

Coping with the Dragon

Essays on PLA Transformation
and the U.S. Military



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Introduction

The probability of conflict between the United States and China over Taiwan has diminished in recent years. The chief potential flashpoint for war, a Taiwanese declaration of independence, has become less likely as Taiwan's independence movement has waned and economic ties with the mainland have strengthened. Should the independence movement in Taiwan regain political momentum, however, the potential for U.S. military intervention in the Taiwan Strait would increase.¹ Further, the perception of U.S. vulnerability in the region could invite assertiveness. So, despite the fact that armed conflict between the United States and China is in no one's interest, China's burgeoning power requires that critical factors in U.S. plans for the defense of Taiwan be examined. This collection of essays offers just such an examination. It looks at China's growing strength, the strategies underlying U.S. plans for military intervention in the Strait, U.S. vulnerabilities, and options for how these vulnerabilities might be overcome through the development of new technologies and strategies.

The U.S. defense commitment to Taiwan, though tacit and conditional, has been a long-standing strategic constant. America's *ability* to prevent the invasion or coercion of Taiwan, however, is more variable. As the Defense Department's most recent report to Congress on Chinese military power indicates, the People's Liberation Army (PLA) has embarked on a concerted effort to modernize, with the goal of being able to conduct (and counter) the sort of rapid, precise, information-intensive operations of which the U.S. military is now capable.²

¹ In March 2005, the PRC legislature passed the Anti-Secession Law, which codified Beijing's threat to go to war if Taiwan declared independence. For a discussion of the status of Taiwan's independence movement, see Robert S. Ross, "Taiwan's Fading Independence Movement," *Foreign Affairs*, 85, no. 2 (March/April, 2006), 141–148.

² *Military Power of the People's Republic of China 2007 Annual Report to Congress* (Washington, DC: Office of the Secretary of Defense, 2007), 3–5, available at <<http://www.defenselink.mil/pubs/pdfs/070523-China-Military-Power-final.pdf>>.

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Of particular concern in a Taiwan scenario is China's growing ability to track, target, and destroy U.S. carrier strike groups (CSGs), which are the fulcrum of American military strategy in the region. The Defense Department reports that the PLA is focused on targeting surface ships at long ranges, perhaps as far as the "second island chain," east of Japan and as far south as Guam.³ China is amassing the intelligence, surveillance, and reconnaissance (ISR) and strike assets needed to conduct long-range precision attacks. These growing capabilities are coupled with PLA doctrine that emphasizes preemption and surprise attack;⁴ the potential significance of this turn of thought was underscored by China's January 2007 demonstration of an anti-satellite weapon. China's growing capabilities demand that the United States carefully review the evolving military balance in the western Pacific and consider the implications for future strategy.

Each essay addresses a key part of the Taiwan intervention puzzle. The compilation moves from an overview of U.S. strength and China's growing military abilities (Gompert); to two pieces on China's present and future military technology (Cheung) and personnel (Lo) resources; to an examination of a particular threat to U.S. regional power, China's improving ISR capabilities (Mulvenon); to a review of U.S. maritime (McDevitt) and aerial (Shlapak) strengths and vulnerabilities; to a piece on how some aerial vulnerabilities could be allayed with UAVs (Libicki); to an analysis of U.S. options to better deter Chinese aggression (Gompert and Long); to a forward-looking article on how a new U.S. fleet architecture could change the balance of power in a Taiwan Strait conflict (Johnson).

David Gompert opens by defining the problem and its key components: China is getting stronger both specifically in its ability to contend with U.S. carrier battle groups and more broadly through military transformation. Gompert points out that though conflict with China is neither inevitable nor in the U.S. interest, the changing balance of power is cause for concern, as the perception of U.S. military vulnerability in the region could be a destabilizing factor.

Tai Ming Cheung then examines one aspect of Chinese military transformation, its military-technological development. Since the 1990s, China has made a sustained effort to develop its technological

³ Ibid., 16.

⁴ Ibid., 12.

and industrial base commensurate with its rising economic status. Citing the wide gulf in technological standards between China and the United States, Europe, and Russia, Cheung questions the goal set for the defense industry's technocrats, scientists, and engineers to leapfrog ahead in defense modernization efforts to catch up to the world's leading military powers by 2020. Cheung focuses on the efforts to introduce reforms to tackle the deep-seated obstacles that have held back China's ability to absorb, create, and diffuse technological innovation.

Timothy Lo focuses on the people aspect of China's military transformation. He emphasizes the need for change that yields a less centralized command structure, collaboration between military branches, a culture that values talent and risk-taking, and armed forces that concentrate on military activities. Lo argues that the Chinese have demonstrated the will to reform by taking actions on each of these, yet more remains to be done if the PLA is to transform itself into a modern military.

James Mulvenon discusses how Chinese advances in the particular area of ISR capability pose increased risk to U.S. aircraft carriers. The paper examines China's overall information operations strategy, specific ISR capabilities, and intentions, and then explores a range of U.S. Navy counter-ISR options.

Mike McDevitt addresses China's maritime strategy and the U.S. Navy's need to improve its capabilities in order to maintain predominance in the Western Pacific. He concludes that Chinese advancements in missile and submarine capabilities means the U.S. Navy must focus on measures to counterbalance Chinese maritime progress.

David Shlapak discusses the role of the U.S. Air Force and notes that developing PLA capabilities will call into question the ability of the United States to operate effectively in such a scenario. Shlapak concludes that the U.S. Air Force and Navy must work together to exploit synergies that would counterbalance Chinese military progress.

Martin Libicki assesses the question of the role and vulnerabilities of U.S. air power and the pros and cons of manned versus unmanned aerial vehicles (UAVs) during a conflict scenario. Libicki concludes that, with further development, UAVs could make a significant (and survivable) contribution to U.S. ISR and communications capabilities.

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David Gompert and Duncan Long analyze new strategic options for the United States. As China's military capabilities improve and the U.S. deterrent threat seems relatively less formidable, America could explicitly threaten to escalate any conflict that China might start, and so confound Beijing's apparent desire to sharply limit any war in both time and space. Such a strategy holds significant risk, but, as a possible way to improve the U.S. defense position in the Western Pacific without committing significantly more resources, deserves consideration. The authors weigh nuclear, economic, and conventional escalation, and conclude that of the three, the prospect of conventional escalation holds the most promise as a credible deterrent.

Stuart Johnson concludes with a proposal to change the naval equation with an alternative future fleet architecture. The aircraft carrier has long been the bulwark of U.S. power projection in the Western Pacific. Thus, China has long had a single problem to address in developing its military capabilities. Johnson discusses how a different U.S. fleet architecture would give China a more complex problem to solve than the one they have been focused on for years.

These essays were written independently of one another and reflect the authors' own assumptions and conclusions, and not those of CTNSP or The National Defense University. Nor are they intended to present a systematic or comprehensive review of the subject at hand; left largely untouched are such disparate but important subjects as the role of U.S.-China economic ties and the relative need for U.S. submarine forces. Taken together, however, they offer insights into the dynamics of the U.S.-China balance of power in the Western Pacific and make a valuable contribution to ensuring that the U.S. military remains capable of preserving American interests in the region.

Though these essays have a military focus, as one reviews the grim prospect of a clash with China as analyzed by the authors, one concludes that the United States must pay particular attention to the delicate political balances surrounding U.S.-Chinese relations and use diplomacy to reduce the chances of a military conflict.

Essay 1

Strategic Context

By David C. Gompert

A string of developments has prompted China to sharpen the focus of its defense strategy and shift military investments eastward, to the Taiwan Strait and the seas beyond. Beijing's botched attempt to intimidate Taiwanese voters in 1996 exposed the extent of Sino-American disparity in usable power. The stunning U.S. interventions in Afghanistan in 2002 and Iraq in 2003 (notwithstanding subsequent U.S. problems in Iraq) displayed growing U.S. combat prowess, especially in exploiting information. From the Chinese viewpoint, U.S. post-9/11 policies, particularly the readiness to use force first and unilaterally, may suggest that the restraints, including self-restraint, on U.S. power are weakening even as that power grows. Meanwhile, China's sharply rising dependence on imported oil has heightened Chinese concern with maritime access, rights, and security. Pro-independence sentiment on Taiwan in the early years of the decade led Beijing to be more explicit about solving the dispute with force if all else fails.

While the motives behind China's new seaward strategy are geopolitical, economic, and complex, the goal of re-unifying Taiwan has become the focal point for planning forces and military operations. Chinese pronouncements make plain that countering U.S. maritime power in the East China Sea and being able to overwhelm Taiwan are now the highest planning priorities for the Peoples Liberation Army (PLA).⁵ In fact, these two objectives overlap, in that superior U.S. forces could defeat a Chinese attack on Taiwan. To prevent the expansion of Chinese military power from endangering regional stability, U.S. interests, and the security of Taiwan, the United States must think no less clearly and act no less purposefully than China is doing. Yet, faced with other challenges, from Afghanistan and Iraq to

⁵ *China's National Defense in 2006*, PRC State Council on Information Office. Available at <<http://www.fas.org/nuke/guide/china/doctrine/wp2006.html>>.

North Korea and Iran, the United States will not find it easy to counter the single-minded and well-resourced strategy on which China has embarked.

Concern about the vulnerability of U.S. forces does not imply that military competition or conflict with China is inevitable or in the U.S. interest. The United States has much to lose by trying to interfere with China's emergence as a responsible power in the region and the world. The United States does not seek a crisis, much less hostilities, over Taiwan, which could destabilize the region, endanger U.S. interests, and lock the two powers into long-term confrontation. However, failing to respond to the Chinese effort to make U.S. military power vulnerable could make a conflict over Taiwan more likely, not less. It could also erode confidence in East Asia, especially in Japan, that the United States can and will check China's use of its growing power. This entire region of immense economic and strategic significance could be destabilized if the United States does not preserve its ability to prevent China from taking Taiwan by force.

The U.S. answer to the new Chinese strategy should be thoughtfully conceived, taking account of the context and complexity of Sino-American relations, regional dynamics, and broadly defined U.S. interests. The United States has many equities to safeguard and many policy levers available to it, not just deadly force. Moreover, predicting Chinese counter-moves to U.S. moves is risky business. There should be no presumption that U.S. efforts to maintain its military advantage will convince China to abandon its effort to erase that advantage. After all, the existing Sino-American military disparity has not dissuaded the Chinese from trying to remedy it. In addition, the course chosen by others—Japan, South Korea, Southeast Asian states, and Taiwan itself—in the event of an arms race and confrontation between China and the United States is not entirely predictable. Given these unknowns and the potential for regional instability, the U.S. should be as judicious as it is resolute in responding to the Chinese buildup.

Thus, the looming vulnerability of U.S. military forces in the Western Pacific should not be addressed in a vacuum. Indeed, what makes the Sino-American military balance critical is its context. With this in mind, this paper will set the stage for those that follow by examining trends in regional security and in the correlation of military

capabilities, the implications of those trends, Chinese perspectives and means, and U.S. aims and options.

The Regional Security Canvas

Even during the height of Soviet power, the United States maintained military superiority in the Western Pacific. The rationale for U.S. military power in this vital region is as strong as ever, but changing. From Korea to Southeast Asia, stability and U.S. security interests depend on that power—therefore on keeping it from becoming vulnerable, but also on avoiding Sino-American conflict.

The most immediate security concern remains Northeast Asia. The need to prevent a Korean conflict is a constant. But the danger now is more one of implosion or nuclear recklessness of the North than of outright invasion of the South. North Korean possession of nuclear weapons raises the stakes for the United States, China, Japan, and of course South Korea, and could strain relations among these interested parties. Given Korean dangers—now nuclear—U.S. deterrence cannot be compromised, no matter what else happens in the region. The U.S. response to China's growing military capabilities should neither neglect security on the Korean Peninsula nor roil Sino-American relations to the point that these two key powers cannot cooperate on Korea, pre- or post-unification. The ability of China and the United States to collaborate on the disposition of North Korea and its nuclear arsenal could become critical.

The U.S. Cold-War mission of defending Japan has been transformed into genuine mutual defense cooperation in and somewhat beyond Northeast Asia. The Japanese are alarmed by North Korean nuclear capabilities and anxious over China's military buildup. So far, the Japanese are reacting to China's growing power and assertiveness with recommitment to their alliance with the United States. Japan may also become more assertive in response to North Korea's nuclear weapons program, perhaps even inching closer to a nuclear weapons capability of its own. Already on edge, Japan would not stand still if it thought that U.S. forces were at risk, that U.S. credibility were in doubt, or that China's growing power were unchecked. In that case, Japanese unilateralism and militarization seem at least as likely as pacifism and accommodation. If managing the rise of China seems difficult now, think of trying to manage the interplay of a rising China and a more assertive and muscular (perhaps nuclear) Japan. In turn, the

effects of Japan's behavior on China must not be underestimated, given that the emotional wounds of their history remain raw to this day. While Japanese forces could do more to offset the growing vulnerability of U.S. forces, Japanese rearmament might cause China to expand its military buildup by augmenting forces, including nuclear ones, that are capable of striking Japan; this certainly would not be good for regional equilibrium. Encouraging broad Japanese militarization is not an option the United States will want to consider in response to the growth of Chinese power.

In addition to these great-power dynamics, regional concerns are rising about terrorism, separatism, piracy, and other sub- and transnational threats in the vicinity of strategic choke-points of Southeast Asia. This sub-region is now both a front in the war on Islamist terrorism and one of the world's most vital trade crossroads. The U.S. Navy's continued strength is important, whether to pursue the terrorists or to guard the sea-lanes. This security function is crucial to East Asian nations and oil-importing allies, South Korea and Japan in particular, who depend vitally on seaborne trade but whose forces lack the range to provide security of their sea lanes. America's naval primacy in Southeast Asia will create complications, however: China's dependence on oil tankers passing through these waters is growing, and it is unlikely that the Chinese will be content with the U.S. Navy controlling waters vital to their economic security—yet another reason China is turning its strategic attention seaward.

Taiwan and U.S. Military Power

At the geographic and strategic center of the region is Taiwan. The ability and will of the United States to assist in Taiwan's defense is of growing importance as Chinese naval, air, and amphibious capabilities improve, and as Beijing seeks negotiating leverage in shaping the eventual relationship of the island to the mainland. With China's offensive capabilities expanding faster than Taiwan's defensive capabilities, the Chinese realize that having the means to degrade the ability of the United States to protect Taiwan could deliver eventual unification—peacefully if possible, forcibly if necessary.

The resolution of the Taiwan dispute will affect far more than the lives of the island's 23 million residents. Although the potential for Sino-American rivalry goes beyond Taiwan, a just and stable resolution, achieved without force or coercion, could reduce that

potential. Conversely, war over Taiwan, beyond its immediate consequences, could shatter the existing order in East Asia.

However accomplished, the fact and terms of Taiwan's becoming again an organic part of China could affect the strategic balance, perceptions, and behavior in the region—most importantly, in Japan—as well as the Sino-American military balance. If China were able to fortify and operate militarily out of Taiwan, its military position in the Western Pacific and beyond would be bolstered, and that of the United States correspondingly weakened. According to the political commissar of the PLA, “[Taiwan] is of far-reaching significance to breaking international forces’ blockade against China’s maritime security ... only when we break this blockade shall we be able to talk about China’s rise. To rise suddenly, China must pass through oceans and go out of the oceans in its future development.”⁶

The Chinese calculus revealed by such statements does not mean that the United States should oppose peaceful unification, which would be an untenable position. But it is important for the United States to comprehend the complex reasons for reunification and its importance to the Chinese. Moreover, if there is an eventual China-Taiwan settlement, the terms will have strategic implications. All the more reason why the United States cannot ignore China's goal of shifting the correlation of forces to gain advantageous terms for reunification and, thus, a larger role as a great power. While the United States cannot and should not try to negate China's goal of greatness, it can and should prevent the creation of a Greater China through forced absorption of Taiwan.

Even if Taiwan is not compelled or coerced into unification, the prospect of unchecked Chinese power could disturb the region, producing a more belligerent Japan, more submissive ASEAN countries (perhaps retarding their bumpy progress toward democracy), and a nuclear or, in the event of unification, “Finlandized” Korea. Moreover, the United States should not assume that Taiwan, as critical as it is, is the only cloud over long-term Sino-American relations. The Chinese regard U.S. power as an impediment to Chinese freedom of action beyond the Taiwan issue.

⁶ Ann Scott Tyson, “Chinese Buildup Seen as Threat to Region,” *The Washington Post*, 20 July 2005.

With the stakes in the region huge, interconnected, and evolving, the United States continues to maintain and adapt a strong military presence as detailed below. A gradual shift is underway from a predominantly Northeast Asian presence to more East and Southeast Asian presence, and from permanent bases to more flexible access and, in Korea, to a more expeditionary force. U.S. forces are becoming increasingly net-centric and capable of joint operations. For now, they are capable of prevailing in any plausible contingency, including hostilities with China over Taiwan. While U.S. ground, air, and naval forces all play a role, naval forces, especially carrier-based, air-strike forces, are the indispensable core, which is why they preoccupy the Chinese.

Approximate U.S. Forces Normally Deployed in East Asia⁷

Ground Forces	35,000 soldiers and marines in South Korea and Japan
Air Forces	180 ground-based fighters and strike aircraft One to several squadrons of heavy bombers in Guam
Maritime Forces	Carrier Strike Group in Japan, including 70 aircraft and 9 surface combatants 3 attack submarines based in Guam 1 USMC Amphibious Ready Group

Whether to deter China from attacking Taiwan, to discourage China more generally from throwing its military weight around, or to avoid unpredictable and unilateral Japanese behavior, maritime power plays a central role in U.S. strategy. U.S. ground forces do not figure

⁷ From Department of Defense Report 309A, "Active Duty Military Personnel Strengths by Regional Area and Country," 31 March 2006; GlobalSecurity.org, "U.S. Forces Korea Order of Battle," available at <<http://www.globalsecurity.org/military/ops/korea-orbat.htm>>; GlobalSecurity.org, "U.S. Forces Japan Order of Battle," available at <<http://www.globalsecurity.org/military/ops/korea-orbat-usfj.htm>>.

significantly in military contingency plans vis-à-vis China. Land-based tactical air power, while important, is limited by the long distances to China from available bases in Japan and elsewhere. U.S. maritime power offers reach, flexibility, and persistence.

American allies, especially Japan and Australia, are being encouraged to play wider maritime defense roles. In cooperation with the United States, the Japanese may build a missile-defense system and beef up their anti-submarine warfare and other maritime capabilities. As already suggested, the United States will walk a fine line between getting Japan to take on increased responsibilities in peacetime security and crisis response and alarming regional neighbors, including South Korea and China itself. The key is to lock Japanese force improvements into the U.S.-Japanese alliance. Of course, that depends on Japanese confidence in U.S. military power, which in turn depends on how the United States responds to China's effort to place at risk U.S. forces in the Western Pacific.

Chinese Perspectives and Programs

Historically, because of their concern about Japanese rearmament, the Chinese have been ambivalent about U.S. military presence in the region—suffering U.S. power as the price of keeping Japanese military power dormant. However, as the U.S. presence appears in Beijing to be aimed increasingly at blocking and even menacing China, as well as frustrating its goal of national reunification, Chinese sentiments about that presence have turned decidedly negative. Presumably, the Chinese are prepared to run the risk of a resurgence of Japanese power if the constraint of American power on Chinese interests can be lifted. This would be consistent with a Chinese worldview that sees China and the United States, not China and Japan, as the final contenders for power in and beyond the Pacific.

As the Chinese see it, the strike capabilities of U.S. nuclear-powered aircraft carriers (CVNs) represent the heart of U.S. military power—and the bull's eye for Chinese strategy and growing capabilities. The ability of carrier-based aircraft to gain air control over the Strait, to sink Chinese amphibious forces, and to strike targets in China is more important than any other factor in a Taiwan scenario. Thanks to more precision-guided munitions and better sensors, CVN-based strike capability is growing, even though the number of CVNs is not. The

threat to China and its forces could become even greater when the United States deploys the stealthy Joint Strike Fighter, starting in 2012.

More broadly, the CVNs are seen by China as the symbol of U.S. military supremacy, a peril to China's economically vibrant coastal regions, the chief obstacle to Chinese freedom of action in the Western Pacific, and a potential barrier to China's unfettered access to the world and its markets. It is neither surprising nor proof of hostile intent that the Chinese want to put the American CVNs at risk, but it is of concern to the United States, nevertheless.

The aim of holding the CVNs at bay, and plans for achieving that aim, are clear from Chinese declaratory policy, and are highlighted and refined by the current PLA national defense policy, concepts of military operations, shifts in emphasis among forces, and investment priorities. It is not difficult to discern a lucid line of strategic thought in the latest Chinese defense White Paper.⁸ The document declares that reunification and the defense of China and its maritime rights are the nation's top security priorities and identifies U.S. military power as the main threat and obstacle to them.⁹ It outlines a multi-tier national strategy to achieve these goals, with particular focus on countering American maritime forces by reorienting and improving Chinese military capability. Other elements are:

- National economic and defense strategies are to be integrated (suggesting that resources, technology, and talent from China's thriving civilian sectors will be made available to the military).
- A reformed, professional, high-quality, trim PLA is needed and will be created.
- "Leapfrog development" of technologies and capabilities will be pursued.
- Emphasis will be on naval, aviation, and missile capabilities, informed and linked by "informationalization," which is the Chinese term for the use of information technology (IT) and networking for intelligence collection and command and control.
- Operations will be increasingly integrated and joint.

⁸ *China's National Defense in 2006*.

⁹ Chinese references to the United States avoid vituperation, which is reserved for the "vicious" forces of Taiwan independence.

- The reach of Chinese “offshore defensive operations” will be extended.
- Long-range, precision-strike capabilities are to be fielded.

China’s calculations and motives may be complex, but there is coherence in its strategy and programs. The geopolitical, technological, and institutional pieces are being put in place. China has placed its long-standing disputes and rivalries with India, Russia, and Vietnam on the back burner and its Pacific interests, access, and defenses on the front burner, which constitutes a shift of focus from the continental west to the oceanic east of the Middle Kingdom. While being careful not to antagonize the United States—economic partner, leader in the war on Islamist terrorism, guardian of world oil supplies and routes, and in any case the world’s superpower—Chinese military planning now revolves around Sino-American contingencies.

China’s emerging security aims and strategy appear to enjoy the full and united support of political and military leaders and are receiving substantially increased resources. Chinese defense spending has increased an average of about 14 percent annually since 1999, compared to average annual GDP growth of about 10 percent. China increased its defense spending by 18 percent in 2007, bringing the official defense budget to \$45 billion.¹⁰ Actual total Chinese defense spending is thought by the U.S. Government to be about three times that amount.¹¹ As important, funding is being shifted into naval and air forces more relevant to countering U.S. maritime power. In a military establishment long (and still) dominated by army generals, this is a powerful indication of Chinese seriousness and of the involvement of party leadership in setting military priorities.

China’s force plans favor specific capabilities needed to:

- coerce or force Taiwan into unification;
- neutralize U.S. capabilities to protect (and possibly embolden) Taiwan;
- counter a perceived U.S. threat to China proper; and
- break U.S. control of the Western Pacific.

¹⁰ Edward Cody, “China Boosts Military Spending,” *The Washington Post*, 5 March 2007.

¹¹ *Military Power of the People’s Republic of China 2007*.

Every one of these goals demands raising the costs and risks to the United States of using its maritime power near or against China and Chinese forces. Yet China is not setting its sights on the ability to defeat the United States in a large, wide, and protracted military conflict, which would require greater resources for the PLA than the leadership is prepared to commit and is unrealistic for the foreseeable future. Moreover, the Chinese surely appreciate the incalculable dangers, should hostilities move beyond engagements off China's coast, last a long time, and turn into a wider Sino-American war that China cannot win.

Rather, with the idea of a swift and decisive move against Taiwan in mind, the Chinese aim is to delay, disrupt, degrade, and possibly deter U.S. intervention based on CVN strike power. The Chinese would surely prefer that U.S. forces not engage at all or, failing that, that hostilities could be tightly confined in duration, scope, and destructiveness—ideally permitting Sino-American relations and trade to get back on track after making amends. Not to get ahead of ourselves, but the ability to frustrate the tidy Chinese idea of a brief, scripted, controlled campaign, with U.S. forces marginalized, should figure in the design of a U.S. response to the looming vulnerability of its maritime power.

In classical terms, China is challenging U.S. sea control of the Western Pacific. Sea control implies an unchallengeable ability to use particular waters and routes while also being able to deny such use to others.¹² It does not mean that others would routinely be deprived of their freedom to use the seas in question for commercial or military purposes, but, rather, that use may be denied at the sole discretion of the controlling power, e.g., in a crisis or conflict. In fact, sea powers like the United States and Great Britain have been champions of freedom of the seas for one and all, *except* when they choose to curtail that freedom. Sea control, classically understood, does indeed describe fairly what the United States currently seeks in the Western Pacific. Thus, the Chinese would be right to understand this to mean that China could be denied use of these international waters in the event of trouble—e.g., Chinese military action against Taiwan—but wrong to

¹² E.B. Potter and Chester W. Nimitz, *Sea Power: A Naval History* (Englewood Cliffs, NJ: Prentice-Hill, 1960), 19.

interpret it to mean that China could be denied use of the seas and access to the world under normal peacetime conditions.

At the same time, the United States is increasingly concerned that China intends to establish the capability to deny the U.S. Navy freedom to operate in the East China Sea. It is important to distinguish between a Chinese desire to break U.S. sea control and a Chinese goal of being able to deny the United States access to and use of these waters. There is nothing in Chinese writings to suggest that the Chinese seek or believe they could achieve such sea control. Their specific ambition appears to be able in limited circumstances and waters to reduce the ability and opportunity of the United States Navy to intervene against Chinese forces. In turn, if the United States cannot maintain permanent and absolute sea control of the Western Pacific—almost certainly an unrealistic goal so near a country with China's potential, ambitions, and need for access—it should aspire to preserve its ability to operate in the region and deny China the hostile use of any international waters of the region.

Chinese Capabilities and Constraints

To assemble the capabilities to break U.S. sea control, China is buying major air and naval combat systems from abroad (figure 2) and will have ample economic means and hard currency to buy much more. To date, Russia has been the main source and, given its limited potential for non-military exports, is likely to remain an eager vendor. China purchased an average of \$2.3 billion in military equipment annually from Russia 1999—2003, up from \$1.9 billion annually during the 1990s. To counter U.S. military power, China will need more sophisticated and capable systems than it can buy from Russia, including long-range sensors and command and control systems. Even if the United States succeeds in pressuring the European Union to retain its embargo on arms sales to China, individual European states, starting with France, will almost certainly pursue deals in disregard of EU guidance. Success in acquiring technologically advanced military equipment from Western suppliers would be an indicator that China is leapfrogging its way into acquiring the technology needed for modern, information-intensive warfare.

Select Major Chinese Foreign Military Purchases 1998–2004.¹³

Equipment Type	Quantity	Origin
Diesel Submarine	8	Russia
Missile Destroyer	2	Russia
Missile Destroyer	2	Russia
Surface-to-Air Missile	12 Bns*	Russia
Surface-to-Air Missile	4 to 8 Bns	Russia
Strike Fighter	76	Russia
Strike Fighter	48	Russia
Combat Aircraft	200	Russia

*Bns = battalions

China cannot, however, be confident of getting all the systems and applied technology it needs from abroad. To gain self-sufficiency, it is gathering and nurturing the technologies needed to produce its own advanced military systems. Thanks mainly to frenzied Western investment in China-based production of civilian products, the Chinese are acquiring modern engineering and manufacturing know-how and experience, technical as well as managerial. For reasons of economic and military strategy, China is also becoming increasingly competent in all aspects of IT.

Whether the weapons, sensor, and communications systems are purchased from abroad or made in China, the PLA's programmatic priorities are clear, ambitious, and true to its new strategy:

- large numbers of advanced submarines, including air-independent propulsion (AIP) submarines¹⁴—the fleet has increased by 19 in the last decade, including new Russian and indigenously-built boats;
- large numbers of advanced short- and medium-range ballistic missiles—the ballistic missile force is estimated to have increased by about 500 in the last decade;

¹³ Jane's Sentinel Security Assessment, "China and Northeast Asia: Chinese Military Procurement." Available at <http://www4.janes.com/K2/doc.jsp?K2DocKey=/content1/janesdata/sent/cnasu/chins150.htm@current&Prod_Name=CNASU&>.

¹⁴ AIP refers to technologies other than nuclear power that enable a submarine to operate without the need to surface or snorkel to obtain atmospheric oxygen.

- modern aircraft—China has purchased over a hundred advanced Russian fighters and is making hundreds more on contract in China;
- modern naval combatants—16 major surface combatants were added in the last decade;
- extended-range sensors—e.g., two AWACS planes from Russia—soon to be delivered, and over-the-horizon radar developed in China;
- information operations, including computer network attack (CNA) and anti-satellite capability—China successfully destroyed one of its own obsolete satellites in January 2007.

For all the emphasis on naval, air, and missile systems, IT and networking are at the heart of what the Chinese are trying to do militarily. As already noted, the PLA has plans to change from a mechanized to an “informationalized” force. Only by integrating naval, air, and missile attacks and enabling them with the fused products of long-range sensors is the Chinese strategy meaningful. With Mao’s antiquated “Peoples War” doctrine giving way to the concept of striking at key enemy capabilities, the Chinese are replacing mass, wide-based, popular resistance and patience with reach, awareness, integration, precision, and speed—all of which demand shared data, collaboration, and, therefore, connectivity.

The Chinese appear to understand how radical a change this is and what they must do to effect it. The PLA recognizes that joint—air, naval, missile, amphibious—operations demand capabilities such as networked battle-management, surveillance, reconnaissance, target acquisition, tracking, sensor-weapon linkage, and weapon guidance. China’s investment in telecommunications networks, extended-range sensors, and its own and European global positioning and navigation systems should come as no surprise.

The PLA is still backward in training, doctrine, inter-service collaboration, flexibility, and distribution of authority in operations. But the need for military reform has been clearly articulated and linked to high national interests, which suggest agreement between the PLA and China’s political leaders that it must happen. In fact, such reforms have begun. Whether it will take a generation or merely years for the PLA to change its character, culture, and practices remains to be seen. (This topic is taken up later).

Even if the Chinese are successful in transforming the PLA, they face an equally difficult challenge in acquiring and absorbing IT in their defense sector, which includes incorporating it into their weapons, platforms, and sensors, as well as using it to integrate those systems with one another and into a distributed, networked command and control network. This challenge can be disaggregated into two separate but related problems: transferring the technology into the military, and creating integrated military networks.

In regard to the first of these problems, imagine a path that stretches from the global pool of advanced IT to China's military forces. The Chinese must clear two hurdles on that path: getting the technology into China, and getting it into China's forces. There are, in turn, two ways the Chinese can overcome these hurdles. The first is to insist that those who wish to sell them military systems also transfer the embedded system technology and associated production directly to China's defense industry, which would enable China over time to curtail military imports and produce what it needs domestically. This strategy of using their huge domestic market as bait is the way the Chinese have acquired technology for infrastructure, manufacturing, and other sectors. The other strategy is for China to develop broad and deep capabilities in IT in the Chinese economy as a whole, with non-defense sectors taking the lead, and then to transfer it into defense.

