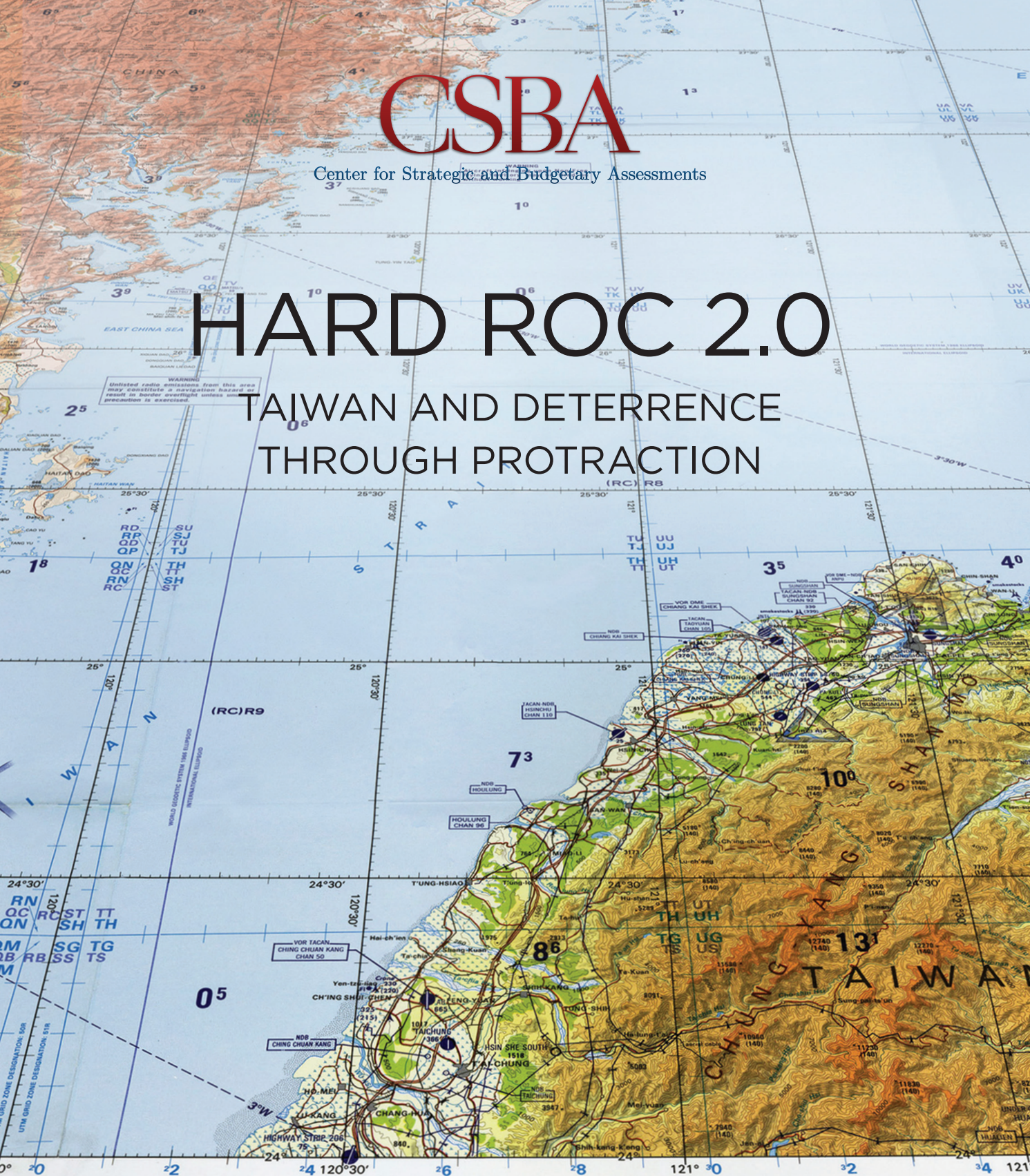


CSBA

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HARD ROC 2.0

TAIWAN AND DETERRENCE THROUGH PROTRACTION



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EXECUTIVE SUMMARY

According to World Bank data, the economy of the People's Republic of China (PRC) more than quadrupled in size between 2000 and 2012. Official PRC defense budgets increased even faster, from \$20 billion in 2002 to \$120 billion in 2013, while the U.S. Department of Defense (DoD) estimate of PRC military spending for 2013 was \$145 billion. In contrast, Taiwan, or the Republic of China (ROC), spent just \$10.8 billion on its defense in 2013. With the resource gap approaching fourteen-to-one, even if Taiwan were to massively increase its defense budget, it would not reverse the cumulative advantages the PRC has accrued over the past two decades. Indeed, the conventional military gap between Taipei and Beijing has grown so wide and is projected to continue widening at such a pace for the foreseeable future that Taiwan can no longer hope to prevail in any remotely symmetrical form of warfare. While there is little doubt that Taiwan would benefit greatly from a significant and sustained increase in military spending, Taiwan has passed the point in time where it could simply "buy its way" out of its security predicament, even assuming it had the political will to do so.

Over the past decade, Taiwan's leaders have responded to the deteriorating cross-strait military balance by emphasizing asymmetric tactics and capabilities, as codified in Taipei's "Hard ROC" defense strategy. However, while Taiwan's Hard ROC strategy calls for increasingly asymmetric approaches, Taiwan's military modernization plan remains, by and large, fairly symmetrical, calling for new fighter aircraft, naval surface combatants, and large submarines, as well as for maintaining heavily mechanized ground forces. In order for it to be viable, a nation's military strategy should be closely tied to its overarching political ends. In this case, the grand strategic goals behind Taiwan's defense strategy should be to dampen any Chinese temptation to prematurely resolve the Taiwan issue through the use of force and signal to Beijing the potentially debilitating costs—whether in time, casualties, or resources—of any cross-strait military operation. When examined through the lens of these objectives, Taiwan's current

defense strategy presents numerous shortcomings. Its capabilities and operational concepts, in particular, are not nearly asymmetric enough in light of the dramatically transformed security environment Taiwan now faces.

Despite the gravity of Taiwan's situation, it would be premature to consider its defense a lost cause. Confronted by a regime that places a growing emphasis on preemption and on the ability to rapidly prevail in localized, high-intensity combat, time has emerged as Taiwan's single most precious strategic commodity. Acquiring and maintaining the ability to protract any conflict with China should therefore be at the very heart of Taiwan's defense strategy. This report outlines a new defense approach Taiwan could adopt in order to buttress deterrence and defend its territory should deterrence fail: Hard ROC 2.0. Hard ROC 2.0 would emphasize virtual, rather than physical, attrition and operational approaches that draw inspiration from guerrilla warfare and place premiums on delay, resiliency, furtiveness, and deception.

The principal aim of Hard ROC 2.0 would be to impede the People's Liberation Army's (PLA's) ability to achieve control of the airspace and maritime environment around Taiwan in the event of war. If the PLA were to initiate a war, it would likely set air supremacy and naval mastery as top objectives in order to facilitate subsequent attacks on or a blockade of Taiwan, break Taiwan's political will, or set conditions for a subsequent invasion. Military capabilities that are both resilient to attack and pose a credible threat to PLA air and maritime operations will thus play a central role in delaying an invasion and prolonging any conflict. ROC forces do not have to achieve *absolute* denial of PLA operations on the seas around the island or in the air above it in order to be effective. The threshold for effectiveness is considerably lower. ROC forces must simply be able to pose a credible *and persistent* threat to air and naval forces seeking to establish initial control over Taiwan's airspace and maritime environment. As long as Taiwan retains, or appears to retain, the ability to destroy a significant fraction of the amphibious shipping and/or transport aircraft required to execute a successful invasion, it will reduce the probability of such an invasion being launched. Taiwan should, therefore, adopt a sea denial strategy akin to *guerre de course*, complemented and protected by an unconventional air defense campaign along the lines of North Vietnam's use of air defenses in its war with the United States. Doing so would buy critical time in which outside powers could intervene and raise the specter of a protracted war, which may in and of itself serve as a deterrent to PRC aggression. In the event of a successful PLA landing, ROC ground forces should be prepared to conduct a layered defense of the island aimed at inflicting persistently high levels of attrition over time with the hope of compelling PLA forces to withdraw. These sea, air, and land efforts should be complemented by a more robust effort by Taiwan to prevail in an "invisible war" that will involve cyber warfare, electronic warfare, intelligence/counterintelligence, and psychological operations. Each core element of Hard ROC 2.0 is discussed on the following pages.

1. “Guerrilla” Sea Denial

The first critical element of Hard ROC 2.0 would be a “guerrilla” sea denial campaign designed to pose a credible threat to the PLA Navy for as long as possible. Indeed, Taiwan does not need to exert absolute control over the waters surrounding the island in order to succeed; it must simply be able to identify and successfully attack a significant portion of any approaching blockade or invasion fleet. To this end, Taiwan should place greater emphasis on midget submarines, land-based coastal defenses, and offensive mining. As a more militarily effective alternative to acquiring eight large air independent propulsion (AIP) submarines, Taiwan could acquire a fleet of 42 midget submarines, similar in their displacement (roughly 120 tons) to those currently possessed by countries such as North Korea and Iran. Such a midget submarine fleet would require a comparable number of personnel as eight AIP submarines but could be much more easily produced indigenously and at a fraction of their cost. In addition to targeting enemy surface combatants directly and inducing the PLA Navy (PLAN) to dedicate a disproportionate share of its fleet to anti-submarine warfare, Taiwan’s fleet of midget submarines would serve as a maritime ISR picket and provide vital warning and targeting data for shore-based anti-ship cruise missile (ASCM) batteries. To hold a putative invasion fleet at risk, which could consist of roughly 32 amphibious transport ships and 60 naval combatant escorts, the ROC would require just over 1,200 ASCMs. These could be stored in road-mobile, four-pack launchers with the same external appearance as trucks ferrying standard 20-foot shipping containers. This would create a veritable targeting nightmare for the PLA to locate and suppress amidst the clutter of commercial containers and trucks throughout Taiwan. The third leg of Hard ROC 2.0’s sea denial approach would place heavy emphasis on mining. Pre-positioning small, lethal unmanned underwater vehicles and/or smart mines in the Strait or near ports on the Chinese mainland would complicate the PLAN’s offensive plans to achieve command of the Strait or blockade Taiwan’s ports. If placed in the shallow and noisy waters of the Taiwan Strait or near key ports from which the PLAN operates, mines could force the PLA to conduct time-consuming mine countermeasure operations, thereby slowing the pace of a PLA invasion force or impeding enforcement of a blockade. Together, 42 midget submarines, 1,200 ASCMs and launchers, and a large inventory of mines could be acquired for about \$1.5 billion less than Taiwan’s currently planned eight AIP submarines while providing greater sea denial capability.

2. “Guerrilla” Air Defense

Guerrilla Air Defense forms the second element of Hard ROC 2.0 and complements the guerrilla sea denial campaign. Taiwan should emphasize a multi-dimensional approach that combines mobile air defenses with significant camouflage, concealment, and deception (CCD) measures. This would force the PLA to conduct a time- and resource-consuming campaign to suppress ROC air defenses while significantly

degrading the PLA's ISR and battle damage assessment (BDA) efforts. If the PLA were to attempt to impose a blockade or invade Taiwan, it would no doubt seek to neutralize Taiwan's sea denial capabilities early in the campaign. Suppressing Taiwan's sea denial capabilities—its midget submarines, ASCM launchers, and disrupting its ISR—would require considerable investments in anti-submarine warfare capabilities, along with sustained, persistent, aerial surveillance and strike operations to find and neutralize mobile ASCM launchers. This would require preceding PLA air and missile operations in order to effectively suppress ROC air defenses, without which PLA aircraft and/or unmanned aerial vehicles (UAVs) could not conduct patrols over suspected ASCM launch areas. Therefore, the longer ROC air defenses pose a credible threat to PLA persistent surveillance and strike operations, the longer it will take for Mainland forces to destroy Taiwan's ASCM force.

Rather than spending billions of dollars to recapitalize the ROC's inventory of fighter aircraft, Taiwan should intensify its efforts to build up a highly distributed and resilient network of ground-based air defense systems. The main objective behind Taiwan's air defense effort should not be to destroy every intruding PLA aircraft, but rather to impose real and virtual attrition on the PLA Air Force (PLAAF), while surviving to operate for as long as possible. Taiwan's ground based air defense network could be greatly expanded at relatively low cost. Between 2006 and 2011 Taiwan sought to acquire 66 new F-16C/D aircraft from the United States at an estimated cost of almost \$6 billion. This sale has not been approved by the U.S. government, but a significant upgrade program for Taiwan's existing fleet of about 145 F-16A/Bs valued at \$3.7 billion is moving forward. According to Jane's, this upgrade includes Active Electronically Scanned Array (AESA) radars, embedded GPS/inertial navigation systems, new electronic warfare management systems, new or upgraded electronic countermeasures pods, tactical datalink terminals, upgraded targeting pods, Joint Helmet-Mounted Cueing Systems, night vision goggles, AIM-9X Sidewinders, Advanced IFF, and Have Glass II radar and IR signature reduction.¹ Upgrading the engines of the existing F-16A/B fleet to restore performance lost due to increased weight and drag associated with these modifications has also been discussed and could cost between \$700 million and \$1 billion. Assuming half the resources proposed for the F-16C/D purchase could be allocated for the engine upgrade and other air defense related systems, then there could be as much as \$2.3 billion available to fund other air defense capabilities. If one were to add the \$1.5 billion savings generated from adopting the ASCM-centric sea denial concept in lieu of the planned AIP submarines, there would

¹ "Lockheed Martin (General Dynamics) F-16 Fighting Falcon," Jane's Aircraft Upgrades (online), accessed September 12, 2014. While not currently part of the upgrade, replacement of existing F100-PW-220 engines with F100-PW-229 engines offering about 23 percent more thrust is also under consideration to restore performance lost due to additional weight and drag associated with many of the preceding improvements. This would add less than \$1 billion to the cost of the upgrade program. Given the difficulty Taiwan faces in securing new fighter aircraft, it should seriously consider adding the new engines to its F-16 upgrade program to maximize their capability. The analysis that follows assumes Taiwan opts to execute the existing upgrade program without the engine upgrade.

be up to \$3.8 billion available for investment in additional air defense systems—all for about \$3 billion less than the overall modernization spending levels Taiwan has proposed over the past decade. For this sum, Taiwan could acquire over 1,800 air defense missiles of the Enhanced Sea Sparrow Missile-class (ESSM-class) with an operational range of approximately 27 nautical miles (nm) and nearly 50 all-terrain vehicles. Each of these vehicles could theoretically transport up to 12 interceptors in a 20-foot shipping container with engagement controls and sensors to support distributed engagements. Relying primarily on passive infrared search and track sensors would greatly complicate and prolong the task for the PLA of seeking out and eliminating the highly mobile missile launchers. The operational principle for employing this air defense network should be long-term survival to “fight another day,” rather than to seek to inflict maximum damage at the onset of conflict. During Operation Rolling Thunder from 1965–1968, North Vietnamese forces fired only one surface-to-air missile (SAM) for every 89 U.S. sorties flown over North Vietnam. This proved sufficient, however, to induce the United States to double the proportion of combat sorties devoted to support missions, from about 20 percent to about 40 percent. By adopting a similar approach, ROC ground-based air defenses could induce the PLA to divert a significant portion of its fighter aircraft toward suppressing Taiwan’s air defenses and inflict the greatest costs over time.

Taiwan should complement this distributed network of mobile air defenses by expanding its CCD efforts, with the aim of preserving counter-air capabilities by presenting large numbers of attractive “false targets” to PLA sensors across the electromagnetic spectrum. This would include high-fidelity decoys to deceive optical and IR sensors, as well as advanced jammers and decoy air defense communication and radar transmitters. All of these will need to move and (if appropriate) radiate in realistic ways and at appropriate times to sustain their effectiveness over a campaign lasting weeks or months. Decoy and deception operations have considerable potential to compel the PLA to further expend ordnance, sensor time, and sorties on false targets, or on targets that were previously damaged. The ability to make damaged airfields appear operational may prove particularly useful. Airfields that might still harbor operational aircraft and that show signs of returning to operational status are likely to receive high priority for re-attack. This might be achieved by covering craters with canvas or plastic tarps designed to look like fresh concrete repairs and by deploying high-fidelity aircraft decoys.

3. Layered Ground Defense

One of the primary missions of Taiwan’s army would be to interdict Chinese amphibious forces in transit using its coastal defense ASCM batteries. If, however, these interdiction operations proved unsuccessful, the ROC Army would take center stage as Taiwan’s last line of defense. Taiwan’s challenging littoral geography and heavily fortified beaches would pose a severe threat to PLA forces with no prior wartime experience

in forcible entry operations, such as amphibious and airborne assault. Surf and land mines spread along Taiwan's largest beaches could exact a heavy toll on Chinese troops, while indigenously developed truck-based howitzers and truck-mounted multiple launch rocket systems (MLRS) could be dispatched toward landing beaches to provide supporting artillery fire.

If PRC forces succeeded in establishing a beachhead, however, the ROC Army could implement a strategy of Fabian defense, delaying and harassing Chinese forces and sabotaging key transport infrastructure in order to slow their advance toward Taipei. Taiwanese ground forces could melt into the island's urban and mountainous areas in order to wage a "war of a thousand cuts" against PLA occupation forces. This would require a stronger emphasis on hybrid operations, civil defense, and highly distributed, autonomous operations by small tactical ground units in a communication-denied environment to sustain irregular resistance operations. The ultimate goal of such a Fabian campaign should be to render any attempt by the PRC to occupy and pacify Taiwan as protracted and painful as possible by raising the perceived costs of Chinese invasion, buying time for international intervention, and ultimately compelling Beijing to withdraw or revise its objectives. By forming neighborhood militias and prepositioning caches of small arms, explosives, and guided rockets, artillery, mortars, and missiles (G-RAMM) clandestinely throughout major cities, Taiwan could lay the groundwork for a protracted guerrilla campaign. In order to add a greater degree of cohesion and effectiveness to Taiwan's civil defense, small units of ROC Army conventional forces specialized in urban and mountain warfare should be kept in reserve and tasked with coordinating sabotage and resistance efforts, as well as with maintaining morale. Rather than remaining operationally distinct, reserve units and professional forces should be co-mingled. This will require a conceptual shift within the ROC Army's war planning, away from its dominant focus on high-end symmetrical land warfare involving armored formations towards more short-range, asymmetric, urban engagements.

4. Fighting The Invisible War

There has been much debate in the United States over the past several years about the potential benefits and risks of disrupting the PLA's battle networks, composed of its ISR, command and control, information processing, communications, and battle damage assessment systems. For the United States, the stakes would certainly be high because such attacks might require strikes or other actions against Mainland China directly. Given the asymmetry of interests, where China's interests would be more at risk than U.S. interests, some have argued that China might be incentivized to escalate the conflict, potentially to the level of nuclear war. However, the same dynamic would not be true in the case of Taiwan. Given that Taiwan's very survival would be at stake in a war with China, it would have little reason to show restraint in disrupting or deceiving

the PLA's battle networks, especially in support of Taiwan's broader air and sea denial efforts. Such activities might involve both kinetic and non-kinetic means, as well as unconventional forms of attack. Network attack capabilities could greatly complicate PLA planning and potentially slow the tempo of PLA operations in war. Even the mere possession of capabilities to disrupt battle networks could frustrate the PLA's attempts to achieve information dominance prior to initiating hostilities and shake Chinese planners' overall confidence in their ability to rapidly prevail over Taiwan. Finally, the ROC's ability to disrupt the PLA's networks and to conduct offensive cyberwarfare represents one of its most viable potential deterrent and cost-imposing strategies.

The measures recommended in Hard ROC 2.0 are fiscally realistic and could therefore be pursued within the investment profile Taiwan has publicly committed to pursue. They also represent truly asymmetric counters to the PLA's growing conventional military superiority. If applied in concert, they would render the prospect of any PRC attempt to alter the status quo through the use of force far more costly and protracted than at present, thereby strengthening deterrence. Furthermore, unlike many of Taiwan's currently planned procurements, Hard ROC 2.0's more asymmetric systems could largely be produced indigenously, thus reducing Taiwan's armaments dependency on the United States. The largely defensive character of such acquisitions would also be more likely to garner support in Washington and less apt to induce a disproportionate response from Beijing. Many of the concepts and systems outlined in this report should be very attractive to a number of countries in the region—including Vietnam, the Philippines, and Indonesia—who have territorial disputes with China and face many of the same challenges responding to the rapid Chinese military modernization looming over Taiwan. Successful implementation of these concepts could therefore make Taiwan a much more attractive security partner in the region. Last but not least, the adoption of such a fundamentally revised defense strategy would provide a powerful means of signaling, to both Washington and the Taiwanese people, that the ROC remains strongly committed to its own defense.

INTRODUCTION

Maintaining stability across the Taiwan Strait has been a longstanding concern for the United States. In the past, American policymakers viewed the Strait as a dangerous flashpoint with the potential for rapid escalation to armed conflict between the United States and the PRC.² Today, however, the challenges facing the United States in the Indo-Pacific region are more diffuse, and the attention of policymakers has turned toward seemingly more volatile territorial disputes in the East and South China Seas. Meanwhile, economic and political relations between Taiwan and the Chinese mainland have markedly improved, and many observers in both Washington and Taipei view the possibility for cross-strait conflict as increasingly remote. As a result, many contemporary discussions of military strategy in Asia increasingly place Taiwan on the back burner.

Despite atmospheric improvements in cross-strait ties, however, the fundamental nature of the dispute has not changed. Beijing still refuses to renounce the use of force as a means of reunification, and China's steady, methodical buildup of missile and air assets aimed at Taiwan serves as a constant and sobering reminder of this fact. At the same time, a series of polls indicate that a vast majority of the Taiwanese population continues to reject unification.³ While both sides' official positions remain unaltered, the cross-strait military balance has moved decisively in China's favor. The armed forces of the ROC

² See, for example, Kurt Campbell and Derek Mitchell, "Crisis in the Taiwan Strait?" *Foreign Affairs*, 80, No. 4, 2001, in which the authors posit, "Perhaps nowhere else on the globe is the situation so seemingly intractable and the prospect of a major war involving the United States so real."

³ Asked about their position on cross-strait relations in an opinion poll conducted in October 2013, 66 percent of Taiwanese respondents supported the status quo, and 24 percent expressed a desire for independence. Only 7 percent came out in favor of unification with China. Chris Wang, "Taiwanese Prefer Independence over Unification: Survey," *Taipei Times*, October 31, 2013, available at <http://www.taipeitimes.com/News/front/archives/2013/10/31/2003575806>.

previously relied on a qualitative edge and their nation's geographical separation from the mainland to offset more numerous PRC forces. But over the past decade, Taiwan has lost these longstanding advantages. Two decades of annual double-digit growth in Chinese military expenditures have resulted in Beijing acquiring a wide margin of conventional superiority over Taiwan, leading to growing concerns that it may no longer be able to withstand a large-scale PRC assault against its territory and raising the specter of a forcible annexation before U.S. forces could intervene.

In addition to the rapid deterioration of the cross-strait military balance, doubts have also been raised over the ability of the United States to rapidly come to Taiwan's defense.

In addition to the rapid deterioration of the cross-strait military balance, doubts have also been raised over the ability of the United States to rapidly come to Taiwan's defense. China's continued investment in anti-access and area denial (A2/AD) capabilities has created new vulnerabilities for U.S. forces and forward bases, considerably raising the prospective risks and costs of American intervention.⁴ This new set of vulnerabilities, combined with the current U.S. fiscal woes and protracted wars in the Middle East, has strengthened a chorus of voices, mainly in academia, calling for the abandonment of Taiwan. Indeed, for an increasing number of observers, America's commitment to Taiwan is both a dangerous strategic liability and the foremost obstacle to the amelioration of Sino-U.S. ties.⁵

Unfortunately, Taipei's seemingly ambivalent attitude towards its own defense has only heightened concerns over the viability of the ROC's conventional deterrent and fueled the American debate over disengaging from Taiwan. Although the Taiwanese Ministry of National Defense has displayed a solid appreciation for the challenges posed by the rapidly deteriorating military balance in its most recent official documents, both President Ma Ying-Jeou and the ruling Kuomintang (KMT) party have systematically privileged "soft power" approaches over "hard" military deterrence, focusing on economic initiatives rather than investing adequately in the island's defense. Consequently, Taiwan's defense budget has steadily declined and reached a record low—2.1 percent of its gross domestic product (GDP) in 2013—considerably less than the 3 percent of GDP President Ma had pledged during his reelection campaign.⁶

⁴ The U.S. Department of Defense (DoD) describes anti-access (A2), as "action intended to slow deployment of friendly forces into a theater or cause forces to operate from distances further from the locus of conflict than they would otherwise prefer," and area-denial (AD) as "action intended to impede friendly operations within areas where an adversary cannot or will not prevent access." Whereas A2 affects *movement* to a theater, AD affects maneuver *within* a theater. See DoD, *Air-Sea Battle: Service Collaboration to Address Anti-Access and Area Denial Challenges* (Washington, DC: DoD, 2013), available at <http://www.defense.gov/pubs/ASB-ConceptImplementation-Summary-May-2013.pdf>.

⁵ For a recent discussion of the American debate surrounding Taiwan, see Iskander Rehman, "Why Taiwan Matters," *The National Interest*, February 28, 2014, available at <http://nationalinterest.org/commentary/why-taiwan-matters-9971>.

⁶ See Craig Murray and Kyle Churchman, *Taiwan's Declining Defense Spending Could Jeopardize Military Preparedness*, Staff Research Backgrounder (Washington, DC: U.S.-China Economic and Security Review Commission, 2013), available at <http://www.uscc.gov/Research/taiwan's-declining-defense-spending-could-jeopardize-military-preparedness>.

In October 2013, Taiwan released its latest annual defense report and made an alarming prediction.⁷ The report estimated that by 2020, Beijing's increased combat capabilities would provide it with the potential to mount a successful cross-strait attack against Taiwan. While the 2020 timeframe was described by the director-general of the Taiwanese Ministry of National Defense's department of strategic planning as a "rough estimate," the report voiced very real concerns over the growing military imbalance, concluding that after "investing immense funds into national defense" and "actively implementing defense modernization," the PRC was "capable of blockading Taiwan and seizing our offshore islands."⁸ Only a few months prior, DoD issued a similarly bleak assessment, stating the following:

Taiwan has historically relied upon multiple military variables to deter PLA aggression: the PLA's inability to project sufficient power across the 100 mile Taiwan Strait, the Taiwan military's technological superiority, and the inherent geographical advantages of island defense. China's increasingly modern weapons and platforms (more than 1,100 ballistic missiles, an anti-ship ballistic missile program, ships and submarines, combat aircraft and increased C4ISR capabilities) have largely negated many of these factors.⁹

The pessimism behind these prognoses highlights the questions underlying this report: can Taiwan be effectively defended, and, if so, how can Taiwan better deter Chinese coercion and aggression while preserving the political status quo?

The first chapter of this report analyzes the current military situation facing Taiwan. In particular, it assesses the PRC's cross-strait military strategy, which focuses on the ability to rapidly overwhelm Taiwanese forces and prevent third parties from intervening in the island's defense in a timely and effective manner.

Chapter 2 evaluates Taiwan's strategic response to the immense challenge posed by the PLA. It outlines the contours of Taiwan's current "Hard ROC" strategy, which places a renewed emphasis on self-reliance, resiliency, and deep interdiction. It concludes by assessing the sufficiency of the ROC's strategic and organizational reforms and detailing their shortcomings.

The third chapter explores how Taiwan can strengthen its defense. It suggests that, despite the ambitions of its military leaders, Taiwan's current defense strategy remains too conventional and insufficiently asymmetric. The military gap between Beijing and

⁷ National Defense Report Editing Committee, Ministry of National Defense (MND), *2013 ROC National Defense Report* (Taipei: MND, 2013), available at <http://www.ustaiwandefense.com/taiwan-ministry-of-national-defense-reports/>.

