996).

Nenninger, Timothy K., 'The Experimental Mechanized Forces', *Armor* 78/3 (May-June 1969), 33–9.
Newmyer, Jacqueline, 'The Revolution in Military Affairs with Chinese Characteristics', *Journal of Strategic Studies* 33/4 (Aug. 2010), 481–504.
Ogorkiewicz, Richard M., *Armor: A History of Mechanized Forces* (New York: Frederick A. Praeger 1960).
Peng Guangqian and Yao Youzhi (eds), *The Science of Military Strategy* (Beijing: Military Science Publishing House 2005).
The People's Liberation Army Navy: A Modern Navy with Chinese Characteristics (Suitland, MD: Office of Naval Intelligence 2009).
Posen, Barry R., *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars* (Ithaca, NY: Cornell UP 1984).
Quadrennial Defense Review Report (Washington DC: DOD Feb. 2010).
Rosen, Stephen Peter, 'New Ways of War: Understanding Military Innovation,' *International Security* 13/1 (Summer 1988), 134–68.
Rosen, Stephen Peter, *Winning the Next War: Innovation and the Modern Military* (Ithaca, NY: Cornell UP 1991)
Ross, Andrew L., 'On Military Innovation: Toward an Analytical Framework', paper presented at the Conference on China's Defense and Dual-Use Science, Technology, and Industrial Base, University of California, San Diego, 1–2 July 2010.
Samuels, Richard J., *'Rich Nation, Strong Army': National Security and the Technological Transformation of Japan* (Ithaca, NY: Cornell UP 1994).
Scobell, Andrew and Larry Wortzel (eds), *Civil-Military Change in China: Elites, Institutes, and Ideas after the 16th Party Congress* (Carlisle, PA: Strategic Studies Institute 2004).
Seapower Questions on the Chinese Submarine Force (Washington DC: Office of Naval Intelligence 2006).
Shlapak, David A. *et al.*, *A Question of Balance: Political Context and Military Aspects of the China–Taiwan Dispute* (Santa Monica, CA: RAND 2009).
Statement of Admiral Robert F. Willard, USN, Commander, US Pacific Command, before the House Armed Services Committee on US Pacific Command Posture, 23 March 2010, 14, <http://armedservices.house.gov/pdfs/FC032510/Willard_Testimony032510.pdf>.
Tsuji, Col. Masanobu, *Japan's Greatest Victory, Britain's Worst Defeat,* ed. H.V. Howe, trans. Margaret E. Lake (New York: Sarpedon Books 1993).
Tversky, Amos and Daniel Kahneman, 'Anchoring and Calibration in the Assessment of Uncertain Quantities', *Oregon Research Institute Research Bulletin,* No. 12 (1972).
Yoshihara, Toshi, 'Chinese Missile Strategy and the US Naval Presence in Japan: The Operational View from Beijing', *Naval War College Review* 63/3 (Summer 2010),59.
Zisk, Kimberly Marten, *Engaging the Enemy: Organizational Theory and Soviet Military Innovation, 1955–1991* (Princeton UP 1993).