The first of these strategies is, of course, a more direct route, in that it clears both hurdles in one step. It could bear fruit sooner, since the development of military applications of the technology would already have been done by foreign suppliers. However, the Chinese cannot have complete confidence that this approach would satisfy the requirements implied by their military strategy. They must assume in their strategic calculations, that the United States may put enough pressure on European exporters to minimize sensitive technology transfer to China.

Meanwhile, as noted, China is acquiring a great deal of commercial IT through telecommunications, computer production, and other sectors and ventures in the economy as a whole. While this will provide a vast reservoir of technology and know-how from which the Chinese can draw for military uses, the development of military applications will be largely up to them. There is no question that China, with its growing pool of technically skilled workers and other resources, can do this over

time. However, it will take more time than the direct strategy for two reasons. First, the Chinese defense industry is not only behind Western defense industries but also, generally speaking, behind Chinese non-defense industries in applying IT. Second, while there have been some efforts in integrating the private sector with the defense sector, the entrepreneurial Chinese firms, scientists, and knowledge workers who are leading China's technology march are not naturally drawn to work in or with the defense sector (certainly not before the PLA is drastically reformed).

A separate but related problem, already mentioned, is the need to integrate military systems—weapons, platforms, sensors, and command and control—into *networks of systems*. The Chinese have limited capabilities in the design, engineering, and integration required for discrete complex systems (e.g., air defense radar-interceptor ensemble), much less inter-domain networks of systems (e.g., space-air-ground sensor fusion or air-naval-missile attack synchronization). Moreover, these are not skills that can simply be imported or licensed. At the same time, with the growing applicability of commercial IT in military networking, as well as the fact that that technology is increasingly designed for connectivity, the Chinese might find systems networking less daunting. This challenge of making complex systems work with one another could be surmounted in years, not decades, if and as well-educated and creative engineers and information scientists become available to contribute to national defense—another reason for the Chinese to expedite military reform.

The speed with which the Chinese will be able to overcome the PLA-institutional problem, the technology-acquisition problem, and the systems-integration problem will be determined by how motivated and determined they are. It is important to keep in mind why the Soviet Union could not overcome these obstacles while the United States raced ahead from around 1980, namely, that the Soviet Union had essentially no consumer market for or commercial investment in IT surrounding its huge, industrial-age, military complex. China is the opposite, with growing demand and even more rapidly growing investment to satisfy not only Chinese but also world markets. It is also important to bear in mind that the U.S. military establishment continues to struggle with its own reform and with acquiring, applying, and integrating IT into complex capabilities. Both powers have a difficult

climb ahead, though at present, the U.S. military has a substantial head start.

The net effect of all this is the prospect of a significant Chinese threat to U.S. maritime power in the Western Pacific—the core of U.S. military power and the backbone of regional stability—in years, not decades. This is not only a PLA priority but also a national priority (though the PLA is undoubtedly using the national commitment to the unification of Taiwan as a way of focusing, motivating, and funding its modernization). In the past, China's overriding twin goals of political stability and economic growth relegated military capabilities to a relatively low priority. Now, the goals of preventing an independent Taiwan (and eventual unification with mainland China) and expanding China's status, freedom of action, and security have become more important—and China's economic successes are in any case no longer seen as being in tension with domestic economic growth and political stability, which remain paramount.

Given the obstacles to be overcome, the development of Chinese capabilities to hold U.S. maritime power at risk will likely be gradual. There may not be a Sputnik-like flash that illuminates an altered balance of forces. U.S. military advantages are sizeable, and the development of Chinese capabilities will take some years. Nevertheless, China's economic and technological ability to alter the status quo should not be underestimated, especially now that the political leadership and the PLA are of one, clear mind that this is a high priority.

Implications for the United States and Its Interests

Confrontation or military conflict with China would signify a failure of U.S. policy. U.S. interests lie in China's becoming a reliable economic partner, a responsible power in a vital region, a collaborator in battling global Islamist terrorism, a stakeholder in secure seas and trade routes, an active member of international institutions, and, someday, a member of the world community of democracies.¹⁵ Nevertheless, growing vulnerability of U.S. maritime forces to Chinese

¹⁵ Apart from Taiwan and the U.S.-Japanese military alliance, China and the United States disagree on definitions of sovereignty and territorial claims and on the right and responsibility to intervene in sovereign nations where oppression is rampant.

submarines and missiles could adversely affect U.S. ability to maintain a strong presence and mount a strong response to Chinese military initiatives. In turn, this would weaken the ability of the United States to:

- maintain regional stability and assure allies and others,
- safeguard economic interests in this vital region,
- contribute to the successful protection of Taiwan from attack or coercion, and
- encourage China to pursue a moderate, non-hegemonic regional strategy.

Although we have cautioned against preoccupation with Taiwan scenarios, it is important to consider the possible effects of increased U.S. maritime vulnerability in that particular context. To illustrate, imagine a future moment in which Beijing concludes that the government in Taipei is using practical cooperation and political dialogue with China as a smoke screen for the pursuit of perpetual separation and de facto independence. The PRC decides it must have a more agreeable and malleable government across the Strait or risk the permanent loss of Taiwan. So it declares a maritime keep-out zone around Taiwan; it deploys its (by then) large and capable submarine fleet; it readies its abundant and accurate ballistic and cruise missile forces; it threatens Taiwan with a missile-air-amphibious assault unless the pro-independence government resigns; and it warns Taiwan that requesting U.S. military intervention would amount to external interference and thus lead to war.

Under such circumstances, if U.S. aircraft carriers are not already operating near Taiwan and China, or if they cannot get there in 2–3 days steaming, or if they are simply not ordered to enter these dangerous waters, the Taipei government may opt to accommodate Chinese wishes by agreeing to negotiate reunification terms or else yielding power to a pro-Beijing government that would agree to do so. Alternatively, if the Taiwanese defy China and call for U.S. help, the carriers could be delayed, disrupted, and degraded enough that Chinese forces will be able to deliver a decisive blow against Taiwan. Either way, since Taiwan will be unable to defend itself independently and might not want to risk destruction, China could prevail by having held off the U.S. fleet. The United States would still have military options, such as trying to liberate the island. But China would have the upper

hand by then. Even if China has no intention of pursuing such a bold and risky move, it wants all concerned to know that it could, so that Taiwan's politics and policies become more malleable and America's military posture becomes more cautious.

Thus could the outcome of a Taiwan contingency, along with wider U.S. interests and regional stability, be affected by the vulnerability of U.S. maritime power. Such vulnerability is precisely what the Chinese, more or less openly, are endeavoring to create. The new military strategy aimed at blunting the threat of U.S. intervention and the threat of force against an intransigent Taiwan send an unmistakable signal. The United States must take stock of the new dynamic and adjust its strategy and forces accordingly.

Yet, in responding, there are hazards the United States wants to avoid—let's call them (in Chinese fashion) the "four instabilities."

The first is "arms-race instability." It would be a mistake for the United States to assume that China will become *less* determined if the United States reacts firmly to the growing vulnerability of its fleet. While considering each of its options, the United States must calculate whether the Chinese can and will respond in ways that are even harder and costlier to counter. For example, as we shall see, a race in which the United States adds more and better anti-submarine and anti-missile defense while the Chinese add more submarines and missiles will be determined by the economics and physics of trying to find growing numbers of submarines and shoot down growing numbers of missiles. In time, depending on China's will to play and pay, the United States could find itself either losing the race (and facing a larger Chinese threat) or holding its own but at soaring costs.

The second is "crisis instability." With both sides striving for an operational edge that could be used to gain early and decisive advantage, the benefits of striking first could cause incidents or misunderstandings about either U.S. or Chinese military activities—submarine patrols, flight patterns, and missile tests—to escalate into war. One especially chilling example is that China might fear that launchers for its conventionally-armed ballistic missiles are targeted by U.S. strike aircraft and therefore launch them massively against Taiwan, U.S. CVNs, and U.S. bases in Japan upon first warning that U.S. aircraft have been launched. The very danger of such escalation may make the parties even more inclined to act precipitously. All else

being equal, the U.S. response should be designed to induce Chinese hesitation, not promote haste.

The third is “balance-of-power instability.” Growing Sino-American tension, regardless of cause, could make actors in this vital region more power-conscious, less confident in regional trading partners, and less sure of the wisdom of alignment with the United States. The danger is less that third parties would side with China than that they would run for the sidelines. The United States must walk a fine line. Acting to preserve the survivability and credibility of U.S. military power may help avert allied skittishness, but a Sino-American cycle of action and reaction could have the opposite effect. Its current policy notwithstanding, Japan could become less stalwart, and Southeast Asian countries and Korea could become non-aligned in the Sino-American confrontation. Apart from realignments, the United States does not want to see the vibrancy of this critical region dampened by power politics and anxiety. Compared to other regions of the world, confidence and tranquility have accompanied East Asian progress over the past several decades.

Finally, there is the risk of “political instability” on Taiwan or between Taiwan and China. U.S. strategy is to deter China from attacking Taiwan while discouraging Taiwan from pursuing independence, which might provoke China to use force. While the United States cannot allow its maritime power to grow vulnerable to China without a response, neither does it want its response to convince Taipei that U.S. protection is unconditional. To illustrate, pro-independence factions on Taiwan might be strengthened and unwilling to entertain reasonable Chinese proposals if the United States declared that China itself might be struck if it attacked Taiwan.

As risks must be calibrated, so must measures of success. Beyond the judgment that the United States cannot allow the core of its maritime power in the Western Pacific to become vulnerable to Chinese forces, policymakers must have in mind some minimally acceptable condition. Is that condition military dominance or mere superiority? Or is a stable balance good enough? Must the United States control the Western Pacific, in the sense of being able to deny China access to and use of those waters, or is it enough to ensure that China cannot deny access and use to the United States?

In the end, what matters are broad regional perceptions and specific operational expectations. The United States can live with growing Chinese capabilities and visible military activity, provided it is understood by all in the region, including China, that U.S. forces can prevail decisively in any conflict. For that to be the perception, it must be the reality.

U.S. Aims and Options

Because Chinese objectives include both favorable, long-term, geopolitical-economic conditions and reunification of Taiwan, U.S. aims should address both. The United States cannot block China's rise as an international power and does not need to.¹⁶ Only at great cost could the United States frustrate China's quest for greater reach and access to the world's oceans, resources, and markets. Setting Taiwan aside for a moment, the United States should have no objection to China's commercial or military use of the Western Pacific (or any other international waters), provided U.S. use of the same waters is not challenged. As a country with global interests and security responsibilities, the United States will maintain the capacity to bring decisive power to bear to prevent China (or any other country) from denying U.S. commercial or military freedom on the seas, regardless of what happens on Taiwan. For this reason, China must expect that the United States will maintain the *capability* to exert sea control, even if it may not need to do so. Assuming the Taiwan dispute is resolved peacefully, the only circumstances in which the United States would deny sea access and use to China is in the event of Chinese aggression.

However, as long as China holds out the option and builds capabilities to use force against Taiwan, the United States should consider it necessary, in effect, to police Chinese military use of international waters from which an assault on Taiwan could be mounted. In other words, it is China's own declaratory policy and arms buildup vis-à-vis Taiwan that have led the United States to position itself to exercise sea control in the East China Sea and, thus, curtailment of the maritime rights China holds dear. Of course, the Chinese will not agree with this analysis. They could not accept that the

¹⁶ This point is made forcefully by no less than Henry Kissinger. Emma Graham-Harrison, "China's Inevitable Rise Risks Conflict-Kissinger," *San Diego Union Tribune*, 3 April 2007.

United States has any privilege whatsoever to deny China the use of international waters for any reason, let alone to subdue a renegade province. However, as the world's one great sea power, the United States does indeed have this prerogative. The problem it faces is to preserve this prerogative in the face of the determined challenge on which the Chinese have now embarked.

Conceptually, the United States can respond to the Chinese effort to reduce the survivability of its Western Pacific maritime forces in several ways:

- Making its forces less vulnerable by protecting them better.
- Exploiting vulnerabilities in China's strategy and forces.
- Reducing dependence on maritime forces without compromising the ability to respond to Chinese aggression.
- Being able and willing to escalate, and making that known.
- Transforming its maritime forces to be less vulnerable.

Making U.S. maritime forces less vulnerable by protecting them better would require, above all, improved anti-submarine warfare (ASW) and theater missile defense (TMD) of the fleet, especially the CVNs. In addition, preserving the ability to gain and maintain air control would be relevant, as would the ability to destroy Chinese weapons and installations from which strikes against U.S. forces could be launched.

Exploiting vulnerabilities in China's strategy would begin by recognizing that the Chinese are novices in applying IT and networking to military capabilities and operations. The PLA's legacy structures and preoccupation with centralized operational control are not conducive to networked warfare. Even for more experienced militaries—like that of the United States—collecting, fusing, distributing, and using information quickly and intelligently are challenges. It may be possible to disrupt Chinese sensor networks or confuse Chinese senses. Beyond targeting the Chinese military's information systems, the United States could also attempt to degrade those in the country at large, hoping to break Chinese will in a conflict.

Reducing dependence on maritime forces without compromising the ability to respond to Chinese aggression would require alternative means to perform what is now expected of ships. In sheer volume, land-based air power can exceed CVN-based air power. The problem is

that available land-bases are not very close to China and, despite their distance, could be increasingly vulnerable to Chinese missile attack.

Being able and willing to escalate, and making that known, would open up a different, larger set of issues and require a different analysis. Several potential escalation paths are open to the United States: resorting to economic warfare; spreading the fighting geographically, including into China; and, in extremis, using nuclear weapons if conventional defense is failing. Whether the United States should take any of these paths depends not only on how damaging it would be to China, but also how damaging it would be to the United States, and how the prospect of escalation, of one or another sort, would affect Chinese conduct.

Transforming U.S. maritime forces to be less vulnerable is much easier to imagine than to do. The U.S. fleet is shrinking as ships become more complex and expensive. Moreover, as currently designed and built, the fleet takes decades to change. This condition simplifies Chinese calculations in two respects: operationally, the Chinese can concentrate their attacks on a few high-value ships (e.g., several CVNs); strategically, they can be confident that the U.S. fleet will not change quickly. A different fleet—larger in number, with strike power distributed, more easily modified—could present the Chinese with added complexity. In parallel, development of unmanned aircraft could give the United States an edge in hostilities with China that does not depend on CVNs as we know them. But such transformation is a long-term option, and a lot could happen—including a showdown over Taiwan—in the decades it could take to build and deploy a new and less vulnerable U.S. Navy.

The remaining essays deal with some of these options. Each option is considered by a different author but within a common framework of U.S. interests, military trends, Chinese strategy, regional third-party interests, and risks.

Essay 2

Innovation within China's Defense Technological and Industrial Base

By Tai Ming Cheung

After spending much of the late 20th Century in intensive care, the Chinese defense technological and industrial base (DTIB) has been showing increasing signs of life and vitality in the past few years. This was most vividly demonstrated at the beginning of 2007 when, in the space of a few weeks, China publicly unveiled its first fourth-generation fighter aircraft (which had taken nearly twenty years to get from design to production) and conducted an anti-satellite test in which a ground-launched ballistic missile successfully blasted apart a Chinese satellite more than 500 miles in outer space. These were visible displays of rising Chinese military technological clout.

China's emergence as a thriving, globally connected, market oriented, and increasingly prosperous economic power, coupled with a sharp acceleration in the rearmament needs of the PLA, has paved the way for a concerted effort to tackle the DTIB's deficiencies and put it on a development path to take its place with leading military powers. The country's defense industry technocrats and military scientists and engineers have been given the task of leapfrogging ahead in their defense modernization efforts to catch up with the world's leading military powers by 2020.¹⁷

¹⁷ Zhang Zhaoyin, "Firmly Seize the Period of Important Strategic Opportunities to Promote Leap-Type Development," *Jiefangjun Bao*, 25 February 2003, in *Foreign Broadcast Information Service [FBIS]*, 7 April 2003.

Such an ambitious target may be more aspirational rhetoric than attainable objective, given the current wide gulf in technological standards between China and the United States, Western Europe, and even Russia. Still, the Chinese DTIB has, since the turn of the 21st century, begun to make progress in achieving technological breakthroughs. New generations of military equipment and other sophisticated hardware are coming off production lines in quantities unmatched in the previous 50 years. This paper examines efforts since the late 1990s to transform the Chinese DTIB. Of central interest are the efforts to introduce reforms to tackle the deep-seated obstacles that have held back China's ability to absorb, create, and diffuse technological innovation.

Reform and Consolidation of the Defense Industry Since the Late 1990s

Before the late 1990s, the approach to reform of the inefficient, backward, and grossly oversized Chinese DTIB was hesitant, piecemeal, and incoherent. This was because the defense industrial leadership in charge had trained and advanced through the ranks of the Maoist-era central planning economy, of which the DTIB was the crown jewel. They blocked the implementation of critical reforms that would have addressed some of the most serious woes impeding its performance. But this determined protectionism began to falter from the mid-1990s as this network of senior military and civilian leaders were retired or sidelined and replaced with a more reform-minded leadership.

The new leadership signaled its intention to move assertively to restructure an ailing DTIB by pointing out the importance of the reform of the defense science and technology (S&T) system during the Ninth Five-Year Plan, which covered 1996–2000. Reform measures included:

- providing greater funding for research institutions,
- improving the management of research funds,
- introducing a competitive mechanism for defense research;
- adopting a contract system for research projects,
- speeding up the application of research findings for production,
- improving the integration of military and civilian technologies.

Far-reaching organizational changes were also drawn up that called for a restructuring of the Commission for Science, Technology, and

Industry for National Defense (COSTIND), a revamping of the country's loss-making defense conglomerates, and a more influential and direct role for the PLA in the management of the defense S&T process.

A key principle guiding the leadership was to intensify efforts to erode the barriers that separated the defense and civilian economies. Defense policymakers wanted to readjust the relationship between these two sectors from a largely one-way, military-to-civilian conversion process to a two-way process in which the defense establishment could harness the technological and economic prowess of the civilian economy for its own purposes.

Reducing the Role of COSTIND and Separating it from the PLA

One of the first key reform measures was the separation of the military and civilian components of COSTIND. Under the old state planning system, COSTIND's role was to represent and balance the interests of the DTIB and the military. This had led to constant bureaucratic infighting, because these two groups had diverging interests. As the consumer, the military wanted weapons delivered on time that met its specifications and were cost-effective. But the DTIB had little incentive to meet PLA requirements because it faced little competition.

Under the system that was introduced in April 1998, the military portion of COSTIND was incorporated into a newly established General Armament Department (GAD). The civilian component was retained and kept its COSTIND title. Under this new system, the DTIB no longer enjoyed monopoly control in the production and supply of arms to the PLA. Although the GAD is obligated to look to the domestic defense industry to fulfill orders for the PLA, if military procurers judge that local manufacturers cannot meet their requirements, they can turn to overseas suppliers to meet their needs.

Another key goal in the restructuring of the defense industrial management system was to separate conflicting administrative and commercial duties of COSTIND and its subordinate defense industrial conglomerates. COSTIND's role following the restructuring was to make and administer government policies toward the defense industry. A dearth of planning guidelines and detailed regulations had

contributed to the woes and lack of direction for the DTIB during the 1980s and 1990s. Following its reorganization, COSTIND rushed to issue an extensive range of rules, work procedures, and guidelines to fill this gap in the regulatory regime. Between 1998 and 2002, more than 20 regulations and documents on technological and quality control were issued.¹⁸

Reform of State-Owned Defense Industrial Enterprise Groups

A central cause of the plight of the DTIB during the 1990s was the faltering performance of its prized defense industrial conglomerates. The five line ministries that had overseen the running of the principal defense sectors had been turned into state-owned corporations during the 1980s and early 1990s, but this change had been cosmetic. They continued to function as state bureaucracies rather than independent, commercially-minded corporations. With little competition to encourage efficiency or innovation and the continuation of soft budget constraints, these firms consistently accumulated losses. Corporate reforms sought to correct a number of specific problems.¹⁹

First, an effort was made to distinguish and separate the responsibilities and functions between the conglomerates and COSTIND. The piecemeal and freewheeling nature of reforms during the 1990s in the defense sector and throughout the general economy had led to confusion and extensive overlapping of activities between enterprises and government agencies. While COSTIND was responsible for the regulatory administration of the defense sector, it was also deeply involved in supporting the business operations of enterprises that it owned.

Second, the establishment of two conglomerates for each industrial sector was intended to promote, what officials described as “moderate” competition.

¹⁸ COSTIND Technology and Quality Section. “Yifaxingzheng, Guifanguanli” [According to Law, Administration, Standard Management], *Guofang Keji Gongye* [Defense S&T Industry], September 2002, 15–16.

¹⁹ “Zhu Rongji Talks at Defense Group Ceremony,” *Beijing Central Television Programme One Network*, 1 July 1999, in *FBIS*, 1 July 1999.

Third, the central government reiterated that the central mission of defense industrial enterprises was to develop and produce weapons to support the country's defense modernization. This message had become obscured as defense enterprises switched their attention to serving the civilian market during the reform period to compensate for dwindling military work. Defense-related work had fallen to around 20 percent of the DTIB's annual industrial output value by the late 1990s.

Fourth, the pace of restructuring of enterprises would be speeded up through the backing of "superior" institutions while "inferior" organizations would be eliminated. This was an important policy breakthrough because it gave a green light to the closure or merger of chronically loss-making enterprises.

Fifth, more financial support was made available to assist enterprises to reduce their debts and resolve other operating difficulties. Economic mismanagement and loss-making operations during the 1980s and 1990s had led to a sharp rise in debt levels across the DTIB. To further reduce dependence on the state for financial support, some of the better-managed enterprises were allowed to raise funds on the domestic and international capital markets through bond issues and, more importantly, stock market listings.

These cost-cutting measures, debt restructuring, and access to new sources of capital, combined with a strong pickup in defense orders, led to an impressive turnaround in the business operations of the defense conglomerates, beginning with the end of the 1990s. After eight consecutive years of losses, COSTIND declared that the defense industry had technically broken even in 2002.²⁰ While the output of civilian goods accounted for most of the defense industry's economic expansion during the 1980s and 1990s, this robust across-the-board increase in revenues and production since the end of the 1990s reflected rising orders for both weapons and civilian products.

²⁰ The size of these past losses was enormous. In 1996, for example, the defense industry's combined losses totaled more than Rmb five billion, which may have been equivalent to around ten percent of the sector's total production output value. See Liu Yichang, "Lifting Defense Scientific and Technological Industries Out of Their Predicament," *Junshi Jingji Yanjiu* [Military Economic Research], January 1998, 8.

Introduction of the “Four Mechanisms”

While organizational, corporate, and financial reforms were aimed at addressing structural problems inherent within the defense industrial system, civilian and military decisionmakers were equally concerned with the underlying problems of a highly conservative, uncompetitive, poorly motivated, inefficient, and corrupted institutional culture. These issues, a legacy of the Maoist socialist planning era, lay at the heart of the defense industry’s disappointing performance. The concept of the “Four Mechanisms” was introduced in an effort to overcome the entrenched monopoly that the country’s defense industrial conglomerates had maintained, not only since their corporate establishment in the early 1980s but also in their previous manifestation as government ministries.

The key concepts contained within the “Four Mechanisms” were:

- **Competition.** The authorities were keen to introduce competition, albeit limited and regulated, into the defense industrial and weapons procurement system to tackle the widespread structural problems and malpractices.
- **Evaluation.** Efforts are now being made to establish a more robust evaluation system by improving the training of financial audit personnel and technical specialists, extending project evaluation requirements beyond major projects to also include medium and small projects, and ensuring that evaluation assessments are written into contracts.
- **Supervision.** Corruption and other forms of financial and business malpractices had been a growing problem in the defense industry and weapons procurement system in the reform period.
- **Recruitment.** Fostering a highly motivated workforce is an important goal of the defense industrial authorities. They are seeking to develop mechanisms that will encourage the grooming of more innovative, committed and hard-working employees.

Building a Robust Regulatory and Standards-based Regime

A glaring deficiency of the DTIB in the late 1990s was the absence of a comprehensive and coherent institutional framework of regulations and technical standards to guide technological development. The formulation and implementation of rules, procedures, and technical specifications during the 1980s and first half of the 1990s took place on

a decentralized and often ad hoc basis because of the lack of strong centralized organizations to oversee this work. In an environment of conflicting standards and competing rules and practices, the diffusion of technological knowhow and sharing of information was seriously impeded.

One of the first priorities for the GAD and COSTIND after the 1998 reorganization was to strengthen and expand the regulatory framework. The GAD immediately began work on the drafting of detailed administrative regulations and laws governing armaments research and development, production, and management issues.²¹ The first fruit of this labor was the PLA Regulations on Armaments, which took two years to draw up and was promulgated by the Central Military Commission in 2000. A steady flow of new rules and regulations concerning defense technological and weapons-related matters have since been issued by military and civilian authorities.

The authorities have encountered considerable difficulty in implementing these laws and regulations. Military units and defense enterprises that previously enjoyed wide-ranging freedom in their activities and were unencumbered with laws and regulations have resisted these new procedures.

The establishment of a regime of common and comprehensive technical standards and military specifications has been another important mission for the PLA and DTIB since the beginning of the reform period.²² This task has taken on added urgency since the mid-1990s in the face of growing leadership calls to the military establishment to pursue technological leapfrogging. The development of complex weapons systems is dependent on thousands of standardized parts and components that must be of high quality and reliability.

The setting of technical standards and military specifications is jointly overseen by COSTIND and GAD, which coordinate and define

²¹ Jiao Qiuguang, (Chief Ed), *Junshi Zhuangbei Guanli Xue* [The Study of Military Armaments Management] (Beijing: Junshi Kexue Chubanshe [Academy of Military Sciences Press], 2003), 178.

²² For a detailed examination and history of the evolution of the Chinese military standardization system, see Kong Xianlun, editor, *Jungong Biaozhunhua* [Military Standardization] (Beijing: Guofang Gongye Chubanshe [National Defense Industry Press], 2003).

the activities of several dozen specialized military committees that formulate standards in a wide range of technical areas. Beginning in 1983, when the first 15 national military standards were issued, an average of around 400 standards were passed annually over the next 15 years, totaling around 5,700 by the end of 1998.

The Chinese military specifications and standards regime has a long way to go to catch up with its counterparts in advanced industrial countries. The U.S. Defense Department had an active list of more than 26,000 military specifications and standards in 2001,²³ which was more than four times the size of the Chinese national military standards list.

Access to Foreign Technology Transfers

Expanding access to foreign technological knowledge, products, and practices, both in the military and civilian sectors, has had far-reaching impacts in promoting the technological development of the Chinese defense innovation system in the reform era. This trend has accelerated and deepened since the late 1990s. Although self-sufficiency remains a cornerstone of the country's defense technological and industrialization modernization goals, this is a long-term, strategic aspiration. The focus over the next couple of decades is to pursue a parallel development strategy of acquiring and absorbing foreign technology that complements and supports indigenous weapons R&D.

Since the 1990s, the DTIB has employed several approaches in the pursuit of foreign technological products and processes:

- *Technical and advisory consultation.* China invited large numbers of foreign defense scientists and engineers during the 1990s to provide technical and consulting advice for weapons development projects as well as for academic and professional exchanges and conferences. This provided the DTIB with a useful source of external information and analysis.
- *Off-the-shelf purchases of complete systems.* The predominant form of technology transfers during the 1990s was the acquisition

²³ U.S. Department of Defense, Office of the Undersecretary of Defense (Acquisition, Technology and Logistics) Logistics Plans and Programs, *MilSpec Reform: A Final Report* (Washington, DC: Defense Standardization Program Office, April 2001), 11.

of sizeable amounts of completed weapons systems, primarily from Russia, for PLA operational use.²⁴

- *Supply of sub-systems and components.* In technological areas in which the Chinese DTIB was weak, foreign assistance has been sought to provide specific sub-systems and components to be incorporated into domestic designs.
- *Offset license assembly and production of complete systems.* From the mid-1990s, China signed a small number of deals, all with Russia, for the license production of fighter aircraft and missiles. This allowed the transfer of technological products and manufacturing processes that were at least a generational leap ahead of existing Chinese technology levels.
- *Joint design and development.* This approach offers the greatest opportunities for technology transfers to China. Since the beginning of the millennium, the Chinese government has asked Russia to undertake the joint development of new generations of weapons and supporting systems. Moscow had previously been lukewarm to these proposals because it was concerned that this would allow the Chinese DTIB to catch up with Russian defense technology levels.

The absorptive capacity of the Chinese DTIB was severely tested in assimilating the influx of Russian defense technology transfers, especially such advanced and highly complex systems as fighter aircraft and naval vessels. The case of the Su-27 license production project provides a vivid insight into the difficulties that the Chinese encountered.²⁵ When Shenyang Aircraft Corporation (SAC), one of the DTIB's premier manufacturing facilities, began to build the Su-27 fighter aircraft from self-assembly kits in the late 1990s, Chinese engineers struggled to implement the advanced technological and industrial management methods needed to construct the aircraft. The first two locally assembled aircraft had to be shipped back to Russia for re-assembly because of sub-standard work.

After these initial problems, quality and productivity levels gradually improved so that, by the end of 2003, the annual production rate of the

²⁴ *Military Power of the People's Republic of China 2004 Annual Report to Congress* (Washington, DC: Office of the Secretary of Defense, 2004), 30–31.

²⁵ This section is based on extensive interviews with Russian military officials closely involved in the Su-27 project, Beijing, 1997, 1998, and 1999.

Su-27 had reached the target figure of 15 aircraft.²⁶ This showed that SAC was able to learn, adapt, and absorb the technology transfers and eventually turn the technology and knowledge acquisition into productivity and quality improvements.

While the Russian defense technology transfers have directly contributed to increases in productivity and quality performance levels in the case of SAC, the impact on indigenous technological innovation capabilities in the DTIB is more difficult to assess because of the lack of available information. Studies of foreign technology transfers into the Chinese civilian manufacturing sector, though, suggest that these transfers alone are not sufficient to promote innovation within local firms. Only when the importation of technological knowledge, products, and processes are combined with in-house R&D activities do increased returns for indigenous R&D result.

Mending a Broken Diffusion System

A fundamental weakness of the defense S&T system has been its poor ability to diffuse technological achievements. At the end of the 1990s, it was estimated that fewer than 15 percent of the military inventions annually developed by defense R&D institutes were commercialized, and fewer than three percent were eventually adopted for large-scale, serial production.²⁷

A key reason for the ineffectiveness of the diffusion process is the lack of incentives that research institutions have to pursue their activities to fruition in the marketplace or on the production line. Most importantly, the lack of an effective patent system and intellectual property rights culture has meant that researchers and their institutions

²⁶ Interview with Russian military official, Beijing, December 2003.