⁸ *Ibid.*, p. 57. For the "rough estimate," see "China Able to Attack Taiwan by 2020: Report," *Taipei Times*, October 9, 2013, available at <http://www.taipeitimes.com/News/front/archives/2013/10/09/2003574061>.

⁹ Office of the Secretary of Defense (OSD), *Military and Security Developments Involving the People's Republic of China 2013*, Annual Report to Congress (Washington, DC: DoD, 2013), p. 55, available at http://www.defense.gov/pubs/2013_china_report_final.pdf.

Taipei has already grown so vast, and it is projected to continue expanding exponentially such that Taiwan's present military strategy and its forecasted force development trajectory run the risk of losing operational viability within only a few years. As a result, Taipei should shift to a more radical strategic approach—Hard ROC 2.0—that would forego further acquisitions of costly, high-end air and naval surface combat platforms. Instead, Hard ROC 2.0 calls for focusing Taiwan's modest budget resources on establishing a more cost-effective and widely distributed ground-based air defense network and coupling it with equally dispersed and unconventional land-based and sub-surface sea denial capabilities. Suppressing this anti-access and area denial network would compel the PLA to dedicate far greater missile and air forces and impose heavy costs on the PLA in terms of a more protracted conflict, while vastly complicating its joint operations. Indeed, in the event of conflict, the ROC's ultimate goals should be to prevent Beijing from acquiring complete mastery over the island's air and maritime environs, irregularly counter any PLA lodgments, and, above all, buy time for third party intervention.

CHAPTER 1: THE EVOLVING CROSS-STRAIT MILITARY BALANCE

When the Taiwan Relations Act was passed in 1979, the balance of military power across the Strait was relatively stable. Although the PRC possessed a much larger army, its navy and air force were comparably small, poorly equipped, and inadequately trained. Taiwan could rely upon the geographic protection afforded by the Strait as well as the qualitative superiority of the ROC Air Force (ROCAF) and ROC Navy (ROCN) to offset the PLA's numerically superior forces.¹⁰ For decades, the PLA's patent lack of power projection capabilities led most analysts to summarily dismiss its threat potential and refer to any future PLA plans to invade Taiwan derisively as constituting little more than a "million-man swim."¹¹ In addition to China's perceived lack of capability, the strategic attention of leaders in Beijing was captured by domestic turmoil, land border disputes, and the nation's volatile relationship with the Soviet Union for much of the Cold War.

Over the past two decades, however, the situation has drastically shifted. The PRC's growth in prosperity and technological prowess has underwritten an impressive modernization of its armed forces. China has also successfully resolved the majority of its land border disputes (with the notable exception of the Sino-Indian border), and Beijing's relations with Moscow have greatly improved. The resulting diminution of China's continental threat perception has enabled Chinese planners to focus a historically unparalleled amount of attention and resources toward the nation's disputed maritime periphery, Taiwan in particular.¹²

The PRC's growth in prosperity and technological prowess has underwritten an impressive modernization of its armed forces.

¹⁰ Writing in 2000, Michael O'Hanlon made the assessment that, "China could not take Taiwan, even if U.S. combat forces did not intervene in a conflict." See Michael O'Hanlon, "Why China Cannot Conquer Taiwan," *International Security*, 25, No. 2, Fall 2000, pp. 51–86.

¹¹ See Richard Halloran, "China Has Ambitious Military Plans, but It Will Take Time," *The New York Times*, January 29, 1997, available at <http://www.nytimes.com/1997/01/29/opinion/29iht-edhall>.

¹² For an excellent study of this shift in Chinese grand strategy, see Carnes Lord, "China and Maritime Transformations," in Andrew S. Erickson, Lyle J. Goldstein, and Carnes Lord, eds., *China Goes to Sea: Maritime Transformation in Comparative Historical Perspective* (Annapolis, MD: Naval Institute Press, 2009), pp. 426–457.

The 1995–1996 Taiwan Strait Crisis, during which the waters surrounding the island of Taiwan were roiled by a series of missile tests conducted by the PRC, proved to be a watershed moment from which Washington and Beijing each drew very different lessons. At the time, the United States responded to the PRC’s coercive signaling with a clear demonstration of strength, dispatching two aircraft carrier battle groups to the Taiwan Strait. This display of military might effectively defused the situation and appeared to revalidate the deterrent value of naval power projection in America’s eyes. For security managers in Beijing, however, the crisis gave added impetus to developing its “counter-intervention strategy,” which focuses on denying or deterring American intervention, while acquiring the ability to rapidly overwhelm Taiwanese defenses.¹³

Since then, Taiwan’s relative security position has steadily deteriorated due to the growing concentration of Chinese military forces directly facing Taiwan and the gradual erosion of the ROC military’s qualitative edge. Moreover, the increasing range and sophistication of China’s A2/AD network has raised concerns that the United States may not be able to intervene effectively in order to prevent a sudden Chinese annexation of Taiwan. This chapter proceeds to examine the strategic ramifications of these two major trends before engaging in an effort to better conceptualize what form a full-scale Chinese assault on Taiwan might take.

China's Growing Military Shadow

China’s growing short-range missile inventory is one of the aspects of Chinese military modernization that attracts the most attention in Taiwan, undoubtedly due the unambiguously offensive character of both the weapons and of the chosen location for their deployment. Indeed, over 1,100 short-range ballistic missiles (SRBMs) are presently positioned along China’s southeastern seaboard, directly facing Taiwan. Each year, despite Taiwanese protestations, Beijing continues to add to their number and improve their range, accuracy, and payloads. However, the intense focus on China’s missile arsenal, while important, tends to overshadow the study of other equally, if not more critically, important military developments.

¹³ Ashley Tellis has succinctly characterized China’s multi-decadal military modernization efforts as being underpinned by two core objectives: “overwhelming the island’s (Taiwan’s) defenses by force, if necessary, in order to preclude a conclusive break with the mainland, and prevent the United States from bringing rearward reinforcements to bear in support of Taiwan and operating in its defense.” See Ashley J. Tellis, *Balancing Without Containment: An American Strategy for Managing China* (Washington, DC: Carnegie Endowment for International Peace, 2014), p.60, available at <http://carnegieendowment.org/2014/01/22/balancing-without-containment-american-strategy-for-managing-china/gz2z>.

This is especially true with regard to the growing fighter gap between Taiwan and the Chinese mainland. As of 2013, it was estimated that the PLA possessed roughly 2,300 combat aircraft capable of engaging in protracted air campaigns, approximately 490 of which are stationed in direct range of Taiwan.¹⁴ By contrast, Taiwan possesses roughly 410 combat-capable aircraft, and this number is set to dwindle drastically in coming years. Indeed, both Taiwan's F-5 fleet and its Mirage 2000s are approaching retirement. Some analysts have estimated that by 2016, Taiwan may have as few as 107 combat aircraft available at any given time.¹⁵ On the naval front, the situation is also alarming. With only 26 major surface combatants, 45 missile boats, and two operable submarines, the ROCN would find itself seriously outmatched in the event of a confrontation with PLAN's rapidly expanding fleet, composed of approximately 75 major surface combatants, a large number of missile boats, and over 70 conventional and nuclear-powered submarines. Finally, Beijing has been investing in its power projection capabilities by commissioning large amphibious transport docks and progressively enlarging its fleet of heavy airlifters.¹⁶ The Chinese government has also prioritized the modernization and mechanization of the PLAAF's 15th Airborne Corps. Presently composed of three divisions and approximately 30,000 troops, the unit is tasked with rapid-response and special missions. It has been placed under the direct command of the Chinese Central Military Commission, suggesting that its role is perceived as increasingly crucial and structured with politically sensitive situations in mind.¹⁷ Close observers of China's military also draw attention to the importance attached to the use of unconventional methods of power projection in PLA strategic thinking. China is postulated to have a large number of operatives and sympathizers inside Taiwan. These agents could act in a time of conflict to sabotage Taiwanese military capabilities, initiate cyberattacks, or otherwise degrade Taiwan's ability to effectively respond to or withstand Chinese attacks. Lyle Goldstein has also cautioned, "The ability of China to employ unconventional methods, such as small civilian ships, in a cross-strait amphibious attack should not be discounted." Observers have noted that China increasingly conducts military exercises incorporating civilian vessels and occasionally experiments with artillery emplaced aboard merchant ships.¹⁸ Similarly, Beijing could no doubt opt to requisition domestic airliners as a means of overtly or surreptitiously ferrying troops across the Taiwan Strait.

¹⁴ U.S.-China Economic and Security Review Commission, 2013 Annual Report to Congress (Washington, DC: U.S. Government Printing Office, 2013), p. 338, available at http://www.uscc.gov/Annual_Reports/2013-annual-report-congress.

¹⁵ Lotta Danielson, ed., *The Looming Taiwan Fighter Gap*, (Arlington, VA: U.S.-Taiwan Business Council, 2012), p. i.

¹⁶ In 2013 China flew two prototypes of the Y-20 heavy airlifter. Jane's assesses this aircraft to have about 80 percent of the range-payload capability of the U.S. C-17A. If development and production proceeds at the same pace as the C-17A the Y-20 could reach operational squadrons as soon as 2020. "Jane's All the World's Aircraft: Development and Production," IHS Jane's, available at <http://www.ihs.com/products/janes/defence/det-products/worlds-aircraft-development.aspx>, accessed August 21, 2014.

¹⁷ Although nominally part of the PLAAF, in reality the 15th Airborne Corps is directly controlled by the Central Military Commission. See "15th Airborne Corps," *GlobalSecurity.Org*, available at <http://www.globalsecurity.org/military/world/china/15abn-corps.htm>.

¹⁸ Lyle Goldstein, "China's Falkland Lessons," *Survival*, 50, No. 3, 2008, p. 76.

The PLA's gradual establishment of conventional superiority over Taiwan has been complemented by the development of its "counter-intervention" strategy.

The PLA's gradual establishment of conventional superiority over Taiwan has been complemented by the development of its "counter-intervention" strategy. Structured around a growing constellation of A2/AD systems, this strategy aims to deter, delay, or prevent U.S. intervention in the event of regional conflict.¹⁹ By continuously investing in the development and deployment of offensive capabilities that challenge U.S. freedom of maneuver in key domains (space, cyberspace, in the air, and at sea), the PRC seeks to raise the risks and costs of American military intervention in the event of a conflict in the Western Pacific to prohibitive levels.

Precision-guided land-attack and anti-ship cruise and ballistic missiles, guided by a robust targeting network and launched from a wide variety of platforms, form a core component of China's putative military strategy.²⁰ By firing multiple cruise and ballistic missile salvos at U.S. capital ships and forward bases in proximity to Taiwan, the PLA could potentially cripple any American attempt to rapidly generate military strength and assist beleaguered Taiwanese forces. Some Chinese strategists have argued that even if Chinese missile attacks fail to neutralize the bulk of U.S. forces, the sheer psychological impact of such an assault coupled with American fears of further escalation could succeed in discouraging the United States from engaging in further military action.²¹

China's non-participation in the Intermediate-Range Nuclear Forces (INF) Treaty has abetted its missile-centric strategy, allowing the PLA to develop and deploy an extensive inventory of land-based missiles with ranges between 500 and 5,500 km.²² The PLA has also greatly improved the resiliency of its land-based reconnaissance strike complex (RSC) by investing in the world's densest network of air defense systems and constructing a sprawling network of hardened underground shelters.²³

¹⁹ For a seminal discussion of China's A2/AD strategy, see Roger Cliff et al., *Entering the Dragon's Lair: Chinese Anti-Access Strategies and Their Implications for the United States* (Santa Monica, CA: RAND, 2007), available at <http://www.rand.org/pubs/monographs/MG524.html>.

²⁰ For a detailed illustration of a putative PLA attack see Jan van Tol, Mark Gunzinger, Andrew Krepinevich, and Jim Thomas, *AirSea Battle: A Point-of-Departure Operational Concept* (Washington, DC: Center for Strategic and Budgetary Assessments, 2010), pp. 20–47, available at <http://www.csbaonline.org/wp-content/uploads/2010/05/2010.05.18-AirSea-Battle.pdf>.

²¹ Chinese strategists refer to this strategy as "intimidation warfare." See Toshi Yoshihara, "Chinese Missile Strategy and the U.S. Naval Presence in Japan: The Operational View from Beijing," *Naval War College Review*, 63, No. 3, 2010, p.39.

²² The Treaty between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles, commonly referred to as the INF (Intermediate-Range Nuclear Forces) Treaty, was signed in 1987. It led to the destruction of the Parties' ground-launched ballistic and cruise missiles with ranges of between 500 and 5,500 kilometers, as well as their launchers and associated support structures and support equipment. See U.S. State Department, *Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles (INF Treaty)*, available at <http://www.state.gov/t/avc/trty/102360.htm>.

²³ On the characteristics and origins of the concept of RCS, see the discussion in Michael G. Vickers and Robert C. Martinage, *The Revolution in War* (Washington, DC: Center for Strategic and Budgetary Assessments, 2004), pp. 10–11, and Andrei A. Kokoshkin, *Soviet Strategic Thought: 1917–1991* (Cambridge, MA: MIT Press, 1998), pp.139–140.

In addition to conventional precision-strike, the PLA has increasingly focused on counter-space operations and “informationized warfare” with the aim of acquiring the ability to disrupt or disable enemy command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) through both non-kinetic and kinetic means. Roger Cliff has suggested that “efforts to electronically infiltrate U.S. and Taiwanese military and civilian information systems would be underway well before the commencement of combat operations.”²⁴

Finally, China has continued to invest in more traditional means of sea denial, such as diesel-electric submarines equipped with AIP to increase their submerged endurance, and is in the process of expanding its already extensive inventory of underwater mines. The PLA’s doctrinal emphasis on offensive mining campaigns poses a severe operational challenge to the U.S. Navy, which has historically neglected mine countermeasure (MCM) capabilities and only recently improved its efforts in response to Iran’s repeated threats to mine the Persian Gulf. Indeed, U.S. naval analysts have posited that the mere suggestion of the presence of Chinese mines in Taiwan’s maritime environs could “seriously hamper” U.S. ability to surge naval power toward the Taiwan Strait.²⁵

More generally, the PRC aims to erode U.S. and allied faith in their ability to prevail in a high-intensity conflict while acquiring the capacity to progressively wrest away large portions of the global commons.²⁶ As Ian Easton of the Project 2049 Institute has noted,

Ideally, victory for the PLA would be keeping the U.S. from upholding its legal obligations to defend Taiwan and Japan, either through a gradual weakening of these bilateral relationships or by a sudden collapse of national will (for example, a White House decision to reinterpret or ignore the Taiwan Relations Act). The psychological pressure induced by the threat of the PLA’s growing offensive missile force is intended to aid the Chinese Communist Party (CCP) in achieving such effects through coercion.²⁷

²⁴ Roger Cliff, Senior Fellow (Atlantic Council), Testimony Before the U.S.-China Economic and Security Review Commission, Hearing on China’s Military Modernization and its Implications for the United States, *How China’s Military Capabilities Might Be Employed in a Conflict with the United States*, January 30, 2014, available at http://www.uscc.gov/sites/default/files/Roger%20Cliff_Testimony1.30.14.pdf.

²⁵ See the comments of an anonymous U.S. Navy MIW (mine warfare) official in Scott C. Truver, “Taking Mines Seriously: Mine Warfare in China’s Near Seas,” *Naval War College Review*, 65, No. 2, 2012, p. 44.

²⁶ For China’s attempts to “wrest away” portions of the global commons, see Dan Blumenthal, “The U.S. Response to China’s Military Modernization,” in Ashley J. Tellis and Travis Tanner, eds., *Strategic Asia 2012–13: China’s Military Challenge* (Washington, DC: The National Bureau of Asian Research, 2012), p. 338.

²⁷ Ian Easton, *China’s Military Strategy in the Asia-Pacific: Implications for Regional Stability* (Arlington, VA: Project 2049 Institute, 2013), p. 57, available at http://www.project2049.net/documents/China_Military_Strategy_Easton.pdf.

As China continues to erect an increasingly broad and robust A2/AD network, the U.S. military has started to explore operational concepts aimed at restoring some of its freedom of maneuver within heavily contested environments.²⁸ In the near future, however, it might prove challenging for the United States to rapidly marshal the military resources required to singlehandedly deter or defeat Chinese aggression.²⁹ As a result, Taiwan will need to focus on buying time and space for American intervention, while taking on a greater degree of responsibility for its own defense.

Conceptualizing a Chinese Attack on Taiwan

China could resort to force for a variety of reasons with an assortment of objectives in mind.

An evaluation of Taiwan's defense strategy and requirements should begin by understanding the range of contingencies they must address. China could resort to force for a variety of reasons with an assortment of objectives in mind. PLA actions could run the length of the conflict escalation ladder, from simple acts of intimidation, as during the last Taiwan crisis, to naval and air jostling, to the rapid seizure of one of the ROC's less defended offshore islands, to air and missile bombardment, blockade, or full invasion of Taiwan.

PLA strategic writings and pronouncements on the issue suggest that a Chinese attack on Taiwan might possess certain key characteristics:

- It might rely heavily on a crippling first strike, occurring with few apparent warning signs or suddenly escalating when least expected. China's objective would be to impose a political settlement before the United States could effectively intervene—without launching a ground invasion of the main island of Taiwan and incurring excessive casualties if possible.
- It would unroll in certain key phases. SRBM strikes might be used to “kick open the door,” facilitating Chinese air operations over the Strait and Taiwan. Chinese air control would likely be viewed as a key prerequisite for a successful naval and amphibious campaign. Mass cyberattacks would target Taiwanese command

²⁸ DoD, *Joint Operational Access Concept (JOAC)* (Washington, DC, DoD, 2012), available at http://www.defense.gov/pubs/pdfs/joac_jan%202012_signed.pdf. The U.S. delay in responding to China's anti-access challenge can be partially explained by its deep involvement in extended counter-insurgency campaigns since 2003. As a result, “While the PLA has fielded a wide and growing array of advanced capabilities to counter U.S. power projection, the United States has spent insufficient time, intellectual effort, and resources responding to new and innovative PLA capabilities.” Jim Thomas, Vice President (Center for Strategic and Budgetary Assessments), Testimony Before the House Armed Services Committee, Seapower and Projection Forces Subcommittee, *U.S. Asia-Pacific Strategic Considerations Related to PLA Naval Forces Modernization*, December 11, 2013, available at <http://www.csbaonline.org/publications/2013/12/u-s-asia-pacific-strategic-considerations-related-to-p-l-a-naval-forces-modernization/>.

²⁹ Planned reductions in force structure resulting from severe fiscal pressures risk further exacerbating the U.S. military's power projection challenge in Asia. See RADM John Kirby, “U.S. Navy Presence at Risk Under Sequester,” *Navy Live* (blog), September 14, 2013, available at <http://navylive.dodlive.mil/2013/09/14/presence-at-risk-under-sequester/>.

and control (C2) systems, radar systems, and key infrastructure. Indeed, PLA military thinkers view the rapid achievement of information dominance as vital to the pursuit of follow-on operations.³⁰ The cyber threat could be exacerbated by the potential presence of sleeper cells of Chinese agents with “insider access” to Taiwan’s battle networks.

- In order to put a quick end to the conflict and avoid it devolving into a protracted campaign, Beijing might attempt to “decapitate” or neutralize the Taiwanese leadership through targeted air and missile strikes, special operations forces (SOF) attacks, or the insertion of airborne troops. Cells of Chinese agents embedded within Taiwanese society would be activated and instructed to engage in acts of assassination, kidnapping, disinformation, or sabotage.³¹
- Should these preliminary phases not succeed in breaking Taiwan’s resolve, China might exercise its option to enact a naval blockade of the island’s major ports with a heavy emphasis on offensive mining operations, primarily carried out by Chinese diesel-electric submarines. Chinese combat aircraft might also seek to establish a no-fly zone over Taiwanese airspace.
- Psychological warfare would likely play an important role by sapping the general population’s morale and encouraging Taiwanese soldiers to defect.
- Under the assumption that PRC forces had obtained uncontested air and sea control, an amphibious invasion would be undertaken only if all other options to subdue Taiwan failed.

A Chinese attack on Taiwan might occur with little apparent warning. PLA doctrinal writings on complex issues such as war control and war termination differ markedly from conventional Western understandings of escalation management, notably by stressing that a sudden, unexpected rise in intensity of the level of conflict can accelerate war termination by providing a rapid, decisive victory.³² Taiwanese defense analysts draw attention to this fact and caution that certain, seemingly more incremental, coercive measures undertaken by Beijing in the vicinity of Taiwan could serve as a means of discreetly laying the groundwork for a major future assault. Retired Taiwanese Air

³⁰ For a detailed analysis of contemporary Chinese discussions on information warfare, see Timothy L. Thomas, *The Dragon’s Quantum Leap: Transforming from a Mechanized to an Informatized Force* (Fort Leavenworth, KS: Foreign Military Studies Office, 2009).

³¹ For a discussion on China’s possible resort to “decapitation” sabotage tactics, see Richard D. Fisher Jr. “Unconventional Warfare Options,” in Steve Tsang, ed., *If China Attacks Taiwan: Military Strategy, Politics, and Economics* (New York, NY: Routledge, 2006), pp. 72–94.

³² According to a 2008 RAND study, “A key element of (the Chinese concept of) war control is seizing and maintaining the initiative to control the scale and pace of a conflict; this is repeatedly emphasized in military writings. However, it is not accompanied by a corresponding recognition that actions to seize the initiative could also precipitate a harsh reaction, leading to inadvertent escalation.” See “China’s Thinking on Escalation: Evidence from Chinese Military Writings,” in Forrest E. Morgan et al., *Dangerous Thresholds: Managing Escalation in the 21st Century* (Santa Monica, CA: RAND, 2008), p.77.

PLA missile forces would likely strike Taiwan at the outset of an attack.

Force Colonel Hsi-Hua Cheng notes, for example, that “routine air demonstration and intimidation can swiftly and readily transform into higher intensity military action against Taiwan, and, if done gradually and carefully, without necessarily alerting Taiwan’s air defenders.”³³ China’s recent imposition of an Air Defense Identification Zone (ADIZ) that overlaps significantly with the established ADIZs of Taiwan, Japan, and South Korea will no doubt heighten concerns in Taipei that routine acts of Chinese assertiveness might lower the ROC’s guard.

Vertical escalation could also occur as a result of an isolated incident involving Taiwanese and Chinese naval or air assets, such as a collision or confrontation, and subsequently spin out of control. China’s growing proclivity for maritime brinkmanship has only exacerbated regional concerns over the risks of inadvertent escalation.³⁴ Finally, the PRC’s decision to use force may result from the perceived breaching of a red line that decision-makers in Taipei were either not entirely aware of or to which they refused to attach a sufficient degree of significance. A 2009 report on Taiwanese defense strategy commented on this possibility, observing that the ROC’s defense planning is complicated by, “the fact that the triggers for the PRC’s use of force and its courses of action cannot be predicted with any degree of certainty.”³⁵ Indeed, the conditions under which Beijing has warned it would use force seem to lack a certain degree of clarity and have evolved over time.³⁶ For all these reasons, a Chinese attack on Taiwan might not be fully anticipated by either ROC or U.S. forces, potentially catching them initially off balance.

PLA missile forces would likely strike Taiwan at the outset of an attack. The core operational objectives of China’s strategic missile forces (the Second Artillery Corps) consist of “penetrating the enemy’s air defense system, striking the enemy’s in-depth targets, and seizing air and naval dominance in future local wars under informationized conditions.”³⁷ The Science of Second Artillery Campaigns (SSAC) also stresses the role of

³³ Hsi-Hua Cheng, “The Employment of Airpower in the Taiwan Strait,” in Richard P. Hallon, Roger Cliff, and Phillip C. Saunders, eds., *The Chinese Air Force: Evolving Concepts, Roles, and Capabilities* (Washington, DC: National Defense University Press, 2012), p. 334.

³⁴ For a detailed analysis of the logic behind China’s increased tendency to engage in acts of maritime brinkmanship, see Oriana Skylar Mastro, “Signaling and Military Provocation in Chinese National Security Strategy: A Closer Look at the Impeccable Incident,” *Journal of Strategic Studies*, 34, No. 2, April 2011.

³⁵ Dan Blumenthal et al., *Deter, Defend, Repel, and Partner: A Defense Strategy for Taiwan* (Washington, DC: Taiwan Policy Working Group, American Enterprise Institute and the Project 2049 Institute, 2009), available at <http://www.aei.org/files/2009/08/03/20090803-Deter-Defend-Repel.pdf>.

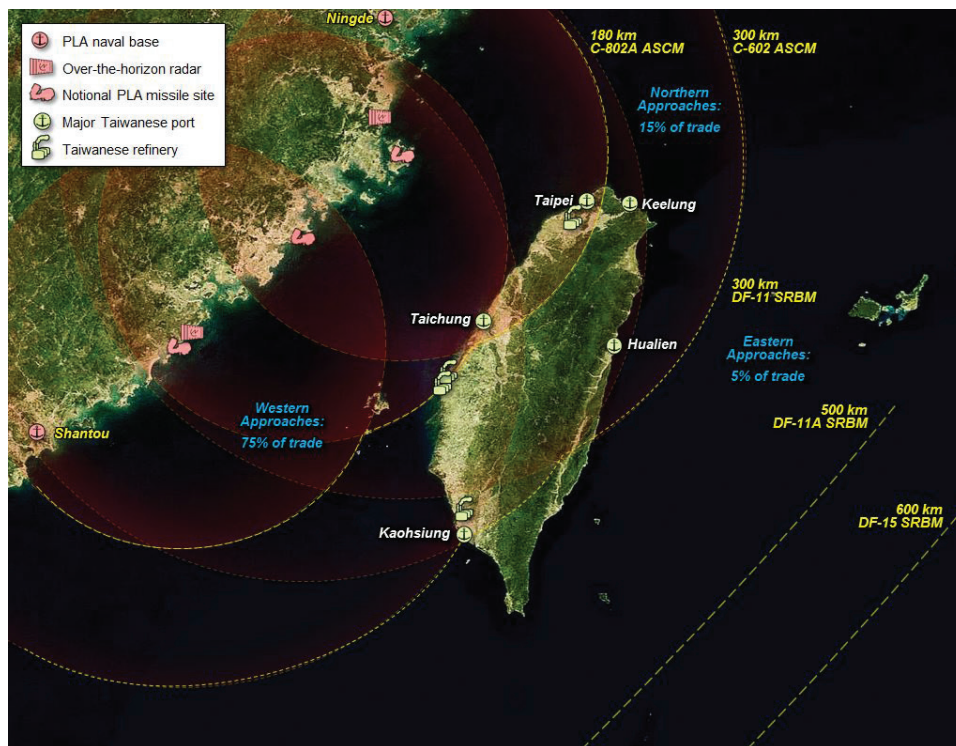
³⁶ China’s red lines have included the following: formal declaration of Taiwan’s independence, undefined moves towards Taiwanese independence, internal unrest in Taiwan, Taiwan’s acquisition or development of nuclear weapons, indefinite delays on the resumption of cross-strait dialogue on unification, foreign intervention in Taiwan’s internal affairs, and foreign troops stationed on Taiwan. See OSD, *Military and Security Developments Involving the People’s Republic of China 2013*, p. 56.

³⁷ *The Science of Second Artillery Campaigns* (Beijing: People’s Liberation Army Publishing House, 2004), p.94.

missiles in attacking airfields and ports through “missile firepower blockades.”³⁸ In a remarkably candid interview, a Chinese military officer attached to the PLA Academy of Military Sciences confirmed that Second Artillery strikes would seek to rapidly degrade Taiwan’s air and anti-missile capabilities, stating the following:

If the fighting started across the Taiwan Straits, these planes will never get a chance to take off. Considering the narrowness of Taiwan straits and the firepower from the Chinese mainland, their airports are so vulnerable. All airports will be destroyed in the first attack. Even if some of them can take off, they can’t land . . . Anti-missile capabilities will be the important targets in military attacks. And they can easily be located by satellite, even with Google Earth. The security of those weapons themselves is really low.³⁹

FIGURE 1: THE MISSILE THREAT TO TAIWAN



³⁸ *The Science of Second Artillery Campaigns* (Beijing: People’s Liberation Army Publishing House, 2004), p.94.

³⁹ See Du Wenlong’s comments in “Taiwan’s Military Strategy Naïve and Dangerous,” *Global Times*, February 4, 2010, available at <http://www.globaltimes.cn/opinion/commentary/2010-02/503614.html>, accessed December 27, 2013.

Consistent with such thinking, missile attacks would be conducted against airfields, ports and other military logistical hubs in Taiwan, degrading the ROC armed forces' ability to generate combat power in the opening hours of a conflict. The PLA might conduct strikes against Taiwan's aircraft and their associated shelters, airfield runways, air defense and air control radars, and related systems to eliminate most of the ROC's counter-air capability. Although this operation might prove costly for the PLA, its success would be critical to establish air control over Taiwan. David A. Shlapak has suggested that "between 90 and 240 sufficiently accurate, submunition-equipped SRBMs—less than a quarter of the number of such missiles that Beijing currently has deployed—would give China a better-than-fair shot at shutting down Taiwan's fighter force in a matter of minutes."⁴⁰ It is unclear, however, how many of the PLA's CSS-6 and CSS-7 missiles have precision guidance; older variants could be particularly inaccurate, with circular error probability (CEP) of 300 meters or more, requiring multiple weapons to be targeted against the same site.⁴¹ Collectively, the throw-weight of all of its CSS-6 and CSS-7 missiles would be limited to approximately 500 tons of conventional high-explosives, likely forcing the PLA to concentrate its stand-off strikes against Taiwan's airfields and perhaps a number of stationary air defense sites rather than a wider range of counter-value targets. The Second Artillery would also likely seek to conserve a portion of its short-range missile inventory in order to target U.S. assets, preventing them from rapidly intervening. William Murray has suggested that Beijing might attempt to launch a devastating blow against Taiwan's surface fleet by programing cruise or ballistic missiles to sink or cripple stationary surface combatants in port.⁴² If the Second Artillery were able to suppress Taiwan's air defenses and keep ROCAF fighters grounded, the PLA would then be able to shift the weight of its efforts from selected missile attacks to high-volume strikes by combat aircraft. Indeed, the Chinese Air Force has striven for the past decade to better coordinate its operations with other services. At the operational level, Andrew Erickson believes that, "Air strikes will be precisely timed to commence moments after the arrival of Second Artillery missile strikes, or just after naval strikes."⁴³

⁴⁰ David A. Shlapak, "The Red Rockets' Glare: Implications of Improvements in PRC Air and Missile Strike Capabilities," in Roger Cliff, Phillip C. Saunders, and Scott Harold, *New Opportunities and Challenges for Taiwan's Security* (Santa Monica, CA: RAND, 2011), p. 75. See also David A. Shlapak et al., *A Question of Balance: Political Context and Military Aspects of the China-Taiwan Dispute* (Santa Monica, CA: RAND, 2009).

⁴¹ Circular error probability (CEP) is the radius of a circle centered on the aim point within which, statistically speaking, 50 percent of the munitions can be expected to impact. The authors thank Barry Watts for this definition.

⁴² William S. Murray, "Revisiting Taiwan's Defense Strategy," *Naval War College Review*, 61, No. 3, p. 20.

⁴³ Andrew S. Erickson, "China's Modernization of its Naval And Air Power Capabilities," in Ashley J. Tellis and Travis Tanner, eds., *Strategic Asia 2012–13: China's Military Challenge* (Washington, DC: National Bureau of Asian Research, 2012), pp. 61–127.

Chinese combat aircraft would also operate under the protective umbrella of PLAN ship air defense systems, which could be employed to target any surviving Taiwanese aircraft engaged in defensive counter-air missions. Taiwanese fighters could also be targeted by PLA air defense systems stationed along the Chinese coastline. China has deployed a number of S-300 PMU-2 and HQ-9 SAM systems along the coastline of Fujian province, directly across the Strait from Taiwan. With over 200 km in range, these systems could prevent Taiwanese aircraft from engaging the PLAAF.⁴⁴ PLA aircraft could strike a broader target set, including C2 facilities, ports and military bases, ships at sea, and critical civil infrastructure.⁴⁵

Furthermore, ongoing PLA advances in improving combat networks will dramatically increase the difficulty of operating conventional aircraft over and from Taiwan in the coming decade. The top portion of Figure 2B illustrates how the ability of advanced ground-based SAMs to engage aircraft is presently limited by the radar horizon of their engagement radars. This allows aircraft below about 2,000 meters (6,500 feet) to operate without fear of long range SAM engagement. PLAAF fighters could currently pose a threat, but they would need to overcome Taiwan's own air defenses. Over the next decade or so, however, it is likely the PLA will field combat network capabilities similar to the U.S. Navy's Naval Integrated Fire Control-Counter Air (NIFC-CA). NIFC-CA has been developed over the past 12 years, and is due for operational deployment in 2015. It links existing weapon systems such as AEGIS ships, SM-6 Standard missiles, E-2D Advanced Hawkeye Airborne Warning and Control System (AWACS), and fighter aircraft and allow any weapon in range to engage targets tracked by any sensor in the network. For example, an E-2D could provide targeting data for an SM-6 SAM launched from an AEGIS ship for a target below the ship's radar horizon.⁴⁶ The bottom half of Figure 2B illustrates how linking target data from a PLAAF AWACS operating over the PRC to long range SAMs would transform the threat environment. Under these conditions, aircraft operating at any altitude over the Taiwan Strait—and almost all of Taiwan—would be vulnerable to SAM engagement. Moreover, aircraft operating up

Ongoing PLA advances in improving combat networks will dramatically increase the difficulty of operating conventional aircraft over and from Taiwan in the coming decade.

⁴⁴ Commenting on China's "offensive air defense," Richard Fisher of the International Assessment and Strategy Center makes the following observation, "For Taiwan the PLA current SAM forces will not only help enforce an air and sea blockade but will also prevent Taiwan's air and missile forces from conducting retaliatory strikes, thereby diminishing the investments Taiwan is making in these capabilities." See Richard Fisher, "China's Offensive Air Defense," in New Frontier Foundation, *China's Military Threats Against Taiwan in 2025*, Defense Policy Blue Paper No.5 (Taipei: New Frontier Foundation, 2014), p.79, available at http://www.dpp.org.tw/upload/news/20140304120411_link.pdf.

⁴⁵ Taiwan's 2009 QDR warns of this threat, noting that China might launch "rapid multi-wave missile assaults against Taiwan, and it can conduct precision strikes against Taiwan's critical political and military infrastructures, airports, sea ports, and military bases." Quadrennial Defense Review Editing Group, MND, *Quadrennial Defense Review 2009* (Taipei: Ministry of National Defense, 2009), p. 37.

⁴⁶ For more on the NIFC-CA program timeline and capabilities see Jeffrey H. McConnell "Naval Integrated Fire Control-Counter Air Capability-Based System of Systems Engineering," presentation, Naval Surface Warfare Center, Dahlgren Division, November 14, 2013, available at: http://www.acq.osd.mil/se/webinars/2013_11_14-SOSECIE-McConnell-brief.pdf.

to 400 km from the PRC could be subject to SAM engagement at any altitude, unless they were operating in the narrow space just to the east of Taiwan where mountainous terrain on the island directly masks PRC AWACS coverage.

In the absence of air cover, it would be extremely difficult for Taiwan's small navy to prevail against the combined might of the PLAN and the PLAAF. Taiwan's fleet of missile boats would be particularly vulnerable to air-launched cruise missile strikes, as the vessels lack on-board air-defense systems.

FIGURE 2A: SAM COVERAGE OVER THE TAIWAN STRAIT

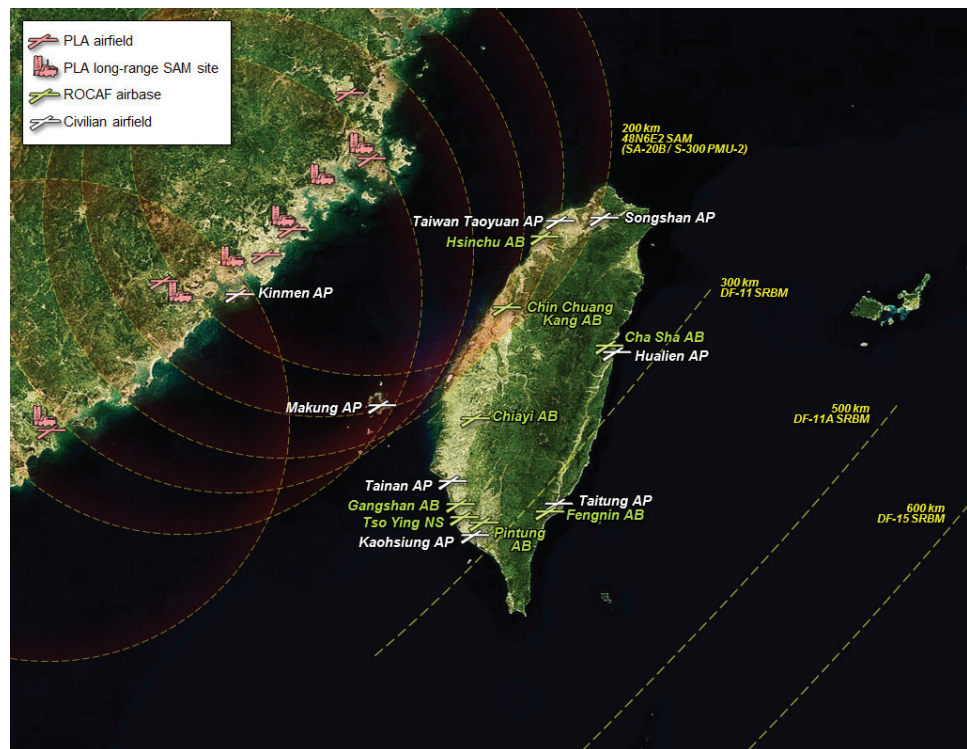
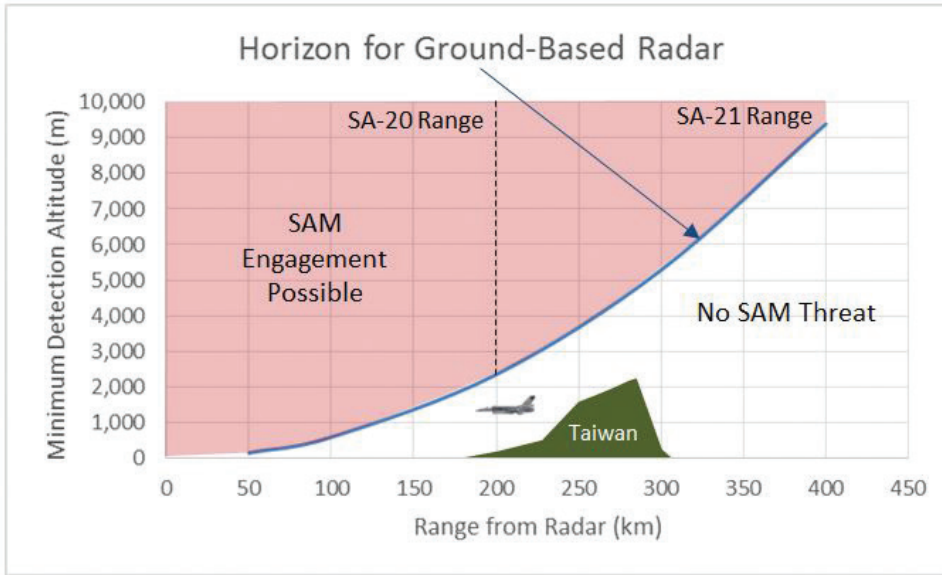
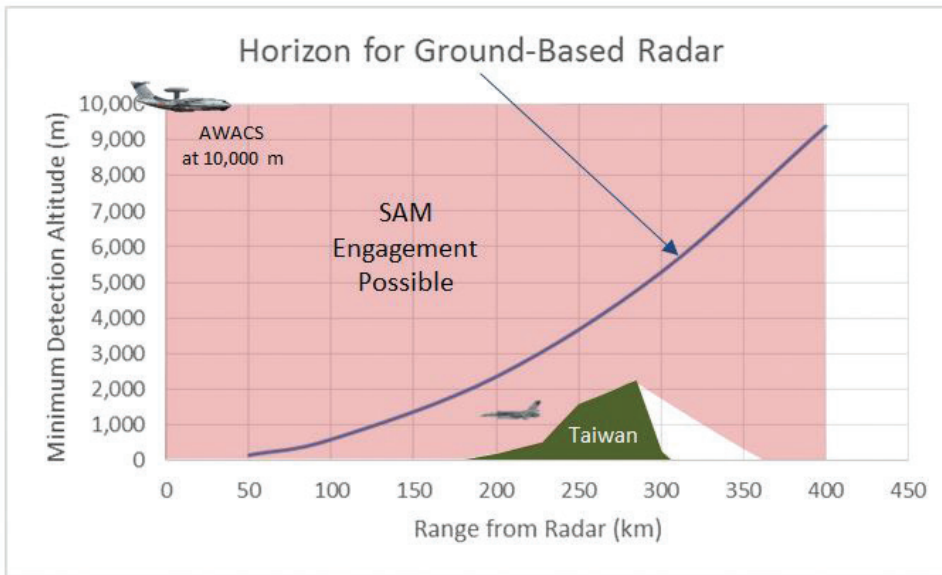


FIGURE 2B: EVOLVING SAM THREAT



If the PLA achieved air superiority over Taiwan, PLA strike aircraft could continuously deliver a higher amount of ordnance *per day* than the PLA's entire SRBM force *in total*.



If the PLA achieved air superiority over Taiwan, PLA strike aircraft could continuously deliver a higher amount of ordnance *per day* than the PLA's entire SRBM force *in total*. As discussed earlier, the 1,100 SRBMs mentioned above each deliver a warhead weighing about 500 kg. The combined warhead weight of all these weapons is therefore around 550 metric tons. In contrast, a conservative estimate of the weapon delivery

potential of the 500 PLA combat aircraft based within reach of Taiwan is about 750 metric tons *per day*.⁴⁷ The initial targets for the Precision Guided Munitions (PGMs) delivered by PLAAF fixed-wing aircraft would likely be ROC Air Force bases. The goal would be to attack aircraft shelters, fuel storage facilities, C2, and operations facilities as well as inflict heavy damage on the operating surfaces. Once accomplished, the PLAAF could then set conditions for invasion by attacking naval bases, ships and missile craft at sea, ASCM facilities and other coastal defenses, and, finally, mobile ROC Army formations. Chinese aircraft could also attack transportation networks in order to prevent or delay ROC reinforcements from reaching invasion sites and amplify the impact of a blockade on the distribution of food and other essentials across the island.

To put these numbers into some perspective, during Operation Allied Force—the only example where air bombardment played the principal role in compelling a nation to capitulate—NATO forces delivered a total of approximately 6,303 tons of munitions over a period of 78 days, of which 35 percent, or about 2,200 tons, were precision guided munitions. Assessments of the relative effectiveness of PGMs and unguided bombs indicate that PGMs are about four times more effective at destroying targets on a per ton basis.⁴⁸ It follows that, had NATO used only PGMs during Operation Allied Force, it might have achieved the same level of damage to Serbian targets by dropping a total of about 3,300 tons of PGMs rather than the much larger actual mix of PGMs and unguided weapons.

TABLE 1: SERBIA AND TAIWAN: A COMPARISON

	Serbia (1999)		Taiwan (2013)	
	Tons of equivalent PGMs delivered (total: 3,300)*		Tons of PGMs required for equal per-unit damage	
Area	34,116 sq. mi	.096 tons per sq. mi	13,855 sq. mi	1,330 tons
Population	9.9M	333 tons per million people	23.4M	7,992 tons
GDP (PPP)	\$50B	66 tons per \$B	\$930B	61,380 tons

⁴⁷ This estimate assumes that only three-quarters of the PLA aircraft are operational on any given day, each flies a single strike mission per day, and the average weapon payload per mission is 2,000 kilograms. Given the relatively short distances many of these strike missions would cover, most operational aircraft could likely fly more than one mission per day, and many of the aircraft are capable of carrying much heavier weapon payloads than assumed in this calculation. This illustration is explored in greater detail in Chapter 3.

⁴⁸ Nicola K. Molloy, *Impact to Defence of Lessons Learnt using Modern Precision Strike Weapons* (Edinburgh, Australia: DSTO Systems Sciences Laboratory, 2003), p.11.

Table 1 shows rough estimates of the relative sizes, populations, and GDPs of Serbia in 1999 and Taiwan in 2013. It also shows the weight of “equivalent PGMs” dropped per square mile, per population size (in millions), and per billion dollars of purchasing power parity (PPP) GDP for Serbia in 1999. Finally, it gives an estimate of the weight of PGMs required to achieve equivalent levels of damage per square mile, population (in millions), and per unit of economic activity. This rudimentary analysis indicates that the Second Artillery Corps missile force alone is capable of only causing about half the damage per square mile that the NATO bombings caused in Serbia in 1999. This, however, probably constitutes the least relevant of the three relative measures of damage presented here. Indeed, Taiwan is a much more populated and wealthy country than Serbia was in 1999. One can assume, therefore, that attacks per square mile would yield a much lower level of damage proportionally to the overall infrastructure and capital stock in Taiwan than it did in Serbia in 1999. Assuming the stakes for the ROC government in a shooting war with the PRC are at least as high (if not higher) than those of the Serbian government in its conflict with NATO in 1999, then the level of damage required to induce the ROC government to capitulate might require considerably more firepower than the Second Artillery would be able to deliver with conventional attacks. This suggests that the quantity of PGMs required is considerably in excess of 8,000 tons—and might be as high as 60,000 tons or more. Assuming the same daily total of 750 tons delivered by fixed-wing aircraft, an effort of this scale would require at very least 10 days—but likely 80 days or more.⁴⁹

Returning to a description of how a PRC attack on Taiwan might unfold if the PLAAF were to achieve air control over the Strait and Taiwan, it is possible that airborne forces could subsequently be inserted in order to secure or sabotage key transport and communication nodes, such as civilian and military airfields or radio and radar stations. PLA SOF might be tasked with locating and neutralizing Taiwan’s civilian leadership in the hope of bringing a sudden end to the conflict or softening up a beachhead and sabotaging coastal defenses in preparation for an amphibious assault. The covert insertion of Chinese SOF acting as Joint Terminal Attack Controllers (JTACs) could also serve as a means of providing the PLAAF with more accurate and timely targeting information.

After eroding Taiwan’s air and naval defenses, the PLA could attempt to establish a blockade of Taiwan’s key ports. Here again, Chinese military thinkers have openly detailed such operations, emphasizing the importance of offensive mining:

⁴⁹ These estimates are important for several reasons. First, they suggest that the ROC would not necessarily have to “throw in the towel” as a result of conventional missile bombardment alone. Furthermore, it indicates that Taiwan may be able to absorb missile strikes and hold out for intervening forces to gain air and naval superiority in and around Taiwan, and, as argued in Chapter 3, this timeline could be extended significantly were Taiwan to invest in the appropriate systems, forces, and operational concepts.

Taiwan is an island surrounded by waters on all sides and with many harbors. Given the vast area of Taiwanese waters, it would take an enormous amount of time to clear mined harbors . . . If the cross-strait situation deteriorates, and tens of thousands of mines are dropped into waters around Taiwan, as happened to Japan in World War II, it will almost be impossible to clean them. Anti-mining is a well-known problem for any navy.⁵⁰

**As an island nation,
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trade.**

While it is difficult to make a precise estimate, China's mine inventory is believed to comprise at least 100,000 weapons, ranging from relatively unsophisticated to much more advanced systems.⁵¹ In the early stages of conflict, China might choose to forward deploy some of its diesel-electric submarines close to Taiwan's congested littoral waters where they could wreak havoc either by seeding large numbers of mines or, perhaps more importantly, by attacking shipping with torpedoes and anti-ship cruise missiles.⁵² As an island nation, Taiwan is acutely vulnerable to a blockade or a sudden disruption in its seaborne trade. Almost all of Taiwan's energy and nearly 70 percent of its food is imported, and Taiwanese trade represented 74 percent of its GDP in 2012.⁵³ Much of this trade flows through a few key ports. Kaohsiung and Taichung, two ports on Taiwan's western coast, account for over 75 percent of Taiwan's yearly international cargo throughput. Taipei and nearby Keelung in the north account for another 15 percent, and Taiwan's major eastern port of Hualien accounts for just over 5 percent.⁵⁴ The PLA could also attempt to impose a formal blockade using warships, but it might have difficulty sustaining such an effort logistically. In addition, PLA ships would be vulnerable to ROC shore-based ASCMs and U.S. nuclear attack submarines.

⁵⁰ "Taiwan's Military Strategy Naïve and Dangerous," *Global Times*, February 4, 2010, available at <http://www.globaltimes.cn/opinion/commentary/2010-02/503614.html>.

⁵¹ Andrew S. Erickson, Lyle J. Goldstein, and William S. Murray, *Chinese Mine Warfare: A PLA Navy "Assassin's Mace" Capability* (Newport, RI: U.S. Naval War College, 2009); and Scott C. Truver, "Taking Mines Seriously," *Naval War College Review*, 65, No. 2, Spring 2012, pp. 53–55.

⁵² For U.S. Naval War College professor William S. Murray, "Beijing's ongoing investment in increasingly modern ASCM-firing diesel submarines reflects a determination to overwhelm and destroy surface ships operating within at least a hundred miles of the shallow waters of the near seas, including Taiwan." See William S. Murray, "Underwater TELs and China's Anti-Submarine Warfare: Evolving Strength and a Calculated Weakness," in Peter Dutton, Andrew S. Erickson, and Ryan Martinson, eds., *China's Near Seas Combat Capabilities* (Newport, RI: China Maritime Studies Institute, 2014), p.48.

⁵³ See Joshua Meltzer, *Taiwan's Economic Opportunities and Challenges and the Importance of the Trans-Pacific Partnership* (Washington, DC: The Brookings Institution, 2013), available at <http://www.brookings.edu/research/papers/2013/09/30-taiwan-trans-pacific-partnership-meltzer>. See also: "Taiwan," *CIA World Factbook* available at <https://www.cia.gov/library/publications/the-world-factbook/geos/tw.html>; and Audrey Wang, "The Road to Food Security," *Taiwan Today*, July 1, 2011, available at <http://taiwanreview.nat.gov.tw/ct.asp?xItem=167684&CtNode=1337>. For more information on Taiwan's energy profile, see Republic of China Bureau of Energy, Ministry of Economic Affairs, "Energy Balance Sheet of Taiwan," available at http://web3.moeaboe.gov.tw/ECW/english/content/ContentLink.aspx?menu_id=1540; and U.S. Energy Information Agency, "Taiwan Energy Profile," available at <http://www.eia.gov/countries/country-data.cfm?fips=TW>.

⁵⁴ See data from Republic of China Ministry of Transportation and Communications, "Cargo Volume by Port," available at <http://www.motc.gov.tw/mocwebGIP/wSite/ct?xItem=11745&ctNode=214&mp=2>.

Therefore, the PLA might focus, at least in the first stages, on offensive mining of key ports on Taiwan's west coast in combination with unrestricted warfare conducted by diesel-powered attack submarines stationed along Taiwan's main sea lines of communication.

Although previous analyses have discounted the PLA's ability to blockade Taiwan effectively using submarines alone, if the PLA were to gain control of the air surrounding Taiwan, Beijing might gain the advantage.⁵⁵ Indeed, were the PLA to acquire uncontested air superiority, Taiwan might find it extremely challenging to counter a Chinese blockade. PLA aircraft could be used to target Taiwan's coastal defenses and its mine countermeasures ships, thus preventing them from creating the narrow "Q-routes" in which mines are cleared, allowing ships to safely enter and exit ports during war. They could also target Taiwan's limited number of P-3 Orion anti-submarine aircraft or bombard Taiwan's civil airfields and ports, damaging critical infrastructure and impeding the ROC's ability to offload cargo. Taiwan could find its major ports surrounded by enemy mines and submarines and its primary runways and ports unable to offload cargo. Furthermore, the PLA Naval Air Force maintains a large number of specialized maritime strike aircraft. These could attack ROC Navy vessels attempting to escort merchant ships to and from Taiwan with overwhelming numbers of advanced, air-launched ASCMs, and PLAAF aircraft could attack the merchant ships with direct-attack PGMs once the defending escorts were neutralized. Under the strains of such a multi-dimensional operation, Taiwan's leadership might opt to accede to the PRC's demands before U.S. forces could respond. Indeed, the PLA would prefer a short war to create a *fait accompli*, thereby avoiding war with the United States, a bloody amphibious invasion of Taiwan, or an extended disruption of global trade.

PLA writings emphasize the importance of rapidly seizing the initiative in the information warfare domain by "controlling the flow of information" and "destroying the enemy's strategic awareness."⁵⁶ Since 2008, all major PLA military exercises have thus incorporated cyber and information warfare components.⁵⁷ Indeed, although a missile and air campaign might be executed on its own, it would most likely be waged in concert with cyber and electronic attacks in order to both degrade Taiwanese C2 and increase the pressure on Taiwan's leadership to capitulate. Roger Cliff describes an illustrative PLA campaign in the following terms:

⁵⁵ See, for example, Michael A. Glosny, "Strangulation from the Sea? A PRC Submarine Blockade of Taiwan," *International Security*, 28, No. 4, Spring 2004, pp. 125–160.

⁵⁶ For the perceived need to immediately seize control of the flow of information, see Wang Pufeng, "信息战研究中若干问题的我见" [My Views on a Number of Matters Pertaining to the Study of Information Warfare] in Shen Weiguang, *中国信息战* [Chinese Information Warfare] (Beijing: Xinhua Publishing House, 2005), pp.36–47. On the benefits derived from destroying the enemy's strategic awareness through "electronic feints, electronic camouflage, electronic jamming, virus attacks, and space satellite jamming and deception" see Yao Youzhi, *战争战略论* [Strategy of War] (Beijing: PLA Publishing House, 2005), pp.475–476.

⁵⁷ The International Institute for Strategic Studies (IISS), *The Military Balance 2014* (London: IISS, 2014), p. 239.

Combat operations would . . . begin with the triggering of malware designed to disable and disrupt, or corrupt U.S. and Taiwanese information systems, along with the use of jammers and lasers to disrupt or blind U.S. and Taiwanese radars, surveillance satellites, and other sensors; the launching of direct-ascent antisatellite missiles against U.S. surveillance satellites, and other sensors; the launching of a barrage of ballistic missiles at U.S. and Taiwanese missile and air defense systems, air bases and any warships within range of China's anti-ship ballistic missiles.⁵⁸

By attacking the ROC's networks, the PLA might prevent some ROC forces, such as its integrated air and missile defense C2 complex, from functioning effectively at the outset of conflict.

The PRC's computer network attack capabilities pose a major threat to both the military and civilian networks of Taiwan, as well as the networks of those countries that might come to Taiwan's aid.⁵⁹ In 2012, Taiwan's National Security Bureau reported that the PRC had targeted its websites more than 3 million times, and the ROC's 2009 Quadrennial Defense Review (QDR) found, "The PRC has been aggressive in the development of . . . electronic warfare, [and] information operations. . . . There are growing threat[s] against the [C4ISR] systems, sea/aerial lines of communication, and homeland defense of the ROC."⁶⁰ As 95 percent of Taiwan's international communications are routed via undersea cable, Taiwan's geographic location and the small number of cable spurs and terminals make it especially vulnerable to network disruptions.⁶¹ The PLA's Fourth Department, which is responsible for network warfare, could attempt a "cyber blockade" of Taiwan by cutting its transoceanic cable links.⁶² By attacking the ROC's networks, the PLA might prevent some ROC forces, such as its integrated air and missile defense C2 complex, from functioning effectively at the outset of conflict. Cyberattacks would be conducted in close coordination with the PLA's General Political Department, which would likely seek to broadcast disinformation and propaganda across Taiwanese military networks, spreading confusion and encouraging Taiwanese troops to desert or surrender. PLA Psychological Operations (PSYOPS) might also be conducted by air, with the transmission of media from the recently fielded Gaoxin-7, a PSYOP aircraft expressly designed with psychological warfare against Taiwan in mind.⁶³

⁵⁸ Roger Cliff, *How China's Military Capabilities Might Be Employed in a Conflict with the United States*, January 30, 2014.