²⁷ Zhu Qinglin and Meng Renzhong (Chief Eds), *Zhongguo Caijun Yu Guofang Ziyuan Peizhi Yanjiu* [China's Disarmament and Research into the Disposal of Defense Resources] (Beijing: Junshi Kexue Chubanshe [Military Sciences Press], 1999), 152–153; and Xin Guoping, "Research on the Industrialization and Commercialization of Science and Technology Achievements from Military Industry," *Ranqi Wolun Shiyun Yu Yanjiu* [Gas Turbine Experimentation and Research], No. 2, Vol. 14, 2001, 55–58. The commercialization rate for the NDSTU was three percent. Zhujian Weili, 172.

have received little or no reward from the exploitation of their work.²⁸ Scientists and engineers have had little motivation to carry on with the development of their research output for commercial dissemination.

The Chinese government and the DTIB finally began to pay serious attention to protection of intellectual property rights in the mid-1990s, spurred by serious disputes with major trading partners, the country's efforts to gain admission into the World Trade Organization, and a growing recognition that an effective patent regime was crucial to spurring S&T development. This has led to the gradual strengthening of the patent regime since the beginning of the new century. Special attention has been paid to enhancing the protection of scientists involved in civilian and defense-related R&D.²⁹ A new statute on defense patents was promulgated in November 2004 to supersede an earlier, outdated law.

Diffusion of defense technological R&D also has been obstructed by other factors, including:

- the backward state of the military technical standards framework,
- the dominance of technology push in R&D projects, in which government requirements have determined priorities and goals, while the demands of end-users have been ignored,³⁰ and
- the lack of a comprehensive regulatory framework to provide rules and laws to guide the development of the commercialization of defense S&T achievements.³¹

Overhauling the Research and Development Process

The Achilles heel of the DTIB during the 1980s and 1990s was the R&D apparatus. None of the measures taken to improve its performance adequately addressed the root causes of the problems holding back the creation, nurturing, and diffusion of innovation that

²⁸ See Du Ying, "Guofang Jishu Zhishi Chanquan Baohu Yanjiu" [Research into the Protection of Defense Technological Intellectual Property Rights], *Zhishi Chanquan* [Intellectual Property], April 2002, 21–24.

²⁹ "Protection of Patents to be Strengthened in China," *China Daily*, 23 April 2003.

³⁰ Carl J. Dahlman and Jean-Eric Aubert, *China and the Knowledge Economy: Seizing the 21st Century* (Washington, DC: The World Bank, 2001), 109.

³¹ Chen Lin and Chen Kai, "Tuiguang Zhuanhua Gongzuo" [Working to Transform Popularization], *Guofang Keji Gongye*, March 2003, 36–37.

persisted as a legacy of the socialist planning system. The major structural impediment was the continuing separation of the R&D and production systems. A second obstacle was that the only source for the promotion of innovation came from governmental agencies and not commercial enterprises. As research institutes and production enterprises relied exclusively on the government and military establishment for funding and resources to undertake defense-related R&D, they had no independent capability or incentive to come up with or pursue their own initiatives. The resultant, deep-rooted, institutional passivity smothered any innovative creativity.

A bolder reform strategy was required to tackle these serious shortcomings in the R&D apparatus.

- First, there was a pressing need to reform the relationship between secondary government and military actors. COSTIND's dual role of looking after the DTIB and at the same time being responsible for meeting PLA equipment needs created fundamental conflicts of interest and confusion.
- Second, the urgent need to break down the compartmentalization of the R&D and production systems was identified, but policy planners were unsure how to carry out this task. There was agreement that the starting point for tackling this issue would be based on the reform model undertaken in the civilian S&T system, i.e., by focusing on the transformation of R&D institutes into commercial enterprises with their own independent legal and financial rights. But concerns were expressed that if defense R&D institutes were turned into commercial enterprises, they would put the pursuit of profits ahead of their duties of engaging in low-margin defense R&D activities.

To bolster this effort to place defense conglomerates at the heart of the defense innovation system, the establishment of in-house technology development centers in large-scale defense enterprises was also encouraged.³² The goals were to increase the amount of investment that firms devoted to R&D, promote interaction with universities and research institutes, concentrate more resources on developing high-technology and dual-use products, and speed up the exploitation and commercialization of proprietary R&D output.

³² Liu Jibin, "Actively Push Ahead with the Work of Reforming of Military Industrial Enterprises," *Guofang Keji Gongye*, April 2002, 9.

- Third, a shake-up in the management of the R&D of major weapons projects was undertaken in response to intensifying high-level criticism over the DTIB's dismal track record. Efforts had been made during the 1980s and 1990s to concentrate limited funds on focal points and overcome S&T bottlenecks in a manner harkening back to the development of strategic weapons in the Maoist era.³³ These initiatives were unsuccessful because of deep-seated structural problems within the R&D system.

A new project management model was introduced in the late 1990s that was based on foreign and civilian practices. It included the adoption of a more centralized leadership structure combined with matrix management concepts designed to improve coordination, responsibility, and regularization among different entities participating in project design and R&D. Overall management of a project was placed in the hands of a director who supervised and coordinated the activities of a number of departments responsible for specialist functional activities, such as planning, technology management, engineering management, production management, contracts management, and equipment testing.

- Fourth, basic R&D assumed even greater importance and priority in funding allocations, especially as defense planners focused increasingly on embracing information-based warfare as a central tenet of PLA future warfighting doctrine and force modernization. Although there had been efforts to enhance basic R&D activities during the 1980s and 1990s, much of the focus had been on traditional defense technology.

These reforms have led to a significant improvement in the performance of the defense R&D system. A conference to review the progress in preliminary weapons R&D during the Ninth Five Year Plan from 1996 to 2000 concluded that a string of major research breakthroughs had taken place in critical basic technologies that had previously held back the development of key weapons projects. The structure of the preliminary research management system had also been readjusted “steadily and in an orderly manner,” and this had contributed

³³ Evan A. Feigenbaum, *China's Techno-Warriors: National Security and Strategic Competition from the Nuclear to the Information Age* (Stanford, CA: Stanford University Press, 2003), 138–139.

to raising the overall innovation capability of the defense S&T system, which in some areas had “reached international advanced standards.”³⁴

Training a New Generation of Defense Scientists and Engineers

The aging and thinning of the ranks of China’s defense S&T workforce had been a ticking time-bomb for the defense innovation system throughout the 1980s and 1990s. While some limited measures were taken to stem the steady depletion in the talent pool during this period, the allure of higher salaries, better career advancement and improved working conditions in the civilian arena proved irresistible for many experienced defense researchers.

Throughout the 1990s, defense policymakers had called for the grooming of a new generation of scientists and engineers to meet the new technological challenges of the 21st Century. But the concrete steps required to reverse chronic under-investment, reform the ossified personnel system, improve the working and living conditions, and stem the widespread waste in resources that had dampened morale, creativity, and productivity were lacking.

COSTIND-affiliated universities also benefited from increased allocations that they began to receive from their parent organization and the PLA toward the end of the 1990s to attract younger blood to join the ranks of the country’s defense S&T workforce. By 2003, COSTIND estimated that the annual number of students graduating from its seven premier universities totaled more than 34,000, of which around 72 percent were undergraduates and 15 percent were postgraduates with masters or doctoral degrees. This represents a significant increase from the late 1990s. The number of graduates from these seven institutions reached around 40,000, or a 19 percent increase, in 2004. Around one-third of the top graduates were allocated jobs in the DTIB.³⁵

³⁴ Fu Mingyi and Xi Qixin, “Army Reports Progress in Preliminary Weapons Research,” *Xinhua Domestic Service*, 9 December 2001, in *FBIS*, 13 December 2001.

³⁵ COSTIND Personnel Education Section, “Convey Defense Talent to Bring About the Raising of the Employment Rate,” *Guofang Keji Gongye*, September 2003, 33.

Attracting and retaining the brightest, best, and most experienced defense scientists and engineers has been an enormously difficult task, especially since the economic benefits offered by the civilian sector far outstrip the DTIB's. It was estimated in 2002 that backbone S&T research staff in defense R&D institutes earned between one-third and one-half as much as their colleagues in the civilian sector. The gap was even wider when compared to scientists and engineers employed in foreign-owned enterprises.³⁶

The PLA's top tier of technological and engineering schools and academies also underwent a major reorganization as part of the streamlining of the defense R&D sector and the downsizing of the military establishment toward the end of the 1990s.³⁷ Jiang Zemin pointed out that the military authorities regarded the PLA academic apparatus as at the forefront of the drive to “develop a military force that could win in the era of information technology.”³⁸

This upgrading and modernization of the defense industrial and military education systems will require careful and long-term nurturing to overcome their neglect and under-investment during the Maoist and early reform periods. A review of the reform of the PLA education system at the end of 2003 found that progress had been mixed. More effort needed to be made in improving training and research facilities and in providing more material support to poorly paid S&T personnel who faced “poverty”. To address these concerns, the PLA announced in 2002 that it would sharply increase investment in the development of key academies, science laboratories, and new teaching courses by five times over the next four years compared to the Ninth Five Year Plan.³⁹

³⁶ Li Bin, “Thoughts on Establishing a System to Industrialise Achievements Made by Defense R&D Institutes,” *Jianchuan Kexue Jishu* [Ship Science & Technology], Vol. 24, No.6, December 2002, 4.

³⁷ For an overview of the restructuring of the PLA educational system at the end of the 1990s, see State Council Economic System Reform Office, *Zhongguo Jingji Tizhi Gaike Nianjian 2000-2001* [China Economic System Reform Yearbook, 2000–2001] (Beijing: Zhongguo Caizheng Jingji Chubanshe [China Financial and Economic Press], 2001), 360–362.

³⁸ “Development of Military Institutes a Priority,” *Renmin Ribao* [People's Daily] 2 September 2003.

³⁹ Shen Yuejin and Huang Huamin, “With the Approval of CMC Chairman Jiang Zemin, the Priority Construction Project for Military Colleges and

Modernizing the Defense Manufacturing Apparatus

The defense manufacturing apparatus has been among the most conservative and insular components of the DTIB. It had grown bloated and inefficient during the central planning era. Despite several efforts to curb its size and improve its output during the 1980s and early 1990s, the production apparatus continued to be an enormous burden and drag on the performance of the rest of the DTIB. The mounting losses that the country's major defense conglomerates suffered throughout the 1990s were in large part due to the chronic structural mismatch between their excessive and outdated manufacturing capacity and the increasingly high-technology demands of the marketplace.

To overcome this serious bottleneck in the design and manufacturing processes, the DTIB became a leading participant in the research and development of computer integrated manufacturing systems (CIMS). DTIB policymakers have further urged the adoption of other high-technology manufacturing and management hardware and software systems to improve productivity, coordination, and discipline within the industrial production system. They see these integrated hardware and software systems as essential in promoting innovation and paving the transition of the DTIB into the era of information warfare by allowing defense enterprises and the R&D system to digitize and automate many of their activities, become connected to information networks, and fully integrate disparate operations.⁴⁰

A significant rebound in military production activity since the late 1990s has contributed to a revival in the performance of the defense manufacturing sector. The sharp cutbacks in defense spending during the 1980s starved production enterprises of military work, which led to the layoff and redeployment of workers to civilian activities. Even when defense expenditures picked up at the beginning of the 1990s, the bulk of the spending went to foreign purchases, R&D, salary increases and welfare-related issues. This dire situation improved in the late 1990s, as long-awaited advanced weapons finally began to emerge from the defense R&D pipeline and enter production. The volume of

Universities has been Officially Launched," *Jiefangjun Bao*, 17 May 2002, 1, in *FBIS*, 17 May 2002.

⁴⁰ Luan Enjie, "Promote the Development of the Defense Manufacturing Industry Through the Strengthening of Manufacturing Technology Innovation," *Guofang Keji Gongye*, August 2003, 10–12.

orders, especially for missiles, aircraft, and naval equipment, accelerated at the end of the 1990s as the PLA undertook a concerted buildup of military capabilities to prepare for contingencies in the vicinity of the Strait of Taiwan. The rearmament of the Chinese military establishment, now a central priority, has allowed the defense production apparatus to shake off its lethargy and pessimism and begin to devote more attention and resources to upgrading its performance.

Increased Role of the End-User

The ascendancy of the PLA in guiding defense S&T research and production activities in the reform era, especially since the late 1990s, has been an important factor in raising the performance of the DTIB. The emergence of demand-pull factors has helped to reinvigorate a system that had lost momentum, direction, and purpose under a central planning bureaucracy that had increasingly become more preoccupied with preserving its own survival than promoting technological innovation and serving the needs of its end-users.

Until the beginning of the 1990s, the technology push policies of the central leadership overwhelmingly drove weapons development and innovation in the defense S&T system. Demand-pull requirements from military end users were secondary. Since the 1998 reforms, the PLA has sought to reorient the DTIB to focus more on meeting end-user needs. Results have been mixed. Through the implementation of the four mechanisms system, the PLA has imposed tougher competitive and evaluation procedures in the development and procurement of weapons systems. In principle at least, defense enterprises have been required to improve their performance to meet these more stringent demands or face losing work. In practice, though, the still highly regulated nature of the Chinese weapons market has impeded the effective application of these procedures. As only limited competition is permitted within the defense sector, enterprises have not had to face the rigors of fully-fledged market competition that would be characterized by competition in design and cancelled projects.

Second, one of the main ways that the PLA has been able to implement demand-pull mechanisms has been through the procurement process: by withholding or postponing orders for equipment that do not meet its requirements. The military had no option but to accept the output of the DTIB during the Maoist era. It was able to become more selective in the reform period. As the quality of indigenous equipment

steadily declined, the PLA became increasingly reticent to procure these arms and began to look elsewhere for weapons that met its needs in the 1990s. Although military chiefs continued to reaffirm the importance of self-reliance, the new demand-pull pressure forced the DTIB to re-examine how it could improve its performance or risk losing valuable contracts.

Third, considerable efforts have been made to link military strategy and doctrinal planning with weapons and technology development. The separation between the military and defense industrial bureaucracies during the central planning era had also led to a gap in joint planning over their long-term development strategies. While consultation and coordination did regularly take place between the two establishments, this was primarily concentrated on annual, 3-year and 5-year economic and administrative plans. Little attention was paid to long-range, strategic planning efforts that often played a crucial role in shaping the evolution of force doctrines and weapons requirements.

Prospects for Technological Leapfrogging

The post-1998 reforms have led to significant enhancement in the performance of the defense innovation system. In 2003, looking back over the first five years of this restructuring effort, military and defense industry chiefs hailed the changes and achievements as the “best period of development in the country’s history.”⁴¹ How far-reaching and sustainable have these reforms been? In particular, to what extent are the key drivers in the underlying innovation process (the invention cycle, absorptive capacity, and integration) now able to further raise the performance of the system to meet leadership demands for technological leapfrogging?

These reform efforts have enabled the DTIB to make long-awaited generational advances in the development and production of weapons systems. A growing proportion of the output of the DTIB since the late 1990s has shifted from outdated early third generation (1960s) to late third generation (1970s) technological standards. In a select number of high-priority areas, such as missiles, progress has been even more

⁴¹ Wang Wengjie, “Delegate Li Jinai Emphasizes: Grasp Tightly the Important Strategic Opportunity, Accelerate the Development by Leaps of Our Army’s Weapons and Equipment,” *Jiefangjun Bao*, 8 March 2003, in *FBIS*, 8 March 2003.

pronounced, with technological capabilities reaching to early fourth generation levels (1980s). Nevertheless, the Chinese DTIB still lags as much as two generations behind the latest global standards in most areas.

Can the DTIB maintain this reform momentum and continue to advance up the ladder of technological innovation through leapfrogging? The Chinese leadership has set an ambitious target of catching up with the world's leading defense industrial powers by 2020. To meet this goal, military planners point out that the defense industry "must not follow the conventional path of development," but must instead "act with daring to skip certain stages" of the modernization process⁴² and focus on the adoption of transformational information technology-related capabilities in place of conventional mechanized systems.

This alternative pathway to modernization entails considerable risks. It involves the development of unproven technologies, the diversion of substantial resources from other parts of the DTIB, and the unpredictable nature of the technological development process. The risks are even higher if the focus is on the development of "frontier" technologies rather than the adaptation and imitation of existing designs and products. Moreover, much of the information technology-related knowledge and technology lies outside the boundaries of the DTIB and within the civilian economy.

The Chinese DTIB would also need to devote significantly more capital investment and other resources if it is to realistically pursue the goal of catching up with the world's advanced military industrial powers. In the late 1990s, China's defense S&T budget was equivalent to just 5 percent of the amount that the U.S. spent in the same area.⁴³ This huge gap in funding strongly suggests that any broad-based leapfrogging efforts would fall far short of reaching the technological standards enjoyed by the U.S. and its Western allies. A more attainable strategy would be the concentration of limited resources in a select

⁴² Fan Xizhong, "Grasp the Core of Informization," *Jiefangjun Bao*, 8 February 2004, 2, in *FBIS*, 8 February 2004.

⁴³ Liu Jingshu, "New Military Changes in the World and Research on the Distribution of China's Defense Economic Resources," *Junshi Jingji Yanjiu*, March 2004, 6.

number of areas where chances of success in narrowing technological gaps and potential military payoffs are greatest.

Essay 3

PLA Reform

By Timothy Lo

The Chinese realize that to carry out a strategy of increasing “comprehensive national power” and achieving dominance in the Western Pacific, they need to be able to successfully exploit technology and in particular, information technology (IT) within their defense establishment.

Effective exploitation of IT within the military requires a networked command and control system that distributes authority and cultivates collaboration across service lines, especially between naval and air forces. In both the commercial and military sectors, the ability to exploit information provides a distinct advantage over those who lack it. Optimal exploitation of information requires a networked decisionmaking process that is not centralized at the top but, rather, distributed down to levels of command that can react with speed and adaptability to emerging events. It also demands cooperation among the branches and units to share information to form a clear picture of the operational environment and achieve better warfighting capabilities.

Historically, however, the PLA command structure has tended to be inflexible and highly centralized. The rigid command structure does not allow for quick adaptation to situations on the battlefield, nor does it facilitate initiative and creativity at lower levels of command. Integration and communication between ground, naval, and air forces is still a relatively new concept to the Chinese. Moreover, the PLA lacks a permanent wartime command organization. This makes transitioning to war a slow process and inhibits jointness, especially during unplanned engagements. The current command structure is organized around separate and distinct “military regions” designed for training and equipping forces for territorial control. China’s historical propensity to maintain large ground forces as the focus of its military has resulted in a cumbersome organization with weak and outdated naval and air

forces. These and other shortcomings have contributed to the difficulty of attracting young talent to the organization.

These characteristics are not restricted to the PLA. They reflect the greater Chinese society and its customs. The traditional roots of Chinese culture and the components of the social ethic of Confucianism stress self-sufficiency and acceptance of hierarchy, both of which, when taken to extremes, are not conducive to change and can stifle creativity. A “pattern of duties—no real rights—was the basis for achieving these ideals,” and when the ideals faltered, “there was always the law and the sword.”⁴⁴ This concept was especially prevalent in military society. Many Chinese observers since the late nineteenth century have blamed these traditional values for China’s past inability to defend itself against foreigners.

Some changes have been made over the last 2 decades, but many more are necessary if the Chinese are to achieve their goal of being the dominant power in the Western Pacific. Effective reform and transformation within the PLA will be sweeping, disruptive, and painful. The success or failure of China’s military strategy is contingent on its ability to overcome structural and cultural impediments.

What Does the PLA Say It Must Do?

Though cultural and structural reformation within the PLA is complex and unprecedented, and the entirety of what the Chinese leadership hopes to achieve is ambitious in both size and breadth, public figures from the military and the political leadership have made statements indicating an acute awareness and understanding of the problems ingrained in the Chinese military and the steps they need to take to remedy them.

For some years, Chinese military planners and thinkers have made statements urging reductions in the size of the PLA. Defense Minister Chi Haotian explained in a 1998 speech to the Japanese National Institute for Defense Studies that part of “developing the PLA into a revolutionary, modernized, and regular army,” required “streamlining” the military to a “reasonable size” with “attention paid to quality

⁴⁴ Ross Terrill, *The New Chinese Empire (and What it Means for the United States)* (New York: Basic Books, 2003), 56.

instead of quantity and scale.”⁴⁵ This idea has remained a theme for some time and was reiterated in the 2006 Chinese Defense White Paper. After affirming that “the focus for the Army was force reduction,” the paper goes on to explain that the necessary condition for this includes reducing the number of troops and increasing the NCO corps.⁴⁶

In addition to, and perhaps of more significance than, the reduction of troops is the priority the PLA places on building up naval and air forces. Plans are being made so that “the Army is streamlined by reducing the ordinary troops that are technologically backward while the Navy, Air Force, and Second Artillery Force (China’s strategic nuclear force) are strengthened.” This, the Chinese argue, will “strengthen the capabilities for winning both command of the sea and command of the air, and conducting strategic counter-strikes.”

PLA reformers also recognize the importance of communication between branches and have made plans to “push forward an integrated tri-service support system.” This, the White Paper explains, will “enhance the capability to provide fast, efficient, and integrated support” and make the military more “flexible and swift in command.” Experimental reforms of joint logistics had already been initiated in the Jinan Theater, several hundred miles south of Beijing, as early as July 2004. For that regional unit, all the “logistical organs, logistical support resources, and logistical support channels of the three services are starting to be integrated.”

In personnel restructuring, the Chinese have proposed “streamlining the staff offices and the directly affiliated organs at the corps level and above, so as to compress the command chains and further improve the operational command system to strengthen the command functions.” They have targeted reducing the number of offices and personnel by about 15 percent by “adjusting staff functions, dismantling and merging offices, and reducing the numbers of subordinate offices and assigned personnel.”

⁴⁵ Le Shaoyan and Gang Ye, “China: Chi Haotian on PRC Defence Policy,” *Xinhua Domestic Service*, 4 February 1998.

⁴⁶ *China’s National Defense in 2006*, Information Office of the State Council, People’s Republic of China. Available at <<http://www.fas.org/nuke/guide/china/doctrine/wp2006.html>>. All of the quotations to the end of this section are from the White Paper.

To upgrade the quality of its soldiers, the PLA plans to implement the “Strategic Project for Talented People,” which they hope will allow them to “focus on training a new type of high-caliber military personnel.” This project will be implemented in two stages. Its goal is a “remarkable improvement in the quality of military personnel, and a big increase in the number of well-educated personnel in combat units.” The White Paper goes on to promise that “the following decade will witness a big leap in the training of military personnel.”

Are They Doing It?

The statements above paint a picture of where the PLA would like to be in the near future, but it is by no means certain that they will get there. Because of the disruptive nature of such wide-ranging reforms, not only to the organizational structure, but also to the culture and traditions of the PLA, there are many obstacles that could prevent the Chinese from achieving these objectives. Yet, while these statements and writings demonstrate only a cognitive understanding on the part of the Chinese leadership, the actions they have taken and are taking, point to sufficient, if not overwhelming evidence of motivation and intention to bring about reform to the Chinese military.

The Chinese laid out a plan of action in the mid-1990’s and have continued to apply the principles embodied in it. With the support of the political leadership, the Central Military Commission put forth a “new line” (policy) for “army building” (defense modernization) to guide all aspects of PLA reform. Known as “Liangge Zhuanbian,” or “Two Transformations,” it called for the armed forces to undergo a “metamorphosis.” The first transformation called for the transition from an army preparing to fight local wars under ordinary conditions to an army preparing to fight and win local wars under “modern high tech conditions.” The second transformation called for an army based on quality instead of quantity.

In preparing to fight and win local wars under modern, high-tech conditions, the Chinese have realized that they must maintain focus on military affairs. In May of 1998, President Jiang Zemin pronounced that all enterprises run by the PLA and People’s Armed Police Force (PAP) must be separated from the army within 3 years.⁴⁷ The edict,

⁴⁷ “Jiang Zemin Criticizes Slow Progress in Army Reform; Reducing the Army by 500,000 Not Proceeding on Schedule,” *Ming Pao*, 19 May, 1998.

which was reiterated later that year, applied mainly to commercial enterprises, such as major hotels, restaurants, real estate ventures, and trade and investment operations. This separation forced the PLA to stop non-military activity and shift its focus to war-fighting proficiency.

To shift the emphasis away from quantity and toward quality, the PLA has reduced manpower over the last 20 years from about 3.3 million to 2.2 million and had proposed a further reduction of 200,000 soldiers by the end of 2006—which the Chinese say they had already completed at the end of 2005.⁴⁸ If the PLA carries out its stated reduction plans, by 2010, it will have a total strength of about 1.5 million.⁴⁹

This reduction becomes even more significant in light of how the Chinese are restructuring the remaining manpower. The shares of the PLAN and PLANAF have increased substantially. In 1998, PLAN personnel totaled 280,000, or 10 percent of the PLA total; in 2010 it is projected to be 199,000 or 14 percent of the PLA total. The PLANAF stood at 470,000 personnel, or 17 percent of the total military population in 1998; it is projected to be 334,000 strong or 23 percent of the military in 2010. The Army made up 73 percent of the 1998 PLA population but is projected to drop to 932,000 troops, or 64 percent, in 2010.⁵⁰ Successful implementation of China's new strategy requires a proper balance between its services and is contingent on creation of a stronger navy and a more advanced air force than it currently possesses.⁵¹

Historically, integration between the services has been weak. The Chinese realize now that joint logistics and combat service support are

⁴⁸ *Military Power of the People's Republic of China*, 5.

⁴⁹ Yitzhak Shichor, "Demobilization: The Dialectics of PLA Troop Reduction," *The China Quarterly* (London: Oxford University Press, 1996), 336-359.

⁵⁰ *The Military Balance, 2004-2005* (London: International Institute for Strategic Studies, Oxford University Press, 2003).

⁵¹ When reviewing Chinese military figures, it is relevant to note that civilians working for the PLA are included in the total number of China's active duty forces. While the exact number of civilians is not known, it is estimated that they constitute 20 to 25 percent of the total force. Source: *China's Defense in 2004*: "The citizens in active service in the PLA are servicemen in active service, consisting of officers in active service, civil cadres and soldiers in active service."

essential to winning “modern high-tech wars,” so the PLA is beginning to develop a joint logistics department. In a 1999 article, the *Liberation Army Daily* newspaper praised the Guangzhou military region for being the first to successfully establish a “theater command automation system” to achieve interoperability between the three service branches in that southern province.⁵² Efforts are also being made to standardize certain functions, including fueling, transportation, and medical care, throughout all branches of the military. In future wars, the PLA is expected to consume large amounts of material. Planners recognize that this need can be better met with joint logistical mobile teams rather than fixed supply points. Efforts are being made to create such a system.

Little freedom is granted to subordinate commanders within the Chinese military organization. However, the requirements of modern warfare and the U.S. military’s emphasis on attacking command nodes has recently forced a debate on the benefits of distributing decisionmaking and has prompted investigations of alternative command styles. A *Liberation Army Daily* article acknowledged the perils of highly centralized decisionmaking and explained that successful integration of the directives of high-level commanders requires “an understanding of what the higher organ (higher leadership) wants, finding out the unit’s situation, and making the unit’s own policy decision.”⁵³ Although the higher leadership’s desire is still the main objective, the lower level commanders are able to formulate “a policy decision in light of the specific conditions and problem.”⁵⁴ Recently published Chinese military textbooks are also beginning to suggest decentralization as a necessity of modern warfare. In *Joint Campaign Operations Command*, published by the Chinese National Defense University, the authors advocate “entrusting command” over centralized command.⁵⁵ Arguing that attacks using modern weapons can often cut off commanders from their troops, they argue that lower-level commanders must be able to “skip the chain of command and

⁵² “Guangzhou War Zone Sets up PLA’s First ‘Theater Command Automation System,’” *Liberation Army Daily*, 25 May 1999.

⁵³ Yu Yongjun, “Jiefangjun Bao Urges PLA to Implement Orders ‘Creatively,’ Avoid ‘Formalism,’” *Liberation Army Daily*, 18 March 2002.

⁵⁴ *Ibid.*

⁵⁵ Wang Wangzhun and Lu Lihua, eds., *Joint Campaign Operations Command* (Beijing: National Defense University Press, 2000).

directly provide assistance.” This allows for rapid reaction to the situation and flexibility in completing tasks.

Talent at every level of rank is essential for reform. To that end, the PLA has taken several steps toward transforming to a military based on quality instead of quantity. In competing with a commercial sector that often offers salaries twice as high as those of the military, the PLA struggles with attracting young, smart, and intellectually curious individuals to groom as future leaders. Admiral Shi Yunsheng described the situation when he said, “those that we need will not come or will not stay. Those we do not need will not go away.”⁵⁶ In its efforts to improve the quality of officers, the PLA recognizes that it will need to select from a larger, more diverse pool of candidates who are knowledgeable and skilled in a wide variety of areas, including advanced technologies, engineering, and social sciences. To attract these skills, the PLA has set up formal officer recruitment programs in universities, seeking both undergraduates and graduates. It is offering scholarships to qualified and willing individuals, such as the National Defense Scholarship, which allows recruits to have “breaks in education” in exchange for short periods of service in critical functions and then return to their studies. Among the existing officer corps, the PLA has instituted minimum and maximum times of service for specific locations. This allows for personal development while helping to prevent corruption and nepotism that can occur during extended stays in one location.

Is the PLA Arguing for and Implementing the Right Actions?

The actions and statements discussed above demonstrate the will of the Chinese to reform. They have begun implementing measures necessary to transform their military to achieve unchallenged military dominance in the region. It is important, however, to examine whether the actions they have argued for are indeed the right actions that will bring about an effective and efficient PLA. The requirements of modern warfare and the ability of the U.S. military—as China’s

⁵⁶ David M. Finkelstein, “Looking for the People in the People’s Liberation Army: Who is G.I. Zhou?,” paper presented at the U.S. National Defense University, *Chinese Military Affairs: A Conference on the State of the Field*, 26–27 October 2000.

greatest military challenger—to attack command nodes demand that the PLA achieve certain capabilities to achieve dominance in the Western Pacific.

- **Collaboration between all military branches.** Shared situational awareness enables collaboration and self-synchronization and enhances sustainability and speed of command, which in turn dramatically increases mission effectiveness.
- **Decentralized decisionmaking.** Distributed decisionmaking permits junior officers to adapt to changing tactical situations and to seize combat opportunities within the operational-level guidance provided by senior commanders.
- **Hiring quality officers.** The ability to recruit and retain competent, qualified, and risk-taking individuals into positions of leadership is essential to any organization, and the PLA is no exception. Even if reform begins now, it will require generations of leaders to maintain the changes and preserve a military culture conducive to exploring new opportunities and taking creative approaches to problem solving.
- **Focus on military goals.** To achieve transformation of its military, the PLA needs to focus on its war mission and not engage in such civilian activities as running government-owned restaurants and building roads and hotels.
- **Rewarding risk-taking.** Future leaders need to have the freedom to think and develop new ideas. It is important to reward and advocate risk-taking. An article in the *Liberation Army Daily* newspaper observed that the PLA does not “need cowards who are afraid of taking risks and bearing hardships.”⁵⁷

The matrix on the following page compares the old PLA with the proposed new PLA according to the five criteria discussed above.

⁵⁷ Yu Yongjun.