⁵⁹ James Mulvenon has made comments to the *Los Angeles Times* as far back as 2002 to this effect. He claims that Taiwan appears to be the driving force behind the Chinese interest in hacking and viruses and warned that the Chinese military could seek to deploy widespread computer disruptions against Taiwanese military systems. Eric Lichtblau, "CIA Warns of Chinese Plans for Cyber-Attacks on U.S.," *Los Angeles Times*, April 25, 2002, available at <http://articles.latimes.com/2002/apr/25/news/mn-39861>.

⁶⁰ Quadrennial Defense Review Editing Group, MND, *Quadrennial Defense Review 2009*, p. 8.

⁶¹ Mark A. Stokes, *Revolutionizing Taiwan's Security: Leveraging C4ISR for Traditional and Non-traditional Challenges* (Arlington, VA: Project 2049 Institute, 2010), p. 27.

⁶² Recent reports have also suggested that one of China's large phased array radar systems in Fujian province has the ability to interfere with the Taiwanese Surveillance Radar Program (SRP) by matching its pulse repetition frequency. See Richard D. Fisher and Sean O' Connor, "New Chinese Radar May Have Jammed Taiwan's SRP," *Jane's Defense Weekly*, IHS Jane's, June 5, 2014.

⁶³ Aaron Jensen, "China Prepares for Psychological Warfare," *The Diplomat*, August 14, 2013, available at <http://thediplomat.com/2013/08/china-prepares-for-psychological-warfare/>.

In addition, Taiwan's 2009 QDR warned, "In the future, the PRC will develop . . . electromagnetic pulse (EMP) weapons . . . to seize electromagnetic advantage in the battlefield and engage in an offensive war."⁶⁴ The 2013 QDR reiterated such concerns, adding, "In the future, the PLA will continue . . . to strengthen its [electronic warfare (EW)] capabilities."⁶⁵ And indeed, certain declassified reports would suggest that China has been testing high-power microwave weapons with a Taiwan-type contingency in mind.⁶⁶ Although Taipei has taken steps to protect its C2 facilities, including hardening the Hengshan Command Post against EMP attacks, the PLA might succeed in disabling many of the ROC's electronic systems and disrupting key C2 control facilities using EMP weapons.⁶⁷

Despite the PLA's conventional advantages relative to the ROC military, a PRC invasion of Taiwan would be a challenging and risk-laden enterprise, and it might only be undertaken if all other options to subdue the island, such as blockade and air/missile bombardments, had failed. Nevertheless, the PLA has greatly improved its ability to conduct amphibious assaults. The PLA is investing in specialized amphibious assault systems such as beach obstacle breaching rockets launched from Landing Craft Utilities (LCUs) and large hovercraft capable of traversing beach-laid minefields. As a sign of the importance the PLA accords to amphibious operations, in both September and October, 2013, a series of massive joint exercises were carried out, some of which featured elite units such as the 42nd Army of the Guangzhou Military Region and simulated a "Normandy-style invasion of Taiwan."⁶⁸ However, the difficult tidal conditions along Taiwan's coastline, when juxtaposed with the island's challenging topography, mean that there are only a dozen or so beaches suitable to conduct a large-scale amphibious landing. Taiwan's mountainous eastern coastline is characterized by steep beach gradient and deep littoral waters, whereas much of the western seaboard is marked by strong currents and treacherous shoals.⁶⁹ In addition to these natural barriers, violent storms

⁶⁴ Quadrennial Defense Review Editing Group, MND, *Quadrennial Defense Review 2009*, p. 36.

⁶⁵ Quadrennial Defense Review Editing Group, MND, *2013 Quadrennial Defense Review* (Taipei: MND, 2013), p.30.

⁶⁶ Jason Ukman, "U.S. Intelligence Analysts Speculated on China's Use of Electromagnetic Radiation on Taiwan," *The Washington Post*, July 22, 2011, available at http://www.washingtonpost.com/blogs/checkpoint-washington/post/us-specified-on-chinas-use-of-electromagnetic-radiation-on-taiwan/2011/07/21/gIQAYVZNTI_blog.html.

⁶⁷ Mark Schneider, *The Emerging EMP Threat to the United States* (Fairfax, VA: National Institute Press, 2007), p. 7.

⁶⁸ Miles Yu, "Inside China: Taiwan Invasion Exercise," *The Washington Times*, October 17, 2013.

⁶⁹ In his detailed survey of the island's geography, John F. Cooper notes, "Taiwan and the Pescadores lie on the edge of the East Asian continental shelf. Thus, to the west of Taiwan, the water (in the Taiwan Strait) is relatively shallow, its depth averaging three hundred feet. The ocean waters off Taiwan's east coast, in contrast, are deep; in fact, thirty miles offshore in the Pacific Ocean, the seabed drops precipitously to a depth of thirteen thousand feet. . . . On the west coast there are tidal basins and, in some areas, swamps. Elsewhere there are spits and sandbars," John F. Cooper, *Taiwan: Nation-State or Province?* (Boulder, CO: Westview Press, 2013), p. 4.

are notoriously common in the region, particularly during typhoon season, which lasts from approximately June to October. During certain periods of the year, therefore, PRC planners might deem an amphibious assault completely unfeasible.

In response to the rapidly shifting military balance and the types of contingencies outlined in this chapter, Taiwan's armed forces have progressively changed their definition of victory in war. Security managers in Taipei no longer plan for a total, conventional defeat of the enemy, but rather seek to enhance deterrence through the adoption of asymmetric strategies and by raising the human and material costs of invasion to unbearable levels.⁷⁰ In addition to this emphasis on asymmetry, Washington's growing reluctance to provide Taiwan with advanced military hardware has prompted Taiwanese defense planners to place a greater priority on self-reliance and indigenous production. Taiwan also seeks to retain a capacity for "deterrence by punishment" in addition to "deterrence by denial." Whereas the responsibility for offensive counterstrikes against the mainland traditionally rested primarily with the ROCAF, in recent years Taipei has shifted towards a more missile-centric strategy and is indigenously developing systems designed for deep interdiction. While these shifts in Taiwanese defense posture make sense, they remain insufficient in the face of China's growing military threat and have not been granted adequate levels of budgetary and political support. The continued viability of Taiwan's defense, however, is not simply a matter of additional funding, but rather contingent on a revision of certain core priorities and investments.

⁷⁰ In the past, Taiwan attempted, at least twice, to compensate for its lack of strategic depth and conventional weakness by secretly initiating nuclear weapon programs. In both cases, the U.S. uncovered Taiwan's nuclear activities and successfully pressured Taipei to terminate the programs. Since 1988, Taiwan's leadership has consistently maintained that the island will not seek nuclear weapons in the future, and the PRC has declared that any such move on Taiwan's part would be considered grounds for immediate military intervention. For a succinct history of U.S. efforts to terminate Taiwan's covert nuclear weapons programs, see William Burr, "U.S. Opposed Taiwanese Bomb in the 1970s: Declassified Documents Show Persistent U.S. Intervention to Discourage Suspicious Nuclear Research," *The National Security Archive* (Washington, DC: George Washington University, 2007), available at <http://www2.gwu.edu/~nsarchiv/nukevault/ebb221/>.

CHAPTER 2: TAIWAN'S CURRENT DEFENSE APPROACH

Hard ROC 1.0

Taiwan's current defense strategy seeks first and foremost to deter China from using force to alter the status quo. This hinges upon "maintaining fundamental warfighting capabilities while focusing on asymmetric capabilities."⁷¹ External commentators have referred to this defense-oriented strategy as the "porcupine strategy," and Taiwan's 2009 QDR employed the metaphor of a "hard rock," which "by implication, could not be dislodged, shattered, or breached by a numerically superior enemy force during an attempt to attack or invade ROC territory."⁷² Taipei's 2013 QDR notes that Taiwan's wartime operations will focus on using innovative and asymmetric capabilities, targeting the "enemy's center of gravity (COG) and critical vulnerabilities to leverage the advantages in time and space in defense operations to block or paralyze attacks."⁷³ Taiwan's struggle for time and space requires its armed forces to be able to absorb a first strike, avert decapitation, and conduct a "multilayered interdiction" campaign, which aims to eliminate PLA forces in transit and prevent them from disembarking on Taiwanese territory. Taiwan's most recent Defense Report outlines four core objectives, which are defined as follows:

Taiwan's struggle for time and space requires its armed forces to be able to absorb a first strike, avert decapitation, and conduct a "multilayered interdiction" campaign.

⁷¹ Quadrennial Defense Review Editing Group, MND, *2013 Quadrennial Defense Review*, p.28.

⁷² Quadrennial Defense Review Editing Group, MND, *Quadrennial Defense Review 2009*, p. 10. For "porcupine strategy," see Baohui Zhang, "Taiwan's New Grand Strategy," *Journal of Contemporary China*, 20, No. 69, 2011, and William S. Murray, "Revisiting Taiwan's Defense Strategy," *Naval War College Review*, 61, No. 3, 2008.

⁷³ Quadrennial Defense Review Editing Group, MND, *Quadrennial Defense Review 2009*. Taiwanese defense officials have in the past referred to the ROC's asymmetrical mindset as being one of "David against Goliath." See former Defense Minister Andrew Yang's comments, in "Taiwan has Asymmetric Strategy: Yang," *Taipei Times*, September 21, 2011, available at <http://www.taipeitimes.com/News/taiwan/archives/2011/09/21/2003513804>.

- Credible Deterrence of any Hostile Intention to Launch an Attack
- Counter Blockade to Maintain Sea and Air Lines of Communication
- Joint Interdiction to Delay Enemies from Approaching the Homeland
- Ground Defense to Deny Enemy Landing and Setting Footholds⁷⁴

In addition to deterrence by denial, Taiwan seeks to retain some capacity for deterrence by punishment, principally by maintaining the ability to launch missile counterstrikes at PLA targets located on the mainland.⁷⁵ The pursuit of a strategy of “active defense with Taiwanese characteristics” plays a central role in Taiwanese military thinking and appears to have taken on a greater significance as the cross-strait balance has progressively deteriorated.

Writing over a decade ago, Kurt Campbell and Derek Mitchell noted the following:

Taiwan has traditionally taken a purely defensive approach to a military conflict with the PRC. But today’s strategists suggest that claiming an advantage at an early stage in the clash may be essential for the island’s survival, leading ROC military officials to think more in terms of quick strikes and rapid escalation.

Taiwanese strategists employ the term “asymmetric counterforce” to describe such operations, which were traditionally confined to Taiwanese SOF and a portion of Taiwan’s air fleet whose pilots were expected to engage in highly perilous “one-way ticket” missions against PRC military infrastructure and C2 nodes. The combination of various factors such as the growing air asymmetry between the PRC and Taiwan, the hardening of PLA basing, and the increased sophistication of PLA air defenses and early warning systems have led the ROC military to explore alternative approaches. Taiwan’s recent advances in cruise missile technology have resulted in a much greater focus on land-based precision strike systems, which are deemed both more cost-effective than manned combat aircraft and less vulnerable to preemptive strikes.

Over the past decade, Taiwan has developed new land-attack and anti-ship cruise missiles powered by ramjets. Variants of Taiwan’s first indigenously produced cruise missiles, the Hsiung Feng 2E (HF-2E) and the Hsiung Feng 3 (HF-3), have been fitted aboard Taiwanese surface vessels as well as on ground-mobile missile batteries, and reports in the Taiwanese press indicate that Taiwan’s armed forces plan to induct several hundred additional HF-2Es.⁷⁶ The HF-3 is a supersonic ASCM, reportedly fitted with a 225 kg

⁷⁴ National Defense Report Editing Committee, MND, *2013 ROC National Defense Report*, p.86.

⁷⁵ As Dan Blumenthal of the American Enterprise Institute has observed, “Taiwan’s military wants to retain some ability to show its population that it can hit back, even if such a capability would not be decisive. A show of force of this kind would also signal to China that it has to pay a higher price in blood and treasure to achieve its political goals.” See Dan Blumenthal, “5 Faulty Assumptions About Taiwan,” *Foreign Policy*, February 12, 2014, available at http://shadow.foreignpolicy.com/posts/2014/02/12/5_faulty_assumptions_about_taiwan.

⁷⁶ Gavin Phipps, “Taiwan Unveils Mobile Launcher for Hsiung Feng 3,” *Jane’s Missiles and Rockets*, IHS Jane’s, August 14, 2013, and Rich Chiang, “Missiles Deployed Within Striking Range of China,” *Taipei Times*, May 29, 2012, available at <http://www.taipetimes.com/News/taiwan/archives/2012/05/29/2003534001>.

warhead with a range between 150 and 200 km, while the HF-2E is subsonic but with a larger payload (425 kg) and a longer range (650 km).⁷⁷ Under the Cloud Peak (Yun Feng) missile program, Taipei is also working to develop a supersonic, ramjet-powered land-attack cruise missile (LACM) with a range of over 1200 km.⁷⁸ Various reports have suggested that follow-on versions of the Yun Feng could have their range extended to up to 2000 km.⁷⁹ Recent reports have also alleged that Taiwan is pursuing an indigenous SRBM program, but this has yet to be officially confirmed.⁸⁰ According to a Taiwanese defense analyst, the goal behind such deep interdiction programs is to “complicate Chinese strategic calculations by raising the strategic uncertainty of military action against the island, and to disrupt the tempo of PLA operations, thereby mitigating their intended effects and affording Taiwan more time to seek outside assistance or intervention.”⁸¹ Some Taiwanese strategists have argued in favor of a more offensive use of ground-based missile systems as a means of “leveling the playing field” by inflicting rapid and irreparable damage on the PLA in the very first stages of conflict. A tightly coordinated series of standoff strikes, they argue, could cripple any PLA attempt to rapidly seize or blockade Taiwan, either by sinking the invasion fleet concentrated at its port of embarkation or by destroying a series of fixed targets such as PLA airfields and C2 nodes.⁸² As Michael Mazza from the American Enterprise Institute has noted,

Some Taiwanese strategists have argued in favor of a more offensive use of ground-based missile systems.

[Cruise missiles] are attractive to Taiwan’s military for a number of reasons, including the fact that in the event of a conflict, cruise missiles might be more likely than manned fighters to reach targets on the mainland. Strikes on critical Chinese command and control nodes could significantly impede PLA operations.⁸³

⁷⁷ Ibid.

⁷⁸ David C. Isby, “Report Reveals Details of Taiwan’s Mach 3 Cruise Missile,” *Jane’s Missiles and Rockets*, IHS Jane’s, April 2, 2013.

⁷⁹ J. Michael Cole, “MND Remains Vague on Medium-Range Missile Report,” *Taipei Times*, December 20, 2012, available at <http://www.taipeitimes.com/News/taiwan/archives/2012/12/20/2003550581>.

⁸⁰ Recent reports have indicated that Taiwan is developing an SRBM, the Tien Chi, or “Sky Halberd,” with a range of 300 km and a 500 kg payload. There have also been unconfirmed reports that 15–50 of these missiles have been stationed on the Dongyin and Penghu Islands, not far from the Chinese mainland. See “Tien Chi (Sky Halberd),” *Jane’s Strategic Weapon Systems*, IHS Jane’s, January 20, 2014.

⁸¹ Wendell Minnick and Paul Kallender-Umezu, “Japan, Taiwan Upgrade Strike Capability,” *Defense News*, May 7, 2013, available at <http://www.defensenews.com/article/20130507/DEFREG03/305060016/Japan-Taiwan-Upgrade-Strike-Capability>.

⁸² See, for example, Heng-Yu Lee’s arguments in favor of asymmetric counterforce operations in, “The Weak Preempting the Strong: The Case of the Taiwan Strait,” *Issues and Studies*, 47, No. 2, 2011.

⁸³ See Michael Mazza, *Taiwanese Hard Power: Between a ROC and a Hard Place* (Washington, DC: American Enterprise Institute, 2014), available at <http://www.aei.org/outlook/foreign-and-defense-policy/defense/taiwanese-hard-power-between-a-roc-and-a-hard-place/>.

While it might prove more challenging than anticipated to inflict severe damage on heavily defended PLA airfields and C2 nodes, Taiwan's ground-based missile programs could serve a useful cost-imposing function by compelling China to channel sizable resources toward the hardening of its defense infrastructure. Washington's adherence to the Missile Technology Control Regime (MTCR) bars the United States from assisting Taiwan in extending the range of its missiles or in the miniaturization of warheads.⁸⁴ Nevertheless, one Taiwanese source predicted that the U.S. government would "basically try to stay out of Taiwan's way, so long as Taipei keeps any such counterstrike projects low-key."⁸⁵ Indeed, there is a growing recognition that Taiwan's indigenously developed missile programs strengthen the island's conventional deterrent while reducing its dependency on U.S. arms imports.

Even though the ROC has shifted the main focus of its counterforce strategy towards land- and sea-based missile systems, it has not completely forfeited ground interdiction from the air. For example, the ROCAF has attempted to compensate for the steady hemorrhaging of its combat aircraft by indigenously developing standoff weapons for its Ching-Kuo Indigenous Defense Fighters (IDF). In January of this year, Taiwan unveiled the Wan Chien (Ten Thousand Swords) standoff air-to-surface missile. The Taiwanese MND has reported that the Wan Chien, which bears certain similarities to the U.S. AGM-154A Joint Standoff Weapon, carries more than 100 sub-munitions and has a range of approximately 200 km. In addition to the Wan Chien, Taiwan has indigenously developed an air-launched anti-radiation missile (ARM), the Tien Chien II.⁸⁶ Taiwanese defense officials stated that the goal behind its development is to enable the ROCAF "to strike airports, harbors, and missile and radar positions, as well as concentrated targets, without exposing the aircraft to anti-aircraft fire."⁸⁷ Taiwanese defense planners have also been striving to acquire the ability to penetrate or circumvent China's increasingly dense thicket of air defense systems via an unmanned combat aerial vehicle (UCAV) development program. The strike variant of Taiwan's indigenously designed UCAV is reportedly in its final stages of development and is designed as a stealth platform with low observability features and a payload capacity of 800 kg.⁸⁸

⁸⁴ IISS, *The Military Balance 2014* p. 275.

⁸⁵ Wendell Minnick and Paul Kallender-Umezū, "Japan, Taiwan Upgrade Strike Capability," *Defense News*, May 7, 2013.

⁸⁶ ARMs are missiles designed to detect and home in on an enemy radio-emission source, serving the purpose of neutralizing radars or jamming communications.

⁸⁷ Gavin Phipps and J. Michael Cole, "Taiwan Unveils Upgraded IDF, Wan Chien Stand-Off Missile," *Jane's Defence Weekly*, IHS Jane's, January 16, 2014.

⁸⁸ Kelvin Wong, "Taiwan MND 2013 Report Details UCAV Development," *Jane's International Defence Review*, IHS Jane's, January 27, 2014. See also "Taiwan Developing Weapons-Capable UAV," *Focus Taiwan*, December 6, 2013, available at <http://focustaiwan.tw/news/aip/201312060012.aspx>.

In a recent report commissioned by the Taiwanese opposition, the Democratic Opposition Party (DPP), Taiwanese defense analysts argued that the rapid induction of such a system would enable Taiwan to lower the “risk of human casualties . . . in the face of multiple threats posed by the high density and precision strikes of the PLA missiles, fighters, and bombers.”⁸⁹

Taiwan's Defense Shortcomings

Taiwan's defense planners have displayed creativity in their move towards a more asymmetric strategy, but they have yet to align Taiwan's defense program, which remains fairly symmetrical, with that strategy or resource it properly. Taiwan's defense budget in 2013 represented only 2.1 percent of its GDP, despite President Ma's campaign pledge to increase defense spending to 3 percent of GDP. In that year, the defense budget actually contracted to \$10.5 billion from \$10.6 billion in 2012.⁹⁰

Already hard-pressed financially, Taiwanese armed forces have also had to contend with the additional costs associated with the planned transition towards an all-volunteer force (AVF). Originally scheduled for 2014, the implementation of an AVF has been pushed back for at least two years, due to recruitment difficulties.⁹¹ A recent study by the U.S.-China Economic and Security Review Commission has drawn attention to the fact that Taiwan has increasingly had to divert funds from other portions of the defense budget in order to pay for rising recruitment and personnel costs. As the study notes, between 2009 and 2013,

Taiwan increased the share allocated for personnel (from 40 to a projected 50.1 percent) and reduced shares allocated for operations (from 30.1 to a projected 22.5 percent) and investments (from 28.4 to a projected 25.9 percent) . . . If this trend continues, the Taiwan military may struggle to maintain current operational capabilities, readiness levels, and equipment inventories.⁹²

In January 2014, Taiwan announced that it planned to slash the Taiwanese armed forces by up to 20 percent, dropping from 215,000 troops to 170,000–190,000 over the course of the next five years. The reasons invoked for this decision were demographic (it is estimated that the number of men of draft age in Taiwan will plummet from 117,184 in 2012 to 75,338 by 2025), as well as economic.⁹³

Already hard-pressed financially, Taiwanese armed forces have also had to contend with the additional costs associated with the planned transition towards an all-volunteer force.

⁸⁹ New Frontier Foundation, *China's Military Threats Against Taiwan in 2025*, p.40.

⁹⁰ See IISS, *The Military Balance 2013* (London: IISS, 2013), p.335.

⁹¹ According to Taiwan's MND, the number of recruits in 2012 formed only 72 percent of the government's target figure. As of August 2013, only 4,290 soldiers had been recruited, far below the 28,531 expected that year. See Gavin Phipps, “Taiwan Postpones Plans for All-Professional Force,” *Jane's Defence Weekly*, IHS Jane's, September 19, 2013.

⁹² See Craig Murray and Kyle Churchman, *Taiwan's Declining Defense Spending Could Jeopardize Military Preparedness*.

⁹³ “Taiwan to Slash Armed Forces By Up To 20%,” *Defense News*, January 21, 2014, available at <http://www.defensenews.com/article/20140121/DEFREG03/301210028/Taiwan-Slash-Armed-Forces-By-Up-20->. For figures on men of draft age in Taiwan, see IISS, *The Military Balance 2013*, p. 274.

Together, these trends suggest that Taiwan's future military will continue to shrink while its personnel costs increase.

Meanwhile, China's level of military expenditures continues to grow at a significant rate, with its official defense budget in 2014 standing at roughly \$132 billion, a 12.2 percent increase in nominal terms over 2013.⁹⁴ Many analysts, however, assess China's real defense budget to be higher, although estimates vary significantly between various organizations.⁹⁵ DoD, for instance, estimates that China's total military-related spending in 2013 has already exceeded \$145 billion.⁹⁶

In light of this clear mismatch, the ROC's refusal to raise the Taiwanese defense budget appears even more troubling. Although Taiwanese officials have repeatedly stated that Taiwan would be willing to disburse supplementary funds if Washington were willing to sell it more high-end U.S. military equipment, a deeper explanation to this troubling phenomenon may be found in the present Taiwanese leadership's approach to deterrence.

Since coming to office in 2008, President Ma Ying-jeou has focused on deepening economic engagement with the Mainland and avoiding behavior that might be deemed provocative by Beijing. According to Richard Bush, Ma's strategy is underpinned by a firm conviction that, "Taiwan could give China such a large stake in peace, that it would not dare to risk that stake by coercing the island into submission."⁹⁷ This policy of detente has proven beneficial on many levels, and ties between the island and the Mainland appear to be more stable and less prone to sporadic bursts of tension than in the past. The speed and perceived lack of domestic consultation with which the Ma Administration has been pursuing economic integration with the Mainland has, however, generated considerable political controversy within Taiwan itself.⁹⁸

⁹⁴ Edward Wong, "China Announces 12.2% Increase in Military Budget," *The New York Times*, March 5, 2014, available at http://www.nytimes.com/2014/03/06/world/asia/china-military-budget.html?_r=0.

⁹⁵ Nathaniel Austin, *Lifting the Shroud on China's Defense Spending: Trends, Drivers, and Implications: An Interview with Andrew S. Erickson and Adam P. Liff*, Policy Q&A (Washington, DC: The National Bureau of Asian Research, 2013), available at http://www.nbr.org/downloads/pdfs/PSA/Erickson-Liff_interview_05162013.pdf.

⁹⁶ Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2014* (Washington, DC: DOD, 2014), p.43, available at http://www.defense.gov/pubs/2014_DoD_China_Report.pdf.

⁹⁷ Richard C. Bush, *Uncharted Strait* (Washington, DC: The Brookings Institution, 2013), available at <http://www.brookings.edu/research/papers/2013/01/14-taiwan-bush>.

⁹⁸ This was most apparent during the so-called "Sunflower Movement" in early 2014, during which protestors occupied the Legislative Yuan in order to express their opposition to the Ma Administration's signing of the controversial Cross-Strait Service Trade Agreement (CSSTA). See Andrew Windsor, *Sunflower Movement Questions Future Direction of Cross-Strait Relations: An Interview with John W. Garver*, Policy Q&A (Washington, DC: The National Bureau of Asian Research, 2014), available at http://www.nbr.org/downloads/pdfs/psa/Garver_interview_061814.pdf.

In addition to the growing unease Ma's policies have fostered domestically, the KMT's approach of focusing almost exclusively on economic engagement while neglecting investment in its own defense runs the risk of endangering stability in the medium to long-term future.

Even though cross-strait ties remain on an upward trajectory, this trend may not last indefinitely and could rapidly reverse itself. Certain ominous signs already appear to indicate that Beijing is increasingly dissatisfied with the status quo. In May 2012, China's freshly minted passport design attracted controversy by blatantly featuring two well-known tourist sites in Taiwan. On the margins of the Asia Pacific Economic Cooperation (APEC) Forum held in Indonesia in October 2013, President Xi Jinping reportedly informed a Taiwanese delegation that "The issue of the political divide that exists between the two sides must step by step reach a final resolution and it cannot be passed on from generation to generation."⁹⁹ Perhaps most significantly, less than two months later, China unilaterally declared an expansive ADIZ, which cuts across preexisting Taiwanese, as well as Japanese and South Korean, zones. China's growing assertiveness, when combined with its impatience over the status quo, would suggest that President Ma's professed strategy of "institutionalization of rapprochement as the first line of defense" may be inadequate without a sustained effort, in parallel, to buttress the island nation's conventional military deterrent.¹⁰⁰

Beyond these issues, Taiwan depends on imports for close to 98 percent of its energy consumption and faces a severe energy security challenge. If subjected to a PLA blockade, Taipei would need to rely entirely on commercial and government stockpiles. Under Taiwanese law, local industry, as well as government agencies, are mandated to maintain a certain level of strategic reserves for use in emergency. Independent observers have noted that, despite Taipei's claims that the island could withstand a blockade for several months, "the consistency with which Taiwan's government and private refiners observe the law remains unclear."¹⁰¹ Estimates of the ROC's ability to sustain fuel-intensive combat operations under blockade appear to vary significantly. In 2008, Taiwanese media reports indicated that oil stocks had plummeted to less than twenty days of supply, whereas more recently an analyst calculated that "If Taiwan could protect its oil refineries and strategic reserves in a war with China, it could meet

President Ma's professed strategy of "institutionalization of rapprochement as the first line of defense" may be inadequate without a sustained effort, in parallel, to buttress the island nation's conventional military deterrent.

⁹⁹ Teddy Ng, "Xi Jinping Says Efforts Must be Made to Close the China-Taiwan Political Divide," *South China Morning Post*, October 6, 2013, available at <http://www.scmp.com/news/china/article/1325761/xi-jinping-says-political-solution-taiwan-cant-wait-forever>.

¹⁰⁰ For "institutionalization of cross-strait ties as the first line of defense," see "Building National Security for the Republic of China," speech by President Ma Ying Jeou, videoconference with the Center for Strategic and International Studies, May 12, 2011, available at http://www6.miami.edu/iccas/President_Ma_Transcript.pdf.

¹⁰¹ Rosemary S. Kelanic, *Oil Security and Conventional War: Lessons from a China-Taiwan Air Scenario*, CFR Energy Report (New York: Council on Foreign Relations, 2013), available at <http://www.cfr.org/china/oil-security-conventional-war-lessons-china-taiwan-air-war-scenario/p31578>.

all of its combined military and civilian jet fuel needs in an air war for five months.”¹⁰² In the event of conflict, however, Taiwan might find it extremely challenging to defend its refineries and strategic reserves from air and missile attack. The psychological impact of widespread resource penuries on Taiwan’s population could also prove debilitating, lowering societal resiliency and affecting both civilian and military morale. In order to alleviate such risks, Taiwan’s political leadership should more vigorously enforce domestic legislation governing strategic petroleum reserves and seek to better shield energy stockpiles in hardened and dispersed shelters. Taiwanese economists have also argued that Taipei should seek to focus more intensely on renewable energy sources, such as solar, biomass, and hydropower, and work towards enhancing energy efficiency by investing in Carbon Capture and Storage (CCS) Technology.¹⁰³

In short, the KMT government’s reticence to invest sufficiently in Taiwan’s defense may prove detrimental to crisis stability by encouraging China to seek a political solution on its own terms via acts of coercion or aggression. Meanwhile, Taiwan’s low level of defense spending inadvertently strengthens the arguments of those in the United States who either accuse Taiwan of freeriding on America’s security commitment or believe that the defense of the small island democracy is a lost cause.¹⁰⁴ For all these reasons—and to hedge against both abandonment and annexation—it would be prudent for Taiwan to seek to further bolster its defense posture.

¹⁰² Ibid.

¹⁰³ By investing in more distributed and resilient sources of energy, such as solar cells positioned on rooftops and tidal power extraction systems, Taiwan could enhance its ability to operate while “under siege”. For the need to invest in CCS technology, see Huei-Chu Liao and Shih Ting Jhou, *Taiwan’s Severe Energy Security Challenges* (Washington, DC: The Brookings Institution, 2013), available at <http://www.brookings.edu/research/opinions/2013/09/12-taiwan-energy-security-liao>.

¹⁰⁴ See for example, John J. Mearsheimer, “Say Goodbye to Taiwan,” *The National Interest*, February 25, 2014, available at <http://nationalinterest.org/article/say-goodbye-taiwan-9931>.

CHAPTER 3: DETERRENCE THROUGH PROTRACTION

Taiwan must be prepared to defend itself against a coercive campaign combining air and missile bombardment, cyberattacks, a naval blockade, and ultimately the threat of an invasion. By revising its priorities and investments, Taiwan could present a far more robust defense and thereby strengthen its deterrent posture. Even at levels of defense spending currently envisaged, Taiwan could enhance its asymmetric force posture by strategically reallocating its limited funds. By doing so, Taiwan could increase its ability to hold out under attack, which would buy time for third parties to intervene, the inevitable disruptions to PRC trade and business to be felt, or the international community to pressure China to cease its military campaign. In essence, Taiwan needs to enhance its ability to deter through the threat of a protracted conflict.

What might a refashioned strategy for Taiwan entail? First and foremost, Taiwan must explicitly acknowledge (at least in internal planning) that it can no longer hope to defeat a determined attempt by the PRC to blockade or assault the island in conventional operations on its own. The existing quantitative and growing qualitative gaps between the opposing forces are so large that if the PRC is willing to pay the materiel, economic, and political costs, it could eventually prevail in any one-on-one struggle. To maximize deterrence, Taiwan must therefore focus on capabilities that allow it to raise the military costs of aggression while expanding and protracting any conflict with China to exact maximum economic and political costs. These measures have the additional benefit of increasing both the time available for, as well as the probability of, outside intervention in its favor. Such a strategic approach would allow Taiwan to better exploit favorable asymmetries by applying its advantages against PRC weaknesses.

To maximize deterrence, Taiwan must therefore focus on capabilities that allow it to raise the military costs of aggression, expanding and protracting any conflict with China in order to impose exacting economic and political costs.

These advantages include Taiwan's relatively short geographic defense perimeter (and thus more fluid interior lines of operation, the PLA's lack of experience in conducting sustained, joint combat operations), the possibility of intervention by strong external powers (in particular the United States), and the PRC leadership's likely aversion to protracted conflict.¹⁰⁵

**Hard ROC 2.0—
should be to
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around Taiwan.**

Taking these asymmetries into account, Taiwan could build its own A2/AD network to raise the threshold for PRC aggression. Such a strategy would bear similarities—albeit on a smaller, more local scale—to the PLA's own strategy for deterring the United States from intervening in regional conflicts by inhibiting the U.S. military's ability to project power in the Western Pacific. Taiwanese defense forces should seek to:

- **Deter** the threat or use of PRC force;
- **Degrade** the PRC's ability to achieve air and sea control over and in the Taiwan Strait;
- **Delay** PRC amphibious assaults in the event of a loss of control of the air and waters surrounding the Taiwan Strait;
- **Disrupt** PRC force concentration and C2 if Taiwan fails to deny the PLA lodgment; and
- **Defend** Taiwan principally through the application of unconventional warfare in the event of a large-scale ground invasion of the main island.

The overarching aim of this defense strategy—Hard ROC 2.0—should be to impede the PLA's achievement of control in the airspace and maritime environment around Taiwan.¹⁰⁶ If the PLA were to target Taiwan, it would likely set air supremacy and naval mastery as top objectives in order to facilitate subsequent attacks on Taiwan, break Taiwan's political will, or set conditions for a follow-on invasion.¹⁰⁷

¹⁰⁵ As described by Swaine and Kamphausen, a similar strategy of "defense-in-depth" has been maintained by Taiwanese military planners to exploit four geographic features: "(1) a front line that encompasses the defense of ROC territory lying in close proximity to the Chinese mainland; (2) the middle line of the Taiwan Strait, which has served for over forty years as an unofficial but mutually understood 'boundary' separating PRC and ROC air and naval forces; (3) Taiwan's coastline, which must be successfully defended to ensure the defeat of any invasion force; and (4) the western plain of Taiwan, the successful defense of which would prevent any invading forces from securing Taiwan's north-south Chungshan highway and thereby gain rapid access to the entire island." Michael D. Swaine and Roy D. Kamphausen, "Military Modernization in Taiwan," in Ashley J. Tellis and Michael Wills, eds., *Strategic Asia 2005–06: Military Modernization in an Era of Uncertainty* (Washington, DC: National Bureau of Asian Research, 2005), p. 394.

¹⁰⁶ James Holmes and Toshi Yoshihara have made a similar argument, noting, "Taipei is better off acknowledging this reality rather than trying to win command of nearby seas . . . Instead the Taiwan Navy should resort to sea denial, the strategy of the weaker navy." James Holmes and Toshi Yoshihara, *Defending the Strait: Taiwan's Naval Strategy in the 21st Century* (Washington, DC: The Jamestown Foundation, 2011), p. 5.

¹⁰⁷ For this reason, some have argued that attacking Taiwan would be "a two-part puzzle: air and naval superiority would come first; an invasion would come second." Trefor Moss, "Shifting Balance in the Taiwan Strait," *Jane's Defence Weekly*, IHS Jane's, November 17, 2010, p. 21.

Going forward, military capabilities that are both resilient to attack and pose a credible threat to PLA air and maritime operations will play a central role in delaying an invasion and prolonging any conflict. Achieving these objectives does not require that ROC forces engage in *absolute* denial of PLA operations on the seas around the island or in the air above it. The threshold for effectiveness is considerably lower. ROC forces must simply be able to pose a credible and persistent threat to any potential invasion by air or sea. As long as they retain, or appear to retain, the ability to destroy a significant fraction of the amphibious shipping and/or transport aircraft required to execute a successful invasion, they will reduce the probability of such an invasion being launched. If this logic is correct, it suggests Taiwan could achieve its goals by adopting an operational approach that relies on a sea denial campaign akin to *guerre de course*, complemented and protected by an unconventional air defense campaign. In the event of a successful PLA landing, ROC ground forces should be prepared to conduct a layered defense of the island, aimed at inflicting persistently high levels of demoralizing attrition over time, thus compelling PLA forces to withdraw. In many ways, Taiwan's overarching military strategy would present certain parallels with guerrilla warfare, which, throughout history, has been "geared to a strategy of exhaustion, gaining time in the hope that the enemy would tire or that something else would turn up."¹⁰⁸

In order to implement this strategy, Taipei should focus on four core operational areas: "guerrilla" sea denial, "guerrilla" air defense, layered ground defense, and strengthening its ability to prevail in the so-called "invisible war" (cyber warfare, electronic warfare, intelligence/counterintelligence, and psychological operations). The ROC Air Force should seek to delay the PLA's achievement of air supremacy over the Strait and over Taiwan itself. The ROC Navy and Army should focus on sea denial efforts, in order to maintain the Strait as a protective buffer and complicate the PLA's campaign planning. Additionally, while the Taiwanese Army should maintain critical capabilities for counter-landing operations and preventing PLA forces from securing a lodgment, it should develop plans and design future forces for a more protracted, irregular resistance campaign to counter the PLA should it succeed in establishing a lodgment on portions of the island. Finally, all elements of the ROC armed forces should maximize the use of electronic warfare to disrupt or deceive enemy intelligence, surveillance, and reconnaissance (ISR), C2, navigation, and communications networks. The remainder of this chapter outlines various capabilities and measures that Taiwan would need to develop and undertake as part of Hard ROC 2.0.

¹⁰⁸ Lawrence Freedman, *Strategy: A History* (Oxford: Oxford University Press, 2013), p.179.

The Guerrilla Sea Denial Campaign

An alternative sea denial approach merits consideration: placing greater emphasis on midget submarines, unmanned underwater vehicles, land-based coastal defenses, and offensive mining.

One of the primary objectives of Hard ROC 2.0 would be to pose a credible threat to PLA amphibious ships for as long as possible. Taiwan does not need to control the waters around the island in order to succeed, it must only be able to identify and successfully attack a significant portion of any approaching invasion fleet. To this end, some analysts have argued that Taiwan should continue to concentrate on building its fleet of small, fast attack craft (FAC) armed with ASCMs to target PLA Navy ships, particularly amphibious assault and landing ships.¹⁰⁹ By following this approach, Taiwan could forego the replacement of its four aging submarines, which could save billions of dollars and avoid the perceived technical risk associated with the submarine program. Along these lines, Taiwan is acquiring advanced fast attack craft while the procurement of new submarines has been placed on the back burner. Taiwan intends to commission 30 stealthy Kwang Hua VI fast guided-missile patrol craft and the ROCN plans to arm each Kwang Hua VI with the supersonic HF-3 ASCM.¹¹⁰ A significant drawback to this approach, however, is that Taiwan would rapidly lose air control over the Strait in a conflict. The Kwang Hua VI FACs, despite the fact that they are relatively low-signature platforms, will simply lack the speed, stealth, and organic air defenses required to successfully evade PLA maritime strike aircraft. As a result, ROC investment in FACs, and surface ships more generally, is unlikely to induce the PLA to undertake any significant investments in response, allowing the PLA to continue its efforts to gain air control through development of aircraft and missiles.

An alternative sea denial approach merits consideration: placing greater emphasis on midget submarines, unmanned underwater vehicles, land-based coastal defenses, and offensive mining. Such a strategy could be far more robust, given the near-certainty that Taiwan would lose control of the air over the Strait early in any conflict. This alternative sea denial approach would seek to deprive the PLA of the ability to achieve naval mastery of the Strait quickly, thereby complicating China's ability to project power or effectively implement a maritime blockade of Taiwan. It would also impose greater costs on the PLA Navy and induce it to increase investments in less threatening capabilities, such as those associated with close-in anti-submarine warfare and mine counter-measure operations. The high volume of maritime traffic, relatively high level of undersea noise, and shallow depth in the Strait, moreover, present a maritime environment well-suited to such an approach.

¹⁰⁹ James Holmes as referenced in J. Michael Cole, "Taiwan Giving Up on U.S. Subs, Eyeing Local Plan: Analyst," *Taipei Times*, December 15, 2011, p. 1, available at <http://www.taipetimes.com/News/front/archives/2011/12/15/2003520765>.

¹¹⁰ "Taiwan Hails Missile as 'Aircraft Carrier Killer'," *Associated Press*, August 10, 2011, available at <http://abcnews.go.com/International/wireStory?id=14269450>.

An Unconventional Submarine Force

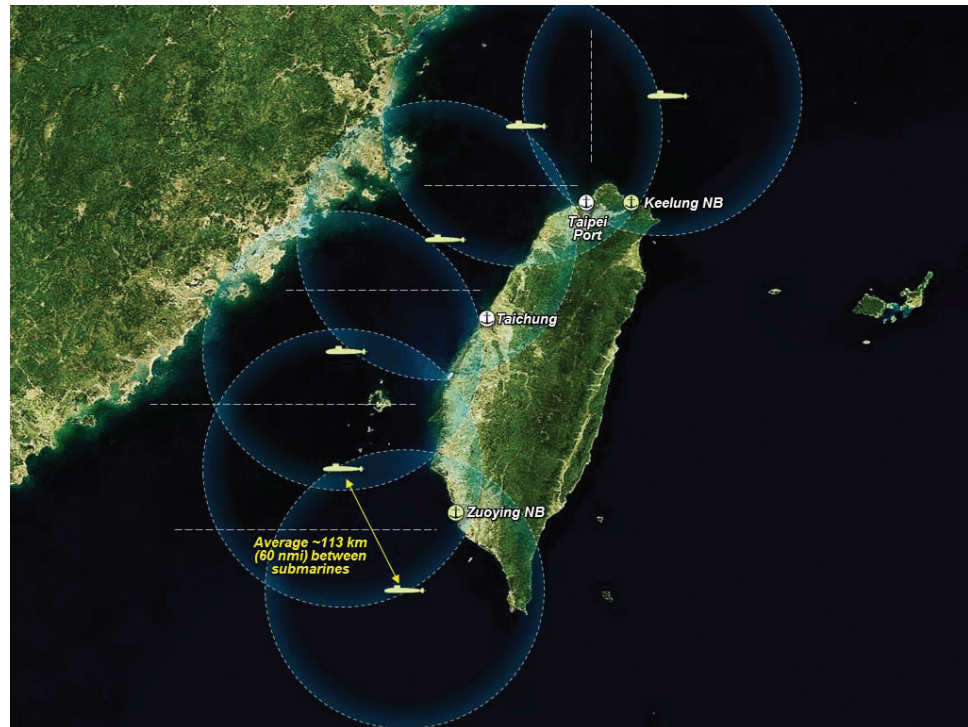
Over the past century, submarines have been one of the most favored systems for conducting sea denial operations, and increased reliance on submarines should form a central tenet of Taiwan's new defense strategy, particularly in light of the growing vulnerability of ROC Navy surface combatants. The United States offered to sell Taiwan eight conventional submarines in 2001, but it has not produced diesel-electric submarines in decades and is unlikely to begin building them.¹¹¹ Conventional submarines are available from European firms, but no European nation is willing to allow a sale due to pressure from the PRC. The lack of foreign suppliers leaves Taiwan with no viable foreign replacement options for its two ex-U.S. training submarines of World War II vintage and two operational boats acquired from the Netherlands in the 1980s. The only real alternative for acquiring new submarines seems to be for Taiwan to build indigenously. With no existing domestic submarine industry, this could prove a serious technical challenge and would likely be more expensive and time consuming than buying directly from foreign suppliers.

While it certainly possesses the shipbuilding prowess needed to launch such a program, the ROC would depend heavily on technical assistance from foreign manufacturers, which might not be forthcoming. Furthermore, the costs of acquiring modern diesel-electric submarines, especially if they were equipped with AIP, would most likely consume a large portion of Taiwan's small defense procurement budget. Assuming Taiwan could overcome the technical challenges of creating a new SSK design and that it could produce them at the same cost per ton as existing SSKs, then procuring eight new submarines would cost approximately \$4.47 billion, which constitutes close to half of Taiwan's total annual defense budget.¹¹² If they had the same ratio of crew per displaced ton as existing submarine designs, then these eight submarines would require a total of 336 sailors to man them. At any given time, no more than six of the eight submarines would be available for patrol, with the others undergoing refit or modernization. This would allow the ROC Navy to place them along a notional "anti-invasion/blockade patrol line," as shown in Figure 3.

With over 60 nm between boats and their relatively slow transit speed, it is likely that there would be significant "gaps" where an invasion fleet could slip between patrolling subs. If an invasion fleet "stumbled across" a ROC Navy SSK, it would no doubt suffer heavy damage, but probably not enough to ensure its defeat before it moved out of range, sank, or chased off the Taiwanese SSK. Neighboring SSKs could also attack the invasion fleet with ASCMs, but these attacks would be limited in size and uncoordinated—increasing the probability that PLAN escorts or fighters covering the fleet could shoot down some or all of the incoming ASCMs.

¹¹¹ "Taiwan's Force Modernization: The American Side," *Defense Industry Daily*, updated June 4, 2014, available at <http://www.defenseindustrydaily.com/taiwans-unstalled-force-modernization-04250/>.

¹¹² In 2013, Taiwan's defense budget was estimated at 307 billion New Taiwan Dollars (NTD), or \$10.3 billion U.S. Figures derived from IISS, *The Military Balance 2014*, p. 280.

FIGURE 3: CONVENTIONAL SUBMARINE PATROL LINE

A picket of midget submarines deployed within Taiwan's acoustically challenging near seas could act as a major obstacle to any Chinese attempt to establish sea control.

Rather than pursuing a limited number of AIP submarines, Taiwan could significantly enhance its sea denial capabilities by acquiring a much larger fleet of midget submarines, which could also be more easily produced indigenously.¹¹³ Countries such as North Korea and Iran have indigenously designed midget submarines that can carry two torpedoes, deploy small teams of commandos for coastal infiltration missions, or lay mines.¹¹⁴ Despite their limited endurance and payloads, they pose a clear danger to U.S. and allied ships transiting through crowded littoral waters.¹¹⁵ A picket of midget submarines deployed within Taiwan's acoustically challenging near seas could act as a major obstacle to any Chinese attempt to establish sea control. Limiting the force structure to essentially the same manpower requirement as the SSKs discussed above could provide crews for 42 mini subs about the same size as the Iranian Ghadir class (120 tons displacement).

¹¹³ The authors thank their colleague Bryan Clark for this suggestion.

¹¹⁴ See Joe Pappalardo, "Is the U.S. Prepared to Face Midget Subs?" *Popular Mechanics*, May 24, 2010, available at http://www.popularmechanics.com/technology/military/news/midget-sub-attacks?click=pm_news.

¹¹⁵ For a description of the threat posed by Iranian midget submarines to U.S. and Gulf Navy ships in the Persian Gulf, see Awad Mustafa, "Gulf Navies Seek Solutions to Iran Midget Sub Threat," *Defense News*, November 9, 2013, available at <http://www.defensenews.com/article/20131109/DEFREG04/311090021/Gulf-Navies-Seek-Solutions-Iran-Midget-Sub-Threat>.

The technical challenges in producing these vessels would be much less daunting than progressing directly to the production of larger SSKs. Each midget submarine could be operated by a crew of eight and equipped with advanced sensors. Even more important than their ability to conduct anti-surface warfare using torpedoes and mines would be the role of the midget submarines conducting ISR to identify the centers of gravity of any potential PLA invasion fleet. This ISR mission would be extremely difficult to accomplish via other less survivable platforms, as the airspace would be highly contested, and the PLA may choose to surround its seaborne invasion forces with throngs of civilian and decoy vessels. After having located PLA bulk troop transports, Taiwan's subsurface assets could then cue Taiwan's ground-based network of precision-strike systems. Transmitting this information in the highly contested communications environment, likely during a conflict, could be challenging. However, the amount of data required to "raise the alarm" is quite small, likely a code word indicating the message refers to "the real invasion" plus a location, time, and course and speed. Most forms of communications jamming seek to increase electronic noise. This reduces signal to noise ratio in the jammed frequencies and, with it, useful bandwidth. If the mini subs are equipped with communications systems capable of communicating across a wide range of frequencies, it is likely they can find parts of the spectrum relatively free from interference and easily transmit their message. Even if all available frequencies experience some level of jamming, minimizing the quantity of data in the message should allow successful transmission in a minute or less, even at very low data rates. In addition to scouting and perimeter defense, some of Taiwan's midget submarines could be dispatched to seed mines. Assuming the midget submarines cost the same per ton as the larger SSKs to produce, their total procurement cost would be about \$1.1 billion. Once received on shore and authenticated, the message would be re-transmitted to the land-based anti-ship cruise missile launchers described in the next section. These transmissions would again use any available radio frequencies as well as fiber optic links to dispersed missile launchers.

Compared to the SSK option—one that Taiwan has been pursuing for over a decade—this would allow much more "dense" patrol coverage and virtually eliminate gaps in sensor coverage exploitable by a PLAN invasion fleet.

The mini subs could thus possess the characteristics and achieve the patrol pattern depicted in Figure 4.

FIGURE 4: MIDGET SUBMARINE PATROL LINE

Furthermore, while Taiwan’s conventional submarines could potentially be targeted at their points of egress as they surge from Taiwanese ports, midget submarines, with their lower requirements in terms of coastal infrastructure, could be more discreetly deployed from multiple points along the Taiwanese coastline.

In the long term, Taiwan would also benefit from cheaper unmanned underwater vehicles (UUVs) capable of placing mines or towing undersea weapons modules to seabed locations before or during a conflict. Unmanned systems could serve as relatively inexpensive platforms for slowing a PLA attack, thinning the PLA Navy’s surface and subsurface fleet, and imposing a greater anti-submarine warfare burden on the PLA in the event of conflict. Taiwan might also indigenously develop shore-launched homing torpedoes, loitering undersea munitions, unmanned sub-surface ASCM pods, and signal-emitting decoys that could complicate the PLAN’s efforts to screen its fleet. Systems of this sort would require advanced navigation and quieting technology, but could be smaller in diameter given their minimal sensor requirements. The strategic dividends flowing from such investments would be enhanced by the fact that, in the eyes of most observers, anti-submarine warfare (ASW) remains the “Achilles’ heel” of the PLAN.¹¹⁶

¹¹⁶ See William S. Murray, “Underwater TELs and China’s Anti-Submarine Warfare: Evolving Strength and a Calculated Weakness,” in Dutton, Erickson, and Martinson, eds., *China’s Near Seas Combat Capabilities* (Newport, RI: China Maritime Studies Institute, 2014).

Land-Based Firepower

As mentioned above, the primary mission of the midget submarines would be to provide warning and targeting data for shore-based ASCM batteries. These ASCM batteries could be procured in large numbers with some of the \$3.4 billion “savings” generated from the midget submarine purchase and would provide the “massed firepower” component of the guerrilla sea denial concept. The HF-2 might be a good candidate for the missile element of the system. It appears likely that four HF-2s, along with all necessary communications, electronics, and elevating mechanisms, could be stored in a launcher with the same external appearance as a standard 20-foot shipping container. This would have several advantages, including the presence of thousands of ready-made decoys already on the island in the form of “real” 20-foot containers and the ease of using civilian trucks to transport them if desired. Furthermore, a number of military logistics vehicles such as the U.S. Marine Corps’ Medium Tactical Vehicle Replacement (MTVR) are capable of independently loading and unloading 20-foot containers and transporting them over rough or poorly maintained surfaces.

Assuming the HF-2 costs the same per pound to procure as the U.S. Harpoon Block II, then each missile would cost about \$1.3 million. A reasonable estimate for the cost of a four-missile “module” in a 20-foot container form factor is therefore of about \$5.7 million. The MTVR to carry the missile module from place to place is likely to cost about \$334,000.¹¹⁷ For about \$6 million, the ROC could thus acquire a highly mobile ASCM launcher with four ready missiles. But how many would be required to pose a significant threat to a PLAN invasion force?

For an invasion fleet architecture of about six Type 071 Yuzhao-class Amphibious Transport Docks and 26 Type 72 Landing Ship Tanks, escorted by virtually the entire PLAN inventory of surface combatants (28 destroyers and 32 frigates), CSBA estimates that just over 1,200 HF-2 missiles would be required.¹¹⁸ This includes enough missiles to sink all of the escorts, two decoy vessels accompanying each amphibious ship, and all of the amphibious ships. It also factors in the loss of 100 missiles, shot down by 24 PLAAF fighters providing around-the-clock combat air patrol protection for the invasion fleet.¹¹⁹ Once the invasion warning is received, any ASCM batteries within range, probably about half, could launch their missiles immediately. These would likely deplete the escort's defensive missile magazines and sink or severely damage an number of ships. The remaining ASCM batteries could then move toward the reported invasion convoy location to be in position to re-engage if the convoy does not turn back. Assuming the invasion is detected halfway across the Strait and advances at 15 knots, the remaining ASCM batteries would have two to three hours to re-position and fire their missiles.

The primary mission of the midget submarines would be to provide warning and targeting data for shore-based ASCM batteries.

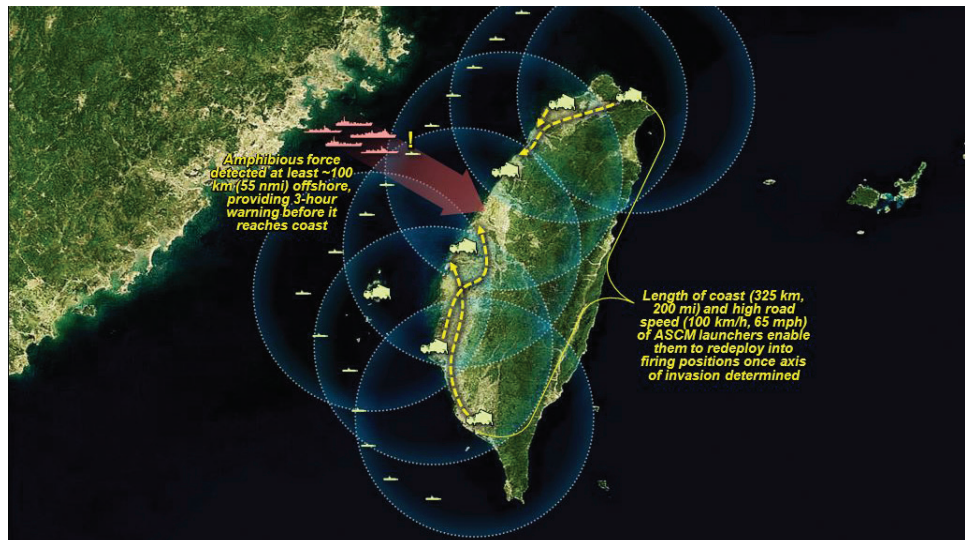
¹¹⁷ In 2004 the U.S. Marine Corps purchased 700 MTVRs for \$185.9 million. Adjusting for inflation this comes to about \$334,000 per vehicle in 2014 dollars. “MTVR,” *Deagel.com*, available at http://www.deagel.com/Military-Trucks/MTVR_a000033001.aspx, accessed June 3, 2014.

¹¹⁸ This calculation is based on the historical analysis of anti-ship cruise missile attacks presented in John C. Schulte, *An Analysis of the Historical Effectiveness of Anti-Ship Cruise Missiles in Littoral Warfare*, Thesis (Monterey, CA: Naval Post Graduate School, 1994), p. 35.

¹¹⁹ This assumes that each fighter launches 8 missiles each with a single shot probability of kill (Pk) of 0.6 against the HF-2 ASCMs using a shoot-look-shoot shot doctrine and that 25 percent of the time fighters mistakenly fire at the same target.

CSBA estimates the total cost to acquire 304 missile modules and the MTRV-like trucks to transport them to be around \$1.85 billion. Adding the \$1.1 billion procurement cost for the 42 midget submarines brings the total cost for this guerrilla sea denial force to just under \$3 billion. This is only about two-thirds the estimated cost of eight modern SSKs and is likely to cause considerably more complications for PLA planners and require far more time and resources for the PLA to overcome.