	Old PLA	Proposed New PLA
Jointness and Integration Between Branches	Service-specific logistics and combat support	Joint logistics and operations
Decentralized Authority	Highly centralized decisionmaking	Empowerment of junior officers to make decisions
Recruitment and Retention of Quality Officers	Conscripted military with very little room for creativity	Recruitment from universities, establishing military scholarships, recruitment from the graduate and post-doctorate levels, increased salaries
Focus on Military Goals	Attention often shifted to running factories or building and maintaining hotels	Separation of PLA-run institutions from the military, yielding a PLA solely focused on warfighting
Rewarding and Advocating Risk Taking	Risk is avoided, orders carried out “mechanically,” with a “formalistic attitude” ⁵⁸	Risk is encouraged and rewarded

As indicated earlier, the PLA has made substantial shifts from the old to the new. Though not yet strong in all categories of reform, there already is significant contrast between the old PLA and the new PLA, especially on a provincial level. The reforms have slimmed down the

⁵⁸ Ibid.

PLA, making it more mobile, more technologically advanced, and more focused, thus indicating a shift in the direction of effective reform.

How Long Will These Changes Take—Years? Decades?

While China's involvement in the greater global economy, interest in the regional balance of power, and concern over Taiwan's threats of independence have provided the motivation for these reforms, the amount of time it will take for reform to come to fruition is contingent on several factors. First and foremost, the attitudes of the political leadership in Beijing must be encouraging and supportive of change. In addition, the senior military leadership of the PLA must be willing to devolve power and autonomy to lower-ranking officers, and the quality of future Chinese junior officers must be on par with the best and brightest of the civilian sector. In essence, all three factors must be present for reform to come about quickly and effectively.

The relationship between the senior military leadership and the political leadership has changed significantly in recent decades. In the past, the political leadership of the Chinese Communist Party (CCP) dictated military goals and specified how to achieve those goals. The military existed to serve the political interests of the CCP and its command structure. The Party led and the military followed. This approach was designed to maintain the military's loyalty to the party.⁵⁹ While regime survival remains the priority of the Chinese political leadership, much more autonomy is granted to the generals and top officers in the day-to-day decisionmaking of military modernization and defense planning, as long as they adhere to two stipulations. First, the military must continue to actively support Hu Jintao as the paramount leader of the Chinese Communist Party. Second, they must stay out of the management of non-military policymaking areas, such as the economy and factional conflicts. Before, the military was involved in city planning and the building of civilian infrastructure. They were often involved with policy planning in regards to the conflict with Taiwan and land disputes in Tibet. Now they are to focus solely on warfighting and revolutionizing the military.

⁵⁹ James C. Mulvenon, "China: Conditional Compliance," in *Coercion and Governance: The Declining Political Role of the Military in Asia*, ed. Multiah Alagappa (Stanford, CA: Stanford University Press, 2001), 4.

Given the power relationships just described, we know that if the political leadership insists on change, the senior military leadership must either promote or permit change. It would not be feasible for the senior military leadership to oppose change insisted on by the political leadership. However, because of the autonomy granted by the CCP to the military leadership to carry out its own implementation, we know that the political leadership will not insist on the specifics of how to change. This gives latitude to the senior military leadership to either slow down reform through the slow implementation of policies, or hasten reform by continuing to bring about the changes mentioned above. Another factor in determining a time frame for change is the junior officers who will be the military's future leaders. If these officers accept and fit into the status quo, or if the military cannot attract technically savvy young people to begin with, reform is certain to be delayed until more changes are made to attract those who favor reform and will fight for it. A new generation will enter the PLA and carry out reform only if the military leadership actively promotes it. It follows that the attitude of the military leadership remains the critical variable and the catalyst for successful reform.

Because we know some changes are already occurring, and the PLA today is beginning to stand in contrast to the PLA of a decade ago, we can assume that the senior military leadership is permitting change, if not actively promoting it. From the speeches of various political leaders, and from the Defense White Paper, we gather that the Party leaders believe reform is necessary if China is to embark on its strategy of comprehensive national power and dominance in the region. PLA effectiveness in attracting quality officers is yet to be determined, but the developments described above provide a strong case that reform is at least on the way and should be achieved within the timeframe of years rather than decades.

Conclusion

It may not always be easy to distinguish between a China that is ready and willing to be a dominating force in the Western Pacific and one that merely talks about it, but it is also not too difficult. The actions the PLA have taken thus far—shifting resources to naval and air forces, devolving authority, integrating the various branches, recruiting quality officers, and developing a culture that is conducive to supporting these changes—are at least a step in the right direction, if not a leap. These

reforms however, have been limited mostly to specific regions or brigades. For the Chinese to achieve their stated goal of dominance in the region, all parties—the political leadership, the military leadership, and the junior officer corps—must be on board. Most important, the changes made at the regional level need to be implemented PLA-wide.

Essay 4

China's Approach to Taiwan and the U.S. Navy's Imperatives for Action

By Michael McDevitt

China's chief strategic issues are maritime or littoral in nature: Taiwan and other territorial disputes, maintaining the economic growth currently driven by overseas trade, and the vibrant economic region on its eastern seaboard. United States predominance in the Western Pacific is the main obstacle to China's control of the sea and airspace along its littoral, and China is bolstering its maritime power in a way that over time could threaten this American predominance. The U.S. Navy must improve its capabilities if it is going to continue to operate freely in the region. Moreover, in light of the changing strategic environment, the U.S. should take stock of the contribution it might expect from regional allies to see if their capabilities are being leveraged to their full potential.

The PLAN and Command of the Sea

China's 2004 Defense White Paper set "command of the sea" as Beijing's goal, but it has been less clear about the path the Chinese will take to achieve this. What would a People's Liberation Army Navy (PLAN) built for "command of the sea" look like?

One alternative is for the PLAN to mimic the pre-WWII Imperial Japanese Navy, and build a fleet to contend with the U.S. Navy in classical naval warfare. This would require aircraft carriers and an effective anti-submarine warfare (ASW) capability against American and Japanese submarines. It could also include a significant submarine

launched ballistic missile force. Whole-hearted adoption of this concept, though, seems unlikely. The costs of both mounting an effective ASW challenge to the U.S. Navy and taking significant numbers of tactical aircraft to sea would be prohibitively expensive. PLA strategists will likely conclude that these capabilities are unnecessary to their strategic objectives and can be achieved by other means.

A much more likely option for the PLAN is a concept called “sea control” by the Chinese. This concept can be described more accurately as a modification of the Soviet “sea denial” strategy of the 1980s. This requires a force that can attack foreign surface, subsurface, and aerial platforms that enter China’s maritime region. This sort of force is within the ability of the PRC to execute and would satisfy most of the PRC’s strategic requirements on the “maritime frontier.” There are indications that Beijing has already decided on this model and is on the path to developing the necessary forces.

A sea denial strategy depends on a suite of capabilities that can impose significant cost on the U.S. Navy as it projects power in the Western Pacific. In particular, it depends on capabilities that threaten American aircraft carriers. China is in the process of bringing three key types of assets to bear on this problem: land-based airpower mated with air-launched cruise missiles, attack submarines, and, in the future, the potential of land-based ballistic missiles with maneuverable war heads that could be effective against ships at sea. To knit this “anti-access system” together they need an intelligence, surveillance, and reconnaissance (ISR) capability that can find and fix U.S. Navy surface forces on the high seas.

The People’s Liberation Army Naval Air Force (PLANAF) and the PLA Air Force (PLAAF) are refining air-to-sea tactics that make use of air-launched cruise missiles. This, of course, is a threat the U.S. Navy faced in the 1970s and 1980s from the Soviet Union that led to, among other things, the AEGIS air defense combat system. It also caused the U.S. Navy to think through novel operational concepts, most notably, using fighters to shoot down Soviet bombers before they got within cruise missile range of carrier battle groups. Collectively these tactics and systems were characterized as shooting the archer, not the arrows. The concept continues to be valid.

Chinese aircraft would most likely continue to operate from the mainland. A small aircraft carrier or two is not out of the question, but, it is unlikely that it would play a role in anti-access, because of its vulnerability to U.S. submarines and aircraft once it ventured beyond the first island chain (about 200 nautical miles from the coast of China). In any case, the cost is heavy and mastering the complex engineering of a project this size will take a decade or more. The use of offshore islands, such as the Paracels, to station aircraft is a possibility. This, though, is likely to be a losing proposition, because the assets would be exposed and vulnerable to U.S. Navy attack aircraft and cruise missiles.

The second facet of the PLAN's anti-access strategy is a submarine force for offensive use against U.S. Navy surface forces. The Soviets used nuclear guided missile submarines (SSGNs) in this role, while employing their nuclear attack submarines (SSNs) to protect nuclear ballistic missile submarine (SSBN) bastions. The Chinese have no bastions to protect, and no SSGNs, but their submarine concept is essentially the same as the Soviets: use submarines to attack U.S. Navy surface strike groups operating within tactical aircraft range of mainland China. The Chinese are focusing on conventionally powered attack submarines that, over time, will carry cruise missiles as well as torpedoes.

The PLA is working on a third element to its anti-access layered defense—one that is uniquely Chinese and uses one of the PLA's most effective capabilities. This new wrinkle is to use ballistic missiles to attack moving surface warships.⁶⁰ Traditionally, ballistic missiles were considered a poor weapon to use against ships at sea; ships move, and once the missile is fired, the aim point of a ballistic trajectory, by definition, cannot be altered to account for target motion.

What the PLA is apparently trying to do is place seekers in high-explosive missile warheads that will activate as the warhead descends into the target area, and then steer the warhead to the moving ship. This is a difficult but not impossible technical task that depends on accurate surveillance plus missile warhead maneuvering technology that can slow down the warhead when it reenters the atmosphere so the seekers

⁶⁰ *China's National Defense in 2006*. The report says that, "China is exploring the use of ballistic missiles for anti-access/sea-denial missions."

are not burned up by the heat of reentry.⁶¹ If the PLA can master and field this weapon system, it will be able to present as serious a challenge to the US Navy as the one presented by Soviet Backfire-launched cruise missiles before the introduction of the Aegis radar system.

The fourth and final component of sea denial is intelligence, surveillance, and reconnaissance (ISR). China's counter-ship strike power is dependent in large part on the PLA's ability to put together the appropriate surveillance, command, tracking, and targeting architecture. Open ocean surveillance capability is needed to locate and track approaching naval forces in order to cue conventional submarines and land-based aircraft. A further, space-based ISR capability would be vital, should China develop long-range land-based anti-ship missiles. Beijing must be able to preserve this ISR architecture, or net, from U.S. disruption. Such ISR capability is the long pole in the tent for the PLA. Without this capability, PLAN ambitions of gaining sea control will not be realized, and the PLA would have to fall back on sheer mass to compensate. In large quantities, a frontal attack by submarines, aircraft, and cruise missiles would still present a credible sea denial capability.

Even within an overarching sea denial strategy, the PLAN is going to require a high capacity amphibious capability so long as Taiwan remains an unsettled issue. This capability need not be able to project land power over vast distances in the manner of U.S. Navy or Imperial Japanese amphibious forces. Taiwan is only 100 miles away from the mainland, and there is no indication that the PRC would be interested in trying to invade another country from the sea.

The PLA and Command of the Air

In addition to command of the sea, the 2004 Defense White Paper also established "command of the air" as a key PLA goal. The concepts of command of the sea and command of the air are closely related in actual combat. Chinese failure to establish command of the air, for instance, could make invasion of Taiwan impossible and hamper its sea

⁶¹ Interview between author and technical experts in the Department of the Navy, June 2006. See also Ronald O'Rourke, "China Naval Modernization: Implications for U.S. Naval Capabilities—Background and Issues for Congress," (Washington, DC: Congressional Research Service, 22 January 2007), 5–6.

denial strategy by neutralizing its ability to deliver air-launched cruise missiles. It is essential, therefore, to establish some understanding of what PLA command of the air might entail. It has three components: win air-control over the Taiwan Strait, deny U.S. Air Force and Marine Corps (USAF/USMC) land-based tactical aircraft (TACAIR) access to the region, and deny access to sea-based TACAIR.

Winning air control of the Taiwan Strait is a necessary prerequisite if China intends to achieve reunification with Taiwan through invasion. The PLA would have to first disable and/or ground the Taiwan air force by destroying early warning systems and airfields through ballistic-missile bombardment and special operations forces (SOF) attacks on airfields and Republic of China (ROC) fighter aircrews. The PLA would also have to deploy modern long-range surface-air-missiles (SAMs) near enough to the mainland coastline so these SAM batteries can command the air space over the Taiwan Strait. Modern fighters armed with advanced air-to-air missiles to engage ROC and U.S. fighters beyond visual range are also important assets for keeping U.S. combat aircraft at bay. The airspace over the Strait lends itself to air-to-air combat where positive visual identification will probably not be a prerequisite to engagement.

A related component of command of the air is denying USAF/USMC land-based TACAIR access to the region. In the event of conflict with China, the United States would hope to make use of its airbases on Okinawa and Guam. With some preparation, former U.S. facilities in the Philippines, notably Cubi Point Naval Air Station, could be possible staging areas. Denying the United States access to these bases would involve long-term diplomatic and strategic decisions.

Kadena Air Force Base on Okinawa will be the primary node for U.S. fighters to be employed in denying the PLA air superiority over the Taiwan Strait. If an invasion of Taiwan is the PLA's goal, it cannot permit U.S. TACAIR to operate freely from Kadena, regardless of the consequences of attacking Japanese territory. China would likely make use of ballistic missiles and possibly SOF to damage or neutralize the base. The only scenario in which the Chinese would engage in hostilities with Taiwan but not attack Kadena is if the PLA is merely intent on a "lesson teaching campaign." In this case, neither Guam nor the Philippines would likely be struck, either.

As with targeting Kadena, Chinese ballistic missile and submarine-launched cruise missile strikes against Guam and the Philippines would have serious implications. In the case of Guam, striking U.S. territory may be an escalatory step that Beijing would hesitate to take. It would certainly provide some justification for the U.S. National Command Authority to authorize U.S. strikes against the Chinese mainland. On the other hand, if the Chinese do not attack Guam, they permit long-range U.S. strike and surveillance assets to operate freely against them. With the Philippines, the Chinese might try to use diplomacy and threats to pressure the government into preventing U.S. access to facilities there. If diplomacy fails, though, the use of force is rife with complications. A ballistic missile strike against Cubi Point or other facilities could result in the reinstatement of the Philippines-U.S. Military Alliance and a more permanent U.S. presence in the Philippines, a consequence Beijing would surely want to avoid.

The third component of Chinese air control over the Strait is denying access to U.S. sea-based TACAIR—in other words sinking, disabling or otherwise keeping at bay U.S. carriers. Key to this is the PLA developing a capacity to detect, track, target, and strike U.S. carriers with high reliability and on a timely basis.

Based on this brief review, PLA ambitions to achieve command of the air beyond the immediate vicinity of the Taiwan Strait would come head-to-head with tough political-military issues with war-widening implications. China has range on its side in competing over the Strait, but the risk of a stiff challenge from USAF fighters operating from bases outside the immediate vicinity remains. Neutralizing them by attacking third country airfields is a complex political issue.

U.S. Navy Imperatives

The purpose of the foregoing review was to illuminate what areas are operational imperatives for the U.S. Navy. In other words, what must the U.S. Navy be able to accomplish to frustrate PLA attempts to win command of the sea? There are four operational (warfighting) imperatives the U.S. Navy must achieve if it is to intervene in the defense of Taiwan: frustrate PLA ballistic missile attacks on forces at sea if the PLA fields this capability; maintain the ability to operate in the airspace over Taiwan and the Strait; disrupt Chinese ISR; and successfully stave off Chinese submarine attacks on U.S. carriers.

These imperatives would also apply to any other Sino-American conflict in the Western Pacific.

Coping with the ballistic missile challenge will require both active and passive defenses. Continuing to improve the preliminary ABM capability already present in surface combatants, so that they can engage faster-flying, longer-range missiles is one step. The other is to adapt to ballistic missile defense the same passive defense techniques fielded to decoy or deceive cruise missiles.

Secondly, in order to frustrate a PLA attempt to invade Taiwan, U.S. and ROC forces must be able to preserve their ability to penetrate the airspace over the Taiwan Strait. The key to success in this portion of the campaign will be the destruction or neutralization of the PLA's mainland-based SAM sites that have sufficient range to cover the Strait. If the U.S. Navy and the USAF are not permitted to conduct suppression of enemy air defense (SEAD) missions against mainland based SAMs, we can expect a steady attrition of non-stealthy allied aircraft over the strait.

Thirdly, Chinese hopes of holding at risk, disabling, and sinking U.S. surface ships, and carriers in particular rest on finding and maintaining a reliable track on those ships. This is particularly true of the missile threat. The most effective way to neutralize China's capability to attack U.S. ships is to disrupt, destroy or otherwise interrupt the PLA network that would allow them to gather open ocean surveillance data, geolocate ships at sea, identify them as warships, and pass targeting information to missiles in flight. The same disruptive ability would also blunt the submarine threat. The Chinese ISR network should be vulnerable at several points, and attacking it may be a more certain method of defense than trying to shoot down the incoming missiles or spoof them with ship-like decoys. All three approaches—hard kill, network disruption, and decoys—could provide good leverage in neutralizing emerging Chinese capabilities as a standard layered-defense approach.

The fourth and final operational imperative for the U.S. Navy is to counter the threat that Chinese submarines pose to the aircraft carriers and other surface ships. China is fielding a relatively large number of diesel submarines based on Russian technology. To detect and destroy them, the U.S. Navy needs to make great strides in its ASW capabilities in the Western Pacific.

The good news is that the ASW problem is at this stage a regional and not a global issue. The U.S. Navy can concentrate its ASW efforts on the Western Pacific. That should permit a narrowly focused approach to training, procuring and equipping; not every ship or aircraft squadron in the entire U.S. Navy needs to be brought to the highest level of ASW proficiency and capability.

Even with a regional approach, though, the U.S. Navy still faces a difficult challenge. It is aware of its shortcomings and is focused on the solving the ASW problem. Research and development (R&D) is showing promise, and new systems will be deployed on the new Virginia Class submarines.

In addition, the Navy could also consider approaches that are more oriented to process and operations. For example, the Navy could organize a variant of the U.S. 10th Fleet, which was established in 1942 to focus solely on countering U-boats in the Battle of the Atlantic. Another model from the past would be Task Force Alfa, which in the 1960s and 1970s was a dedicated ASW operational force. Task Force Alfa developed and refined ASW tactics during deployment at sea and became an “elite” anti-submarine warfighting organization. Similarly, during the 1980s, a dedicated ASW destroyer squadron was established with some success in the Pacific Fleet. Such initiatives would bring needed dedicated operational focus to the problem.

Another option would be to review the Atlantic-Pacific fleet balance and increase the numbers of naval combatants assigned to the Pacific Fleet. For example, perhaps all of the remaining Perry-class frigates (FFGs) in commission could be reassigned to Pearl Harbor.

Allied Contributions

The United States Navy is not alone in its efforts to ensure continued freedom to operate in the Western Pacific. The continued presence, and efficacy, of our forces is of considerable interest to our allies in the region. The U.S. can expect to be supported and to receive help in achieving these imperatives. Allied contributions come in two basic forms: land from which to operate and naval capability. Of the U.S. allies in the region—a list that includes South Korea, the Philippines, and Australia—

Japan is in a position to help the United States the most in a conflict with China over Taiwan.

Territory from Which to Operate

Bases on Japanese soil are of the foremost importance. The reality is that any combat over Taiwan will take place in the vicinity of Japan, and location is critical to a successful defense of Taiwan. In any sort of a Taiwan conflict, access to bases in Okinawa (especially Kadena air force base), and perhaps to facilities on smaller islands in the Ryukyu chain between Taiwan and Okinawa, would be central to successful use of land-based fighters to help maintain air operations over the Taiwan Strait. Air bases in Japan are also essential for land based surveillance and ASW aircraft (E-2's and P-3's) and other support aircraft, especially tankers. It is a long flight from Kadena on Okinawa to Taiwan (about 350 nautical miles) and tanking would be a central factor in sustaining fighters in the vicinity of Taiwan.

The Philippines are in a position to make a similar contribution. Like Japan, the nation enjoys the advantage of location. The Bashi Channel separates the northern island of Luzon from Taiwan, where the former U.S. airfields of Clark Air Force base and Cubi Point Naval Air Station are strategically desirable locations that can accommodate large numbers of land-based tactical aircraft. Granting access to these air bases would be a high leverage contribution the Philippines could make. Providing access to these facilities would allow large numbers of aircraft to be close to the conflict and allow the United States to generate many more combat sorties (because of the relatively short range compared to other locales). History provides a telling example of this point. In December 1941, Japanese aircraft flying from Taiwan destroyed General Douglas MacArthur's air force based at Clark Field, and ensured Japanese air superiority for the rest of their campaign in the Philippines.

While South Korea is also in the vicinity of any fight over Taiwan, Seoul's contribution is expected to be much more limited. Much depends up whether or not the threat of a North Korean invasion has abated, which would determine whether a strong deterrent posture was necessary or not.

On the other hand, maintaining a good relationship with Seoul could also work to Beijing's advantage. The Republic of Korea (ROK)

government has made it clear it does not want to have to choose between Washington and Beijing, and has yet to agree to permit the use of U.S. forces such as air power in off-peninsula missions. It is extremely unlikely that Seoul would be willing to permit U.S. forces currently in Korea to use the ROK as a base to stage against China or even fly defensive sorties over the Taiwan Strait. It is also extremely unlikely that Thailand would permit its airfields to be used for launching strikes into South Western China.

Force Contributions

In addition to real estate, U.S. allies could make direct military contributions to a conflict over Taiwan. The Japanese Self Defense Force (SDF) in particular has capabilities that would be important to success in a “defense of Taiwan” campaign; specifically, a modern air defense surveillance and fighter force, a significant number of P-3 ASW aircraft useful for both ASW and open ocean surveillance, and an excellent surface Navy force of ASW destroyers and Aegis equipped air defense destroyers. Not only is the SDF well equipped, it is well trained and used to operating with U.S. forces.

The Air Self Defense force contribution is unlikely to include active participation in counter air work over Taiwan, but its modern interceptors and up to date air defense and early warning capability would be important because it provides a rear area relatively secure from PLA air raids against bases or U.S. ships operating in proximity to the Japanese islands. It would also be something that Japan could do without creating a constitutional issue, because it would involve protecting the homeland from attack.

The Maritime Self Defense Force is very good at anti-submarine warfare. Its helicopter-equipped surface combat force, when combined with the ASW P-3's, provides an important capability that could greatly assist the U.S. Navy in dealing with PRC submarines, provided the government leadership permits them to operate in an offensive, hunter-killer mode. If they are only permitted to operate in defense of Japanese territorial seas, their value is limited to periods when U.S. Navy forces are operating near Japanese waters. Nonetheless Japanese contributions, even if limited to their territorial seas, would be very important to the U.S. Navy. The Japanese Maritime Self Defense Force (JMSDF) would essentially “have the U.S. Navy’s back,” to put it in street vernacular.

Japan has a small but very capable conventional submarine force. Conventionally powered submarines are not an optimum ASW weapon because slow submerged speed and limited endurance on battery limits the amount of water they can search. However, operating south of Okinawa in Japanese waters, they could perform valuable roles as pickets against PLA Navy attempts to pass from the East China Sea into the Pacific.

A close study of the maritime geography of the region illustrates that the Ryukyu chain, including Okinawa, forms a sort of “picket fence” between Central and North China and the open ocean of the Pacific. The Ryukyus essentially form a seaward boundary of the East China Sea, making it difficult for PLA ships and submarines to easily access open-ocean. This fact of geography provides a tremendous advantage to the United States, provided that Japan is diligent in monitoring these waters even if not an active belligerent.

The United States could probably count on a useful Australian naval contribution to the ASW campaign against PRC submarines, as well. Beyond that, there is not much that the Australians could bring to the fight, though political support from Canberra would be important. Other Asian allies and friends do not really have much capability that would be relevant in a campaign fought over a thousand miles away or are likely to withhold active support for political reasons.

When tallying possible allied contributions, it is important to consider whether political circumstances could keep Japan on the sidelines. Though the recent February 2005 statement in the wake of the 2+2 U.S.-Japanese Ministerial meeting has put Japan on record as seeing the issue of Taiwan as a strategic issue for Tokyo, it would be a mistake to conclude that the United States can count on unquestioned Japanese support.

The circumstances that lead to conflict would be an important consideration for Tokyo. If China launched a “bolt out of the blue” attack on Taiwan because Beijing was simply tired of waiting for Taipei to get on with some sort of reunification dialogue, then active Japanese support in the ensuing fight would be more likely. On the other hand, if Taipei were perceived as having provoked the conflict by baiting Beijing through incrementally moving toward independence in Chinese eyes, then Japanese support would be much more problematic. Even then, it is unlikely that the Japan would forbid launching U.S.

combat sorties from Kadena air force base on Okinawa. But it is likely that their military would be limited to a strictly defensive role defending Japanese sovereignty and interests.

In this situation, Japan would probably not be drawn into proactive support unless China chose to attack U.S. bases on Japanese soil, especially Kadena air force base. If Beijing elected to widen the war by attacking Japan, then Tokyo probably would aggressively hunt down PLA submarines. Just as it is Beijing's finger that is on the trigger on whether or not fighting starts, in certain circumstances, it is also Beijing's choice whether or not the conflict widens.

Conclusions

The PLA has been able to accomplish a great deal in recent years in developing capabilities to influence military action in and around Taiwan. Up to now, it has had the advantage of being able to focus its energies on a single canonical scenario. Taiwan is the PLA's equivalent of America's Cold War focus on the inter-German Central Front. China's will and capability should not, therefore, be underestimated.

In response, the U.S. Navy can and must become just as focused. The Navy must think clearly through the implications of what it must be able to do to preserve its ability to operate freely in the Western Pacific. This will include a determined focus on key advances in China's submarine and missile capabilities in particular. By combining this with cultivating close cooperation with capable allies (Japan and Australia), the U.S. can, if not neutralize, at least retard China's ability to disrupt operations of the U.S. fleet in the Western Pacific.

Essay 5

Counter-Intelligence, Surveillance, and Reconnaissance

By James Mulvenon

The Carrier Strike Group (CSG) would be the primary U.S. force projection asset in a China-Taiwan conflict. Yet the U.S. Navy's CSGs face an increasingly serious threat from Chinese anti-ship cruise missiles (ASCMs), advanced torpedoes, and ballistic missiles. The effectiveness and lethality of Chinese attacks depends heavily on effective ISR (space, airborne, underwater, and terrestrial) to find, track, and target the carriers and other components of the strike groups. At a minimum, this requires weapons systems with long reach and an ISR infrastructure to identify and track the target's path (and any course changes after launch), send this information to the missile(s), and then update the tracks of the ships and transmit any changes so the missile and/or warhead can make mid-course corrections. This paper briefly examines China's overall information operations (IO) strategy, specific ISR capabilities, and intentions, and then explores a range of U.S. Navy counter-ISR options.

Chinese Information Operations (IO) Strategy

At the highest level of theoretical abstraction, China's ISR modernization program can be seen as a subset of the PLA's emerging IO doctrine. Chinese definitions of IO closely mirror U.S. joint information operations doctrine. Chinese IO doctrine incorporates operational security (OPSEC), communications security (COMSEC), computer network operations (CNO), psychological operations (PSYOP), electronic warfare (EW), physical destruction, and denial

and deception (D&D). Chinese writings group these concepts into five broad categories: intelligence warfare (*qingbaozhan*), communications countermeasures (*tongxin duikang*), electronic countermeasures (*dianzi duikang*), psychological warfare (*xinlizhan*), and computer countermeasures (*jisuanji duikang*). Chinese ISR capabilities and counter-ISR measures against U.S. or other allied assets fall mostly under the “intelligence warfare” category, though the categories are not cleanly delineated.

The offensive and defensive aspects of information operations, including ISR and counter-ISR measures, are attractive to the PLA for a number of reasons. First, IO allows the PLA to attack both of the centers of gravity in a Taiwan contingency: (1) the will of the Taiwanese people and (2) U.S. military intervention. To this end, IO is meant to help deter or delay U.S. intervention, target U.S. assets in the theater, and thereby help create sufficient panic that Taipei capitulates before the United States arrives in force. Chinese ISR systems could potentially assist this goal by facilitating the identification, tracking, and targeting of U.S. Navy ships, and China’s emerging counter-ISR capabilities threaten the U.S. space-based reconnaissance infrastructure. Second, IO has longer range than their conventional power projection assets, which allows the PLA to “reach out and touch” U.S. forces, even in the continental United States (CONUS). In the intelligence realm, this means that Chinese ISR systems could develop a picture of U.S. and allied force posture at a range that exceeds the range of their non-strategic weapons. It also means that PLA preemption or retaliation in the cyber realm can reach all the way to military rear area systems or even civilian networks and critical infrastructure. Third, the U.S. military is perceived to be dangerously dependent on information technology systems, particularly computers and the need to use civilian backbone. For some PLA specialists, for instance, the Non-Classified Internet Protocol Router Network (NIPRNET), the DOD network used to exchange unclassified but sensitive information, is an “Achilles Heel,” and attacking it with distributed denial of service tools could degrade U.S. force deployment with plausible deniability. It is important in this context to recognize that Chinese IO strategy focuses on two levels of disruption and paralysis, not destruction. The first level is disruption of an opponent’s C4ISR and logistics infrastructure, while the second level targets critical non-military domestic infrastructure to “paralyze civilian political leadership” and degrade operational

capability. In addition, it must be noted that Chinese IO strategy is seen as a complement to kinetic operations, not a replacement for them. Fourth, IO is a facilitator of and a central element of China's emerging concept of preemptive attack against high-tech adversaries like the United States. From their analyses of Operations *Desert Storm*, *Allied Force*, *Enduring Freedom*, and *Iraqi Freedom*, the Chinese military has concluded they cannot allow U.S. forces to assemble unmolested on their periphery with a full force protection package in place, unless they wish to suffer the same fate as their Iraqi, Serbian, and Taliban counterparts.⁶² In this view, the only way to challenge a high-tech adversary is to attack preemptively, using so-called "assassin's mace" weapons. The success of such an effort, however, relies heavily on the ability of a survivable ISR infrastructure to find and track the targets in the first place. The next section describes these capabilities in broad outline. More detailed description can be found in classified documentation.

Chinese ISR Capabilities and Intentions

Recent editions of the annual Department of Defense report to Congress on Chinese military power provide ample evidence of Chinese progress in improving the PLA's space, airborne, underwater, and terrestrial ISR capabilities:

Acquisition of modern ISR systems remains a critical aspect of Beijing's military modernization. China is developing its ISR capabilities based on domestic components, supplemented by foreign technology acquisition and procurement of complete foreign systems. PLA procurement of new space systems, AEW [airborne early warning] aircraft, long-range UAVs, and over-the-horizon radar will enhance its ability to detect, monitor, and target naval activity in the western Pacific Ocean. It appears, from writings on PLA exercises, that that this system currently lacks integration and that a fused, efficient ISR capability will not be achieved for many years.