FIGURE 5: DISTRIBUTED LAND-BASED SEA DENIAL



Sea Mining

The third leg of a sea denial strategy would place heavy emphasis on mining. While mines have not always been effective against large commercial ships, they are much more effective against military ships, whose complexity and need for high performance make them vulnerable to a “mission kill” from a mine strike. If placed in the shallow and noisy environment of the Taiwan Strait or near key ports from which the PLAN operates, mines could force the PLA to conduct time-consuming demining operations.¹²⁰ This effort could slow the pace of a PLA invasion force. Mines could be delivered surreptitiously by fishing vessels, placed by FACs, dropped from aircraft, or delivered by submarines or UUVs. When activated, these mines could prove a major threat to a PRC force at a relatively low cost to Taiwan. Most importantly, ROC mining operations could prolong the conflict, allowing time for other countries to intervene.

¹²⁰ PLA mine counter-measure technology continues to lag behind that of the West, although it is seeking to redress this weakness. For more information on Chinese mine warfare, see Andrew S. Erickson, Lyle J. Goldstein, and William S. Murray, *Chinese Mine Warfare: A PLA Navy ‘Assassin’s Mace’ Capability* (Newport, RI: U.S. Naval War College, 2009).

In 2005, then Commander of U.S. Pacific Command, Admiral William Fallon, urged Taiwan to procure mines for defensive purposes.¹²¹ To date, however, the United States and its regional allies continue to lag far behind China in mine development. The U.S. Navy is currently phasing out the Mk 67 submarine-launched mobile mine and will soon have no submarine-deployable mines.¹²² In addition, the United States has no dedicated surface mine laying capability. Although the U.S. military has a variety of air-delivered mines, such as the Mk 62/63, Mk 65, and Mk 82/83, delivery by non-stealthy aircraft would be problematic during conflict. Furthermore, the U.S. Air Force's limited inventory of stealthy B-2 bombers would likely be in high demand. Nevertheless, the U.S. Navy is increasing the priority placed on offensive mining, which could provide the basis for a new submarine-deployable mining capability.¹²³ Modification of the Mk 48 torpedo could provide both U.S. and Taiwanese forces with an advanced mobile mine capable of being deployed by underwater platforms.

The Guerrilla Air Defense Campaign

If a guerrilla sea denial campaign like the one described above existed on Taiwan, one of the main prerequisites for any PLA invasion would be its elimination or effective suppression. This would require considerable investments in ASW capabilities in order to neutralize the midget submarine threat along with a sustained, persistent aerial ISR/strike operation to find and eliminate as many of the mobile ASCM launchers as possible. A fundamental requirement for the latter operation would be degrading ROC air defenses to the point that PLA aircraft and/or UAVs could loiter continuously over suspected ASCM launch areas. The longer ROC air defenses pose a credible threat to PLA persistent ISR/strike operations, the longer it will take to attrite the ASCM force. It makes sense, therefore, for the ROC to create an air defense capability that is as resilient to attack and suppression as possible so that it can remain sufficiently effective to delay the destruction of the shore-based ASCM force for months. Of course, it will also be able to protect other important targets, but protecting the ASCM force is of prime importance, because once it is eliminated, Taiwan would no longer have an effective means of preventing amphibious landings or countering a blockade.

As noted earlier, the PRC retains roughly 1,100 SRBMs and 2,300 fighters, bombers, and attack aircraft with nearly 500 directly in range of Taiwan. Taiwan, on the other hand, has no ballistic missiles in its current missile inventory and only about 410 combat-capable aircraft. Given the lopsided air competition, Taiwan cannot hope to prevail in a symmetric competition for air control. Taking into consideration the high cost and

¹²¹ William Fallon as referenced in "U.S. official urges switch to 'defense'," *Taipei Times*, October 16, 2005, available at <http://www.taipetimes.com/News/front/archives/2005/10/16/2003275976>.

¹²² Scott C. Truver, "Taking Mines Seriously," *Naval War College Review*, 65, No. 2, Spring 2012, pp. 53–55.

¹²³ Truver, "Taking Mines Seriously," p. 53.

Rather than spending large amounts of funds on additional aircraft, Taiwan should focus its efforts and investments on establishing a highly distributed and resilient network of ground-based air defense systems.

extreme vulnerability of Taiwanese air platforms, Hard ROC 2.0 proposes a radical reorientation of Taiwan's air defense approach. Rather than spending large amounts of funds on additional aircraft, Taiwan should focus its efforts and investments on establishing a highly distributed and resilient network of ground-based air defense systems. As shall be explained in greater depth, the main objective behind Taiwan's air defense strategy should not be to engage in a fruitless attempt to destroy every intruding PLA aircraft, but rather to impose real and virtual attrition on the PLAAF while preserving air defense combat power as long as possible. Taiwanese defense planners should not only seek to impose costs on the PLAAF, but also, and perhaps more importantly, to buy precious time for the United States to intervene.

Hard ROC 2.0 does not eliminate the combat aircraft force structure. The existing combat aircraft serve a number of important purposes including peacetime air sovereignty enforcement. Upgrading Taiwan's existing fleet of F-16s would still oblige the PLA to devote significant resources to suppressing and destroying ROC Air Force facilities early in a conflict. In other words, Taiwan's combat aircraft should be used to induce disproportionate PLA efforts to subdue and destroy them. Indeed, although maintaining ROC *control* over its airspace and the airspace over the Strait may not be a realistic goal, substantially *delaying* or *degrading* the PLA's ability to gain control of ROC airspace remains feasible. The ROCAF's efforts should focus on two main objectives: riding out initial ballistic and cruise missile attacks and making it increasingly difficult for the PLA to establish needed air cover for follow-on naval and amphibious operations.

The PLA's efforts to neutralize Taiwan's air defenses and paralyze the ROC Air Force would likely depend on a mixture of SRBM and LACM strikes in the early hours of a conflict. PLA SRBM salvo attacks against ROC Air Force bases represent an attractive option to degrade Taiwan's ability to conduct defensive counter-air operations. LACM strikes might focus on key air defense radars, C2 facilities, and critical infrastructure targets. The potentially devastating effects of such a missile-centric strategy, however, can be mitigated in three ways. First, its effectiveness can be reduced through a combination of active and increasingly effective passive defensive measures. Second, distributed, mobile air defense systems would be difficult for the PLA to target and re-attack predominantly with missiles. Finally, sustaining PLA strikes would likely require the eventual employment of manned aircraft to deliver a sufficient volume of munitions. The most likely mission for PLA ballistic and cruise missiles would be to disrupt and degrade Taiwanese air defenses enough to allow combat aircraft to follow-up with heavy, sustained strikes to permanently destroy remaining air defenses and pave the way for naval and eventual ground operations.¹²⁴ However, as discussed earlier, missiles alone are unlikely to cause sufficient damage to induce Taiwan's capitulation. The main task for the missile strikes would thus be to "open the door" for fixed wing air attacks

¹²⁴ This description is consistent with Chinese strategic writings that emphasize "key point strikes" to "paralyze first and annihilate later." Roger Cliff et al., *Entering the Dragon's Lair*, pp. 34–35.

by rendering airbases unusable and destroying known ground-based air defenses. Employing manned aircraft might be deemed excessively risky if Taiwan's air defenses have not yet been fully suppressed (or if the PLA's battle damage assessment is limited and the extent of suppression cannot be determined). An air denial strategy should exploit these factors to improve Taiwan's defensive position by maintaining a constant air defense "threat-in-being." Moreover, Taiwan should seek to reduce the PLA's ability to conduct accurate battle damage assessments, thereby inducing its adversary to wastefully expend ordnance when re-attacking targets. Accordingly, Taiwan should emphasize a multi-dimensional approach that combines highly mobile active defenses, increased passive defenses for facilities that cannot be made mobile, and significant CCD measures to degrade PLA ISR and battle damage assessment efforts.

Moving Toward a Guerrilla Air Defense Force

In the near-term, the ROC should seek to ensure the continued effectiveness and survivability of Taiwan's network of ground-based air and missile defense systems. Taiwan's Chiang Wang (Strong Net) air defense network was initially designed to protect Taiwan's airbases, but it can also be used to: 1) create an air defense posture that poses a persistent SAM threat to PLA aircraft; 2) make PLA efforts to suppress Taiwan's air defenses more time consuming; and 3) require that a substantially greater number of PLA missiles and strike aircraft be dedicated to this mission, thereby reducing the number of missiles and aircraft available for other purposes.¹²⁵ As part of this network, Taiwan can exploit its large inventory of Stinger man-portable air defense systems (MANPADS) and its medium- and long-range SAM batteries consisting of I-HAWK, PAC-3, and Tien Kung-I/II systems.

Taiwan is acquiring nine PAC-3 batteries optimized for ballistic missile defense, all of which are scheduled to enter service by 2015.¹²⁶ These systems will provide limited protection for high-value military and civilian sites, including population centers, but the system's interceptors have a shorter range and less lethal warhead against aircraft and cruise missiles than the PAC-2/GEM. Given the need to pose a persistent threat to hostile aircraft, Taiwan should consider stockpiling less costly PAC-2 missiles rather than additional PAC-3 missiles. Taiwan would accept greater risk in defense against ballistic missiles, but China's overwhelming advantage in ballistic missiles relative to Taiwan's interceptors suggests improved capabilities against LACMs and aircraft may be more operationally and cost effective. Taking steps to reduce the time required to setup and take down Patriot batteries to give them a "shoot-and-scoot" capability would improve their ability to survive initial strikes and participate in prolonged "air defense in being"

¹²⁵ "Taiwan: Air Force," *Jane's World Air Forces*, IHS Jane's, available via www.ihs.com, accessed December 27, 2013.

¹²⁶ U.S.-Taiwan Business Council, *The Balance of Air Power in the Taiwan Strait* (Arlington, VA: U.S.-Taiwan Business Council, 2010), p. 6.

operations. The Patriot was not designed for rapid relocation and requires up to thirty minutes to pack up after an engagement and an additional half hour to return to full operational status after a move. Patriot radar trailers are deployed with the engagement control station (ECS), truck-mounted electric power plant (EPP), and associated cables required to provide electrical power to both the radar and engagement control station. It might be possible to integrate the radar and a dedicated electric generator onto a single vehicle and provide the engagement control station with its own power source as well. This would eliminate the need for a separate EPP and streamline relocation by eliminating the need to connect and disconnect power cables.

Over the mid- to long-term, Taiwan's ground based air defense network could be greatly expanded at relatively low cost. Between 2006 and 2011 Taiwan consistently sought to acquire 66 new F-16C/D aircraft from the United States at an estimated cost of almost \$6 billion.¹²⁷ This sale has not been approved by the U.S. government, but a significant upgrade program for Taiwan's existing fleet of about 145 F-16A/Bs valued at \$3.7 billion is moving forward.¹²⁸ According to Jane's, this upgrade includes Active Electronically Scanned Array (AESA) radars, embedded GPS/inertial navigation systems, new electronic warfare management systems, new or upgraded electronic countermeasures pods, tactical datalink terminals, upgraded targeting pods, Joint Helmet-Mounted Cueing Systems, night vision goggles, AIM-9X Sidewinders, Advanced IFF, and Have Glass II radar and IR signature reduction.¹²⁹ Upgrading the engines of the existing F-16A/B fleet to restore performance lost due to increased weight and drag associated with these modifications has also been discussed and could cost between \$700 million and \$1 billion. Assuming half the resources proposed for the F-16C/D purchase could be allocated for the engine upgrade and other air defense related systems, then there could be as much as \$2.3 billion available to fund other air defense capabilities. If one were to add the \$1.5 billion savings generated from adopting the ASCM-centric sea denial concept in lieu of the planned AIP submarines, there would be up to \$3.8 billion available for investment in additional air defense systems—all for about \$3 billion less than the overall modernization spending levels Taiwan has proposed over the past decade.

¹²⁷ No official price for the F-16C sale to Taiwan was ever established. However, a sale of 40 F-16C/D aircraft to the Greek government in 2006 cost \$3.1 billion. The average cost per aircraft in 2006 dollars was \$77.5 million. Adjusting for inflation and the size of the proposed Taiwan sale yields an estimated cost of \$5.98 billion in 2014 dollars. Source for Greek aircraft prices: "Greece," *F-16.net*, http://www.f-16.net/f-16_users_article5.html, accessed June 4, 2014.

¹²⁸ Shirley A. Kan, *Taiwan: Major U.S. Arms Sales Since 1990* (Washington, DC: Congressional Research Service, 2014), p. 24.

¹²⁹ "Lockheed Martin (General Dynamics) F-16 Fighting Falcon," Jane's Aircraft Upgrades (online), accessed September 12, 2014. While not currently part of the upgrade, replacement of existing F100-PW-220 engines with F100-PW-229 engines offering about 23 percent more thrust is also under consideration to restore performance lost due to additional weight and drag associated with many of the preceding improvements. This would add less than \$1 billion to the cost of the upgrade program. Given the difficulty Taiwan faces in securing new fighter aircraft, it should seriously consider adding the new engines to its F-16 upgrade program to maximize their capability. The analysis that follows assumes Taiwan opts to execute the existing upgrade program without the engine upgrade.

A ground-based missile defense system concept could form the core of the guerrilla air defense campaign. As with the guerrilla sea denial concept, this system could leverage existing missiles and the ubiquitous 20-foot shipping container to create an affordable, highly elusive, and resilient air defense network. For purposes of illustration and cost estimation, CSBA used the ESSM as the weapon component of the system. Based on first-order analysis of the volume per missile in the current production MK 56 guided missile vertical launching systems (GMVLS), up to 12 ESSM (or similar) missiles could be accommodated in the form factor of a 20-foot shipping container. There would be significant space left over for an elevating mechanism and retractable sensors. For purposes of this analysis each containerized “module” is assumed to also be equipped with an advanced infrared search and track (IRST) system and modern phased-array radar.¹³⁰

The overall goal of the air defense scheme should be to complicate, disrupt, and slow PLA air operations rather than physically destroy a maximum number of PLA aircraft. This is the air defense approach adopted by the North Vietnamese during Operation Rolling Thunder from 1965 through 1968 and by the Serbian air defenses during Operation Allied Force in 1999. Recent CSBA analysis of Rolling Thunder data indicates that the North Vietnamese air defenses fired only one SAM for every 89 U.S. sorties flown over North Vietnam. This proved sufficient, however, to induce the United States to double the proportion of combat sorties devoted to support missions, from about 20 percent to about 40 percent. This diversion of sorties that could have otherwise been engaged in strike missions resulted in a 25 percent reduction in the intensity of air attacks against North Vietnam, even though U.S. monthly aircraft loss rates never exceeded five per thousand sorties (0.5 percent).

The overall goal of the air defense scheme should be to complicate, disrupt, and slow PLA air operations rather than physically destroy a maximum number of PLA aircraft.

¹³⁰ The AN/AAS-42 IRST currently being added to the U.S. Navy F/A-18E/F Super Hornet fleet and the AN/MPQ-64 F1 Improved Sentinel radar were used as representative systems for cost estimation. Taiwan is capable of producing indigenous systems with similar capabilities.

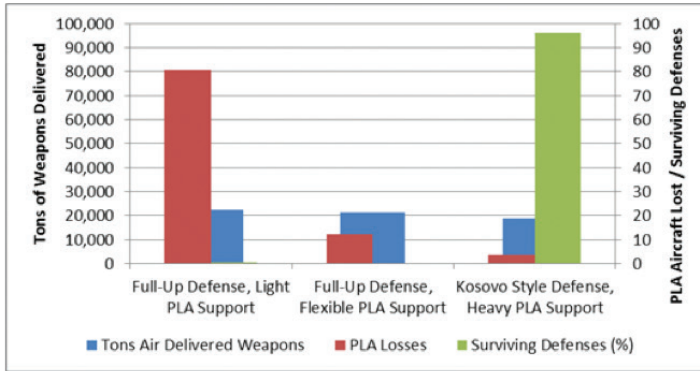
FIGURE 6: GUERRILLA AIR DEFENSE NETWORK

Indeed, for approximately \$3.8 billion, Taiwan could acquire over 1,800 small, containerized air defense missiles and nearly 50 all-terrain vehicles. An MTRV, for example, could theoretically transport up to 12 ESSM with engagement controls and sensors to support distributed engagements in a 20-foot container. More centralized C2 could be achieved by accessing fiber-optic networks. The ESSM can be used for both missile and air defense and has an operational range of approximately 27 nm.¹³¹ Relying primarily on passive IRST sensors would greatly complicate and prolong the task of seeking out and eliminating the highly mobile missile launchers. This tactic would not be able to take advantage of the full range of an ESSM-class weapon, but would probably enable sufficient engagements to induce the PLA to channel a significant portion of its fighter-bomber sorties toward suppressing Taiwan's air defenses.

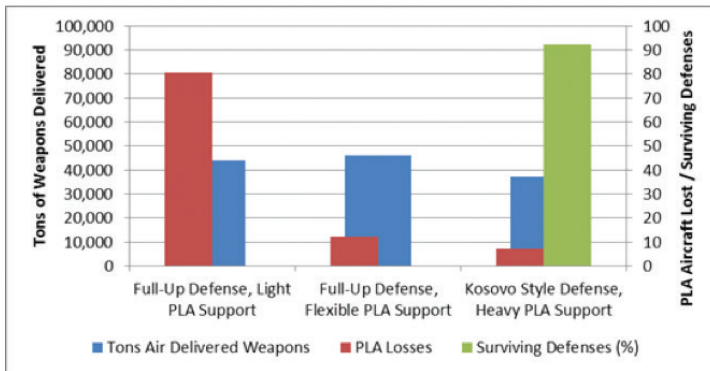
¹³¹ See "RIM-162 Evolved Sea Sparrow Missile (ESSM)," *Global Security*, available at <http://www.globalsecurity.org/military/systems/munitions/rim-162.htm>.

FIGURE 7: COMPARING OPERATIONAL CONCEPTS FOR AIR DEFENSE

15 Day Campaign



30 Day Campaign



60 Day Campaign

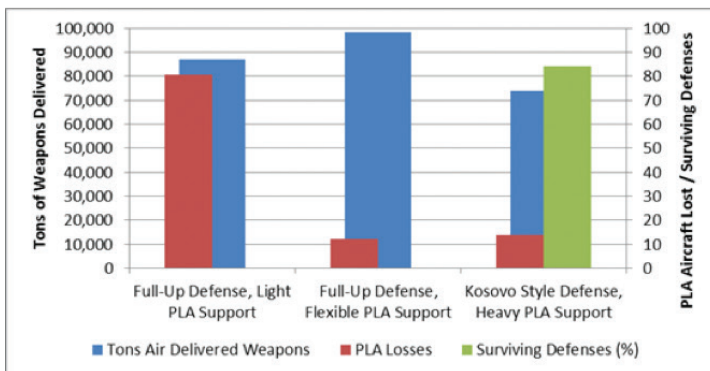


Figure 7 illustrates how effective such a defense might be. The operational principle behind the defenses would emphasize long-term survival to “fight another day” rather than operating at full capacity (or “full-up”) to inflict maximum damage in the short term. The bars in all three panels of Figure 7 indicate the tons of air delivered weapons putatively dropped on Taiwan, using the same PLA sortie rate and force deployment assumptions discussed earlier. They also display the number of aircraft lost by the PLA and the fraction of Taiwanese defenses that remain active. The set of bars on the left in each panel depicts a case where the defenses operate in an aggressive or full-up mode, like the Egyptian SAM defenses in 1973 or the Iraqi defenses in 1991, and if the PLA chooses to maximize the number of strike sorties it flies each day by limiting support sorties to no more than 20 percent of the total.¹³²

- *Full-up Defense, Light PLA Support:*

This particular scenario leads to a rapid depletion of the Taiwanese SAM inventory, with all SAMs expended on only the fourth day of conflict. The PLA forces lose about 80 aircraft in this case (about 16 percent of their deployed force). These losses are significant and could not be sustained for long, but with the defense exhausted, the PLA would have gained air superiority over Taiwan and could thus begin to systematically prepare for an invasion by conducting persistent ISR/strike operations to locate and neutralize ASCM launchers and other strike missions to “soften-up” the island for invasion. Given the stakes involved in any hot war between China and Taiwan, one should also assume that the PLA’s threshold for aircraft losses would be quite high.¹³³

- *Full-up Defense, Flexible PLA Support:*

The second illustrative case presupposes the same engagement doctrine by Taiwanese defenses, but assumes that the PLA, anticipating significant resistance, elects to devote about half of its sorties to support missions designed to suppress and destroy Taiwanese air defenses. This reduces the number of strike sorties and weight of bombs delivered to Taiwan while reducing PLAAF losses per sortie by about 75 percent as well.¹³⁴ A higher PLA support ratio would increase the risk that a Taiwanese SAM

¹³² This level of support sorties is similar to the proportion flown by U.S. forces in less heavily defended areas of North Vietnam during Rolling Thunder. The results assume that two SAMs are fired per engagement with a per engagement SAM Pk the same as the SA-2 achieved during the early months of Rolling Thunder, prior to the introduction of effective countermeasures—about 9 percent per engagement. They further assume that enough SAMs are fired each day to impose the same loss rate on the PLA that the Israeli Air Force suffered on average during the first three days of the Yom Kippur War in 1973.

¹³³ The Israeli Air Force lost about 80 aircraft in the first week of fighting in 1973 from a total force of just 406 aircraft, while the Coalition lost over 20 aircraft to enemy action in the first week of Operation Desert Storm in 1991. See Alfred Price, *The History of U.S. Electronic Warfare*, vol. III (London: Greenhill Books, 2006), p.254; and Eliot Cohen et. al., *Gulf War Air Power Survey*, vol. V (Washington, DC: Air Force Historical Studies Office, 1993), Table 204.

¹³⁴ In this case we assume the PLA loss rate per sortie is the same as for Coalition aircraft at the beginning of Operation Desert Storm in 1991.

launcher be destroyed from about 1 percent per engagement in the previous “Light PLA Support” case to about 10 percent per engagement. Under this putative scenario, the combination of lower SAM lethality and greater risk of destruction would result in the exhaustion of Taiwanese missile defenses on the first day of the conflict.¹³⁵ This case assumes the PLAAF adjusts to a lower support ratio once the defenses are eliminated, as the Coalition did in 1991 against Iraq. The result is a drastic reduction in PLAAF losses. This yields the worst set of outcomes from the defender’s point of view, as it results in the rapid depletion of the defenses, low losses for the PLA and the highest levels of damage to Taiwan for campaigns lasting 30 days or more.

- *Kosovo Style Defense, Heavy PLA Support:*

The third and most optimal case assumes the defenses launch one missile for every 89 PLA sorties flown against Taiwan. This works out to about 15 SAM launches per day in our example and is the same SAM launch per sortie ratio that the United States experienced during Operation Rolling Thunder from 1965 through 1968. It should prove sufficient to force the PLA to maintain a high support to strike sortie ratio as long as SAMs continue to be launched. The relatively low number of engagements per day would allow Taiwanese SAM crews to carefully choose their targets and only engage them in situations where they are confident that support assets are either not present or are distracted by decoys or other deceptive measures. The SAM launcher loss rate per engagement is the same as in the “Light PLA Support” case, but with many fewer engagements per day, Taiwan’s air defense would survive for much longer. ROC air defenses do not shoot down as many PLA aircraft as in the light support case, but over the course of a 60-day campaign, they would succeed in shooting down more aircraft than in the flexible support case. As a result of the “virtual attrition” imposed by the higher PLA support sortie ratio, this air defense posture would actually result in, out of the three cases examined, the lowest tonnage of bombs dropped on Taiwan. Furthermore, unlike either of the previous cases, the defenses retain over 80 percent of their initial capability 60 days into the campaign.

As an added benefit, China’s aircraft would not be able to deploy persistent ISR/strike assets to locate and destroy Taiwanese mobile ground-based missile systems until the ROC’s mobile air defenses were perceived as being definitively neutralized. This could easily take several months if the ROC decided to acquire a widely distributed and easily concealable air defense network, thus providing the United States with more time to intervene in Taiwan’s defense. In all three examples, the PLA would eventually be able to deliver enough weapons to cause “Operation Allied Force” levels of damage to Taiwan. This serves to underscore the need to think in terms of increasing the amount

China’s aircraft would not be able to deploy persistent ISR/strike assets to locate and destroy Taiwanese mobile ground-based missile systems until the ROC’s mobile air defenses were perceived as being definitively neutralized.

¹³⁵ In this example the defenses still attempt to inflict maximum damage and fire 1020 SAMs in 510 engagements on the first day of the conflict, losing all 51 mobile launchers in the process. They succeed in destroying only 12 PLA aircraft.

of time required to reach significant levels of damage—and in terms of virtual attrition—rather than on “winning the war” on more conventional terms by attempting to shoot down the maximum number of PLA aircraft.¹³⁶

Taiwan should also continue to indigenously develop the Sky Bow III (Tien Kung III) Air Defense System, which may be capable of defending against fifth generation fighters.¹³⁷ Taiwan might also consider creating mixed air defense batteries by integrating Sky Bow III and other air defense systems with a capability such as the Goalkeeper Close-In Weapons System (CIWS) to protect air defense radars from cruise missile and PGM attack. Such steps would further complicate the suppression of Taiwan’s air defenses by the PLA. The use of legacy anti-aircraft artillery for point defenses could also complement SAM operations and increase the number of PGMs the PLA would need to employ to destroy air defense targets. Longer term, directed energy and high-powered microwave systems might offer Taiwan more cost-effective capabilities to complement their kinetic air and missile defense systems. The United States is developing directed energy missile defense systems and electromagnetic railguns that have the potential to shift cost-exchange ratios toward the defense, with interceptions potentially costing only a fraction of the cost of attacks.¹³⁸ Combining directed energy weapons with missile defense batteries could greatly complicate the PLA’s operational planning by reducing the likelihood that its missile attacks could successfully overwhelm Taiwan’s layered defenses. Moreover, constructing a network of directed energy weapons that could sustain air and missile defense operations without replenishment of munitions could reduce strain on Taiwan’s supporting infrastructure during high-intensity combat operations. It is, however, unlikely that the United States would share directed energy technologies with Taiwan, given concerns over technological security. Nevertheless, Taiwan could pursue an indigenous program similar to Israel’s “Iron Beam” system to complement its kinetic defenses. While such a system would not be effective against ballistic missiles, it could be used to defend against sub-sonic cruise missiles and aircraft.

¹³⁶ We define aircraft shot down or damaged beyond economical repair by opposing defenses as “real attrition.” “Virtual attrition,” on the other hand, is the loss of potential striking power through diversion of effort into non-strike missions. When air forces devote resources that could be used to attack valuable enemy targets to other activities designed to minimize their own real attrition, whether through fighter escort, electronic jamming, or Suppression of Enemy Air Defenses (SEAD), their striking power is reduced proportionately.

¹³⁷ “Radar-equipped Sky Bow III could repel J-20: defense ministry,” *Radio Taiwan International*, March, 21, 2011, available at <http://english.rti.org.tw/Content/GetSingleNews.aspx?ContentID=121936>, accessed on December 27, 2013.

¹³⁸ See Mark Gunzinger and Chris Dougherty, *Changing The Game: The Promise Of Directed Energy Weapons* (Washington, DC: Center for Strategic and Budgetary Assessments, 2012).

Passive Air and Missile Defenses

In general, it may be more cost effective for Taiwan to place a greater emphasis on its passive missile and air defense capabilities, especially relative to its active ballistic missile defense systems. During the 1970s, Taiwan exploited its mountainous terrain by constructing a number of tunnels and hide sites for its aircraft and key C2 nodes. Taiwan has completed the excavation of a large underground aircraft shelter carved out of a mountain near Hualien at Chiashan Air Base that can accommodate several hundred aircraft and which has its own power supply. Another aircraft shelter at Taitung/Chihhang Air Base has room for dozens of aircraft, and Taiwan is reportedly constructing additional underground aircraft shelters.¹³⁹

As the operating surfaces and taxiways serving these underground facilities could suffer enough damage to prevent the aircraft from operating, Taiwan should invest more heavily in the ability to quickly repair them, as it would oblige the PLA to conduct frequent re-attacks. Creative use of advanced decoys could induce the PLA to expend significant numbers of sorties on strikes against non-operational bases. Establishing a peacetime pattern of fighter operations from a more diversified network of bases, especially in combination with decoy and deception measures, would increase the number of PLA missiles required to target ROC air assets with a corresponding decrease in the number of PLA assets available to destroy other targets.