Exploitation of space and acquisition of related technologies remain high priorities in Beijing's ISR improvements. China is placing major emphasis on improving space-based reconnaissance

⁶² For example, see Lu Linzhi, "Preemptive Strikes Are Crucial in Limited High-Tech Wars," *Jiefangjun bao*, 7 February 1996.

and surveillance, including electro-optical, synthetic-aperture radar, and other satellite reconnaissance systems. These systems, when fully deployed, are expected to provide a regional, and potentially hemispheric, continuous surveillance capability. China has begun to embrace new satellite architecture emphasizing common satellite buses. This approach to satellite construction is based on use of a standard, versatile satellite bus module, with minor modifications to accommodate various payloads. In addition to domestic development, China probably will continue to use commercial satellite imagery and may seek to join an international consortium-owned constellation. China is cooperating with a number of countries, including Russia, Ukraine, Brazil, the United Kingdom, France, Germany, and Italy, to advance its objectives in space.

China's airborne ISR program has placed significant emphasis on UAVs. China's armed forces have operated the Chang Hong (CH-1) long-range, air-launched autonomous reconnaissance drone since the 1980s. China developed the CH-1 by reverse-engineering U.S. Firebee reconnaissance drones recovered during the Vietnam War. An upgraded version of the system was displayed at the 2000 Zhuhai air show and is being offered for export. A PRC aviation periodical reported that the CH-1 can carry a TV, daylight still, or infrared camera. It most likely is not equipped with a data link, which would allow remote-controlled operation, nor is it capable of providing real-time payload feedback to the remote operator. China's armed forces also operate other UAVs, primarily for battlefield reconnaissance or electronic warfare.

China also is pursuing naval ISR programs that include the Y-8 AEW aircraft and efforts to procure or produce an AWACS. These platforms eventually will complement China's other ISR platforms, such as the Tu-154 multi-role, special mission aircraft equipped for ELINT collection missions and possibly electronic warfare. The PLAAF reportedly also has several aircraft—both fighters and bombers—capable of performing an imagery reconnaissance function. China may have developed passive acoustic sensors for use in coastal waters and also may have at least one underwater acoustic range. This range could be used to track torpedoes during training exercises. Because of China's interest in ASW, development and deployment of additional

underwater sensors is probable in the next 5–10 years and will expand through 2020. Some of these future systems may be installed as far offshore as the edge of the continental shelf. Passive sensors would provide only a few miles of coverage against quiet submarines but could detect merchant shipping and noisy combatants at greater distances.⁶³

Taken together, these systems represent a growing threat to U.S. Navy assets in the Western Pacific, particularly in a cross-Strait contingency. The remainder of this essay addresses potential U.S. Navy options to counter Chinese ISR capabilities.

Potential U.S. Navy Counter-ISR Options

A variety of counter-ISR options are available to the U.S. Navy. These range from long-term economic measures to choosing much more aggressive crisis options. In between these extremes are other possibilities, such as plausibly deniable actions and options unrelated to China itself. Each of these options is discussed below.

- Long-term measures
 - Strengthen export controls on C4ISR-related technologies
- Non-China crisis options
 - Stop sharing disposition of U.S. Navy assets with Taiwan
 - Isolate PRC from international ISR data
- Plausibly deniable crisis options
 - Disabling or destroying dedicated PLA satellites
 - Disabling or destroying PRC satellites
 - Computer network attack (CNA) against Chinese cyberspace, including backbone telecom
 - Disrupting sensor fusion with CNA
 - Disrupting C2 with CNA
 - Covert action or air strikes against OTH radar sites on coast
- Escalatory (in order of gravity of consequence) crisis options
 - Overt CNA against Chinese C4ISR

⁶³ *Military Power of the People's Republic of China 2004 Annual Report to Congress* (Washington, DC: Department of Defense, 2004), 44,45. While more recent reports are available, the 2004 report dwelt extensively on ISR issues. It is quoted at length here to ensure that sensitive information is not compromised.

- Sinking submarines
- Shooting down AEW aircraft
- Air/missile strikes against OTH radar sites on the mainland
- Air/missile strikes against fusion centers on the mainland
- Air/missile strikes against National Command Authority facilities

Long-Term Measures

Strengthening export controls on C4ISR-related items sounds good in theory, but is extraordinarily difficult in practice. Dual-use items and components are very difficult to track, and non-U.S. suppliers would be all too happy to fill the gap if U.S. companies were prohibited from selling such items to China. For these reasons, a better option is strengthening the European Union (EU) Code of Conduct in the event that the EU arms embargo is lifted, which would at least facilitate a record of transactions. Another part of this approach would be pushing a “buy American” strategy that would basically trade export licenses for transparency. This would offer two main benefits. First, it would aid in monitoring of Chinese C4ISR modernization. Second, it would help collectors, because they would be dealing with familiar technologies. Moreover, it would provide opportunities to manipulate key components in China’s supply chain through tactics such as placing covert “backdoors” in the technology for later surreptitious intrusion and even possibly shutdown.

Non-China Crisis Options

One way to reduce the likelihood that the PRC would be able to locate and track U.S. surface ships is to withhold information about their positions from Taiwan. Some advocate sharing information about the disposition of U.S. Navy forces with Taiwan early in a crisis or conflict. Others argue against this option on the grounds that the information passed to Taiwan would quickly find its way into the hands of the Chinese intelligence services. Indeed, a mountain of open source reporting indicates that Taiwan is not faring well in its intelligence war with the PRC. According to Taiwan media reports, networks of agents are being rolled up on the mainland with alarming regularity and there is widespread concern about PRC penetration of the Taiwan military, intelligence community, and political system. The main advantage of withholding this information from Taiwan would be increased

operational security. At the same time, refusing to share the information would not be cost-free. The potential disadvantages include political fallout in the form of accusations of “lack of trust” and the potential lost benefits of joint planning and at least limited interoperability.

Another possibility that addresses the problem somewhat indirectly, but carries relatively low risks of escalation, is attempting to isolate China from international ISR data. Commercial remote sensing data from many sources is widely available to China. The PLA would likely seek to purchase imagery from some of these providers. For U.S. companies that provide commercial imagery, Washington’s options include exercising shutter control or outright purchase of all images. As for foreign providers, disabling foreign platforms is not likely to be in U.S. interests for straightforward diplomatic reasons, but Washington would have the option of putting diplomatic pressure on foreign governments or purchasing the relevant images directly from the providers. In addition, navigation satellite data could be jammed, or access to such data could be otherwise denied. The advantages of such an approach would be reducing the PLA’s comprehensive ISR capability in a way that doesn’t directly impinge upon Chinese sovereignty and is thus unlikely to spark unintended escalation of a crisis or conflict in the Taiwan Strait. The main disadvantage is that U.S. ability to pressure foreign providers to refrain from selling images or other data to China is likely to be highly limited.

Plausibly Deniable Crisis Options

As the PLA moves from reliance on civilian satellites to dedicated military systems, a more aggressive, though potentially still deniable crisis option is disabling or destroying PLA satellites. This option offers a discreet response to plausibly deniable information operations by the Chinese side, particularly during the pre-kinetic phase of coercion against the island. Such an approach would hopefully send a clear deterrence signal to Beijing, while allowing China to back down without losing face with its domestic population. The main disadvantage is that the reliance of U.S. forces on space-based assets for communications, positioning, and ISR renders the United States asymmetrically vulnerable in space, China’s successful 11 January test of a direct-ascent kinetic-kill vehicle highlighted that vulnerability.

The United States could also consider disabling or destroying PRC satellites that do not belong to the PLA. Most satellites in the PRC constellation are state-owned or controlled. The PLA could revert to civilian satellite transponders for at least some purposes if its dedicated satellites were disabled, or it could “mobilize” civilian satellites to augment its capabilities in the event of a crisis. The advantage of disabling such satellites would be degradation of PRC ISR and communications capabilities. The disadvantages would be the likelihood that the attack would not stay secret for long owing to the greater public profile of non-military satellites, and that the United States is asymmetrically dependent on space assets.

The United States could also contemplate computer network attack against civilian telecommunications and computer backbone infrastructure, either as a “shot across the bow” or to degrade national network capability. Given state ownership of the major infrastructure, the former could, like the previous example, be a deniable signal, though much less discreet. An attractive target for this type of the attack is any one of the nine, state-owned, international Internet gateways, destruction of which would symbolically sever some percentage of China from the global grid. A more comprehensive attack against all nine gateways could severely hamper the PLA’s ability to conduct unfettered computer network attack against DOD networks, forcing them to use ad hoc connections. Attacks designed to degrade national network capability, on the other hand, could have important operational impact, particularly given PLA plans to mobilize a large percentage of the national communications grid in preparation for operations against Taiwan.

Another option would be to attempt to disrupt PLA C2 by attacking computer networks. The main advantage this option offers is that CNA is a potentially potent and plausibly deniable long-range weapon. The disadvantages are that it is a high-risk strategy and that inadequate knowledge about the target communications infrastructure could lead to unintended, escalatory cascade effects into other C2 networks, the most worrisome of which would be those related to nuclear C2. The relatively small size of China’s nuclear force, coupled with the lack of a robust strategic early warning infrastructure, mean that attacks against nuclear C2 could cause Beijing to move its forces unnecessarily to a higher state of alert and thereby trigger parallel reactions from U.S. Strategic Command. This is not to say that there would be a nuclear

exchange, but the rapid dynamics of the crisis might put pressure on Blue to attempt to decapitate Red's silo-based force with conventional or even nuclear assets. Conventional attack is especially attractive to Blue, given that it would potentially hoist Beijing by the petard of its no-first-use policy. If one wishes to avoid any of these nuclear dynamics, overt CNA should steer clear of unknown command and control networks and use caution with those only partially understood.

A less risky strategy would be to target sensor fusion with computer network attack, particularly the fusion of space, airborne, and ground sensors for maritime surveillance against U.S. Navy ships in the area. Again, CNA has the advantage of range and plausible deniability, but attacks against sensor fusion could be more circumscribed with less chance of escalatory cascade effects.

The last—but potentially most escalatory—of the plausibly deniable counter-ISR options would be direct action missions, presumably to be carried out by Taiwan special forces personnel, against the OTH radar sites. The advantage of this measure is the possibility of disabling significant ISR assets without using more overt means like air strikes or cruise missiles. The disadvantages, apart from the risk of escalation, are the high risk of failure and the likelihood that captured personnel would be used as hostages.

Escalatory Crisis Options

In an escalatory environment, particularly after the Chinese have conducted kinetic attacks against Taiwan or U.S. military assets, all of the measures discussed above could be employed, though in some cases with different targeting strategies or new methods of attack.

With less concern for escalation, allied forces could disable or destroy a wide range of military and civilian satellites with the express purpose of degrading PLA communications and relay capability, rather than simply communicating deterrence in a pre-crisis phase. Overt CNA attacks could also be conducted on a much wider scale against civilian telecommunications infrastructure, military command and control, and sensor fusion targets. Despite the reduction in concern about unintended consequences, however, these attacks would nonetheless require a high degree of intelligence preparation of the battlefield, particularly to avoid degradation of networks related to nuclear command and control. Instead of employing special forces,

OTH facilities could be attacked using precision air or cruise missile strikes.

In this phase, kinetic attacks against ISR could include sinking submarines, attacking AEW platforms, and attacking other high-value targets on the mainland. From an escalation perspective, there is a significant firebreak between attacks on ISR assets operating outside China's borders or in outer space and those assets located on Chinese territory. Attacks on the mainland would immediately raise concerns in Beijing about the vulnerability of its strategic nuclear forces. Sinking one or more non-nuclear Chinese submarines, given the plausibly deniable nature of subsurface combat, is potentially the least escalatory of these targets, since one or both sides could disavow the attack or ascribe it to an accident. Attacks on AEW platforms would be more escalatory, though losses of aircraft in an intense beyond visible range missile environment could be downplayed or even blamed upon third parties. Air strikes on OTH radars, intelligence fusion centers, and command and control facilities on the mainland would run a high risk of contributing to escalation, and, like the overt CNA described above, would likely lead to a higher level of alert for Chinese theater and strategic nuclear forces. Efforts to use the choice of targets as a signal of escalation control, such as only choosing targets below the Yangzi River or avoiding targets in Beijing, run the risk of being misinterpreted or ignored by the Chinese side, which may not have the capability or the political freedom to respond with appropriate restraint to the signals.

Conclusions and Implications

Recent advances in Chinese C4ISR and long-range weapons have increased the risk to the carrier strike group, which is the primary force projection asset in a China-Taiwan scenario. The above analysis suggests a wide range of potential U.S. counters to the PLA's ISR, which is critical to Chinese ability to detect, track, target, and strike U.S. forces at extended range and keep them at bay or disrupt U.S. military forces long enough to effect Taiwan's capitulation. Options at every rung of the escalatory ladder are available, though the various measures present a spectrum of difficult challenges. Some require almost exquisite intelligence knowledge about Chinese systems, particularly command and control, while others, especially those that contemplate preemptive escalation, require sophisticated assessments

of Chinese intentions and capabilities. Some escalatory options open new battlefields that might have long-term, deleterious effects on current U.S. military dominance, particularly measures involving combat in space. Nonetheless, the measures outlined above, governed by careful planning and combined with political will, offer the hope of undermining the ability of Chinese ISR to successfully identify, track, and target U.S. Navy assets in the Western Pacific.

Essay 6

Projecting Power in a China-Taiwan Contingency: Implications for USAF and USN Collaboration

By David Shlapak

This paper assesses the contribution the U.S. Air Force (USAF) might make in deterring or defeating aggressive action by China in the Western Pacific. The model used in the analysis assumes an attempt by China to seize (or coerce) Taiwan, but the conclusions are applicable to a broad range of contingencies in the Western Pacific.

Air and maritime power, along with surface-to-surface missiles (SSMs), are at the core of the threat that the PLA poses to Taiwan. Defending against them will be critical for the island's armed forces and the United States, should the United States choose to support Taiwan in a showdown with China. While there may be a limited role for U.S. land forces in a China-Taiwan conflict—primarily as potential providers of ground-based theater missile defense (TMD)—the lion's share of the burden would most likely be borne by air and maritime units.⁶⁴

⁶⁴ We include under the maritime umbrella those units of the United States Marine Corps that might be engaged—primarily fixed-wing aviation squadrons operating from land bases or as part of afloat carrier air wings.

This paper will explore the potential role of U.S. air power in countering a Chinese attack on Taiwan.⁶⁵ The PLA is fielding an array of capabilities that will increasingly call into question the ability of U.S. forces to operate effectively and efficiently in a Taiwan scenario. Innovations in the capabilities of U.S. air forces would increase the likelihood of a successful intervention in a cross-Strait battle and could enhance deterrence.

A Review of the Situation Six Years Ago

To understand how the cross-Strait balance has changed, it is noteworthy to examine the situation 6 years ago. At that time, the author and two RAND colleagues undertook an assessment of the China-Taiwan military confrontation using a mix of quantitative and qualitative measures, including a sophisticated computer theater warfare model, the Joint Integrated Contingency Model (JICM). The resulting analysis “[i]dentified a handful of issues that appear crucial in helping Taiwan maintain an adequate defensive posture vis à vis the PRC, and [d]eveloped a set of recommendations for steps the United States might take to assist Taipei in dealing with those issues.”⁶⁶

This simulation, which was set in a notional 2005 time frame, focused primarily on the fight for air superiority, Chinese attainment of which—at least for periods of time and over specific areas—would be necessary to mount a sustained coercive campaign or any variety of invasion.⁶⁷ Using techniques of “exploratory analysis,” the RAND team simulated over 2,000 different air wars between China and Taiwan, systematically varying seven parameters that a prior screening analysis had identified as potentially critical:⁶⁸

⁶⁵ By *air power* in this paper we mean both land- and sea-based fixed-wing aviation.

⁶⁶ David A. Shlapak, David T. Orletsky, and Barry Wilson, *Dire Strait? Military Aspects of the China-Taiwan Confrontation and Options for U.S. Policy*, MR-1217-AF, (Santa Monica, CA: The RAND Corporation, 2000), 4.

⁶⁷ The study also examined some key aspects of the struggle for sea control in the Taiwan Strait, the outcomes of which we will not discuss here.

⁶⁸ Exploratory analysis, which is intended to help analysts build and illuminate compelling arguments illustrating the differences between policy options, was first described by Steven C. Banks in *Exploratory Modeling and the Use of Simulation for Policy Analysis*, N-3093-A (Santa Monica: The RAND Corporation, 1992).

- The size and composition of the air forces committed by the PLA.
- The possession by each side of modern, beyond-visual-range (BVR) air-to-air missiles (AAMs), such as the Advanced Medium-Range Air-to-Air Missile (AMRAAM).
- The number and quality of SSMs used by the Chinese.
- The number of precision-guided munitions (PGMs) available to the Chinese.
- The ability of Taiwan's air force to sustain sortie generation in the teeth of a concerted Chinese attack.
- The quality of Taiwan's aircrews.
- The number, if any, of U.S. land- and sea-based air forces committed to Taiwan's defense.

RAND also made two important assumptions regarding U.S. forces in those cases in which they engaged in the conflict. First, we assumed that the U.S. and Taiwan forces could coordinate their actions sufficiently that “blue on blue” fratricide would not be a significant problem. Second, we assumed that U.S. power projection bases, whether on land or at sea, would not be attacked or otherwise interfered with.

Overall, the Chinese fared poorly in these simulated campaigns. When the RAND team rated each outcome as “good,” “fair,” or “poor” from the U.S. perspective, we found that China appeared to score definitive wins in only about ten percent of the cases in which the PLA employed the forces that represented our best estimate of its capabilities in 2005.

Among the study's conclusions, three merit recapitulation here. First, denying the PLA Air Force control of the air required that Taiwan's air bases remain operable and able to efficiently generate sorties so that its air force could keep up the fight against the numerically superior Chinese.

Second, cases in which the Chinese were permitted to close the qualitative gap between their air force and that of Taiwan—by flying a larger proportion of more modern aircraft, by fielding advanced BVR AAMs like the Russian AA-12, or by improving the training of their pilots and aircrew—tended to turn out badly for the United States and Taiwan.

Third, even relatively small injections of U.S. combat power—a 72-jet USAF fighter wing flying from Kadena Air Base on Okinawa in Japan, for example, or one or two carrier air wings—could make a major difference in the outcome of the air war.

Such were our findings looking forward to 2005 from the vantage point of 1999. The situation appears significantly different today. The actual 2005 base case would incorporate:

- substantial doubt as to whether Taiwan’s air bases could survive a heavy Chinese assault;
- a PLA Air Force inventory that looks more like the “advanced” case RAND described in 2000;
- substantially improved Chinese capabilities to threaten U.S. bases like Kadena and platforms like aircraft carriers.

The Shifting Balance on the Taiwan Strait

Since the turn of the century, the preponderance of evidence suggests that China’s defense modernization has come farther faster than many analysts had anticipated. One indication of this is in China’s official military budget, which has doubled since 2000 to almost \$45 billion in 2007. China’s real military budget—taking into account central government defense expenditures not accounted for in the PLA account, as well as the differential costs of personnel and equipment in China—is much higher. The Department of Defense estimated China’s real military budget at \$90 billion for 2005, while a detailed RAND analysis estimated it at between \$69 and \$76 billion.⁶⁹ As a result of these investments, areas of substantially improved capabilities have appeared within the PLA. Three that would be of special importance in a cross-Strait contingency are:

- Continued deployment of more capable SSMs. Our 2000 analysis projected China with a force of either 210 or 420 short-range missiles (CSS-6 and CSS-7 SRBMs) in the 2005 time frame. The Pentagon’s 2006 annual report on the PLA stated that China had 710-790 SRBMs aimed at Taiwan and was deploying about 100 additional missiles per year.⁷⁰ In addition, China is developing

⁶⁹ *Military Power of the People’s Republic of China 2007*, 22. See also Keith Crane et al., *Modernizing China’s Military: Opportunities and Constraints*, MG-260-1-AF (Santa Monica: The RAND Corporation, 2005), 233.

⁷⁰ *Military Power of the People’s Republic of China 2006*, 3.

land-attack cruise missiles (LACM) and, while Taiwanese reports that up to 200 might have been deployed by 2006 seem exaggerated, there is little doubt that LACMs will soon begin entering PLA service, if they have not already done so.⁷¹

- Second, the PLA Navy (PLAN) has been making progress in deploying platforms and weapons that will greatly improve its ability to mount a sea denial threat against Taiwan and U.S. Navy (USN) forces.⁷² Included in these additions are new surface warships, such as the LANZHOU class guided missile destroyer, which features *Aegis*-like phased array radar and vertically launched surface-to-air missiles (SAMs), and new advanced KILO and YUAN class submarines armed with advanced torpedoes and anti-ship cruise missiles (ASCM).⁷³
- Third, China appears to be significantly improving its ability to defend its own airspace and contest control of the skies over the Taiwan Strait. The PLA Air Force is reckoned to deploy over 150 Su-27/30 Flanker aircraft, for example, and is fielding SA-10/15/20 SAMs as well as developing the F-10 fighter (similar in capabilities to the F-16 and likely to enter squadron service in the next year or so) and developing its own advanced SAMs.

Taiwan has thus far been unable to keep pace with China's military buildup. While the PLA's budget has skyrocketed over the past decade, Taiwan's has declined, in real and nominal terms and as a percentage of

⁷¹ Rich Chang, "China to Deploy Cruise Missiles: NSB," *Taipei Times*, 24 April 2005. Available at <<http://taiwansecurity.org/TT/2005/TT-240405.htm>>.

⁷² While the subject of this article is air power, China's increasing naval capabilities are relevant in that they could affect how U.S. naval aviation engages in any cross-Strait conflict.

⁷³ Regarding the Yuan, see Bill Gertz, "Chinese Produce New Type of Sub," *Washington Times*, 16 July 2004. Available at <<http://www.washtimes.com/national/20040716-123134-8152r.htm>>. For a sobering assessment of the threat posed to U.S. naval forces by China's submarine force, see Lyle Goldstein and William Murray, "Undersea Dragons: China's Maturing Submarine Force," in *International Security*, spring 2004. See also Goldstein and Murray's dialog with Michael O'Hanlon, "Damn the Torpedoes: Debating Possible U.S. Navy Losses in a Taiwan Scenario," in *International Security*, fall 2004.

the island's GDP over the same period.⁷⁴ Economic woes—Taiwan, the “Silicon Island,” suffered grievously with the collapse of the 1990s tech bubble—and the rancorous politics of its young democracy have left the island's defensive capacity treading water. That the \$20 billion arms sale offered by the United States in 2001—which included systems critical to countering China's growing power, such as theater-ballistic missile defenses—remains unconsummated after years of bitter partisan wrangling between Taiwan political parties is but the most obvious example of the worrisome lethargy that seems to be afflicting Taipei's response to the threat posed by the PLA.⁷⁵

Critics of the arms sale package, and by extension of any increased Taiwanese efforts at self-defense, argue that attempting to match China's buildup is akin to tossing grains of sand into the ocean; tiny Taiwan can never hope to win an arms race with the leviathan across the Strait. This is true, as far as it goes. However, it ignores two crucial points.

First, deterrence is not only about whose forces are stronger, or even which side experts believe would likely prevail in a conflict; it is about perceived costs and benefits. Given that the Chinese leadership almost certainly understands that it would incur enormous political and economic losses in the wake of even a successful military campaign against Taiwan, it seems likely that Beijing would seriously contemplate taking such a gamble under only two conditions: if Taiwan's behavior were unbearably provocative, or if China believed that it could achieve a quick victory that presented the world with a *fait accompli* that rendered futile any resistance to the new status quo. As the military balance across the Strait shifts in the mainland's favor, the latter possibility looms as a growing risk.

⁷⁴ Michael Pillsbury, “The U.S. Role in Taiwan's Defense Reform,” paper presented to U.S.-China Economic and Security Review Commission conference in Taiwan, February 2004. Available at <http://www.uscc.gov/researchpapers/2004/04_05_24_dr_pspeechintaipei_final1.htm>.

⁷⁵ There are others. For example, in the late 1990s, the Taiwan navy planned to procure about 40 *Kwang Hua VI* missile-armed attack boats. These small, fast, stealthy warships could be very effective in helping ward off any Chinese invasion attempt. At this writing, only one vessel of the class appears to have been completed, with the rest on indefinite hold due to lack of funding.

Second, Taiwan's strategy has never been to stand alone against the unleashed might of the PRC. Instead, its goal has been to hold out, like the beleaguered settlers in an old John Wayne Western movie, until the cavalry—in the form of the U.S. military—can throw its weight into the balance. While the termination of the U.S.-Taiwan defense pact in 1979 ended any formal American commitment to come to Taiwan's defense, every U.S. administration since has made clear that a PLA attack on the island could result in conflict between China and the United States. The deterrent impact of this possibility is substantial, but to a large degree it hinges on Taiwan's perceived ability to buy sufficient time for the United States to bring its superior power to bear in a meaningful way. If Taiwan's military continues its decline relative to the PLA, its ability to "hang in" under attack will become increasingly doubtful, with potentially dangerous consequences for cross-Strait stability.

Anti-Access with a Vengeance? The Growing Threat to U.S. Forces

If Taiwan's own defenses are growing less robust, responsibility for deterring or defeating any Chinese use of force will fall more and more on the shoulders of the United States. The U.S. military's ability to project power into the Taiwan Strait and coastal China is currently a three-legged stool, with carrier-based air serving as one leg, and land bases on the Japanese island of Okinawa and the U.S. territory of Guam serving as the two dry-land components. As noted above, China is investing heavily in capabilities that are likely, over time, to put all three of these at risk.⁷⁶

The importance of carrier-based air in the U.S. response to any Chinese attack on Taiwan is indisputable. When China attempted to coercively influence Taiwan's 1996 presidential election by lobbing missiles into the sea near the island's two major ports, Beijing was apparently shocked by the appearance of two U.S. carrier strike groups (CSGs) deployed by the Clinton Administration as a show of support for Taiwan. The incident appears to have motivated an urgent effort to upgrade the PLA's ability to threaten American naval forces, especially

⁷⁶ An extensive assessment of the potential of China's antiaccess capabilities can be found in Roger Cliff et al., *Entering the Dragon's Lair: Chinese Antiaccess Strategies and Their Implications for the United States*, MG-524-AF (Santa Monica: The RAND Corporation, 2007).

CSGs. The PLAN currently operates three Russian-built SOVREMENNY-class destroyers and has an additional hull on order. Equipped with the SS-N-22 SUNBURN supersonic anti-ship cruise missile (ASCM), these warships, along with the other modern destroyers and frigates China is putting to sea, form the surface component of a credible, if limited, sea-denial capability. Beneath the waves, KILO, SONG, and YUAN diesel submarines and the soon-to-be-operational Type 93 nuclear attack sub—all equipped with various combinations of wire-guided and wake-homing torpedoes and ASCMs—constitute another challenge to U.S. naval commanders. There are also indications that China is seeking to develop the capability to strike ships at sea with ballistic missiles and has reportedly tested a maneuvering re-entry vehicle (MaRV) potentially suitable for such a mission. Even if a CSG's defenses are powerful enough to protect the carrier and its escorts from Chinese attack, to the extent that its efforts are diverted from protecting Taiwan to protecting itself—by operating further away from the Strait, for example, or committing sorties to fleet air defense—the U.S. ability to counter a Chinese move against Taiwan would be diluted.

As a 2004 DOD report notes, the PLA is deploying a new, longer-range variant of the CSS-6 SRBM that will be able to reach U.S. air bases on Okinawa.⁷⁷ If the Chinese fit these missiles with submunition warheads, which they have reportedly done, unsheltered aircraft at these installations will be extremely vulnerable.⁷⁸ Kadena, which plays host not just to a USAF fighter wing but also airliner-size aircraft like E-3 AWACS and air-to-air refueling tankers that cannot fit into shelters, could be devastated. Analysis suggests that a handful of reasonably accurate missiles with submunition payloads could essentially blanket the parking ramps at Kadena, damaging or destroying dozens of aircraft in the opening minutes and hours of a cross-Strait conflict.⁷⁹ Missiles could also be used to attack unhardened

⁷⁷ *Military Power of the People's Republic of China 2004*, 37.

⁷⁸ For reports of Chinese development of submunition warheads for airfield attack, see for example Richard J. Newman, "The Chinese Sharpen Their Options," *Air Force Magazine*, October 2001. Available at <<http://www.afa.org/magazine/oct2001/1001china.asp>>

⁷⁹ For a discussion of conventional ballistic and cruise-missile attacks on air bases, please see John Stillion and David T. Orletsky, *Airbase Vulnerability to*

maintenance facilities and to damage runways and taxiways, slowing sortie generation for surviving aircraft and further diminishing the combat power that the U.S. could bring to bear.⁸⁰

Guam, which lies about 1,300 nautical miles from the Taiwan Strait, is today relatively safe from Chinese attack. The only missiles presently in the PLA arsenal with sufficient range to strike targets there are IRBMs and ICBMs that are fitted only with nuclear warheads; nor can any current Chinese bomber reach Guam. The relative sanctuary and assured access offered by the island, which is sovereign U.S. territory, are why both the USAF and USN are investing heavily in making Guam the primary hub for power projection in the Western Pacific.⁸¹

Conventional Cruise-Missile and Ballistic-Missile Attacks, MR-1028-AF (Santa Monica: The RAND Corporation, 1999).

⁸⁰ By attacking a U.S. base on Japanese territory, China would be engaging in a form of horizontal escalation, with all of the attendant risks. Allowing U.S. forces to use facilities on its soil in operations against China would make Japan a cobelligerent, affording Beijing some legal cover for striking back against those installations. One may also speculate that a China anxious or angry enough to pick a fight with the United States over Taiwan might be unlikely to retreat from the prospect of angering Japan, calculating that its post-war status in Asia would be determined far more by its success or failure in coercing or conquering Taiwan than by the details of how the outcome was reached.

⁸¹ Guam is United States territory, so striking it might appear to be a major escalatory step for Beijing. As with everything else relating to using force against Taiwan, China's leaders would certainly think long and hard before attacking American territory. There are, however, several factors that might mitigate the escalatory risks in Chinese eyes.

First, of course, is the possibility—perhaps probability—that U.S. forces will strike targets on the Chinese mainland (indeed, as the PLA field more and more advanced and longer-range surface-to-air missile (SAM) systems, it becomes difficult to imagine how the U.S. could engage in defending Taiwan without attempting to draw down those defenses and, in the process, bombing Chinese territory). Regardless of how limited these attacks might be, they would seem to clear the way for the PLA to launch parallel attacks against targets directly supporting U.S. military actions against China.

Second, it should be recognized that declaratory policy aside, there is “U.S. territory” and then there is “U.S. territory.” Would the Chinese leadership expect Washington to risk a significant escalation or expansion of the war over, say, a few missile warheads impacting on an air base almost 10,000 miles from the U.S. mainland? It is probably helpful for U.S.

One near-term option the Chinese could pursue to neutralize Guam might be to execute a high-altitude nuclear burst, tens or hundreds of miles above the island. Such a detonation, which is well within China's means, would produce an electromagnetic pulse that could damage electronic equipment, including the avionics of aircraft and the combat systems of surface ships and surfaced submarines. The use of a nuclear weapon would of course represent a major roll of the dice for the Chinese, who would be banking on the escalatory risks being dampened by the absence of large-scale physical destruction and minimal loss of life connected with a high-altitude explosion. Beijing certainly would not undertake such a risky gambit lightly; however, if U.S. forces on Guam were seen as a threat that needed somehow to be dealt with, the Chinese might feel compelled to at least consider the option.

The PLA appears poised to field weapons that will give it additional, conventional options against U.S. installations on Guam. LACMs fired from long-range bombers and submarines will begin to pose a threat sometime in the next few years. It is also not implausible that Beijing could choose to field IRBMs with advanced conventional payloads explicitly to target Guam, especially if the United States continues to build up its forces on the island.

In addition to these increasingly dangerous threats to its bases, U.S. airpower will confront more serious challenges once in the air. China has assembled the components of a relatively sophisticated integrated air defense system (IADS) that could be deployed to support a

policymakers to assert that they would run those risks, but in the event it would be hard to blame the Chinese for disregarding those assertions.

Third, what meaningful escalatory options would be available and attractive to the U.S. leadership should they wish to respond to an attack, on Guam? Could the President credibly threaten to use nuclear weapons against an adversary that has the ability to incinerate a handful of American cities? Expanded conventional attacks on China would risk either being so small as to constitute pinpricks or, if larger, both dilute the main effort at defending Taiwan and run the risk provoking a Chinese counter-counter move, forcing another turn on the escalatory spiral.

The argument here is not that China would lightly make the decision to strike Guam but, rather, that it may be imprudent to stake too much on the belief that Beijing would not dare to attack military targets on a distant outpost of American soil.

campaign against Taiwan. In the next few years, China will field several hundred aircraft capable of employing advanced BVR “fire-and-forget” air-to-air missiles, such as the Russian AA-12 and the domestically developed PL-12. These weapons could help offset the relatively poor—in comparison to their U.S. counterparts—training of Chinese fighter pilots. As the author has argued elsewhere, “[e]ven a mediocre pilot can become a serious threat when equipped with an AMRAAM-type missile.”⁸² China is also reported to have spent over a half billion dollars in recent years buying various versions of the advanced Russian S-300 SAM system, which is being operated in conjunction with the SA-15, and indigenously produced weapons.

Having painted a dismal picture of an increasing Chinese threat to U.S. forces in defense of Taiwan, it is well to remember that the PLA would still face enormous challenges in executing any operation against the island. While the mainland’s military is on a path to greater professionalism, its training levels remain low by Western standards. China’s command, control, reconnaissance, and logistics infrastructures, while improving—in some cases rapidly—are nonetheless underdeveloped. It is also worth emphasizing that the PLA has absolutely no experience of modern warfare. Its most recent venture in large-scale operations was the 1979 invasion of Vietnam, which was a military disaster. However, as the PLA’s institutional reforms, doctrinal innovations, and hardware modernization efforts continue to progress, the contemporary U.S. concept for power projection—built upon unchallenged dominance of the oceans and skies and freedom of operation from relatively invulnerable bases ashore and at sea—will increasingly be called into question. Ensuring that the United States can effectively intervene in a Taiwan Strait contingency at a reasonable cost in lives and resources demands that U.S. air power be able to deny China control of the air over Taiwan and the Strait and the seas around the island, interdict the air and sea movement of PLA troops to Taiwan, and hold at risk a variety of targets on the Chinese mainland. Accomplishing this in the face of growing Chinese capabilities for power projection and area denial will require a new degree of innovation and cooperation between the land- and sea-based components of U.S. air forces.

⁸² Shlapak, Orletsky, and Wilson, 36.

Collaboration to Defend Taiwan

Neither the USAF nor the USN can reasonably expect to single-handedly carry the day in defense of Taiwan in the face of China's growing power. The USAF suffers from a dearth of potential operating bases. As noted earlier, Kadena is the best situated, assuming that Tokyo permits it to be used in a Taiwan contingency.⁸³ Osan and Kunsan air bases in South Korea are a reasonable distance from the Taiwan theater, but forces based there will for the foreseeable future be focused on the dangers emanating from Pyongyang, and there are serious questions surrounding their political availability to support U.S. intervention in a cross-Strait fight.⁸⁴ Bases in the northern Philippines are about as far from Taipei as is Kadena, but could be politically difficult and would be just as vulnerable to Chinese attack—more so, since presumably they would not be hardened or equipped with missile defenses. Basing USAF assets on Taiwan itself is politically implausible and operationally foolhardy.⁸⁵

⁸³ There are possible air base locations on islands further south in the Ryukyu chain, such as Shimojishima. Even Japan's own self-defense forces have encountered profound resistance from local residents to establishing additional bases in the islands. For a discussion, please see Zalmay Khalilzad et al., *The United States and Asia: Toward a New U.S. Strategy and Force Posture*, MR-1315-AF (Santa Monica: The RAND Corporation, 2001).

⁸⁴ In March 2005, South Korean President Roh Moo Hyun stated that U.S. forces based in Korea "should not be involved in disputes in Northeast Asia without our consent." Given warming relations between Seoul and Beijing, and South Korea's need for China's cooperation in managing Kim Jong-il, it should certainly not be assumed that consent would be forthcoming if requested for a Taiwan Strait scenario. "Roh Opposed Expansion of U.S. Troops' Role to Northeast Asia," *Seoul Yonhap* in English, 8 March, 2005. Available at <<http://www.yonhapnews.net/Engservices/3000000000.html>>.

⁸⁵ China has stated that the deployment of foreign forces on Taiwan constitutes as *casus belli* that could itself trigger an attack. Whether the U.S. would want to test Beijing's seriousness on this score during peacetime is certainly debatable. There are also major risks associated with deploying USAF assets to Taiwan in a crisis context. The PLA operates about 100 missiles that can reach Kadena, as opposed to perhaps 700 that can strike Taiwan, and Taiwan's air bases have few if any shelters available for any USAF aircraft based there; a decision to try to operate from Taiwan would put U.S. forces in the center of the proverbial bulls-eye. Also, almost all of the maintenance and support equipment for the U.S. units, as well as their munitions, would need to be

The USN, for its part, homeports a single carrier in Japan. While it plans to rapidly generate additional decks in the event of a Taiwan crisis, it is not implausible that only one or two CSGs will be available in the first hours to days of a China-Taiwan fight. The PLA's doctrinal emphasis on striking hard and fast to achieve a rapid decision in any future conflict makes that initial period crucial.⁸⁶ Given the dangers posed by Chinese submarines and other "anti-access" assets, a naval force operating in the vicinity of Taiwan will likely have to commit a substantial portion of its available combat power to protecting itself. A single carrier or a pair might be hard-pressed to provide more than a token level of air superiority or maritime strike capability until PLAAF and PLAN threats had been substantially suppressed.

Given these circumstances, timely and effective U.S. intervention in a cross-Strait contingency may well require a degree of USAF-USN collaboration that goes beyond each service's existing doctrinal and operational preferences. Here we will discuss two broad issues:

transported to Taiwan. This would substantially prolong the period before USAF forces could mount sustained, high-tempo operations even if the deployment were unmolested by the Chinese. If we take Beijing at its word, the operation might be undertaken under fire, which would almost certainly make it far more time-consuming and costly. Whether the deterrent value of having U.S. forces actually on the island would offset these risks is a judgment that would be up to the President and his senior advisors. To this author, at least, the balance seems fairly one-sided.

⁸⁶ At the heart of China's new doctrine is a conviction that "in limited, modern war...winning the first battle is vital, because it may be the decisive one." Victory and defeat will typically be determined by the delivery of swift, punishing blows that undermine the enemy's political will or diplomatic position—"fighting a quick battle to force a quick resolution." This doctrinal inclination to strike the first blow has obvious, and troubling, implications when applied in the context of a future U.S. attempt to deter Chinese military action against Taiwan. See Paul Godwin and John J. Schulz, "Arming the Dragon for the 21st Century: China's Defense Modernization Program," in *Arms Control Today*, December 1993; Nan Li, "The PLA's Evolving Warfighting Doctrine, Strategy, and Tactics, 1985-95: A Chinese Perspective," in *The China Quarterly*, June 1996; Harold Brown, Joseph W. Prueher, and Adam Segal, *Chinese Military Power*, (New York: Council on Foreign Relations, 2003); and Thomas J. Christensen, "Posing Problems without Catching Up," *International Security*, Spring 2001.

protecting the joint force's key bases, and bringing air-to-air and maritime strike combat power to bear against China.

Protecting Bases of Operation

First, for both services, maintaining secure bases for operations will be of paramount importance. For the USN, this may mean operating further to the east of Taiwan than would have been the case a decade ago; putting more blue water between the CSGs and the mainland would both move the carriers out of range of some Chinese strike assets and allow the group's defenses more space and time to engage threats. The price, of course, is a decreased ability to generate sorties over Taiwan and the Strait because of the increased distances that the carriers' fighters would need to fly to and from the combat arena.⁸⁷

The USAF could assist the USN in several important ways. As the nation's primary provider of aerial refueling capabilities, the Air Force has long provided tanker support to USN aircraft. Longer distances mean more fuel, and the need to generate combat sorties could reduce the number of USN F/A-18s available for use as "buddy" tankers for their brethren. USAF planning for a Taiwan contingency should incorporate sufficient tanker support to enable the USN to maximize the number of air-to-air sorties it can produce from any given number of carrier decks.

The USAF could also augment the CSGs' organic surveillance and targeting capabilities. E-3 AWACS aircraft and long-endurance UAVs, like the RQ-4A *Global Hawk*, operating from Guam, could significantly enhance situational awareness for the strike group commander.⁸⁸

⁸⁷ Longer base-to-target distances reduce sortie rates both because the missions simply take longer and because some aircraft components, such as hydraulic systems, tend to break down as a function of how long they are in use, increasing maintenance workloads as the jets are forced to fly farther. See David A. Shlapak et al., *A Global Access Strategy for the U.S. Air Force*, MR-1216-AF (Santa Monica: The RAND Corporation, 2002), especially chapter 3.

⁸⁸ In the limit, the CSG could conceivably rely on the USAF to provide the bulk of its airborne C⁴ISR capability and trade off some of the air wing's airborne early warning and intelligence collection assets to make room for additional fighters.

For the Air Force, secure basing for its fighter forces, at least, appears to mean developing the capacity to defend Kadena and fight it effectively under attack. This will involve making substantial investments in passive defenses, including hardening key facilities, building additional aircraft shelters, and improving rapid-runway repair capabilities.⁸⁹

Active defenses should not be neglected, either. There have historically been political questions associated with any U.S. deployment of theater-missile defense (TMD) systems on Okinawa. With closer U.S.-Japan security relations and more open concerns being voiced in Tokyo over China's increasing military power, it is worth at least considering permanently basing additional U.S. Army Patriot Advanced Capability 3 (PAC-3) interceptors at Kadena.⁹⁰ The USN could boost Kadena's TMD defenses substantially by deploying Aegis Ballistic Missile Defense warships to help protect it. Adding a midcourse defense layer to the terminal protection offered by PAC-3 on top of the hardening and reconstitution of Kadena itself would make the base a far tougher nut for the Chinese to crack. And, in a Taiwan scenario, Kadena is a sufficiently valuable asset to warrant a joint effort to defend it.⁹¹

Guam will likely grow in importance as a power-projection hub for both the USAF and USN. While Guam currently faces only a very limited conventional threat from China, it seems likely that over the next 10 years or so it will become increasingly at risk. The LACM threat, whether air- or submarine-launched, will demand attention from

⁸⁹ These kinds of capabilities are not new for the USAF, which built extremely robust air bases in NATO Europe to counter Warsaw Pact offensive air and missile attacks that were expected to dwarf anything that China will likely be able to unleash on Okinawa in the near- to mid-term.

⁹⁰ PAC-3 systems are cumbersome to deploy, so moving them to Kadena "on warning" could well take too long and expose the base to devastating attacks before they could become operational. One battalion is currently in place at Kadena, having deployed there in fall 2006.

⁹¹ Large aircraft that cannot be sheltered, such as AWACS, E-8 JSTARS, and air refueling tankers, are particularly vulnerable to even a ragged attack on an air base. The USAF might therefore also want to consider either re-basing large aircraft from Kadena to Guam or putting plans in place to "flush" them to safer locations if conflict with China (or North Korea, for that matter) appears likely.

both services, as will defending the island from ballistic missiles. It may also be prudent to begin planning how and when to begin hardening key facilities on Guam.

Quelling the Dragon: Bringing Combat Power to Bear Over and On the Taiwan Strait

Bringing adequate air combat power to bear over the Taiwan Strait and attacking targets on the mainland will be made more challenging by increasing Chinese air defense, air, and naval capabilities and the need to commit substantial effort to defending U.S. land and sea bases. An intelligent and synergistic division of labor between the USAF and USN could leverage U.S. capabilities in ways that make the problems much more tractable.

In terms of flying into the surface-to-air and air-to-air threats that China will be deploying in increasing numbers, U.S. naval aviation will be hampered for at least the next decade by the lack of stealthy aircraft. Conventional aircraft confronting China's modern fighters and, especially, its SA-10/20-class "double digit" SAMs, run the risk of suffering unsustainable losses unless and until PLA defenses are suppressed or eliminated. Early on in a Taiwan contingency, then, the main USN contribution to offensive "airpower" may well be in the form of Tomahawk Land Attack Missile (TLAM) strikes on Chinese targets. The Block IV variant—the so-called "Tactical Tomahawk"—could be very valuable in helping defeat Chinese air defenses and mobile missile launchers because of its ability to be retargeted in-flight to hit any of 15 pre-programmed aim points or a specific set of GPS coordinates and to loiter and transmit back battle-damage assessment information.⁹² On the negative side of the ledger, the air and missile threats posed by China will mean that TLAM rounds will be competing for magazine space with air-defense and TMD missiles in the vertical-launch systems of USN surface ships, possibly limiting the number of cruise missiles available.

Once the Chinese long-range air defense began to be rolled back, USN and Marine F/A-18s could begin to engage in air-to-air and surface strike missions over the Strait. As noted earlier, however, the number of available sorties could be limited by the need to protect the

⁹² United States Navy Fact File, "Tomahawk® Cruise Missile." Available at <<http://www.chinfo.navy.mil/navpalib/factfile/missiles/wep-toma.html>>.

fleet and the possibly increased distance between the carrier's secure operating area and the Strait.

Compensating for any limitation in USN ability to mount air-to-air missions, the USAF would exploit its ability to operate out of Kadena—an ability partially and importantly secured by sea-based missile defenses—to fly a fairly large number of air-to-air sorties over the Strait. F-15C and F-22 aircraft at Kadena should be able to sustain a two-a-day sortie rate over the Strait, assuming the base remains operable.⁹³ The stealth design and superior avionics of the F-22 would likely come into play to good effect in a China scenario by allowing the aircraft to operate with substantial effectiveness in both counter air and surface-attack roles, even in the presence of modern Chinese fighters and SAMs.

With adequate refueling support, fighters operating out of Guam, which should also be the base for almost all of the many large tanker and ISR aircraft needed in this scenario, could reinforce aircraft flying off carrier decks and out of Kadena. However, fighter sortie rates would be significantly reduced by the long duration of each mission.⁹⁴ Analysis suggests that flying from Guam would reduce sortie rates by about 50 percent versus operating from Kadena. So, a fighter wing that could sustain three combat air patrol stations over the Strait if flying

⁹³ The sortie rate is derived from Shlapak et al., 63.

⁹⁴ The air superiority problem over the Strait could be partially addressed by adding longer-range fighters to both the USAF and USN inventories. However, unless these aircraft also flew at significantly higher speeds than even the “supercruise” F-22—and building a maneuverable fighter that is at once very fast, very long-legged, and even remotely affordable would be a possibly-insuperable design challenge—they could not be expected to come close to the level of productivity in terms of sorties generated per airframe that is achieved by current-generation aircraft based closer in. As the USAF fighter force seems likely to shrink in numbers over the coming decade(s), this would represent a problem in scenarios where maintaining combat air patrol (CAP) orbits represents a sizeable portion of what U.S. air forces are called upon to do, as would likely be the case in a China-Taiwan contingency. Thus, the best solution for the problem may be to continue to base at least some fighters at places like Kadena and perhaps other “close in” facilities, but—as discussed earlier—provide those (likely few) installations with quality active and passive defenses.

from Okinawa might manage only one or two if operating out of Guam.⁹⁵

USAF bombers operating from Guam or elsewhere—Diego Garcia, Alaska, Hawaii, or the continental United States—would undertake attacks on surface targets, including Chinese warships and troop transports. The stealthy B-2 could operate at night to attack mobile targets in defended airspace, while B-1B and B-52H bombers could employ long-range standoff weapons to engage fixed land targets.⁹⁶ Modified heavy bombers equipped with *Harpoon*, SLAM-ER, or Joint Air-to-Surface Standoff (JASSM) missiles could inflict heavy damage on Chinese surface forces from ranges “in excess of 135nm.”⁹⁷

Facing the Future: U.S. Air Power in the Taiwan Strait

By harnessing innovative, cooperative concepts, the USAF and USN can maximize the effectiveness of American air power in a Taiwan Strait contingency. However, even the cleverest thinking and planning cannot disguise the existence of some critical shortfalls in existing—and in some cases, planned—capabilities.

The first is the fact that the joint force fields entirely inadequate defenses against ballistic missiles, either to protect its own operating bases (and the prospect looms of a Chinese ballistic missile threat to carriers as well as to land bases) or to help defend Taiwan from the coercive threat presented by China’s ever-increasing arsenal of sophisticated SRBMs.⁹⁸ Even taken together, existing TMD programs may be inadequate to provide the kind of robust defenses that would be desired in this kind of campaign. New initiatives may be needed. Given the value of a layered approach to increasing TMD effectiveness, the development and deployment of workable boost-phase defenses would

⁹⁵ The sortie rate is derived from Shlapak et al. (2002), 63.

⁹⁶ If it can be spared from air-to-air duties, the F-22 would provide a 24-hour ability to prosecute defended targets within China and on the Strait.

⁹⁷ United States Navy Fact File, “*SLAM ER Missile Systems*.” Available at <<http://www.chinfo.navy.mil/navpalib/factfile/missiles/wep-slam.html>>. It is important to note that, as of this writing, USAF heavy bombers cannot employ long-range weapons to strike maritime targets.

⁹⁸ As the threat presented by China’s conventional missiles to Japan grows, it would not be surprising if Tokyo demanded a substantial U.S investment in protecting Japan as part of the price for its cooperation in a Taiwan conflict.

be of special importance. Since these would most likely be fielded either as high-altitude or space-based systems, the USAF—which is currently making relatively small investments in TMD—may need to consider upping its ante in the missile-defense game.⁹⁹

The second concern is the continued lack of a carrier-based stealthy fighter. When it reaches service sometime in the next decade, the Lockheed-Martin F-35C Joint Strike Fighter will give the USN its first true low-observable aircraft, more than 20 years after the F-117 debuted with the USAF.¹⁰⁰ Until then, the effectiveness of the fleet's F/A-18 fighters in a China-Taiwan conflict will be limited by survivability concerns.

Using a Taiwan contingency as a driver for force modernization reaffirms the USAF commitment to pursue additional stealth capabilities within its force structure, both for platforms and standoff munitions. The role for large numbers of short-range land-based fighter-bombers, on the other hand, is less clear. In the Western Pacific, there is simply no place to base them.

Further, the Joint force needs to develop better concepts and capabilities for all facets of the kill chain against defended, mobile

⁹⁹ The USAF's Airborne Laser (ABL) program is the only boost-phase defense system currently under development. The ABL has suffered from cost and technical problems throughout its development cycle and, at this writing, it is unclear if and when it will become operational. See, for example, two reports from the U.S. General Accountability Office: *Theater Missile Defense: Significant Challenges Face the Airborne Laser Program*, GAO/NSIAD-98-37, October 1997, and *Airborne Laser Costs and Military Utility*, GAO-04-643R, May 2004.

It is also worth noting that a race between China's ability to deploy additional ballistic missiles and U.S. efforts to defend against them will be very expensive for the defender, and may prove impossible to "win" definitively, as is discussed elsewhere in this volume. However, the political and operational costs of allowing not just our own forces but our allies' territory to be essentially undefended may be sufficiently high to justify additional investments in systems capable of at least "thinning out" the attacker.

¹⁰⁰ The initial operational deployment for the F-35C (the USMC variant, the F-35B, is scheduled to enter service one year earlier) is slated for 2013. The program's history, as well the recent track record for bringing new combat aircraft into service, suggests that this date may prove optimistic.

targets. For the USAF, this could involve not just improved ISR but possibly a new generation of platforms offering a combination of survivability and endurance that will allow them to loiter close enough to targets such as SSM launch areas to successfully engage fleeting targets—perhaps with a yet-to-be-developed set of highly responsive (hypersonic or directed energy) weapons.¹⁰¹

The growing Chinese threat to Kadena has led some observers to suggest that the USAF seek additional bases to confront China with the need to attack additional targets—and, not incidentally, additional countries—in order to suppress Air Force operations. And, indeed, in part due to relationships energized or reinvigorated by the so-called “global war on terrorism,” new opportunities for basing may be cropping up in the Asia-Pacific region, in places as diverse as the Philippines and India. It would certainly behoove the USAF to explore options for gaining additional contingency access. However, two points need to be made about any USAF attempt to disperse its way out from under its survivability problem.

First, there are actually only a handful of places where it makes sense to base short-ranged fighters—the asset most vital to operate relatively close to the combat zone—for a China-Taiwan contingency. Absent a decision by the United States to turn a localized struggle for control of Taiwan into a general war with China, the theater of operations will likely for the most part be geographically constrained to China’s

¹⁰¹ UAVs potentially offer the important advantage of not putting a pilot and crew at risk when undertaking dangerous missions such as these. An armed, stealthy platform with range and endurance similar to *Global Hawk* would be very valuable in this and other future scenarios for both strike and surveillance tasks. There is, however, little evidence to suggest that developing and building such a UAV would be substantially cheaper than fielding a similar manned aircraft—which means that it would probably wind up being quite expensive and not as “disposable” as many of the more enthusiastic advocates of unmanned aircraft might wish. There is also the problem that there is currently no program to develop such a system; the primary effort to build a “combat” UAV, the Joint Unmanned Combat Air Systems (J-UCAS), aims to produce what is essentially an uncrewed JSF. Short-legged and with a limited payload, it would not appear to be ideally suited to the scenario we envision here.

For his insights regarding historical and contemporary experience with aircraft and UAV costs, I thank my colleague Thomas Hamilton.

southeastern coast. Thus, bases in India or Kazakhstan are likely to be of little use, for fighters at least. The southern Ryukyus and northern Luzon in the Philippines are really the only places where fighters could usefully be based.

Second, the old military adage that “tracers work both ways” also applies here. Any base close enough to the Strait to enable fighters to operate efficiently is also close enough to China to be at risk from PLA missiles. It takes only a few dozen reasonably accurate ballistic missiles with submunition warheads to ravage even a fairly large, unhardened air base; in a race between a USAF seeking suitable new bases and Chinese missile production, the outcome seems foreordained. Only a hardened and defended base—something that the USAF has not yet managed to construct even at Kadena—would seem to offer significant operational advantages.¹⁰²

Conclusions

Growing Chinese capabilities and Beijing’s refusal to forswear violence as a means for resolving its dispute with Taiwan poses an important challenge for U.S. strategy and planning. Air power, both land- and sea-based, will be central to any U.S. military response to a Chinese attack across the Strait. The PLA recognizes this, and is inventing heavily to field a range of weapons that will over time pose increasingly worrisome threats to American forces and bases in a Taiwan contingency. As these develop, the USAF and USN will need to exploit the synergies offered by their forces to ensure that the necessary joint capabilities and concepts are in place to enable effective operations. Leveraging Naval TMD capabilities to protect USAF bases and employing USAF C⁴ISR and long-range bombers to help defend Naval surface forces and conduct maritime strike are two examples of the kind of innovative doctrinal and operational thinking that will be needed to enhance deterrence and, if necessary, successfully prosecute a war in the Taiwan Strait.

¹⁰² The political advantages should also not be overestimated. It seems doubtful that a China willing to confront Taiwan, the United States, and Japan would be deterred or deflected from a violent course by the likelihood that it would also have to take on the Philippines.

Defending Taiwan Without Manned Aircraft

By Martin Libicki

The current U.S. reliance on air power to defeat conventional adversaries may not work in a no-warning Taiwan Strait scenario. Both carrier- and land-based aircraft need survivable runways to work from. Aircraft carriers, large non-stealthy ships with very unique visual signatures, are becoming easier to find and hit. Fixed air bases have become straightforward to target. China's missiles are becoming good enough to disrupt operations or to take them out of commission altogether. Moreover, with repeated missile strikes, China can keep manned aircraft degraded or out of commission for an extended period of time.

The United States can find another way to keep the Chinese from physically taking (as distinct from coercing) Taiwan. China's strategy, after softening Taiwan's defenses, would require landing enough soldiers and equipment on the island (primarily by sea) and counting on them to overwhelm Taiwan's remaining defenses. The Taiwan/U.S. counterstrategy would be to destroy such forces either in transit, on arrival, or on the island. It is no great exaggeration to abstract a successful campaign into a simple contest:

- China attempts to run the gauntlet of the Strait with sea and air assets to land forces and logistical supplies on the island, as well as deliver ordnance in support of land forces.
- The United States and Taiwan try to destroy those forces or turn them back.

The United States thus focuses on finding and killing China's assets—or on operations that support such activity—on the theory that success at doing so will be the single greatest contributor to carrying

out the military mission. Other elements of war, in particular those that require land forces, are more appropriate for Taiwanese forces.

An invasion requires naval and air lift. The former suffer the longer exposure—a minimum of 3 hours transit time (and perhaps closer to 10), plus the additional burden, once the war starts, of keeping afloat while in harbor, especially while loading and unloading. Airlift will be exposed for 30 minutes while taking off and landing, plus transit time. If China can achieve tactical surprise, the first wave across the Straits has the advantage that it is unlikely to be targeted until it is underway, and Taiwan or the United States concludes that it is an invasion fleet.

If the United States cannot depend on runways within range of the theater, then it cannot depend on the aircraft. Operations will have to depend on more survivable assets. These include submarines (together with their sensors, weapons, and mines), satellites, very-long-range bombers, and unmanned aerial vehicles (UAVs).

UAVs are likely to be key to preventing a Chinese invasion. Engaging enemy platforms requires four conditions: finding targets, tracking them, communicating information about them, and engaging them. The U.S. submarine force alone is unlikely to be able to engage more than a small part of the entire invasion fleet. There are simply too few submarines in the present and programmed fleet. In the opening days of the war, they are unlikely to number more than five in theater. Their sensor capabilities are unsuited for wide-area scanning and geopositioning. Satellites can see but not loiter. Proposals to field enough Synthetic Aperture Radar-capable satellites to provide 15-minute revisit times may help, but having them track and characterize large numbers of moving objects still presents quite a challenge. They cannot “paint” a target (provide missiles radio frequency [RF] reflections to home on), and they do not shoot. In theory, B-2s could loiter in the Strait, searching for Chinese assets and attacking them. However, B-2s were not designed for that mission. Worse, they can provide only limited time on station, given the flight times from CONUS and air refueling points. Further, at least some number of the B-2 inventory of twenty would have to be held back to hedge against the kind of nuclear contingencies a conventional war with a nuclear-armed China might create.

Finally, there is no guarantee that the satellite communications required to tie these systems together will be viable. Geosynchronous

satellites, the workhorses of long-range battlefield communications, sit in known positions in the sky. Jamming in-theater uplinks to such satellites is not hard for those with enough RF energy at their disposal nearby—and the Chinese mainland is nearby.

UAVs, by contrast, can play three-and-a-half of the four roles required to break down a Chinese invasion force. They can provide persistent, wide-area sensing over and around Taiwan. With the addition of specialized payloads they can “paint” a target with laser or radar, or, at a minimum, keep continuous watch over a target sufficient to provide its GPS coordinates. UAVs can also be outfitted to form a communications network stretching from the battlefield to land-based nodes on the global fiber-optic grid (two objects flying at 20 kilometers altitude can “see” each other if within a thousand kilometers). Finally, at least one UAV, the Predator, already has the capacity to damage vehicles and thin-hulled ships with Hellfire missiles, which means that they have the heft to carry Sidewinders and other anti-aircraft missiles. Submarines and other stealthy ships carry an arsenal of heavy weapons that could strike targets that UAVs found but could not strike themselves.

If manned aircraft are not available for the scenario, why assume that UAVs are? After all, they have to take off and land, just as manned aircraft do.

The answer has three parts. First, because UAVs are smaller, lighter, and slower than manned aircraft, they will not need the same takeoff and landing infrastructure required for manned aircraft. This gives the military more launch options, not least of which is a slingshot from a naval vessel that is smaller and/or stealthier than an aircraft carrier. Second, because UAVs are not manned and are not meant to carry heavy loads, they are cheaper, which means that one can afford to build and lose more of them. One-way UAVs can be built without worrying about recovery subsystems. A mission that requires a \$500,000 missile and a one-way \$500,000 UAV is no less cost-effective than one that uses a two-way aircraft and a \$1,000,000 missile. Third, some UAVs are, in fact, built for 24-hour missions (durations that are hard on aircraft crews). Such a UAV flying at 500 knots could spend about 12 hours on station, even though based 5,500 kilometers from Taiwan.

The basic operational concept for employing UAVs is as follows. Once the decision is made to engage the Chinese invasion force, the

United States would flow UAVs into the region. The latter would consist of (1) stealthy long-range UAVs (e.g., Global Hawk) maintained at air bases out of Chinese range, and (2) cheaper but still high-endurance UAVs that can be dispersed among smaller airfields closer to the theater or even to Taiwan itself. Over time, these would be complemented by shorter-ranged and even cheaper UAVs launched from stealthy ships, and perhaps very inexpensive short-range UAVs airdropped into Taiwan. Together they would form a sensor net coupled with a communications grid that would specialize (at least initially) on spotting and characterizing Chinese naval assets. With some tweaking they could also be used to spot and get bearings on airlift assets. Targets would either be struck by UAVs themselves, or would be painted and geolocated for strike by long-range missiles.

Several issues need to be addressed to implement this concept.

- *Takeoff and recovery*: U.S. doctrine assumes the existence of manned aircraft runways for UAVs. Experimentation is needed to determine capability for launching (and recovering) UAVs in austere environments including naval environments.
- *Survivability*: China is unlikely to let UAVs operate unmolested. Some of them may survive by being hard to see; others by appearing in such numbers that all of them cannot be engaged at once.
- *Communications*: What are the obstacles that would impede UAVs from communicating as a network: e.g., station-keeping in the face of weather, jamming, power requirements?
- *Spoofing*: The light weight (and expected low cost) of UAVs limits the size of the sensor packages they can carry. Experiments would need to be conducted to explore tradeoffs of range, loiter time, and sensor payload weight. Time is on our side here, as advances in information technologies permit more sensing and computing capability to be incorporated into a given package.