Greater utilization of highways as dispersal runways could further complicate PLA planning and increase the number of potential “airfields” for which the PLA must account. Taiwan’s Air Force should continue to expand its ability to use non-traditional runways, including 5,000-foot sections of highway as well as civil airfields. The ROC Air Force is already taking important steps in this regard. Taiwan’s Air Force regularly conducts highway-landing drills, thus demonstrating its ability to use unconventional launch and recovery airstrips. The ROCAF should co-locate petroleum, oil, and lubricant (POL) storage, as well as caches of munitions and runway repairs kits, near alternate runways and potential highway diverts.¹⁴⁰ By improving its ability to launch and recover aircraft from unconventional, non-military runways, Taiwan could further multiply the number of targets PLA planners would have to take into account when planning strike operations.

¹³⁹ “Taiwan: Air Force,” *Jane’s World Air Forces*, IHS Jane’s, available via www.ihs.com, accessed December 27, 2013.

¹⁴⁰ Analysts have raised concern over the vulnerability of Taiwan’s fuel production and storage facilities. Rosemary A. Kelanic, for example, has warned that, “Taiwan possesses a mere four refineries on a territory roughly the size of Maryland. These would make tempting targets for Chinese missiles, as might Taiwanese fuel stockpiles. . . . Taiwan’s oil security in a conflict with China hinges upon its ability to defend refineries and stockpiles. If China were to destroy them, Taiwan’s jet fuel supply would be more than strained; it would be nonexistent, with devastating results for Taiwanese airpower.” Rosemary S. Kelanic, *Oil Security and Conventional War: Lessons from a China-Taiwan Air Scenario*, available at <http://www.cfr.org/china/oil-security-conventional-war-lessons-china-taiwan-air-war-scenario/p31578>.

Advanced Camouflage, Concealment, and Deception Measures

While CCD has traditionally been considered part of passive defenses, successful CCD involves a combination of minimizing telltale signatures of valuable assets and creating attractive false targets to induce the attacker to expend resources to either destroy them or more closely examine them to determine their validity. Employment of multi-spectral (e.g., radar, thermal, and visual) decoys to create false targets like radar sites and aircraft and the use of obscurants (e.g., smoke and camouflage) would be an important element in any CCD effort. However, any crisis or conflict involving Taiwan and the PLA will include hundreds of radar, IR, and signals intelligence (SIGINT) sensors. An effective Taiwanese CCD campaign designed to preserve counter-air capabilities will need to present large numbers of attractive “false targets” to PLA sensors across the electromagnetic spectrum. This will require significant numbers of high-fidelity decoys to deceive optical and IR sensors, as well as advanced jammers and decoy air defense communication and radar transmitters. All of these will need to move and (if appropriate) radiate in realistic ways and at appropriate times to sustain their effectiveness over a campaign lasting weeks or months. As mentioned previously, decoy and deception operations have considerable potential to induce the PLA to waste weapons, sensor time, sorties and other resources on targets that are already damaged. The ability to make damaged airfields appear to be operational may prove particularly useful. Indeed, any airfield that might still harbor operational aircraft and shows signs of returning to operational status is likely to receive high priority for re-attack. This might be achieved by covering craters with canvas or plastic tarps designed to look like fresh concrete repairs and deploying high-fidelity decoys.

In the cyber domain it may be necessary to create false networks and communications traffic correlated with physical and electronic decoy operations to confuse PLA cyber reconnaissance units.

In the cyber domain it may be necessary to create false networks and communications traffic correlated with physical and electronic decoy operations to confuse PLA cyber reconnaissance units. The success of these advanced CCD measures will likely have a substantial impact on both the number of air defense assets that survive the initial PLA strikes and the length of time they can present a meaningful threat to PLA air operations against Taiwanese targets. Advanced CCD efforts would greatly complicate the PLA’s ISR/strike efforts and would tax PLA sensors, networks, and battle damage assessment capabilities, eroding the PLA’s confidence in the success of any initial strikes.

Fighter Modernization and Improved Air-to-Air Munitions

In addition to active and passive defenses, Taiwan should continue rebalancing its fighter force structure. Taiwan currently maintains 18 fighter squadrons, and ROC Air Force training has a tendency to overemphasize ground attack operations.¹⁴¹ By rebalancing its fighter force structure to increase the number of aircraft dedicated to and optimized for defensive counter-air and maritime strike roles, fighters could hold out a greater prospect contributing toward campaigns to deny the PLA control of the air and sea.

¹⁴¹ IISS, *The Military Balance 2011* (London: IISS, 2011), p. 274.

In the near term, modernizing Taiwan's aging fighter force and weapons inventory is critical. Realistically, Taiwan's aircraft will not be as capable as the PLA's more advanced combat aircraft, such as the J-11, J-20, and J-31 fighters now in development. Nevertheless, ROCAF airframes should be armed with advanced sensors and long-range air-to-air missiles in order to pose a more credible air-to-air threat. Taiwan already possesses AIM-120C Advanced Medium-Range Air-to-Air Missiles (AMRAAMs) and indigenously produced Tien Chien (Sky Sword) beyond-visual-range (BVR) air-to-air missiles. Expanding its inventory of BVR air-to-air weapons and increasing the carrying capacity of its fighter aircraft could further enhance its air denial posture. Unfortunately, the ROC Air Force's BVR weapons have a longer range than the ROCAF's legacy fire control radars. The aging APG-66 radar on the F-16A/Bs, for example, was designed for short-range air-to-air weapons like the AIM-7M Sparrow; it therefore lacks the capability to employ AMRAAMs at their optimal range. In 2011, the United States approved a \$3.7 billion deal to upgrade Taiwan's current inventory of 145 F-16A/B fighters with active electronically scanned array (AESA) radars, updated global positioning systems (GPS), and improved electronic warfare systems and data link terminals. These upgrades will significantly improve the air-to-air performance of the F-16A/Bs by extending the effective range of their BVR weapons.¹⁴² Unfortunately, during the scheduled upgrade program of these fighters, it is estimated that as many as a squadron at a time of F-16 A/Bs will be unavailable for combat duty, further reducing Taiwan's air fleet.

Over the longer term it is not clear that Taiwan could expect to gain as much advantage from acquiring more advanced combat aircraft as it could from investing in more resilient air defense capabilities such as those described earlier. With that in mind, it may be wise to consider additional upgrades to the F-16A/B fleet to extend its useful life and continue to present the PLA with an "air force in being" problem that is likely to complicate PLA planning and operations, all while absorbing substantially more resources to neutralize than Taiwan will need to expend in F-16 "life extension" upgrades.

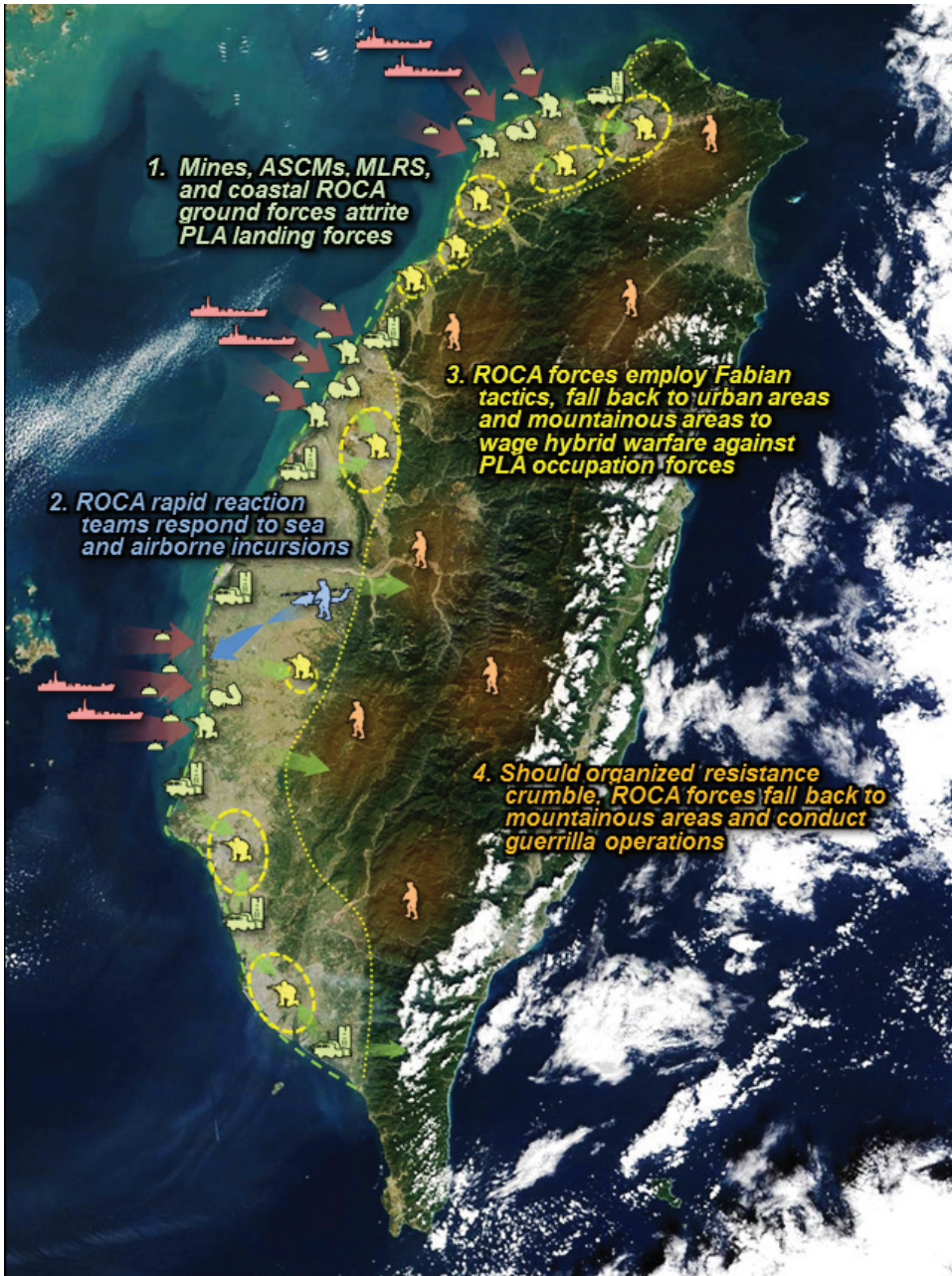
¹⁴² U.S.-China Economic and Security Review Commission, 2011 Annual Report to Congress (Washington, DC: U.S. Government Printing Office, 2011), p. 285.

Layered Ground Defense

As mentioned earlier, one of the primary missions of Taiwan's army would be to interdict PLA amphibious forces in transit. If, however, interdiction operations failed to halt a determined PLA invasion force, the ROC Army would provide Taiwan's last line of defense. Highly trained and with a growing focus on rapid combined-arms operations, the ROC Army currently positions approximately 80 percent of its manpower on Taiwan, with the remaining 20 percent stationed on Taiwan's offshore islands. The ROC Army would focus first and foremost on counter-landing operations. Taiwan's challenging littoral geography and heavily fortified beaches would pose severe challenges to the PLA, which possesses no prior combat experience in amphibious and airborne assault. If the PLA succeeded in establishing a beachhead, however, the ROC Army could implement a strategy of Fabian Defense, delaying and harassing Mainland forces and sabotaging key transport infrastructure in order to slow their advance toward Taipei.¹⁴³ Taiwanese ground forces could melt into the island's urban and mountainous areas in order to wage a "war of a thousand cuts" against PLA occupation forces. This would require a stronger emphasis on civil defense, as well as the adoption of a "starfish strategy," in which small tactical ground units would operate autonomously within a communication-denied environment to sustain irregular resistance operations. The ultimate goal of such a Fabian campaign should be to render any attempt by the PRC to occupy and pacify Taiwan as protracted and painful as possible, thereby raising the perceived costs of invasion, buying time for international intervention, increasing the possibility of horizontal escalation in the PRC or elsewhere along its periphery, and ultimately compelling Beijing to withdraw or revise its objectives.

¹⁴³ Fabian Strategy draws its name from the famous Roman general Quintus Fabius Maximus. After Rome had suffered two major defeats against Hannibal's Carthaginian forces in 217 BC, Fabius chose to eschew large-scale battles and to adopt a scorched earth policy. Small units of Roman troops continuously harassed their more conventionally powerful opponents and sought to sever their supply lines. Since then the term has come to designate attrition-oriented strategies employed by conventionally inferior powers. See Adrian Goldsworthy, *The Punic Wars* (London: Cassell Military, 2000), pp.352.

FIGURE 8: LAYERED GROUND DEFENSE



Counter-landing Operations

Ever since the 1950s, the ROC Army's core operational objective has been to repel a PLA amphibious invasion. Taiwan's beaches have, as a result, been heavily fortified, and ROC Army training places great emphasis on counter-landing operations. Taiwan's doctrine with regard to counter-landing operations is strategically defensive but tactically offensive in nature, prioritizing speed and firepower as a means of conducting devastating counterstrikes on PLA amphibious forces. The ultimate goal of such operations, notes Taiwan's 2013 QDR, must be to "execute continuous counterstrikes to destroy enemy forces on the beachhead before they secure their footholds."¹⁴⁴ Taiwan's most recent annual defense report emphasizes the fact that,

If the enemy attempts an amphibious landing with its superior naval and air support, the ROC Armed Forces need to apply the overall capabilities of all-out defense, construct defensive systems in the entire in-depth defense area, and conduct continuous counter-strikes to defeat enemy forces at the beachhead before lodgements are secure.¹⁴⁵

Taiwanese ground forces might find themselves faced with the challenge of repelling a landing while under heavy fire from PLA naval and air assets.

Accordingly, the ROC Army would attempt to repel PLA amphibious forces via crippling barrages of shore-based firepower, while maintaining an operational reserve to respond to PLA forays elsewhere along the Taiwanese coastline or in the event of an airborne assault. Surf and land minefields along Taiwan's largest beaches would slow a PLA amphibious assault, while indigenously developed truck-based howitzers and truck-mounted multiple-launch rocket systems (MLRSs) such as the Ray Ting 2000 could be dispatched toward landing beaches to provide supporting artillery fire. Taiwanese infantry and light armored vehicles equipped with Javelin anti-tank missiles could target landing craft and mechanized units. If one presumes that a PLA amphibious assault would only take place once Beijing had assumed air and sea control, Taiwanese ground forces might find themselves faced with the challenge of repelling a landing while under heavy fire from PLA naval and air assets. This would require Taiwanese commanders to coordinate their counterstrikes from hardened C2 structures below ground, while Taiwanese troops armed with MANPADS such as Stinger missiles could help compensate for the lack of air cover by modestly shielding Taiwanese ground forces from some PLA fixed- and rotary-wing aircraft. An expansion of Taiwan's subterranean infrastructure along its shoreline could allow Taiwanese ground troops to move along relatively protected interior lines and launch surprise assaults against PLA ground forces.

¹⁴⁴ Quadrennial Defense Review Editing Group, MND, *2013 Quadrennial Defense Review*, p.40.

¹⁴⁵ Quadrennial Defense Review Editing Group, MND, *2013 Quadrennial Defense Review*, p.86.

Geoffrey Till, a well-known British naval historian, has observed that, traditionally,

The defenders' main difficulty in dealing with forces hitting the beach derives from the fact that the invader has the initiative in deciding the time and place of his assault. The defender therefore has to spread his defenses along the coastline and keep a reserve back to deal with landed forces that local defenses cannot contain and expel. The famous dispute between Rommel and von Runstedt before the Normandy landings was not about defense either on the beaches or further inland; instead it was about the balance that should be struck between the two.¹⁴⁶

Taiwan's military doctrine attempts to strike such a balance through the use of rapidly deployable airborne forces. The ROC Army recently integrated its army aviation and special warfare brigades under one central command called the Aviation and Special Forces Command (ASFC). The ASFC serves as a quick reaction force in the event of PLA landings, as well as to counter any attempt by Beijing to conduct a decapitation strike or a minimum warning invasion. In such scenarios, PLA SOF or airborne troops might attempt to capture key airfields or to kill Taiwan's key political leaders. Reportedly heavily inspired by Israeli tactics, Taiwan's airborne forces have recently conducted a series of exercises simulating heliborne counterstrikes against PLA forces attempting to capture a Taiwanese airstrip.¹⁴⁷

Hybrid Warfare, Urban Combat, and the Defense of the Interior

If China were to gain air and sea superiority, the ROC Army's attempts to mass forces for counter-landing operations would likely fail. To hold out the prospect of a protracted land campaign and occupation, the ROC Army should move towards a more decentralized, modular structure, which places greater emphasis on hybrid urban warfare, civil defense, and guerrilla warfare. Frank Hoffman has defined hybrid warfare as "a combination of conventional military forces and irregulars . . . aimed at achieving a common political purpose."¹⁴⁸ Hybrid campaigns can pose a significant asymmetric threat to a conventionally superior foe by blending "the lethality of state conflict with the fanatical and protracted fervor of irregular warfare."¹⁴⁹ In the case of Taiwan, an overt embrace of hybrid warfare could serve as a powerful signal to the PRC.

In the case of Taiwan, an overt embrace of hybrid warfare could serve as a powerful signal to the PRC.

¹⁴⁶ Geoffrey Till, *Seapower: A Guide for the Twenty-First Century* (London: Frank Cass Publishers, 2004), p. 208.

¹⁴⁷ "Taiwan's Military Showcases Defense Capability," *Kyodo News International*, August 26, 2013, available at <http://www.globalpost.com/dispatch/news/kyodo-news-international/130826/taiwans-military-showcases-defense-capability-wake-sca>.

¹⁴⁸ Peter R. Mansoor, "Hybrid Warfare in History," in Williamson Murray and Peter R. Mansoor, eds., *Hybrid Warfare: Fighting Complex Opponents from the Ancient World to the Present* (New York: Cambridge University Press, 2012), p.2.

¹⁴⁹ Frank G. Hoffman, "Hybrid Warfare and Challenges," *Joint Forces Quarterly*, 52, 1st quarter, 2009, p. 38.

Indeed, by raising the specter of a grinding war of attrition, the island democracy may better deter any future attempt at forcible unification by the Mainland.

The PRC's last major conflict was fought against a conventionally inferior adversary, which nevertheless managed to impose serious costs on its conventional forces. During the 1979 Sino-Vietnamese war, Vietnamese irregular units, or *dan qan* (citizen soldiers) operating from a decentralized network of regional command centers inflicted a disproportionate number of casualties on the PLA. Vietnam's citizen soldiers had received small arms training from the People's Army of Vietnam (PAVN) several months before China's attack and been charged with delaying China's advance, imposing a maximum amount of casualties, and disrupting the PLA's lines of communication.¹⁵⁰

In the event of a successful PLA landing on Taiwan, certain aspects of Vietnam's unconventional strategy could be replicated. For example, by forming neighborhood militias and prepositioning caches of small arms, explosives, and G-RAMM clandestinely throughout major cities, Taiwan could lay the groundwork for a protracted guerrilla campaign.¹⁵¹ Small units of ROC Army conventional forces specialized in urban and mountain warfare should be kept in reserve and tasked with coordinating sabotage and resistance efforts, as well as with maintaining morale. Taiwanese Army Rangers, for example, are expertly trained in both urban and mountain warfare and could spearhead guerrilla operations in the event of an amphibious invasion. Rather than remaining operationally distinct, reserve units and professional forces could be comingled. This will require a conceptual shift within the ROC Army's war planning away from its dominant focus on high-end symmetrical conflict on land involving armored formations and towards more short-range, asymmetric, urban engagements. David Kilcullen has underscored the key role decentralization can play in the successful prosecution of urban warfare, arguing,¹⁵²

The ability to quickly aggregate and disaggregate (mass and disperse) forces and fires is the critical aspect of organizing for urban combat. . . . Ground forces will need to move dispersed but then fight concentrated. This implies a modular structure, perhaps down to a much lower level than the past.

¹⁵⁰ Henry J. Kenny, "Vietnamese Perceptions of the 1979 War with China," in Mark A. Ryan, David M. Finkelstein, and Michael A. McDevitt, eds., *Chinese Warfighting: The PLA Experience since 1949* (Armonk, NY: M.E. Sharpe, 2003), pp.217–241.

¹⁵¹ Some analysts have come to similar conclusions, noting that "Strategic endurance involving an effective, long-term, organized resistance could enhance deterrence by raising the costs of an amphibious invasion and forcible occupation of the island," and, "A system of civilian militias is worth considering for strategic endurance." See Blumenthal et al., *Deter, Defend, Repel, and Partner*, p. 12.

¹⁵² David Kilcullen, *Out of the Mountains: The Coming Age of the Urban Guerrilla* (New York: Oxford University Press, 2013), p.264.

In order to better tailor its force structure to the exigencies of modern urban warfare, the ROC Army will therefore need to move away from its traditionally rigid hierarchical command structures by empowering its corps of non-commissioned officers. The hidden presence of small, autonomous units equipped with MANPADS, jammers, explosives, and portable anti-tank guided missiles (ATGMs) within dense urban areas would pose a significant risk to PLA forces, as well as sap their troops' morale and complicate their ability to conduct proper battle damage assessment (BDA).

There are encouraging signs that the paradigm shift towards hybrid warfare is already underway. Reports have indicated that Taiwanese strategy increasingly "hinges on using non-military installations (government facilities, schools, warehouses) as staging points during wartime," and that "such unidentified locations scattered throughout the country would provide cover for troops."¹⁵³ Taiwan's 2013 Annual Defense Report also specified that numerous civil requisitions plans existed, including

...over 10,000 fixed facilities, 30,000 vehicles, over 2,000 heavy machinery, over 50 vessels, over 300 fishing boats, and over 60 aircraft that can be immediately mobilized during wartime to effectively support military operations.¹⁵⁴

The recent debate within Taiwan over the potential procurement of surplus U.S. Abrams tanks provides another indication of the ROCA's shifting operational focus. A number of Taiwanese defense analysts have rightly argued that the procurement of 200 new main battle tanks (MBTs) would not serve the island's strategic interests.¹⁵⁵ This is largely due to the island's geography. With a mountainous interior and a coastline that is either heavily urbanized or dotted with rice paddies, Taiwan's landscape is not conducive to armored warfare. The challenging nature of the island's geography acts as a key enabler for a defense-in-depth strategy and should be leveraged in order to render the island as "indigestible" as possible. The ROC's difficult mountainous terrain and sprawling cities provide two geographic arenas in which Taiwanese ground forces can level the playing field by imposing disproportionate costs on the PLA. Taiwan's mountain ranges contain numerous hide sites and provide ideal rear bases for the conduct of hybrid operations. Moreover, roads running through mountain passes and over bridges can be easily sabotaged. The island's urban areas likewise provide Taiwanese ground forces with the means of prevailing against an opponent inexperienced in the conduct of urban warfare. ROC training increasingly involves drills in urban environments in addition to more traditional counter-landing exercises.

¹⁵³ "Taiwan," *Jane's World Armies*, IHS Jane's, last updated August 21, 2013.

¹⁵⁴ National Defense Report Editing Committee, MND, *2013 ROC National Defense Report*, p.152.

¹⁵⁵ Wendell Minnick, "Debate Renewed over Taiwan's Need For Tanks," *Defense News*, July 30, 2013, available at <http://www.defensenews.com/article/20120730/DEFREG03/307300002/>.

Perhaps one of the greatest impediments to the ROC's move towards hybrid warfare lies in the ROC's decision to move towards an all-volunteer force.

Perhaps one of the greatest impediments to the ROC's move towards hybrid warfare lies in its decision to move towards an all-volunteer force. Not only will this reform accentuate an already strong civil-military divide (a recent poll showed that 74.7 percent of the Taiwanese population had a poor opinion of Taiwanese armed forces), but it also runs the risk of lowering the operational readiness of Taiwan's reserve forces and civilian population.¹⁵⁶ Under current plans, men born on or after January 1, 1994 will only be required to serve for four months rather than one year, a short period of time during which it will be difficult for them to learn more than the bare rudiments of armed combat. Small, lightly populated nations such as Singapore and Israel have long relied on conscription as a means of preserving both their military strength and their national unity in the face of larger prospective adversaries.¹⁵⁷ When confronted with an increasingly assertive and powerful China, Taiwan must make sure to incentivize readiness for hybrid warfare. Mandatory military service, for both men and women, provides a means of better accomplishing this aim.¹⁵⁸

The Starfish Strategy

Finally, China's intense focus on integrated network and electronic warfare suggests that in the event of conflict, ROC Army forces must be prepared to operate in a communications-denied environment.¹⁵⁹ Taiwan's 2013 QDR prioritizes the security of Taiwanese C2 systems through early warning and effective countermeasures and various passive defense measures such as hardening and CCD. Major Taiwanese C2 nodes such as the Heng Shan Military Command Center in Taipei or the Kinmen Defense Command Headquarters on the offshore island of Kinmen are buried deep underground and connected by fiber-optic cables. Nevertheless, Taiwanese troops may not only need to learn how to operate in smaller, more autonomous units, but also how to "fight in the dark" in the event of a severe degradation of the island's battle networks.

¹⁵⁶ See Kevin McCauley, "A Tale of Two Volunteer Programs: China and Taiwan," *China Brief*, The Jamestown Foundation, 13, No.17, August 23, 2013, available at http://www.jamestown.org/uploads/media/China_Brief_Vol_13_Issue_03.pdf; and J. Michael Cole, "Taiwan's All-Volunteer Military: Vision or Nightmare?" *The Diplomat*, July 9, 2013, available at <http://thediplomat.com/2013/07/taiwans-all-volunteer-military-vision-or-nightmare/>.

¹⁵⁷ For a good discussion of the strategic and societal ramifications of universal military service in Israel, see Daniel Maman, Eyal Ben-Ari, and Zeev Roshenhek, eds., *Military, State and Society in Israel* (New Brunswick, NJ: Transaction Publishers, 2001).

¹⁵⁸ In Taiwan conscription has historically applied to men exclusively.

¹⁵⁹ Chinese military theorists view electronic and information warfare as key enablers for follow-on operations. One well-known strategist, for example, makes the following observation, "In the modern military, each combat unit and each weapon system are coagulated to become one operational body through the bonding action of the military information system, and if it loses this bonding action, then the military becomes a plate of loose sand," Yuan Wenxian, *Lectures on Joint Campaign Operations* (Beijing: PLA National Defense University Press, 2009), p.2.

One Taiwanese military analyst has suggested that ROC forces should move towards adopting a “starfish strategy.” The term “starfish strategy” was first popularized as a means of describing the internal structure of certain business organizations. Organizations that are more decentralized, argue certain business strategists, are more likely to self-regenerate in the event of major damage, much as a starfish’s capacity for neural regeneration allows it to grow a new leg in the event of amputation.¹⁶⁰ Rigid, hierarchical organizations, on the other hand, are frequently less resilient to major change and suffer from an inability to overcome crippling blows to their anatomy. Applying this analogy to Taiwan’s armed forces, Hsi-hua Cheng suggests that, “Taiwan should try to apply this strategy to decentralize the commanding activity to the very basic units of its organizations, equipment, facilities, or personnel, to ensure that sustainability and survivability will expand.”¹⁶¹ Moving towards a starfish strategy would not only imply the adoption of a more modular command structure, with smaller units and higher-quality NCOs, but also the recurrent conduct of joint exercises simulating combat operations under conditions of lost or degraded communications.