Also, to be fair, success at attriting an invasion force is not the same as sea superiority of the kind that can keep *any* forces from reaching the island. An attrition strategy is necessarily a probabilistic one. Some percentage of the invasion force will get through, though a large share will not. Afterwards resupply becomes an issue. That may be enough to give native forces a fighting chance and Beijing pause. That said, U.S. forces, *with* manned aircraft, cannot promise this, at least for the first week of an invasion.

UAVs can make a high-impact contribution to preventing China from dominating the battlespace around Taiwan. That said, there is still a role for manned aircraft in the air superiority mission. Successful air-to-air engagements require high-quality structural airframes, powerful engines, and, not least, agile and fast responses. The first two make the UAV expensive (and in need of the long runways). The last requires a degree of artificial intelligence that for now rests in long range research and development. Therefore, to the extent that the defense of Taiwan, or deterrence of an attack, depended on keeping China from operating in the airspace over and adjacent to the Strait, Taiwan and the U.S. will have to depend on classical manned fighters.

Detering China through Escalation

By David C. Gompert and Duncan Long

The day must not come when Chinese decisionmakers perceive the likely consequences of taking military action as less bad than the likely consequences of not doing so. Given China's increasing investment in military capabilities designed to counter American power in the Western Pacific, the perceived risk of military failure that U.S. forces currently present to Chinese decisionmakers may be diminishing. A careful examination of America's deterrent options is warranted. Although the most straightforward solution to an undesirable shift in the regional correlation of forces is to apply more U.S. resources to the area, this may not be tenable, given other U.S. defense commitments. The United States should carefully consider whether it can improve its deterrent posture toward China by introducing the probability that China would regret using force even if it succeeded in shifting the local correlation of military forces in its favor. Three escalatory strategies to deter China merit analysis: nuclear escalation, economic escalation, and conventional escalation.

Before taking up the merits of these three strategies, it is useful to reflect on the deterrent value of escalation. One strong argument for examining escalation options is the unmistakable theme in Chinese military thought in favor of confining the duration, scale, and geographic scope of hostilities with the United States.¹⁰³ Recent Chinese writings on military strategy reveal a belief that U.S. forces can be defeated in a quick and limited action against vulnerable "key strike points" (e.g., CVNs) before larger and superior U.S. forces can be brought to bear. The essence of Chinese thought is not to escalate

¹⁰³ For examples, see James C. Mulvenon et al, *Chinese Responses to U.S. Military Transformation and Implications for the Department of Defense* (Santa Monica, CA: RAND Corporation, 2006), 46–59.

but to *de-escalate* hostilities after achieving initial success, such as the submission of Taiwan before U.S. forces can intervene. The Chinese know that the larger and longer the conflict, the poorer the chances of prevailing militarily over their more powerful opponent. Above all, they want to minimize the risk to China itself. Because the United States has not declared an intention to escalate—and may even have created the impression of an aversion to escalation—the Chinese may think that it is possible to win a local battle and avoid a general war. For the United States to eschew escalation in favor of a brief “local war under high-tech conditions”—the term the Chinese have coined—is to conform to China’s expectation and preference. It follows, then, that a U.S. strategy designed to confound these preferences could have a profound deterrent effect on the Chinese, thus avoiding war altogether.

China’s predilection for conducting a quick, limited war thus begs examination of whether some kind of escalation strategy could deter China and ameliorate the growing threat to U.S. forces in the Western Pacific. To be an effective deterrent, such a strategy must be credible. The United States must be capable of putting escalation into practice, and its actions must meet two basic criteria: they must leave America better off relative to China and better off relative to not having escalated. This last criterion is especially important in light of the disparity of interests in the Western Pacific. Any U.S. strategy, no matter how catastrophic the consequences it threatens for China, loses credibility if it demands that America pay too high a price to pursue it.

To establish whether an escalatory strategy can be an effective deterrent, it is necessary to analyze the consequences of putting it in practice. In this paper, the chosen setting for examining U.S. nuclear, economic, and conventional escalation options is an armed conflict between China and the United States involving conventional forces off and along the eastern seaboard of China.¹⁰⁴ We neither predict nor prescribe rivalry or confrontation with China of the sort that could lead to armed conflict. Indeed, the consequences of an escalating conflict with China could be catastrophic for both countries and much of the world. However, there are scenarios, mainly involving Taiwan, plausible and important enough to warrant thinking them through and preparing accordingly.

¹⁰⁴ “Conventional forces” could include information warfare attacks by one or both sides.

Nuclear Escalation

The 9/11 terrorist attacks brought home to Americans the ghastly reality of mass destruction in a way that the Cold-War abstraction of mutual assured destruction never did. That event has stiffened U.S. resolve to prevent the use of weapons of mass destruction (WMD) on U.S. soil. On one level, this resolve finds expression in tough policies toward states seeking nuclear weapons, such as North Korea and Iran, as well as fanatical anti-American terrorist groups, such as al Qaeda, which presumably would use a nuclear weapon if it had one. On another level, though, the determination not to allow large numbers of Americans to die in such a way again may affect public and official attitudes about whether and under what conditions the United States would ever use nuclear weapons first, knowing there would be nuclear retaliation.¹⁰⁵ Consideration of escalation across the nuclear threshold in a conflict with China must start with these new facts of life.

There is another important fact of life: the United States cannot be confident of denying China the option of detonating at least a few nuclear weapons on U.S. territory, if China is determined to have this option. Why is this so? After all, the U.S. strategic nuclear arsenal is and will likely remain vastly larger than China's, with 1000s versus 100 or fewer deliverable weapons.¹⁰⁶ China's long-range delivery systems—twenty or so intercontinental ballistic missiles (ICBMs) and a single nuclear-powered ballistic missile submarine (SSBN) carrying another dozen missiles—are currently highly vulnerable to a U.S. nuclear (counter-force) attack, especially if the whereabouts of the SSBN is known. Moreover, an ambitious (e.g., multi-tier) U.S. ballistic missile defense (BMD) system—assuming one is deployed—could

¹⁰⁵ The United States has not given up its prerogative to use nuclear weapons first against a nuclear weapon state or ally of a nuclear weapon state.

¹⁰⁶ “China's current nuclear weapons arsenal totals about 400 devices, 300 of which consist of warheads and gravity bombs for use on its “strategic ‘triad’ of land-based ballistic missiles, bomber and attack aircraft, and SSBN.” David Gompert et al. *China on the Move: A Franco-American Analysis of Emerging Chinese Strategic Policies and Their Consequences for Transatlantic Relations* (Santa Monica, CA: RAND, 2005) 41.

intercept most or all of the few Chinese missiles that are not destroyed on their launchers.¹⁰⁷

However, it is well within the technological and economic means of China to expand and improve its retaliatory force to the point that the combination of a U.S. counter-force first strike and BMD would not prevent at least a few weapons from penetrating and causing enormous death and destruction within the United States.¹⁰⁸ It is important for American strategists to remember that China has placed a relatively low priority on its long-range strategic-nuclear offensive capabilities, which could and likely would change if the United States were to declare a *nuclear* escalation strategy. Even while modernizing its conventional forces, China can afford to build a strategic nuclear force of substantially greater size, readiness, reliability, and survivability than its current one. Already, the Chinese regard the survivability of their nuclear delivery systems as their highest priority in modernizing their strategic nuclear force, implying a commitment to a credible, second-strike capability. In addition, the Chinese could develop relatively cheap counter-measures and decoys to complicate U.S. missile defense. Attainment of what the Chinese call “credible minimal deterrence” of U.S. nuclear use would seem to be achievable, inevitable, and sustainable for China, despite clear and continued U.S. strategic-offensive superiority and deployment of BMD.¹⁰⁹

Any U.S. threat of nuclear escalation is, thus, of dubious credibility. To execute such a threat, the United States would have to be prepared to launch a massive nuclear first strike against China *and* quite possibly suffer a smaller but still devastating Chinese nuclear retaliatory strike on the U.S. homeland. The former would cause incalculable harm to China, its population, its stability, and its economy, not to mention long-term damage to America’s moral and political standing. The latter could visit as much destruction on the United States in a day as, say,

¹⁰⁷ Such performance is beyond the capacity of the existing U.S. missile defense program of record, but not necessarily beyond one that combined boost-phase, mid-course, and terminal interceptors integrated with land- and space-based sensors.

¹⁰⁸ China could be expected to follow a “counter-value” retaliatory strategy, aimed at maximizing damage.

¹⁰⁹ Mulvenon et al, 98–99.

the American Civil War did in four years.¹¹⁰ In effect, China can, if determined to do so, confront the United States with a decision of whether to lose Los Angeles *and* destroy Beijing to save Taipei. A U.S. threat to resort to nuclear weapons if Taipei's loss appeared certain, knowing that tens of millions of Chinese and millions of Americans could be killed if it carried out that threat, exceeds the bounds of credibility. For the United States to fail to prevent the conquest of democratic Taiwan by undemocratic China would be a terrible blow to U.S. interests, values, credibility, and prestige. But few Americans would view it as worse than, say, a hundred "9/11s." Indeed, few would deem it bad enough to justify a massive nuclear attack on China, quite apart from Chinese retaliation. A U.S. nuclear escalation strategy against China, then, would leave America better off than China, even if China retaliated, but worse off for having escalated.

This does not mean that the United States should make a point of relieving Chinese fears that an attack on Taiwan and on U.S. intervening forces could somehow lead to nuclear war, with consequences for China that would vastly outweigh any possible gains. Nor is it certain that China would expand its nuclear retaliatory capabilities in response to an explicit U.S. nuclear escalation strategy. However, to *rely* on nuclear escalation would require U.S. planners and leaders either to bet that China would not respond as described above or to be prepared for an arms race in which China multiplies missiles and nuclear warheads, which are relatively cheap, while the United States ploughs more and more resources into more and better missile defense, which is very expensive. Moreover, to rely on a nuclear escalation strategy is to rely on a future U.S. president to make an improbable decision: starting a nuclear war with a nuclear power over a non-vital interest.

Economic Warfare

The importance of economic growth to China and the dependence of China on the world economy and on the American economy to sustain that growth suggest that China could be deterred if the United States threatened to escalate any local military conflict by attacking China's economy. At the same time, the credibility of such a deterrent threat is

¹¹⁰ Civil War casualties were nearly two hundred thousand killed outright, over half-a-million dead from all causes, and another half-a-million wounded.

in doubt; the importance of China to the world economy and to the American economy means that attacking China's economic health could be costly to the attacker and third parties, especially but not only if China responds in kind with economic attacks.

It is difficult to analyze economic escalation as a separate strategic option. The massive trade, investment, and financial flows involving China and the United States, described below, would not in any case be unaffected by a severe crisis, much less a shooting war, between the countries. Markets do not like turmoil or violence, and Sino-American war would inevitably do economic damage. Moreover, domestic politics can turn hostile toward business interests and transactions that smack of "trading with the enemy." However, the depth, duration, and effects could be much more severe if Washington systematically targeted economic values of China (or vice versa, of course). In any case, any utility of economic warfare as a deterrent or path of escalation would depend on whether it was a chosen strategy as opposed to a mere byproduct of war.

The material, psychological, and strategic effects of economic escalation strategies have not gotten the thorough analysis that nuclear theory received during the Cold War. Because the Soviet Union was neither dependent on nor important to the world or American economy, there was not a vast difference between economic warfare and the low level of "business as usual." The situation with China, of course, is radically different. Debate on economic warfare with China has not progressed beyond two rather simplistic and paradoxical propositions:

- First, that China's integration into the world economy will moderate its external behavior, even as it will promote liberty and reform internally. China's economic dependence may even be used to constrain and manipulate its conduct.
- Second, that U.S. investment in and importation from China will engender accommodation in U.S. policy toward China. This affords China some protection against U.S. attempts to constrain and manipulate its conduct.

There is truth in both propositions; economic interdependence is one of many reasons the two countries have to try to avoid confrontation and conflict. Indeed, the urge to cooperate is evident, though not absolute, in the policies and conduct of both sides. Yet, this relationship

of mutual dependence and caution could, in theory, be exploited by one side or the other in search of advantage in a crisis. After all, the danger of nuclear holocaust induced both the United States and the Soviet Union to be cautious, yet each followed strategies, on and off, to exploit the other's caution. Whether the United States could turn economic interdependence with China to its advantage to affect the outcome of a war—thus, as a strategy to deter war—depends on the scale and asymmetries in that interdependence, the tolerance of each population for hardship, and the sensitivity of national leaders to public feelings.

Let's start with some numbers. The data used here are purposely and liberally rounded off, since actual figures fluctuate from year-to-year, and rough magnitudes are what matter.¹¹¹

- China's GDP is about \$2.5T (five percent of the world economy) and growing at about 10 percent annually.¹¹²
- The U.S. GDP is about \$13T (30 percent of the world economy) and grows at about three percent annually.¹¹³
- The value of annual growth (in \$) of China's economy is roughly half that of the U.S. economy.
- China's exports to the United States are about \$280B/year, which represent 13 percent of U.S. imports and 20 percent of Chinese exports.¹¹⁴
- China's imports from the United States are about \$55B/year, which represent four percent of U.S. exports and eight percent of Chinese imports.¹¹⁵

¹¹¹ It should be further noted that Chinese and U.S. economic figures often differ. See Michael F. Martin, "What's the Difference—Comparing U.S. and Chinese Trade Data," *Congressional Research Service*, 10 April 2007. The sources of the numbers used are noted below.

¹¹² Figures are based on 2006 estimates. *IMF World Economic Outlook Database*, September 2006. Available at <<http://www.imf.org/external/pubs/ft/weo/2006/02/data/index.aspx>>.

¹¹³ Ibid.

¹¹⁴ Figures are from 2006. *Trade in Goods (Imports, Exports and Trade Balance) With China*, U.S. Census Bureau, Foreign Trade Statistics. Available at <<http://www.census.gov/foreign-trade/balance/c5700.html#2007>>; and *U.S. Trade in Goods and Services*, U.S. Census Bureau, Foreign Trade Statistics. Available at <<http://www.census.gov/foreign-trade/statistics/historical/gands.pdf>>.

¹¹⁵ Ibid.

- Chinese annual investment flow into the United States is on the order of \$150B,¹¹⁶ nearly all of it for portfolio investment.¹¹⁷ As of 2005, China held about \$530B in U.S. securities, including U.S. Treasury debt, agency debt, corporate debt, and a small amount of equity.¹¹⁸ As of January 2007, China held \$350B in Treasury securities, or 15 percent of all outstanding U.S. Treasury debt held by foreign countries¹¹⁹ and seven percent of all such debt held by the public.¹²⁰ Very roughly, China receives \$30B from the U.S. Treasury annually in interest payments and debt retirement payments.¹²¹
- U.S. annual investment flow into China is on the order of \$5B, nearly all of it direct investment in production.¹²² The total U.S. direct investment position in China is around \$17B.¹²³

¹¹⁶ Based on 2004 to 2005 change in estimated Chinese holdings of U.S. securities of all types. *Survey of Foreign Holdings of U.S. Securities, 1974–2005*. U.S. Department of Treasury, Treasury International Capital System. Available at <<http://www.ustreas.gov/tic/shlhistdat.html>>.

¹¹⁷ China's total FDI position in the United States in 2005 was only \$400M. Jennifer Koncz and Daniel Yorganson, *Direct Investment Positions for 2005*, U.S. Department of Commerce Bureau of Economic Analysis, July 2006, 35. Available at <https://www.bea.gov/scb/pdf/2006/07July/0706_DIP_WEB.pdf>.

¹¹⁸ *Survey of Foreign Holdings of U.S. Securities*.

¹¹⁹ *Major Foreign Holders of U.S. Treasury Securities*. U.S. Department of Treasury, Treasury International Capital System. Available at <<http://www.ustreas.gov/tic/mfh.txt>>.

¹²⁰ *The Debt to the Penny and Who Holds It*, U.S. Department of Treasury, TreasuryDirect. Available at <<http://www.treasurydirect.gov/NP/BPDLogin?application=np>>.

¹²¹ This figure is based on the assumption that China receives the same share of interest payments and debt retirement payments as it holds Treasury securities—seven percent. Based on FY2006 figures, the U.S. Treasury pays about \$410B in interest a year, and retires about \$35B in debt. Annual interest expense figure from *Interest Expense and Average Interest Rate Graph*, U.S. Department of Treasury, TreasuryDirect. Available at <http://www.treasurydirect.gov/govt/charts/charts_expense.htm>. Debt retirement figure from *Debt Position and Activity Report*, September 30, 2006. U.S. Department of Treasury, TreasuryDirect. Available at <http://www.treasurydirect.gov/govt/reports/pd/pd_debtposactrpt_0609.pdf>.

¹²² This figure is based on \$3.1B in documented foreign direct investment flow from the United States to China in 2005 and \$9B in FDI from the Virgin

Of these facts and figures, the most salient for our purposes are the scale of China's (a) annual exports to the United States and (b) cumulative investment in U.S. financial securities. Americans consume Chinese products, while Chinese accumulate American holdings in huge numbers. These two phenomena are related, in that China's bulging investment in the United States finances America's equally bulging trade deficit with China. While the Chinese economy depends heavily on American consumers, the American economy depends heavily on Chinese (official) investors.

Also significant for our purposes is that the U.S. and Chinese economies are not merely interdependent but deeply integrated, in the sense that a great deal of China's manufacturing is done by U.S. companies (largely for re-export), and a great deal of U.S. assets are held by Chinese banks. Because the two economies overlap, what affects each, including economic warfare, unavoidably affects the other.

For our purposes, Sino-American trade and investment can be viewed as several streams of payments from one country (or entities of that country) to the other (or its entities):

- Payments for imports
- Repatriated profits
- Interest payments
- New investment flows

In a given year, China might receive, say, \$300B from the United States via these streams, and the United States might receive two-thirds that amount from China. The former is about 15 percent of the Chinese economy; the latter about one percent of the U.S. economy.

Islands to China in the same year. It is reasonable to presume that substantial additional investment flows to China from U.S. firms registered offshore. The Virgin Islands, for instance, provided \$9B in FDI to China in 2005. Thomas Lum and Dick Nanto, *China's Trade with the United States and the World*, CRS Report for Congress, 4 January 2007, 39.

¹²³ Jennifer Koncz and Daniel Yorganson, *Direct Investment Positions for 2005*, U.S. Department of Commerce, Bureau of Economic Analysis, July 2006, 33. Available at

<http://www.bea.gov/scb/pdf/2006/07July/0706_DIP_WEB.pdf>.

It is not our purpose to get into the intricacies of Sino-American economic accounting or the mechanics of possible Sino-American economic warfare. A simplified, indicative way to think about an economic escalation strategy is to imagine the United States cutting off all payments going to China in the event of Chinese use of force (e.g., against Taiwan and/or U.S. forces). This is tantamount to discontinuing imports from China, investment to China, and returns on Chinese investments in the United States.¹²⁴ It is reasonable to assume that China would reciprocate. In such an event, there would be several sorts of macroeconomic effects:

- Direct losses China would suffer
- Direct losses the United States would suffer
- U.S. losses resulting from its stake in China's economic health
- Chinese losses resulting from its stake in U.S. economic health
- Effects of third-party reactions on the United States
- Effects of third-party reactions on China

Direct losses can be derived from the flow of payments. On the surface, it appears that Chinese direct losses would be appreciably larger than those of the United States—half again as large in absolute terms and 15 times as large as a fraction of GDP.¹²⁵ Of course, not all payments have equal significance. For example, if China suddenly lost \$280B in revenue (annualized) from exports to the United States, it could also avoid some of the costs associated with the production of that \$280B worth of goods, or it could sell some of them (presumably at lower prices) in other overseas markets, depending on the behavior of third parties (see below). So the real economic loss would be less than \$280B.

Similarly, if China discontinued buying U.S. Treasury bonds, other buyers, domestic or foreign, could be found. The real concern, though, is what would happen to U.S. interest rates if Chinese demand for U.S. bonds were to vanish. Independent estimates indicate that U.S. interest

¹²⁴ Note that it is often unclear who owns U.S. debt; it would be difficult to cut off interest payments on U.S. Treasury securities and agency securities to China in a targeted fashion, much less payments on corporate debt. For the sake of broad analysis, though, we presume that these steps are possible.

¹²⁵ Of course, as in all fair economic dealings, both parties gain from all Sino-American transactions and therefore may lose if these transactions are terminated.

rates would rise by 200 basis points if China cut its rate of accumulation of U.S. financial holdings in half.¹²⁶ In that event, the value of the dollar would fall, and a recession could ensue. Equity values would decline because companies would be forced both to compete for capital with rising bond yields and to pay higher interest on debt. Factors that have buoyed the U.S. economy in recent years—the strong housing market and steady consumer spending—would be vulnerable. Higher mortgage costs would cause housing prices to fall; household consumption would decline as mortgages, home-equity lines of credit, and credit-card usage all became more expensive. Through it all, the U.S. government would be hard-pressed to stave off the crisis—the large deficits would constrain fiscal stimulus, and the Federal Reserve could not finance recovery in the face of rising interest rates without risking inflation.

The consequences of Sino-American economic warfare are complicated by the fact that companies and banks from each country are heavily invested in the other. About half of Chinese exports are from foreign-invested enterprises (FIEs) operating in China, of which some share (perhaps ten percent) are U.S.-invested.¹²⁷ Therefore, some share of the economic loss from a cutoff of U.S. imports from China would fall on the profit line of U.S. firms (which could not repatriate those profits anyway, in our scenario). By the same token, if U.S. interest rates had to be raised to attract investors to offset the loss of new Chinese financial investment, this would penalize China by depressing the value of its existing \$530B in U.S. financial assets. These secondary effects do not alter the overall picture: significant losses for both sides; larger absolute losses for China than for the United States; and much larger Chinese than American losses as a percent of GDP.¹²⁸

The content of Sino-American trade is important in consideration of economic warfare. The popular belief that Americans get only cheap

¹²⁶ Daniel Gross, “The Perfect Storm that Could Drown the Economy,” *The New York Times*, 8 May 2005.

¹²⁷ Matt Nesvisky, *Will Super-High Chinese Growth Continue?* National Bureau of Economic Research, November 2006. Available at <<http://www.nber.org/digest/nov06/w12249.html>>.

¹²⁸ We are not suggesting that GDP would actually fall by this amount. We are simply using it as a point of reference.

clothes and gadgets from China is way off the mark. U.S. imports from China range from consumer goods to machinery to electronics and information systems. Although China provides nothing that the United States could not get elsewhere, Chinese products are indeed inexpensive and feed important sectors of the U.S. economy, including retail and IT. Sudden interruption of these supplies—again, 13 percent of all U.S. imports—would be extremely disruptive.

About half of all U.S. exports to China are capital and infrastructural equipment (e.g., machinery and power-generation systems), which are important to modernizing the country, expanding its productive capacity, and employing the large influx of laborers entering the economy from the countryside. Very roughly speaking, U.S. exports to China, while smaller, matter as much to China as Chinese exports to the United States matter to the United States. Whether China could buy from other sources the vital production and infrastructure equipment it has been importing from the United States depends on the behavior of U.S. competitors. It would be a mistake for China to assume that any countries would conduct business as usual with China in the middle of a war with the United States begun by a Chinese attack on Taiwan and/or U.S. forces.

Third-party reactions could be very important both for the United States and China. For instance, denying the Chinese their interest on U.S. Treasury bonds or payment for selling those bonds could spook all foreign investors. The Chinese could exacerbate this problem by placing their U.S. financial securities on the market. At the very time the U.S. Treasury would need more bond buyers to make up for the loss of Chinese investment of as much as \$150 billion per year, it might find itself with fewer. It is one thing to expect friends of the United States not to buy from or sell to China in the event of U.S. economic action, and it is quite another to expect them to lend money to the United States to make up for lost Chinese financing. More likely, third parties would reduce existing U.S. holdings if they expected interest rates to rise and the dollar to fall. Further, the blows sustained by the U.S. economy could spark a crisis in the world economy, of which the U.S. economy is the locomotive. A fall-off in global economic growth and demand would deepen the impact on America.

It is said that capital is cowardly: it becomes more costly to attract when perceptions of risk rise. The act of freezing Chinese financial

investment could send a chill through the very financial markets the United States would count on to make up the difference from lost Chinese capital, possibly requiring it to raise interest rates even more to finance federal spending. Raising interest rates above levels indicated by normal monetary conditions and policy would dampen the economy, while also increasing future U.S. interest payments to creditors. Thus, tampering with Chinese financial holdings in and returns from the United States would have significant and lasting ramifications.

At the same time, Chinese suspension of repatriation of U.S. profits could weaken third-party enthusiasm for direct investment in China, on top of possibly suspending investment in support of the United States. Combined with the loss of new U.S. investment in China, this could deprive China of capital needed to sustain strong economic growth, which has been based heavily on foreign direct investment. Perhaps third parties would instead swoop into the Chinese market to increase both exports and holdings at the expense of their U.S. competitors, but that is unlikely. The third parties with the capital and products that China needs are mainly Japan, Taiwan, and the European Union—all American allies of one or another ilk. Bearing in mind that the context is one of Sino-American conflict, the most plausible scenario is that they would at least be cautious in the face of huge uncertainties and at most would align themselves with U.S. policy in response to China's resort to force. On the whole, third-party reactions and other indirect effects are as likely to increase as to offset the costs of economic warfare to both countries, though more punishingly to China than to the United States.

Overall, China would suffer more than the United States in the event of reciprocal cutoff of payments. Indicatively, China's loss might be on the order of its annual economic growth, whereas loss to the United States might constitute a significant fraction of its lower economic growth—say, ten percent of GDP compared to, say, one percent of GDP.¹²⁹ Economic escalation would leave China worse off than the United States. At the same time, the U.S. economy could receive a strong shock.

Whether or not the defense of Taiwan would justify such a cost to the United States depends on one's view—ultimately subjective—of

¹²⁹ This assumes a one-year interruption. Briefer interruptions would presumably have less effect but would still be a major shock.

the importance of defending Taiwan. Like China, the United States depends on growth to support a growing population; to create individual opportunity; to deal with major post-industrial challenges, from public education to urban renewal; to cover the costs of baby boomer health and retirement care; and to reduce the budget deficit. Unlike China, the United States has huge global security interests, responsibilities, and liabilities. A step reduction of U.S. economic growth from, say, three percent to two percent is a big drop with big implications. Though there is no common metric that permits weighing economic and societal interests against the adverse consequences of failing to counter flagrant Chinese military action, it is at least arguable that the United States could end up worse off for having depended on a strategy of economic escalation, especially since it is unclear that economic war with China would actually prevent the loss of Taiwan. This undermines the importance of deterrent value to a strategy of escalation.

There is a further flaw in using economic escalation as a deterrent. In seeking to deter China by threatening economic warfare, the United States would necessarily reveal which economic weapons it felt yielded it an advantage. China would naturally seek to blunt these weapons prior to hostilities. It could, for instance, reduce its holdings of U.S. Treasury bonds and invest instead in assets that could not be used against it. A U.S. declaration that its debt commitments were conditional on geopolitical considerations would also have chilling effect on the market at large. The United States would bear pain in the near term for adopting a strategy that would become steadily less effective.

Apart from general economic war as an escalation strategy, the United States might attempt a more discriminating campaign—in effect, a “precision strike” against China’s economy. Two options come to mind: information warfare (IW) attacks on Chinese computer systems and networks, and interruption of sea-borne oil imports. Both these subjects deserve greater consideration than can be afforded them here. For the former, suffice it to say that the Chinese regard IW attacks as an attractive option for a weaker military fighting a stronger one, a

fact that militates against IW as U.S. escalation strategy.¹³⁰ Clearly, though, the United States must be *prepared* for intensive, extensive, and two-way IW against both military and economic targets in any Sino-American conflict. As for the latter, China has a growing requirement for imported oil, mostly transported by sea, and there is little doubt that the U.S. Navy can pinch off much or all of that flow. But the more difficult issues are whether the deprivation would have a major effect on China in a conflict, how China would react, and what the effect would be on world oil flows, markets, and economics. For now, let's just say that neither an IW campaign or the interdiction of Chinese oil imports alter the general conclusion that economic escalation warfare is not an attractive deterrent, at least not one on which the United States would want to rely.

If we have failed to identify all the ramifications of economic warfare between the world's largest, strongest mature economy and its largest, strongest emerging economy, we have probably failed on the side of underestimating the harm. Overall, this excursion into the realm of economic escalation as a way of deterring conflict with China leaves us at least as wary as we admittedly were at the beginning.

Conventional Escalation

Nuclear escalation and economic warfare are not the only ways the United States could confront China with the prospect of costs that exceed expected gains of taking military action against U.S. friends (e.g., Taiwan) and forces. If Sino-American hostilities occurred, the Chinese, according to their own statements, will try to limit (a) the scope of combat with U.S. forces to Taiwan and the waters around it; (b) the duration of hostilities to days; and (c) targets for both sides to the forces directly engaged.¹³¹

Indeed, the central premise of Chinese strategy is that it is possible to win a conflict with the United States *only* by making selective "quick and decisive" attacks on critical U.S. forces in hopes of settling the issue at hand (e.g., Taiwan's fate) before the United States can bring its

¹³⁰ First and well documented in Roger C. Molander, Andrew S. Riddile, Peter A. Wilson, *Strategic Information Warfare* (Santa Monica, CA: RAND, 1996). More recently, Mulvenon et al.

¹³¹ Mulvenon et al, 46–59.

full power to bear against Chinese forces or China itself.¹³² U.S. strategy could target that premise. Being warned or shown that U.S. forces will both persist and expand the conflict—even with no hint of nuclear use—could give the Chinese pause, either before or during hostilities. This could furnish the United States with added dissuasion, deterrence, crisis dominance and, failing that, operational advantage.

Even before analyzing the costs and benefits of conventional escalation as a deterrent, it is important to bound the discussion. While the Chinese have a clear interest in keeping a conflict short, the United States also wants to keep some limits on a war. Rational American war aims for a conflict over Taiwan amount to some approximation of the *status quo ante*. War with China would demonstrate that America will not tolerate Chinese use of force to achieve its goals and would blunt the immediate Chinese military threat. It would not entail China's total military defeat or regime change—the resources demanded by such expansive aims (like the use of ground troops on the mainland) are out of balance with U.S. interests in the region, and it is difficult to imagine how such a conflict could come to a favorable stable end state. A conventional escalatory deterrent, then, hinges on a declared U.S. intention to turn back any Chinese aggression, no matter how initially successful it may be. This would include, if necessary, strikes on capabilities on the Chinese mainland that make successful aggression possible.

Apart from deterrence strategy, the United States would likely face operational choices regarding conventional strikes on capabilities on the Chinese mainland in the course of a conflict. In the event of war with the United States, China would rely heavily on air, naval, missile, and air-defense forces based in and deployed from the mainland to gain control of the Straits, delay and disrupt U.S. intervention, and launch air and missile strikes and an amphibious assault on Taiwan. The United States could not treat Chinese territory as a sanctuary without granting the Chinese all the advantages of operating near the homeland, with none of the disadvantages. U.S. exemption of mainland targets could influence the course and outcome of hostilities, as well as the extent of U.S. losses.

¹³² Lu Linzhi. "Preemptive Strikes Are Crucial in Limited High-Tech Wars," *Jiefangjun bao*, 7 February, 1996, quoted in Mulvenon et al, 47.

The further the Chinese get in building air, naval, and missile capabilities to attack U.S. forces, the more dependent U.S. forces become on having the options (i.e., capabilities and authority) to strike such targets. In effect, the Chinese strategy of gaining an edge in a quick, local engagement will naturally push the United States to avoid being confined to such an engagement.

Indeed, even in the absence of a calculated escalation strategy, the U.S. Secretary of Defense and President could well receive requests from U.S. force commanders to target some or all of the following, in ascending order of strategic significance:

- Air-defense radar installations and missile batteries
- Short- and intermediate-range missile launchers
- Air forces and bases
- Amphibious-force staging areas
- Naval bases
- Military command and control facilities
- Reinforcements en route from elsewhere in China
- War reserve stocks
- Telecommunications networks used for command and control
- Forces throughout the country
- Other infrastructure, ports, and industry needed to sustain combat operations

The question here is whether operational exigency can be turned into strategic advantage. The United States could consider the ascent of this ladder not only on its immediate military merits but also as an escalatory strategy aimed at deterring China's leaders from using force or convincing them to stop fighting and back down before the PLA as a whole and China proper are damaged. Put differently, if the Chinese are optimizing for a short local engagement, and the United States plans counter that by preparing for expanded hostilities, it makes sense to *apprise the Chinese of this logical implication of their own strategy*.

Whether the conventional escalation option is, on balance, advisable hinges on how the Chinese would react to it, programmatically and operationally. Surely they already realize that there is some risk of not being able to confine the geography, target classes, and duration of a conflict. Despite this—or, perhaps, because of it—they are building capabilities not only to assault Taiwan but also to attack U.S. forces. The specific capabilities being stressed in their modernization program

(e.g., attack submarines and missiles) suggest that the Chinese believe it may be possible to deliver a quick strike to prevent U.S. forces (e.g., carriers) from saving Taiwan. They have not shown equal commitment to capabilities to protect China itself from U.S. counterattacks. The Chinese thus appear to believe that improved capabilities for quick and limited attacks on U.S. forces might help avert wider war and forestall U.S. counterattacks. Disabusing them of this belief would undermine the logic of their current modernization priorities. Alternatively, it would force them to allocate more resources for the defense of the Chinese mainland. Either way, convincing the Chinese that their current strategy will raise, not reduce, the risks to China itself would shake the foundation of that strategy.

How would a U.S. conventional escalation strategy affect Chinese decisions in actual hostilities? Might the Chinese respond with nuclear weapons to U.S. conventional attacks on China? A Chinese general recently indicated that, despite Beijing's official "no first use" policy, they might.¹³³ Given U.S. nuclear preponderance, if the Chinese respond to escalating conventional attacks with nuclear weapons, they could be lighting a fuse that could lead to devastation of their country, the end of stunning Chinese economic growth, and the end of the regime—with no reunification of Taiwan to show for it. A Chinese threat to resort to nuclear weapons in the event of U.S. conventional attacks on mainland military targets is hardly credible and therefore does not argue against a U.S. conventional escalatory option. The United States should nevertheless avoid targeting the political leadership or China's nuclear arsenal, attacks China could consider to be strategic enough in nature to warrant a nuclear response.

At the same time, the Chinese could and might well escalate with conventional weapons against U.S. bases and forces in Japan, Guam, and elsewhere in the region. While China's air force would likely be decimated or grounded by U.S. air superiority, its growing

¹³³ "If the Americans draw their missiles and position-guided ammunition on to the target zone on China's territory, I think we will have to respond with nuclear weapons," General Zhu Chenghu said at an official briefing. His threat was not that China would use nuclear weapons first if U.S. forces intervened in a crisis or conflict over Taiwan, but rather if U.S. forces attacked mainland China. Alexandra Harney, "Top Chinese General Warns US Over Attack," *The Financial Times*, 14 July 2005. Available at <<http://www.ft.com/cms/s/28cfe55a-f4a7-11d9-9dd1-00000e2511c8.html>>.

intermediate-range ballistic missile (IRBM) force would give it some deep-strike capacity, using conventional warheads. Depending on the level of U.S. conventional escalation against China, the Chinese might not limit conventional missile attacks on Japan to U.S. facilities and forces. Whether this would shake or instead harden Japanese support for the United States in conflict with China is unclear, though the Chinese know Japan better than to bet on the former. Still, the threat to Japan is a credible one. The United States is unlikely to consider using nuclear weapons in response (for reasons already presented) and, thus, may have some difficulty deterring this Chinese response to U.S. conventional escalation. Therefore, the United States should assume that its forces and bases in the region could come under attack in the event that it attacked the mainland. However, the Chinese should be aware that such counter-escalation on their part would ultimately work to the disadvantage of the weaker combatant in the war.

U.S. objectives—de-motivating China’s emerging military strategy, deterring China from contemplating its execution, and dissuading China from menacing Taiwan—all depend on Chinese awareness of the risks they are inviting. It follows that if the United States is in fact prepared to extend the duration and scope of hostilities as necessary to prevail, including conventional strikes on military targets in China, it is essential to make this known to the Chinese. The United States would need to communicate that Chinese aggression—as defined by Americans, not Chinese—would start an escalatory process that would lead ineluctably to Chinese defeat and extensive losses.¹³⁴ This need not be conveyed as a threat so much as an inevitable implication of China’s own strategy of building capabilities for a decisive strike on those U.S. forces that could assist in the defense of Taiwan. The Chinese need to understand that they have embarked on a provocative strategy and thus risk provoking the United States to counter it. This may not convince hard-liners in the Chinese military; but it could and should be taken seriously by their political leaders.

¹³⁴ The Chinese would still have the theoretical option of trying to pressure Taiwan into submission without engaging U.S. forces at all. But the United States could counter that by positioning its forces, particularly its fleet, to make it hard for Chinese forces to avoid. Whether it would do this despite the growing vulnerability of the fleet would be an important U.S. decision, weighing the deterrent benefit of a “trip-wire” against the risk of losses.

U.S. statements would have to be made with the utmost care. Taiwan cannot be allowed to assume that it now has unconditional American support; an emboldened Taipei could precipitate the very conflict a conventional escalation strategy is designed to prevent. It is therefore worth reiterating the U.S. policy that provocation by Taiwan, including moves toward independence, would jeopardize U.S. willingness to help defend the island.

In sum, the threat of conventional escalation should frustrate China's evident strong desire to keep any conflict limited. As importantly, even assuming non-nuclear Chinese retaliation, this strategic option could meet both of the criteria suggested earlier: the United States would end up (a) better off than China and (b) better off, arguably, than if limited, localized hostilities go badly and China achieves its war aims by use of force. Geography and other factors make it hard for China to counter conventional escalation in kind. A Chinese nuclear response would be deterred by the forbidding U.S. nuclear retaliatory threat. At any point in the escalation, there would be more harm that U.S. forces can yet do to Chinese targets than the other way around—a key to crisis dominance and success should deterrence fail.

Comparisons and Conclusions

China has started down a path that could lead it to the brink and beyond. It is committed to unification of Taiwan with the mainland regardless of Taiwanese democratic views; it has said it will use force if all else fails to achieve unification; and its new national defense strategy and military priorities reflect an increasingly sharp focus on making Taiwan feel growing pressure and, if need be, deadly force. Knowing that the United States is prepared to intervene militarily to prevent China from forcing its rule on Taiwan, the Chinese understand that their current policy could lead to hostilities with U.S. forces. This is reflected in the priority the Chinese put on the ability to disrupt, degrade, delay and possibly deter U.S. armed rescue of Taiwan. Because the current U.S. military posture has not dissuaded the Chinese from the course they have chosen, the United States must contemplate an alternative or else be prepared to accommodate China's wishes and compromise its own interests and ideals.

Deterring China with the threat of escalation is one such alternative. China has clearly demonstrated its preference for limiting any conflict in the Western Pacific in time and space, creating a *prima facie* case for

U.S. strategies that deny this aim. Effective escalatory strategies must both cause greater harm to China than to the United States and leave the United States better off executing than not, even with China's likely response.

The former criterion is easily met—the nuclear, economic, and conventional options considered here all pass that test. The latter criterion is more difficult to satisfy. An escalation strategy must be not only feared by China but also be one that the United States would be willing to execute if deterrence failed. If the Chinese sensed that the United States would not escalate in the event—if the deterrent threat was not credible—their fear of the consequences and thus the moderating effect on their policies would be diminished. Only one of the strategies considered here passes this test—escalation of conventional attacks on the Chinese mainland.

In addition to fielding the needed escalatory capabilities, the United States would need to modify its declaratory policy, which presently is not designed to accentuate Chinese fears about escalation to include attacks on the mainland. While strategists like to be vague about contingent options, and diplomats shudder at talk of escalation, it seems better in this case to be sure that the Chinese get the message, namely: *A conflict with the United States will last and could expand until Chinese forces are defeated, in the course of which China itself will not be a sanctuary.* The United States might also want to be sure the Chinese knew that it was not planning a nuclear first strike.

Even seemingly attractive escalation strategies are fraught with dangers: failing to deter; creating bi-lateral tensions; triggering preemption; inducing responses worse than anticipated; and the worst “sin” of all, being left to choose between exposing a bluff and carrying out a disastrous escalation. In the particular case of Sino-American conflict, chances are that the stakes will be greater for the Chinese than for the United States, which can add to the unpredictability of the results of escalation. As already stated, escalation strategies make sense only if there are no effective and affordable non-escalation strategies. The regional military status quo, however, is changing to favor the Chinese. If the United States is unprepared to accept this and unwilling to redress the correlation of forces by reallocating its resources, threatening conventional military escalation could be an effective strategy to deter China in the Western Pacific.

Essay 9

Introducing Complexity into China's Attempt to Hold U.S. Maritime Forces at Risk

By Stuart Johnson

The aircraft carrier is the fulcrum of American maritime power and the key to U.S. power projection in the Western Pacific. Carriers present a multi-pronged and powerful threat to China—they can establish air superiority, strike targets in mainland China, interdict Chinese forces moving on Taiwan, and provide a protective umbrella under which other U.S. and allied maritime elements can operate. This is a difficult challenge for the Chinese to surmount, but it is a clear and simple one. Incremental improvements in U.S. capabilities, which take years to be incorporated in the fleet, can be anticipated and accounted for. Given a relatively static target against which to focus its resources, China's military will eventually solve the problem. Be it through ever greater numbers of anti-ship missiles or diesel submarines, China will find a way to hold America's carriers, and through them the U.S. position in the Western Pacific, at extreme risk. With U.S. forces largely at bay, Beijing could feel confident that any conflict in or around Taiwan could be kept limited in scope and brief in time.

The United States has several options to prevent this erosion of its maritime dominance and ability to operate freely in the Western Pacific. One is to impose complexity upon the Chinese by redesigning U.S. fleet architecture around numerous smaller, networked platforms with modular capabilities. Rather than present the Chinese with a single

and relatively static, albeit difficult, maritime challenge to overcome, such a U.S. fleet architecture can enormously complicate the problem with which the Chinese must cope. It would leave them a much greater number of lower signature ships to track, no clear center of gravity to target, and uncertainty as to the threat with which they are faced. Modular systems would allow the fleet to adapt much more rapidly, both in the strategic sense, by incorporating new technologies in months and years instead of decades, and in the tactical sense, by deploying capabilities as circumstances demanded. These features would impose costs on Chinese planning and procurement by creating uncertainty as to how they should prepare for conflict with the United States, and, in the event of such a conflict, give a clear operational advantage to the U.S. fleet. A new fleet architecture based on numerous smaller, networked ships with modular capabilities can achieve all this while making the U.S. Navy's own planning and operations simpler and more economical.

Causing Complexity

Military operations are typically dynamic, confusing, stressful, and unpredictable. Combatants are presented with very complex problems to understand and solve. Even with advanced information networks, the command and control of forces still comes down to people choosing which enemy units to engage, which of one's own units to use, when to advance or retreat, and so on. Because the quality of human problem-solving tends to decline steeply as the complexity of the problem increases, military strategy, capabilities, and tactics are often aimed at complicating the enemy's operational problems and decisionmaking. In developing and using U.S. naval forces, the ability to complicate warfare for the Chinese and other potential adversaries is an important quality.

In maritime operations, qualities of forces that can complicate the decisionmaking and operational problems facing an adversary include:

- Large numbers of platforms that the enemy must target
- Large variety in the forces with which the enemy must contend
- Fast platforms
- Low signature platforms
- Different combinations of forces, quickly organized
- Distribution of forces across large areas for the enemy to search, control, or avoid

- Uncertainty as to the mission and capabilities of a given platform
- The ability of dispersed and diverse units to collaborate

Without necessarily having superior firepower, weapon accuracy, sensor quality, or training, forces that possess the aforementioned complicating qualities can make warfare more perplexing than otherwise for Chinese decisionmakers and intelligence systems. Possible consequences include slowing their decision speed; delaying the positioning or use of suitable forces once decisions are made; making it more difficult for Chinese forces to elude detection; taxing their surveillance, tracking, targeting and weapons allocation; isolating over-matched enemy units; producing command and control confusion or overload; and shifting the balance of opportunities to China's disadvantage. Such operational effects can decide battles and wars. Moreover, faced with such an operational environment, China's leaders are far less likely to conclude that they can execute an operation in or around its littoral while containing the ability of the U.S. fleet to engage.

Of course, the factors that produce these effects—numbers, speed, variety, distribution, collaboration—must be developed in the architecture and capabilities of a fleet. Architectures and forces that are designed to exploit network principles are, all else being equal, superior at creating these effects and thus complicating the operations of the Chinese or other potential adversaries.

The process of designing and building the right fleet, and then adapting it as conditions change, can also be very complex—i.e., dynamic, unpredictable, multi-dimensional, expensive. This is especially so when responding to or anticipating the force development of adversaries, which may be equally complex. Of course, the pace and dynamics of developing capabilities are much slower than those of operating them: years and decades instead of days and weeks. While this may provide the Chinese time to observe and analyze what capabilities are being built, it can also preclude swift adjustment if their observations or analyses are wrong or tardy. Just as it takes years to plan, develop, build and field a given ship, weapon, or sensor, it can take years to realize mistakes and decades to recover from them.

Consequently, fleet-development strategies that confuse, divert, impede, or tax the Chinese in developing their forces can provide

decisive operational advantages when hostilities occur. Better yet, such strategies may dissuade the Chinese from policies that might lead to confrontation, assuming the Chinese realize that the capabilities they have built may be inadequate. Even if hostilities do not occur, the economic losses could alter the terms of the military competition between the United States and China. In order to recover, China may have to write off, redirect and/or increase investment.

There are a number of ways to complicate Chinese force-development, among them:

- Concealment, deception, and ambiguity.
- Producing new capabilities quickly.
- Expanding existing forces quickly.
- Significantly altering capabilities quickly without having to build anew.
- Producing capabilities that have multiple applications, the priorities among which can be quickly shifted.
- Producing capabilities that are very costly to counter.

Of course, such techniques only make sense when they are consistent with sound and economical efforts to produce effective forces. Better to achieve the desired effects by natural than by artificial design or deception that impairs the development of ones own capabilities. Thus, a fleet architecture that facilitates fast production of a large number of platforms and systems, that opens up and preserves a variety of ways to package capabilities, that shifts in emphasis in light of changing missions, and that cultivates ambiguity regarding future capabilities can complicate and compromise China's force development.

Suffering Complexity to Cause Complexity

Minimizing complexity for the United States is as important as causing it for the Chinese, whether in conducting operations or in developing capabilities. Often, however, the attempt to create complex problems for an adversary has involved comparably complex undertakings. Here are some examples from recent U.S. military experience:

- Anti-submarine warfare (ASW) aims to confound and neutralize submarines by detecting, tracking and attacking them with a variety of sensors, platforms and weapons. But ASW involves

- mastering complex acoustics, underwater weapons physics, and coordination of many systems to achieve even modest success.
- The U.S. nuclear-powered ballistic-missile submarine program is meant to present the enemy with insurmountable strategic problems. But it involves exceedingly demanding propulsion, navigation and weapons science and engineering.
 - Ballistic-missile defense (BMD) can reduce an enemy's confidence of being able to strike ones forces or territory. However, even the United States can achieve only minimal success at this after decades of effort and billions of dollars spent.
 - U.S. and other militaries are now investing in the technologies and operating concepts of integrated, net-centric warfare in order to improve their ability to wage joint expedition warfare. Developing the information systems and networks is a challenge, but relatively simple compared to the complexities of transforming organizations and command-and-control architectures.
 - Because counter-terrorism involves the integration of law enforcement, military operations, border security, aviation security, maritime security, international collaboration and myriad other undertakings, it is if anything more complex to the protagonists than to the antagonists.

In every case, the price for imposing complexity on an adversary has been the requirement to manage and support complexity, with all its costs, risks, and challenges. While all these cases may have been justified, or unavoidable, none provided particularly good economic leverage, in cost, time or management effort.

The U.S. naval fleet can be thought of as a complex way of presenting adversaries with operational and force-development complexity. There are 7 different basic types of ships, as well as significant variations among classes within several of the types. Each type has at least one hull; some have more than one. Because each vessel of each type is expected to carry out multiple missions, it must contain multiple systems. Indeed, it is more accurate to think of a ship of the current and planned U.S. fleet not as a singularity but as a collection of multiple integrated systems and some common support (e.g., hull, propulsion, and overhead). The crews partly provide common support and partly operate the separate systems. Each vessel is very complex, as is the fleet as a whole.

The fact that a multi-purpose ship is really a bundle of separate systems tends to make each ship costly and technically risky to build, man, operate and maintain. Consequently, with funding for ship-building constrained and the cost of units going up, the fleet is both smaller than it need be and smaller than is needed. Yet, for all this complexity, a given unit at a given time and place during an operation may be able to present Chinese forces with only a single problem, be it ASW, BMD, air strike operations, maritime intercept, air defense, or surveillance. Moreover, because it takes so long to build such complex systems, adversaries, and the Chinese in particular, have ample time to observe, analyze and develop forces to counter them. In sum, the current approach provides poor leverage: incurring complexity for the United States without necessarily complicating the adversary's operational or force-development choices.

As was touched on earlier, one of the most significant cases of such complexity is the U.S. large-deck nuclear-powered aircraft carrier (CVN), which has a crucial role in preserving security worldwide and in vital regions, most notably the Persian Gulf and the Western Pacific. To the Chinese, the CVN presents enormous operational and strategic problems, as evidenced by determined Chinese efforts and growing investments to counter it. Yet, because CVNs take so long to build, are kept in the force so long, cannot be readily modified, have more or less known properties, and are too costly to be built in large numbers, the Chinese can concentrate their investment in capabilities that are effective against small numbers of large, "high-value" surface targets—i.e., long-range surveillance, anti-ship missiles and quiet submarines. Indeed, the U.S. CVN presents China with a simple (though not easy) force development problem. As the Chinese deploy very large numbers of ballistic missiles and quiet submarines (both being relatively inexpensive), the United States will face a new strategic complication: CVN vulnerability. More vulnerable U.S. CVNs will simplify operational difficulties for the Chinese and give them greater leverage both in military competition and in an actual contingency. In sum, the U.S. CVN could become a more complex problem for the United States than for China.

Another case involves the nuclear-powered attack submarine (SSN)—highly sophisticated, unmatched in ASW, expensive, and, of necessity, relatively few in number. Against Soviet missile-carrying submarines, U.S. SSNs presented an effective threat. However, against

larger and growing numbers of inexpensive but quiet new non-nuclear submarines spread over wide areas, an area in which China is making a substantial investment, the SSNs may be faced with greater complexity than they themselves present. Efforts by the United States to respond to this quantitatively and geographically expanding threat of simple submarines could result in reversed leverage.

Of course, in the new security environment, challenges and threats are numerous, varied and changing. The U.S. fleet may be called upon to respond to a range of threats in the Western Pacific, from major conflict with China, to a limited conflict with China, to interdiction in support of counter-proliferation and counter-terror efforts, to name only a few. CVNs, SSNs and other platforms may be used for multiple purposes in a wide spectrum of contingencies, adding further diversity to the operational problems they may have to face. The environment also presents a dilemma in developing forces, namely, how to create versatility, which is crucial. Designing individual platforms to be versatile can add to the complexities of building, maintaining, manning, and using them. A fleet architecture should address the problem of diverse, and shifting, requirements without adding to the complexity of developing and using it.

Keeping It Simple

Like complexity, simplicity can be realized both in how capabilities are developed and maintained and in how they are used. Moreover, given that both military forces and military operations are inherently complex, what does it mean to keep them simple?

In an operation, commanders are confronted with many difficult and urgent choices, especially in regard to how to employ their own forces. Having numerous and widely distributed forces with diverse capabilities does not necessarily add to complexity. Indeed, having small numbers of multi-purpose/multi-system ships can complicate a commander's choices insofar as ships cannot be in several places or perform all of their functions at the same time. Having large numbers of single-purpose/single-system ships, capable of being distributed over a wide area, can provide a commander with both more options and fewer, simpler choices. To illustrate with an elementary case, a single complex ship capable of performing ASW, BMD, and land-strike, but only one at a time, offers fewer solutions than a set of simple ships each of which can perform just one of these missions. The former can

address one problem in one place at a time; the latter can address three problems in as many as three places at a time. For the commander, the latter simplifies decisionmaking. Simplicity is also an important quality in force-development. The combination of fewer hull-types and versatility through modular specialization means:

- Fewer investment programs to manage.
- Simpler ships to design, build, maintain and man.
- Greater commonality in technical and industrial capabilities.
- Less bureaucracy to administer these functions.

With the right architecture, a fleet can be highly versatile even though its individual elements are simple. Instead of being multi-system/multi-purpose singularities, ships can be simpler components of larger networked systems. The former is becoming increasingly complex and costly, at both the individual ship and fleet levels. They are also integrated systems, with weapon and sensor packages hardwired to the hull, making them difficult to adapt. A fleet designed to exploit networking, modularity and common hulls can be simpler overall and in its units, thus reducing costs, risks, bureaucracy, and technical and industrial capacity needs. Such a fleet and its units can also be simpler to modify.

In sum, in an operation, simplifying U.S. decisionmaking and solutions can be as beneficial as increasing complexity for the Chinese. Similarly, the more simply and economically the U.S. can complicate and raise the costs of planning, building and maintaining China's forces, the greater the competitive leverage.

A recent study, commissioned by Congress and done by the Department of Defense's Office of Force Transformation (OFT), outlined alternative architectures for a future fleet. The alternative fleet designs matched the projected cost of the programmed fleet. They also mimicked the programmed fleet's operational formations; that is, the alternatives had 12 Carrier Strike Group equivalents, 12 Expeditionary Strike Group equivalents, and 9 Surface Strike Group equivalents. The alternatives were designed to present an adversary with increased complexity through increased numbers of smaller, faster, stealthier platforms networked together for overall combat effectiveness. A brief review of the OFT alternative with the smallest and most numerous ships illustrates a future fleet that captures simplicity in design while presenting an adversary with a highly complex operational challenge.

This fleet architecture (outlined in Tables 1-3 below) makes use of ship concept designs developed at the Naval Postgraduate School and by NAVSEA. Very small aviation support ships (SAVNs) carry a squadron of eight Vertical/Short Take Off and Landing (VSTOL) Joint Strike Fighters, 2 MV-22 (Osprey) helicopters, and 8 unmanned aerial vehicles (UAVs). Eight SAVN ships match the cost and capability of one CVN. The SAVN's displacement is about 13,500 tons. Very small (100 tons displacement) surface combatants, designated VSC-100, provide a fast, low-signature hull that can be fitted out with a combat module tailored to the operational challenge at hand. The sensor and weapons modules with which they could be equipped are listed in Table 4. They are designed to be carried to theater by a support ship (designated SPT) and deployed in flights, much like aircraft from an aircraft carrier.

More surface strike power would come from a large hull weapons ship, designated WPS, outfitted with 360 vertical launch systems as well as USVs and UUVs. This WPS would share a 57,000-ton-displacement hull with the SPT. An amphibious operations support ship (T-AKE) would also make use of this common hull. Four small air independent propulsion (AIP) submarines, designed to be carried to theater by the SPT ship, are substituted for each of the programmed fleet's nuclear attack subs. A ship design already included in the programmed fleet, a fast combat logistics vessel (T-AOE), rounds out the platforms used in the alternative fleet architecture.

This force would have 846 total combatants, compared to 243 combatants in the programmed fleet. It would also have 1,560 unmanned vehicles of various kinds; the programmed fleet currently has none.

Programmed Group (CSG)		Carrier	Strike	Alternative Aviation Strike Group (ASG)		Fleet
Platform Type	12 Formations		Platform Type	12 Formations		
	Number	Vessels in each Formation		Number	Vessels in each Formation	
CVN	1		SAVN	8		
UVs	6		UVs	3 UAV, 3 USV, 18 UUV on X-WPS and 8 UAV on each X-CRS		
Aircraft	60 JSF (CV) and 12 MV-22		Aircraft	64 VSTOL JSF and 16 MV-22		
CGX	3		WPS	1		
LCS	2		VSC-100	24		
SSN	1		SPT	1		
T-AOE	1		AIP	4		
			T-AOE	1		

Table 1. An Alternative Carrier Strike Group.

Programmed Group (ESG)	Expeditionary Strike	Alternative Expeditionary Strike Group (ESG)	Fleet
Platform Type	12 Formations Number Vessels in each Formation	Platform Type	12 Formations Number Vessels in each Formation
LHD, LPD and LSD	1 each	T-AKE or MPF(F)	2
Aircraft	6 VSTOL JSF and 24 MV-22	Aircraft	6 JSF VSTOL (or modified CTOL) JSF, 18 MV-22, and 3 MC-X
CGX	2	WPS	1
DDX	1	UVs	3 UAV, 3 USV, 18 UUV On X-WPS
UVs	9	SPT	1
LCS	3	VSC-100	23
SSN	1		

Table 2. An Alternative Expeditionary Strike Group.

Programmed Surface Strike Group (SSG)		Alternative Surface Strike Group (SSG)	
Platform Type	9 Formations Number Vessels in each Formation	Platform Type	9 Formations Number Vessels in each Formation
CGX	3	WPS	1
		UVs	3 UAV, 3 USV, 18 UUV On X-WPS
		VSC-100	5

Table 3. An Alternative Surface Strike Group.

Capabilities and Modules for the Very Small Surface Combatant (VSC-100)

- ◆ Used in the aviation, expeditionary, and surface strike groups of Alternatives B and C
- ◆ Small, fast, modular surface combatant craft
- ◆ Carried to theater by large support ship (X-SPT)
- ◆ Payload capacity increased as less fuel carried
- ◆ Full Load Displacement: 100 tons
- ◆ Speed: 60 knots; Crew: 3
- ◆ Limited capacity for fixed systems, carries one module at a time
- ◆ Operated as a unit or in flights of two or more craft
- ◆ Modules:
 - ◆ ASW-1: Variable depth sonar
 - ◆ ASW-2: Towed array, torpedoes, fire control system
 - ◆ Strike-1: 6-cell launcher, fire control system
 - ◆ Strike-2: 3 UAVs (for targeting)
 - ◆ Mine Warfare: 1 UUV, acoustic MCM system, mine neutralization system
 - ◆ SOF: 2 rigid-hull inflatable boats
 - ◆ USV: 2 unmanned surface vehicles
 - ◆ SUW-1: 8 Surface-to-surface missiles
 - ◆ SUW-2: Close-In Weapon System
 - ◆ AAW: Launcher, missiles, multifunction radar
 - ◆ UUV: 12 medium UUVs
 - ◆ Sensors: small sensors for acoustic detection
- ◆ Half of a set of modules bought for each VSC-100

Table 4. Modules for the VSC-100.

While it would create complexity for the enemy, a fleet like the proposed force would simplify things for the United States. The three largest ships—the WPS, the T-AKE, and the SPT—make use of the same hull, making construction less complex and less expensive.

Hulls designed with a common interface permit the fleet to be adapted to changing circumstances, tactical or strategic. A change in the environment that demands more of a given capability can be accommodated by plugging the appropriate module into more ships. Moreover, as advances in technology evolve, they can be “spun on” to the module without having to pull the entire ship out of service. The hulls themselves would be quicker and cheaper to build, and could be built by more shipyards, than large, complex multi-mission ships with highly integrated systems.

At the tactical level, ships can be outfitted with the set of modules that the situation requires. Whereas a multi-mission destroyer can perform ASW, BMD or land-strike roles, but only one at a time in one place, three smaller ships with the appropriate modules can perform all of these various roles simultaneously in three different places. This modularity both streamlines shipboard operations, by giving the ship commander one major task, and simplifies things for the battle group commander, who has distinct pieces that he can assemble for a distinct set of challenges.

Economizing in the Creation of Complexity

Whether in operations or in force development, a fleet based on numerous smaller, faster ships with low signatures and modular capabilities increases complexity as viewed by China and other adversaries while making fleet design and construction simpler for the United States. It offers greater numbers, dispersion, area-surveillance, variety, and versatility. This increase in numbers alone would present an adversary like China with greater complexity. At the very least, instead of targeting American airpower by striking a single CVN, China must locate eight SAVNs ships. Rather than one or two Virginia class submarines with which to cope, an aviation strike group would present four or more AIP submarines. Moreover, the profusion of platforms and unmanned vehicles will distribute U.S. sensing capability over a greater area and make it more difficult for Chinese forces to operate undetected.

The fleet would involve many specialized but adaptable types of surface vessels, based on a small number of hulls with common interfaces that allow modular combat systems to be inserted as an operation demands. By utilizing more or less standard modular systems that can be installed to make the vessels capable of one or another mission, this architecture creates complexity for adversaries. It can thus provide both operational and strategic-economic leverage.

Specifically, such an architecture would:

- present Chinese forces and commanders with large numbers and variety of threats and targets;
- place a heavy burden on China's ISR and its ability to find and track large numbers of fast, low signature units;
- make each battle loss less costly;
- provide wide surveillance and more individual trackers;
- permit specialization without adding to fleet complexity;
- deliver new capabilities more quickly than China can adjust;
- provide flexibility as conditions and requirements change;
- create diverse options more easily and quickly pursued;
- simplify industrial-technical base requirements (e.g., building and maintenance).

Like other network-based structures, such an architecture allows for continual reconfiguration, whether of vessels, strike groups, or entire fleets. While Chinese capabilities are more or less fixed, those of this architecture are variable and versatile. The latter may be able to reduce substantially the time it takes to create new capabilities. In addition to providing competitive advantages, such qualities may be of great value in a complex, changing and unpredictable security environment.

Invariably, this would induce considerable uncertainty in the calculations of Chinese commanders who appear to be striving for conditions that would permit them to disable (or keep at bay) U.S. maritime forces as they execute a well-scripted offensive operations limited in scope and time. They would certainly be of value in maintaining American maritime dominance in the Western Pacific.

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