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The Invisible War

In his classic treatise on statecraft, the ancient Indian strategist Kautilya famously made the distinction between what he referred to as “open and silent warfare.” “Open warfare,” he observed, “is fighting at the place and time indicated,” whereas “silent warfare” consists of “secret practices and instigations through secret agents” through which a belligerent could “prevail by maintaining secrecy, and striking again and again from concealed positions.”¹⁶² For Kautilya, true victory lay in the hands of those who could excel in the practice of both arts of war. Contemporary PLA strategists apply a similar reasoning to their discussions of “beyond-limits” or “unrestricted warfare,” and place a heavy emphasis on the disruption of enemy battle networks, psychological operations, stratagems, and covert warfare.¹⁶³ Taiwanese defense forces must: operate with equal agility on “grey” battlefields, acquiring the ability to disrupt or corrupt the PLA’s battle networks; continue operations through cyber and electronic attacks; and even conduct disruptive peripheral and psychological attacks against the Chinese Mainland.

¹⁶⁰ See Ori Brafman and Rod A. Beckstrom, *The Starfish and the Spider: The Unstoppable Power of Leaderless Organizations* (New York: Penguin Group, 2006).

¹⁶¹ Hsi-Hua Cheng, “The Employment of Airpower in the Taiwan Strait,” in Richard P. Hallon, Roger Cliff, and Phillip C. Saunders, eds., *The Chinese Air Force: Evolving Concepts, Roles and Capabilities* (Washington, DC: National Defense University Press, 2012), p.343.

¹⁶² Roger Boesche, *The First Great Political Realist: Kautilya and his Arthashastra* (Lanham, MD: Lexington Books, 2002), p.82.

¹⁶³ According to two preeminent Chinese strategists, “In terms of beyond-limits warfare, there is no longer any distinction between what is or is not on the battlefield. Spaces in nature including the ground, the seas, the air and outer space are battlefields, but social spaces such as the military, politics, economics, culture and the psyche are also battlefields. . . . Warfare can be military, or it can be quasi-military, or it can be non-military.” Qiao Lang and Wang Xiangsui, *Unrestricted Warfare* (Beijing: PLA Literature and Arts Publishing House, February 1999), pp.206–207.

Disrupting Battle Networks: Cyber Warfare, Electronic Harassment, and Spectrum Denial

There has been much debate in the United States over the past several years evaluating the potential benefits and risks of disrupting the enemy battle networks, composed of its ISR, C2, information processing, communications, and battle damage assessment systems. For the United States, the stakes would certainly be high because such attacks might require strikes or other direct actions against the adversary's territory, which could be highly escalatory. However, in the event of war between the PRC and Taiwan, a different dynamic might ensue. Given that Taiwan's very survival would be threatened, it could have far less hesitation to disrupt or deceive the PLA's battle networks, especially in support of Taiwan's broader air and sea denial efforts. Such activities might involve both kinetic and non-kinetic means. Network attacks could greatly complicate PLA planning and potentially slow the tempo of PLA operations in war. Even the mere possession of capabilities to disrupt or deceive battle networks could undermine PRC leaders' confidence in the PLA's ability to achieve information dominance prior to initiating hostilities, as well as their confidence in defeating Taiwan quickly. The ability to disrupt the PLA's networks and to conduct offensive cyberwarfare, moreover, represents the most viable potential deterrent and cost-imposing strategy available to a country like Taiwan—with an inferior military but a technologically advanced society.

The PRC has developed sophisticated cyber capabilities and established whole organizations to conduct such operations to augment more conventional forms of attack.¹⁶⁴ Taiwan therefore must assume that its key networks will be targeted for attack by the PLA at the outset of a conflict, if not beforehand. Given the difficulties of attributing cyberattacks to their perpetrators, such attacks are unlikely to be deterred. Cyber warfare also tends to be “offense dominant,” meaning that attackers maintain certain advantages over defenders in terms of the relative costs between attacking and defending forces. In particular, attackers can choose a single avenue of attack from numerous options, whereas defenders must protect many avenues of approach, making network defense significantly more expensive than network attack. All of this suggests that rather than prioritizing network defenses, it would be prudent for Taiwan to develop robust, redundant networks, coupled with retaliatory network attack capabilities.

ROC efforts to disrupt PLA battle networks would be most valuable if other countries come to Taiwan's aid. Admiral Jonathan Greenert and General Norton Schwartz have noted the importance of “offensive operations to deceive or deny adversary battle networks, particularly ISR and C2 systems. This reduces the effective density of adversary

¹⁶⁴ See, for example, the report on Chinese cyber operations prepared for the U.S.-China Economic and Security Review Commission: Bryan Krekel, Patton Adams, and George Bakos, *Occupying the Information High Ground: Chinese Capabilities for Computer Network Operations and Cyber Espionage* (Falls Church, VA: Northrop Grumman Corporation, 2012), p. 10.

anti-access systems . . . ”¹⁶⁵ Others have similarly noted, “blinding China’s ISR may be critical to blunt its attack. . . . [The] ‘blinding campaign’ is the key sub-campaign that enables all the others.”¹⁶⁶ If disruption of enemy battle networks is central to effective defense against anti-access forces, what roles might Taiwan play?

Taiwan appears uniquely suited to disrupt PLA battle networks. First, it may have greater access than any other U.S. partner or ally to sensitive PRC networks. Hundreds of thousands of people travel each month between Taiwan and the Mainland, and many Taiwanese business interests are intertwined with PLA business interests, offering potential points of access to conduct operational preparations for network attacks.¹⁶⁷ Second, Taiwan could develop a more in-depth understanding of the PLA’s battle networks since it shares a common language. Finally, Taiwan has the technical wherewithal to disrupt the PLA’s networks, with world-class computer software programmers and engineers who could be enlisted in the effort.¹⁶⁸ The key to disrupting networks in a conflict would be to map them prior to war. Mapping the networks and developing plans to disrupt or deceive them would be time consuming and labor intensive. A major effort and significant resources would have to be devoted to the task. In July 2013, Taiwan’s defense ministry announced that its Communications, Electronics, and Information Bureau (CEIB) had commissioned a fourth cyber warfare squadron. Two months later, Taiwan announced that it would also create a facility for conducting simulated cyber warfare.¹⁶⁹

Taiwanese armed forces should also prepare to wage a protracted “electronic harassment” campaign against conventionally superior Chinese forces. As some contemporary observers have noted, spectrum supremacy is highly challenging to obtain. It can prove exceedingly difficult to ascertain when and whether a prospective adversary has been ejected from what constitutes an immense and invisible battlefield.¹⁷⁰ For outnumbered and outgunned Taiwanese armed forces, electronic warfare could play a vital “leveling”

Taiwanese armed forces should also prepare to wage a protracted “electronic harassment” campaign against conventionally superior Chinese forces.

¹⁶⁵ Norton A. Schwartz and Jonathan W. Greenert, “Air-Sea Battle: Promoting Stability in an Era of Uncertainty,” *The American Interest*, February 20, 2012, available at <http://www.the-american-interest.com/article.cfm?piece=1212>.

¹⁶⁶ Jan van Tol, Mark Gunzinger, Andrew Krepinevich, and Jim Thomas, *AirSea Battle: A Point-of-Departure Operational Concept* (Washington, DC: Center for Strategic and Budgetary Assessments, 2010), pp. 34, 112, available at <http://www.online.org/wp-content/uploads/2010/05/2010.05.18-AirSea-Battle.pdf>.

¹⁶⁷ Andrew Jacobs, “Ties to China Linger as Issue as Taiwanese Prepare to Vote,” *The New York Times*, January 4, 2012, available at <http://www.nytimes.com/2012/01/05/world/asia/in-taiwan-elections-question-of-china-looms.html?pagewanted=all>.

¹⁶⁸ Taiwanese hackers are thought to be responsible for a large portion of the viruses infecting Chinese computer systems.

¹⁶⁹ Russell Hsiao, “Critical Node: Taiwan’s Cyber Defense and Chinese Cyber-Espionage,” *China Brief*, The Jamestown Foundation, 13, No. 24, December 5, 2013, available at http://www.jamestown.org/uploads/media/China_Brief_Vol_13_Issue_26.pdf.

¹⁷⁰ See Brendan Koerner, “Spectrum Warfare: Inside the New Arms Race to Control Bandwidth on the Battlefield,” *Wired*, February 18, 2014, available at <http://www.wired.com/2014/02/spectrum-warfare/>.

role by disrupting Chinese force concentration, eroding their informational awareness, and sapping their overall morale. The ubiquity and relative affordability of electronic jammers and GPS denial of service devices could provide the ROC armed forces with a useful and cost-effective means of diluting the PLA's conventional superiority. In the event of conflict, Chinese military assets under electronic attack might temporarily lose their communication and navigation capabilities in the midst of highly contested territory, thus rendering them more vulnerable to ROC forces with a better knowledge of local terrain and conditions.

Taiwan should therefore focus on training more electronic warfare specialists and deepening its inventory of sophisticated sensors and jammers. Jammers are typically far more effective when operated from the air than from the ground. Rather than disburse large amounts of funds on manned electronic warfare aircraft, Taiwan might consider acquiring a swarm of high-endurance, low-signature, and runway-independent UAVs. Fitted with electronic attack payloads, these unmanned systems could then be dispersed throughout the island and launched from pneumatic and hydraulic launchers to engage in a protracted electronic harassment campaign against PLA ground units or ship convoys.¹⁷¹ In the future, developments in technology will allow armed forces to place miniaturized jammers on small, hand-launched UAVs, such as the U.S. Wasp.¹⁷² As the ROC reconfigures its ground forces, it might consider providing units with such devices for experimentation. Just as the ROC can prevent the PLAAF from rapidly gaining mastery of the air by investing in a more distributed and resilient form of air defense, it can also work to deny the PLA spectrum dominance and thus from attaining the state of informational supremacy so highly valued by PLA military strategists.

Psychological Operations

One of the most important factors in a potential cross-strait conflict would also be one of the most challenging to measure. Indeed, both parties' so-called "will to war," or level of commitment after the initiation of conflict, would rest heavily upon elements that are difficult to quantify, such as the morale of their armed forces, the determination of their respective political leaders, and the levels of sustained societal support for military action.¹⁷³

¹⁷¹ Taiwan might consider acquiring or developing a platform similar to the Bat UAV, a catapult-launched low-flying UAV with a blended wing design, infrared and synthetic aperture radar sensors, and a flight endurance of close to 15 hours. Engineers have recently succeeded in fitting the Bat UAV with an electronic attack payload. See John Keller, "Catapult-launched Bat UAV from Northrop Grumman Being Adapted to Electronic Warfare," *Military and Aerospace Electronic*, November 25, 2013, available at <http://www.militaryaerospace.com/articles/2013/11/bat-uav-ew.html>.

¹⁷² See Paul McLeary, "U.S. Army Maps Future of the Electronic Battlefield," *Defense News*, June 7, 2013, available at <http://www.defensenews.com/article/20130607/DEFREG02/306070009/US-Army-Maps-Future-Electronic-Battlefield>.

¹⁷³ French general and strategist Andre Beaufre famously defined strategy as "the art of the dialectic of two opposing wills using force to resolve their dispute." Andre Beaufre, *An Introduction to Strategy* (New York: Frederick A. Praeger, 1965), p.22.

Described by some as “the forgotten dimension of strategy,” questions related to civil resiliency and morale loom large in Taiwanese strategic thinking.¹⁷⁴ Taiwan’s 2013 QDR, for example, contains an entire section on what it terms “overall intangible combat capabilities,” which range from military morale and the nurturing of patriotism within Taiwanese society to cultural education and psychological warfare. There are concerns over the Taiwanese public’s “weaker threat awareness,” given that, “for over half a century the public has been living away from wars in peace and prosperity,” thus “gradually neglecting threats and surrounding security issues.”¹⁷⁵ Questions related to the lowered resilience of post-industrial societies are not unique to Taiwan and have been posed by Western thinkers for decades. In addition to these concerns, Taiwan’s QDR and most recent defense report both draw attention to Mainland China’s so-called “three-front war” strategy of legal, public opinion, and psychological warfare, which consists of “using propaganda and cross-strait exchange activities to confuse the peoples’ awareness of friend/foe and disunite the people.”¹⁷⁶ Long-time observers of PLA military thinking have drawn attention to the heightened focus in China on psychological warfare with particular regard to what is described as “alienation psychological warfare . . . aimed at generating dissension and discord in the enemy’s camp, creating friction and fracturing links between the population and the leadership, between allies, and between the military and civilian leadership.”¹⁷⁷

In response to concerns over Taiwan’s societal resilience and China’s growing focus on psychological warfare, the Taiwanese QDR called for a strengthening of patriotic education and for a form of psychological counteroffensive, which seeks to prevent war by winning over the hearts and minds of the mainland Chinese citizens. This should be accomplished, the QDR states, by “advocating the concepts of freedom and democracy through psychological warfare communication platforms,” with the hope of “guiding” Mainland public opinion.¹⁷⁸ Taiwanese officials regularly profess their hope that “Taiwan’s success as a market-oriented democracy . . . can influence Mainland China in a positive way.”¹⁷⁹

¹⁷⁴ See Michael Howard, “The Forgotten Dimensions of Strategy,” *Foreign Affairs*, Summer, 1979, available at <http://www.foreignaffairs.com/articles/32623/michael-howard/the-forgotten-dimensions-of-strategy>.

¹⁷⁵ For example, writing in the mid-1990s, Edward Luttwak wrote that even though post-industrial modern societies “may still possess the physical attributes of great power strength or the economic base to develop such strength . . . [that] their societies are so allergic to casualties that they are effectively debellized, or nearly so.” Edward N. Luttwak, “Twilight of the Great Powers: Why We No Longer Will Die For a Cause,” *The Washington Post*, June 27, 1994.

¹⁷⁶ The report adds, “It (China) hopes to gradually change the Taiwanese people’s impression of it being militaristic, and to weaken the awareness of servicemen in the ROC armed forces, so as to weaken our determination to resist the enemy.” National Defense Report Editing Committee, MND, *2013 ROC National Defense Report*, p.46.

¹⁷⁷ Dean Cheng, *Winning Without Fighting: The Chinese Psychological Warfare Challenge*, Backgrounder no. 2821 (Washington, DC: The Heritage Foundation, 2013), available at <http://www.heritage.org/research/reports/2013/07/winning-without-fighting-the-chinese-psychological-warfare-challenge>.

¹⁷⁸ Quadrennial Defense Review Editing Group, MND, *2013 Quadrennial Defense Review*, p.64.

¹⁷⁹ See Thalia Lin, “Don’t Say Goodbye to Taiwan,” *The National Interest*, February 27, 2014, available at <http://nationalinterest.org/commentary/dont-say-goodbye-taiwan-9966>.

Within this context, it should be recognized that people on both sides of the Straits would perceive a cross-strait conflict as fratricidal. Indeed, close to 98 percent of Taiwan's population is Han Chinese, and any act of PRC aggression which resulted in a large numbers of Taiwanese casualties might provoke a societal backlash on the Mainland. In the midst of a recent controversy over the PLA's display of a map of Taiwan during a military drill, a number of Mainland Chinese "netizens" protested against such overt demonstrations of hostility, arguing that a cross-strait war should be avoided at all costs since "the people on both sides of the Taiwan Strait are all ethnic Chinese."¹⁸⁰ The instrumentalization of Chinese ethnic nationalism and of both societies' shared civilizational heritage might prove to be a more effective and discreet means for Taiwan to help shape Mainland public opinion than a singular focus on democracy promotion.¹⁸¹ Indeed, this might not only prove more effective in winning over Mainland China's increasingly vibrant blogosphere, but also be considered less provocative by a CCP regime whose foremost concern remains its own survival.¹⁸² Moreover, Taiwan's promotion of its democratic identity might serve a more useful purpose if directed inwards as a constant reminder to its populace of what it stands to lose in the event of PRC aggression.

In the event of an attack on Taiwan, however, its psychological operations could take on a far more offensive character, extending moral support to democratic and ethnic opposition movements within both China's urban areas and its more restive peripheral regions. Acts of socioeconomic retribution could also be envisaged. It is estimated, for instance, that Taiwan-Invested Enterprises (TIE) currently employ at least 15 million PRC citizens, primarily within urban areas. If these firms were to suddenly cease their activities, the resulting economic turmoil could lead to major unrest in China's major cities. Finally, it is important to stress that Taiwan's concerns with regard to its populations' resiliency in the face of hardship and mass casualties could be extended to the majority of modern societies, including Mainland China, which has not experienced a conflict involving numerous fatalities since 1979. Decision-makers in Taipei could durably reinforce crisis stability by reinforcing Taiwan's defense and raising the prospect of a bloody and protracted war in the event of PRC aggression.

¹⁸⁰ "Tactical Taiwan Map on CCTV Draws Concern," *Taipei Times*, October 16, 2013, available at <http://www.taipeitimes.com/News/taiwan/archives/2013/10/16/2003574633>.

¹⁸¹ For an interesting study of the progressive emergence of a pan-national Sinic identity in China, Taiwan, and Hong Kong, see Frank C.S. Liu and Franck L.F. Lee, "Country, National, and Pan-national Identification in Taiwan and Hong Kong: Standing Together as Chinese?" *Asian Survey*, 53, No. 6, 2013, pp. 1112–1134.

¹⁸² Ian Easton describes Taiwan's model of governance as "anathema to the CCP's narrative, which holds that ethnically Chinese people can only be ruled by an authoritarian system," Ian Easton, *China's Military Strategy in the Asia-Pacific: Implications for Regional Stability* (Arlington, VA: Project 2049 Institute, 2013), p.4, available at http://www.project2049.net/documents/China_Military_Strategy_Easton.pdf.

Intelligence Operations and Covert Warfare

While much attention is focused on PRC intelligence operations against Taiwan, the robustness of Taipei's network of human intelligence (HUMINT) collectors on the Chinese mainland is frequently overlooked. This is another area where Taiwan can develop an asymmetric edge by leveraging its unparalleled knowledge not only of points of failure in PLA weapon systems, but also of the shadowy world of bureaucratic politics in the PRC. It might also prove useful for Taiwanese intelligence to enhance its penetration of the more frustrated and disenfranchised portions of Mainland Chinese society with the goal of facilitating unrest on the PRC's soil in the event of aggression. Finally, Taiwan possesses highly capable SOF, trained to operate behind enemy lines with the capability of carrying out covert missions in the PRC.¹⁸³ The ROCN's Underwater Operations Unit and the Taiwan Marine Corps' Amphibious Reconnaissance Unit could both play an important diversionary role by sabotaging PLA vessels as well as undersea infrastructure and naval bases located along the Mainland's southeastern coastline.

In summary, Taiwan can and should raise its defense spending, both as a means of signaling to Washington that it remains committed to its own defense and of backstopping its continued negotiations with the Mainland aimed at improving cross-strait relations. The strengthening of Taiwan's conventional deterrent, however, is not solely contingent on the provision of additional resources. Indeed, there are many useful steps that the ROC can take, even under its current defense spending caps, by reallocating its scarce resources toward more tightly focused air and sea denial efforts, irregular ground defense, and network attack. For the ROC Air Force, this would entail shifting resources from manned fighters and active ballistic missile defenses toward a highly distributed and resilient network of ground based air defenses, passive defense such as the use of decoys, as well as, in the longer term, toward employing ground-based directed energy systems. For the ROC Navy, this reorientation would entail shifting resources from its surface fleet toward undersea systems, such as midget submarines, the development of unmanned underwater vehicles and building up a larger inventory of sea-mines. The ROC Army, for its part, should shift resources away from combined arms maneuver forces and toward coastal defense while adopting, in parallel, a more hybrid structure in order to more effectively implement a Fabian ground defense strategy. This would revolve around well-trained resistance fighters capable of operating in a highly decentralized manner from urban and mountainous terrain. Finally, Taiwan should accord highest priority to improving its network attack and electronic warfare capabilities in order to deny the PLA information dominance and sharpen its asymmetric edge.

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¹⁸³ See "Taiwan Seeks to Strengthen its Special Operations Capabilities," *Jane's Defence Weekly*, IHS Jane's, May 24, 2006.

CONCLUSION

In February 2014, Taiwanese and PRC officials met officially for the first time in over six decades. The meeting was perceived, in the United States and abroad, as a powerful indicator of the new warmth in cross-strait ties.¹⁸⁴ Meanwhile, even as relations between Beijing and Taipei have markedly improved, China's increasingly tense maritime interactions with countries such as Japan and the Philippines have captured the attention of U.S. policymakers and triggered widespread concerns over the risks of escalation. As a result, questions related to the future of Taiwan and its defense are seldom raised, and the island democracy only rarely features in contemporary discussions of crisis stability in Asia.

This intellectual neglect constitutes a potentially hazardous blind spot in American strategy. Indeed, by virtue of its rarefied geographical position and continued centrality in PLA military planning, Taiwan is, and will remain, of major strategic significance. Furthermore, despite surface improvements in cross-strait ties, the PRC appears no closer to renouncing the use of force as a means of resolving the dispute. The PLA's steady concentration of military assets aimed at Taiwan serves as a constant reminder of this fact. Meanwhile, the Taiwanese people continue to reject unification with the PRC and remain as strongly attached as ever to their freedom from Chinese coercion or aggression.

For the past decade, security managers in Taipei have struggled to preserve this freedom in the face of a rapidly deteriorating military balance. Confronted with the dual challenge of the PRC's growing military capabilities and the increased reluctance of the United States to provide high-end military equipment, Taiwanese planners have

¹⁸⁴ See Austin Ramzy, "China and Taiwan Hold First Direct Talks Since '49," *The New York Times*, February 11, 2014, available at http://www.nytimes.com/2014/02/12/world/asia/china-and-taiwan-hold-first-official-talks-since-civil-war.html?_r=0.

engaged in a reconceptualization of their defense strategy, privileging asymmetric tactics while emphasizing resiliency and self-reliance. While this report has expressed support for certain elements of this doctrinal reorientation, it has also pinpointed various shortcomings in terms of its current implementation and has argued in favor of a more economically sustainable and radically asymmetric strategic approach. Hard ROC 2.0 recognizes that a surprise PLA invasion is less likely than a coercive air and missile campaign, cyber attacks, or a naval blockade intended to break Taiwan's political will or prepare for a follow-on invasion. The ROC should, therefore, primarily aim to deny PLA forces the ability to operate within Taiwan's waters and airspace and disrupt or delay any attempt at establishing lodgment on Taiwanese territory. If Taiwan wishes to preserve the ability to accomplish such objectives in the face of China's rapid and continuous growth in military and technological prowess, its security managers will need to engage in a profound and wide-ranging revision of their operational concepts and force structures.

There is no doubt that Taipei urgently needs to increase its defense spending and reorder its spending priorities. As compared to China's 20 years of annual double-digit percentage increases in defense spending, Taiwan's defense modernization remains insufficiently resourced. Although Taiwan's political leadership has established a floor of 3 percent for defense spending, defense expenditure continues to fall far short of that requirement. Absent a stronger commitment to the island's defense, Taiwan's political leadership may struggle to convince an increasingly divided Washington of the need to fully maintain its present security commitments.

Taiwan's growing defense challenges, however, will not be resolved by a mere increase in resources. Indeed, this report has argued that Taipei can only hope to deter PRC aggression by fundamentally modifying its armed forces' existing concepts of operations, as well as the nature of its defense acquisitions. In light of the rapidly growing conventional mismatch between ROC and PRC armed forces, the main priority of Taiwanese defense planners should be to raise the human and material costs of Chinese military action, especially by holding out the specter of a protracted war. When confronted with a Chinese leadership that is both leery of prolonged conflict and intent on preventing external intervention, Taiwan's ability to buy time is critical.

At a time when China's relations with its smaller neighbors are increasingly characterized by military asymmetry, Taiwan's predicament has the potential to emerge as something of a strategic parable; the lessons drawn from its study could prove highly didactic in nature. This report has argued in favor of Taiwan acquiring a model anti-access network for the 21st century: multi-dimensional, highly resilient and distributed, with mutually reinforcing lines of effort. The candidate operational concepts laid out draw their inspiration from guerrilla warfare and seek to impose virtual and moral, as well as physical, attrition on enemy forces. Mindful of the island's growing resource constraints, Hard ROC 2.0 has attempted to provide a first blueprint for an anti-access

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architecture that is both more cost-effective and better tailored to the challenges posed by China's military rise. It calls for a progressive divestment away from high-end, conventional platforms and, as a result, for a major cultural shift within Taiwan's armed forces. However, successful transition to a protraction centered deterrence strategy and fielding of the asymmetric capabilities to support it could present an opportunity for Taiwan to greatly increase its stature as a security partner for its neighbors who confront many of the same challenges in seeking to respond to rapidly growing Chinese military capabilities.

Together, coastal defenses, irregular ground forces, midget submarines, aircraft decoys, and network attack and electronic warfare capabilities may not appear as prestigious as traditional combat aircraft, ships, and tanks. Nevertheless, a judicious employment of such systems would likely prove far more effective at denying the PLA the use of Taiwan's airspace and surrounding waters. Increased investments in these capabilities should be perceived not only as a way of addressing the deteriorating military balance, but also as a means of signaling to both Washington and the Taiwanese people that the ROC remains strongly committed to its own defense.

GLOSSARY

A2/AD	Anti-access/area denial
ADIZ	Air Defense Identification Zone
AESA	active electronically scanned array
AIP	air independent propulsion
AMRAAM	Advanced Medium Range Air-to-Air Missile
APEC	Asia Pacific Economic Cooperation
ARM	anti-radiation missile
ASCM	anti-ship cruise missile
ASFC	Aviation and Special Forces Command
ASW	anti-submarine warfare
ATGM	anti-tank guided missiles
AVF	all-volunteer force
AWACS	Airborne Warning and Control System
BDA	battle damage assessment
BVR	beyond-visual-range
C2	Command and Control
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
CCD	camouflage, concealment, and deception
CCP	Chinese Communist Party
CCS	Carbon Capture and Storage
CEIB	Communications, Electronics, and Information Bureau
CEP	circular error probability

CIWS	Close-In Weapons System
COG	center of gravity
CSBA	Center for Strategic and Budgetary Assessments
CSSTA	Cross-Strait Service Trade Agreement
DoD	Department of Defense
DPP	Democratic Opposition Party
ECS	engagement control station
EMP	electromagnetic pulse
EPP	electric power plant
ESSM	Evolved Sea Sparrow Missile
EW	electronic warfare
FAC	fast attack craft
GDP	gross domestic product
GMVLS	guided missile vertical launching systems
GPS	global positioning systems
G-RAMM	guided rockets, artillery, mortars, and missiles
HUMINT	human intelligence
IDF	Indigenous Defense Fighters
INF Treaty	Intermediate-Range Nuclear Forces Treaty
IRST	infrared search and track
ISR	intelligence, surveillance, and reconnaissance
JTACS	Joint Terminal Attack Controllers
KMT	Kuomintang
LACM	land-attack cruise missile
LCU	Landing Craft Utilities
MANPADS	man-portable air defense systems
MBT	main battle tanks
MCM	mine countermeasure
MLRS	multiple launch rocket systems
MTCR	Missile Technology Control Regime
MTVR	Medium Tactical Vehicle Replacement
NIFC-CA	Naval Integrated Fire Control-Counter Air
nm	nautical mile
OSD	Office of the Secretary of Defense
PAVN	People's Army of Vietnam
PGM	Precision Guided Munitions

Pk	probability of kill
PLA	People's Liberation Army
PLAAF	People's Liberation Army Air Force
PLAN	People's Liberation Army Navy
POL	petroleum, oil, and lubricant
PPP	purchasing power parity
PRC	People's Republic of China
PSYOPS	Psychological Operations
QDR	Quadrennial Defense Review
ROC	Republic of China
ROCAF	Republic of China Air Force
ROCN	Republic of China Navy
RSC	reconnaissance strike complex
SIGINT	signals intelligence
SOF	special operations forces
SRBM	short-range ballistic missile
SSAC	Science of Second Artillery Campaigns
TIE	Taiwan-Invested Enterprises
SAM	surface-to-air missile
UAV	unmanned aerial vehicle
UCAV	unmanned combat aerial vehicle
UUV	unmanned underwater vehicle

